



Mobile health: Connecting managers, service providers and clients in Bombali district, Sierra Leone

Intervention study on mHealth for maternal and newborn health in resource-poor community and health system settings

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Final report

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Abbreviations and acronyms

| | |
|----------------|---|
| ANC | Antenatal care |
| ANC1 | First antenatal care visit |
| CHA | Community health assistant |
| CHC | Community health centre |
| CHO | Community health officer |
| CHP | Community health post |
| CHW | Community health worker |
| CITPH | Center for Innovation & Technology in Public Health |
| DHIS | District health information system |
| DHMT | District health management team |
| DHS | District health sister |
| DMO | District medical officer |
| EDCU assistant | Endemic disease control unit assistant |
| EL | Endline |
| EmONC | Emergency obstetric and neonatal care |
| FGD | Focus group discussion |
| FHCI | Free health care initiative |
| FP | Family planning |
| HIV | Human Immunodeficiency Virus |
| HMIS | Health management information system |
| HW | Health worker |
| KIT | Royal Tropical Institute |
| MCH | Maternal and child health |
| MCH aide | Maternal and child health aide |
| MCHP | Maternal and child health post |
| MICS | Multiple indicator cluster survey |
| ML | Midline |
| mHealth | Mobile communication for health |
| MNCH | Maternal, newborn and child health |
| MNH | Maternal and newborn health |
| MoHS | Ministry of Health and Sanitation |
| MRC | Medical Research Centre |
| NATCOM | National Telecommunications Commission |
| NET-RC | DFID New and Emerging Technologies Research Competition |
| PHI | Public Health Institute |
| PHU | Peripheral health unit |
| PNC | Post-natal care |
| PW | Pregnant woman |
| RNCH | Reproductive, neonatal and child health |
| SECHN | State-enrolled community health nurse |
| SLL | Sierra Leone Leone (currency) |
| SRHR | Sexual and reproductive health and rights |
| STI | Sexually transmitted infection |
| SSI | Semi-structured interview |
| TBA | Traditional birth attendant |
| USL | University of Sierra Leone |
| VPN | Virtual private network |
| WCBA | Women of childbearing age |
| WHO | World Health Organization |

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Executive summary

Background and objectives

This intervention study ‘mobile health for maternal and newborn health in resource-poor community and health systems settings, Sierra Leone’ was funded by DFID as part of the New and Emerging Technologies Research Competition. The study, implemented in 2012–2013, followed the feasibility study carried out in 2011.

The general objective of the study was to assess the effect of integrating mobile communication strategies, as part of existing health service packages, on maternal and newborn health (MNH) service utilization in one health district, Bombali, in Sierra Leone.

Specific research objectives were: (i) to assess changes in utilisation of MNH services, including family planning (FP), associated with expanded options for client-initiated and provider-initiated mobile communication; (ii) to assess changes in health workers’ job satisfaction and control at work, and other self-reported changes due to expanded options for provider–provider communication and provider–client communication; (iii) to assess changes in MNH referral systems due to expanded mobile communication options; (iv) to assess changes in maternal death reporting; (v) to identify implications for the health system of mobile communication initiatives; and (vi) to make policy recommendations for the integration of mobile communication initiatives in district-level MNH service packages.

This report presents the overall results of the intervention study that took place between August 2012 and July 2013; for details it refers to the Baseline² and Midline³ reports that were published earlier.

Interventions

The interventions over the 12-month period were divided into two stages of six months each, and were separated into two ‘wedges’ of six chiefdoms each. Some of the interventions were started in stage 1 in the first wedge and only later in the second wedge. This step-wedge approach thus created an ‘internal’ non-intervention (counterfactual) group to compare interventions.

The stage 1 interventions (August 2012 to January 2013) consisted of, firstly, the establishment of a virtual private network (VPN, or ‘closed user group’) to improve communication between health workers; this part was implemented across both wedges, i.e. in all chiefdoms of Bombali district. It included all 98 peripheral health units

² Magbity et al., 2013.

³ Jalloh-Vos et al., 2013.

(PHUs) receiving a mobile phone and SIM card that allowed health workers to call their managers and colleagues in the VPN network for free. During stage 2 (February–July 2013) these interventions continued.

Secondly, interventions regarding health workers' communication with clients and regarding TBA involvement were also started during this first stage, but only in Wedge 1 facilities; Wedge 2 facilities started implementation only during stage 2. This included distribution of prepaid phone credit to facilities in order to call clients, to remind them of appointments.

Thirdly, all PHUs in the six chiefdoms included in Wedge 1 received a solar charger for the phone. Wedge 2 PHUs did not receive these, as initially not enough were available, and thus the Wedge 1 facilities involved in client communication were prioritized. Subsequently, the further distribution of chargers was abandoned, as the chargers had been found to be of too low quality and ineffective.

Lastly, in one chiefdom in both Wedge 1 (from stage 1) and Wedge 2 (from stage 2), selected traditional birth attendants (TBAs) in one chiefdom were engaged and provided with a mobile phone and access to the VPN, to improve links between health workers and TBAs for the purpose of strengthening the client communication intervention.

Methods

Mixed methods were used for data collection. Quantitative methods were employed to collect information on (i) facility characteristics and staffing levels (baseline survey involving 98 facilities) and (ii) background information on one part of the intervention (VPN) and one part of the outcomes (health worker job satisfaction), through repeated surveys in all 13 chiefdoms (baseline, midline and endline), resulting in 542 completed health worker questionnaires.

Qualitative methods were implemented in two Wedge 1 chiefdoms (midline and endline) and two Wedge 2 chiefdoms (endline). They consisted of: (i) 101 semi-structured interviews with enrolled clients, their male partners, TBAs, health workers and health managers, (ii) eight focus group discussions with 106 female and male community members, (iii) summary information from maternal death reports; and (iv) summary information from monthly PHU reports on mHealth enrolment and follow-up.

Findings

Service utilization

Communication between health workers and clients: The average number of 'weekly or more often' phone calls and text messages from health workers to clients increased, as expected. The difference was more pronounced in Wedge 1, where the average number of staff per facility is lower and where the facility phone may be more available to individual staff than in other types of facilities. Three main reasons for communication

were identified, although with some variation across respondent types: appointments, health information on a range of topics, and clients' health status.

Health promotion and information about health topics emerged as important. Topics, gaps in information and queries among clients may need to be explored before an intervention is started.

Communication between health workers and TBAs: The change in communication between health workers and TBAs, reported in the health workers questionnaire findings, was different from what was expected, with a decrease between baseline and endline in Wedge 1 despite the latter starting the TBA intervention activities earliest. Difficulties with solar chargers, using the phone and the introduction of the VPN system, together with health workers' communication with clients, may have influenced this result which is contradicted by results from the qualitative data. The main reasons for TBAs to get in touch were difficult cases, to inform clients about referral to the clinic, and client mobilization. Health workers initiated contact to reach clients and to inform TBAs about meetings and ask them to help out at the clinic.

Utilization of reproductive health services: The comparison at midline (double difference analysis with counterfactual) of measured change in the intervention chiefdoms (Wedge 1) and in the non-intervention chiefdoms (Wedge 2) during the stage 1 intervention period showed a significant positive net effect on facility-based service utilization in Wedge 1, for seven out of ten of the selected indicators (ante-natal care (ANC) 1, ANC4, facility delivery, postnatal care (PNC) 1, PNC2, PNC3 and newly initiated family planning). This analysis had its limitations because of a lack of routine health system data for the last month of the stage 1 intervention period as well as for all of the stage 2 period. The full 12-month intervention analysis will be done once data become available; this will allow the full effect of the mHealth intervention to be appreciated over time.

In comparison, qualitative data obtained from all types of respondents indicated conclusively that there was a perceived increase in utilization for various types of reproductive health services and these were linked to the increase in communication between health workers and clients.

Influence of Bombali Sebora chiefdom: The possible influence of the Bombali Sebora chiefdom, which includes a large part of the district capital city of Makeni, in the control arm Wedge 2, was studied in a separate double difference analysis. When excluding the chiefdom from Wedge 2, the comparison revealed that the net gains largely disappear, as Wedge 2 indicators for the remaining (largely rural) chiefdoms in Wedge 2 improved and the difference between the changes in both wedges became smaller – indicating that service utilization in Bombali Sebora chiefdom is poor. Once the full routine data set is obtained, further analysis may reveal whether the results were sustained and what possible explanations could be.

TBA influence: When comparing the service coverage utilization data in the first stage of implementation of Wedge 1 with and without the TBA intervention chiefdom, a positive effect of TBA involvement was found for utilization of family planning services. This effect was also confirmed by qualitative data from the respective chiefdoms where the influence of TBAs in the community as motivators was described. For the other service coverage indicators, no effect was found for the TBA intervention, although the qualitative data contradicted this finding, indicating that TBAs played an important role connecting clients with services. As the TBA intervention was implemented in one chiefdom in Wedge 1 only, involving relatively few participants over a short period of time, it is possible that any effect was not strong enough to be reflected in the routine health management information system data.

Other health benefits: The qualitative research data identified a number of other perceived health benefits of the mHealth intervention related to the communication between health workers and clients – namely, seeking care earlier, reducing defaulting on treatment, improved responses to emergencies, better quality of services and a reduction in unintended pregnancies, among both married women and teenagers.

Sensitivities and gender issues: A number of sensitive issues surfaced that may need attention in programmes involving new or expanded mobile communication. Some female clients mentioned being uncomfortable using other people's phones because of privacy issues and feelings of being dependent on others. A number of respondents described how men were uncomfortable, or outright jealous, about their partners receiving phone calls.

Family planning was a key sensitive issue for both clients and partners. In several instances, women and some community males indicated that women joined the family planning programme and the mHealth scheme without informing their partners to avoid problems. This was sometimes associated with the decision to use a third person's phone as a means of communication, rather than their partner's phone. On the other hand, some of the partners and other males in the community were clearly supportive of women joining the mHealth scheme for both ANC and family planning.

New interventions may need to address sensitivities related to topic contents, privacy and confidentiality.

National phone line: Data collected on the knowledge and use of the national information line were inconclusive. There were indications of a higher than average number of calls from Bombali district but at the same time a lower than average number of calls from Bombali relating to family planning, gynaecology and pregnancy issues. However, given the short duration of the intervention measured and data limitations, no conclusions could be drawn. Relatively few respondents were actually aware of the free information line.

Health worker job satisfaction and communication

Communication with peers and seniors: As expected, the health worker survey responses showed a perceived increase in communication among health workers between baseline and endline. Qualitative data confirmed this and described health workers' appreciation for this intervention.

Further analysis showed inconsistencies within and between wedges. At midline there was a general trend towards an increase in communication frequency for both wedges, which could possibly be attributed to the novelty of the intervention, which plateaued (and then decreased) over the course of the implementation.

Reasons for communication: The qualitative and quantitative data indicated that the improved communication opportunities brought about by the interventions allowed health workers to consult in a timelier manner and more fully with their supervisors and colleagues, without time or phone credit constraints. Consultations related to improving quality of services (via advice on clinical issues and referral) and to operations and logistics, such as timely notification of meetings or workshops, supply chain management and disease surveillance information.

Job satisfaction and communication: The mHealth package of interventions resulted in an improvement in the perceptions of health workers regarding communication with peers and seniors and quality of working life. In contrast, the results for the working conditions domain, such as satisfaction with facility, safety and supplies, did not show a significant difference over time or between wedges. Overall, the data could be interpreted as improved job satisfaction due to the mobile communication intervention. Attribution could not be determined with certainty because of the lack of a counterfactual. Qualitative data, however, supported the improvement of quality of working life resulting from the intervention.

Only those domains of job satisfaction that were related to the intervention, such as communications with peers and quality of working life, were investigated within the context of this study. Job satisfaction or motivation relating to other domains such as remuneration, locus of control or career advancement were not investigated.

Information about TBA job satisfaction was only collected through interviews, but these also suggest an increased satisfaction among TBAs with their activities. Phone ownership was an important factor, as was status in the community, because they were seen by the community as linked to the facility and part of the health system.

Workload: In interviews, most health workers were quite positive about the new communication opportunities that brought important changes to their ways of working. Health workers referred to an increased workload due to the new mobile communication and interaction, and the increased service utilization can also be seen as such. However, many seemed to have found the overall balance positive. Some indicate that the increase

in utilization and improved relationships with clients are positive and worthwhile outcomes of the increased workload, making them feel proud.

In general, TBAs expressed more varied responses regarding workload. Some felt the workload had reduced; others experienced an increase, interpreting this as an opportunity. Many TBAs appreciated the efficiency improvements around their work, in terms of a reduction of effort needed to travel back and forth to the facilities, as well as the phone credit savings.

Benefits of improved communication: The expanded mobile phone communication options offered a number of benefits to health workers and TBAs, including reduced travel time and increased service utilization. These resulted in perceptions of improved relationships and trust among health workers and between these and TBAs and reduced cost of communication.

Referral

Communication about (ambulance) referral: Appropriate and timely referral is a life-saving step in the chain of events surrounding obstetric complications. Key informants suggested that the VPN had been used to improve communication between referral levels, and results indicated that this had been successful. TBAs were often an important link in this chain. It was, therefore, promising that health workers noted that TBAs engaged with them for advice about difficult cases in the community.

Changes in the referral process: Qualitative data indicated that the VPN mobile network had reduced the cost of referral communication and improved access to the district and mission hospital ambulances. Referral efforts may have become more efficient, as health workers could now obtain advice from colleagues first and then decide together whether referral was really necessary. A number of respondents maintained that the mobile network had saved lives.

Maternal death reporting

The number of maternal death notifications to the district health management team (DHMT) tripled between baseline and midline. Since maternal deaths are known to be grossly underreported in Bombali district, the increased reporting most likely was a result of improved reporting and not an actual increase in maternal deaths. This was confirmed by observations emerging from the qualitative data.

Implications for the health system

Service delivery: The study showed that improving service utilization involved not only the 'static' clinic services but also an emerging alternative of 'mobile' consultation. This may require reflection on the implications for provider–client interaction and the need for a protocol to address this. Also, service quality was an important aspect, with much of the communication between health workers being about seeking clinical advice and doing a better job. Finally, services would need to be prepared for an increase in demand, not only in terms of workload but also equipment and the drugs and supply chain.

Workforce: It is important to realize that the various mHealth interventions have different cost–benefit ratios. Introducing an easy way to call colleagues such as the VPN may bring important time-efficiency gains against little effort, while a client communication strategy based on health workers calling clients places other demands on the time and management capacity of staff. The same type of issues would then also influence job satisfaction and motivation. TBAs found that mobile communication greatly improved the efficiency of their efforts (qualitative data), in terms of better planning, improved logistics options, reduced cost and time saved.

Information: This was a key potential of mobile applications in various modes and levels of interaction and efficiency. In our study, 'information' (and connecting people to make an information flow possible) was core to the intervention. As expected, there was a strong preference for direct communication with clients as well as among health workers, as opposed to text messaging, to ensure better understanding and not excluding communication with illiterate clients, among others. A further shift towards texting instead of calling, to gain efficiency in communication between health workers and clients as well as among health workers, could result in important efficiency gains; it should, however, address the identified disadvantages of texting and the inclusion of pictorial or audio elements.

Equipment and technology: The interaction of certain mHealth strategies and application with certain health system building blocks demands thinking through a number of issues related to equipment and technology, from choice of phone, alternative charging options and network coverage to issues not tested in our study such as choice of applications, privacy protection and interoperability.

Financing: While building on existing and expanding telecommunications infrastructure, any basic mHealth system that should allow using one or several applications (of which there are many) would require initial investment and ongoing maintenance costs. Stakeholders should make evidence-informed decisions about what is worth investing in, who should pay and which applications are most cost-effective in their setting.

Governance: Given the issues at stake, there may be a need for an mHealth regulatory framework that, in addition to the above-mentioned aspects, would also address legal issues, ethical issues, public–private partnerships, affordability and sustainability, among others. Another governance-related aspect would be how to use mobile communication to improve the accountability of services to the community and to improve community empowerment and voice.

Equity: Equity considerations about the groups that should benefit from an mHealth intervention are important to reflect on at the design stage. Our intervention sought to engage those most in need with the health services and to make the services more responsive. However, the mere fact of using a mobile phone as a tool to establish that link already has implications for who can benefit. Those most in need in terms of MNH

services are likely to be, among others, the poorest, those with least education and awareness and those living in rural and more remote areas. Each of these characteristics might constitute a barrier to participating in a programme aimed at involving precisely such disadvantaged groups.

‘Technology’, if not well thought through operationally, has the potential to benefit those less in need and exclude those most in need. However, there are also ways to make mHealth programmes more inclusive, such as including TBAs (or community health workers) as go-betweens, so that as many clients without access to a phone as possible could participate. These are important issues to consider when setting up or applying mHealth strategies as part of service packages. In the end, the aim is to reduce, not to widen, the ‘information, technology and service gap’ between those who can afford to access these services and those who cannot.

Conclusions

Objective 1: Service utilization

Due to the unavailability of data the counterfactual analysis was (as yet) limited to five out of the first six months of stage 1 intervention implementation, while no outcome analysis was possible for stage 2 and thus the full 12-month intervention period. Once the missing data are available, full analysis over a longer period of time may show different results or explain discrepancies found in the current analysis.

There was an increase in mobile communication between health workers and clients. Appointments, health information, clients’ health status and health promotion were main reasons to communicate. No positive effect was seen for mobile communication between health workers and TBAs in the pilot TBA chiefdoms – although qualitative data suggest an increase in communication.

Available data showed that the intervention led to a positive net effect for facility-based service utilization for seven of the ten selected indicators: ANC1, ANC4, facility delivery, PNC1–3 and newly initiated family planning. This was strongly confirmed by qualitative data. However, when controlling for the chiefdom with the district capital, however, the initial net gains largely disappeared.

The TBA pilot intervention showed a positive effect on both new and continuing family planning and no effect for the other service utilization indicators. Qualitative data meanwhile strongly suggest an increase in utilization for all indicators. It is possible that this effect could not be shown in the small pilot study sample (in just one chiefdom and over a short time period).

Other perceived benefits of the mHealth intervention, based on qualitative data, focused on seeking care earlier, reducing defaulting on treatment, improved responses to emergencies, better quality of services and a reduction in unintended pregnancies.

Issues relating to women’s empowerment and decision-making and confidentiality were identified as important factors influencing enrolment in the client reminder scheme. Participation in the client reminder scheme for antenatal care appears to be less sensitive than for family planning.

Relatively few people in the district were aware of the national information line. No link could be made between the functioning of the line, the use made thereof by Bombali district clients and the other interventions.

Objective 2: Health worker job satisfaction and communication

An overall improvement in the frequency of communication between health workers and between health workers and TBAs was seen, but no trends relating to type of communication and to which cadres of health workers. Reasons for the increase in frequency of communication between health workers were related to improving quality of services and operations and logistics.

Despite a high level of job satisfaction at baseline, data showed an increase in satisfaction scores for domains that were most likely influenced by the intervention. However, attribution could not be ascertained due to the study design.

Health workers often experienced an increased workload due to the activities, tools and effects of the intervention, but found the overall balance positive. This balance may become disrupted once the extra workload is not part of a study but belongs to standard practice.

Benefits associated with the intervention as perceived by respondents included improved relationship and trust among health workers and between these and TBAs, reduced cost of communication, and improved recognition of TBAs by the government, leading to a changing role and status of TBAs in the community.

Objective 3: Referral

The VPN system was shown to be useful in a number of complementary ways: it has strengthened ambulance referral, encouraged pre-referral discussions between service levels and thus better indications for referral, and led to better access to next-level staff.

Objective 4: Maternal death reporting

Since the introduction of the VPN mobile network, maternal death notifications tripled; this was interpreted as an increase in reporting, not in deaths. The calculated underreporting of maternal deaths implied that more efforts are needed to reduce underreporting, including the use of the mobile phone system.

Objective 5: Implications for the health system

There were important issues to consider and address that deal with the interaction between mHealth technology and interventions and the health system building blocks.

Mobile technology offers opportunities to be seized for the benefit of disadvantaged people, but also harbours risks and challenges for the health system that require reflection and mitigation.

Equity considerations refer, among others, to who will be able to enjoy the benefits of the intervention. These should be of paramount concern from the very beginning, because technology-driven tools and strategies tend to have built-in, often unacknowledged selection mechanisms. For example, the choice of systems and infrastructure pre-determines to a large extent who can be included and who will be excluded, informally, on grounds of poverty, literacy or location.

Recommendations

Based on our findings and the above discussions and conclusions, we make the following recommendations to stakeholders.

Health worker to client communication, including the client reminder scheme: The preliminary quantitative analysis and qualitative analysis suggest that the mHealth intervention relating to communication between health workers and clients may result in an increase in service utilization and better relationships between health workers and clients. If this is confirmed by full analysis (when the data are made available), scale-up is recommended. For efficiency reasons there may be a need to consider including additional communication modes apart from only 'calling', such as (automated) texting, although in the Sierra Leone context this has proved challenging. Such a shift should address the identified challenges of texting, improve mobile literacy, especially of women, and possibly include pictorial or audio elements.

Health information and health promotion: The health information component of the mHealth intervention was appreciated by health workers and clients. However, the study could not demonstrate whether the health information needs of clients were sufficiently addressed. This issue needs to be further studied in order to adjust the service provided and meet the needs of clients. Health promotion topics, gaps in information and queries among clients may be explored before a new intervention, and sensitivities addressed related to contents, privacy and confidentiality.

TBA involvement: The involvement of TBAs in health worker to client communication is a promising practice that is generally appreciated by all involved. TBAs can possibly play an important role as lynchpin in communication between clients and health workers. Scale-up would require substantial investment for training and supervision of TBAs, and robust monitoring and evaluation is recommended in a larger implementation population. Other cadres such as community health workers could also be considered, and mHealth applications could be integrated into their training.

VPN network: Although no cost-benefit analysis was undertaken, a VPN is probably a very cost-efficient way to organize communication at health district level. Texting

could be promoted as an additional communication option among staff and between these and the DHMT. For maximum benefit, the number of facility phones per facility should be considered. Larger facilities with more staff may need more than one phone to guarantee that a phone is available to health workers. Centralized negotiations with providers could lead to reduced prices.

Phone charging: The success of the intervention depends on the availability of a phone to health workers (and others such as TBAs); therefore, solutions need to be found and small investments made in innovative solutions for phone charging.

Network coverage: There is a need to extend the mobile networks to additional parts of the country to reach the most in need and avoid creating (or widening) the 'mobile technology gap'. Universal network coverage in Sierra Leone could be advocated for and negotiated between key national stakeholders.

National FHCI/SRHR phone line: Data from this study show limited knowledge and relatively little use of the national phone line. This is not surprising due to the short period in which it has been accessible to the general public. Continued monitoring and evaluation is needed to see how this develops in the course of time, and better marketing and information-sharing about the phone line should be considered.

Ambulance referral: The inclusion of ambulance drivers in the VPN network appears to have improved the time needed for referral pick-up and should be considered for scale-up.

Maternal death reporting: Besides maternal death notification, which has improved considerably with the intervention, mobile communication could be used for quicker information and data collection about maternal deaths for reviews and audits.

Monitoring and evaluation (M&E): As mHealth is integrated into existing and future programmes, there is a need to keep track of data, benefits, experiences and lessons learned. These aspects, in turn, should be integrated into M&E systems.

Further research: In addition to M&E, research components should be built into larger programmes to keep generating evidence on what works and what does not. A priority research agenda could be discussed and agreed on. Possible topics are related to comparing various mHealth applications and systems for health worker to client communication, client monitoring, data collection and access, and cost-effectiveness analysis – for example, staff investment vs. increased service utilization.

Keywords

Health communication, health systems, mHealth, mobile health, mobile technology, maternal health, newborn health, intervention study, Sierra Leone



1 Introduction

The 'mHealth for maternal and newborn health in resource-poor community and health systems settings, Sierra Leone – Phase 2' research project is funded by the DFID programme on New and Emerging Technologies Research Competition (NET-RC). This programme aims to realize the potential of new and emerging technologies for poor people by identifying applications from which, directly or indirectly, they can reap tangible benefits such as improved health and reduced risk of disease.

Research under the NET-RC programme (i) focuses on the best ways to responsibly introduce and use relevant, effective and affordable new technologies in resource-poor settings; (ii) identifies and deals with barriers that prevent disadvantaged people from benefiting; and (iii) addresses possible risks in terms of undue effects on development goals.

This current study follows the successful implementation of a first-phase feasibility study, 'mHealth for maternal and newborn health in resource-poor community and health systems settings, Sierra Leone' carried out between December 2010 and August 2011.⁴

1.1 mHealth feasibility study results

The objective of the first-phase study was to assess the feasibility of introducing and operating selected mobile communication technologies for improved communication on maternal and newborn health (MNH) in a fragile health system in resource-poor settings. The research was mainly qualitative, exploratory in nature and implemented in two sites, Kenema district and Western Area. The main research methods included semi-structured interviews (SSIs), in-depth interviews, focus group discussions (FGDs) and literature review. The main research participants were health workers, health managers and community key informants from the two sites; health service clients and male, female and young community members from the districts; and key informants (health managers and experts) at national level.

The study found that health workers, clients and other community members alike saw much potential in using mobile communication across various health care domains, to improve information, service delivery, access, quality, efficiency, responsiveness and, ultimately, health outcomes.

Work-related use of mobile communication technologies for public health purposes (mHealth) was already very common among health workers. The preferred mode

⁴ See feasibility study report (Magbity et al., 2011).

of communication was voice calls, although half of the health workers also used text messaging (community members – i.e. the health service clients – do not). Barriers identified related to external factors such as geographical coverage of the mobile network and literacy levels, but also to factors that could be addressed by the health system, including poor access to battery charging facilities, poor access to a duty phone and poor access to payment of top-up cards.

Data confirmed that almost all health workers possess a mobile phone; however, only one third of the clients interviewed have one, although another third have conditional access to a family member's phone. Community members consistently mentioned MNH as the most important area that would benefit from mHealth strategies.

Expectations regarding mHealth among both health workers and community members were found to be high, although some health workers fear an increased workload, while confidentiality and privacy issues also raise concerns, especially in view of the practice of 'phone sharing'.

"I expect them to call me and check on my general welfare and to encourage me to visit the clinic frequently, so that the position of my baby can be checked on a regular basis." – Female client, Kenema (Magbity et al., 2011:23)

Communicating with and receiving relevant information from mobile network operators regarding coverage data, subscribers and tariffs has been challenging, and the telecommunications regulator, NATCOM, has not yet been able to share relevant information. This context should be taken into account when pursuing mHealth in Sierra Leone.

While mHealth is perceived as potentially beneficial in a number of ways, health policymakers and managers may need to prepare for strains and demands on the health system. These include a possible increase in workers' workload; the consideration for establishing a 'protocol' for (mobile) communication with clients; standards and systems for an increased information flow among health workers and between them and clients; consideration of costs to health staff and clients; and governance issues surrounding ethical issues and confidentiality, public-private partnerships and sustainability.

1.2 mHealth intervention study

Building on the results from the first-phase feasibility study, the 'mHealth for maternal and newborn health in resource-poor community and health systems settings, Sierra Leone – Phase 2' project proposal was submitted to and approved by DFID in July 2011. The contract for the intervention study was signed in October 2011, after which implementation preparations started, starting with an inception phase.

The research protocol was subsequently developed, in close collaboration with all consortium partners. It was submitted in parallel to the Sierra Leonean Ethical Review Committee and the KIT Research Ethical Committee. Ethical approval was received from both bodies by May 2012.

Baseline research

The baseline study was carried out prior to the start of the intervention, and a separate report is available.⁵ The baseline survey measured the situation before the start of the Bombali district interventions in two wedges. A step-wedge approach was introduced to create an 'internal' non-intervention group to allow comparison of interventions (see the following chapters for further explanation). Information was collected through a survey from 181 health workers, representing 94% of the estimated number of health workers employed at the time of the baseline study.

Health workers generally reported good mobile phone network coverage, with 54% indicating coverage 'all the time' and 30% 'most of the time'. Slightly more health workers in the highest level of facility (community health centres) reported better coverage compared to health workers in lower-level facilities, but this was not statistically significant. Most of the health workers (86%) reported that they were able to initiate and receive phone calls/text messages inside the health facility. For the remaining 14%, an average walk of 28 minutes was needed to reach network coverage (range between 1 and 90 minutes walking).

Almost none of the health worker respondents (1%) had access to a dedicated facility work phone; all indicated that they made and/or received work-related calls and messages using their personal phones. The health workers used the mobile phone almost exclusively for calling, with only a few indicating that they also sent text messages. Baseline data showed that more than half of the health worker respondents made calls to and received calls from clients, while less than half called and received calls from traditional birth attendants (TBAs).

Comparison analysis between the intervention wedges at baseline showed a large number of similar characteristics for both health facilities and health workers. Some significant differences were found that indicate that Wedge 1 respondents may have to make more of an effort to communicate by mobile phone than those in Wedge 2. This is related to the ability to make calls within the peripheral health unit (PHU) and reported availability of network coverage, although subsequent data indicate irregular coverage throughout the district.

Midline research

Halfway through the study, midline research (covering the period between August 2012 and January 2013) was undertaken to document the situation at that point in time,

⁵ See Magbity et al., 2013.

compare with baseline and, where needed, make adjustments to the intervention (e.g. via training and supervision) and the endline research preparations. More detailed information is available in the report on the midline study, published in 2013.⁶

Endline research and final report

Endline research took place in August–September 2013. The current report presents the overall results of the intervention study that took place from August 2012 to July 2013. For most indicators it collates the results of the three measurement points in time: baseline, midline and endline studies.

⁶ See Jalloh-Vos et al., 2013.



2 Context

This chapter provides relevant background information for a proper understanding of the intervention study undertaken and the results presented in this report. We will address maternal and newborn health (MNH) worldwide and in Sierra Leone, as well as the use of mHealth, also in the international and national context.

2.1 Maternal and newborn health worldwide

Based on data from 2010, up to 287,000 women⁷ worldwide die each year in pregnancy and childbirth, around a quarter of a million of these in Africa. Most die because fewer than 50% of births are assisted by skilled birth attendants and due to a lack of emergency care in the World Health Organization (WHO) Africa Region.⁸ In addition to supply-side factors contributing to maternal deaths, the much-cited Three Delays model by Thaddeus and Maine⁹ also highlights demand-side issues concerning socio-economic and cultural factors, access, decision-making, transport and related aspects such as information, perceptions and attitudes.

There has been some progress in sub-Saharan Africa over recent decades, but a woman's lifetime risk of a maternal death is still 1 in 3800 in developed countries, versus 1 in 150 in developing countries.¹⁰

Besides the human loss, in low-income countries a woman's death represents an enormous cost to her nation, community and family. In addition, for every woman who dies from complications related to childbirth, dozens more suffer injury, infection or disease.¹¹

The root causes of the extremely high maternal and newborn mortality are the low status of women in many developing countries relating to decision-making power, education, access to resources and nutrition; gender-based violence; early, frequent and unwanted pregnancies; low use of FP; and low use of maternal health services.¹²

Neonatal death rates are increasing, and children being born in Africa have the highest risk of dying before they are one month old.¹³ Child survival programmes have primarily focused on important causes of death after the first four weeks of life – pneumonia,

⁷ WHO, 2013.

⁸ WHO, 2013.

⁹ Thaddeus and Maine, 1994.

¹⁰ WHO, 2013.

¹¹ WHO, 2005; 2010c.

¹² UNFPA, 2013.

¹³ United Nations Inter-agency Group, 2012.

diarrhoea, malaria and vaccine-preventable conditions. However, in the last few years it has become obvious that deaths during the first weeks of life (neonatal deaths) account for an increasing proportion of under-five deaths.¹⁴ There has been a gap in the continuum of care, especially during delivery and in the first week of life for both mother and child, which contributes to a high proportion of neonatal deaths, and action must be taken if deaths are to be reduced further.

Finally, investing in the high-burden countries by improving essential interventions is estimated to yield a return of nine times the investment value of US\$5 per capita per year from 2013 to 2035.¹⁵

2.2 Maternal and newborn health in Sierra Leone

Sierra Leone currently ranks 158 out of 169 countries on the Human Development Index, with unacceptably high maternal and child mortality figures.¹⁶ The health system in Sierra Leone is characterized by inadequately qualified health care workers, insufficient supply systems, and poor coordination and management.¹⁷

Reproductive and child health is one of the priorities of the Ministry of Health and Sanitation (MoHS), so the Reproductive and Child Health Strategic Plan was developed in 2008 with a focus on low-cost, high-impact interventions. As part of the implementation of the strategic plan, the Basic Package of Essential Health Services was developed and launched in March 2010. The package serves as a guide in the provision of standards of services and human resource needs at each level of care and competency training needs, and it provides the basis for the development of operational plans including budgets. It covers services that have greatest impact on the major health problems, especially those related to maternal and child health (MCH).

The interventions in the Reproductive and Child Health Strategic Plan and Basic Package of Essential Health Services also deal with the three delays that affect maternal deaths: delay in seeking appropriate care (traditional beliefs and practices, awareness of danger signs, decision-making, perceptions of, access to and quality of services), delay in accessing care (distance, cost, transport, communication) and delay in receiving care that is timely and of an appropriate quality.¹⁸

The three major causes of maternal death at district hospital level are bleeding, eclampsia and infection/sepsis.¹⁹ Newborn deaths contribute 23% of under-five deaths. The three major causes of neonatal deaths in Sierra Leone are preterm birth complications, infection and asphyxia.²⁰ MNH services are provided at all levels. Three levels of PHUs provide

preventive and curative primary health care services: maternal and child health posts (MCHPs), community health posts (CHPs) and community health centres (CHCs). The PHUs work very closely with community health workers, including TBAs, to provide health services at community level. Secondary-level services are provided at district hospitals, with tertiary care provided at regional and national referral hospitals. At district level the District Health Management Team (DHMT) coordinates the health services. At PHU level, antenatal (ANC), delivery and postnatal (PNC) preventive and curative services are provided.

According to preliminary results of the Sierra Leone Multiple Indicator Cluster Survey (MICS), more than 86% of pregnant mothers attended ANC services at least once in their most recent pregnancy, but delivery at a health facility remains low at 50%²¹ (see Annex 1 for more key indicator data). Insufficient numbers of health facilities are equipped and staffed according to standards to provide emergency obstetric and neonatal care (EmONC). Thus the EmONC needs assessment conducted in 2008 showed that no PHUs qualified as a basic EmONC facility and that most hospitals do not qualify as comprehensive EmONC facilities.²² There are limited referral systems in many districts, leading to delays in the provision of comprehensive EmONC.

Meanwhile, access to maternal and child health services has improved after the launch in April 2010 of the Free Health Care Initiative (FHCI) for pregnant and lactating women and children less than five years of age. This in turn has improved the utilization of health services, with an increase of 32% in institutional delivery and a 150% increase in the attendance of under-fives. However, there are challenges, as members of staff are overwhelmed with work and logistics are under pressure; therefore, the quality of care and outreach services has declined.²³

Although family planning is recommended as one of the strategies for reducing maternal mortality, the current contraceptive prevalence in the country is low. In the 2010 MICS survey it was shown to have risen from 6.7%²⁴ to 10.0%, with a total unmet need for family planning of 27%.²⁵ The total fertility rate is high, at 4.3 children per woman.

Recent government policy documents in the area of sexual and reproductive health (SRH) include the Reproductive, Newborn and Child Health policy²⁶ and the Reproductive, Newborn and Child Health strategy 2011–2015,²⁷ both published in 2011. In 2013 the President of Sierra Leone launched the National Strategy for the Reduction of Teenage Pregnancy (2013–2015), entitled 'Let girls be girls, not mothers!'.²⁸ The current study aims to support these key government commitments.

14 WHO, 2013.

15 PMNCH, 2013.

16 UNDP, 2010; Statistics Sierra Leone and ICF Macro, 2009.

17 MoHS, 2009.

18 Thaddeus and Maine, 1994; Herschderfer et al., 2012.

19 MOHS/WHO, 2011.

20 Bhutta, 2010.

21 UNICEF, 2011.

22 MoHS, 2008a.

23 MoHS, 2011; Maxmen, 2013.

24 Statistics Sierra Leone and ICF Macro, 2009.

25 UNICEF, 2011.

26 Sierra Leone Government and MoHS, 2011a.

27 Sierra Leone Government and MoHS, 2011b.

28 Sierra Leone Government, 2013.

2.3 Bombali district²⁹

Bombali district, the proposed intervention district, is located in the southern part of the Northern Region of Sierra Leone, with the district (and regional) headquarter town Makeni city and a surface area of 8,273 km². Bombali district has 13 chiefdoms.

Bombali district has a population of 469,064 people (2012, extrapolated from the 2004 census), of which 120,081 live in Makeni city. For every 100 females in the district there are 93 males. The chiefdom of Sella Limba is the only chiefdom with more males than females, due to mining activities in that chiefdom.

Temnes are the largest ethnic group (47%), followed by Limba (25%), Loko (14%), Susu (5%), Fullah (4%) and Madingo (3%). The most widely spoken languages are Temne, Limba and Loko. The majority of the population is Muslim (70%), followed by Christians (26%).

Children under five, children 6–11 years, people 15–49 years and people 65 years and over make up 15%, 18%, 45% and 5% of the population, respectively. Children (0–17 years) make up 50% of the total population. The high child dependency ratio is considered a poor prospect for rapid socio-economic development.

The average household size in Bombali district is 6.6 persons per household, and 28% of households are headed by females. Houses are usually single units (99%) with one storey (91%) and constructed from mud blocks (69%) or mud and wattle (12%), with a roofing of zinc (71%) or thatch (26%) and a floor of mud (71%) or cement (27%). Housing units are generally in a poor state of repairs, with only 9% needing no repairs. One third (34%) of households live in overcrowded rooms (i.e. more than two people per room), with 20% living with ten or more persons per room.

Over 95% of households use wood and kerosene for cooking and light. Wells (50%) and rivers or streams (40%) are the main sources of water for households, with only 9% having access to piped water. Only 14% of the population uses an improved (not shared) toilet facility.³⁰

Health facilities are not always close to households; only 35% have a facility relatively close by (less than ½ mile), while 30% have to travel 5 miles or more to reach a facility.

Three quarters (75%) of females and over half (55%) of males are illiterate.³¹ Word of mouth is the most common source of information for households (65%), followed by radio (33%). The Sierra Leone District Health Services baseline survey showed a similar pattern, with radio being more important than television and print media (see Annex 1).

The main economic activity in the district is crop farming (77%), followed by trade and repair (11%), other services (2%), mining (2%), education (1.5%) and construction (1.2%).

²⁹ Unless otherwise specified, this section is based on Thomas, 2010.

³⁰ Statistics Sierra Leone and MOHS, 2010.

³¹ UNICEF, 2011.

Registration of vital events is incomplete – for example, only 53% of children are registered at birth in Bombali district.³²

As shown in Annex 1, the total fertility rate in Bombali district is 4.0 (just under the national figure of 4.3), with 12.8% of women (or their partner) using a modern FP method and an unmet need for FP of 19%. Outreach undertaken by health field workers to women to talk about family planning is limited (11% of women reached in the past 12 months). Although the level of ANC1 visits in Bombali district is encouraging at 80%, only 59% of women make the advised four or more visits for ANC, and only 45% of deliveries take place at a health facility. Only 41% of new mothers make the advised first postnatal visit within 48 hours.

2.4 Priorities for MNH in Sierra Leone

Priorities for MNH in Sierra Leone are included in the Reproductive, Newborn and Child Health strategy³³, as follows:

| | |
|-----------------------------|---|
| Objectives | <ol style="list-style-type: none"> 1. To ensure the provision of comprehensive, adolescent-friendly sexual reproductive health services 2. To reduce the level of unwanted pregnancies in all women of reproductive age 3. To reduce the incidence of unsafe abortion and ensure provision of post-abortion care 4. To reduce maternal and neonatal morbidity and mortality 5. To reduce child morbidity and mortality 6. To improve the nutritional status of women and children 7. To reduce the incidence and prevalence of sexually transmitted infections (STIs), including HIV and AIDS 8. To eliminate harmful practices such as Female Genital Mutilation (FGM), premature marriage, and domestic and sexual violence against women and children 9. To reduce the rate of infectious and other non-infectious conditions of the reproductive health system |
| Cross-cutting issues | <ul style="list-style-type: none"> • An ongoing financial commitment and resource allocation • Strengthening the health system for the delivery of quality reproductive, neonatal and child health (RNCH) services at all levels, including an efficient and functional referral system • Strengthening coordination, partnerships and integration • Promoting integrated RNCH services and practices in communities and households • Improving the RNCH well-being of vulnerable and marginalized populations, including during emergencies, and incorporating gender issues • Implementing evidence-based practice through research and M&E |

³² Statistics Sierra Leone and MoHS, 2010.

³³ Sierra Leone Government and MoHS, 2011b.

To improve the understanding of local MNH issues and context, during a workshop involving key expert stakeholders from government, university, civil society, the private sector and development partners, organized in February 2011 in Freetown as part of the preparatory activities for the mHealth feasibility study, a number of issues were identified as key community and health system issues that affect MNH in Sierra Leone. These cover both demand-side and supply-side factors, and are referred to below (see Table 1).

2.5 mHealth in the international context

The notion that mHealth has rapidly gained momentum over the past few years is based on the rapid rise in mobile phone use among rural and other traditionally disadvantaged populations in developing countries (made possible by increasing mobile network coverage and falling costs) and expanding communication technology options.

The main rationales for using mHealth as a strategy are: to improve access to services, disease diagnosis and treatment, quality of care or cost-effectiveness. However, until recently, few scientific studies had been undertaken that evaluate health outcomes.³⁴ This has changed in later years, with a number of systematic reviews undertaken and more original research being published and other under way, including rigorous evaluations.³⁵

Blaya et al. (2010) concluded in their systematic review that the use of mobile technology, including mobile devices, can be helpful to reduce communication time between health-sector stakeholders. Important for our study, they assessed that such technologies could have a greater impact on quality of care in resource-poor settings than elsewhere.

Free et al. (2013b) also undertook a review and found that mobile communication support interventions for health care providers can lead to modest improvements in health care delivery (diagnosis and management outcomes), which is also significant for our efforts. Braun et al. (2013 systematic review) expanded on this by looking at how community health workers (CHWs) can make use of mobile technology. They found evidence that such an approach can help improve the quality and range of services offered by CHWs. In our study we build on this by expanding to other community-based providers such as TBAs.

Adapting and expanding the approaches used in three recent reviews, current and potential usage of mHealth-related approaches can be categorized according to the nine domains presented in Table 2 (page 36).

³⁴ Mechaël et al., 2010; Tomlinson, 2013; Heerden et al., 2012.

³⁵ For recent reviews, see among others Aranda-Jan et al, 2014; Blaya et al., 2010; Braun et al., 2013; Buhia, 2013; CITPH and PHI, undated; Déglise, 2012; Free, 2013a and 2013b; Freytsys and Velez, 2013; Philbrick, 2013; Tamrat and Kachnowski, 2012; and Ratzan and Higgs, 2013.

Table 1: Factors affecting maternal and newborn health in Sierra Leone

(as perceived by stakeholders)

| Community/client issues | Health system/provider issues |
|---|---|
| Teenage pregnancy | Low ANC coverage |
| Unwanted pregnancies | Low family planning coverage |
| Unsafe abortion | Poor client satisfaction |
| Recurrent spontaneous abortion | Absence of adolescent-friendly services |
| Absence of birth preparedness plan | Not enough knowledge of community health workers in handling complications |
| Late first ANC visit | Late referral |
| Poor knowledge of SRH issues | Poor knowledge/skills of providers of neonatal resuscitation and newborn care |
| Poor knowledge of health education issues | Lack of basic and comprehensive EmONC facilities |
| Poor knowledge of expected date of delivery | Low immunization coverage |
| Poor knowledge of normal and danger signs of pregnancy and delivery | Lack of information on referral systems |
| Poor involvement of men in women's reproductive health issues | Poor outreach visits by providers |
| Poor knowledge of men on reproductive health issues | |
| Low level of facility delivery | |
| Low level of postnatal visits | |
| Low early and exclusive breastfeeding | |
| High defaulter rate for immunization | |
| High malnutrition rate | |

Source: Stakeholder meeting, Freetown, 16 February 2011

2.6 The scope for mHealth to improve maternal and newborn health

In June 2010, a global coalition called for the innovative use of mHealth to strategically contribute to broader efforts to improve MNH.³⁶ These technologies address MDG5 (reduction of maternal mortality) as well as target 6 of MDG8; the latter aims to narrow the 'digital divide' between the global South and North.

Available literature identified a number of areas where mobile communication technology, usually as part of a broader set of interventions, could make a difference. Our non-systematic literature review in preparation for this study identified several relevant scientific studies in Asia offering evidence for service utilization gains. However, for sub-Saharan Africa the available literature was limited, which is telling for the state of evidence regarding mHealth interventions at the time.

³⁶ UN Foundation, 2010.

Table 2: Framework of mHealth domains

| Domain | Description |
|--|---|
| Health service domains | |
| 1. Education and awareness | Disease prevention, health promotion, community mobilization, creating a virtual community |
| 2. Point-of-care support | For diagnosis, screening, clinical care and referral |
| 3. Client monitoring | E.g. treatment adherence support, appointment reminders/tracking |
| 4. Emergency medical response system | Accidents, emergency obstetric care, disaster management |
| Health system domains | |
| 5. Disease and epidemic outbreak surveillance | Real-time tracking of diseases |
| 6. Health management information system (HMIS) | Including programme monitoring, supply chain management |
| 7. Human resources for health management, supervision and professional development | Staff management, distance learning and continuing professional development for health care workers (including 'mLearning') |
| 8. Health financing | E.g. use of smart cards, vouchers, insurance and other mobile payments |
| 9. General coordination | Improving communication among health managers and service providers for general information and coordination purposes |

Source: own elaboration based on inputs from Mechael et al., 2010; Vital Wave Consulting, 2009; and Sloninsky, 2008

We found a considerable amount of grey (not peer-reviewed) literature on mHealth initiatives such as those relating to improved health service delivery and reduced maternal deaths in Rwanda,³⁷ improved quality of care, provider–client communication and emergency referral in Senegal,³⁸ and improved access to maternal health services in Kenya.³⁹

Furthermore, we identified two scientific (intervention) studies underway in Zanzibar/Tanzania and Ghana that as yet had to report on findings. The first (Wired Mothers,

³⁷ Mugume, 2010.

³⁸ Netsquared, undated.

³⁹ Changamka, undated.

Zanzibar)⁴⁰ focused on assessing the effect of mobile communication interventions on pregnant women's use of health care, skilled attendance at delivery, and neonatal morbidity and mortality, as well as on the health system response to obstetric emergencies. The second (MoTeCH, Ghana)⁴¹ focused on mobilizing supply and demand of services, to improve health outcomes, especially regarding MNH – for example, improved ANC access, skilled attendance of deliveries, PNC, essential home practices and immunization.

There has been progress since then. CITPH and PHI concur with others that evidence has expanded and that more is underway: "mHealth applications in the MNH field are in the formative stage, and existing evidence for effectiveness and impact is new, but rapidly evolving."⁴² One important systematic review⁴³ found that mHealth tools can address obstetric emergencies by reducing time barriers and facilitate urgent care, by providing phones to TBAs and seizing the opportunity of home-owned phones, among others. Also, mHealth interventions can improve on available human resource capacity by using phones to connect various levels of providers (such as community-based health workers with supervisors for consultation and timely referrals). SMS text communication with pregnant women was found effective in improving health education and connecting them to services.⁴⁴

Also, new initiatives and attention have emerged around the use of mobile technologies to advance MNH. Philbrick⁴⁵ reports on the mHealth Alliance and UN Foundation effort to describe the state of the evidence on mHealth and MNCH as well as trends, stakeholder needs and opportunities for research. CITPH and PHI⁴⁶ address the potential for leveraging mHealth for MNH, describing the 'Current Landscape & Opportunities for Advancement in Low-Resource Settings'. Also, the recent 'mHealth Field Guide for Newborn Health',⁴⁷ involving USAID and others, explains how mHealth may support newborn health 'through referral and tracking of mothers and infants, decision support for CHWs, CHW supervision, scheduling and tracking postpartum and postnatal visits, and teaching and counseling for mothers and families'. And the UN Secretary-General's Every Woman Every Child global strategy now works together with the mHealth Alliance to award grants for mobile technology to advance MNH.^{48,49}

Philbrick concurred that the body of evidence for mHealth and MNCH is growing, but at the same time identified a number of evidence gaps along the MNCH continuum of care,

⁴⁰ Lund, 2012.

⁴¹ Mechael and the Dodowa Research Center, 2009; MoTeCH, undated; Grameen Foundation and Motech, 2011.

⁴² CITPH and PHI, 2013:8.

⁴³ Tamrat and Kachnowski, 2012.

⁴⁴ Tamrat and Kachnowski, 2012; Philbrick, 2013.

⁴⁵ Philbrick, 2013.

⁴⁶ CITPH and PHI, undated.

⁴⁷ Kielsing, 2014.

⁴⁸ See www.who.int/pmnch/media/news/2012/20120925_iwg_grants/en/.

⁴⁹ See also the World Bank case study on effectiveness of mHealth tools for MCH (as reported on www.globalhealthhub.org/2012/02/29/do-m-health-tools-really-work-testing-the-impact-of-mobile-technology-on/); and the recent inclusion of an mHealth private business representative on the Board of the Partnership for Maternal, Newborn & Child Health (PMNCH) that is hosted by WHO (www.who.int/pmnch/about/governance/board/gsm_association/en/)

in the framework of the 'Countdown to 2015'⁵⁰ MNH agenda in preparation for the post-Millennium Development Goals era: FP, malaria prevention and treatment, prevention of mother-to-child transmission of HIV, and others.⁵¹

2.7 mHealth for maternal and newborn health in Sierra Leone

Mobile phone communication is provided by four main companies, Airtel (ex-Zain), Africell, Sierratel and Comium, which offer mobile network services in the entire country.

The coverage of mobile networks is not uniformly distributed, as some populated sites have connectivity, while others do not. With less than 21% of the population having a mobile phone subscription, Sierra Leone's cellular penetration is still relatively low compared to other West African countries.⁵² Mobile phone geographical coverage is estimated to be 80%.⁵³

However, mobile phone use is expanding in Sierra Leone, and the related communication technology is being taken on board by both businesses and public services. The stakeholder workshop undertaken during the NET-RC feasibility study produced anecdotal evidence that health managers and health workers in many of the country's 13 districts already use mobile phones for health-related purposes, especially for emergencies and referrals but also for other domains.⁵⁴

This was confirmed by a 2011 survey⁵⁵ among 200 government health workers in Western Area, Bombali, Moyamba and Kenema districts. It showed that virtually all used a mobile phone for work-related purposes; in 90% of the cases these were personal (not duty) phones. The phone was mostly used for giving or asking advice from a professional or friend, giving information about reproductive health issues or calling for an emergency or follow-up of a referral. The mobile phone was less frequently used for organization and coordination issues, which provided an opportunity for the intervention study.

The health workers considered the greatest impact of mobile phones on MNH to be in the areas of emergencies, advice and information, which might indicate that they might need more sensitization and training on appointment reminders. Common constraints mentioned were the availability of a phone, the problems of charging the phone (in areas without electricity or other power source) and the limited network coverage in some areas.⁵⁶

In 2011 the Sierra Leonean government had not embarked on developing an mHealth policy. At the same time, public, private and donor funds were being used to invest in mHealth infrastructure (equipment, software etc.) and build capacity across medical professional groups. While mHealth initiatives were ongoing, no formal evaluations had taken place, nor had there been relevant publications. While a lack of technical expertise or knowledge on applications is not perceived as a barrier to implementing mHealth initiatives, a lack of a policy framework, high perceived cost, a perceived lack of demand for mHealth and a lack of infrastructure were considered barriers.⁵⁷

The MoHS has recently set up a national mHealth coordination committee that has been operational since 2012, with the aim to increase and improve utilization of mHealth, monitor mHealth initiatives and verify the quality of MNCH services in Sierra Leone using mHealth tools.⁵⁸ It focuses on two levels: community/client and facility/district. It is currently preparing a concept note to provide a framework for mHealth-related activities and programmes.

One major recent initiative is the mHealth component in the CHWs programme in Bonthe district that also includes a research component. It uses mobile phones with MoTeCH open source software to send pre-recorded behaviour change messages, generate automated follow-up alerts and improve communication with CHWs, health facilities and the district level.⁵⁹

Furthermore, there are several initiatives under way that use text messages for HIV therapy adherence, monitoring drug stock-outs and for telemedicine (education, diagnostics/patient care).

Supported by the WHO, the national MoHS has thus embarked on a process to integrate mHealth into relevant strategic plans, but initially intends to generate more evidence of effective interventions. The NET-RC Phase 1 (feasibility) and Phase 2 (intervention study) research contribute to this body of evidence. These studies constituted the first national-level MoHS mHealth initiative focusing on MNH, one of the MoHS priority areas.

⁵⁰ See the www.countdown2015mnch.org website for more information on the post-MDG agenda.

⁵¹ Philbrick, 2013.

⁵² WHO, 2011.

⁵³ NATCOM, 2011.

⁵⁴ Magbity et al., 2011.

⁵⁵ Jalloh, 2011.

⁵⁶ Jalloh, 2011.

⁵⁷ WHO, 2010b.

⁵⁸ See National mHealth Coordination Committee, 2011.

⁵⁹ Centre for Global Health, Trinity College Dublin et al., 2013.



3 Study design and methodology

This chapter presents a description of the overall intervention study objectives, intervention logic, methodology⁶⁰ and intervention process.

3.1 Intervention study objectives

The general research objective was to assess the effect on MNH service utilization of integrating mobile communication strategies into existing health service packages in one health district in Sierra Leone.

Specific research objectives were:

- to assess changes in MNH/FP service utilization by female clients, associated with expanded options for client-initiated and provider-initiated mobile communication:
 - for the entire district (engaging all PHUs and through the national information line); and
 - in the selected PHU catchment areas that implement the intervention involving TBAs;
- to assess changes in health workers' job satisfaction and control at work, and other self-reported changes due to expanded options for provider–provider communication and provider–client communication;
- to assess changes in MNH referral systems due to expanded mobile communication options;
- to assess changes in maternal death reporting;
- to identify implications for the health system of mobile communication initiatives; and
- to make policy recommendations for the integration of mobile communication initiatives in district-level MNH service packages.

3.2 Interventions

The study contained a number of interventions that were selected from among a larger range of options and agreed on using information from literature review, situation analysis, the outcomes of the feasibility study and the results of an intervention options ranking exercise with stakeholders.

Interventions started in August 2012 and included several components, of which two (health worker to client communication and TBA involvement) were staged over time

⁶⁰ The overall research protocol is available on request (see inside cover page for contact details).

across wedges: six months for stage 1 (August 2012 to January 2013) and six months for stage 2 (February to July 2013). The staging was designed to allow a step-wedge evaluation research methodology (see below). Table 3 summarizes the various interventions by stage and wedge; the diagram in Figure 1 visualizes these. Further details on selection of chiefdoms are given in the methodology section below. Tambaka chiefdom was not included in the wedge design but also benefited from the interventions and is included in the analysis where relevant.

A summary overview of the interventions and their expected outcomes can be found in the intervention logic diagram in Annex 2.

1. Virtual private network

(Health worker to health worker communication)

A virtual private network (VPN), also called a 'closed user group', was put in place for the duration of the study and across both wedges, in collaboration with Airtel, one of the four mobile network operators in Sierra Leone. Airtel was chosen based on perceived best coverage (reaching most PHUs in the district) according to district health stakeholders. Mobile phones and SIM cards were thus procured and distributed across all 98 MoHS district health facilities and key MoHS district-level management and service staff (key DHMT and hospital staff and the MCH aide coordinator), including ambulance drivers/transport officers, as well as local (city and district) council staff, at the start of stage 1.

Figure 1: Diagram of mHealth interventions

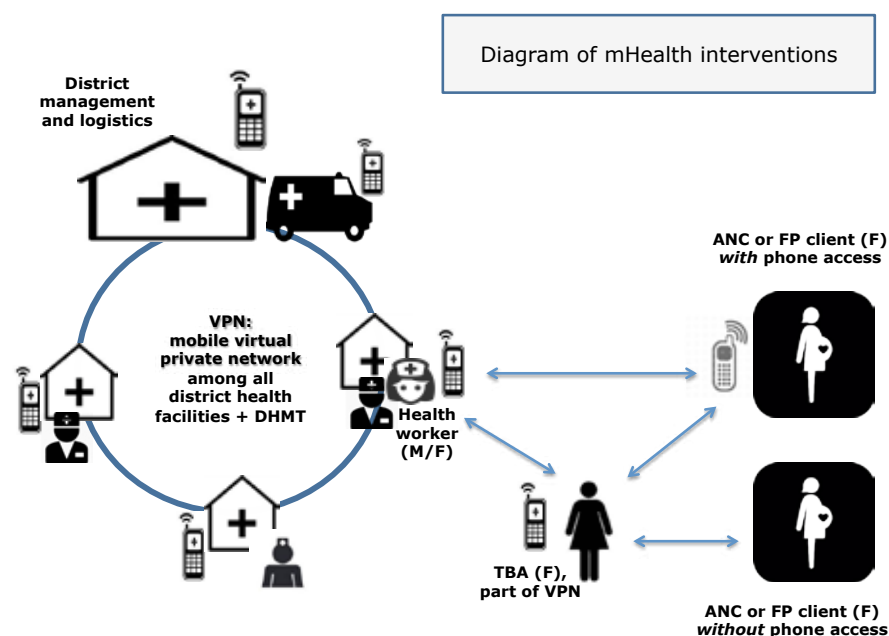


Table 3: Overview of Bombali district interventions by stages and wedges

| Geographical location | Interventions | Time period | |
|--|---|---|---|
| | | Stage 1 (August 2012 to January 2013, 6 months) | Stage 2 (February to July 2013, 6 months) |
| Wedge 1 (6 chiefdoms) | 1. VPN: free calls and text messages 2. Health worker to client communication 3. Solar-powered battery charger (many malfunctioning) 4. TBA involvement (1 chiefdom) | ✓ ✓ ✓ ✓ | ✓ ✓ ✓ ✓ |
| Wedge 2 (6 chiefdoms) | 1. VPN: free calls and text messages 2. Health worker to client communication 3. Solar-powered battery charger 4. TBA involvement (1 chiefdom) | ✓ – – – | ✓ ✓ – ✓ |
| Tambaka (1 chiefdom) | 1. VPN: free calls and text messages 2. Health worker to client communication 3. Solar-powered battery charger 4. TBA involvement (1 chiefdom) | ✓ – – – | ✓ ✓ – – |
| National (all districts incl. Bombali) | National phone line a. FHCI complaints from facility management committees b. FHCI complaints from general public c. MNCH advice to general public | ✓ – – – | ✓ ✓ ✓ ✓ |

TBAs linked to all PHUs (five or six TBAs per PHU) in two chiefdoms (those in one chiefdom starting in stage 1 and those in another chiefdom starting in stage 2) were also part of the VPN. The VPN allowed for unlimited calls (both stages) and text messages (stage

1)⁶¹ among all members without cost to them, as the pre-paid monthly cost per phone number was paid for centrally (in this case by the project).

PHUs and TBAs in Wedge 1 (six chiefdoms) also received a solar-powered battery charger to make it easier to recharge the mobile phone's battery where this would otherwise be difficult. Wedge 2 PHUs did not receive these during the first stage, as we were unable to purchase sufficient numbers in time for them all to be introduced from the start of stage 1, hence Wedge 1 was prioritized in view of the client communication intervention. Later it was decided not to distribute solar chargers in Wedge 2, since by that time the chargers had been found to be ineffective and of too low quality and no suitable cost-effective replacement could be found in time.

2. Engaging with clients

(Health worker to client communication)

In August 2012 a group of 51 PHU in-charges or their representatives who worked in health facilities making up the first wedge were trained in the interventions. It included: use of phones; communication with supervisors, colleagues and selected TBAs; and the use of data collection registers for pregnant women and FP clients enrolling in the mHealth intervention (including informed consent information) and related guidelines for subsequent engagement with clients. The registers were designed specifically for the project in addition to the usual registers. There were separate registers for pregnant women (covering ANC, delivery and PNC) and for FP (covering FP for female clients).

In August 2012, Wedge 1 PHU staff started to invite pregnant women coming for ANC and FP clients to enrol in the mHealth scheme, ensuring full informed consent. The enrolment criteria stated that: they should have access to a phone (their own, or a phone they had access to in their household or neighbourhood, or via a TBA (the latter was encouraged only in the designated TBA intervention chiefdom, see below – although still possible in other chiefdoms)); and that they should agree to be contacted by a health worker for appointment reminders and related information.

A system was put in place, including the monthly transfer of a limited amount of phone credit (2000 units, equivalent to SLL 80,000)⁶² to Wedge 1 PHUs, to allow MoHS staff to use the existing regular mobile network to communicate with enrolled clients as per protocol. This meant that clients would be called ahead of time to remind them of their next appointment and that they would be asked if everything was fine and whether they had any questions; and the clients would be provided with health education specific to their situation.

61 The network operator unilaterally decided to no longer include free text messaging in the VPN contracts as of early 2013 (exact date unclear). This implied that text messaging was no longer available free of charge during much of the stage 2 intervention; the phone credit was then also used for texting and not only calling.

62 SLL80,000 = US\$18.18 (exchange rate US\$1 = SLL4400), which, without texting, would allow a maximum of 167–222 minutes calling time to the two most widely used networks (Airtel and Africell).

PHUs were issued with monthly report forms to report on the number of clients enrolled by type of service used and by the ownership of the phone (pregnant woman or FP client, communicating via their own, someone else's or a TBA phone).

In February 2013, at the start of stage 2, 44 PHU in-charges (or their representatives) of Wedge 2 facilities received training and started with the same interventions as those described for Wedge 1 (except the solar chargers, see Table 3): inviting pregnant women to enrol, transfer of phone credit, initiating calls to clients and reporting.

3. Expanded VPN: linking in TBAs

(Health worker to TBA communication)

In one chiefdom (Paki Masabong, one of the six chiefdoms in Wedge 1), a total of 34 TBAs (five or six TBAs from each of the six PHUs in the chiefdom) were included in the VPN during stage 1 to enable their participation in the health worker to client intervention. The TBAs received a similar training as the health workers, now also addressing the role of TBAs in identifying new clients and following up existing clients, and the use of phones for communicating with PHUs.

In February 2013 a group of 48 TBAs (six TBAs from each of the eight PHUs in the chiefdom) from Gbanti Kamaranka chiefdom in Wedge 2 were added to this intervention and received the related training.

The TBAs were selected by the PHU staff, guided by the following criteria: a TBA should not only be interested and willing to participate but also not be based in the PHU village, have enough geographical/numerical reach, already be linked to the PHU, be active as a TBA, be reliable and be able to learn how to work with a phone and the report format. A pictorial tally reporting form was designed for the TBAs (see Annex 3).

4. National MoHS toll-free information line on sexual and reproductive health and rights (SRHR)

(Client-initiated information provision)

This component entailed the design of a national call centre ('Mami En Pikin Wellbodi Fone Line',⁶³ no. 117) to receive complaints on the national FHCI and providing information on MNCH, led by the MoHS in coordination with partners; the mHealth programme made a limited contribution in the form of assisting to design the intervention and manual and participation in the coordination meetings.

The system was conceived around three pillars. In August 2012 the pillar dealing with submission of FHCI complaints by Facility Management Committees became operational; the second pillar dealing with FHCI complaints submitted by the general public, as well

63 *Mami and pikin well-bodi*: Mother and child health.

as the third SRHR information line pillar, became operational in January 2013. From stage 2 (February 2013), the line was promoted among mHealth-enrolled clients in Bombali district through little cards given to them with the national phone line number printed on one side and an open space where the PHU's name and facility phone number could be written) and the PHU's own number on the other (see Figure 2). The general public also received information about the service through radio spots broadcast within Bombali district.

Figure 2: Client cards to promote Mami en Pikin wellbodi fone line (117) and PHU line



3.3 Methodology

Study design

The NET-RC intervention study had a quasi-experimental design with a mixed-methods approach (combining quantitative and qualitative research methods). A partially staged implementation was created by using a step-wedge design for the health worker to client communication and TBA interventions described above. The VPN and the national phone line were not part of the step-wedge design. The step-wedge design thus allowed for a counterfactual analysis that compares selected outcomes (coverage of ANC, skilled delivery, PNC and FP) between the intervention and the non-intervention parts (see Table 2). Annex 4 provides an overview of the overall study objectives in relation to research questions, research methods, data collection tools and envisaged research participants for the entire study.

Description of study district

Among several eligible districts (where no VPN or other mHealth-related interventions were in place yet), Bombali district (see Figure 3) was selected, as it is centrally located with relatively easy geographical access to most of its chiefdoms and since it has >90% mobile phone network coverage at the PHU level for at least one (same) mobile network operator. The district is divided into 13 chiefdoms and has 98 functioning PHUs and five hospitals. Access to some of the health facilities in the district is difficult due to the poor road network, especially during the rainy season. Agriculture, trading and mining

are the main economic activities. Literacy levels are low, with 75% of females and 55% of males being illiterate. The main ethnic groups in the district are Temne and Limba. The district is predominantly Muslim.^{64,65}

Study chiefdoms and wedge definition

In principle, all 13 chiefdoms in the district were included in the study. Tambaka chiefdom in the extreme north of Bombali district was excluded from the wedge design because there are only three PHUs in a very large, sparsely populated and very remote area and also because there was a lack of mobile network coverage at the three PHUs during the design stage.

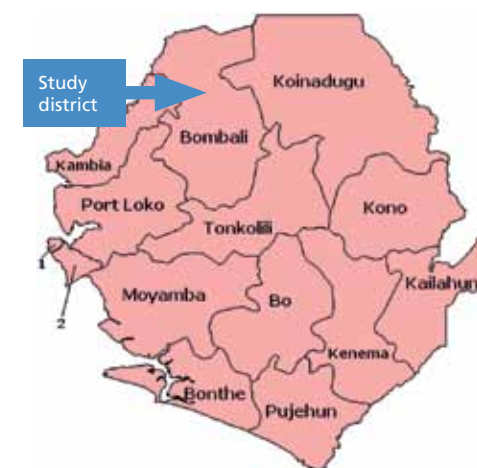


Figure 3: Map of Sierra Leone with Bombali study district

The intervention was, therefore, implemented in two stages in 12 chiefdoms. Each stage involved an equal number of matched chiefdoms (six in the Wedge 1 group and six in the Wedge 2 group) based on a density ranking (number of PHUs/100,000 population); see Table 4.

Table 4: Overview of wedges and chiefdoms by PHU density

| Wedge 1 | PHU density* | Wedge 2 | PHU density* |
|--------------------|--------------|---------------------------------------|--------------|
| Safroko Limba | 36.8 | Libiesaygahun | 32.4 |
| Biriwa | 30.8 | Magbaimba Ndowahun | 30 |
| Paki Masabong** | 30 | Gbanti Kamaranka** | 26.5 |
| Makari Gbanti*** | 29.5 | Sanda Tendaren*** | 23 |
| Gbendembu Ngowahun | 20.2 | Sanda Loko | 18.8 |
| Sella Limba | 13.2 | Bombali Sebor (including Makeni city) | 12.5 |

* PHU density: number of PHUs/100,000 population
 ** TBA intervention chiefdom (one in each wedge)
 *** TBA comparison chiefdom (one in each wedge)

During the course of the implementation of the phased intervention, one chiefdom in each wedge involved TBAs in the mHealth package of interventions. The TBA intervention chiefdoms were matched to non-TBA intervention chiefdoms for comparison purposes.

64 Thomas, 2010.

65 Statistics Sierra Leone and UNICEF-Sierra Leone, 2011.

The choice of TBA pilot chiefdoms and matched non-intervention chiefdoms was based on the PHU density ranking (described above) and on the availability of reported good mobile telephone network reception. The study team assumed on the basis of their experience within Bombali district that the TBA and non-TBA chiefdoms were comparable regarding socio-cultural factors. The TBA intervention and comparison chiefdoms are indicated in Table 4.

Health facility sampling

The focus of the mHealth interventions was on primary MNH care; hospitals were not included in the intervention. All functioning health facilities – community health centres (CHCs), community health posts (CHPs) and maternal and child health post (MCHPs) – in the study district were eligible for data collection. One non-functioning facility (Fullah Town II in Bombali Seboria chiefdom) was excluded from the study, leaving a total of 98 health facilities.

Participant selection

Prior to the baseline study there were 194 registered maternal health workers in the district, including community health officers (CHOs), community health assistants (CHAs), state-enrolled community health nurses (SECHNs), maternal and child health aides (MCH aides), endemic disease control unit (EDCU) assistants, midwives, nursing aides and dispensers; and excluding laboratory staff, porters, cleaners, community health workers, TBAs and vaccinators. Sample size calculations showed that a sample size of 225 was needed to detect a 10% difference in outcome (see Annex 5). A 'take all' approach (data collection from the universe of health workers in Bombali) was thus decided on for the series of measurements (baseline, midline, endline).

Data collection and sampling

The study was designed to respond to the overall research objectives formulated for the intervention study (see above). The details of the research component of the intervention are described in the intervention study research table (Annex 4). An overview of the data collection tools in relation to the baseline, midline and endline studies can be found in Table 5. Selected sources of information, applied to both wedges although partly staged over time, included:

- qualitative information in relation to the interventions using SSIs with enrolled clients, non-enrolled eligible clients, male partners of enrolled clients, TBAs, health workers and health managers (in two chiefdoms in each wedge), in relation to mobile phone use and the mobile phone interventions; and FGDs with male and female community members;
- quantitative (survey) information about individual health workers in all chiefdoms, collected at baseline, midline and endline to measure changes over time on respondent characteristics, mobile telephone coverage and current use of mobile communication, including initiating or receiving work-related phone calls and text messages to other staff in the health sector, to TBAs and to clients. Information

Table 5: Data collection plan and variation

| + = implemented as planned [+] = planned but changed | | | | | | |
|---|-------|--|-----------------------------|--|----------------------------|--|
| Plan and variation | | | | | | Comments |
| Tool | Code | Participants | Baseline | Midline | Endline | |
| Qualitative semi-structured interviews | SSI 1 | Clients enrolled | | + | + | Completed as planned |
| | SSI 2 | TBAs (TBA intervention area) | | + | + | Completed as planned |
| | SSI 3 | Health workers | | + | + | Completed as planned |
| | SSI 4 | Health managers | | + District level | + District, national level | Completed as planned |
| | SSI 5 | Male partners of enrolled clients | | | + | Completed as planned |
| | SSI 6 | Eligible non-enrolled clients | | [+] | [+] | Adapted: planned but unable to collect at midline, thus discontinued at endline; information aimed for collected via endline community FGD 1 |
| Qualitative FGD | FGD 1 | Community members (male and female) | | | + | Completed as planned; expanded as indicated above |
| Quantitative survey | SUR-1 | Health workers | + | + | + | Completed as planned |
| Other quantitative data collection | DAT-1 | PHUs (gestation age at ANC1) in TBA intervention/ comparison areas | + | [+] | [+] | Discontinued after baseline, as data collected proved unreliable |
| | DAT-2 | DHMT monthly reports on maternal death notifications | + | + | + | Completed as planned |
| | DAT-3 | PHUs (no. clients enrolling) | | + | + | Completed as planned |
| | DAT-4 | Facility information questionnaire | + | | | Completed as planned |
| | DAT-5 | Data collection about national information line | | [+] | + | Only endline, as phone line implementation suffered delays (outside influence of project) |
| Other | | HMIS/DHIS PHU service utilization (ANC1-4, facility delivery, PNC1-3, FP (new/continuing)) | + Apr11-Jul12 (pre-interv.) | [+/-] Aug-Dec12 and [Jan13] (6 months) | [+] [Feb-Jul13] (6 months) | Baseline completed. Midline 84% completed (1 month pending). Endline incomplete (6 months pending). |
| | | Intervention supervision records | Continuous | | | Completed |
| | | PHU mHealth client enrolment and follow-up registers | | | + | Received from many but not all PHUs and quality irregular |

on mobile telephone use and job-related satisfaction and communication was also collected;

- summary information from DHMT reports on PHU maternal death notifications;
- summary information from monthly PHU reports on mHealth enrolment and follow-up;
- quantitative data about health facility characteristics and staffing levels (questionnaire); and
- health service utilization data derived from the health management information system (HMIS) and district health information system (DHIS).

Health worker survey

The quantitative health worker survey targeted all (baseline 193, midline 202, endline 203) maternal health workers in the 98 primary health care facilities in Bombali district. The survey was designed to gather information about the characteristics of the health worker, mobile phone use for initiating and receiving calls and text messages, barriers to the use of mobile phones, and job satisfaction and communication.

The survey, of which the endline format is presented in Annex 6,⁶⁶ included a job-related satisfaction and communication component that was developed as 21 statements categorized into three domains:

- quality of working life;
- communication with peers and seniors; and
- working conditions.

The statements were meant to be answered using an agreement scale built and validated on earlier work undertaken in Sierra Leone.⁶⁷

The agreement scale was used to measure changes in perceptions of health workers over time. Development and reliability analysis of the job satisfaction and communication sections of this questionnaire were described in the baseline report;⁶⁸ a summary is presented in Annex 7.

In addition, two extra statements were included to provide information on health workers' perceptions of communication with clients.

At endline a project evaluation component was added to the health worker survey format used at baseline and midline (Section VII, End of project; see Annex 6).

⁶⁶ The slightly different baseline and midline versions of the health worker survey can be found in the respective reports. See Magbity et al., 2013; and Jalloh-Vos et al., 2013.

⁶⁷ See Herschderfer et al., 2012.

⁶⁸ For details, see Magbity et al., 2013.

Topic guides

The baseline analysis and stage 1 supervision findings and field experiences were used to generate contents for the design of the midline SSI topic guides that were field-tested and adapted prior to use. For the endline interviews, the topic guides were adapted to capture specific information on perceptions of change and to stimulate more in-depth probing.

In addition, new topic guides were developed for groups of respondents not covered during the midline interviews. All endline topic guides were field-tested and adapted prior to use. Topic guides for interviews with enrolled clients, TBAs, health workers, health managers and non-enrolled eligible client were used at midline, while at endline a slightly adapted version was used (see Annexes 8-11).⁶⁹ Topic guides for interviews with male partners of enrolled clients and FGDs with male and female community members were used for the first time during the endline (see Annexes 12 and 13).

Sampling

Sampling for the midline and endline qualitative interviews aimed for maximum variation; Annex 14 contains the sampling frame.

Two types of information proved difficult to collect reliably:

- PHU data on gestational age at ANC1 were no longer collected after baseline, as baseline data analysis had shown that data were unreliable⁷⁰ (see baseline report for details); and
- despite huge efforts during midline, no clients could be interviewed who fulfilled the eligibility requirements to participate in the client scheme but had declined enrolment. At endline, FGDs were held with women in the community to obtain information about barriers to enrolment.

Data collector training

Data collectors were trained prior to each of the three research points through separate quantitative and qualitative research workshops conducted by the MoHS, MRC and KIT, including the principal investigator. During the workshops and based on the research protocol, the data collectors were trained in survey and interviewing techniques, discussed ethical issues of the study, field-tested the data collection tools and adapted them where needed. Organizational and data quality assurance issues were also addressed.

Data collection

Data were collected at three points in time: May-June 2012 (baseline), January-February 2013 (midline) and August-September 2013 (endline). Informed consent was obtained from all research participants prior to enrolment.

⁶⁹ Not included: topic guide for non-enrolled clients, as it was not used at endline.

⁷⁰ Data collected on the last day of menstruation, needed to calculate the gestational age at ANC1, were not uniformly noted at the PHU level; the alternative data, noting the height of fundus at ANC1, proved to be unreliable during the quality check.

Overall, data collection often took longer than planned because health workers were not always immediately available when the data collector visited.

Data entry

Data entry of the health worker survey data and from the mHealth registers was done in EpiData version 3.1 by trained people. The EpiData files were cleaned (consistency checks and searching for missing and invalid data), validated and exported into Intercooled STATA version 9 for analysis by MRC staff.

Other quantitative data (e.g. from DHIS/HMIS, number of maternal death notifications to the DHMT, PHU monthly reports) were entered into Microsoft Excel. Data verification and analysis was also done by MRC staff using Microsoft Excel.

The qualitative interviews were recorded (audio) in the field. Transcription, quality control and coding were done once the researchers returned.

As for the DHIS/HMIS data, issues with the staff's technical capacity at PHU and district level, with the amount of support and supervision received, and with the procedures in place regarding data management were factors outside our control that may have affected the quality of available data.

Data analysis

Descriptive statistics were compiled for the collected data about the health workers' characteristics and behaviour. Whenever necessary, variables with multiple answers were recoded into new aggregated ones (with fewer categories). Open-ended questions were also coded to facilitate the analysis.

In addition, a comparison analysis of health worker and health facility characteristics was carried out at baseline between the chiefdoms designated for Wedge 1 and Wedge 2, to determine whether the wedges were comparable before the introduction of the interventions.

Health worker and health facility characteristics were compared in the following ways:

- a) Change over time within and between wedges – for research objective 1 (health worker to client intervention, with double difference analysis for change in utilization):
 - Wedge 1: baseline versus midline, midline versus endline, baseline versus endline
 - Wedge 2: baseline versus midline, midline versus endline, baseline versus endline
 - Comparing differences within each wedge between wedges at baseline, midline and endline; and
- b) Change over time of the total group (Wedge 1, Wedge 2 and chiefdom Tambaka) – for research objective 2 (health worker communication and job satisfaction intervention, pre/post analysis):

Baseline versus midline, midline versus endline and baseline versus endline (midline comparison mainly to check on the effect of the other intervention).

The significant results of these comparisons will be discussed in Chapter 5.

Statistical testing for the relationship between two categorical variables was carried out using the Chi-squared test. An independent samples t-test (two categories) and analysis of variance test (ANOVA, three or more categories) were used to compare the means of numerical continuous variables. A 95% significance level was used ($p=0.05$) for all tests throughout the document; p-values are not stated in the text, but p-values for significant differences are presented in Annex 15. In line with the 'take all' approach, which meant the inclusion of all the study population, it was decided that there was no need to calculate confidence intervals. (Datasets included DHIS/HMIS data including maternal death notification data; health worker survey with 'take all' sample; facility survey targeting all facilities; enrolled clients' registers.)

The qualitative data were coded and analysed using ATLAS.ti version 7.1. Themes and subthemes were allocated on the basis of topic guides, objectives and issues emerging from the data.

The qualitative findings were reported as 'most', 'many' or 'common' if half or more of the respondents mentioned similar issues, and 'some' or 'few' if mentioned by less than half of the respondents.

Quality assurance

To ensure that the data collected were of an acceptable quality, the following measures were taken:

- Field-testing and finalizing the data collection instruments and the training of data collectors rested with the highly experienced principal investigator. This work was done in close collaboration with expert colleagues from MRC and KIT.
- Only enumerators with previous experience of field data collection were recruited. These staff were thoroughly trained in data collection and sensitized about the importance of respectful attitudes.
- Data collectors were supervised during fieldwork using standardized quality assurance procedures. These included checking coding on questionnaires against responses and reviewing surveys for completeness.
- The health worker survey and the qualitative interview guides were designed in English. At a later stage they were translated into Krio and back into English using a participatory process that took place during the training phase. This iterative process allowed validation of the terminology and phrasing used (all terms and questions were understood in the same way by all).
- The baseline, midline and endline instruments were all field-tested and adapted prior to data collection.

- Data entry and transcription of audio recordings was closely supervised. Standard procedures and tools were used to ensure correct and complete data.
- Specially designed EpiData data entry screens were developed to accommodate the skipping pattern of the surveys and to ensure that all questions were entered. Whenever necessary, short lists of acceptable answers/responses were used to categorize and standardize the entry of data coming from open questions. EpiData screens were used in a similar way to enter register data.
- A coding framework was developed in a participatory manner to guide the coding of qualitative data in Atlas.ti. The coding framework was based on a combination of the content of topic guides and grounded methodology.
- A research results validation meeting was organized in Freetown in January 2013, where over 50 representatives of key stakeholders involved in mHealth activities attended to provide feedback on the draft findings.

Research capacity strengthening

A secondary objective of the intervention study was to strengthen research capacity in Sierra Leone with a focus on intervention, action research and realist approaches, as well as on dissemination and effective use of research results. The baseline, midline and endline studies provided opportunities to (further) train a dedicated group of (largely the same) researchers from the University of Sierra Leone.

3.6 Study limitations

The following study limitations were identified:

- Data were collected from one district which was purposefully selected from among only a few eligible districts, and so cannot be taken as representative of the current situation in other districts or in the country.
- Chiefdoms (each consisting of different numbers of PHUs of varying levels) were taken as the unit of analysis, as opposed to individual PHUs. While this possibly conceals variation at PHU and community level, it was a pragmatic decision taken to align data collection activities with the regular supervision channels used by the DHMT and the CHO (in charge of the CHC, who supervises the lower-level facilities within the chiefdom).
- Given the small number of chiefdoms in the district, the wedges were not determined by random sampling but, rather, by PHU density (number of PHUs/100,000 population) matching, to reflect the effect of the intervention on service utilization (assuming that low PHU density indicates a larger distance to the facility).
- A counterfactual was constructed for two of the intervention components only (health worker to client communication and TBA interventions), allowing for a double-difference analysis (net effect) between the intervention and the non-intervention samples. The VPN intervention can only be analysed in terms of pre- and post-intervention
- Care was taken to implement the interventions as designed and in the same way in

both wedges and over time. However, the low quality of solar chargers distributed during stage 1 (only to Wedge 1 facilities and related TBAs) in practice meant that the majority were dysfunctional and could not be used effectively. It was then decided to not distribute solar chargers among Wedge 2 facilities at the start of stage 2. This in theory could have created bias; however, in practice this could have been very small only, since indeed most Wedge 1 facilities could not make use of their solar chargers during stage 2.

- The timeline for the intervention study was relatively limited (two stages of six months each), which prevented us from looking at results over a longer time period. Also, the special circumstances of the national elections taking place during this short period (late 2012) may have influenced interactions between health workers, clients and services.
- Information collected relating to gestational age at ANC1 could not be used, as data proved unreliable, as described already in the baseline report. This implies that no conclusions can be drawn on the effect of the interventions on shortening gestational age at ANC1.
- Since data collectors were not able to identify non-enrolled eligible clients, no data were obtained from this specific respondent group. Data about reasons for not taking part were only explored in FGDs.
- In general, qualitative research data quality depends very much on the ability of the interviewers and FGD facilitators (who were thoroughly trained), as well as on the willingness and openness of respondents to collaborate (for whom a safe environment was created and sensitivity used during the interview or FGD).
- Although data collectors during midline and endline probed better than during the baseline for the cost of phone top-ups and phone charging, obtaining reliable data remained difficult in some cases. Some respondents may have provided relatively high figures, anticipating (more) financial support through the project.
- DHIS and HMIS data obtained were of limited quality due to problems with the DHIS software and hardware and staff capacity.
- DHIS/HMIS data were difficult to obtain, as the national and district MoHS levels were experiencing severe technical problems in 2012 and 2013, combined with key staff turnover at the beginning of 2013. As of January 2014 (the last month of project administrative operations), data obtained covered the periods April 2011 to July 2012 (pre-intervention data to establish trend) and August to December 2012 (covering all but one month of the stage 1 intervention phase). We have not yet obtained data for January 2013 (last month of stage 1 intervention) or February to July 2013 (stage 2 intervention). This limited the analysis of outcome indicators and calculation of net effect. Relevant government authorities are aware of the situation and working towards solutions (which are outside our area of influence).
- The financial scope of the project did not allow for including a cost-benefit analysis, which otherwise would have been an interesting additional component.

For the more 'rigorous' research component including counterfactual analysis, there are certain aspects that merit special attention.

Contamination

- Contamination happens when the non-intervention group is (actively or passively) subject to the (partial or total) intervention in the other group. Our study cannot rule out that any contamination from Wedge 1 (intervention) to Wedge 2 (control) may have occurred during stage 1 (the ‘true’ counterfactual period) and influenced results in Wedge 2 to a certain extent. For example, Wedge 2 health workers may have adopted client communication activities based on what they heard from Wedge 1 colleagues; Wedge 2 clients may have seen or heard about Wedge 1 activities and initiated contact with their PHUs (who after all already started using the facility phones, albeit without receiving credit to call clients) in similar ways etc.

Recall bias

- This bias is a risk in surveys and interviews that ask about the past. Respondents may not remember the past, or remember it only in part or with errors as to exactly what happened. In addition, memories of events which at the time appeared (or now appear) important are customarily recalled more vividly than events which appeared (or now appear) less important, while subsequent related incidents may ‘reinforce’ or change the memory of earlier incidents. In our study we consider this risk limited, due to the relatively short timeline of the intervention and research, with queries usually only going back a few months (although we realize that this is still long enough not to remember things as accurately as, say, yesterday).

Confounders

- This term relates to parallel interventions or other external factors that create ‘confusion’ (show a difference or association when in reality there is none). Although in the present study a counterfactual (control group) was constructed for some of the interventions (health worker to client communication and TBAs), this does not rule out that other interventions, events and factors could have influenced service utilization for ANC, delivery, PNC and FP. It is, therefore, important to acknowledge the possibility that other interventions and events might influence one wedge differently than the other wedge and explain part of the difference found. This is even more the case for the other interventions for which no counterfactual could be created, but only a pre-/post-intervention comparison was possible.
- Thus, mapping of relevant major programmes and interventions was undertaken at endline and will be reported on in the next chapter and in Annex 26. It cannot be ensured that all interventions that may influence outcomes and their actual influences were correctly identified; however, the present study does not claim to have investigated the potential parallel influence of these interventions.



4 Intervention descriptive information and process

This chapter addresses the process and descriptive information leading up to the presentation of the intervention study results (Chapter 5) for each of the research objectives. We use the three measurements in time (baseline, midline and endline data collection) and the sources as indicated in the methodology chapter to present findings on facilities, participants and the interventions. We also use the programme’s monitoring and supervision data to provide important contextual information and share our assessment of the intervention process, identifying what went well, as well as challenges.

4.1 Health facility information

There are three types of PHUs in Bombali district: community health centres (CHCs), which are the facilities at the highest level; community health posts (CHPs) in the middle; and maternal and child health posts (MCHPs) at the lowest level.

The number of health workers appointed to the facilities in Bombali district varied from one to eight (average of two health workers per PHU). Figure 4 shows the distribution of facilities by the number of staff. Nearly a third (31%) of the PHUs had one clinical health worker, and 94% had three or fewer health workers.

Figure 5 shows the breakdown of the staff size by type of facility, at endline. As expected, CHCs and CHPs have the largest numbers of staff. Most of the MCHPs (87%) had two or fewer clinical staff members. Masuba clinic (next to the Makeni midwifery school) is now a CHC with eight staff members.⁷¹

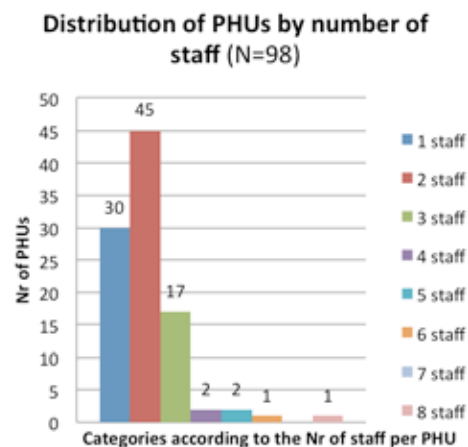


Figure 4: Distribution of PHUs by number of staff at endline

The health facilities were located at an average distance of 28.8 km (range 2–88 km) from the district headquarter town, Makeni, where the DHMT has its offices. The average

⁷¹ The Masuba clinic was mentioned in the baseline report as a PHU with many members of staff, housed in the same compound as the DHMT and next to the midwifery school. It has a large catchment population. At the time, it was formally an MCHP (the lowest level of PHU), although it did not represent the staffing situation of MCHPs in general. It was upgraded to a CHP before midline and to a CHC before endline.

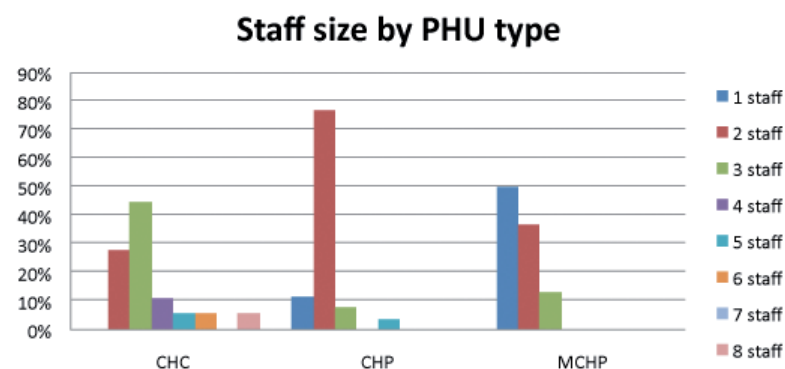


Figure 5: Facility staff size by PHU type

distance for Wedge 1 facilities was 24.4 km and for Wedge 2 facilities 31.2 km. Tambaka chiefdom is located farthest from Makeni. A summary of the distances by chiefdom is given in Table 6, with detail by PHU provided in Annex 16.

4.2 Participant characteristics

In this section we present the characteristics of the participants in the quantitative and qualitative data collection.

4.2.1 Participants in qualitative interviews and FGDs (midline and endline)

Midline study (Wedge 1 only)

In total 40 participants (2 health managers, 10 health workers, 12 TBAs, 16 mHealth-enrolled female clients) from two out of the six chiefdoms (the TBA intervention chiefdom and one other) in Wedge 1 were interviewed.

The two health managers at district level had an average age of 56 years and an average of 15 years working experience in the health sector.

The 10 health workers (six MCH aides, two CHOs and two CHAs) came from two chiefdoms: Paki Masabong (selected as the TBA intervention chiefdom in Wedge 1) and Sella Limba. They had an average age of 45 years (range 30–58 years) and an average of 15 years (3–34) working experience in the health sector. Almost all of the health workers were PHU in-charges (nine out of the 10). The 12 TBAs in Paki Masabong chiefdom had an average age of 53 years. They walked on average for 104 minutes to reach the health facility that supervised them.

Of the 16 female mHealth-enrolled clients interviewed, eight joined the mHealth scheme when they were pregnant and attending ANC, and eight joined the mHealth scheme when they attended FP services. Seven of the clients came from Paki Masabong chiefdom,

Table 6: Average PHU distance in km to district headquarter town

| Chiefdom | Wedge | No. of PHUs* | Average distance of chiefdom PHUs (km) |
|--------------------|-------|--------------|--|
| Sella Limba | 1 | 8 | 61.5 |
| Makari Gbanti | 1 | 14 | 10.4 |
| Paki Masabong | 1 | 6 | 19.2 |
| Biriwa | 1 | 10 | 29.3 |
| Gbendembu Ngowahun | 1 | 7 | 22.4 |
| Safroko Limba | 1 | 9 | 12.6 |
| Sanda Loko | 2 | 6 | 58.0 |
| Gbanti Kamaranka | 2 | 8 | 41.1 |
| Libiesaygahun | 2 | 5 | 42.4 |
| Magbaimba Ndowahun | 2 | 3 | 44.0 |
| Sanda Tendaren | 2 | 5 | 34.2 |
| Bombali Sebor | 2 | 14 | 6.1 |
| Tambaka | ** | 3 | 76.0 |
| Total Wedge 1 | | 54 | 24.4 |
| Total Wedge 2 | | 41 | 31.2 |
| Overall total | | 98 | 28.8 |

* Functional PHUs only
** Excluded from wedge design

while nine came from Sella Limba. Their average age was 28 years. They had to walk on average for 70 minutes to reach the health facility.

More detailed background characteristics of the midline qualitative interview participants are provided in Annex 17.

Endline study (Wedge 1 and 2)

In total 48 people (15 health workers, 5 health managers, 11 TBAs, 11 mHealth-enrolled female clients and 6 male partners of enrolled clients) participated in SSIs. Health workers, TBAs, mHealth-enrolled clients and partners of clients came from two chiefdoms in Wedge 1 (the TBA intervention chiefdom and one other) and two chiefdoms in Wedge 2 (the TBA intervention chiefdom and one other). The health managers were not linked to specific chiefdoms but came from the district and national levels.

Out of the five health managers interviewed, two came from district level and three from national level. The average age for the group was 50 years (range 41–56 years), and they had been working within the health sector for an average of approximately 24 years (15–38).

The 15 health workers (eight MCH aides, four CHOs, two CHAs and one SECHN) came from four chiefdoms: Paki Masabong and Sella Limba in Wedge 1, and Gbanti Kamaranka and Libiesaygahun in Wedge 2. The mean age of the group was 42 years (26–60), and on average they had 12 years (2–30) of professional experience. Eleven out of the 15 health workers were PHU in-charges.

Eleven TBAs were interviewed as well. From those, three came from Paki Masabong (Wedge 1) and eight from Gbanti Kamaranka (Wedge 2). Their mean age was 53 years (range 30–63 years), and they had been working as TBAs for an average of approximately 13 years (2–22). On average the TBAs interviewed needed to walk for up to two hours (range 12–240 minutes) to reach the nearest health facility.

Eleven clients and six partners came from three chiefdoms. Four clients and two partners came from Sella Limba (Wedge 1). The remaining ones came from Gbanti Kamaranka and Libiesaygahun (Wedge 2). Six clients were enrolled during an ANC visit, and five while using FP services. Clients were on average younger (28 years; range 20–37) than the interviewed partners (41 years; range 32–56). Regarding the level of education, six of the clients did not have any education. The remaining five had completed secondary education. Education level among partners was more diverse (two with no education, one primary, one secondary and one tertiary). On average, clients had to walk less than an hour (42 minutes; range 5–85 minutes) to reach the nearest health facility.

In addition to the SSIs, 57 female and 49 male community members participated in eight FGDs. All FGD participants came from the same four chiefdoms used for the SSIs (53 from Paki Masabong and Sella Limba (Wedge 1), and 53 from Gbanti Kamaranka and Libiesaygahun (Wedge 2)). The mean age of the FGD participants was 28 years (range 16–50 years) for females and 36 years (14–65) for males. Half of the participants (52) had not followed any formal education before. From the remaining group, 12 had completed primary education, 36 secondary, and six tertiary. All participants with the highest education level (tertiary) were male.

More detailed background characteristics of the endline qualitative interview participants and of the FGD participants can also be found in Annex 17.

4.2.2 Health worker survey respondents

Information on the characteristics of baseline and midline study participants is available in the respective reports.⁷² For the endline research, information was collected from 188 health worker respondents employed in 95 out of the 99 health facilities in Bombali district. Data were not collected from the non-functioning facility, Fullah Town II in Bombali Seboria chiefdom, as previously mentioned. Data were also not collected from two PHUs in Tambaka chiefdom (Fintonia and Sanya) and one PHU (Kamasikie) in Biriwa chiefdom due to staff absence.

72 See Herschderfer et al., 2013; and Jalloh-Vos et al., 2013.

The number of health workers surveyed (188 out of 203) represents 93% of the clinical staff reported to be in place in the district and was considered sufficient to represent all the primary health care maternal health workers in the district at the time of the endline survey. Figure 6 shows the number of health worker respondents by cadre (type).

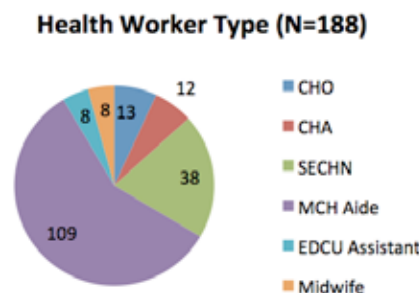


Figure 6: Number of health worker respondents, by cadre of health worker

The mean age of the health workers that joined the survey was 41 years (range 24–62 years). As in the midline survey, 80% of participants were female. CHOs and EDCU assistants were all male, and all MCH aides were female. The rest of the professional cadres had both female and male participants. Ninety five per cent of participants had children.

Almost all health workers (94%) had been in their current working position for more than three months, and nearly all (97%) were on the government's payroll. Those not on the government payroll were two state-enrolled community health nurses (SECHNs) and four MCH aides.

Annex 18 provides a detailed overview of the background characteristics of the respondents to the health worker survey.

Figure 7 (page 64) shows the distribution of staffing cadre by type of facility. As expected, the distribution of professional cadres by type of facility remained very similar to that described during the midline. The largest group, the MCH aides, came from all three types of facilities. Nevertheless, the majority of these (64% of all MCH aides, or 37% of all staff) worked at MCHP level. For other cadres, such as midwives and CHOs, the distribution was more homogeneous. As expected, all eight midwives and almost all CHOs (12 out of 13) worked at CHC level.

Every PHU has a designated in-charge, responsible for the management of the facility. In general, the higher the PHU level, the higher the level of in-charge. In total, 95 (51%) of the respondents were recorded as facility in-charge. Figure 8 (page 64) shows the distribution of the in-charge positions by cadre.

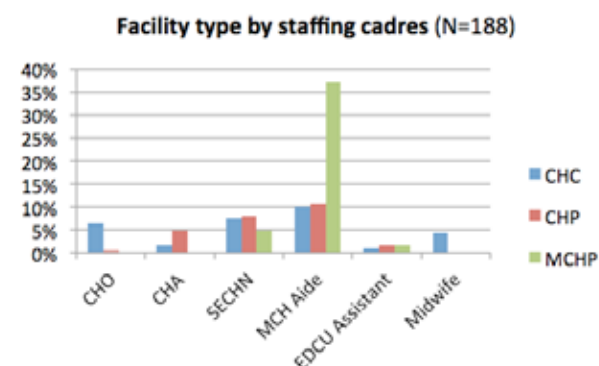


Figure 7: Distribution of health worker respondents by cadre and health facility

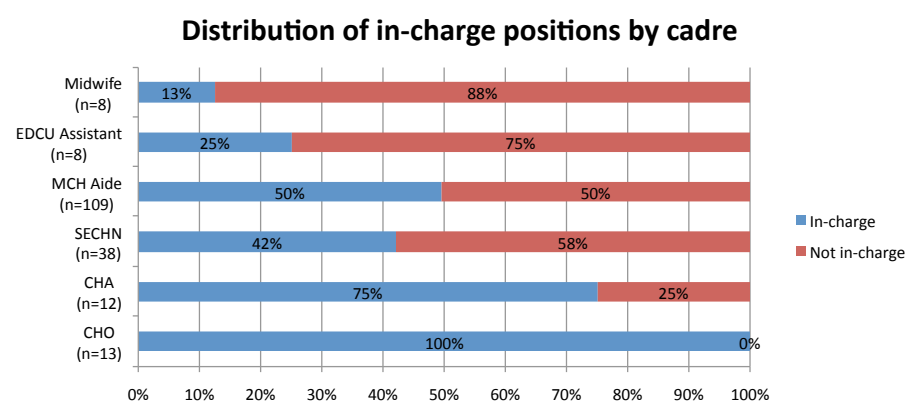


Figure 8: Distribution of the in-charge positions by cadre

4.3 Intervention stages

The mHealth stage 1 interventions started with the launch of the district VPN system as part of the regular PHU in-charges meeting on 4 August 2012. This was followed by a training of PHU in-charges and MCH aides from Wedge 1 PHUs in the health worker to client reminder scheme the next day. The following week there was a training of TBAs in Paki Masabong chiefdom on the same scheme, including the issuing of phones (to all PHUs in the district, TBAs in Paki Masabong chiefdom and district-level contacts) and solar chargers (to PHUs and TBAs in Wedge 1).

Stage 2 started in early February 2013, again combined with the regular PHU in-charges meeting, and also followed by training of Wedge 2 PHU in-charges and MCH aides (mHealth reminder scheme). Training of Wedge 2 TBAs took place the following week in the Gbanti Kamaranka TBA intervention chiefdom, when also phones were issued to TBAs (but no solar chargers).

Supervision was done through various channels:

- phone supervision by MRC (monthly);
- field supervision by MRC, DHMT staff, national MOHS staff and KIT staff;
- regular summarizing of reported problems to MRC (either directly or through the DHMT);
- supervision through attendance at PHU in-charges meetings (MRC and DHMT staff), including checking of monthly PHU reports, and occasionally also, PHU registers; and
- regular summarizing of reports received (PHU reports, DHMT reports on maternal death notification, TBA reports).

Implementation of the interventions generally went well, as health staff, TBAs and clients realized the opportunities offered by the mobile communication.

4.4 Client enrolment

Registers

During the lifetime of the project, PHUs were expected to submit monthly PHU reports on the mHealth scheme to district level (Wedge 1 PHUs for 12 months, Wedge 2 PHUs for 6 months); see Annex 19 for the forms. Proper registration of enrolled clients at first visit and registration of follow-up proved challenging for many PHUs, however, as did submitting timely reports.

At the end of the project, registers were temporarily collected from PHUs to allow data processing and analysis; 82% of 98 PHUs submitted pregnant woman (PW) registers (ANC, PNC, and institutional deliveries), while 77% of PHUs submitted FP registers (new and continuation FP clients). Data processing and analysis was challenging, not only because of missing registers but also since for many enrolled clients (2363, or 29% of those registered) no phone number was noted. This was particularly difficult to handle, as 75% of entries for clients with missing phone numbers in the register in fact showed information of follow-up calls, which seemed contradictory. On the other hand, among entries for clients with phone numbers, only 68% showed documented follow-up phone calls and/or documented visits or both. Annex 20 shows the details on both categories. Despite the inconsistencies observed with data it was decided not to exclude any of these entries from the registers in order to have a full picture of the situation. This resulted in a total of 8110 clients (pregnant women and FP clients) enrolled in the phone reminder scheme between August 2012 and July 2013. Figure 9 shows how the provision of phone numbers at registration changed over time, partly due to training and supervision efforts.

Enrolment process

Figure 10 shows the rapid expansion and subsequent levelling off of enrolment efforts, for Wedges 1 and 2. A total of 5708 clients enrolled in Wedge 1 (over a 12-month period),

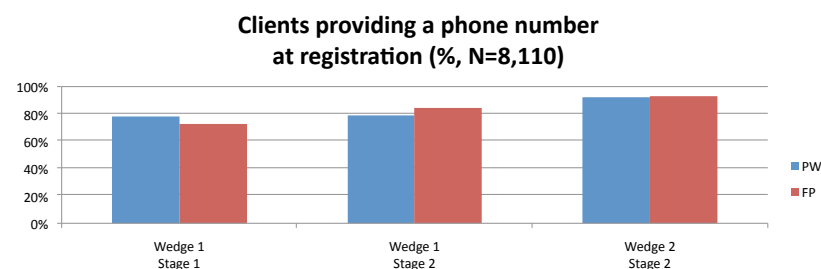


Figure 9: Clients providing a phone number at registration

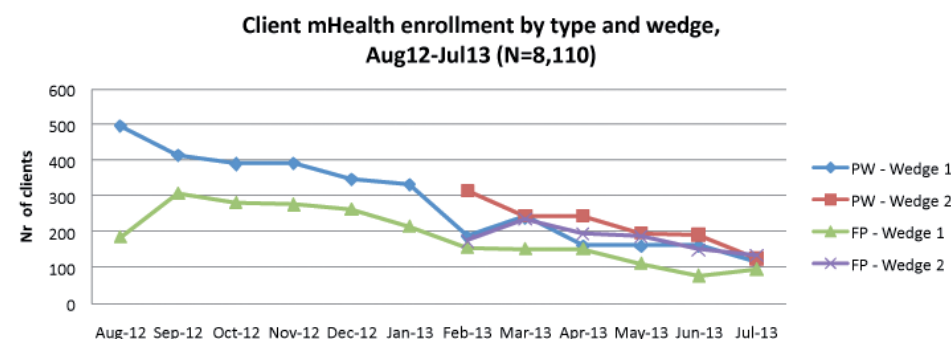


Figure 10: Client mHealth enrolment

and 2402 in Wedge 2 (over a six-month period). Most clients registered when coming for ANC1 and FP (both new and continuing), and much less during ANC2–4, delivery or PNC. Annex 20 contains further information about the distribution of clients over Wedge 1 and 2 chiefdoms, also disaggregated per client type (PW and FP). The proportion of client type per wedge is presented in Figure 11. In each wedge, the proportion of FP clients is lower than PW clients.



Figure 11: Type of enrolled clients per wedge

Enrolment coverage

We have tried to calculate the 'enrolment coverage', in this case defined as enrolled clients compared to the expected number of women of child bearing age (WCBA).

Details are presented in Annex 21, where we also explain a number of assumptions and reasons for using WCBA as denominator.

The data on enrolled clients were analysed taking into consideration three key elements of the process (enrolment, evidence that the client had access to a phone (phone number in the register), and evidence of follow-up visits). The data quality issues previously described (entries in the registers without documented phone number but with documented follow-up calls) were taken into account during the analysis. For the analysis, client data were sorted into groups: (1) a main group of WCBA clients enrolled in the mHealth scheme (with and without documented phone number, with and without documented follow-up calls), and two subgroups: (2) WCBA clients enrolled, with documented phone access at registration (with and without documented follow-up calls); and (3) WCBA clients enrolled, with documented follow-up calls by health workers (with and without documented phone number). For each of these groups, we calculated the enrolment coverage, by chiefdom aggregated to wedge, and by stage. Figure 12 presents the coverage calculated for the clients of the intervention who had documented follow-up calls (group 3 as described above), representing the optimal situation; Annex 22 contains the graphs for all groups.

By aggregating the total number of enrolled clients in Wedge 1 (stages 1 and 2) and Wedge 2 (stage 2 only) chiefdoms we calculated a proxy of the absolute reach of the intervention using as denominator the estimated number of WCBA per wedge. The combined coverage (Wedge 1+2) for the first group (all enrolled) reached 8% and was, of course, the highest among the three groups previously defined. Of the remaining two groups, coverage among those with documented calls (group 3) was calculated at 5.6%, and 6.5% was the aggregated coverage among those with a phone number (group 2). This last calculation was severely affected by the poor quality of data in the registers; therefore, it is unlikely to be accurately representing the actual coverage of the intervention.

For all three groups, coverage overall is higher in Wedge 1 (first six months) than in Wedge 2. This is explained because of the longer duration of the intervention in Wedge 1 (12 months against six months).

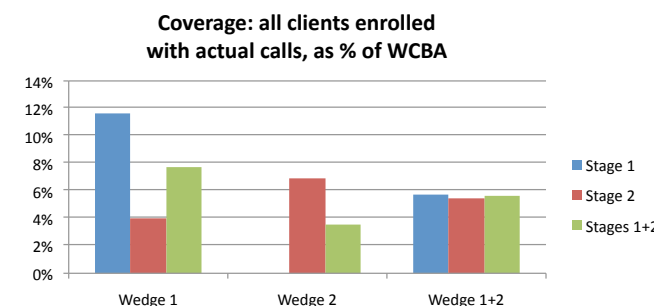


Figure 12: Client enrolment coverage

Coverage decreases substantially in Wedge 1 between the first and second six-month stages (and for all six chiefdoms). This might have been expected, as during the first stage the ‘reservoir’ of potential clients (e.g. those in varying stages of pregnancy, continuing FP clients) was invited to join, while in the second period facilities would have to rely more on new clients (e.g. ANC1, new FP). However, this seems at odds with the data mentioned earlier, indicating that for both stages and across both wedges, most clients registered when coming for ANC1 and new FP (also in stage 1 and 2 of Wedge 1).

One issue to consider is whether enrolled clients have in any way a different profile from those who came but chose not to enrol, were not offered enrolment or did not qualify to enrol. Socio-economic conditions or other external factors may have played a role (see also ‘enrolment challenges’ below).

Enrolled clients’ phone ownership and access

Provision of a phone number at registration is significantly higher in Wedge 2 than in Wedge 1, and also (among FP clients, not PW clients) in Wedge 1 stage 2 than in stage 1. The overall increase in registered phone access could partly be explained by greater efforts to train and supervise staff on client enrolment and the use of the registers, and maybe by phone supervision. This might explain the change observed among PW clients but does not seem sufficient to explain the variation among FP clients.

Figures 13 and 14 show phone ownership at registration, by stage and by client type. It is interesting to note that clients own more phones in stage 2 than in stage 1 (Wedge 1) and in Wedge 2 than in Wedge 1 (stage 2). Significant differences were furthermore found regarding phone ownership. More enrolled FP clients than PW had their ‘own’ phone. This can be logically explained, as women interested in FP services, aiming to keep things confidential, may be less interested in enrolling with someone else’s number. PW clients, however, may not have confidentiality issues, enabling them to enrol even if the phone is not theirs. The difference in phone ownership among FP clients appeared predominantly in chiefdoms where the TBA had no phone. Interestingly, in TBA intervention chiefdoms, FP clients preferred to enrol using the TBAs’ phone number.

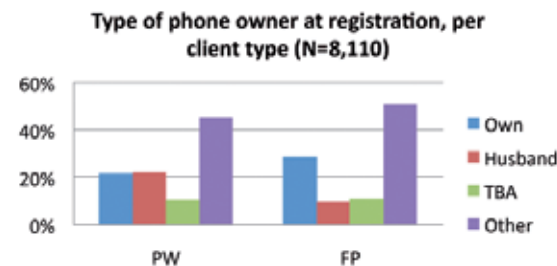


Figure 13: Type of phone owner at registration, per client type

When comparing across client types, as expected, FP clients made less use of their husbands’ phone than PW clients – this translated into a larger share of ‘other’ owners from family and community. The latter category, overall, is higher than expected and offers interesting insights when looking closer; it included family members of the clients but also in-laws, community health workers and community leaders, among which imams and chiefs; details are included in Annex 23.

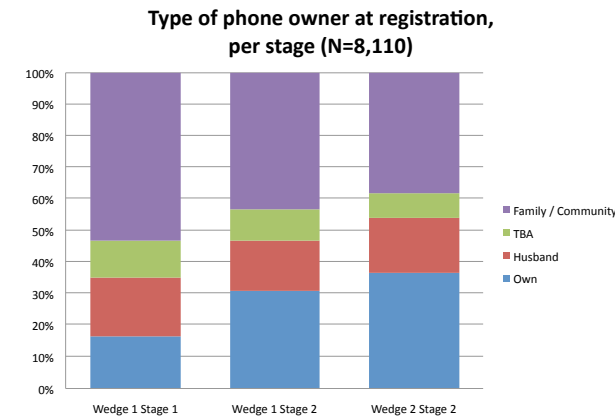


Figure 14: Type of phone, per wedge

Finally, Figure 15 presents the same information but only for the TBA intervention and TBA comparison chiefdoms. If the comparison chiefdoms are anything to go by (as they are relatively similar to the TBA chiefdom), using TBAs as an intermediary is the preferred option of many clients in the Wedge 1 TBA chiefdom (but less so in the Wedge 2 TBA chiefdom). The issues around this are addressed further below in this chapter. Disaggregating for client type (Annex 24) shows that FP clients have a stronger preference for the TBA route than PW clients do – as expected, however, this is only apparent in Paki Masabong chiefdom (Wedge 1 TBA intervention chiefdom), where this route was explicitly offered as an option.

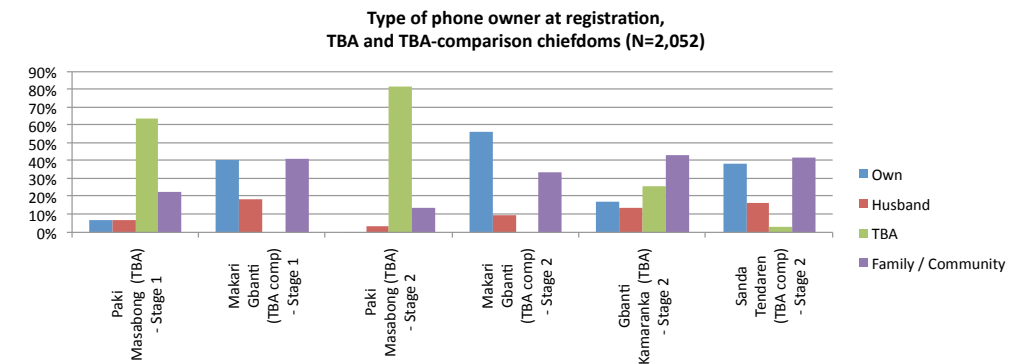


Figure 15: Type of phone owner, TBA and TBA comparison chiefdoms

4.5 Enrolment challenges and sensitivities

A number of challenges were observed during the recruitment and enrolment of clients for the mHealth intervention.

Network coverage

Some clients referred to limited network coverage at several PHU locations or at various client locations (implying that clients could not be called, or call from, there).

“Some women refused to join the reminder scheme, because the village where they stay doesn’t have network coverage, so they decided not to join the reminder scheme.” (EL W1 P40, Female FGD, non-TBA intervention chiefdom)⁷³

Phone number registration

Many enrolled without a phone number being documented as observed above – i.e. clients did not know or communicate the phone number of the person they wanted the call to pass through or this number was not noted by the health worker (in some cases maybe because the number was known – for example, a TBA or CHW phone – or noted somewhere else, such as the regular register, for instance. In any case, as we saw, it would not stop many of these clients from receiving calls and being followed up, as was evident from subsequent register entries.

Feelings about owning and using the mobile phone

The mobile phone was generally an item of which women clients were proud owners. Not having one sometimes caused feelings of jealousy or unhappiness.

“Some are jealous when they do not have a phone. If they ask somebody to make a call for them and the person says there is no credit or the phone is not charged, they will accuse the person of [having a] bad heart.” (EL W1 P12 Female FGD, TBA intervention chiefdom)

“If you don’t have money to buy a mobile phone, you will not feel good. They have to go and meet those with phones, by so doing they will expose their secrets because that person will not allow their phone to go out... so their secret is exposed and they don’t feel good about that.” (EL W2 P13 Male FGD, TBA intervention chiefdom)

Men in an FGD shared that they feel somewhat ‘exploited’ when using somebody else’s phone, because they sometimes have to pay for more credit than they use; the same may apply to female clients.

“If I want to make an urgent call to someone, so if I go to another person to use his phone, he will tell me to buy credit in order to make a call. So I will buy like

⁷³ The respondent ID of qualitative research quotations included in this report consists of the timing of data collection (ML=Midline, EL=Endline), the Wedge (1 or 2), the unique interview number (e.g. P6), an indication of the type of respondent (e.g. TBA, health worker) and the type of chiefdom (TBA intervention chiefdom or non-TBA intervention chiefdom). A TBA intervention chiefdom is a chiefdom that engages TBAs in the VPN for the health worker to client communication intervention. Where FGD quotes are used and more than one participants is quoted, we use ‘R’ and the sequential number (1, 2 etc.) – for example, ‘R2’.

100 units and I will only say one or two words and all the credit will stay with the phone owner. I will not feel good about that, but if it was mine, I will keep the remaining credit [as well].” (EL W2 P23 Male FGD, non-TBA intervention chiefdom)

So some clients thus wanted to enrol but did not have (access to) a phone.

“Some refused to join the scheme because they don’t have phones. They might need the facility number, but the phone is not there to make calls with.” (EL W1 P40, Female FGD, non-TBA intervention chiefdom)

In the community, various reasons were given for the lack of mobile phone ownership. Older women were seen as unable to use the phone, and poor people as unable to afford one:

“The only people that do not use phones here are the old women who cannot even dial, receive or make a call... but young [and] old men, young girls all use the phone here... Those who cannot afford the cost of the phone are the ones without a phone. They may badly need the phone but cannot afford to buy them.” (EL W1 P41 male FGD, non-TBA intervention chiefdom)

Low socio-economic status may translate into not possessing a phone. Combined with limited connections to people with more resources (not having access to another person’s phone), this leads to ineligibility to enrol and exclusion from the intervention and its benefits. This may have been indirectly mitigated by the ‘multiplier’ effect discussed in the next chapter, whereby TBAs and clients who are called and encouraged by health workers to come to the clinic spread the message and in turn motivate others (probably often not enrolled) to join.

Discomfort to talk via phone

Not everybody feels comfortable about talking on the phone about personal issues, which in the context of health are often felt to be sensitive. When presenting more detailed findings in the next chapter on the communication between health workers and enrolled clients, we quote several clients who indicated they felt rather unhappy having to borrow another person’s phone, as they could not speak in private. While these women ultimately decided not to be deterred and still enrol, others who already enrolled later left again because they did not want others to find out they were part of the mHealth scheme (see below). It is, therefore, likely that some clients did not enrol at all for this reason. Even when the TBA route was an option, not all felt like using it.

“Some did not join the programme because they are shy and don’t want to talk in public.” (EL W1 P35 Female FGD, non-TBA intervention chiefdom)

“I informed [others about the phone], some didn’t join the mHealth. (...) My friends said they don’t have a phone. [They know they can be called through

the TBA phone,] but they said they want to have their own phone and not the TBA's." (EL W2 P55 PW client, TBA intervention chiefdom)

Sensitivities around family planning

Particular constraints existed in the area of enrolment of female FP clients, who stated various reasons for either not joining the FP programme or not joining the mHealth scheme (but still joining the FP programme). The most common reason for this mentioned during supervision was that they did not want their partner (or parents or others close to them) to know about their use of FP methods. Interview findings confirmed the existence of such sensitivities, as will be reported later in this chapter.

Other clients may actually have been prevented from enrolling. It was reported that (Muslim) religion, as well as some spouses, were not allowing the use of FP. Our qualitative data show that a number of husbands have a problem with their partner being called by the health worker, joining the FP programme, or both. Examples of this emerged from across all research chiefdoms. Men and women in separate FGDs expressed their views as follows:

"Some women, when they sit and discuss with their husbands, about joining the family planning, as soon as they join the family planning, they will become wayward to their husband. (...) As the woman joins family planning, she will not go under her husband control again. We have seen some of the women who joined the family planning leave their husbands." (R6) "They don't care any longer if they sleep with many men, because they know that they will not get pregnant as long as they are on family planning." (R1) (EL P41 W1 Male FGD (two respondents), non-TBA intervention chiefdom)

"The problem that some people don't want to join the scheme... the family planning (...) they don't want anybody to know that she is involved in it." (R1) "Our husbands don't want us to join the family planning; they always feel that we have got a licence to do prostitution." (R2) "Some people if they don't have their own phone they will not join, because they would not like their secret to be told to outsiders, more especially if you are married." (R3) (EL W1 P58 Female FGD (three respondents), TBA intervention chiefdom)

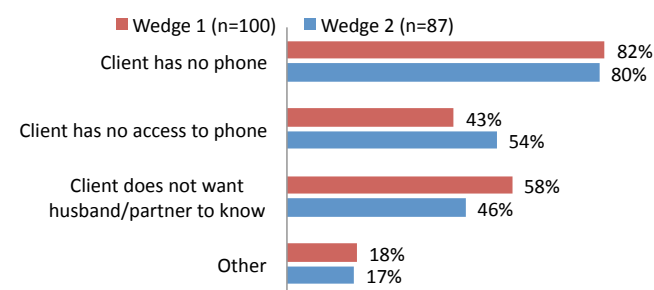
Health workers' views on barriers to enrolling

The above links well to the outcome of the health worker survey, which asked about the perceived barriers to client enrolment in the mHealth scheme. Figure 16 presents the findings, with a main focus on phone ownership and access as well as confidentiality issues (not wanting the partner to know).

Enrolled clients leaving the scheme

Twenty-nine out of 52 PHUs in Wedge 1 (56%) and 12 out of 41 PHUs in Wedge 2 (29%) had at least one member of staff who indicated at endline that clients had left the health

Perceived barriers to client enrolment



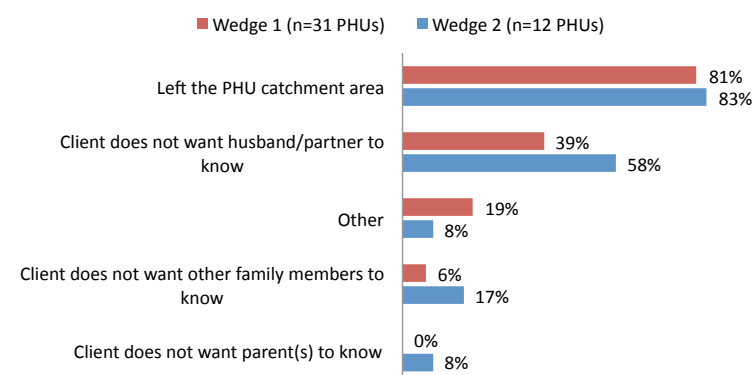
Multiple responses allowed, percentages do not add up to 100.

Figure 16: Perceived (health worker) barriers to client enrolment

worker scheme. This is a statistically significant difference which can be explained by the difference in duration between the health worker communication to client schemes in Wedge 1 (12 months) and Wedge 2 (6 months). In Wedge 1, 27 PHUs indicated that in total 86 clients had left, which is an average of three (range 1–7) clients per PHU. In Wedge 2, 10 PHUs indicated that 50 clients had left the scheme, which is an average of five per PHU (range 1–10 clients).

The most common reason for clients to leave the mHealth scheme was migration out of the PHU catchment area, followed by the client not wanting other people (especially husband/partner) to know she was part of the scheme. Other reasons mentioned were in Wedge 1 a wish to have a child (n=4 PHUs), side effects of FP (n=1 PHU), clients who were part of the mHealth scheme until their delivery and refused to join the FP part of the scheme (n=1 PHU), and in Wedge 2 that the client's phone was stolen (n=1 PHU). Details by wedge are shown in Figure 17.

Reasons for clients to leave mhealth scheme



Multiple responses allowed, percentages do not add up to 100

Figure 17: Reasons for clients leaving mHealth scheme

Follow-up issues

Specific follow-up challenges were minor; the main problems being clients' phone being off, not being answered or being outside network coverage. Some spouses and phone owners were not near the clients, so these had to call back. A few PHUs indicated that they circumvented the 'no number' problem by calling through a TBA's phone or a chief's phone.

Several PHU responses during supervision mentioned an improvement in health communication and referred to the mobile phones as being a great help for communication. PHUs also mentioned receiving positive feedback from clients and communities, stating that clients appreciated the calls, attendance at the clinic had increased and that clients were happy with the reminder calls, as they could now rely on the nurse to remind them about their appointments.

4.6 Phones and solar chargers

During stage 1, there was a short delay in giving out phones to the MCH aide coordinator and the ambulance driver at the hospital (neither is a member of the DHMT, but they are considered key district-level contacts); both received their phones in September 2012. Phones for district and city council health contacts were only delivered by the DHMT after the elections (November 2012), after newly elected council members were installed.

The majority of the phones functioned well over the entire period (12 months for most), with only minor problems. At endline, 14% of facility phones were not working (13 of 94 survey respondents); the difference between wedges (10 in Wedge 1 and 3 in Wedge 2) was not statistically significant. The reasons for the 13 phones not working were problems related to the phone itself, charging, the network and the SIM card. One phone got lost, and one phone was taken along by a previous in-charge. Almost half of these phones (n=6) stopped functioning in or after the last month of intervention.

During stage 1, it appeared that the facility phone was sometimes removed from the facility, and this issue was taken up by the DHMT.

"...Even though we have two or three workers in the clinic, the in-charge is the one that takes care of the phone. But it is the property of the facility. Sometimes when the in-charge is travelling she goes with the phone though there are other people at the facility. ...We warn them the phone is not their personal property and that they should leave it at the facility when they are going out or travelling out of the centre." (ML W1 P2 District-level respondent)

The action was reflected in the supervision data: all health workers included in the midline interviews confirmed that they and other staff had access to the facility mobile phone. This is also illustrated by the following quotes:

"Yes, my colleague whom I work with here has access to the phone. He uses it, because we don't take it out of the facility. If I am away, the phone will be with the one who is at the centre at that moment." (ML W1 P16 Health worker, TBA intervention chiefdom)

"Well, no other person uses this phone other than us staff at this [clinic]. The porter and vaccinator also use the phone to call pregnant women they know in order to come to the clinic." (ML W1 P30 Health worker, non-TBA intervention chiefdom)

"We keep the facility phone here, if the CHO is here he keeps it, but if they call any one of us he will give us the phone. But if he is not at the clinic he leaves it here at the clinic." (EL W1 P8 Health worker, TBA intervention chiefdom)

The solar chargers that were distributed did not perform well. In the first month of the intervention it became apparent that many of them were not charging effectively, if at all. By the end of the first stage, 44 solar chargers out of the 53 distributed were either damaged, not working or not effectively functioning; only nine were still functioning. It was subsequently decided to not distribute additional solar chargers in Wedge 2, as no suitable cost-effective replacement could be found. (Wedge 2 facilities had not received them during stage 1, as we were unable to purchase sufficient numbers in time for them all be introduced from the start of stage 1.)

4.7 VPN, network coverage and network providers

VPN system

Initial problems with facility phones (for facilities and TBAs) not functioning within the VPN were solved by ensuring registration of all SIM cards with Airtel and working together with Airtel to remove all the SIM blocks. Initially, a few PHUs reported credit being deducted for calls within the group, but this issue was solved within the first weeks of implementation. No major problems were reported, except for problems with network coverage (for example, having to walk some distance to obtain network reception).

During stage 1, texting alongside calling was part of the VPN package that had been negotiated with the provider of choice (Airtel), including a considerable discount in the framework of its corporate social responsibility policy. However, Airtel then unilaterally decided to exclude texting from the VPN package (this was a national-level decision affecting all Airtel VPNs in the country) at some point during the early months of stage 2. From that point, PHUs were allowed to use phone credit not only to communicate with clients but also for texting.

After major problems during the first months of Wedge 1 implementation with the provision of credits to the facility phones, it was decided to change the credit provider

from Airtel to a sub-provider of Airtel, which led to all the credit problems being solved. At the end of stage 1, four PHUs mentioned delays in receiving Airtel credit, possibly due to their phones being off at the time the credit was sent. The other PHUs in Wedge 1 indicated that they received the full credit on time. Some PHUs noticed that credit was disappearing for other calls (for example, personal calls by facility staff) and through the Airtel 'me-to-you' system (which transfers credit from one phone to another). During stage 2, no credit transfer problems were noted.

Networks and coverage

The percentage of health workers that reported being able to make and receive phone calls and text messages *inside* their PHU was similar at baseline and endline (86%), with no differences within or between wedges.

For the 26 (14%) health workers who reported at endline that they were *not* able to make and receive phone calls and text messages *inside* the PHU, the time needed to walk to a place where there would be network coverage averaged 22 minutes (range 2–120 minutes; mode:⁷⁴ 30 minutes).

Most health workers at endline reported good mobile telephone coverage all the time (41%) or most of the time (49%); this indicates that there were very few with 'almost never' coverage. The results are significantly different from baseline, and the same is the case for the differences between baseline and endline in each of the wedges, as shown in Figure 18. These differences, however, largely disappear if the scores for 'all the time' and 'most of the time' are combined.

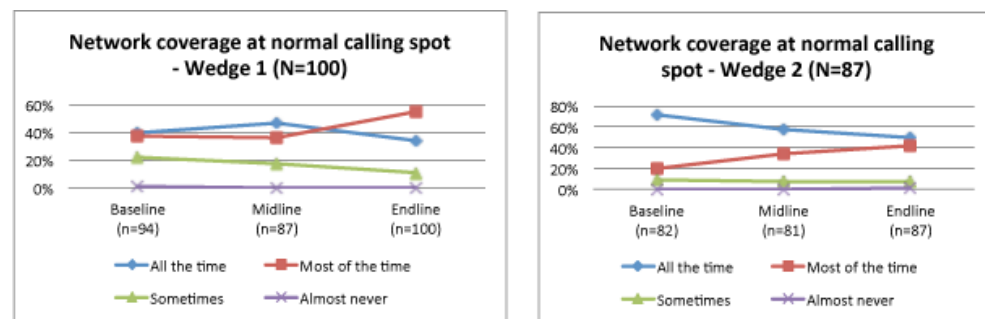


Figure 18: Evolution of network coverage at normal calling spot and by wedge

Slightly more health workers in CHCs (93%) indicated coverage all or most of the time compared to those working in CHPs and MCHPs (both 89%), although this was not significant. CHCs are usually located in chiefdom headquarter towns, which are more likely to be in the vicinity of (or have) mobile network masts.

⁷⁴ The mode is the result found most frequently. Here, a mode of 30 minutes compared to a range of 2–120 minutes implies that there are many medium distances, several short ones and one or more large distances.

All respondents indicated having at least one network available in their area. There was no difference between baseline and endline for having one (23%) or more than one (77%) network available. Figure 19 offers a more detailed overview by wedge over time. There is a statistically significant difference between Wedge 1 and Wedge 2 at baseline, midline and endline, with Wedge 2 having on average a higher number of networks available. This might be explained by the presence in Wedge 2 of the chiefdom Bombali Sebora, which contains a large part of the district headquarter town Makeni.

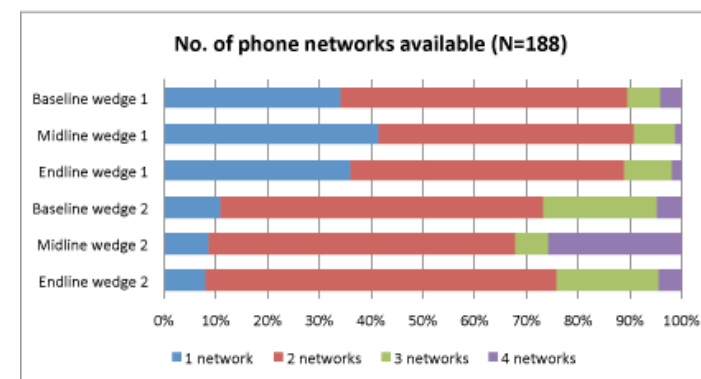


Figure 19: Number of phone networks available

Airtel (99%) and Africell (78%) were available to most health worker respondents at endline. Airtel is the network that is used for the interventions (VPN and health worker to client communication), and its high percentage at baseline, midline and endline confirms the choice of this network.

It is important to highlight that reported phone coverage shows no difference between wedges at baseline or endline for Airtel, as this is the network of choice for the intervention, nor for any of the other networks. Annex 25 shows the reported network availability for each network across the wedges. It also includes a graph on the combination of networks available to respondents.

During interviews and FGDs, respondents addressed network coverage issues. Responses from midline and endline qualitative data collection were similar. Respondents from some communities reported good network coverage:

"No, I don't have problems [with the network]." (EL W2 P9 Health worker, TBA intervention chiefdom)

In all other communities (in the same chiefdom as quoted as well as those in the other three chiefdoms where data collection took place), there were interviewees who reported unstable coverage at times and sometimes frequently; this was confirmed by various types of community respondents from various chiefdoms and is not aligned to the results from the health worker survey. This could be explained by the fact that coverage at the

district/PHU location is likely to be better than coverage in the PHU catchment area. Unstable network access was reported by all types of respondents, and poor coverage was reported in more remote rural areas and in specific places. The respondents also felt that weather conditions influenced network coverage.

"The only difficulty I get with calling the client is the network problem. As for us here we don't have too much problem with the network but those who are in the surrounding areas have a serious problem with the network." (EL W2 P14 Health worker, TBA intervention chiefdom)

"Well, like I told you, the network is not good here..." (EL W2 P26 Male partner, non-TBA intervention chiefdom)

"In this community, more over inside Mapaki when it rains heavily, the network becomes blocked. But if the weather is clear the network is fast." (EL W1 P28 male FGD, TBA intervention chiefdom)

"The network problem is everywhere. Even in Makeni, [network company] has a problem there. We all have the network problem." (ML W1 P16 Health worker, TBA intervention chiefdom)

People adopted ways to overcome network problems, mostly by finding 'hot spots' which may be on top of a hill or in a certain place in the back yard.

"Well the only barrier that will be there is the network problem in certain places and people go to a particular point where they get network." (EL P49 National level respondent)

"Yes, I find it difficult to make calls. Like sometimes, when there is no network, I have to go to the top of the hill in order to find coverage." (ML W1 P31 Health worker, non-TBA intervention chiefdom)

Health workers reported that for some activities they call a phone in another village to inform the village with no network.

"If we cannot get one person because of network [problems] we can pass the message to another village where there is network for the information to flow." (EL W2 P14 Health worker, TBA intervention chiefdom)

Clients confirmed this as well:

"We go finding [the network]... We move around and try to find a particular location." (ML W1 P12 PW client, non-TBA intervention chiefdom)

4.8 Health workers' ownership of and access to phones

For health workers, the intervention of providing mobile facility phones within the entire district (all wedges) and establishing the VPN for communication among health workers is reflected in a much higher use of a facility phone at endline compared to baseline. Only 1% of the health workers reported using a facility phone at baseline, while 95% of the health workers at endline reported doing so. The seven (4%) health workers who reported using a personal phone indicated that this was for making work-related calls and messages, and all but one (3%) indicated that they received work-related calls and messages on their personal phone. It appears that in general there was good accessibility to the facility phone.

Interviews with the DHMT and health workers provided insights into the use and accessibility of the facility phones provided during this study. They said that, in most cases, they had access to the phone. Sometimes health workers used their personal phones when the facility phone was not available or had problems with charging and was not working.

During the endline SSIs, health workers in various communities reported that the facility phone was available to them, as is illustrated by the following quotes:

"We keep the facility phone here. If the CHO is here he keeps it, but if they call any one of us he will give us the phone. But if he is not at the clinic he leaves it here at the clinic." (EL W2 P8 Health worker, TBA intervention chiefdom)

"...[The in-charge] is not selfish with the phone; she makes it available to me. If she goes out we have a place where we put it so we can get access to it." (EL W2 P14 Health worker, TBA intervention chiefdom)

One national-level informant said that sometimes the in-charge takes the phone along and nobody else has access:

"Some health workers... tend to hold on to the phone and make it their property and no one else will use it. But the phone is for the facility; no one should monopolize it. It is common with the in-charges who will not allow the junior workers to use it, but the phone is for everyone." (EL P49 National level respondent)

TBA phones

TBAs felt very proud that they could speak with health workers. In the presence of others it enhanced their status, and they also felt proud that they could talk confidentially with them.

"I felt proud among my companions, because for the phones which they gave us it is not all TBAs who have it, they selected us who are far from the [facility],

so to my companions take me higher than them, because I can now call the health worker and we can talk. Sometimes we talk secrets which other people cannot understand.” (EL W2 P11 TBA, TBA intervention chiefdom)

Reaching clients

In the community, various reasons were given for the lack of mobile phone ownership, as discussed below. Women who did not have a phone were more difficult to reach. In the areas where TBAs were part of the intervention and received phones, the health workers called the TBAs to reach clients. TBAs also used mobile phones to call nurses or clinics.

“It was my personal phone, but later the phone started giving me some problems. That was the time when [they] helped to give phones to TBAs, which was good timing.” (EL W2 P51 TBA, TBA intervention chiefdom)

“Most of the pregnant women do not have phones, so I call the TBAs to inform the pregnant women to come for clinic.” (ML W1 P16 Health worker, TBA intervention chiefdom)

In chiefdoms without TBAs with a facility phone, health workers call various other people, and clients use other people's phones to call the health worker. In one community with no TBA intervention, a person was appointed to take messages or call the nurse if needed, as the TBA does in the TBA intervention area. (The enrolment register data, discussed above, also showed that in chiefdoms without the TBA intervention, people still liaise with TBAs to receive calls.)

“All the villages in this catchment area identified one person with a phone, so that the nurse will be calling them and they will in turn pass the message on... and [she] gave the clinic phone number to the contact person, so that they will call the nurse if there is any emergency in the village.” (EL W2 P23 Male FGD, non-TBA intervention chiefdom)

“Well... the network is not good here, but [my partner] is always reached through one woman. The nurse calls the woman, and she tells my wife the message.” (EL W2 P26 Male partner, non-TBA intervention chiefdom)

4.9 Paying for phone calls

At endline, 20 (11%) health workers indicated they paid for work-related phone calls and text messages, compared to 100% at baseline (Figure 20). A significant difference was found at endline between Wedge 1 (6% paying, 6 staff) and Wedge 2 (16% paying, 14 staff). The six Wedge 1 staff who paid all reported that they also used the facility phone; while of the 14 Wedge 2 staff who paid, six stated that they did not use the facility phone, and three of the 14 indicated that the facility phone was not working.

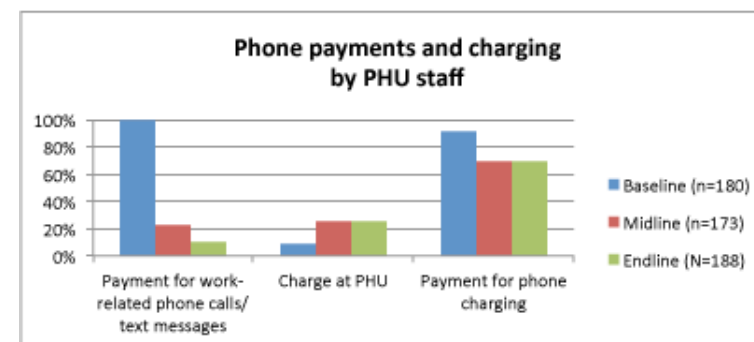


Figure 20: Phone payments and charging by PHU staff

At endline, these 20 health workers paid an average of SLL5885 per week for work-related calls/messages (range SLL2000–12,000). As expected, the average in Wedge 1 was lower (SLL5333) than in Wedge 2 (SLL6111), but this is not statistically significant. All 20 health worker respondents (both wedges) indicated that they paid out of their own pockets. To obtain the credit, staff walked on average 23 minutes (range 3–180 minutes), with longer distances in Wedge 2 (average 28 minutes) than in Wedge 1 (average 11 minutes).

There are various reasons emerging from the qualitative data about why health workers and clients had to pay to use the mobile phone. One reason was that the facility phone got stolen and the health worker or TBA needed to pay to replace it.

“I had a cholera case attack here when a lot of people came around; along the line people were calling me frequently, and all of a sudden someone stole the phone. (...) I started complaining, but they said I should buy it since that is the law. So I went and bought one...” (EL W2 P9 Health worker, TBA intervention chiefdom)

A more frequent reason reported was that health workers and TBAs used their personal phone to make a call.

“Well, to be sincere, I think it is a responsibility for me if I am to contact somebody to come to clinic the next day and the facility phone is off; then I can use my own personal phone to call the person.” (ML W1 P26 Health worker, non-TBA intervention chiefdom)

Clients, in turn, had several ways to initiate contact with the facility health worker. They could flash (a short unanswered call to signal ‘call me back’) to suggest that the health worker should call back (and, as seen later in this report, health workers mostly consider this a normal request and respond). Alternatively, they would need to have credit in the (own or borrowed) phone they were using, except for calling the national information line (number 117, the *Mami en pikin wellbodi fone line*), which is toll-free.

4.10 Charging the phone

At endline, 43 (23%) respondents indicated they charged the work phone at the PHU, 16 (9%) at home, and 129 (68%) somewhere else (e.g. shop or charging outlet). Unlike at midline (when there was still some positive effect of the Wedge 1 solar chargers, which at endline may have disappeared), there was no longer any difference between wedges regarding charging phones at the PHU.

Wedge 2 health workers charged their phones at home significantly more often than Wedge 1 health workers (19% versus 1%). This could be explained by Wedge 2 containing Bombali Seboria chiefdom and Makeni city, which has free electricity grid supply to many homes.

Paying for phone charging had reduced from 91% of respondents at baseline to 69% of respondents at endline (Figure 20), with a significant difference between Wedge 1 (75%) and Wedge 2 (61%). The total average amount paid for charging at midline was SLL1183 (range SLL1000–3000), which is slightly less than at baseline (SLL1337; range SLL1000–10,000).

As previously reported, there were problems with the solar chargers provided to Wedge 1 health facilities; interviews with health workers and TBAs provided insights into these problems and how they were perceived. A DHMT staff member and other health workers described the problem for most of the chiefdoms at both midline and endline:

"...It is only the charger that is not working, but the phone is in good order, and for me I am using the solar panel of the clinic; that is the one we are using." (EL W1 P57 TBA, TBA intervention chiefdom)

"Oh yes, yes, they are having a lot of problems with charging. You know, the community does not have electricity as such and does not have generators. A lot of them are complaining about the solar panel, so I think that is a barrier because when you call and could not get the person, they tell you their phone was not charged and their solar panel was down." (ML W1 P1 District-level respondent)

When the solar charger was down, health workers and TBAs had to pay to get the phones charged. This cost both money and time, as they may have had to travel to find a charge shop that had fuel for the generator to charge the phone. However, one health worker found that using their own money for charging the phone outside the facility was less of a problem than trying to find money for the fuel for the facility generator. Clients could not always reach the facility because the phone was off. The frequency with which the battery needed charging was also perceived as a problem.

"I am always available, except when it is not charged because here we do not have light facility. Though we have a generator but it is not easy for us to buy fuel, the cost of one litre fuel is too much... Charging is not always

available, that is why they cannot get us, but if we cannot get the person we send somebody to tell the person to come, so they can come." (EL W2 P3 Health worker, TBA intervention chiefdom)

Clients also reported problems getting the phones charged. Sometimes they had to ask their husbands to charge the phone or the charging shop could be out of fuel for the generator and they had to cover a greater distance to go for charging. The money spent on charging the phone could also have implications for the overall household budget.

"The major problem we are having is the charging, we have to travel to go to [village] to charge our phones, the price to go to [village] is 3000 Leones, and you pay 1000 Leones for charging, which is a bit difficult. Imagine you do that every week; this is a lot of money." (EL W1 P58 Female FGD, TBA intervention chiefdom)

"[My husband] takes the phone up there where they light the machine, for charging... Yes, the place is very far from our house. It is up there. (...) We pay 1000 Leones. If he has 1000 Leones he will not mind... except that we women have to know how to get other things in order to provide for that day." (EL W2 P2 FP client, TBA intervention chiefdom)

Many clients, therefore, preferred to 'flash', because they did not have money or did not want to spend the credit of another person who owned the phone. Health workers acknowledged this as well.

"We tell them to flash us because they don't have money. The phones that they have, they access it from another person." (ML W1 P26 Health worker, non-TBA intervention chiefdom)

It demotivated health workers to have to pay to charge phones out of their own pockets.

"I don't feel good, because they don't give me [reimbursement] for that. But there is no other way... it is my own money that I use to charge the phone which does not belong to me. I don't use it for my own personal purpose." (ML P16 Health worker, TBA intervention chiefdom)

Especially for TBAs, who received no incentive beside the phone, charging the phone could become a burden:

"Yes the problem we are having is the charging, and to me it is a problem, because I don't have money to charge the phone every week. Especially when I have frequent calls, it is a serious burden to me, more especially when incentives are not given. So it is difficult for me to spend 1000 Leones for a week just to inform the clients to go to the facility." (EL W2 P53 TBA, TBA intervention chiefdom)

Sometimes there was no problem, as was reported by the following health worker:

"No, [charging] is not a problem for me here. But at night I switch the phone off, and in the morning I turn it on, because they will call me." (EL W2 P22

Health worker, non-TBA intervention chiefdom)

One TBA was able to fix the solar charger that was initially not working:

"I have the solar charger. When I take the charger out in the sun, I connect it to the phone... At first when they gave it to me, it was not working, but I repaired it, and it is now working." (ML W1 P19 TBA, TBA intervention chiefdom)

One health worker stated that they could rely on the village chief for charging the phone at night, as there was a generator.

4.11 Calling versus texting

At endline, 100% of health staff indicated that they called more than they texted for work communication which was very similar to baseline (97%). No differences were found between wedges at baseline and endline.

The preference for calling rather than texting was confirmed by the interview data at midline and endline. There was consensus among all types of respondents about the preference for calling rather than texting. The reasons given for the preference for this way to communicate with other health workers were: having difficulty reading, finding calls easier to understand and not having learned how to text.

"Well I don't know how to text, so I prefer calling. What I don't know I will not do so that I will not get myself into problems." (ML W1 P4 Health worker, TBA intervention chiefdom)

"I want to be called more, because that is what I understand [more] than texting." (ML W1 P20 FP client, TBA intervention chiefdom)

However, the preference for texting or calling also related to network problems. A few health workers liked texting especially when the network was not very reliable, to ensure that information would be received:

"I text when there is problem with the network... For me the network is not stable, especially when I am in my quarters. Even in my office when a call comes, if I don't go out quickly the line will break, but if you text me I will receive it and will read the message." (ML W1 P30 Health worker, non-TBA intervention chiefdom)

"We go to their houses or we send text messages to their phones." (EL W2 P4 Health worker, TBA intervention chiefdom)

For health worker to client communication, health workers and clients also had a clear preference for calling rather than texting because clients understood the contents of the message better and because many were illiterate.

"I prefer to call because right now 90% of them (clients) are illiterate." (ML W1 P26 Health worker, non-TBA intervention chiefdom)

However, at least one illiterate woman had found a way to deal with texting by asking someone else to read it for her. Of course, this will be easier for a general appointment than an explicit FP message.

"Even if he texts, the schoolboy reads it for me because I don't know how to read." (EL W2 P18 FP client, non-TBA intervention chiefdom)

Some of the women stated that people who went to school could use texting:

"Yes, some of us who attended school send text messages. If I want someone to send credit for me, I will send a text message to that person, and the credit will come." (EL W1 P40 Female FGD, non-TBA intervention chiefdom)

One man in an FGD thought that not all SIM cards included a texting facility.

Some health workers felt that sometimes text messages could be tempting to read or difficult to avoid, and this could lead to cuts in credit:

"Well there were some problems when there were Premier League games. Some text messages used to come in, and when you read it they cut your credit, and I had to report that to the supervisor." (EL W2 P19 Health worker, non-TBA intervention chiefdom)

4.12 TBA involvement

There were multiple challenges encountered in the chiefdoms with TBA interventions, during stage 1. Communication proved difficult because of poor network coverage in many TBA locations and because of phone charging problems with the solar chargers. Several TBAs continued to have problems operating their phones. These observations prompted changes to the TBA training and supervision in stage 2, which indeed pre-empted a number of knowledge- and skills-related problems; a small TBA case study is presented below.

Most TBAs had problems with filling in the TBA reporting forms, and some had their children assist them. The majority of TBAs did not return these forms to PHUs, which in turn mostly did not submit them to the DHMT.

Case study on TBAs

Derived from the midline qualitative research data (interviews with clients, health workers, TBAs and managers), the following case study was developed to illustrate some of the constraints TBAs experienced when using the mobile phones.

The responses from two TBAs from the intervention chiefdom showed that some TBAs did not feel able to use the phone and carry out activities as expected. Even though they reported that they had received training prior to the start of the intervention, they had difficulties using the phone and getting through to others for the following reasons: they did not understand how the phone worked, did not know how to unlock the phone, did not carry the phone all the time and did not always manage to call health workers when referring clients.

One related health worker interviewed indicated that coverage of the network was sometimes an issue, but he also felt that for some TBAs the training provided was insufficient.

This is illustrated by the quotes from two TBAs and a health worker from the intervention district.

"They [the health workers] often ask me what is wrong with my phone, because they call me but they don't get me. And I tell them that I also tried to call them but I did not get them... I don't call to inform her about our coming, because sometimes even if we try to call her we will not get her. So that is why we just take the patient to the clinic... Sometimes the phone locks, and I don't know how to open it. I sometimes want to talk to the nurse but the phone is locked... I use it. I told you that I use it, except when it was locked for two to three weeks I was not be able to use it... I take the phone along with me to the bush. But sometimes I forget it in my pocket and leave it in the heat." (ML W1 P6 TBA, TBA intervention chiefdom) (Note: this TBA stated that her solar charger worked.)

The responses from a second TBA in this chiefdom indicated that she was having similar problems. The TBA was confused and unhappy about why the phone was not working, although sometimes she seemed able to call.

"She [the nurse] said when she calls me, the number does not ring... No, even the other nurse in [PHU location] has not called me on that phone.... I have to go and visit her... Maybe [the nurse] doesn't know my number.... I am thinking

that she doesn't know me; that is why she doesn't call me..." (ML W1 P18 TBA, TBA intervention chiefdom)

The response of the health worker from this chiefdom indicated that the problems in communication with TBAs lay with coverage and charging, but also with the TBAs not being sufficiently taught how to use phones.

"I do not have any problem in calling my colleague workers yet. The only problem is with the TBAs who stay at this other end. I call them but I do not get them because of the coverage... you call them and they do not answer the phone, until they see the missed call then they call back... They don't know much about phones. They always say they were not close to the phone... For those close to this clinic, I sent for them, so that they will come to meet me. They don't even know how to use the phone. They told me the phone is not in working order, but when they brought the phone I used my own charger to charge the phone and it worked... They trained them how to work with the phone, how to charge it, and how to answer calls, and make calls... But they should teach them better how to use the phone." (ML W1 P4 Health worker, TBA intervention chiefdom)

Other respondents also echoed the need for more training; however, some health workers went a step further:

"For me it is not necessary to give phones to TBAs, because they don't understand how to use them. It is just with them without any use. The other one gave the phone to her grandson, and the other brought the phone as the SIM has been blocked, and I have it here now." (ML W1 P16 Health worker, TBA intervention chiefdom)

4.13 Scheme administration, supervision and phasing out

As observed above, the administration of the enrolment of clients and subsequent communication (including documentation of the consent procedure, recording of planned and actual visits and reminder/follow-up calls and the monthly PHU reports to district level) remained a problem during stage 1 and also stage 2, despite additional attention during Wedge 2 training and supportive supervision. The main constraints appeared to be workload, type of staff, capacity of staff, frequent staff changes and limited communication of information on the scheme to other staff in the facility. For example, staff who did not attend the launch and training or who were new to the PHU were not updated by others.

Phone supervision was used to obtain insights into the functioning of the scheme between field visits, but there were several constraints, including some PHU phones being switched off or frequently outside the coverage area (possibly due to not being

charged or a lack of network coverage). Other challenges were the workload of PHU staff (reachable but too busy to either answer the phone or talk for a longer time) and some facilities not answering the phone when it rang. Some PHUs promised to call back with information or to discuss issues but never did.

The intervention research concluded on 31 July 2013. Payment for the VPN continued for a few more months, as had been agreed with the DHMT. The DHMT aimed to negotiate a transfer of the terms of the contract from the project in order to be able to continue the VPN network. Continuation of the health worker to client communication scheme was a bigger financial challenge and seemed to depend on donor funding.

4.14 Mapping of other interventions

In this study, the effect of the mHealth interventions was measured through counterfactual analysis comparing the characteristics, outputs and outcomes obtained by Wedge 1 and Wedge 2 chiefdoms between baseline and midline points. In addition, results were also analysed comparing the same elements between baseline and endline for Wedges 1 and 2, and finally by comparing the period between midline and endline for Wedge 2. Attribution of any difference found to the intervention was not necessarily evident, as other parallel interventions of varying nature may have been responsible for generating the difference in results regarding, for example, service utilization for ANC, delivery, PNC and FP. (Although such 'confounding' interventions were more likely to weigh in on pre/post analysis than double difference (counterfactual) analysis.)

In view of the above, mapping of relevant major other (parallel) interventions in Bombali district was seen as important and undertaken during the endline research through key SSIs with district health managers. In addition, other respondents were also asked whether they knew about any other intervention that could explain some of the mHealth intervention results.

Annex 26 presents the overview table listing all known interventions in all 13 chiefdoms of the district. All of these are interventions beyond the work of the DHMT/MOHS in all PHUs in all chiefdoms in the district.

- UNICEF was active in all chiefdoms regarding child health, nutrition and immunization, including health worker incentives; just as UNFPA (community advocacy, male involvement) and Marie Stopes (FP outreach via CHWs).
- Health Poverty Action was active in five chiefdoms (of which four in Wedge 2) with a mother and child programme that *inter alia* provides training for CHWs and incentives for TBAs; this may have had the potential to impact on similar outcome indicators, albeit unequally across both wedges, as the mHealth interventions.
- Also *Restless Development* reproductive and child health activities were concentrated in Wedge 2 (two chiefdoms); as well as activities by BRAC, the Sierra Leonean Red Cross and CESATAS (each in one chiefdom in Wedge 2)

- On the other hand, MRC supported one project in one Wedge 1 chiefdom; while *Munafa*, active on child health, concentrated its work in three Wedge 1 chiefdoms.

On the surface, the number and type of parallel interventions did not seem too unbalanced across either wedges or TBA intervention chiefdoms. While the mapping focused on the chiefdom level, the interventions mentioned might not have reached every village or PHU catchment area in that chiefdom. However, we do not know whether this was really the case and to what extent results attributed to mHealth interventions actually would need to be attributed to one or more of these parallel interventions; the assessment required to find out falls outside the resource scope of this study.

Annex 26 also carries a summary of parallel interventions mentioned by other respondents, as part of their 'regular' endline interview. While no information was collected in these interviews on the geographical focus of these parallel interventions, some were mentioned more often than others, such as the following.

a. The Free Health Care Initiative (FHCI)

As expected, many respondents of various types mentioned the FHCI, which has been implemented since April 2010. This initiative was (and is) implemented across the whole country and across the whole district and thus is unlikely to have influenced our findings.

"In the past we used to pay money to go to hospital, but now there is a free medical [service] there, [that] is why plenty of us go to hospital." (EL W2 P12 female FGD, TBA intervention chiefdom)

"I think one of the important things which influences pregnant woman is that in the past they used to pay. When you want to deliver, if you don't have money [that] is a problem. But the free health care has influenced many people to go to the [clinic], because they don't have to pay." (EL W1 P28 male FGD, TBA intervention chiefdom)

"The free health care by government has helped also." (EL W2 P52 TBA, TBA intervention chiefdom)

"The free health care [could have had an effect]. Before the coming of the FHC, deliveries at home were 70% and in the facility 30%. But with the FHC it is now the reverse. So FHC is the main intervention that has equally caused a change." (EL P59 District-level respondent)

b. Policies and activities that discourage home deliveries

Byelaws and other activities to discourage home deliveries were mentioned across both wedges and by health service clients, community members as well as health workers and national managers.

"The community made a law that if a woman is pregnant and remains careless without coming to the hospital to deliver, when she delivers at home will be fined. They have that law in the community." (EL W1 P30 Male FGD, TBA intervention chiefdom)

"Women turn up plenty to the hospital to deliver, since women are not allowed to deliver at home." (EL W2 P12 female FGD, TBA intervention chiefdom)

"They made a law that if anyone delivers at home [she] pays a fine of 100,000 Leones. I don't even have enough to eat, so as I feel labour pain I go straight to the clinic." (EL W2 P18 FP client, non-TBA intervention chiefdom)

The following response from a health worker, from the same chiefdom as the FP client quotes above, makes clear it why the client was keen to comply.

"When I came here, I held meetings with the community elders and the TBAs. I told them that on no account should a pregnant woman deliver in any village. If a pregnant woman wants to deliver, let them come with her to the clinic. If they fail to come to the clinic and anything happens, I take them to the police. So that is why you see an increase in deliveries at the clinic." (EL W2 P22 Health worker, non-TBA intervention chiefdom)

c. The distribution of food supplies to pregnant and lactating women and for children

Food distribution attracted many women to attend clinic services, possibly related to the poor socio-economic conditions.

"SNAP is an organization that supplies food to lactating mothers and pregnant women at the clinic. Some of the foods they supply are beans, corn flower, bulgur and oil. So this motivates the women to come to clinics. (...) If she fails to come to the clinic, she will miss out on the food. So all this is a benefit for the women." (EL W2 P13 Male FGD, TBA intervention chiefdom)

One of the TBAs from this chiefdom confirmed this:

"Now there are more women going to the clinic. The reason is because the nurse communicates when there is going to be food. Also, we remind clients when to visit the facility; that has helped to increase the number of pregnant women in the facility." (EL W2 P47 TBA, TBA intervention chiefdom)

Also male and female community members, in the other three chiefdoms, concurred.

"When you go to the hospital they give you supply." (EL W2 P17 Female FGD, non-TBA intervention study)

"The programme where UNICEF brings food for the children to the clinic has motivated many clients to come to the clinic. So when they return home they will be very happy because of the food supplied to them at the clinic." (EL W2 Male FGD, non-TBA intervention chiefdom)

"The reason why more women come to the clinic now is that there is supply of food there. Most of the women now come only for those supplies." (EL W1 P41 Male FGD, non-TBA intervention chiefdom)

Other initiatives mentioned (see Annex 11) included, among others, performance-based financing (PBF), health talks on the radio, and community mobilization activities conducted by health workers.

"One [issue that also influenced] is the increment of salaries, the PBF which they give us... Everybody works very hard so that her PBF will improve, so that she will be able to [improve] her centre. Some of the PHUs are now renovated, (...) and people are happy about that." (EL P1 District-level respondent)

"The radio also helps. Any radio that is on air will always talk about health. That alone gives awareness to our people, because they talk not only in English but in all local languages, and they get it and understand it. That is another way. (...) And also, the nurses are always trying to mobilize the patients, like, what the nurse was doing here: pregnant women and lactating mothers can make a garden, and once a week they all meet together to work, and at the end of the day they share the proceeds among themselves. That alone makes the attendance increase." (EL W1 P30 Male FGD, TBA-intervention chiefdom)

"Health Poverty Action [influences service utilization] (...) because they have trained community mobilizers and give stipends to promote health talks and report maternal deaths. They also have an ambulance service in their operational areas..." (EL P59 District-level respondent)

These findings contributed to anecdotal evidence that a number of interventions were taking place at the same time as the mHealth interventions and that some of these may explain part of the (intervention/counterfactual and pre/post) differences found.



5 Findings regarding research objectives

This chapter presents the results of the intervention study, based on the three measurement points in time (baseline, midline and endline data collection) and the sources as indicated in the methodology chapter. The findings are presented for each of the research objectives.

It also presents comparisons between (i) the groups of chiefdoms that were part of the two implementation wedges; and (ii) baseline, midline and endline (overall and by wedge), as well as related comparisons for specific variables. An overview of all the similarities and differences is provided in Annex 15. The TBA implementation and comparison chiefdoms were also part of this comparison. These comparisons took into account the characteristics of health workers and health facilities, mobile phone coverage and use, job satisfaction and communication.

5.1 Objective 1 – MNH/FP service utilization

(Health worker to client communication)

5.1.1 Communication between health workers and clients (quantitative)

As expected, the frequency of health workers' calls and texts to clients increased substantially (Wedge 1 intervention only) at midline, and this was sustained until endline (significant difference; see Figure 21; Annex 27 provides additional details). At endline, for both wedges combined, the frequency of communication to clients is significantly different (higher) than at baseline (Figure 22). In turn, the reported frequency of calls and texts from clients decreased (significantly) between baseline and endline (both wedges combined).



Figure 21: Health worker calls/texts to clients

No differences were observed between types of health workers and facilities for call frequencies to/from clients. At endline, in-charges made significantly more frequent calls/texts to clients (59% vs. not in-charges 41%). This was not seen for receiving calls/texts from clients. There were no differences observed at baseline for in-charges/not in-charges or distance to Makeni. At endline, however, the further a member of staff was

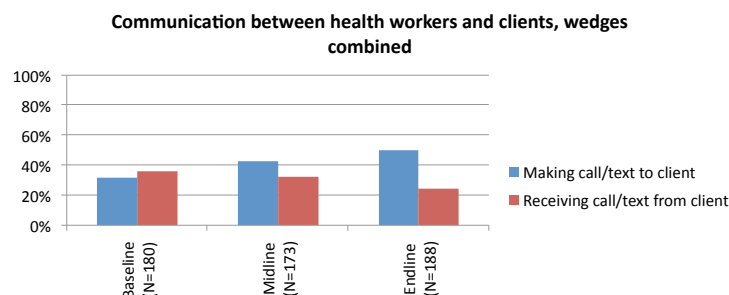


Figure 22: Communication health workers and clients

based from Makeni, the more frequent the staff communicated (both for making and receiving calls/texts) with clients (6% 1–10 km vs. 19% 11–30 km vs. 48% 30+ km). This was found to be significant.

When asked at endline, health workers reported calling on average 7.7 clients during the week before the interview (Wedge 1: 7.4; Wedge 2: 8.4; no significant difference). Among the three reasons for calling clients suggested in the survey (appointment reminders, follow-up on missed appointments and follow-up after a clinic visit), the latter scored highest during baseline and midline (both wedges), while at endline appointment reminders came out number one. In addition, other reasons mentioned included informing about outreach, immunization and the availability of drugs and supplies.

Inversely, clients called health workers mostly to make appointments (at least at midline and endline), then for advice about illness (also midline and endline), while missed appointments always came third. Other reasons mentioned mostly related to (obstetric and other) emergencies, adverse drug effects and showing appreciation.

Health workers were also asked about barriers to client communication (see Figure 23). The main reasons were the client's phone being off, no or no functioning phone number, and no network coverage at the PHU.

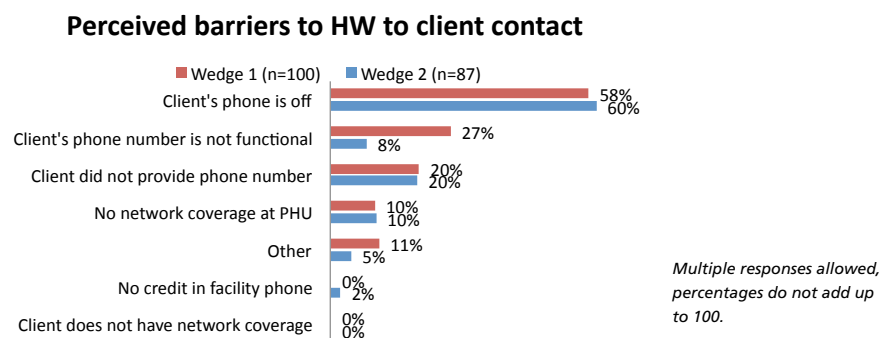


Figure 23: Perceived barriers to health worker-client contact

5.1.2 Communication between health workers and TBAs (quantitative)

Comparing baseline to midline and endline, there was a pronounced difference between wedges, contrary to what was expected. Whereas communication in Wedge 1 (which had a TBA intervention component after the baseline) decreased significantly, communication with TBAs increased (but not statistically significantly) in Wedge 2 (which only started the TBA intervention after the midline) – see Figure 24.

No differences were observed between types of health worker or for (not) being in-charge for call frequencies to/from TBAs. While at baseline CHC staff made calls or sent texts to TBAs significantly more frequently (37% vs. CHP 18% vs. MCHP 14%), this difference was not seen for receiving communication from TBAs and was not seen for either making or receiving at endline. The further away a member of staff was based from Makeni, especially if the PHU was beyond 30 km, the more frequently they communicated with TBAs; this was significant at baseline for receiving calls (11% for both 1–10 km and 11–30 km vs. 36% for 30+ km). This was also found to be significant at endline for both making (7% for 1–10 km versus 16% for 11–30 km versus 27% for 30+ km) and receiving calls (6% for 1–10 km versus 12% for 11–30 km versus 38% for 30+ km).

Reasons stated at endline for communication initiated by health workers were, in response to suggested answer categories in the survey, mostly to inform TBAs about meetings and workshops (79%) and requests to come and help out at the clinic (68%).

'Other' reasons (18%) included reminders about reports, bringing clients to the clinic, informing clients about ANC, PNC and FP, informing clients about appointments, outreach, meetings and immunization, giving advice, monitoring PW in their areas and telling them not to deliver at home but at the clinic. Little emphasis emerged on communication about appointment reminders and bringing clients to the clinic (as in the qualitative findings); this may be due to a lack of probing for more 'other' reasons. In addition, the answers from staff in TBA chiefdoms were a minority in the above statistics (while separating them out led to the problem of analysing relatively small numbers).

While there was no mention of clients at baseline, five out of 20 respondents in Paki Masabong TBA chiefdom at midline mentioned mobilizing or informing clients to come to the clinic or for immunization (outreach). At endline six out of 20 respondents in Paki Masabong mentioned informing or monitoring clients for clinic visits, outreach or the related reports. In Gbanti Kamaranka TBA chiefdom only one out of 30 respondents mentioned the ANC clinic at endline (no mention of clients at baseline or midline).

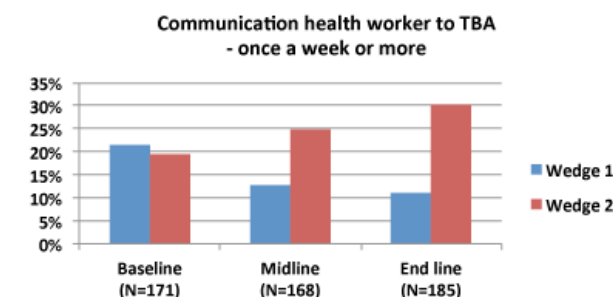


Figure 24: Health worker calls/texts to TBAs

One main reason was mentioned at endline for communication initiated by TBAs: requests to help with difficult cases, including referral (100%). Other reasons (6%)⁷⁵ included information about meetings, notification of clients coming to the clinic and appointments.

5.1.3 Reasons for communication (qualitative)

From the qualitative data, and across the various types of respondents, the two types of clients (PW and FP clients) and the two ways of initiating communication (by clients or by health workers or TBAs), three main reasons for communication emerged, although with some variation: appointments, health information and health status. The reasons given by health workers and TBAs partly overlapped with the quantitative data presented.

a. Health workers' reasons for getting in touch

When health workers (and sometimes TBAs) initiated communication with clients, they did so to discuss appointments (advance reminders, missed appointments, informing about 'clinic sitting' and availability of expected supplies), offer health information on a range of topics (nutrition, medication, child care, family planning, hygiene) and check on their health status.

There was little difference between PW and FP clients regarding reasons for calling, apart from expected differences related to their specific concerns.

"We call the clients to know why they failed to come to clinic; others we call them for family planning." (EL W1 P32 Health worker, TBA intervention chiefdom)

"Like the ones whose children are anaemic, we always make sure that they report, if we admit her for three days and we discharge her to go home we need to be monitoring to know how the child is faring... Even the pregnant women who are anaemic we always make sure that they come to [the clinic]." (EL W2 P3 Health worker, TBA intervention chiefdom)

"I call them to remind them to come to the clinic. When they forget to come, I call the TBA and tell her to call a particular client to remind her to come to the clinic. Especially the pregnant women I force them to come to the clinic because I will be the one to deliver them." (ML W1 P21 Health worker, TBA intervention chiefdom)

Indeed, reminding clients to continue contraceptives and not to forget their appointments was common.

⁷⁵ Multiple answers were possible, so total is >100%.

"[The health worker] calls us to come, and when we come she will tell us [that] if we want to stop giving birth to babies, let us come for drugs. So we will come and collect the drugs." (EL W2 P2 FP client, TBA intervention chiefdom)
"Well, when they tell us to go home and come after one month, they will call and remind us before that one month reaches." (EL W2 P21 PW client, non-TBA intervention chiefdom)

Some health workers took their role very seriously:

"Yes. Through this phone, I had one client at Kamode, but she went to Freetown, but I told her the time she should report at the clinic. When she went to Freetown she fell sick and did not have a phone to call. So I went to the family house, and they gave me the number of the person whom she went to visit in Freetown. So I called her, and she told me she has not forgotten, and when it was time for her to attend clinic, she was here at the clinic." (EL W2 P22 Health worker, non-TBA intervention chiefdom)

Not only did health workers call to remind clients about appointments; they also called to check on side effects and problems.

"Yes, like those on family planning, especially [the] 'depo injection', when I give them I will call them after two weeks to know how they are feeling and, if they have any problems, let them tell me. (...) When I attend [pregnant women] and they return to their villages, I will call them to know if they are not feeling any further pain." (EL W1 P34 Health worker, non-TBA intervention chiefdom)

Distribution of food for clients was another reason health workers called clients.

"We also call them for supply [of food supplements]." (EL W2 P14 Health worker, TBA intervention chiefdom)

"At times when food supplies [for pregnant women] come for us, they call me and tell so that I can tell the others. They come with corn flour, oil and other condiments." (ML W1 P28 Pregnant woman, non-TBA intervention chiefdom)

Health workers also initiated communication with TBAs to reach clients.

"We just gave them an appointment for the coming week, when there was no facility phone... Now that the facility phone is here we call them through the phone, [and] if they don't come, we will call the TBAs to tell them to come for the clinic, because the medicine which we gave them is for a period of time, and when it finishes, they should come and collect the other consignment." (EL W1 P32 Health worker, TBA intervention chiefdom)

"[The doctor] asked me if everything is alright with me and if the patients are ok, and I told him they are all ok." (ML W1 P13 TBA, TBA intervention chiefdom)

b. Clients' reasons

When clients called their clinic (or sometimes the TBA), they also did so to ask about agreed appointments and 'clinic sittings'. They also called for health information and to discuss health problems they experienced or follow up on advice they received.

"I can call her to tell her that I am not feeling well, and she can advise me, and the following day I come to the [clinic]. Or if the baby has any problem, she can advise me to do so and so, and the following morning I take the baby to the hospital." (EL W2 P18 FP client, non-TBA intervention chiefdom)

"Some flash me in order to know if there are medicines for family planning at the clinic, others will flash to know if their time is due to come for clinic, and others will call to report to me that they are seeing their menstrual period." (EL W1 P34 Health worker, non-TBA intervention chiefdom)

"Anytime when I am in doubt and I don't understand, I will call [the nurse] for direction, and she will help me. ...I call to ask if it is time for me to go for the injection, or it is not yet time she will tell me when to visit her. ...[And] if the baby is sick I will call the nurse." (ML W1 P20 FP client, TBA intervention chiefdom)

Women also called just to make sure that they knew the 'programme for the week':

"About what people have to do for the week, if there is a programme, maybe I have to go somewhere." (EL W1 P45 PW client, non-TBA intervention chiefdom)

Clients and TBAs called the facility to ensure that there was a health worker present to see to the clients who were planning to come or were on the way. This was confirmed by various respondents including a health worker, TBA and client, of whom we quote two:

"Yes, before we found it difficult to meet the nurse at the clinic, but now this facility phone has helped us, and it is now easy to call the nurse before we come to the clinic." (EL W1 P40 Female FGD, non-TBA intervention chiefdom)

"I can just pick the phone and ask her if she is around, [and] she can tell me. I cannot strain myself. She can tell me to come on a particular time. That is why I am happy about that." (EL W2 P24 FP client, non-TBA intervention chiefdom)

Clients found it important to know where and when an (outreach) clinic was held or that staff would be present, so they would not go in vain. This was especially important for clients who had to travel a considerable distance to get to the clinic.

"If you are sick at home, and you have the facility number, you have to call the hospital to know whether the nurses are there or not, but if the facility phone was not there, you would walk to the hospital for nothing because the nurses would not be there to attend to you. That is why the facility phone is important." (EL W1 P40 Female FGD, non-TBA intervention chiefdom)

"Like over the river, during this rainy season, I was not able to go over there. But there is one client there, when she wanted to come to the clinic she called me, but I told her to wait for me till I return from Makeni... this facility phone has solved a very big problem..." (EL W2 P22 Health worker, non-TBA intervention chiefdom)

c. TBA reasons

TBAs called health workers to announce referral of pregnant women and children to the clinic, and to communicate they had mobilized clients for routine clinic visits.

"Like I said, the TBAs have a phone, so if anything happens, the clients go to the TBAs to call us to alert us that patients are on their way to the centre, and we also tell them that the patients should not go to other centres. The facility phone is more for those outreach areas, and now they call before they come to the clinic." (EL W1 P31 Health worker, TBA intervention chiefdom)

"Pregnant women can report to me that they are not feeling well, and I can call the nurse who can instruct me to treat her or to refer her." (ML W1 P23 TBA, TBA intervention chiefdom)

Not only TBAs from the intervention chiefdom communicated with health workers. TBAs from the other chiefdom, who did not receive a phone, also contacted PHU staff to consult:

"Some [TBAs] call me when they have difficulty with delivery. They will flash me, and when I call they tell me that they have a labour case at hand. She tells me the dilation, and I then tell her to move [the client] to my centre." (ML W1 P27 Health worker, non-TBA intervention chiefdom)

d. Health promotion

Health workers and clients spontaneously spoke about the information they share and receive, respectively, regarding the need to come for ANC, delivery, immunization and FP, and the importance of keeping appointments. During the interviews, some interviewers probed what clients learned from health workers. The findings showed that clients and TBAs remembered most instructions about exclusive breastfeeding, hygiene, use of bed nets and nutrition.

"[The nurse] always tells us not to forget to come and take the injection at the end of the month, so my husband will take me to the clinic... She advised me on what to eat, and tells us not to give any other food apart from breast milk to the baby... not to forget to clean the mouth of the breast before I give it to the baby... I clean my hands very well together with my children, before we eat." (EL W2 P2 FP client, TBA intervention chiefdom)

"She tells me to tell the woman to go to the clinic, and I should even talk to her about how to clean her house to get good health care and to deliver a fine and strong baby without a problem." (EL W2 P11 TBA, TBA intervention chiefdom)

One TBA stated that face-to-face communication with health workers that used to take place before the intervention was replaced by phone calls. In chiefdoms without TBAs, health workers were calling and advising individual clients about nutrition etc. by phone.

"Well, at any time we talk to the doctor he advised us to clean our environment, and let us sleep under a bed net... As a result of the test made from my community, he sees that most of the children and pregnant women are suffering from malaria. He advised that I should also pass on this information to my community people, and that has helped to reduce malaria in our community... Before the phone, we usually got health talks in the facility, but now the doctor can remind us through the phone, to remind our people about sanitation." (EL W2 P51 TBA, TBA intervention chiefdom)

"Whenever she calls me, she tells me to be buying eggs to eat." (EL W1 P36 FP client, non-TBA intervention chiefdom)

"When I go, she advises me not to walk bare footed because of the baby in my stomach." (EL W2 P16 PW client, TBA intervention chiefdom)

5.1.4 Communication sensitivities and confidentiality

Earlier we reported that some women did not join the mHealth client reminder scheme because they did not have their own phone and did not want to use another person as a go-between for personal issues (see Chapter 4). Other women in the same situation did join, but still felt uncomfortable using another person's phone; this was found across all four qualitative research chiefdoms.

"I do not feel fine, but there is no other way. I don't have a phone... Because he owns the phone, he can be standing as I talk... even if I don't want him to hear what I will be saying." (EL W2 P18 FP client, non-TBA intervention chiefdom)
"I don't feel good, because I will reveal my own secret if I use someone else's phone to make a call. But I have no option because I don't have money to buy a phone." (EL W1 P35 Female FGD, non-TBA intervention chiefdom)

We also reported that husbands sometimes did not allow their wives to join the scheme, as they did not feel comfortable with a health worker calling their partner. Health workers recognized this and made efforts to support clients who joined, by sensitizing husbands.

"[In the beginning] when we called the clients... their husbands were angry with the calls... But we sensitized their husbands well, so they are not angry. We sensitized them about the phone, so they are in line with us." (EL W2 P4 Health workers, TBA intervention chiefdom)

"The husbands of the women whom the nurses call get annoyed when their wives receive calls. They think it is their boyfriend who is calling them all the time, so it has created all sorts of problems. Now we have noticed that we should involve their husbands, so that any time they see that number, they will know that it is the facility that is calling. So we have to talk to the husbands and tell them to understand." (EL P49 National level respondent)

However, several clients reported that their partners were actually very supportive of them joining the mHealth scheme.

"[When we discussed it,] my husband said it is a fine programme and it is good. Even if I am sick now before going to the hospital, I can pick up the phone and call." (EL W1 P39 PW client, non-TBA intervention chiefdom)

The sensitivity often related to FP, for clients themselves as well as their partners. Still, many clients joined the FP scheme, although sometimes without their husbands' knowing (similar findings captured across all chiefdoms).

"Some [women] fought with their husbands, because the men want to have more babies. Some of the women had to hide and come to join the family planning in secret." (EL W2 P2 FP client, TBA intervention chiefdom)

"Some men, if you tell them that you want to join the family planning programme, they will say you have got another boy lover – that is why you want to join family planning. So they will not allow you. But some women will join the programme without even telling their husbands." (EL W1 P35 Female FGD, non-TBA intervention chiefdom)

"As for me I will not tell my husband. (...) Because if I say I want to go somewhere, he can stop me. (...) That is what I know." (EL W2 P17 Female FGD, non-TBA intervention chiefdom)

"Yes, it is important for him to know, but the kind of husband I have will not allow me to join. If he knows it is a problem, ...I will not have peace in my home." (EL W2 P18 FP client, non-TBA intervention chiefdom)

Even some men acknowledged the issue and agreed that in some situations utilization of FP services is easier if done without the husbands' knowledge:

"Well what I know about family planning is that women would not want to reveal the secret of joining family planning to their husbands, because due to ignorance the husband would not accept his wife to join family planning. The feeling is, like, if they join family planning they think their wives would want to embark on prostitution. So if any woman wants to join family planning she has to do so without discussing with her husband. It has to be a secret between her and the nurse." (EL W1 P28 Male FGD, TBA intervention chiefdom)

Women who did not own a phone had more challenges if they didn't want their husband to know, as they would need to establish alternative communication routes – which wasn't always easy. Some women simply felt that joining without their partners' knowledge was not an option as it would be asking for trouble; for that same reason, family members were not always helpful.

"[The nurse] called me through my husband's phone, because I don't want my husband to be angry with me. If I allowed the nurse to call me on another person's phone, my husband would get angry. He would suspect me of having a boyfriend, and I wouldn't like to have problems with him of such a nature." (EL W2 P55 PW client, TBA intervention chiefdom)

"Some family members will not allow you to use their phones to call the clinic because they are afraid our husbands... will attack them [because] they are giving us the opportunity to talk to our boyfriends." (EL W1 P40 Female FGD, non-TBA intervention chiefdom)

Several health workers concurred and emphasized the importance of respecting women's wish for confidentiality, and that this is where for some clients the communication route via TBAs was important (this was not confirmed by quantitative data). As one health worker explained:

"[The TBA] will go and call the client that I want to talk with. I do that because they don't want their husbands to know about their family planning. Their husbands will say their wives want to be sleeping with others that is why they have joined family planning. So they don't want them to know. That is why we call them through the TBA's phone, and it has worked for them so far." (ML W1 P21 Health worker, TBA intervention chiefdom)

"Again, most men don't want their wives to join family planning, so those women come to me, and I give them the facility phone number; so that they will flash through someone's phone. I will call them and explain to them how to use the medicines, and if there is any problem they will call, and I will help

them. So that is how this phone has helped us at the clinic." (EL W1 P34 Health worker, non-TBA intervention chiefdom)

"No, there has been no problem, because I call them secretly. If [they] don't want [their] husband to know then I will keep it secret; no one will know." (EL W2 P25 Health worker, non-TBA intervention chiefdom)

However, the need for confidentiality was not generalized among clients. First, some clients felt their husbands should know in any case, as he is the decision-maker:

"Yes I have to get permission from my husband. (...) Because I am under his care, he is at the forefront, he has to tell me what to do." (EL W2 P17 Female FGD, non-TBA intervention chiefdom)

"Yes, I will tell my husband because my husband knows I am not foolish. If I tell him, he can allow me to go. (...) It is my husband who makes the decision." (EL W2 P17 Female FGD, non-TBA intervention chiefdom)

Second, and more importantly, many husbands were seen as actually supportive.

"...The last child whom I gave birth to put me through a lot of strains. It was about to give me problems, so that is why he asked me to join [the family planning reminder scheme]. I told him, and he agreed. He himself urged me to join." (EL W2 P24 FP client, non-TBA intervention chiefdom)

"In fact he encouraged me to come and join the family planning so that we can rest and raise the ones we already have. [It made me] feel good, and my body is looking good now." (EL W2 P2 FP client, TBA intervention chiefdom)

"Yesterday one woman came with her husband to the clinic. He learned that the nurse had been calling his wife to come to clinic, so he appreciated the nurse very much. That is how men should be doing for their wives." (EL W1 P35 Female FGD, non-TBA intervention chiefdom)

Some men also expressed their explicit support. One male community member said:

"If my wife joins the reminder scheme, she will learn more about her health and will also educate me on health issues." (EL W1 P41 Male FGD, non-TBA intervention chiefdom)

"It makes me feel abreast with the maternity work. It makes me feel that there is much more improvement and that more facilities will be coming in that would be able to assist our people. (...) I also feel good because for the nurses, to call our partners alone is good, because in times of sickness we can... call

that number, so that they can rush in. There are a lot of things they do which help us.” (EL W1 P38 Male partner, non-TBA intervention chiefdom)

Clients in non-TBA as well as in TBA intervention chiefdoms (the latter with the option to select the TBA as go-between) often still opted to use their husbands’ or someone else’s phone (quantitative data confirm this) or to have their husband answer his wife’s phone.

“If I am not around he will take the phone to me at the house where we work. Both of us work in the same farm close to our house. He in fact was the one who joined me on the family planning.” (EL W2 P2 FP client, TBA intervention chiefdom)

“I use my own phone. Because when you go to clinic, they ask you if you have or your husband has a phone, and they will ask you if your husband will not feel bad about that. But I told them to call me anytime; even if I am not around, my husband will pick the call [on my phone], because I have explained to him. So any time the phone rings, he can pick it and talk to the nurse, and when I come he can tell me that it is time to go to the clinic.” (EL W1 P39 PW client, non-TBA intervention chiefdom)

5.1.5 Effect on service utilization

The first objective of this intervention study was to assess changes in MNH/FP service utilization by female clients associated with expanded options for mobile communication, both for the general intervention and the TBA intervention.

It was with this objective in mind that a counterfactual was created (wedge design). For the related double difference analysis, the change over time in the non-intervention group – i.e. change due to other factors than the intervention – was used as a reference point. The observed change in the intervention group (Wedge 1) was then compared with the change in the non-intervention group (Wedge 2). If the ‘observed change’ in the intervention group were larger than the ‘expected change’ in the non-intervention group (‘difference in difference’), the positive net effect could be attributed to the intervention.

It is important to reiterate that such double difference analysis would only be valid if both groups remain unchanged over time and if external factors (other, parallel interventions) equally affect both groups.

Data availability and results

Our comparison of the difference in coverage for selected indicators was based on the difference between the periods August–December 2011 (original baseline) and August–December 2012 (study baseline to midline), for the chiefdoms included in Wedges 1 and 2. This was with the following in mind:

- Stage 1 (August 2012–January 2013) was the only ‘true counterfactual’ allowing double difference analysis between Wedge 1 and 2, as thereafter chiefdoms in Wedge 2 (the hitherto counterfactual) also started the intervention.
- As designed by our research protocol, we used routine HMIS service utilization data for the coverage calculations. However, despite considerable effort, relevant data available to date only covered the period up to 31 December 2012.⁷⁶ Due to issues with the HMIS and DHIS, data for 2013 have not been available. (Issues are being addressed, data entry for all of 2013 has been started for each of the districts, and hopefully 2013 data will become available in the course of 2014.)
- This implies that we had incomplete data for stage 1 (true counterfactual for only five of the six months available) and no data for the subsequent stage 2 (an additional six months for the 12-month overall intervention period, although not a true counterfactual).
- Results presented here were thus based on the five-month intervention between August and December 2012 (baseline to almost midline). That period of intervention was used to calculate post-intervention coverage, which was then compared with the baseline coverage during the same period a year earlier (August–December 2011).

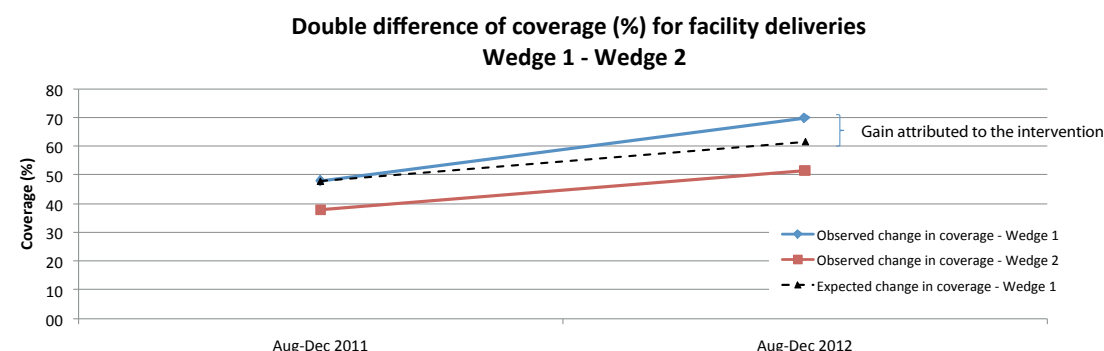


Figure 25: Net effect of intervention on coverage for facility deliveries

⁷⁶ These five months may have been atypical, as they included major events such as the Christmas period (also the case for the comparison period in 2011) and national elections (November 2012).

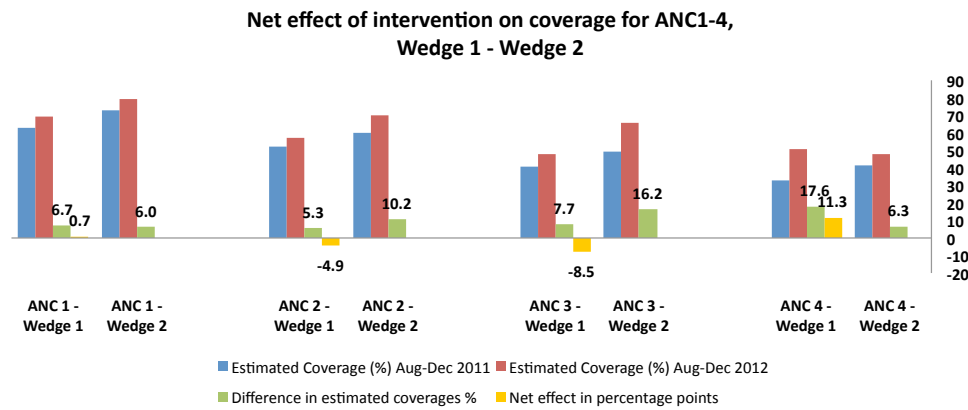


Figure 26: Net effect of intervention on coverage for ANC1-4

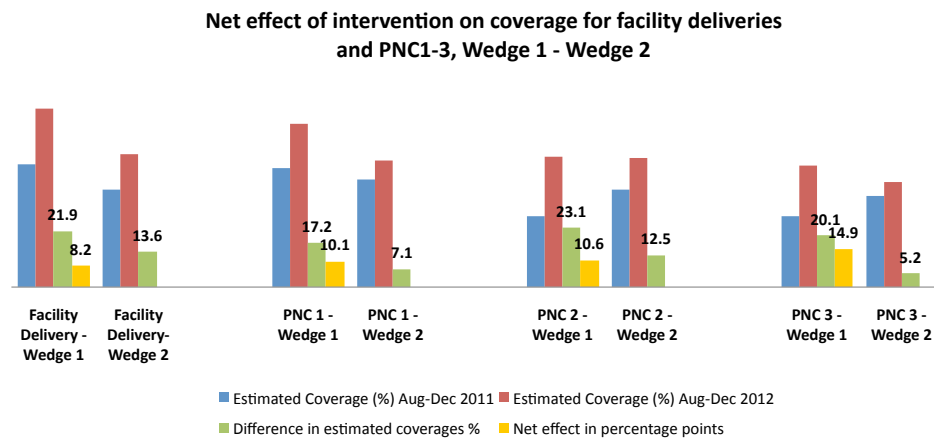


Figure 27: Net effect of intervention on coverage for facility deliveries and PNC1-3

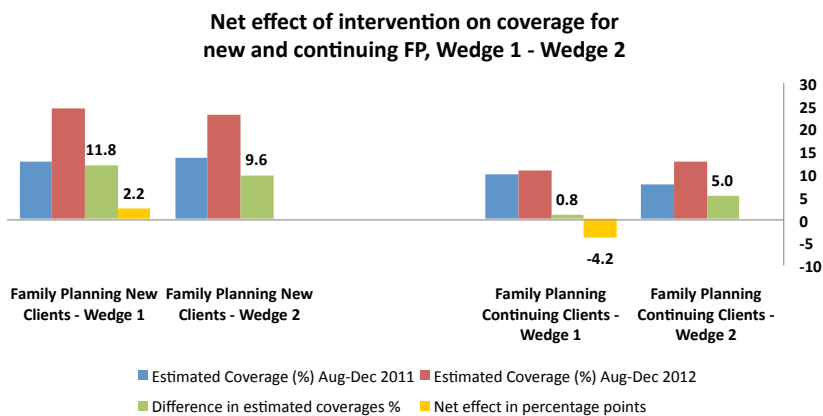


Figure 28: Net effect of intervention on coverage for new FP and continuing FP

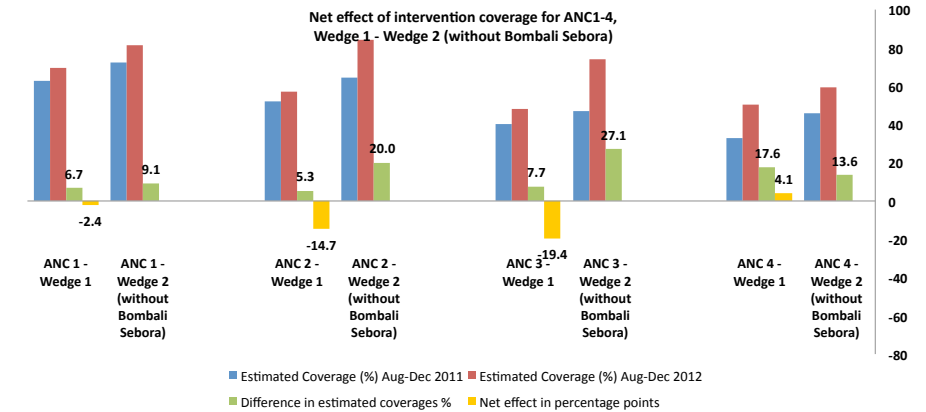


Figure 29: Net effect of intervention on coverage for ANC1-4 (without Bombali Sebor)

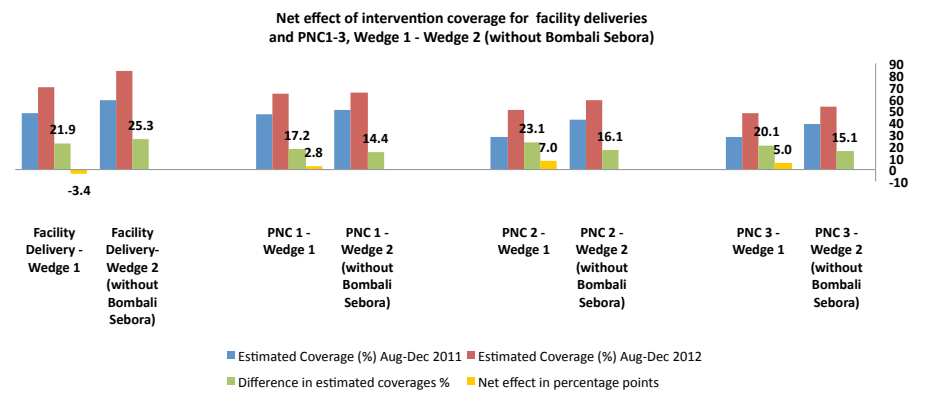


Figure 30: Net effect of intervention on coverage for facility deliveries and PNC1-3 (without Bombali Sebor)

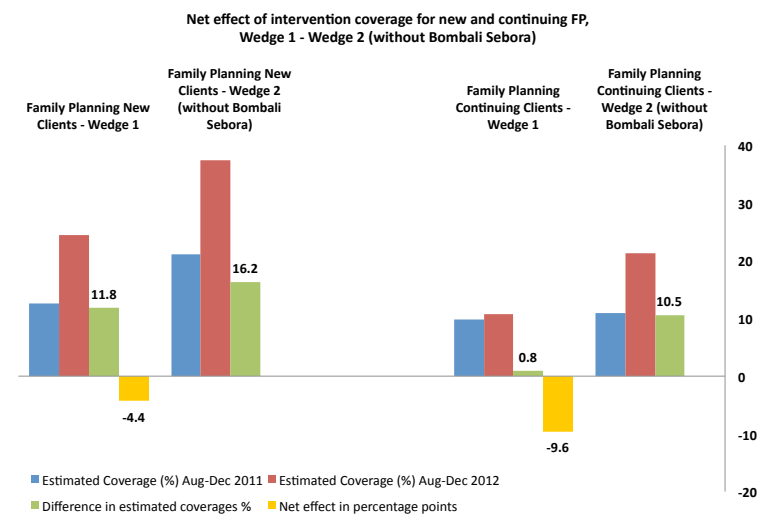


Figure 31: Net effect of intervention on coverage for FP (without Bombali Sebor)

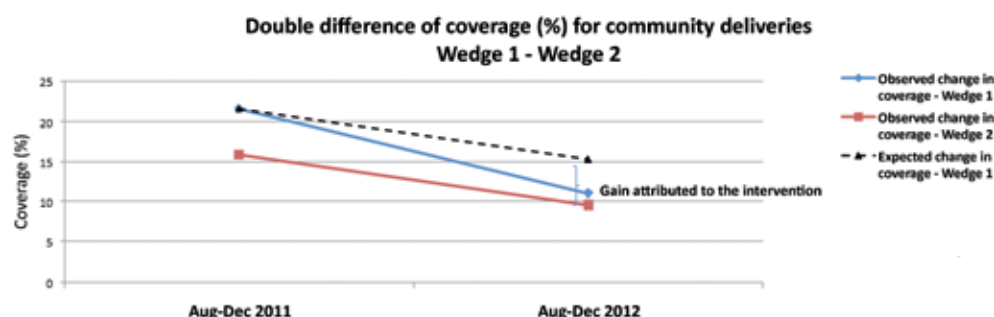


Figure 32: Net effect of intervention on coverage for community deliveries

Full calculation and results for all 12 indicators (ANC1–4, facility delivery, PNC1–3, new FP, continued FP; all fixed services only, no outreach) comparing Wedges 1 and 2 are presented in Annex 28. A visualization example, about the double difference for facility deliveries, is presented in Figure 25. Figures 26–28 use a different and more compact format, combining a number of indicators.

The non-intervention wedge figures clearly show an upward trend for all indicators across both wedges, without exception. For nine out of ten indicators, results show a net gain of the intervention of between 0.7 (ANC1) and 14.9 (PNC3) percentage points. Three indicators show a net loss: ANC2, ANC3 and FP continuation. The latter seems at odds with strongly positive qualitative data (to be presented hereafter) on strengthened information and motivation for increased service utilization.

Outreach

Understanding the variation of results across ANC1–4 is, therefore, challenging. One explanation could be that mHealth-enrolled clients, after initial ANC1 facility contact, thereafter used outreach services for ANC2 and ANC3 (but not for ANC4 for some reason); non-enrolled clients may not have done this as much, as they may have been less aware when outreach clinic sessions were being held. Indeed the available outreach coverage data show a positive net effect of the intervention across all ANC types; however, we are hesitant to make any claims based on these due to concerns about data quality.

Interestingly, if we were to use the outreach data, we would find that double-difference analysis of outreach service utilization generated a negative effect for deliveries in the community and PNC1–3 services – which actually might be a good sign, as one of the goals of increased engagement with clients would be that there are fewer community deliveries (as most happen without skilled birth attendants). And this seemed exactly the case, as shown in Figure 32.

Also for FP there was a difference between the net effect on new FP visits (positive) and on continuation visits (negative). Yet qualitative data point to a strong influence on FP continuation, and the discrepancy is difficult to explain.

Controlling for Bombali Sebora

We wondered whether Bombali Sebora chiefdom, containing the district headquarter town, being relatively urban and having relatively better availability of a variety of services, may have influenced the Wedge 2 average. Annex 28 also presents the coverage data now controlled for Bombali Sebora (so Wedge 2 calculations are based on the other five chiefdoms only). The results confirmed the initial idea that Bombali Sebora is 'different' and thus that controlling for it would change the net effect. In fact, it appeared that the chiefdom's usual coverage was weaker than that seen in other chiefdoms; the negative effect on Bombali Sebora pulled down the combined coverage indicators of Wedge 2.

Renewed double-difference analysis after removing Bombali Sebora thus showed that the relative 'gains' (net effects in Wedge 1 previously found) largely disappeared: net gains on ANC1, facility delivery and new FP turned to a net loss, while the remaining positive effects (only for ANC4 and PNC1–3) were markedly reduced; see Figures 29–31.

Controlling for the TBA intervention chiefdom

As stated at the beginning of this section, one objective was to assess the influence of the TBA intervention. We, therefore, assessed whether removing the one TBA chiefdom (Paki Masabong) would change the combined results of Wedge 1. With this intention we used the reported data over time (about client enrolment) and compared the results from Wedge 1 with and without the TBA chiefdom. The slopes of the trend lines indicated whether there is a difference (lines converging or diverging) or not (parallel trend lines) on the overall behaviour of the wedge due to the inclusion of the TBA chiefdom. For nearly all indicators, the trend lines were in parallel. This could be interpreted as 'the TBA intervention in the chiefdom did not affect the trend of the total Wedge 1'. The example of ANC3 is provided in Figure 33.

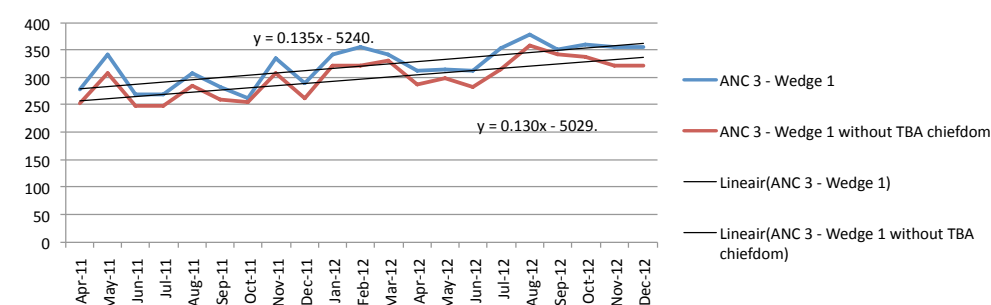


Figure 33: ANC3 utilization in Wedge 1, with/without TBA intervention chiefdom

The main difference that seemed important to highlight was the one seen for FP, where exclusion of the TBA intervention chiefdom led to a flatter slope – i.e. the TBA chiefdom improves the Wedge 1 average coverage for both types of FP. Figure 34 shows that, over

time, the number of new clients increased, and that, on top of that, the proportion of new clients coming from the TBA chiefdom in relation to the total new clients in Wedge 1 also increased.

More specifically, between April and June 2012 there was an increase in the number of new FP clients; and an even bigger increase between August and December 2012, just after the start of stage 1 of the intervention.

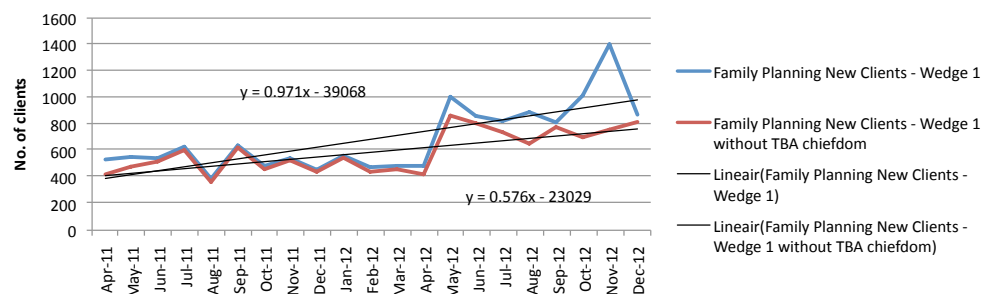


Figure 34: Comparison of new FP utilization in Wedge 1, with/without TBA intervention chiefdom

Qualitative perspectives on changes in utilization

During the midline and endline research, DHMT members, health workers, enrolled clients and partners of clients from all four chiefdoms, as well as TBAs from the two chiefdoms, credited the initiation and availability of mobile communication with increased service utilization. Health workers made a direct connection between increased utilization of ANC services, facility delivery, PNC and FP and the availability of mobile phones. ANC was mentioned most frequently among examples of increased utilization; references from all chiefdoms involved in the interviews illustrated this (although the quantitative data only confirmed a net effect on ANC1 and ANC4). The following responses were made to the question whether respondents observed a change in utilization and whether use of mobile phones could explain this:

"Well, before women did not come for ANC. At times I got four to ten women who came for ANC, but now I get above 24 clients. (...) [This happened] because of the call; I call them through the facility phone." (EL W2 P25 Health worker, non-TBA intervention chiefdom)

"Before people did not come to the clinic. Some pregnant women would not come to the clinic till they deliver. But that has changed; many women now come to the clinic." (EL W1 P36, FP client, non-TBA intervention chiefdom)

"[The relationship] has changed greatly now, because patients do come to the clinic in large numbers... They come for ANC, treatments, and when pregnant women come I also treat them." (ML W1 P4 Health worker, TBA intervention chiefdom)

"There is an increase in family planning because of the communication [clients] have with the health worker. (...) Those [reporting] figures are increasing, which we did not have before." (ML W1 P2 District-level respondent)

"Well, it is improving, and the flow of ANC is increasing with the use of the mobile phones; especially in the hard-to-reach areas where the service providers call their clients, which has helped increase the ANC, postnatal care, deliveries have all increased." (EL P48 National-level respondent)

Men in the FGDs also found that the phone calls reinforced clinic attendance.

"She goes to the clinic always, especially when the nurse calls her to go and meet her at the clinic." (EL W2 P5 Male partner, TBA intervention chiefdom)

The following quote from a health worker illustrates that the observed increase in utilization was sometimes the effect of a combination of factors, of which mHealth was one:

"We have a system here which they call under-five clinic... now the turnout is very good. This includes even pregnant women and children from 0 to 5. In the past, when there was no phone they were not coming, but now when they educate them about issues, they are coming in their numbers. Even apart from the mobile they are having rapid education, any time they come to clinic." (EL W1 P30 Male FGD, TBA intervention chiefdom)

The use of the facility phone was credited by all types of respondents with increasing the motivation of women to visit the clinic and to take other women with them.

"Before I did not care for the clinic much, but the reminder phone has helped me to come to the clinic, because the nurse calls me always to remind me." (EL W1 P36 FP client, non-TBA intervention chiefdom)

"We are getting more deliveries now than before. (...) It is because of the facility phone that we use, to call clients to come to the clinic and deliver." (EL W1 P34 Health worker, non-TBA intervention chiefdom)

"Well, she goes to the clinic more frequently now than before. Even if I told her to go to the clinic, she would not. But now she goes to the clinic, and she even informs the other women when to go." (EL W2 P26 Male partner, non-TBA intervention chiefdom)

Clients coming for FP started to rely on health workers to remind them – both female clients and men concurred:

"If the nurse does not call me to remind me, I will forget, because I have lots of work to do, but it is the job of the nurse to call us and remind us." (ML W1 P37 FP client, non-TBA intervention chiefdom)

"She never knew the date or time to attend clinic, but now they can call and remind her, so it is much better... because of the facility phone. They can now call them and remind them about the clinic." (EL W1 P38 Male partner, TBA intervention chiefdom)

"Those that joined family planning before did not take their medicines correctly, but now that this phone is at the clinic, the nurse always calls those women on family planning and reminds them to take their medicines." (EL W2 P23 Male FGD, non-TBA intervention chiefdom)

Indeed, most of the respondents reported an increase in utilization of FP services because of the client reminder scheme.

5.1.6 Reasons for increased service utilization

a. Knowledge about staff availability

From the interviews it emerged that the mobile phone improved communication about the time facility clinic sessions were held and enabled health workers to personally invite clients (as reported above). Also, clients knew where and when an outreach clinic was held or that staff would be present, so they would not go in vain. This was especially important for clients who had to travel a considerable distance to get to the clinic.

"If you are sick at home, and you have the facility number, you have to call the [clinic] to know whether the nurses are there not, but if the facility phone was not there, you will walk to the [clinic] for nothing because the nurses will not be there to attend to you. That is why the facility phone is important." (EL W1 P40 Female FGD, non-TBA intervention chiefdom)

"Like over the river, during this rainy season, I was not able to go over there. But there is one client there, when she wanted to come to the clinic she called me, but I told her to wait for me till I return from Makeni... this facility phone has solved a very big problem..." (EL W2 P22 Health worker, non-TBA intervention chiefdom)

b. Perception of improved relationships

Women attributed the increase in utilization to a change in the relationship between them and health workers.

"Most women now come to the clinic because of the way the nurses call them and talk to them. The women therefore go and tell other women, and that information which goes round has helped more women come to join the

reminder scheme." (EL W1 P36 FP client, non-TBA intervention chiefdom)

"I get to know that when the nurse calls me, she cares for my health care, so I can decide to go and meet her." (EL W1 P39 PW, non-TBA intervention chiefdom)

"At first when this phone was not [there], the nurse will not talk to us good. She will shout at us. But with the phone she talks to you politely, and this has encouraged women to come to the facility." (EL W1 P58 Female FGD, TBA intervention chiefdom)

A reason given for improved relationships was increased familiarity between clients and health workers.

"The nurses call us, so it is good... We are used to each other now. (...) She calls me regularly; that is why I know her very well." (EL W2 P27 PW client, non-TBA intervention chiefdom)

"I told you about the intimate relationship now that exists between the clients and the service providers, which is a good thing as there is privacy when using the mobile phone to call the clients. (...) The advantage is that clients are able to interact with their service providers because there is secrecy, and there is an intimate relationship between the nurses and the clients. The nurses have to go and visit the clients, which is very good now." (EL P48 National level respondent)

One woman stated that she understands better what the nurses expect from her and, therefore, attends the clinic.

"Now she can call me, and I can understand certain things. But in the past, when she didn't have my number, I could not understand a lot of things, and I could be careless to go there." (EL W1 P45 PW client, non-TBA intervention chiefdom)

Some clients felt that the increased communication led to better attitudes of health workers. The relationship also improved because clients and health workers became more familiar with each other.

"The nurses call us, so it is good... We are used to each other now." (EL W2 P2 FP client, TBA intervention chiefdom)

"She calls me regularly; that is why I know her very well." (EL W2 P27 PW client, non-TBA intervention chiefdom)

"As a result of this call, when we come he treats us well, jokes with us and attends to us." (ML W1 P28 PW client, non-TBA intervention chiefdom)

Health workers mirrored clients' views on improved attitudes from their own perspective, by referring to improved relationship with their clients.

"The difference is great. I am now used to them; we make jokes, although I only came here last year. I talk to them and ask them why I did not see them in the last clinic, and I will say I want to see them, and they will come." (ML W1 P21 Health worker, TBA intervention chiefdom)

"The relationship is now cordial between us, because when they hear my call and they too call me, to interact is good. ... They appreciate when we call them; they are happy." (ML W1 P16 Health worker, TBA intervention chiefdom)

Sometimes the improved relations translated into some degree of women's empowerment. While some women prefer to hide the use of contraceptives from their husband and so did not want to use the phone or only via the TBA, others felt proud to be called by the nurse and to talk to the health worker while their husband was near.

"They are happy. The other day when we were talking her husband was close to her, and she told her husband that she was talking to the nurse. They feel big when I talk to them on the phone." (ML W1 P21 Health worker, TBA intervention chiefdom)

Another reason for the change in relationships between clients and health workers was noted by clients, health workers and managers. This related to clients feeling that health workers cared more for them because of the increase in communication.

"It is due to the way she calls me, because she [has] patience to take her time and call, that shows she cares for me." (EL W2 P24 FP client, non-TBA intervention chiefdom)

"It shows that we really have concern for them, which tells them that we care for them, since we always want to know how they are doing." (EL W2 P3 Health worker, TBA intervention chiefdom)

Health workers particularly emphasized the mutual appreciation and shared goals of better health between the community and health workers since the implementation of the intervention.

"There is unity now between [us] and them, which shows that we care for them. They too care for us. When you fail to call somebody, that shows that you are not interested in the person. But because we are trying to reduce this infant mortality rate, the phone has helped us greatly." (EL W2 P3 Health worker, TBA intervention chiefdom)

c. Involvement of TBAs

Respondents pointed to the added value of TBAs as focal points in the community, for communication to and from the health facility. Some felt this really contributed to increased service utilization.

"Well, since they came with the phone, if a pregnant woman is here, when it is time for labour, the TBA can use the phone to call out there; if they cannot come they will carry her to [the facility]." (ML W1 P9 FP client, TBA intervention chiefdom)

In the chiefdoms where TBAs were given a mobile phone, some women came to the TBA to find out if and where a clinic was being held. This also enabled women without phone access to find out in advance and not travel in vain. In addition, TBAs were more motivated to take women to the clinic, because they could phone to make sure staff would be there.

"I always go house to house to inform them that the nurse wants to see the pregnant women and lactating mothers at the clinic. That has helped to influence the number of pregnant women going to the clinic." (EL W2 P46 TBA, TBA intervention chiefdom)

"Now more women attend the clinic than before, because women are informed that the nurse is in the facility, and also by reminding them to visit the facility. Also when there is a supply of food items, the nurse communicates with us through the phone, and in turn we pass on the information to the women. If there is a change of date, the nurse also communicates to me. That is why you see more women in the facility than before." (EL W2 P47 TBA, TBA intervention chiefdom)

"[Now that] the facility phone is available... the turnout for the clinic has increased greatly, because the TBAs are now motivated because of the facility phone, to come with the patients to the clinic." (EL W2 P4 Health worker, TBA intervention chiefdom)

"This phone has helped a lot, because all those who used to be relaxed about coming to the clinic, I will call them and tell them: tomorrow is a clinic day... Or if they don't have a phone I call through the TBA's phone to remind them to come to the clinic. So it helps me... It makes the turnout good at the clinic. They come in large numbers." (ML W1 P21 Health worker, TBA intervention chiefdom)

Also some male partners appreciated the improved logistics.

"Yes, the nurses are using the facility phone for its purpose, because before this time, we had to send someone to call the nurse, which is a long distance or go to [village], which was very difficult. But now we just have to call, and the

message will reach faster, so the money spent is not a waste at all; it is a good thing." (EL W2 P26 Male partner, non-TBA intervention chiefdom)

One TBA stated that women do appreciate the fact that the nurse calls. She felt this was more effective than the TBA going to the homes to motivate the women, without a phone call from the nurse to refer to.

"The work of the phone has enabled me to go to the clients and inform them when they should visit the nurse, and also this has motivated the clients to go to the clinic. Because it is the nurse who is now calling them to visit the clinic, so that makes them happy, so this has increased the care we gave before. Mind you, we go to their houses, sit with them, encourage them to go to the clinic. This has never happened, so the phone has helped." (EL W2 P54 TBA, TBA intervention chiefdom)

In the chiefdom where women enrolled with TBAs as their contact person, health workers often referred to contacting the TBA to inform the women, which makes their task easier. TBAs also felt happy being part of the programme.

"...They call pregnant women to come on Thursdays. They call me and ask me to inform them to come on Thursday. I also call them to get feedback from them, and they will tell me they are there. That is a fine thing for us." (ML W1 P14 TBA, TBA intervention chiefdom)

Meanwhile, in areas where the TBA did not receive a phone, an increase in utilization was also observed for similar reasons.

"The distance is too far. It is about one and half miles from here to [place in catchment area]. The clients were very stubborn to go for clinic... They now go to the clinic frequently... As you can see the people, I don't need to tell you. (...) We just say we shall be holding a clinic at such a place, and they come. Like one of the family planning clients, I just called her and she came... It is very wonderful; I cannot tell you a lie. It has really improved." (ML W1 P26 Health worker, non-TBA intervention chiefdom)

d. Multiplier effect

Health workers said that being able to reach one client by phone also alerted others to come to the clinic.

"One of the advantages of the facility phone is that we get more clients now at the clinic, and we get more women for family planning than before. Now if we want to go on outreach to other villages, we call directly, and the town crier will announce to the whole village that we are coming on a particular date." (EL W1 P34 Health worker, non-TBA intervention chiefdom)

e. Involving men

Much more than in the midline study, the role of husbands was mentioned. Health workers stated that especially those women who gave their husband's phone number felt happy that they made time to talk to their husbands.

"When I call the husband, I know what to tell him: that when the woman is ready to give birth, let him send her to the [clinic] or when she is ready to take her medicines the husband can urge her to do so. Some men, once they are informed, they can tell their wives to come. Some women can have problems; when they tell their husband, he can call me and explain to me." (EL W1 P37 Health worker, non-TBA intervention chiefdom)

Some health workers indicated that the phone helped to talk to husbands and change attitudes towards FP.

"At first, the men were ashamed to come, but with the help of the phone the mothers talk to them. (...) [It] is their responsibility to talk to... people to come to the clinic. So we now get the men on board to come for family planning." (EL W2 P3 Health worker, TBA intervention chiefdom)

One TBA related the phone communication to husbands starting to accompany their wives to the clinic.

"The women, lactating mothers, pregnant women, are using the [clinic] more now than in the past. In the past when someone was sick they liked to prepare native medicines and gave it to her to rub on or drink. But now with the coming of the phones, we tell them what to do: if a person is sick, he or she must go to the [clinic]. Now we see the pregnant woman coming with her husband to the [clinic]; in the past that did not happen." (EL W2 P11 TBA, TBA intervention chiefdom)

5.1.7 Perceived benefits

Based on the qualitative research data, various perceived benefits of the mHealth intervention programme were identified.

a. Health benefits: seeking care earlier, reducing defaulting, follow-up on treatment, better emergency response and improved quality

Health benefits were derived from the descriptions above on improved service utilization outcomes. In addition, health workers and women commented on what they felt were wider health benefits of the phone and how these came about. One health worker connected the phone calls with more regular ANC visits and the taking of medicines. The latter was thought to have contributed to the weight of newborn babies.

"Yes, [pregnant women's] health has improved a lot because they come to the clinic frequently now and they take their medicines according to how we tell them. For example, some women delivered here days ago. If they tell you that these women have just delivered, you will not believe it. The babies are as large as if they are one week old. This is because they were coming for the clinic and taking their medicines accordingly." (EL W1 P32 Health worker, TBA intervention chiefdom)

Women in one FGD found that the reminder scheme for ANC visits and assisted delivery helped women to deliver with fewer complications.

"We are happy about this new development. Because of this client reminder scheme, our pregnant women no longer have complications in delivery, because we are constantly in touch with the health facility. And whenever the message reaches the TBA, the pregnant women scheduled for that date will visit the clinic. That is why we are happy about this new development. We hope it will continue." (EL W1 P58 Female FGD, TBA intervention chiefdom)

And in another FGD, men explained their idea that the phone led to earlier availability of help and, therefore, to fewer maternal deaths:

"Now that this maternity phone is here, pregnant women will not suffer again, and breastfeeding mothers will also not suffer. Because before, when the clinic phone was not available, the pregnant women wanted to deliver, and the nurse did not stay close to where she stays, [then] she would suffer and die. But now that does not happen, because the patient will call the nurse to come for her and help." (EL W1 P35 Female FGD, non-TBA intervention chiefdom)

"When there was no mobile phone, there were a lot of maternal deaths because there was no communication with hospitals in big towns like in Makeni. But now when there is a phone, if anything happens, the nurse will call immediately, and they will come and solve the problem. If there was no phone there would have been maternal deaths. So that is one help the mobile is giving." (EL W1 P30 Male FGD, TBA intervention chiefdom)

"We used to have maternal deaths, children died, and some children got sicknesses... But now with the coming of this programme it has helped us. Lactating mothers no longer die, and pregnant women are no longer dying in labour. We thank God that there are changes now." (EL W2 P12 Female FGD, TBA intervention chiefdom)

One TBA, who talked about the improved communication with nurses for complicated deliveries since the introduction of the phone, remarked:

"Thank God for the phone given to us, or else pregnant women will die, because of a lack of communication with the nurse." (ML W1 P25 TBA, TBA intervention chiefdom)

Some men thought that the more frequent visits helped their wife to have fewer complications during pregnancy.

"Before my wife joined the reminder scheme, she complained about stomach pain, her womb was shaking, but now that she is part of the client reminder scheme, all those sicknesses stopped, and she no longer complains." (EL W2 P5 Male partner, TBA intervention chiefdom)

"Because she goes to clinic now she gets medicines and is not sickly anymore." (EL W1 P44 Male partner, TBA intervention chiefdom)

One benefit mentioned was that clients sought services earlier, even without being fully aware of the danger signs. They would call with a symptom, and the health worker would advise them to come to the clinic or not.

"There are times, if a woman delivers and has problems she can flash, and I call her for her to explain to me so that I can give her the necessary [support] or I tell her to come. So those are the changes; in the past I would not have had credit to call." (EL W1 P37 Health worker, TBA intervention chiefdom)

"...Now they do not wait for us to teach them about certain things, like the signs. No sooner than they notice a sign, they complain to us about what is happening to them. We either go to the person or they find their way to us." (ML W1 P26 Health worker in non-TBA intervention chiefdom)

b. Fewer unintended pregnancies

Another benefit reported was the increased continuity in contraceptive use and treatment, reported by clients, health workers and male community members.

"In fact the family planning disappoints when you forget to take the pills. You will get pregnant when it finishes and you forgot to take another pill. That was how my third child came, but now I started taking this injection, and the nurse calls me and reminds me, so it is very important to me." (EL W1 P36 FP client, non-TBA intervention chiefdom)

"[My husband] felt happy [about the nurse calling to remind her about family planning] because he has seen what he wanted... [which is] for me not to get pregnant." (EL W2 P24 FP client, non-TBA intervention chiefdom)

"Sometimes we give them reminder cards when the time comes. Sometimes they lose it, and by the time you think of it, they are pregnant. But we remind them that the time is getting closer, and they too always comply with that. So a lot of them are no longer getting unwanted pregnancies." (EL W2 P9 Health worker, TBA intervention chiefdom)

Not only married women benefited from the mobile phone to access FP and continuity of care. A similar process was reported for preventing teenage pregnancy:

"This is very good for the teenagers here now, because the use of the facility phone by the nurses has helped to reduce pregnancy and deaths among teenagers now." (EL W2 P23 Male FGD, non-TBA intervention chiefdom)

One district-level respondent referred to better quality of services that resulted from improved communication through the use of phones, linking it to immediate benefits for clients.

"This mobile phone... really helps; communication is very essential in any community. ... You can use [the mobile phone] at the PHU with your health sister to conduct some difficult deliveries over the mobile phone. I have done [this] with my staff in an area that is very difficult to reach... There was a particular MCH aide who had a case and sent for the ambulance. The ambulance went but could not cross the river. So she called me over the phone, and I instructed her as to what to administer, and she got through successfully. She called me again in the morning and reported to me that the patient was normal and has been delivered. So I believe with mHealth we can do more." (ML W1 P1 District level respondent)

5.2 Objective 2 – Health worker job satisfaction and communication

In this chapter we present findings on the health worker to health worker communication, including changes over time and between the wedges. We address frequency of communication with various health system levels, reasons for that communication, changes in health workers' feelings about communication and job satisfaction, and perceived benefits of improved communication.

5.2.1 Frequency of communication among health workers

The VPN was a means for health workers and other key health actors to communicate with each other without dependency on phone credits, and it was envisioned that this would increase the frequency of communication. Annex 29 shows the health worker respondents' reported frequency of *initiated* and *received* calls and text messages, to and from various categories of health staff (district, own PHU in-charge, chiefdom in-charge, other health staff).

a. Making and receiving work-related calls and text messages to and from other PHU staff

As expected, health workers called other PHU staff or texted them more frequently after the intervention was implemented, at endline compared to baseline. The difference (see Figure 35) was more pronounced in Wedge 1, with 69% of the health workers indicating that they made calls or sent messages to other staff (excluding in-charges) once a week or more often, which is significantly more frequent than indicated at baseline (50%). A different trend was seen in Wedge 2, with a slight decrease (not statistically significant) in the frequency of calls to other staff when comparing baseline to endline.

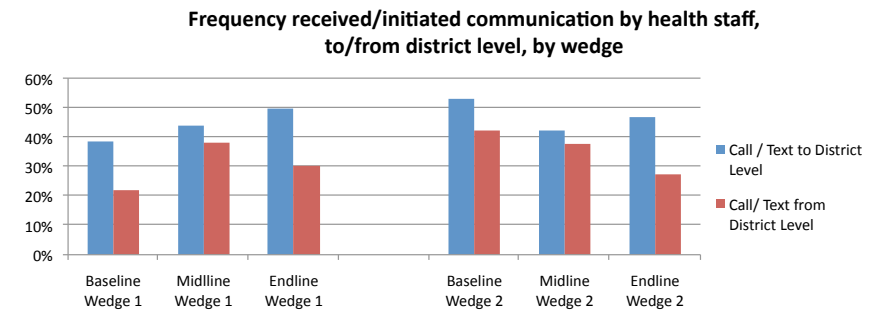


Figure 35: Frequency of health worker calls/texts to and from other staff

Wedge 1 health workers indicated that they received calls and text messages (weekly or more often) from other PHU staff more often at endline than at baseline; however, this was not statistically significant. The same is the case for the slight decrease indicated by Wedge 2 staff. Both wedges showed (significant) higher frequencies at midline than endline.

No differences were observed between different types of health workers and facilities for the frequency in calls and texts to and from other staff. In-charges (71%) made significantly more frequent texts and calls to other staff at endline than not in-charges (55%), but received communications in similar frequencies. While no differences were observed at baseline by distance to Makeni, at endline the staff furthest from Makeni communicated with other staff significantly more frequently than staff closer to Makeni (29% for 1–10 km vs. 62% for 11–30 km vs. 81% for 30+ km).

b. Making and receiving work-related calls and text messages to and from the chiefdom in-charge (at CHC)

There was little (and not statistically significant) difference between baseline and endline for the frequencies of initiating communication (once a week or more often) with the chiefdom in-charge at the CHC, with only a change shown by Wedge 2 staff.

Regarding receiving calls and texts from the chiefdom in-charge at endline compared to baseline, both wedges showed an increase in the once a week or more category, but this was not statistically significant. Again, Wedge 2 and both wedges combined showed a significant increase from baseline to midline.

At endline there were significantly more frequent calls made and received by CHAs (70%) than by MCH aides (26%) and SECHNs (10%). In-charges made and received significantly more frequently calls and texts to and from the chiefdom in-charge at baseline (28% versus not in-charges 11%) and endline (39% versus not in-charges 10%).

Staff that were further away from Makeni made and received calls or texts with their own chiefdom in-charge significantly more frequently at baseline (6% for 1–10 km vs. 22% for 11–30 km vs. 38% for 30+ km) and at endline (4% vs. 26% vs. 42%). At baseline there was no difference in call frequency between health facility types, but this changed towards endline, where CHP (35%) and MCHP (31%) staff made and received calls more frequently to and from the own chiefdom in-charge (based at the CHC) than CHC staff (0% and 0%), which was expected.

c. Making and receiving work-related calls and text messages to and from their own PHU in-charge

The data showed statistically significant, considerable decreases in the frequency of health workers' communication (once a week or more) to their own in-charge, from baseline to endline. Wedge 1 decreased from 44% to 21%, while Wedge 2 dropped from 49% to 22%.

The drop in the frequency of received calls and messages (once a week or more often) was even more pronounced at endline compared to baseline. This was seen in both wedges, with a higher decrease in Wedge 2 (from 57% to 11%) than Wedge 1 (from 39% to 11%).

No differences were observed between various types of health worker at baseline and endline for the whole group. At endline, PHU staff located further away made and received calls and texts significantly more frequently than PHU staff closer to Makeni (0% for 0–10km vs. 21% for 11–30 km vs. 11% for 30+ km).

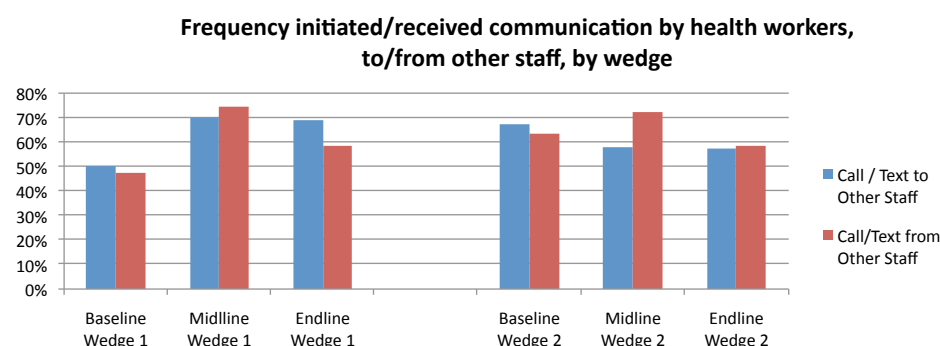


Figure 36: Frequency of health worker calls/texts to and from district level

d. Making and receiving work-related calls and text messages to and from district level

The frequency of calls and text messages initiated by health workers to the district level (once a week or more often) increased from baseline to endline for Wedge 1 (from 38% to 50%), while the Wedge 2 frequency dropped (53% to 47%); see Figure 36. However, neither these changes nor the difference between wedges were statistically significant.

The frequency of calls and messages received by health workers from the district level (also once a week or more) showed a similar pattern: an increase for Wedge 1 (from 22% to 30%, significant) and a decrease for Wedge 2 (from 42% to 27%, not significant). The difference between wedges was not significant.

No differences were observed between various types of health worker or facility and distance categories at baseline and endline for the whole group. In-charges made calls and texts significantly more frequently than other health workers to the district level at baseline (43% in-charges versus 18% not in-charges) and endline (63% vs. 32%).

5.2.2 Reasons for health worker to health worker communication

As at baseline and midline, health workers at endline were asked about the reasons why they initiated and or received calls and text messages from other health workers for each level of health worker interaction. Key results are summarized here, while more detailed graphic overviews can be found in Annex 30.

For communication with the district level, ambulance referral remained important (although with a slight decrease towards endline), while clinical advice gained importance. Other reasons (surveillance, HMIS, drugs and supplies) lost importance across both wedges.

With chiefdom in-charge and own PHU levels, clinical advice was most important and grew over time, as did other reasons dealing with drugs and supplies (both) and surveillance (chiefdom in-charge). Reasons to get in touch with colleagues overwhelmingly concentrated on clinical advice (growing over time).

The qualitative interview and FGD data also allowed identification of a series of reasons why health workers communicate with each other via mobile phones. The results were partly similar to and partly different from the quantitative data. Coinciding with the survey outcome was that one of two main reasons mentioned by many health workers, from all four chiefdoms and both wedges, related to exchanging ideas (with peers) and seeking information and advice (from peers and seniors), to address problems and doubts and improve the quality of their work. The type of problems ranged from clinical advice on obstetric complications to explanations on certain tools and reporting.

"I call them to exchange ideas. I work here alone, so I find it difficult, and I call for advice... They also help to clear my doubts." (ML W1 P21 Health worker, TBA intervention chiefdom)

"Well, when we did not have these phones it was not easy to reach our colleagues. Sometimes I had to take a bike to go and meet my colleague, but with the use of the phone we no longer have such strains. And if I have any difficult case, the phone has enabled me to call any of my colleagues to assist me to successfully deal with the case." (EL W2 P14 Health worker, TBA intervention chiefdom)

"The facility phone has helped me a lot, as I now call those other colleagues who have stayed long in this field and have experience. I call them for advice, and it has helped me improve a lot. Like the partograph: I learned about it through the facility phone. I actually did it in college but still did not understand, so I called my colleagues to teach me through the phone how to use it." (EL W1 P34 Health worker, non-TBA intervention chiefdom)

"Sometimes when I have doubts with this paperwork, I call [colleague health workers] for direction, and they will tell me what I want." (ML W1 P16 Health worker, TBA intervention chiefdom)

Supervisory and district management staff confirmed this, and the latter also had their own role to play.

"For now I am the supervisor for all the PHUs in this area. If I am ready to go to them, I call them. When they have problems that are above them, they call me so we can discuss it." (EL W2 P19 Health worker, TBA intervention chiefdom)

Unlike the survey data, the other main reason referred to by many was the need to stay up to date on planned meetings, workshops and programme activities.

"I ask [my supervisors] if there is any meeting or programme, and we get [the information] from them. Anyway, the phone is helping us. Initially workshops used to be held there without our knowledge." (ML W1 P27 Health worker, non-TBA intervention chiefdom)

"I do make and receive calls and can also text my colleagues, and they too text me in return, as well as our bosses, in terms of referrals, and they too call us when there are workshops, meetings or any information they want to pass on to us." (EL W2 P3 Health worker, TBA intervention chiefdom)

"One of these days... they tried my line but could not get me [as the phone was not charged]. [Later] they told me that I missed an important meeting. That is one area to show that the mobile phone has helped us. If the phone had been charged, I would not have missed the meeting. Right now, they have just called [for me] to attend a meeting in Makeni tomorrow. If the phone was not there, how was I going to get the information?" (EL W1 P43 Health worker, non-TBA intervention chiefdom)

A reason mentioned by fewer respondents concerned the use of the phones for supply chain management and to exchange disease surveillance information. One health worker also emphasized the increased efficiency the mobile intervention is enabling. DHMT staff confirmed this.

"The Disease Surveillance Officer called us and asked about the disease outbreak, so we told him, and in turn we also called the District Operations Officer to inform him if we are short of vaccines, and he would tell us when to go for it." (ML W1 P26 Health worker, non-TBA intervention chiefdom)

"In the past... sometimes drugs would get finished, and we would not [be able to reach] the District Medical Store... to inform them... But through this phone now we can call them to say we have run out of drugs, so they can come to your aid immediately; while in the past it was not easy, except if you would take transport to go out, [but] then if you did not find drugs then you end up spending [time] for nothing." (EL W2 P19 Health worker, non-TBA intervention chiefdom)

"I believe they [health workers] have already realized different things because of the fact that they have a telephone in their possession... For example, during this cholera outbreak it was really wonderful to see them communicate to report the number of cases they have. They can even use it to communicate with their companions to report what has happened in their area, and I believe with that they put things together and know the steps they should take." (ML W1 P1 District level respondent)

5.2.3 Reasons for communication between health workers and TBAs

TBAs expressed similar but also other reasons for having the communication link with health workers. Also here, diverse respondent groups across both TBA intervention chiefdoms referred to getting or sharing information and seeking advice. The nature of the TBAs' relationship with health workers implied that this was often related to mobilizing community members and care for pregnant women (dealt with in more depth in the previous section) and referral (addressed in the next section).

"I have seen changes [compared to] before. Now I learn things from the nurse that I have never learned before. The nurse will explain to me on [the phone] line things I found difficult to understand, and this has helped me." (EL W2 P53, TBA, TBA intervention chiefdom)

Health workers, in turn, confirmed this, as did managers.

"Before [TBAs] did not take their work very seriously... but now because of the facility phone which was given to them, they take the work [more] seriously than before. So now... the TBAs mobilize the clients for us, and we call them

to inform them about the upcoming clinic.” (EL W1 P31 Health worker, TBA intervention chiefdom)

“[TBAs] now reach [community clients] because they make calls to their nurses, and their nurses also call them. Sometimes they tell them to visit certain clients at a particular place if the client fails to show up for the clinic.” (EL P1 District level respondent)

Another reason mentioned by TBAs and community members related to the time-efficiency of information, communication and transport.

“What I have noticed is that the phone has lessened our work. At first, when we didn’t have a phone, we walked to the [health] centre, and sometimes you didn’t meet the nurse; you walk [back] again to your village, so it really annoys me, and you can decide not to visit that clinic [again]... But with the phones you can tell the pregnant woman that the nurse is not available for this week but will be available the other week, and that is encouraging. That is why I believe the phone has lessened my work [compared to] before.” (EL W2 P47 TBA, TBA intervention chiefdom)

“In terms of getting information the phone has increased the speed at which we have the information. In the past some information came late, and we missed some important training.” (EL W2 P54 TBA, TBA intervention chiefdom)

“What has changed... is that in the past, when [health workers] needed the TBAs to come for meetings, they had to send somebody to go around, but now things have changed. Communication goes through; the nurse can just call them to tell them that she wants to see them on a particular day, and they will all come.” (EL W2 P7 male FGD, TBA intervention chiefdom)

5.2.4 Job satisfaction and communication

As described in the baseline report, information on job-related satisfaction and communication was obtained through 20 agreement statements making up three domains that were shown to be reliable, as well as two separate statements, and were part of the health worker survey at baseline, midline and endline.⁷⁷ For each domain (communication with peers and seniors, working conditions and quality of working life) a combined score was calculated. The standardized combined scores for these domains ranged from 0 to 100, with a higher score indicating a better situation. Figure 37 presents the change in score between baseline and endline, by wedge. A more detailed overview can be found in Annex 31.

⁷⁷ For more information on the methodology and reliability analysis, see baseline study report (Magbity et al., 2013).

In both baseline and endline results, health workers had lower average combined scores for the domain *working conditions* compared to the domains *communication with peers and seniors* and *quality of working life*.

In the domain *communication with peers and seniors*, the combined average score was significantly higher at endline (82.3) than baseline (76.5). This was also the case within each wedge separately. Across wedges, Wedge 1 scored higher than Wedge 2 (statistically significant).

In the domain *working conditions*, the combined average score at endline and baseline were similar, between and within wedges and overall (any differences were not significant).

In the domain *quality of working life*, the combined average scores at baseline (74.4) and endline (76.3) were significantly different, mainly due to a difference in Wedge 2 (from 73.1 to 77.1), while Wedge 1 showed no difference.

As in the baseline, two separate statements with agreement scales were used to measure how health workers perceive communication with clients. The results of the analysis of these two statements by wedge are also in Annex 31.

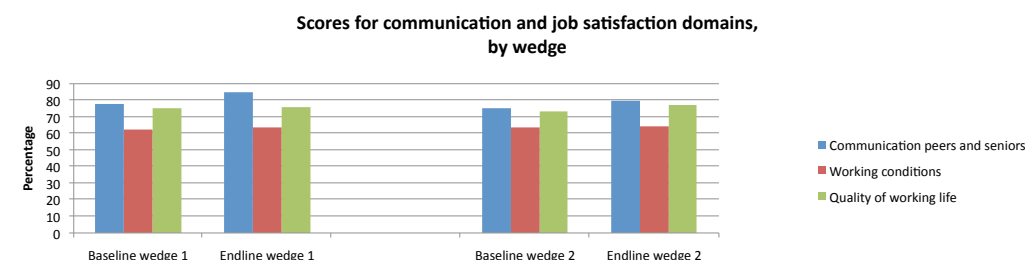


Figure 37: Scores for communication and job satisfaction domains

In general, a large percentage of health workers felt that contacting clients was easy and that they had the means to do so. At both baseline and endline, over 80% of the health workers agreed with the statement that ‘contacting individual clients in the community for services is easy’. The percentage of health worker respondents who agreed with this statement increased significantly from baseline to endline, within each wedge and overall (but not between wedges, where there was no difference).

While Wedge 2 dipped during midline before rising again, Wedge 1 peaked during midline – as expected due to the health worker to client communication intervention.

A significant increase in the number of health worker respondents agreeing with the statement ‘I have the means to contact individual clients directly’ was seen from baseline

(81%) to endline (91%), as would be expected because of the mHealth intervention. Significant increases were seen in Wedge 1 (from 73% to 89%) and Wedge 2 (from 80% agreement at baseline to 91% at endline).

The qualitative research data add perspective to the above and address issues of workload, job motivation and satisfaction.

a. Workload

Many health workers spoke about the surge in incoming calls as increasing their workload, especially while conducting a delivery or when they attended to an emergency. In general, health workers did not speak negatively about this increase in workload. They saw this as part of their responsibilities for service provision and being able to provide more clients with appropriate care, as demonstrated by the following quotes:

"It has... increased work for me. I can be doing one thing, and they call me for another. Even as you are talking to me, they are calling me for an emergency. (...) Well it doesn't disturb me as such, because it is part of my work. It only disturbed me a little when I was treating [[an] emergency out there." (EL W1 P29 Health worker, TBA intervention chiefdom)

"One of the problems we have, especially when we are in the maternity room trying to conduct delivery, [is that] they keep calling, but there will be no time to take it. [Only once] we finish, we trace the number. At times we can be busy with a patient, and a call keeps coming... Well, since everything has an advantage and a disadvantage, we weigh the advantages because the phone is helping us more than the disadvantages, so I think I prefer everything." (EL W1 P43 Health worker, non-TBA intervention chiefdom)

One health worker respondent indicated that it was difficult at the beginning of the study, but that they had become used to this burden of being called more often.

"Well, to me I don't see that as an extra burden. I am used to it now, because it is part of my job... It is not an extra workload for me. At first it was difficult but now no way because it is part of our job." (EL W1 P4 Health worker, TBA intervention chiefdom)

Health workers from across all chiefdoms found ways to deal with the increase in incoming calls while they were occupied with other work activities, although some chose a different option (letting face-to-face clients wait to first attend to the call) from others (letting the caller wait to first attend face-to-face clients).

"If I am busy working, and a call comes in, I will take the phone from my pocket and watch the number, then I will tell the person that I am busy: 'I will call you later'." (EL W2 P8 Health worker, TBA intervention chiefdom)

"[When] I am on delivery or another patient is waiting, you can tell a [colleague] to pick it and put it to your ears... for me not handle it with blood, and the person can talk to me, and I will tell them to wait for my call later." (EL W1 P29 Health worker, TBA intervention chiefdom)

"I can tell the patient to excuse me, so that I can answer the call, like... I did just now when I told them I had a visitor." (EL W2 P19, Health worker, non-TBA intervention chiefdom)

Apart from calls, the increased service utilization – recognized by many – could also be seen as increased workload. However, this was not voiced as such by health workers. On the contrary:

"Like I explained, the work has become less now on us, as we used to get just 10 patients before, but now, we have more than 20 to 25 patients every Wednesday." (ML W1 P31 Health worker, non-TBA intervention chiefdom)

We also asked TBAs about whether having a mobile phone influenced their workload. Most TBAs spoke positively about their changing role in the community, and these views are reflected in the previous section of this chapter. Specific references to workload included several TBAs who reported a reduction in workload due to knowledge about when the health worker is present at the facility.

"The phone has reduced the work that I have been doing. Now you explain to the nurse through the phone without [it costing] a cent, and you are sure of meeting him in the facility." (EL W2 P50 TBA, TBA intervention chiefdom)

Some TBAs did and others did not have a phone. One TBA suggested that the phone may disturb them at night:

"In our own area here TBAs are plenty, but only six of us have phones. So we are asking and pleading with [them] to help the others to get... phones (...). There are times you would want to sleep, and then the phone rings, and you just have to take it. So even when I want to sleep they disturb me or even if I am not well they can call me, but I am sure if the other TBAs have the phone my work can be less." (EL W2 P11 TBA, TBA intervention chiefdom)

Two TBAs (from the same chiefdom), however, reported an increase in workload, specifically mentioning that it was not financially compensated. One said:

"Now we are having more pregnant women and lactating mothers than before, because the nurse calls you to remind clients to go to the clinic. And if there is a vaccine the nurse will also call the TBA to inform the people in the community, so to me this is another responsibility this phone has brought."

Charging is one [issue] and [also] the number of cases you send to the facility. In the end no incentive is given for what we are doing, so it is really an additional workload.” (EL W2 P53 TBA, TBA intervention chiefdom)

In contrast, another TBA in the same chiefdom was grateful about her workload having increased, since the phone brought new opportunities, while before she felt under-utilized:

“Well, now I have more work when I have the phone, because in the past they used to forget about me. It used to take a long time [unless] I would go and [ask] her to give me work. But now even if I am here she can call me and give me work for the patients, so now I have plenty of work to do than in the past when I didn’t have the phone.” (EL W2 P11 TBA, TBA intervention chiefdom)

Comments and implication regarding workload were diverse. Table 7 tries to capture the main reasons why workload would decrease or increase.

Table 7: Inventory of factors influencing workload (interpretation of qualitative data)

| Factors potentially reducing workload | Factors potentially increasing workload |
|--|--|
| <ul style="list-style-type: none"> – Phone communication > more efficient information management > less time spent on organizing logistics, walking, travel – Receiving client calls > reduction in number of clients coming to clinic – Clients may come earlier than without mobile communication > cases may be easier to handle | <ul style="list-style-type: none"> – Calling clients for reminders etc. > takes time and effort (new activity) – Client reminders > increased service utilization (longer queues) – Receiving client calls (new service) – Clients who otherwise would not have come > now can call > may now come – Less referral as problems solved via telephone peer/senior advice > more work at facility |

b. Job motivation and satisfaction

Health workers from both wedges generally were positive about their jobs, and the changes brought about by both the health workers to health worker as well as the health worker to client communication interventions. Some felt motivated due to the quicker communication and information exchange – for example, for meetings and workshops (see also earlier quotes). Others indicated that the new opportunities for peer support, created by the phone, boosted their job satisfaction.

“I feel good about my job when this facility phone is here. As I said, if anything happens, I will first call my colleagues before I call the office for help. I feel satisfied about my job now more than before, and I enjoy the job more now than before.” (EL W1 P31 Health worker, TBA intervention chiefdom)

Being able to do a job well and the intrinsic motivation of health workers were important for health workers and contributed to them being happy with the phone. This diligence they showed towards their clients was also expressed by the following quote:

“Yes. Through this phone, I had one client at Kamode, but she went to Freetown, but I told her the time she should report at the clinic. When she went to Freetown she fell sick and did not have a phone to call. So I went to the family house, and they gave me the number of the person whom she went to visit in Freetown. So I called her, and she told me she has not forgotten, and when it was time for her to attend clinic, she was here at the clinic.” (EL W2 P22 Health worker, non-TBA intervention chiefdom)

District and national health managers, as well as female community members, also observed an increase in job satisfaction:

“The health workers feel [more] secure because they will not buy [phone] top-ups [anymore], so this in itself is motivating because when there was no phone, health staff had been constrained to talk freely. With this intervention, health staff talk to each other freely and also with the DHMT, so this leads to job satisfaction.” (EL P59 District level respondent)

“...If someone is not happy, [they] will not call you, I am sure. Since they are calling us to visit the clinic, I think the phone has helped to please them. We understand that credit was provided for them to call us; that alone motivated them to do more.” (EL W1 P58 female FGD, TBA intervention chiefdom)

Health workers were also happy that they did not have to pay for credit with their own phones:

“Now that they have given us this facility phone, we don’t have to buy credits again as compared to before when I bought credit to call. Now I call the villages for free without paying anything. I now call all the catchment villages and inform them about vaccination or they come for clinic, and if we want to keep meeting with them, we will call them, and they will come.” (EL W2 P8 TBA, TBA intervention chiefdom)

TBAs also reported increased job satisfaction, although more at midline than endline. The primary satisfaction TBAs seemed to get out of the programme was to be part of caring for pregnant women in the community, having the ability to call to discuss problems and be part of the solution, learning along the way. This they felt was their role, and they felt proud to be part of the programme.

“I feel good, because it is my work I am doing. I was asked if I could be involved in this mobile work, and I consented, so I feel good that I am part of

a process of talking to our pregnant women and family planners to visit the clinic.” (ML W1 P8 TBA, TBA intervention chiefdom)

“I will be happy if this continues, by regarding us as important people in our community.” (ML W1 P25 TBA, TBA intervention chiefdom)

“The benefit is that whatever they tell me through the phone I will understand. So that is a benefit for me.” (ML W1 P19 TBA, TBA intervention chiefdom)

Ownership of a telephone was for some TBAs a reason to feel proud and acknowledged.

“I like it because it has promoted me; I have never held a phone for myself.” (ML W1 P23 TBA, TBA intervention chiefdom)

District-level staff also here observed improved motivation:

“The mere fact that phones have been given to them free [of charge] and [that] they have the feeling of belonging to a system ...has helped the TBAs to be motivated.” (EL P59 District level respondent)

5.2.5 Benefits

Respondents identified several benefits of the improved communication options among health workers and between these and TBAs. (Benefits related to clients and their health status are reported elsewhere in this chapter.)

a. Perception of improved relationships between health workers and with seniors

Most health workers indicated that their relationships with other health workers became closer, stronger and more cordial, mainly due to the increase in interaction because of the VPN network, and described this as follows:

“This phone has created a lot of relationships. We discuss lengthily about our problems on the phone, and we assist one another.” (ML W1 P30 Health worker, non-TBA intervention chiefdom)

“Like this facility phone, we went far with it, and we can now talk for a long time. In fact we interact a lot; it has really made a change. Any time I want to make a call [it] is quick access, and we can also talk for long. Almost every day a person can have access to call his colleague.” (EL W2 P Health worker, TBA intervention chiefdom)

“Well, the relationship is now cordial because in the [past when I used my credit to call] we just talk for few times, but now when there is the phone I can call her, and we can talk a lot.” (EL W1 P37 Health worker, non-TBA intervention chiefdom)

Health workers mentioned also that the VPN had resulted in a better relationship with the DHMT, mainly because the threshold to communicate became lower and accessibility of DHMT members better.

“[The facility phone] has made the relationship between the DMHT and even the clients that we have outside so cordial. Now in every one or two days, you either talk to your clients or your bosses. Whatever happens in the office you will know.” (ML W1 P26 Health worker, non-TBA intervention chiefdom)

“[The relationship with the DHMT] is cordial. [The phone] helps us to be able to get access to communicate with them, because not everybody can withstand one-on-one communication with some elders. But with the phone you can call and communicate with them, and they too can respond well.” (EL W2 P3 Health worker, TBA intervention chiefdom)

b. Reduced cost of communication

Health worker respondents from all chiefdoms emphasized that the VPN system turned communicating about work-related issues free of charge and encouraged peer to peer communication.

“[The phone] has created a big difference, because we can now communicate regularly with each other to discuss health issues. [In the past] we were communicating, but with fear. Fear of your credit. At times there is no credit in the area you find yourself, but now we have no fear of burning credit, so that has created a difference.” (EL W1 P29 Health worker, TBA intervention chiefdom)

“I cannot hesitate to emphasize that the facility phone has improved the capacity of our services. When we did not have it, we were unable to call and discuss for a long time. If you used your personal phone, it wouldn't take long [before] the credit would finish.” (EL W1 P43 Health worker, non-TBA intervention chiefdom)

c. Perception of improved relationships between health workers and TBAs

The responses of TBAs and health workers, across both wedges, and also district managers, indicated that the improved communication led to better relationships among health workers and TBAs.

“[The relationship with the nurse is] so cordial, respectful for each other. This has helped to promote trust and confidence between the TBA and the nurse, because we do talk on issues pertaining to the health of our people in the community.” (EL W2 P54 TBA, TBA intervention chiefdom)

“[The mobile phone] has changed my feeling because it was not easy to call the TBAs because they did not have phones, and it was not easy for us to call the phones of our clients' relatives. But now we call them, and they are happy to

answer their call, which I am also very happy about.” (ML W1 P4 Health worker, TBA intervention chiefdom)

“Giving the phone to the TBAs was a big motivation, because they now call the health staff and talk to them. This has motivated them a lot, and there is that cooperation between them and the health staff. Now they bring clients to the health staff. This did not happen before.” (ML W1 P2 District level respondent)

Another recurring theme that was highlighted by both TBAs and health workers was the cooperation between the two groups to achieve better health outcomes since the implementation of the mHealth intervention. This in a number of cases resulted in perceptions of the TBAs being part of the facility team and thus being seen as part of the health system.

“As a TBA I know I have been recognized by the health worker that we work as a team to improve the health of our people. That is why the health worker is calling me, and this kind of relationship has proven well.” (EL W2 P50 TBA, TBA intervention chiefdom)

“Now through the use of the phone we are much close than ever before, now we talk like colleagues, we do things together. (...) The phone has brought a closer relationship than ever before... I see this as a member of one family, doing things collectively; I feel recognized and part of the health sector.” (EL W2 P53 TBA, TBA intervention chiefdom)

“[The collaboration between TBAs and the facility] made the relationship very cordial between us, and they feel part of us now.” (EL W1 P31 Health worker, TBA intervention chiefdom)

b. Perception of changing role and improved status of TBAs in their community

A number of TBAs (albeit from one of the two TBA intervention chiefdoms where interviews took place) strongly felt that their role and status in the community had improved; this did not surface in the midline research. This was seen as a consequence of having received a mobile phone for their work, which in turn was linked to a higher degree of recognition by ‘the government’.

“They now have great respect for me, because the community chose me to be their TBA, so with this phone it has increased my respect. They don’t have money to offer to me, but at any time I want people to work on my farm both the clients and their husbands always come to my aid, so you see the benefits I am now getting. Because of the phone my status has increased. (...) Whatever I say in this community, people do listen.” (EL W2 P47 TBA, TBA intervention chiefdom)

“Since [I received] this phone, clients do have high regard for me. If someone wants to visit the clinic they must come to me, because I am recognized by my people as the middle person to contact. Their husbands also come to me; they can assist me in doing some work. So this is a blessing for us as TBA to be given a phone and be recognized by government. In my community the chief can’t do anything without calling me, so the phone has brought added value to my prestige. I feel so good about this phone.” (EL W2 P50 TBA, TBA intervention chiefdom)

“Before the phone was given not much attention was placed on me, but with this phone they strongly believe that government has given me more position to look after the welfare of the community. They are also of the belief that I would look at human rights violations, such as sexual harassment, violence, maternal health (...). It has made me recognized by the chief. The chief now supports me fully... So I am very much comfortable.” (EL W2 P51 TBA, TBA intervention chiefdom)

“This phone has added to my morale. I feel good about it. As I told you, everybody holds high esteem for me in this community, because the health worker talks to me alone through the phone, so I am happy because I am recognized as part of the health team.” (EL W2 P52 TBA, TBA intervention chiefdom)

“In the past our relationship was not as close as this. They [took] it that the TBA is with the pregnant women, but they see me as a partner to them now.” (EL W2 P11 TBA, TBA intervention chiefdom)

One of the health managers confirmed the significant role of TBAs.

“It is good to also include the TBAs because they will help us to reach areas where we cannot go, or not everybody has a phone. Like, the clients don’t have phones, so we use the TBAs to call the clients and remind them to come for clinics. Even the husbands, when they see the TBA, they will know that it is for a reminder to attend ANC, postnatal care and also to deliver at the hospital. And if their babies are sick, they should come to the hospital. They should not sit at home until the baby dies, so I think it is very important.” (EL P49 National level respondent)

c. Improved efficiency of TBA efforts (qualitative: transport, cost, time)

For TBAs, an explicit benefit mentioned by many, across wedges and both midline and endline research, was the reduction of effort (both physical and monetary) needed to travel back and forth to the facilities, as well as the phone credit savings.

“I have no other work. This work has helped me because there are problems that come up here. We used to pay for transport, but now if it happens I don’t

have to pay for transport; I remain sitting here and call.” (ML W1 P23 TBA, TBA intervention chiefdom)

“I believe it has benefited me. Before the coming of the phones, if you didn’t have a phone, you walked to the facility and found out that the nurse was not at the centre, and you have walked a very long distance – that will not encourage you. But now I no longer walk in vain. If I am going to walk, I know the nurse is at the facility or she will inform me of any meeting she has anywhere.” (EL W2 P46 TBA, TBA intervention chiefdom)

“It will be easy for us because once [the phone] is charged, we are not paying anything when we communicate, and it allows us to talk for a long time. So that can make us [talk] for a long time without paying anything, compared to the past when we bought 100 units [and] only talked for a short time; by the time you think of it the unit it is finished.” (EL W2 P3 TBA, TBA intervention chiefdom)

5.2.6 Continuation of the intervention

All 188 health worker respondents recommended at endline that the VPN should continue, most arguing that it made communication and, subsequently, their work easier. They especially mentioned the discussion around difficult clinical cases with other health workers. Other reasons mentioned were: faster communication, less or no cost to them, reduction in the number of maternal deaths, useful for ambulance referral, assistance for drugs and useful during outbreaks. Some examples from the answers to the open survey questions:

“Because it’s helpful. It reduces the workload.” (Health worker questionnaire EL-GK-9, Wedge 2, TBA intervention chiefdom)

“Information is passed on easily. Difficult cases are discussed and solved, and it also reduces the number of referrals.” (Health worker questionnaire EL-PM-5, Wedge 1, TBA intervention chiefdom)

“Because it reduces maternal mortality, as there is easy access to an ambulance.” (Health worker questionnaire EL-SL-1, Wedge 1, non-TBA intervention chiefdom)

“Information flows easily. The relationship between staff of different PHUs is more cemented, as there is easy communication.” (Health worker questionnaire EL-GK-2, Wedge 2, TBA intervention chiefdom)

“VPN has helped us to learn through communicating with colleagues on things we did not know before, so it has increased our knowledge, which in turn has helped on service delivery.” (Health worker questionnaire EL-SE-9, Wedge 1, non-TBA intervention chiefdom)

Nearly all (185 out of 188, or 98%) of the respondents recommended that the health worker to client communication scheme should continue. The reasons given by the three staff who did not recommend this were: no network coverage (n=1, Wedge 2), poor network in catchment area (n=1, Wedge 1) and most clients do not have phones (n=1, Wedge 1).

The main reasons for recommending continuation were the ease of contacting patients, being able to remind them about upcoming or defaulted visits and follow-up on treatment. Other reasons were multiplier effects (inform one, reach many), increased utilization of services, phone use in case of long distances or bad road conditions (rains), phone use for emergencies, phone as an acceptable route of communication for shy clients or sensitive issues that might be difficult to deal with face to face, improving or sustaining relationships with clients and reducing maternal deaths:

“For shy patients, they are able to discuss issues over the phone and solve them.” (Health worker questionnaire EL-MK-7, Wedge 1, non-TBA intervention chiefdom)

“The ANC and FP visits have increased.” (Health worker questionnaire EL-MK-25, Wedge 1, non-TBA intervention chiefdom)

“Patients get the feeling of being cared for.” (Health worker questionnaire EL-SL-10, Wedge 1, non-TBA intervention chiefdom)

“If you can look at our registers you find out that defaulters are now making appointments when to see us. Before such things were not happening. So we need this to continue.” (Health worker questionnaire EL-SE-13, Wedge 1, non-TBA intervention chiefdom)

“It helps the client to come on time and reduces serious complications.” (Health worker questionnaire EL-BS-4, Wedge 2, non-TBA intervention chiefdom)

“It reduces tension between client and health worker. It reduces tension at the clinic, as we know when to expect clients.” (Health worker questionnaire EL-GK-9, Wedge 2, TBA intervention chiefdom)

All 25 health worker respondents in the TBA chiefdoms recommended that the involvement of TBAs in the health worker to client scheme should continue. The main reason they mentioned was to contact clients without (access to) phone and/or network coverage for visit reminders. Other reasons mentioned were to inform clients about coming to the clinic, to inform TBAs for assistance at PHU, to motivate TBAs and to advise TBAs.

“It motivates them [TBAs] to do the job. They are constantly prompted by health workers to remind clients of dates for appointments.” (Health worker questionnaire EL-PM-3, Wedge 1, TBA intervention chiefdom).

"[The phones] help to contact them [TBAs] easily especially during night delivery [for assistance at PHU]." (Health worker questionnaire EL-PM-2, Wedge 1, TBA intervention chiefdom)

"It makes it easy to attend to patients that are on their way, as the health workers would have prepared themselves before their arrival." (Health worker questionnaire EL-PM-7, Wedge 1, TBA intervention chiefdom)

"This has made TBAs feel that they are part of the medicine group. It shows that they too are important in decision-making in the health care." (Health worker questionnaire EL-PM-12, Wedge 1, TBA intervention chiefdom)

"Some areas are without network, but calling the TBAs helps to contact these clients. It also helps in preparing for labour, as the TBA calls to inform us to expect a patient in labour." (Health worker questionnaire EL-GK-8, Wedge 2, TBA intervention chiefdom)

"It helps us to contact patients who do not have phones to come to the clinic. It also helps us to remind patients about appointments, and it also helps the clients to contact us for advice." (Health worker questionnaire EL-GK-9, Wedge 2, TBA intervention chiefdom)

5.3 Objective 3 – MNH referral systems

Referrals take place from community and TBA to health facilities, from lower-level PHUs (such as an MCHP) to higher-level PHUs (such as a CHC), and from PHUs to the hospital. In this section we will mostly focus on ambulance referral from PHUs to the hospital.

As expected and displayed in Figure 38 and in Annex 32, the majority of phone calls and text messages about ambulance referral were made from the PHUs to the other levels, especially the district level. There were only few calls/texts received about ambulance referral.

There was a significantly higher percentage of respondents making calls and texts from PHUs to the district level for ambulance referral purposes in Wedge 1 than in Wedge 2 at all three time points. The percentage of staff making calls and texts for ambulance referral decreased from baseline through midline to endline for the total group and Wedge 1 (both significant). A similar decrease was seen in Wedge 2 (from baseline to midline), but this was only borderline significant. This decrease might be explained by clinical advice calls to district level and subsequent handling of cases at PHU level, but potentially also by reduced numbers of more severe cases due to the health worker to client scheme that encouraged clients to report problems earlier.

Percentage of staff indicating that reasons for calls/texts included ambulance referral, by level and way of communication

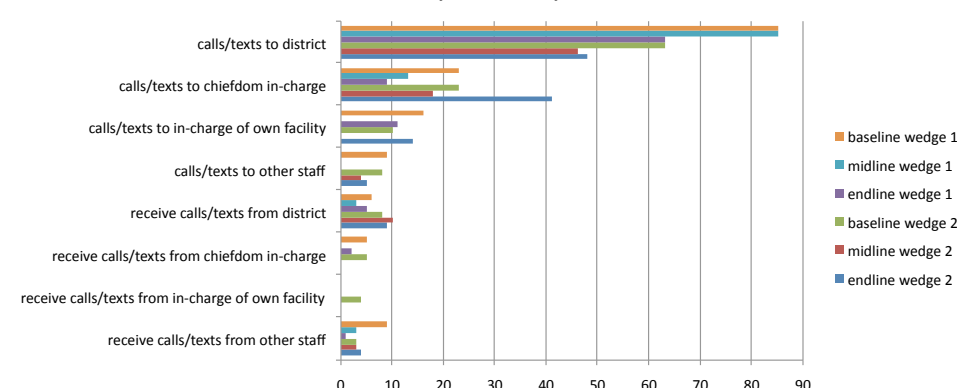


Figure 38: Percentage calls/texts for ambulance referral

The number of staff making calls or texts to the chiefdom in-charge decreased in Wedge 1. This was borderline significant for the difference between baseline and endline. It also decreased for Wedge 2 from baseline to midline, but increased again at endline with a borderline significant difference between midline and endline. There were significantly more staff making calls and texts to the chiefdom in-charge in Wedge 2 (as compared to Wedge 1) at endline.

The percentage of staff making calls to the in-charge decreased in both Wedge 1 and Wedge 2 from 16% and 10%, respectively, to 0%, but then these went up again to 11% and 14%, respectively. This is significant for Wedge 1 (baseline versus midline) and for Wedge 2 (midline versus endline), but not at all time points.

There was a significantly higher percentage of staff in Wedge 2 making calls to other staff for referral as compared to Wedge 1 at endline. No staff were making calls in Wedge 1 for referral at midline and endline, which was significantly different from the baseline level (7%).

No significant differences were found in the percentages of staff receiving calls or texts from the district level or the in-charge of their own facility between wedges and at the three time points. A significant decrease of calls and texts received from other staff takes place from baseline to endline in Wedge 1 (9% to 1% of staff), while the percentage of staff receiving calls or texts from other staff remained the same in Wedge 2 (3–4%).

At baseline, one respondent mentioned a client calling or texting for the ambulance, with no respondents mentioning this at midline or endline.

Of the respondents who said they ever received calls or texts from TBAs, 56 out of 61 at baseline (92%) and 33 out of 37 respondents at midline (89%) and all 53 respondents at endline (100%) indicated that TBAs requested help with difficult cases (including referral).

While there was no difference between the wedges at baseline for this, there was a significant difference at midline. Respondents in Wedge 2 at midline indicated that they received messages requesting help with difficult cases (including referral) from all the TBAs (100%), while only 76% did so in Wedge 1, and this came back to a similar level (100% each) at endline. This might reflect earlier and more regular attendance of clients at the PHU due to the health worker to client scheme, which started at baseline for Wedge 1 and at midline for Wedge 2, thus creating the difference at midline.

Many interview respondents mentioned (ambulance) referral, with several mentioning that it was easier now to get the DHMT ambulance through the VPN system that was established as part of the intervention.

"Before now we found it difficult to get the ambulance if we had pregnant woman in a critical condition. But now as we call the office at Makeni, they will send the ambulance immediately." (ML W1 P4 Health worker, TBA intervention chiefdom)

"Now it is easy for us to alert the ambulance, and they will come to collect the patient." (EL P1 District level respondent)

"Yes, the service providers have improved a lot in that area. As we have observed, the referral services have improved. Whenever there is a complication, the people call on the service provider, and they will attend to the patient on time. So the use of the mobile phones in the clinic is very good, as you will be able to go to the right place, at the right time." (EL P48 National-level respondent)

Several respondents mentioned that it was much easier with the facility phone to call the ambulance than before. For example, they now got used to calling the ambulance from Kamakwie hospital (a mission hospital in the north of Bombali district).⁷⁸

"There was a time when I had a case of obstructed labour here, so I called the nearest hospital at Kamakwie. They came with the ambulance and collected the woman, and she was rescued. But in the past to even get a bike to transport the patient you want to refer was a problem. But through the help of the mobile phone, we can call the hospital quickly for the ambulance, and they will come to rescue the person. That is the difference." (EL W2 P43 Health worker, non-TBA intervention chiefdom)

There were also suggestions that referral might have become more efficient, as health workers could first get advice from colleagues and then decide together whether referral was really necessary. This might contribute to more clinical advice calls and

fewer ambulance referral calls, as indicated in the quantitative findings. It would then contribute to more efficient use of referral resources such as ambulance fuel and staff time, as many of the PHUs are a great distance from the district headquarter town (see Annex 16 for distances between PHUs and Makeni), and most are reached through unsealed roads and usually rough terrain.

"The nurses no longer call for an ambulance unnecessarily. This is because the nurses used to call for an ambulance, and when the ambulance goes there they will tell the driver that the woman had delivered. But now it does not happen, as they will call us on the phone, and we give them instructions as to what to do..." (EL P1 District-level respondent)

"Before, I found it difficult to call the DHS to explain to me how to deal with cases like eclampsia, or to refer cases, but now if I have such case, I will call, and they will enlighten me on how to apply the first aid before I refer the case." (EL W2 P25 Health worker, non-TBA intervention chiefdom)

"Before they refer, they have to communicate with their colleagues at other PHUs to help them. If... they don't have an idea, they will call the DHS, who in turn would help to solve the problem. That has reduced the number of referrals. They only refer when all opportunities have been exhausted, so as a result of the phone it has changed the referral system, which is evidence based as compared to the time we didn't have the phones." (EL P59 District-level respondent)

The mobile phone also reduced the costs for health workers, since they used to have to call for an ambulance using their own credit. Now they could use the facility phone, which provided more opportunities for exploring the problem with the client and seeking advice from colleagues

"One can now communicate with the PHU staff at any time when you are free. But this did not happen when they used their own phones, as their credit was finished before even telling us the message. But now if there is any critical case during labour, the nurses will call the sister, and the sister will explain how to do it without any referral. The sister will communicate through the phone, by instructing the nurse what to do and how to do it, without any problems." (ML W1 P2 District level respondent)

"The phone helped. What it has given to me is that it has enabled us to transfer cases without the headache again of buying top-up." (EL W2 P3 Health worker, TBA intervention chiefdom)

"There are some... at risk cases when they used to delay referral. This phone has helped us refer cases in time, since we do not burn credit." (EL W2 P19 Health worker, non-TBA intervention chiefdom)

⁷⁸ The Kamakwie hospital ambulance was included in the VPN in stage 2.

Many respondents also thought that the phone made the referral process faster:

"Because it is available at all times then when we have credit, we do not lose the network too much like on our own personal phones." (EL W2 P20 Health worker)

"It is faster now because if anything happens I will call my bosses and get them, and they will take action that very moment." (EL W2 P22 Health worker, non-TBA intervention chiefdom)

As a result of improved and faster referral, respondents felt outcomes had improved.

"We had referral cases, but we had no phones to call for an ambulance and refer those cases, and the patient will die. But now if you call the office for an ambulance, you will not use credit, as it is free, and you will continue to call them until they send the ambulance for the patient. So now it is not easy for maternal death to occur, but in the past, lots of maternal [deaths] happened in a year." (EL W2 P25 Health worker, non-TBA intervention chiefdom)

"Last week there was a child who is under-aged. Her pelvis was not matured yet, but she delivered by God's grace... She only attended clinic once. When she returned home, she felt the labour pain. We realized that she could not deliver here, so we called Makeni, and she was transferred by the ambulance." (EL W1 P29 Health worker, TBA intervention chiefdom)

"It could have been the worst, because by the time you try to get somebody to go with a bicycle to report to [village], which is the nearest hospital, things would have gone bad, but it is very automatic with the phone." (EL W1 P30 Male FGD, TBA intervention chiefdom)

Consultations about referral also took place between the TBA and the PHU and between clients, the TBA and PHU, as is illustrated by the following quotes.

"Most of the deliveries now happen at the clinics. If there is any complication, the TBA will call the in-charge at the clinic, and the nurse will also call for an ambulance in time, so that they will deal with that complication in time, so the patient will not die." (EL P48 National-level respondent)

"There were too many maternal deaths, but now [when] something happens, I just pick up the phone and call the centre to say my wife is on the way, or [I] take her to the TBA who has a phone, and the TBA will alert the nurse." (EL W1 P30 Male FGD, TBA intervention chiefdom)

"Before, when there was no facility phone, when a pregnant woman wanted to deliver, people had to put the patient in a hammock and carry her to Kamakwie. But now that there is a facility phone, the nurse has to only make a phone call, and the ambulance will come for the patient." (EL W2 P40 Female FGD, TBA intervention chiefdom)

"And whatever happens here I call them to tell them. If a pregnant woman reports to me that she is feeling pain, I call the nurse first before taking any action. If the nurse instructs me to do the work, I will go ahead; if she asks me to go with her, I go with her." (ML P23 TBA, TBA intervention chiefdom)

Clients also called health workers to consult about a problem. The health worker might have been able to go and see the client if feasible and refer if necessary.

"Before, when this phone was not here, it was not easy to call your patients, but now that this facility phone is here, and the number is exposed to everyone, the patients will call you at any time to come to her aid, if she has a serious problem. So because of that I will take a bike and go there to help. If it is a case that I will be able to manage, I will take her to the clinic, but if the case is beyond my knowledge, I will recommend to them to transfer the patient to Makeni." (EL W2 P4 Health worker, TBA intervention chiefdom)

The phone system also assisted with making arrangements with family members of a patient that was being, or would be, referred.

"The phone has enabled me to tell relatives that the case they brought is going to be referred, and I will encourage him or her to find some money to come and meet me. Or if it is... urgent, I can call the ambulance to come and collect the person, and I will later call the relative of the person. That is how the phone has been helping me handle complications." (ML W1 P27 Health worker, non-TBA intervention chiefdom)

5.4 Objective 4 – Maternal death notification reports

Maternal death notifications in Bombali district are received by the DHMT. Before the start of the mHealth project these notifications were communicated on paper or through health workers' personal phones. Between January 2011 and July 2012 (19 months), a total of 12 maternal death notifications were received by the DHMT (i.e. an average of 0.6 per month). Between August 2012 and May 2013 (10 out of 12 months of the intervention),⁷⁹ a total of 19 maternal deaths were received (i.e. an average of 1.9 per month); see Figure 39.

79 Data on maternal deaths received are missing for the months June–July 2013.

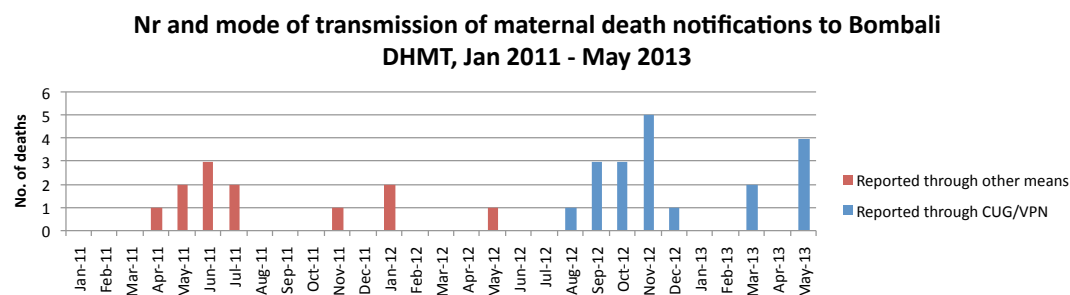


Figure 39: Number and mode of transmission of maternal death notifications
(Source: DHMT Bombali)

This is a tripling in the number of notifications each month, although several interview respondents mentioned that there were actually fewer maternal deaths since the start of the programme. Over the ten-month period a total of 137 maternal deaths would be expected for Bombali district, which indicates underreporting even after a tripling of the notifications.⁸⁰

When asked about maternal death notification during interviews, none of the respondents had encountered a maternal death. Some respondents indicated a decrease in maternal deaths.

"No, I don't have any maternal deaths. Even last week I had a crucial case where I administered a dose, and maintenance dose. Nothing happened, so I called for an ambulance to come and take the client." (ML W1 P34 Health worker, non-TBA intervention chiefdom)

"...If we have a patient in a difficult situation, we call the ambulance, and they come immediately and take the patient. It has helped greatly, because there were many deaths before. Now thank God for this [mobile phone] programme." (ML W1 P4 Health worker, TBA intervention chiefdom)

"When there was no mobile phone, there were a lot of maternal deaths because there was no communication with hospitals in big towns like in Makeni, but now when there is a phone, if anything happens, the nurse will call immediately, and they will come and solve the problem. If there was no phone, there would have been a maternal death. So that is one help the mobile is giving." (EL W1 P30 male FGD, TBA intervention chiefdom)

⁸⁰ Expected maternal deaths for Bombali district for a ten-month period are based on: population in 2012 (469,065 as extrapolated from Census 2004), 4.1% pregnant women (based on population projections by Department of Planning and Information, MoHS, based on 2004 census data), maternal mortality rate 857/100,000 (DHS, 2008) and over ten months (10/12) = $469,065 \times 4.1/100 \times 857/100,000 \times 10/12 = 137$ expected maternal deaths.

"If the reminder scheme was not here, many people would have been dead by now. Because many pregnant women who could not deliver on their own could not be transferred to the big hospital. It is a good thing [VPN] because if there is complication here, the nurse will call for the ambulance, and they will come for the patient." (EL W2 P6 female FGD, TBA intervention chiefdom)

In the baseline survey 13 out of 181 health workers mentioned calling or texting the district level (11), their CHC in-charge (2) or other PHU staff (2) to report a maternal death, while only one health worker received calls or text from other PHU staff reporting a maternal death.

At midline three out of 173 health workers mentioned calling or texting the district level (2) or their own in-charge (1) in the previous three months to report a maternal death. None of the health worker respondents indicated receiving calls or texts in the previous three months from other staff reporting a maternal death.⁸¹

At endline one out of 188 health workers mentioned maternal death notification for which the staff called or texted the district level and also called/texted their chiefdom in-charge. Two other staff members received a call or text from the district level (2) in the previous three months regarding notification of a maternal death.

One perception that the mobile communication system led to an increase in maternal death reporting was shared by a DHMT member:

"When a maternal death occurs in other PHUs which is not their own PHU but in the same catchment area, they think it is not a maternal death to them. But now, if there is any problem, like if a patient in another PHU has a problem, we will tell them to go there and investigate and later call us and give us feedback." (EL P1 District level respondent)

Health workers confirmed this observation. The phone made it more practical to report a maternal death immediately after it happened.

"[Before,] they [would have to] go and report in Makeni when there was no phone. But now that we have phones, we just call and report that there is a maternal death, because they were too late to come with the patient, so she died while I was administering first aid." (EL W2 P4 Health worker, TBA intervention chiefdom)

"Before, when there was no facility phone, we only reported maternal deaths at the end of the month, but now we don't have to pay for transport to go and

⁸¹ Questions in the health worker survey which relate to this had no time period indicated at baseline, but this was changed at midline with continued use at endline, whereby to each question about calling to various levels 'in the past three months' was added, thus making comparison between baseline and midline/endline for these questions difficult.

report, but we only have to call through the facility phone and report.” (EL W1 P32 Health worker, TBA intervention chiefdom)

“In the past we had [cases] that the DHMT should know about quickly, [but] your phone would not have credit or would not be charged. But now we can call and tell them that [there is] a case, and they can come for her. Now we can call the sisters, so now it is easy for us.” (EL W1 P37 Health worker, non-TBA intervention chiefdom)

When asked about maternal death reporting during the interviews, none of the respondents had encountered a maternal death.

“No, I don’t have any maternal deaths. Even last week I had a crucial case where I administered a dose, and a maintenance dose. Nothing happened, so I called for an ambulance to come and take the client.” (ML W1 P34 Health worker, non-TBA intervention chiefdom)

5.5 Objective 5 – Health system issues

Many of the aspects addressed under previous sections are associated with health system issues. These will be addressed as part of the discussion in the next chapter. Meanwhile, in some of the interviews, health system-related issues were identified, sometimes stated in the form of recommendations.

For our purpose we organized the health system issues along the lines of the WHO’s ‘six building blocks of health systems’.⁸²

Health workforce

One health worker suggested that mobile communication interventions should not be limited to health workers and TBAs but also involve other cadres such as CHWs.

“I will recommend that it is a good programme. If they are to take it to any other area, let them... extend it to other community health workers – since we can train community health workers here to give treatment on malaria.” (EL W1 P29 Health worker, TBA intervention chiefdom)

Equipment and technology

The recommendations for overcoming barriers to accessing and using facility phones related to ways to charge phones, including recommendations to charge the phone with the solar system available in the PHU and a budget for generators and fuel.

“Well, if they are able to improve on the coverage, it will be good for us. [The Ministry] has done theirs; if the phone companies can do more, fine.” (ML W1 P26 Health worker, non-TBA intervention chiefdom)

“I will recommend that they should change the solar chargers, which is number one. Some of the TBAs, their phone has problems. ... I told you they need to replace those solar chargers, as they are not good.” (ML W1 P21 health worker, TBA intervention chiefdom)

“They should find for us a good solar so we can charge the phone, because the solar is the major problem. (...) Here when they charge today, tomorrow they will say there is no fuel to charge, and it will take two to three days before they charge.” (ML W1 P31 Health worker, non-TBA intervention chiefdom)

Health workers praised the phone intervention as a means of improving communication, and this was seen to support a move towards better health. They felt that the intervention should be expanded to other chiefdoms in other districts, so that others could benefit too.

“Wherever you take this programme, mobile phone coverage should be there, because if there is no network, you will not be able to communicate. But if there is coverage, you will communicate with other districts with the facility phone.” (EL W1 P34 Health worker, non-TBA intervention chiefdom)

When the use of mobile communication helped overcome some constraints and led to more clients coming for services, new constraints became evident – such as the need for more equipment because of higher utilization levels.

“Now the community thinks about this reminder scheme as a good thing for them. ...The nurses are delivering quality service to them and taking care of the pregnant women and children well. (...). The only problem we have at the clinic now is that... the labour room of the clinic only has two beds, and there are times when three or four pregnant women meet to deliver in that same room, which is very bad... (...) The nurse will not be able to admit more than two patients at the same time.” (EL W2 P13 male FGD, TBA intervention chiefdom)

“The only thing I will recommend is to let everybody do a trial. This we have done in our district, and it has worked very well; let everybody [do a] trial and see the wonders they will see in their districts.” (EL P1 District-level respondent)

This health worker concurred:

“We recommend that they extend the programme. Most of the TBAs who are active do not have a phone. We recommend that the TBAs get phones, which

⁸² WHO, 2007.

can help us the more because they are living in the various communities. If we call them directly, they can go to the clients and tell them that their time is up. Then if there is any problem, they can call immediately and inform us.” (EL W2 P19 Health worker, non-TBA intervention chiefdom)

“I want them to go with the same functions they have provided, because communication is the best thing in the world. Without communication everything will come to a standstill.” (ML W1 P30 Health worker, non-TBA intervention chiefdom)

Governance

(Community) participation can be seen as a cross-cutting issue or as one belonging under the governance building block – due to its relevance for the accountability component and sustainability.

“We recommend that they give all the TBAs phones in their chiefdoms, as well as the community people, as you did in some of the chiefdoms here in this district. If you involve the community people in their own health problem, it will help a lot, because if they are involved in their own health problems, they will feel belonged and will help solve some of the health problems they have.” (EL P1 District level respondent)

Other building blocks relate to service delivery, information and financing; they are not addressed separately here since the many issues mentioned in relation to them were dealt with in previous sections.

5.6 National phone line

The toll-free 117 phone line offers a complaints option on the national FHCI (operational from August 2012 for Facility Management Committees and from January 2013 for the general public) as well as information on SRHR, more specifically on MNCH (from January 2013, for the general public). The mHealth programme contributed to promoting the line in Bombali district, from February 2013 onwards: among the public in general (via radio) and among the mHealth-enrolled clients specifically (by handing out small information cards).

Figure 40 compares the number of FHCI-related phone calls with the calls for medical advice and ‘not relevant’.⁸³ Clearly, since the launch of the medical advice component this attracts most callers by far; also, the number of irrelevant calls diminishes sharply.

⁸³ Data were collected by the MoHS from the start but went missing for the period January–March 2013 due to a virus problem with the computer. Thereafter, newly collected data were initially not disaggregated by district, which only happened again from June 2013.

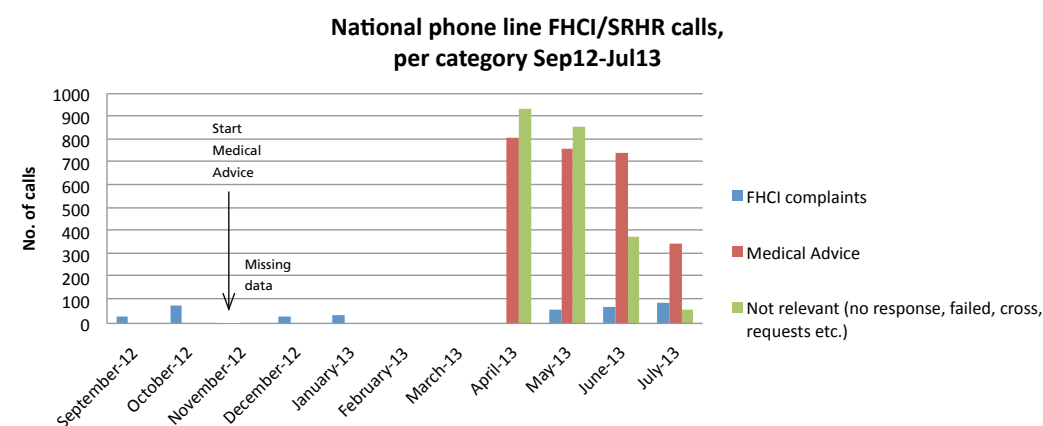


Figure 40: National phone line calls

Data disaggregated by district on calls by the general public for health advice were only available from June 2013. The number of calls from Bombali district appeared higher than average, but since trends over time were not available, it is not possible to draw any conclusions.

Meanwhile, even though line 117 is specifically meant for queries on MNCH, Figure 41 shows that by far the most queries were on malaria (this includes malaria during pregnancy and in children). Queries on FP, STIs, gynaecology and pregnancy made up the rest of the top five health issues, but were relatively few. Interestingly, fewer calls were made on most of these issues from Bombali district than from the 13 districts on average.

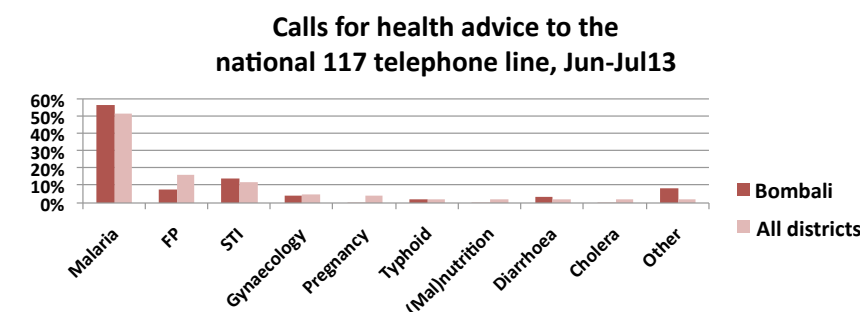


Figure 41: Calls to the national line on health-related issues

The national information line for SRHR was established relatively recently, with little marketing during the FHCI-complaints-only phase. In December 2012 the actual public information line was launched, and publicity campaigns started in early 2013 to make the line more widely known and attract users. The interviewers asked respondents about their awareness, knowledge and use of the line. Most respondents had not heard about the line; some had, from the radio. The ones

who recognized the number thought it was for complaints about treatment and payment for services for pregnant and lactating mothers. Others confused the national phone line with the mobile phone programme. Below we present a short summary of the qualitative data obtained through interviews and FGDs.

Some health managers thought that the information line about SRHR was not known to many of the people in Bombali district.

“We the health workers are aware of [the line], but not even 50% of people in Bombali are aware of this phone line.” (EL P1 District-level respondent)

During the FGDs and interviews, the responses showed some awareness of the national phone line but not necessarily a clear understanding of what the line was for.

“Well, as for me I have heard it once on the radio...” (EL W2 P7 male FGD, TBA intervention chiefdom)

“They (the phone line call centre) tell us that we should take good care of our children... For the mothers: they should wash their hands clean after using the toilet, cover the breast at all times, and clean the environment.” (EL W2 P2 FP client, TBA intervention chiefdom)

“Let me not lie to you: I have not seen anyone call that number. No, I have not seen anyone call that number, but if we are to know about that number, it should come from the nurse”. (EL W2 P5 Male partners, TBA intervention chiefdom)

Respondents often confused the national phone line with the mobile phone communication intervention in their chiefdom; some thought the nurse could refer clients to it.

“What I know is that, if my baby is sick and I take her to the clinic and there is no medicine there, the nurse will call the 117 phone line so that they will send the medicines, or the nurse will refer me to the big hospital.” (EL W2 P6 female FGD, TBA intervention chiefdom)

The line’s formal purpose combines complaints about the FHCI with an SRHR information service.

“Yes, I have heard about it. I heard on the radio that if a pregnant woman or lactating mother comes to the [clinic] for treatment and the nurse asks her to pay, she must call the mami en pikin well-bodi⁸⁴ phone line and report.” (EL W1 P30 male FGD, TBA intervention chiefdom)

⁸⁴ Mami and pikin well-bodi = Mother and child health.

Some clients combined both purposes and believe the line is (also) for complaints about health services in general.

“117 is a special number we can use should anything happen or when a nurse is not... at the centre so that we can call and complain; that is why they put that 117. When something happens due to the fault of the nurse, for instance with the under-fives or a pregnant woman, we can call that line to complain.” (EL W2 P24 FP client, non-TBA chiefdom)

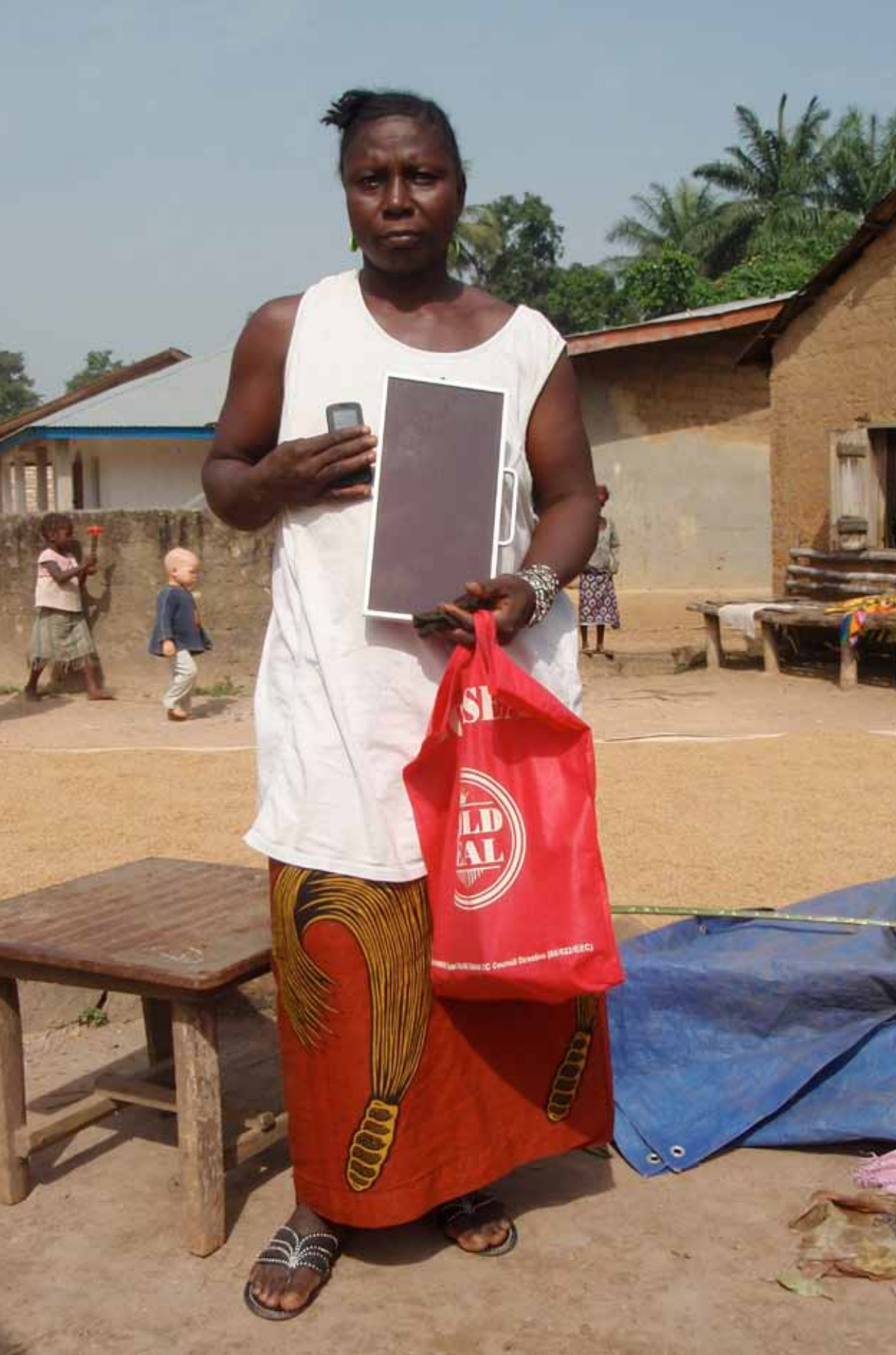
Also another community member thought it was a line to call during an emergency:

“One of these days we had a case of a non-pregnant woman whose condition was bad. They used the 117 line, called the government hospital, and they sent the ambulance to come and collect the woman, although the woman did not survive because of the pain.” (EL W1 P28 male FGD, TBA intervention chiefdom)

One of the few respondents who had a good idea what the phone line was about was from national level.

“Well, [people] call and ask a lot of questions like family planning, which is one of the key questions which they ask about.” (EL P49 National level respondent)

Because there was so little knowledge about the phone line, responses to questions about reasons for calling and satisfaction levels did not emerge from the qualitative interviews.



6 Discussion, conclusions and recommendations

Sierra Leone has taken important steps over the last decade towards improving the health status of its people, the FHCI launched in 2010 not being the least of the milestones. Yet the current MNH statistics, with unacceptably high maternal, neonatal and child mortality figures⁸⁵, and a health system that faces many challenges⁸⁶ warrant further strategizing on what can be done to improve health-seeking behaviour and access to and quality of MNH services, among others.

Mobile communication technologies came to the global forefront for different reasons than advancing health. Yet from a public health perspective it makes common sense to make use of such 'global developments' and make the best possible use of new technologies to serve public health purposes.⁸⁷ After a period of somewhat uncritical enthusiasm about 'mobile health', with a focus on gadgets and technology rather than the health of people for whom the technology should be used, many realized that the evidence base for one intervention or another remained uncomfortably thin.⁸⁸

In recent years, efforts have indeed multiplied to broaden and deepen the evidence for mHealth interventions, with a strong emphasis, among others, on MNH. It is precisely to this effort that the current intervention study and report intends to contribute, in the context of resource-poor community settings and a relatively fragile health system.

In this report, we have so far presented and analysed our findings regarding the effect of the mobile communication interventions, implemented in Bombali district between August 2012 and August 2013, on the utilization of MNH and FP services, referral and maternal death reporting. On the basis of our mixed-method step-wedge design study, that has been mentioned as an efficient way of evaluating mHealth outcomes⁸⁹, we furthermore assessed the interventions' influence on the communication among health workers, TBAs and health service clients and on health workers' job satisfaction.

For each of the five research objectives that were our points of departure, we will further discuss the results presented earlier and arrive at conclusions at the end of each section; recommendations follow thereafter.

⁸⁵ UNDP, 2010; Statistics Sierra Leone and ICF Macro, 2009; Statistics Sierra Leone and UNICEF-Sierra Leone, 2011.

⁸⁶ MoHS, 2009; Maxmen, 2013.

⁸⁷ WHO, 2011.

⁸⁸ See WHO, 2011; Philbrick, 2013; CITPH and PHI, undated.

⁸⁹ Piette et al., 2012.

6.1 Utilization of MNH/FP services

Research objective 1: *Assess changes in MNH/FP service utilization by female clients, associated with expanded options for client-initiated and provider-initiated mobile communication • for the entire district (engaging all PHUs and through the national information line), and • in the selected PHU catchment areas that implement the intervention involving TBAs*

Communication between health workers and clients

Health promotion and providing information to clients was one of the elements in the mHealth intervention package and has been reported by others as effective, including for ANC appointments, follow-up of family planning and delivery and newborn care.⁹⁰

As expected, the survey data showed an increase in the average number of weekly or more often calls and messages from health workers to clients. Moreover, a significant decrease to just 10% was seen in health workers who reported that they 'never' initiated mobile communication with clients. These differences were more pronounced in Wedge 1, where the average number of staff per facility is lower (there are more MCHPs) and where it is assumed that the facility phone is more available to individual staff than at other types of facilities where more personnel need to share the phone.

Across the various types of interview respondents, the two types of clients (pregnant women and FP clients) and the two ways of initiating communication (by clients or by health workers and TBAs), three main reasons for communication were identified, although with some variation: appointments, health information on a range of topics, and clients' health status (qualitative data, confirmed quantitatively). Clients more than health workers reported communication relating to health information, while only health workers reported inquiring about clients' health status. In relation to communications started by the health providers, women revealed that they feel 'special' when the health worker takes time to call them and inquire about their well-being.

As expected, health communication was shown to be an important reason for communication between health workers and clients. Clients could spontaneously recall a limited number of health information topics. No additional information on other desired topic areas of health information was obtained. This needs to be further looked into, especially in light of our previous feasibility study findings in another district that revealed some sensitivities about receiving certain kinds of information by phone (for example, relating to FP and test results for pregnancy and STIs).⁹¹

90 Free et al., 2013a ; Freytsis and Verlez, 2013 ; Tamrat and Kachnowski, 2012 ; Ratzan and Higgs, 2013; Labrique et al., 2013a; Aranda-Jan et al., 2014.

91 See Magbity et al., 2011. However, other studies have sometimes shown that mobile communication can alleviate sensitivities, e.g. when clients found it difficult to discuss information face-to-face and preferred a phone-based conversation (Aranda-Jan et al., 2014).

Communication between health workers and TBAs

As mentioned in the section on TBA influence, below, TBAs and other community health workers have been involved in a number of mHealth studies. In our research, the change in communication between health workers and TBAs was different from expected, with a decrease between baseline and endline in Wedge 1, even though it started the TBA intervention activities earliest; the observed increase in Wedge 2 was not statistically significant. This was despite the pre-existing level of communication between both groups and seemed at odds with the results from the qualitative data. However, the introduction of the VPN and the client communication scheme (for all chiefdoms) in Wedge 1 may have taken attention away from maintaining communication with TBAs in the five non-TBA intervention chiefdoms. Difficulties with solar chargers, TBAs' ability to use the phone and the small study population may also have influenced this result. Also, while a high number of TBAs were registered as phone owners in the Wedge 1 TBA intervention area, this was less the case for the Wedge 2 TBA area.

TBAs' reasons for getting in touch were to address difficult cases, inform health workers about referral to the clinic and discuss client mobilization. Health workers initiated communication to reach clients, inform TBAs about meetings and ask them to help out at the clinic.

Utilization of reproductive health services: net effect and data considerations

mHealth effectiveness studies have shown some positive outcomes for interventions aimed at improving reproductive health service utilization, including those targeted by our study i.e. ANC, skilled delivery, PNC and family planning.⁹²

The comparison at midline (double-difference analysis with counterfactual) of measured change in the intervention chiefdoms (Wedge 1) and in the non-intervention chiefdoms (Wedge 2) during the stage 1 intervention period showed a significant positive net effect on facility-based service utilization in Wedge 1, for seven out of ten of the selected indicators (ANC1, ANC4, facility delivery, PNC1–3 and newly initiated FP). This analysis had its limitations because of a lack of HMIS/DHIS routine data for the last month of the stage 1 intervention period. For the same reason, intervention analysis for the second six months (stage 2) could not be carried out (yet) due to the absence of data. The full 12-month intervention analysis will be carried out once data become available. This is also needed to appreciate the full effect of the mHealth intervention over time.

In comparison, qualitative data obtained from all types of respondents indicated conclusively that there was a perceived increase in utilization for various types of reproductive health services (including some neonatal and child health services), and these were linked to the increase in health worker–client communication.

92 Freytsis and Velez, 2013; Lund et al., 2012; CITPH and PHI (undated); Thirumurthy and Lester, 2012.

Counterfactual

This analysis was made possible by constructing a counterfactual (non-intervention situation) for comparison. It would only be valid if both groups (wedges) were comparable at baseline and remained unchanged over time and if external factors (other interventions) equally affected both groups. We, therefore, mapped all known relevant interventions, ongoing in one or more of the districts' chiefdoms and concluded that a number of these potentially contributed towards MNH/FP service utilization. Some were present in all chiefdoms and thus are not likely to influence the wedges unequally, while many others were active in one or more chiefdoms; their combined effect could possibly balance out across both wedges. Within the design of this intervention study, it was not feasible to control for the combined effect of each of the mapped interventions on facility utilization. Attribution of the measured net effect of the intervention on service utilization could not be concluded, but within the context of this operations research in a real-life situation, a positive net effect due to the intervention could be assumed.

Outreach

Three service utilization indicators (ANC2, ANC3 and continued FP) showed a negative net effect in contrast to those mentioned earlier. These results contradict the convincingly strong qualitative data across all respondents which suggest an overall increase in service utilization. This trend deviation could potentially be related to an increase in outreach service utilization (not facility-based). The available outreach coverage data show a positive net effect across all ANC types for the stage 1 intervention. It is possible that clients in the intervention wedge were more aware and better motivated than those in the counterfactual wedge. Although these data could partially explain the negative effect on facility-based services (except for continuing FP), we are hesitant to draw conclusions due to the poorer quality of outreach data compared to facility-based data.

Despite this consideration, it is still interesting to address the negative net effect found for outreach utilization of PNC1–3 services and community deliveries. If this proves to be a true effect, this would in fact be a *desired* effect, since one of the goals of increased engagement with clients would be to generate more facility deliveries rather than births in the community. A shift in postnatal controls to the facility is also desired, as this implies a more frequent and consequent spacing of controls and earlier detection and timely treatment of complications when compared to irregular and infrequent community outreach services.

The negative result seen for continued FP is difficult to explain, especially since the qualitative data from health workers, female clients and male partners supported an increase in FP continuation.

The relatively short intervention period with counterfactual (six months, of which routine data for only five months were available for analysis) may have played a role in generating these challenging, partly contradictory results; a longer intervention period may have led to less puzzling results. The full data for the 12-month intervention period,

once available, may also improve our understanding (with the caveat that the latter six months are not based on a real counterfactual).

Influence of Bombali Sebor

The possible influence of the relatively urban population in the capital of Bombali district (Makeni) was studied in a separate double-difference analysis, by excluding Bombali Sebor chiefdom (containing a large part of the district capital city) from Wedge 2. This showed that the relative net 'gains' (previously found net effects in the intervention wedge) largely disappear, as Wedge 2 indicators improve – indicating that service utilization in Bombali Sebor is poor. As no qualitative data were obtained in this chiefdom, this phenomenon cannot be explained at this point in time. Once the full routine data set is obtained, further analysis may reveal whether the results are sustained and what possible explanations could be.

TBA influence

In the global arena, there is an ongoing discussion on the contribution of TBAs to improving MNH. Recently the discussion in many countries has shifted to the changing role of TBAs to health promoters and motivators in connecting female community members to essential reproductive and maternal health services.⁹³ In Sierra Leone this has resulted in dialogue about redefining the roles of TBAs,⁹⁴ while in the field, many health facilities work with this widely available community cadre to create awareness, motivate clients to use services and enhance (emergency) referral.⁹⁵

A recent systematic review on mobile applications involving community health workers, including TBAs, concluded that studies that evaluated programme outcomes offered some evidence that mHealth tools can help improve community health workers' quality of care, service efficiency and monitoring capacity and allow remote supervision of this cadre;⁹⁶ some of these were confirmed by others.⁹⁷ In the well-known maternal health and mobile communication study involving midwives and TBAs in Indonesia, TBAs indicated that the phones enabled them to better respond to client needs due to improved access to relevant information.⁹⁸ This was the context for including a specific TBA component in our intervention and research.

The effect of the TBA intervention was measured by comparing the service coverage utilization data in the first stage of implementation of Wedge 1 with and without the TBA intervention chiefdom (Paki Masabong). A positive effect of TBA involvement was found for utilization of FP services. This was considerable for new FP clients and moderate for continuing clients. This effect was also confirmed by qualitative data from the respective chiefdoms where the influence of TBAs in the community as motivators

93 Byrne and Morgan, 2011.

94 UNICEF, 2013; Kok et al., 2012.

95 Herschderfer et al., 2012.

96 Braun et al., 2013.

97 Chang et al., 2011; Chib et al., 2008; Braun et al., 2013; Lemaire, 2011.

98 Chib et al., 2008; Braun et al., 2013.

was described. For the other service coverage indicators, no positive effect was found for the TBA intervention, although the qualitative data contradicted this finding – indicating that TBAs played an important role in connecting clients with services. As the TBA intervention was only a pilot study involving relatively few participants in one chiefdom over a short period of time, it is possible that any effect was not strong enough to be reflected in the HMIS/DHIS routine data.

The national information line

Data collected on the knowledge and use of the national information line was inconclusive. It should be considered that the health advice pillar of the line only went into operation in January 2013. The limited data seemed to indicate a higher than average number of calls from Bombali district; however, since no trends over time were available, no conclusions could be drawn. Data disaggregated by subjects of the calls seemed to indicate a lower than average number of calls from Bombali relating to FP, gynaecology and pregnancy issues, while ideally the opposite had been expected. Information obtained from interviews showed that relatively few respondents were actually aware of the free information line and that many confused the purpose of the line with the information received by phone from the health workers under the mHealth scheme. It may be possible that because of the increased communication between health workers and clients, there was less need for additional information from the national line.

Other health benefits

The qualitative research data identified a number of other perceived health benefits of the mHealth intervention programme component that focused on the communication between health workers and clients – i.e. contributing to but also beyond service utilization outcomes as described. These included seeking care earlier, reducing defaulting on treatment, improved responses to emergencies, better quality of services, and a reduction in unintended pregnancies, both among married women and teenagers.

Sensitivities and gender issues

A number of sensitive issues surfaced that may need attention in programmes involving new or expanded mobile communication. Some female clients voiced discomfort using other people's phones because of privacy issues and feelings of being dependent on others. A number of respondents described how men were uncomfortable, or outright jealous, about their partners receiving calls on a mobile phone and needed proof that the call was actually from a health worker and not 'another man'.

FP was a key sensitive issue for both clients and partners, as was also identified in our earlier findings in a feasibility study in another district.⁹⁹ In several instances, women and some community males indicated that women joined the FP programme and the mHealth scheme without informing their partners to avoid problems or the partner's

refusal to allow participation. This was confirmed by health workers, who also reported that they would help the women keep this confidential. This was sometimes associated with the decision to use a third person's phone (often the TBA but also others), rather than their partner's phone. Some other women, however, felt that joining the scheme without their partner's knowledge was not a good idea because of the view that the husband was the decision-maker or because they felt that within a marriage all decisions should be taken together.

Several health workers acknowledged these sensitivities and described their efforts to sensitize men or reassure men about the programme. New interventions may need to address sensitivities related to topic contents, privacy and confidentiality.¹⁰⁰

Some of the partners and other males in the community were clearly supportive of women joining the mHealth scheme for both ANC and FP. Some men reported that they actually took the initiative for this, and some saw this as an example of changes in gender relations, whereby phone communication sometimes helped to shift men's attitudes towards FP and accompanying their partners to the clinic.

Conclusions

- *Missing utilization data:* Due to data unavailability the counterfactual analysis was (as yet) limited to five out of the first six months of intervention implementation, while no outcome analysis was possible for the full 12-month intervention period. Once the missing data are available, full analysis over a longer period of time may show different results or explain discrepancies found in the current analysis.
- *Communication between health workers and clients:* There was an increase in mobile communication between health workers and clients, although differences were seen between wedges. Appointments, health information, clients' health status and health promotion were the main reasons for communicating. Health promotion and information about health topics emerged as important. Topics, gaps in information and queries among clients may need to be explored before an intervention is started.
- *Communication between health workers and TBAs:* No positive effect was seen for mobile communication between health workers and TBAs in the pilot TBA chiefdoms. Qualitative data suggested an increase in communication that possibly was not visible in the small study population. The main reasons for TBAs getting in touch were difficult cases, informing about referral to the clinic and client mobilization. Health workers initiated contact to reach clients, inform TBAs about meetings and ask them to help out at the clinic.

99 Magbity et al., 2011.

100 CITPH and PHI (undated); Labrique et al, 2013b; Ratzan and Higgs, 2013; Chang et al., 2011; Aranda-Jan et al., 2014.

- *Increase in service utilization:* The data available showed that the intervention led to a positive net effect for facility-based service utilization in seven of the ten selected indicators: ANC1, ANC4, facility delivery, PNC1–3 and newly initiated FP. This was strongly confirmed by qualitative data.
- *Influence of Bombali Sebara on service utilization:* When controlling for the chiefdom with the district capital, the Wedge 2 indicators became more positive, and the difference between the changes in both wedges became smaller; the initial positive net affects largely disappeared.
- *Influence of TBA intervention on utilization:* The pilot intervention showed a positive effect on both new and continuing FP and no effect for the other service utilization indicators. Qualitative data strongly suggested an increase in utilization for all indicators. It is possible that this effect could not be shown in the small pilot study sample and over a short time period.
- *Other health benefits:* Other perceived benefits of the mHealth intervention focused on seeking care earlier, reducing defaulting on treatment, improved responses to emergencies, better quality of services and a reduction in unintended pregnancies.
- *National information line:* Relatively few people in the district were aware of the line; no link could be made between the functioning of the line, the use made thereof by Bombali district clients and the other interventions.
- *Sensitive issues:* Issues relating to women's empowerment and decision-making and confidentiality were identified as important factors influencing enrolment in the client reminder scheme. Participation in the client reminder scheme for ANC appears to be less sensitive than for FP.

6.2 Health worker job satisfaction and communication

Research objective 2: Assess changes in health workers' job satisfaction and control at work, and other self-reported changes due to expanded options for provider–provider communication and provider–client communication

Communication with peers and seniors

Literature offers evidence for the potential of mobile communication to mitigate human resources for health constraints by improving communication (availability, timeliness) among various levels of staff, such as between health workers and remote seniors and specialists to improve quality of care and between community health workers and

their supervisors for consultations and timely referral.¹⁰¹ One paper described voice communication as “the simplest...most transformative application”,¹⁰² citing the use of closed user groups or virtual private networks, as adopted in our study as well, among current examples.

As expected, the health worker baseline to endline survey responses showed a perceived increase in communication between health workers. Qualitative data confirmed this and further described health workers' appreciation for this intervention. Health worker respondents agreed that the major advantage of the VPN was the opportunity to talk without time restrictions to colleagues and without incurring costs as in the past. According to them, this encouraged calling more often and for longer.

Further analysis of the types of communication and between which types of health workers showed inconsistencies within and between wedges. At midline there was a general trend towards an increase in communication frequency for both wedges that could possibly be attributed to the novelty of the intervention, which plateaued (and then decreased) over the course of the implementation. There were no further general trends found in the data.

There was a slight indication that the change in initiating communication was overall larger than that for receiving calls. This could be explained by recall bias by the respondents. Despite the same starting date for the VPN intervention, the increase over time in (weekly or more often) communication between health workers was more pronounced in Wedge 1. This could possibly be explained by the interest in phoning due to the same start time of the other communication element in the package of interventions – health worker to client communication that was accompanied by solar chargers – and phone top-up credits.

Communication between the health workers and their ‘own in-charge’ showed a considerable decrease in frequency from baseline to endline. This could be explained by the fact that each facility was allocated just one phone, which means that if two health workers from the same facility want to speak to each other (as in the case of communication with their own in-charge), this would have to occur outside the VPN line and incur costs. It is plausible that if a health worker needed advice from an in-charge who was not present at the facility, they would choose to call another health worker (DHMT member) who was carrying a phone with a VPN connection.

Reasons for communication

There are indications from the qualitative and quantitative data that the improved communication opportunities brought about by the interventions allowed health workers to consult in a timelier manner and more fully with their supervisors and

101 Tamrat and Kachnowski, 2012 ; Freytsis and Velez, 2013; Labrique et al., 2013a; Chang et al., 2011 ; Aranda-Jan et al., 2014; CITPH and PHI (undated).

102 Labrique et al., 2013a:12.

colleagues, without time or phone credit constraints. Consultations focused, on the one hand, on obtaining clinical advice and ambulance referral. These reasons could be instrumental in improving the quality of care (including timely and correct referral), eventually resulting in reducing maternal deaths and disabilities. The other category of reasons related by the respondents was related to operations and logistics. These reasons included remaining updated on planned meetings, training workshops and programme activities, supply chain management and disease surveillance information.

Job satisfaction and communication

The presence of motivated staff is an important contributing factor to health system performance but also one of the hardest inputs to achieve.¹⁰³ Health worker job satisfaction is linked to motivation and results from a complex interaction between on-the-job experience and organizational environment. Management culture and working conditions are also considered important factors that influence health workers' motivation.¹⁰⁴ Few studies have dwelt on the issue of health worker job satisfaction in relation to mHealth, although some have shown that the introduction of mobile phones increased community health worker motivation.¹⁰⁵

The mHealth package of interventions seemed to have resulted in an overall improvement in the perceptions of health workers in two domains that were related to the intervention: communication with peers and seniors and quality of working life. As with other data in this study, there were inconsistencies within wedges and between wedges at various times that could possibly be attributed to the influence of the other elements of the intervention package being implemented.

In contrast, the results for the working conditions domain did not show a significant difference over time or between wedges. This was an unexpected result that may be explained by the fact that the statements making up this domain were general, without a direct reference to the use of a mobile telephone or other equipment provided as part of the intervention.

The two statements related to communication with clients showed a similar increase in positive answers at endline compared to pre-intervention baseline. The statement referring to 'contacting clients is easy' resonated with the intervention with a more pronounced increase than the statement that addresses 'having the means to contact clients'.

Despite relatively high baseline job satisfaction scores, the data could be interpreted as most likely representing improved job satisfaction due to the mobile communication intervention. Attribution could not be determined with certainty because of the lack of a counterfactual group with which to compare results. Qualitative data supported an improvement in the quality of working life resulting from the intervention.

¹⁰³ WHO, 2006.

¹⁰⁴ Peters et al., 2010.

¹⁰⁵ Chang et al., 2011.

The study investigated only the domains of job satisfaction within the context of this research. Job satisfaction or motivation relating to other domains such as remuneration, locus of control or career advancement were not studied as no changes were expected. Information about TBAs' job satisfaction was collected through semi-structured interviews, not the attitude scale, and also suggests increased satisfaction with their activities. Phone ownership was an important factor as a status symbol, because TBAs were seen by the community as part of the health system linked to the facility. Within the current context in Sierra Leone, where the role of TBAs as birth attendants is disappearing, and along with it their status and position in the communities,¹⁰⁶ TBA participation in the mobile communication intervention appeared to result in renewed motivation by TBAs to continue working in the role of community health worker or motivator. Only one TBA identified expressed dissatisfaction due to the lack of financial compensation for their services, but this is an issue previously seen in other parts of the country¹⁰⁷ and could influence TBA participation in the future.

Workload

Not many published papers refer to the issue of introducing new, technology-related ways of working for already overburdened health workers, although some hint at this being a potential challenge.¹⁰⁸ In interviews, most health workers expressed themselves quite positively about the new communication opportunities that have brought important changes to their ways of working. Health workers referred to an increased workload due to the new mobile communication and interaction, and the increased service utilization can also be seen as such. However, many seemed to have found the overall balance positive. Some indicated that the increase in utilization and improved relationships with clients is a positive and worthwhile outcome of the increased workload, making them feel proud. It may be possible that this is an effect of being in a study situation and that the increase in workload may become a demotivating factor in the future if the intervention is scaled up and part of standard care.

In general, TBAs expressed more varied responses regarding workload. Some felt the workload had reduced; others experienced an increase, although this was not necessarily a problem but could also be taken as an opportunity. Many TBAs appreciated the efficiency improvements around their work, in terms of a reduction in effort (both physical and monetary) needed to travel back and forth to the facilities, as well as the phone credit savings, and it can be assumed that workload issues for TBAs are not a major factor to be considered when scaling up this intervention.

Benefits of improved communication

The expanded mobile phone communication options offer a number of benefits to health workers and TBAs, including reduced travel time and increased service utilization by clients. These provided incentives for both groups and resulted in perceptions, as

¹⁰⁶ Herschderfer et al., 2012.

¹⁰⁷ Herschderfer et al., 2012.

¹⁰⁸ WHO, 2012.

expressed by interviewees, of improvements: improved relationships and trust among health workers and between these and TBAs, reduced cost of communication, and improved recognition of TBAs by the government, leading to a changing role and status of TBAs in the community.

These rather positive spin-offs of the mobile communication programme offered opportunities on which to capitalize – for example, engaging communities, TBAs and health workers in renewed and motivated efforts to address some of the long-standing challenges around MNH.

Conclusions

- *Communication between health workers:* An overall improvement in the frequency of communication between health workers and between health workers and TBAs was seen, with no trends relating to type of communication and to which cadres of health workers.
- *Reasons:* Reasons for the increase in frequency of communication between health workers could be categorized as relating to (i) quality of services (consultations with colleagues on clinical issues and referral) and (ii) operations and logistics (timely notification of meetings or workshops, supply chain management and disease surveillance information).
- *Job satisfaction and communication:* Despite high job satisfaction at baseline, data showed an increase in satisfaction scores for domains relating to the intervention that is most likely a result of the intervention. Attribution could not be concluded with certainty due to the study design.
- *Workload:* Health workers often experienced an increased workload due to the activities, tools and effects of the intervention, but found the overall balance positive. This balance may become disrupted once the extra workload is not part of a study but belongs to standard practice; although, in turn, the burden of certain study-associated activities such as keeping files and separate reporting will then reduce.
- *Benefits:* Benefits associated with the intervention as perceived by respondents included: improved relationships and trust among health workers and between these and TBAs, reduced cost of communication, and improved recognition of TBAs by the government, leading to a changing role and status of TBAs in the community.

6.3 Referral

Research objective 3: *Assess changes in MNH referral systems due to expanded mobile communication options*

Communication about (ambulance) referral

Appropriate and timely referral is a life-saving step in the chain of events surrounding obstetric complications.¹⁰⁹ Recent reviews and other studies analysing mHealth interventions in maternal and newborn health around the world found that mHealth strategies and tools, involving TBAs and other lay health workers, can help improve the timeliness and appropriateness of obstetric referrals.¹¹⁰

In our study, key informants (with knowledge and experience) suggested that in the past and in the absence of a facility phone, communication relied heavily on personal phones that were not always operational. The VPN was used to improve communication between referral levels, and results indicated that this had been successful, although not equally between levels when comparing wedges.

TBAs were often also an important link in this chain. It is, therefore, promising that health workers noted that TBAs engaged with them for advice about difficult cases in the community. The fluctuation encountered in the communication pattern between health workers and TBAs potentially reflected earlier and more regular attendance of clients at the PHU, due to the health worker to client communication scheme.

Changes in the referral process

Qualitative data indicated that the VPN reduced the cost of referral communication and improved access to the district ambulance, as well as to the ambulance from the mission hospital (Kamakwie) in the north of Bombali district. Referral might have become more efficient, as health workers could now first get advice from colleagues and then decide together whether referral is really necessary. Although the direct outcome, a reduction in the number of maternal deaths, could not be easily captured, a number of respondents stated that the mobile network had saved lives.

The facility phone thus led to more timely access to the relevant person to discuss possible referral and, where needed, alert an ambulance. Discussion of the signs and symptoms via the phone potentially improved accurate indications for referral.

109 Campbell and Graham, 2006 ; Médecins Sans Frontières, 2012; PMNCH, 2011.

110 Tamrat and Kachnowski, 2012; Cole-Cesay et al., 2010.

Conclusion

- The VPN system has been shown to be useful in a number of complementary ways: it strengthened ambulance referral, encouraged pre-referral discussions between service levels and thus better indications for referral, and led to better access to next-level staff.

6.4 Maternal death reporting

Research objective 4: Assess changes in maternal death reporting

Notifications

Improved reporting efficiency and quality through mobile technologies has been documented widely¹¹¹ including for community-based reporting¹¹², although we did not find literature in relation to maternal death reporting.

The number of maternal death notifications to the DHMT tripled between baseline and midline. Since maternal deaths are known to be grossly underreported in Bombali district, the increased reporting was most likely a result of improved reporting, and not of an actual increase in the number of maternal deaths. This was confirmed by observations emerging from the qualitative data, where respondents report a perceived decrease in maternal deaths.

Communication about maternal deaths

Survey results showed only few health workers engaged in communicating about maternal deaths by mobile phone, which was maybe logical, as the absolute numbers were relatively small (even though the gross underreporting is a good reason to try and improve communication).

Conclusions

- Since the introduction of the VPN, maternal death notifications tripled; this was interpreted as an increase in reporting, not in deaths.
- The calculated underreporting of maternal deaths implied that more efforts are needed to reduce underreporting, including the use of the mobile phone system.

111 Aranda-Jan et al., 2014; Labrique et al., 2013a; Tamrat and Kachnowski, 2011; WHO 2011.

112 Freifelt et al., 2010.

6.5 Implications for the health system

Research objective 5: Identify implications for the health system of mobile communication initiatives

While expanded mobile communication, via a range of different formats and channels, is perceived as potentially beneficial in a number of ways from health outcomes and client monitoring to supply chain management, human resource management and clinical decision-making, there may be associated effects, strains and demands on the health system that are worthwhile (or even crucial) to identify prior to embarking on new interventions or scaling up existing ones.

This section builds on the findings and discussion related to the first four research objectives, uses the qualitative data specifically addressing health system issues and reflects on the findings around this aspect presented in the feasibility study that preceded the current research.

WHO's six 'health system building blocks'¹¹³ are used to structure the discussion on health system issues in relation to mobile communication technologies. The aim is to have a closer look at how the research findings can be interpreted in terms of how aspects of mHealth technology and interventions interact with the health system building blocks and identify opportunities and risks. A recently published framework identified the potential of mHealth innovations and elements of the health system, with a special application to reproductive, maternal, newborn and child health¹¹⁴, while also others highlighted such opportunities.¹¹⁵ While mobile communication is perceived as potentially beneficial in a number of ways, there may also be strains and demands on the health system¹¹⁶, for which health policymakers and managers may need to prepare. In general, all highlight the need for contextualization of the planned intervention vis-à-vis, among others, the socio-cultural context of health staff and clients involved and the health system concerned.¹¹⁷

Service delivery

The opportunity to improve service utilization has been central to the present intervention study. In this case, this not only entailed the traditionally available on-site clinic services but also an emerging alternative of 'mobile consultation' between clients and health workers. This was not limited to appointments and clinic follow-up but, as we saw in the findings presented, expanded to over-the-phone information about health problems, health promotion and advice about drugs, sometimes using the TBA as an intermediary. This may require thinking about how to deal with the time required for such new

113 WHO, 2007.

114 Labrique et al., 2013a.

115 CIPPH and PHI (undated).

116 Aranda-Jan et al., 2014; Grameen Foundation and MoTeCH, 2011.

117 Lemaire, 2011; Grameen Foundation and MoTeCH, 2011;

services. There may generally be a need to reflect on implications for provider–client interaction – for example, selection of issues and problem that are (not) suitable to deal with over the phone, access, time availability and confidentiality, to name a few) – and the need for a protocol to address these issues, as has been suggested also by a recent comprehensive review.¹¹⁸

Also, the issue of service quality was an important aspect, as was also evident from our findings, with much of the communication between health workers seeking clinical advice to find answers and do a better job. Finally, services need to (be) prepare(d) for an increase in demand, not only in terms of workload but also equipment and the drugs and supply chain. Several respondents indicated that they were confronted with more clients than service infrastructure and systems were prepared for (FP supplies, delivery room space); an issue that has been observed elsewhere as well as a consequence of introducing mobile communication to link clients to services.¹¹⁹

Health workforce

Some of the key human resources-related issues, and the potential of mHealth communication strategies to mitigate health workforce constraints, were addressed above, as they form part of other objectives as well – i.e. workload and job satisfaction. Regarding the first, it is important to realize that the various mHealth interventions have different ‘cost–benefit’ ratios (although more studies are needed to address this in-depth, as argued above). For example, introducing an easy way to call colleagues such as the VPN may bring many time-efficiency gains against little effort (except that some people keep receiving calls all day long – not an unimportant dimension to manage); in contrast, a client communication strategy based on health workers calling clients, in addition to being called by clients, places other demands on the time and management capacity of staff. (Although it should be noted that we did not undertake a cost–benefit analysis.)

One constraint at the intersection of technology and workforce was the problems some TBAs had in fully operating the phone. Follow-up through supportive supervision by PHU staff and emphasizing this aspect even more during the training of TBAs overcame this to a large extent but required considerable time input. The need for training in relation to mobile technologies has been described by others for health workers in general¹²⁰, some in addition pointing to the opportunity to strengthen supervision.¹²¹

The same type of issues, in addition to ‘the work becoming easier’, ‘I no longer have to pay out of my own pocket’ and improved personal relationships with colleagues, TBAs and clients, would then also influence job satisfaction and motivation. Also, information-related and distance learning-related mobile applications could be considered to

further strengthen human resources for health via in-service learning by health workers (mLearning).¹²²

TBAs found that mobile communication greatly improved the efficiency of their efforts (qualitative data), in terms of better planning, improved logistics options, reduced costs and time saved.

Lastly, in interviews the suggestion was made that CHWs, and possibly others, could also be considered as a cadre to be involved in mobile health strategies.

Health information

Delivering and sharing information and health communication for behaviour change are key potentials of mobile applications.¹²³ These can be realized through various modes and levels of interaction and efficiency, including voice calls, text messages, voice messages (automated or personalized), picture messages, automated voice-response systems (but with the option of linking to a ‘real’ person), information lines, data collection and submission/sharing, and automated remote monitoring of clients.

The use of an automated messaging system as part of the intervention, to enable a flow of selected information to clients, was ruled out at an early stage due to considerations around client literacy and language issues and acceptability. In our study, ‘information’ (and connecting people to make an information flow possible) was core to the intervention. As expected, a strong health worker preference for direct communication with clients, as opposed to text messaging, was reported and supported by survey and qualitative data. Reasons for this preference were that health workers perceived calls as easier to understand and texting to exclude communication with illiterate clients, and that clients often did not know how to use texting. A further shift towards texting instead of calling between health workers and clients as well as among health workers, could result in important efficiency gains paired with effective health communication as documented by others although sometimes with mixed results.¹²⁴ It should, however, address identified challenges of texting, improve mobile technology literacy¹²⁵, especially of women and in the context of health literacy¹²⁶, and consider the inclusion of pictorial or audio elements, as also suggested by others to overcome barriers for inclusive participation by less-privileged populations.¹²⁷ For communication among health workers, the same trend of calling instead of texting was seen, although some text messaging was reported. A possible shift to more text messaging between health workers would require the development of text messaging strategies and the training of health workers to actively or passively use these strategies.

118 Ratzan and Higgs, 2013.

119 Grameen Foundation and MoTeCH, 2011.

120 Ratzan and Higgs, 2013; Lemaire, 2011.

121 Freytsis and Velez, 2013; Aranda-Jan et al., 2014.

122 Labrique et al., 2013a; Zolfo et al., 2010; Freytsis and Velez, 2013.

123 Free et al., 2013a; Tamrat and Kachnowski, 2012; Ratzan and Higgs, 2013; Freytsis and Velez, 2013.

124 Ratzan and Higgs, 2013; Braun et al., 2013; Free et al., 2013a and 2013b; Hasvold and Wootton 2011; Chang et al, 2011; Tamrat and Kachnowski, 2012; Arandja-Jan et al., 2014; CITPH and PHI (undated); Seidenberg et al., 2012.

125 Labrique et al., 2013b ; Lemaire, 2011.

126 Ratzan and Higgs, 2013; CITPH and PHI (undated). Aranda-Jan et al., 2014 also show the need to address this.

127 Labrique et al., 2013a and 2013b.

Equipment and technology

The interaction of certain mHealth strategies and applications with certain health system building blocks demands thinking through a number of issues related to equipment and technology. We dealt with, and partly reported on, issues around choice of phone, choice of solar charger, other charging options that need considering (such as small generators), the system of phone credit (top-up) transfer to staff phones to make the client communication component possible; network choice and network coverage issues, even when the national information line had a special, similar short code across all network providers; and VPN versus other options of pre-paid group access to calling and texting.

There are other aspects that confront new and ongoing mHealth programmes, of which some were addressed on our study, such as choice of hardware, mode of communication (voice, text, other), communication options (information to clients, exchange among health staff), and also confidentiality and privacy as highlighted by several.¹²⁸ Other aspects were not addressed here but may need attention in different settings when designing mHealth interventions, such as data collection and sharing options, operating platforms and other software, data security and inter-operability (across various providers and platforms). The importance of these types of issues was also highlighted by other authors.¹²⁹

Financing

While building on existing and expanding telecommunications infrastructure, any basic mHealth system that should allow using one or several applications (of which there are many) carries an initial investment cost and ongoing maintenance costs, such as for network and software subscriptions alongside training and other programmatic activities¹³⁰. Stakeholders have to decide what is worthwhile investing in and who should pay, while considering which applications may be most cost-effective in their setting; although authors indicate more research is needed to establish evidence of cost-effectiveness of mHealth strategies.¹³¹

And, in case ‘users’ (e.g. clients) are expected to pay for participation in such a ‘system’, the immediate question is: who may be included, and who may be excluded?. This question links to equity issues discussed below and has also been asked by the authors of a recent MNH and mHealth analysis¹³² as well as an earlier report on lessons learned from Ghanaian experiences.¹³³

128 Labrique et al, 2013b; Ratzan and Higgs, 2013; Chang et al., 2011; Aranda-Jan et al., 2014.

129 Tomlinson et al., 2013; WHO, 2011; CITPH and PHI (undated).

130 CITPH and PHI (undated).

131 Ratzan and Higgs, 2013; Tamrat and Kachnowski, 2012; Philbrick 2013; Aranda-Jan et al., 2014; CITPH and PHI (undated).

132 Tamrat and Kachnowski, 2012.

133 Grameen Foundation and MoTeCH, 2011.

Governance

Currently, there are various mHealth initiatives in Sierra Leone in various locations. The government is in the process of developing a national mHealth strategy.¹³⁴ Given the issues at stake, as described in our conclusions and this health sector section, and following what others also observed, it may be worthwhile considering the need for an mHealth policy or regulatory framework, as has been suggested by others¹³⁵. In addition to the above-mentioned aspects, such a framework would also address legal issues, ethical issues, public–private collaboration, affordability, sustainability and other issues.

Another governance-related aspect would be how to use mobile communication to improve accountability (of services to the community) and to improve community empowerment and voice. This has started with the FHCI complaints line (for Facility Management Committees and the general public) but could be expanded to other ways of engaging clients and communities, as has been proposed by the authors of a recent comprehensive review¹³⁶ and others.¹³⁷

Equity

Equity is not a ‘building block’ of the health system but one of its purposes. It is of key importance to reflect on the groups that should benefit from an mHealth intervention, before designing them. One comprehensive review concluded that mHealth investments need tailoring to ensure they reach the most marginalized populations in need. The authors suggested that mHealth interventions use an ‘equity lens’ to ensure that the ‘information, technology and service gap’ closes rather than widens and does not increase health inequities between those who can access technology-based services and those who cannot.¹³⁸ Others mirror such concerns as well.¹³⁹

Our intervention evidently sought to engage those most in need with the health services, and the services to be more responsive. However, the mere fact of using a mobile phone as a tool to establish that link already has implications for who can benefit.

Those most in need in terms of MNH services are likely to be, among others, the poorest (not owning a phone, no money to buy one or pay for phone credit and not always sufficiently ‘socially mobile’ to access another person’s phone); those with least education and awareness (with difficulties operating a phone); and those living in rural and more remote areas (with less mobile network coverage) – not to mention illiteracy and vernacular as obstacles for the potential use of texting services. (In this case all clients and most health workers had a strong preference for calling over texting anyway.)

134 Verbal communication by Hon. Deputy Minister II, Mr Foday Sawi, during the January 2013 research results validation meeting organized in Freetown for this research project.

135 Tamrat and Kachnowski, 2012; WHO, 2011; Aranda-Jan et al., 2014; CITPH and PHI (undated); Lemaire, 2011; Grameen Foundation and MoTeCH, 2011; Heerden et al., 2012; Kwankam, 2012.

136 Ratzan and Higgs, 2013.

137 Heerden et al., 2012.

138 Ratzan and Higgs, 2013.

139 Philbrick, 2013; Lemaire, 2011; Heerden et al., 2012.

Each of these can constitute formidable barriers to participating in a programme aimed at catering to precisely such disadvantaged groups. 'Technology', if not well thought through operationally, has the potential to cater to those less in need and exclude those most in need.

However, there are also ways to make programmes, including mHealth programmes, more inclusive. In our case this was one reason to decide to include TBAs as a go-between, so that as many clients as possible without access to a phone could participate. While this worked in those two chiefdoms, we soon realized that clients do not only depend on TBAs but between them are able to engage a very diverse range of 'resource persons' in their community.

Regarding clients' resources, we did not think it was feasible to 'solve' the problem of clients needing money to initiate communication (except for the free information line), for reasons of logistics, budget and selection difficulties. However, we again found that clients have their own ways to make the most of limited resources – i.e. the informal 'flash' ('call me back') system seemed to work fine – as long as health workers are motivated to follow up and can do so at no cost to themselves.

Conclusions

- There are important issues to consider and address that deal with the interaction between mHealth technology and interventions and the health system building blocks. Mobile technology offers opportunities to be seized for the benefit of disadvantaged people, but also harbours risks and challenges for the health system that require reflection and mitigation.
- Equity considerations – who will be able to enjoy the benefits of the intervention – should be of paramount concern from the very beginning, because technology-driven tools and strategies tend to have built-in, often 'hidden' selection mechanisms. For example, the choice of systems and infrastructure pre-determines to a large extent who can be included and who will be excluded, informally, on grounds of poverty, literacy or location.

6.6 Recommendations

Based on our findings and above discussions and conclusions, we recommend the following to the Sierra Leone National mHealth Coordination Committee, the Ministry of Health, DHMTs (with local councils), relevant government departments and civil society organizations, development partners and researchers.

1. *Health worker to client communication, including the client reminder scheme:* The preliminary quantitative analysis and qualitative analysis suggest that the mHealth intervention relating to communication between health workers and clients may result in an increase in service utilization and better health worker–client relationships. If this is confirmed by a full analysis (when the data are made available), scale-up is recommended. For efficiency reasons there may be a need to consider including additional communication modes apart from only 'calling', such as (automated) texting, at least among staff; for communication with clients this has proven challenging in the Sierra Leone context. Such a shift should address identified challenges of texting, improve mobile literacy, especially of women, and possibly include pictorial or audio elements. (National mHealth Coordination Committee, MoHS, DHMTs)
2. *Health information and health promotion:* The health information component of the mHealth intervention was appreciated by health workers and clients. However, the study could not demonstrate whether the health information needs of clients were sufficiently addressed. This issue needs to be further studied to adjust the service provided and meet clients' needs. Health promotion topics, gaps in information and queries among clients should be explored before a new intervention, and sensitivities addressed related to contents, privacy and confidentiality. (National mHealth Coordination Committee, MoHS, NGOs, researchers)
3. *TBA involvement:* TBA involvement in health worker to client communication is a promising practice that is generally appreciated by all involved. TBAs can possibly play an important role as lynchpin in communication between clients and health workers. Scale-up would require substantial investment for training and supervision of TBAs, and robust monitoring and evaluation is recommended in a larger implementation population. Other cadres such as CHWs could also be considered, and mHealth applications could be integrated into their training. (MoHS, DHMTs, NGOs)
4. *VPN:* Although no cost–benefit analysis was made, a VPN is likely to be a very cost-efficient way to organize communication at health district level. Texting could be promoted as an additional communication option among staff and between these and the DHMT. For maximum benefit, the number of facility phones per facility should be considered. Larger facilities with more staff may need more than one phone to guarantee the availability of health workers by phone. Centralized negotiations with providers could lead to reduced prices. (MoHS, DHMTs)

5. *Phone charging*: The success of the intervention depends on the availability of phones to health workers (and others such as TBAs); therefore, solutions need to be found and small investments made in innovative solutions for phone charging. (MoHS, DHMTs)
6. *Network coverage*: There is a need to extend the mobile networks to additional parts of the country to reach the most in need and not create (or widen) a 'mobile technology gap'. Universal network coverage in Sierra Leone could be advocated for and negotiated between key national stakeholders. (National mHealth Coordination Committee, MoHS, development partners)
7. *National FHCI/SRHR phone line*: Data from this study show limited knowledge and relatively little use of the national phone line. This is not surprising due to the short time it has been accessible to the general public. Continued monitoring and evaluation is needed to see how this develops in the course of time, and better marketing and information sharing about the phone line should be considered. (MoHS, DHMTs, NGOs, development partners)
8. *Ambulance referral*: The inclusion of ambulance drivers in the VPN appears to have improved the time needed for referral pick-up and should be considered for scale-up. (MoHS, DHMTs, NGOs)
9. *Maternal death reporting*: In addition to maternal death notification, which has considerably improved with the intervention, mobile communication could be put to use for quicker information and data collection about maternal deaths for reviews and audits. (MoHS, NGOs)
10. *Monitoring and evaluation*: As mHealth is integrated into existing and future programmes, there is a need to keep track of data, of benefits, of experiences, of lessons learned. These aspects, in turn, should be integrated into M&E systems. (National mHealth Coordination Committee, MoHS, DHMTs, NGOs, development partners)
11. *Further research*: In addition to M&E, research components should be built into larger programmes to continue generating evidence on what works and what does not. A priority research agenda could be discussed and agreed on. Possible topics are related to comparing various mHealth applications and systems for health worker to client communication, client monitoring, data collection and access, and cost-effectiveness analysis – for example, staff investment vs. increased service utilization. (National mHealth Coordination Committee, MoHS, NGOs, researchers, development partners)



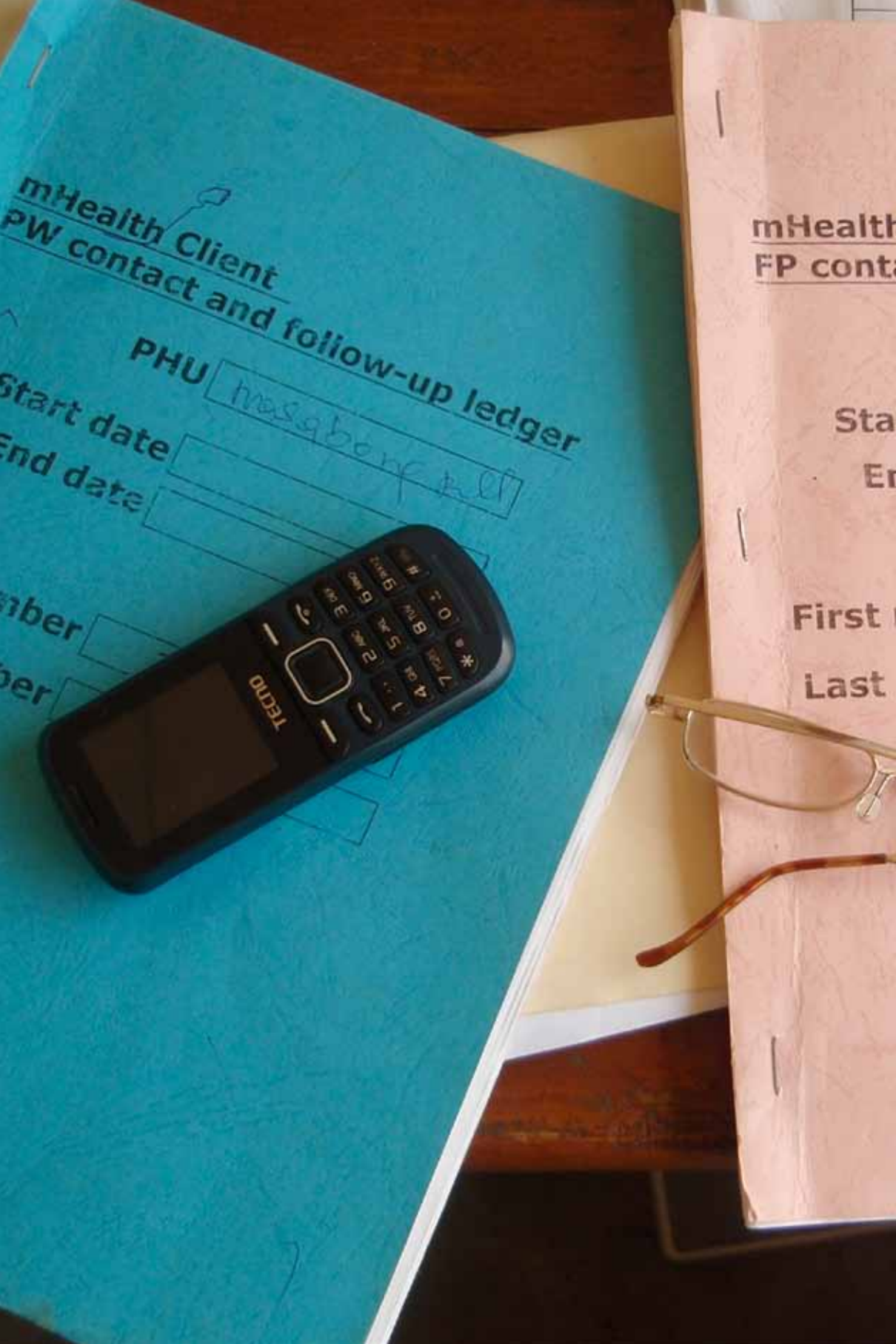
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Overview of annexes

Please note: due to certain limitations, of all below Annexes only Annexes 1, 2 and 4 are included in this book. These and all other annexes however can be found online in a complementary publication, see <http://lr4d.dfid.gov.uk/Search/DocumentLinks.aspx?OutputID=195924> or check on www.kit.nl.

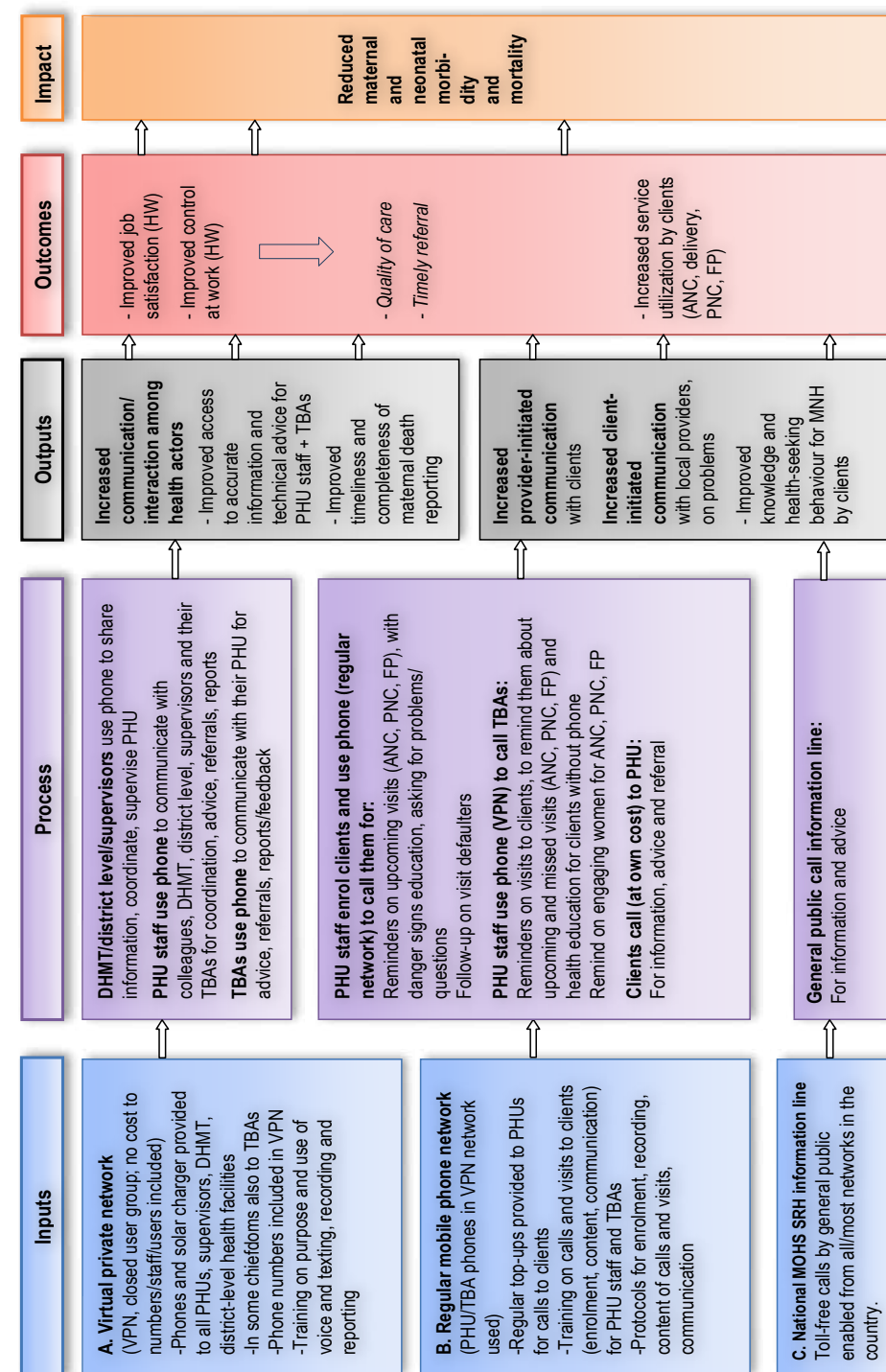
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Annex 1 – Key indicators

| Key indicators for Bombali district and national level (at start of intervention study) | | | |
|--|------------------|----------|--------------|
| Indicator | Bombali district | National | Source |
| Total fertility rate | 4.0 | 4.3 | MICS 2010 |
| % women 15-49 year currently married or in union who are using (or whose partner is using) a modern contraceptive method | 12.8% | 10.0% | MICS 2010 |
| % women 15-49 year currently married or in union with an unmet need for family planning | | | |
| spacing | 11.8% | 17.7% | MICS 2010 |
| limiting | 7.3% | 9.7% | MICS 2010 |
| total | 19.1% | 27.4% | MICS 2010 |
| % women 15-49 years who were visited in past 12 months by a fieldworker discussing family planning | 11.3% | 16.2% | SLDHSBS 2009 |
| % women 15-49 with a birth in last 2 years who have had ANC at least once by a skilled provider | 97.3% | 93.0% | MICS 2010 |
| % women who had a live birth in last 2 years by number of ANC visits | | | |
| no ANC | 2.4% | 4.0% | MICS 2010 |
| 1 or more ANC visits | 80.1% | 86.6% | MICS 2010 |
| 2 or more ANC visits | 78.0% | 85.9% | MICS 2010 |
| 3 or more ANC visits | 75.1% | 83.0% | MICS 2010 |
| 4 or more ANC visits | 58.6% | 74.7% | MICS 2010 |
| median months pregnant at first ANC visit | Not available | 4.5 | SLDHSBS 2009 |
| % women 15-49 years with a live birth in last 2 years who had assistance at delivery of a skilled personnel | 61.0% | 62.5% | MICS 2010 |
| % women 15-49 years with a live birth in last 2 years who delivered in a health facility | 44.6% | 50.1% | MICS 2010 |
| Timing of first Post Natal Care visit | | | |
| < 4 hours | 24.1% | 46.7% | SLDHSBS 2009 |
| 4-23 hours | 7.3% | 3.4% | SLDHSBS 2009 |
| 2 days | 9.5% | 9.4% | SLDHSBS 2009 |
| 3-41 days | 3.9% | 6.5% | SLDHSBS 2009 |
| no visit | 39.7% | 27.0% | SLDHSBS 2009 |
| % women 15-24 years who are literate | 53.3% | 48.3% | MICS 2010 |
| % women 15-49 years who are literate | 25.4% | 32.1% | SLDHSBS 2009 |
| % men 15-49 years who are literate | 45.2% | 51.0% | SLDHSBS 2009 |
| % women 15-49 years who at least once a week | | | |
| read a newspaper | 3.3% | 7.2% | SLDHSBS 2009 |
| watch television | 1.1% | 9.8% | SLDHSBS 2009 |
| listen to the radio | 53.2% | 58.7% | SLDHSBS 2009 |
| % men 15-49 years who at least once a week | | | |
| read a newspaper | 16.7% | 21.7% | SLDHSBS 2009 |
| watch television | 6.6% | 11.9% | SLDHSBS 2009 |
| listen to the radio | 73.0% | 78.8% | SLDHSBS 2009 |

Sources: 1. SLDHSBS 2009 = Sierra Leone District Health Services Baseline Survey 2009 (see Statistics Sierra Leone and MoHS 2010)
2. MICS 2010 = Multiple Indicator Cluster Survey 2010 (see Thomas 2010)

Annex 2 – Intervention logic diagram



Annex 4 – Intervention study research table

| Objectives | Indicators, variables, issues | Research methods | Data collection tools | Research participants |
|--|---|---------------------------------------|---|--|
| 1. To assess changes in MNH/FP service utilization by clients, associated with expanded options for client-initiated and provider-initiated mobile communication: a. for entire district (engaging all PHUs and through the national information line) b. in the selected chiefdoms that implement the intervention involving TBAs | Average gestation stage of pregnant woman at first ANC visit | PHU records analysis and calculations | DAT-1 Data collection tool for PHU/DHMT records | All PHUs in one TBA intervention chiefdom and one TBA comparison (non-intervention) chiefdom. Purposeful sampling of TBA intervention chiefdom, pairing with comparable comparison chiefdom. |
| | Percentage of pregnant women having 1, 2, 3 or 4 ANC visits | HMIS data analysis and calculations | District-level HMIS data records | All PHUs in Bombali district |
| | Percentage of pregnant women with delivery at health facility | HMIS data analysis and calculations | District-level HMIS data records | All PHUs in Bombali district |
| | Percentage of pregnant women having 1, 2 or 3 PNC visits | HMIS data analysis and calculations | District-level HMIS data records | All PHUs in Bombali district |
| | Number of new FP clients enrolled and existing clients who continue | HMIS data analysis | District-level HMIS data records | All PHUs in Bombali district |
| | Number of clients enrolling in mobile phone reminders (with registry of being contacted and their response) | PHU records analysis and calculations | DAT-3 Data collection tool for PHU/DHMT records | All intervention PHUs (step-Wedge sequence) |
| | Client views on client-initiated and provider-initiated communication; and related improvements in access to information, advice and referral and perceived changes in health-seeking behaviour (including national information line, client calls to PHUs and interaction/communication) | Semi-structured interview | SSI-1 Interview guide clients enrolled mobile phone reminders | Total 25–30 clients enrolled in mobile phone reminders, divided over responders (clients who could be reached) and non-responders (clients who could not be reached by phone or who were reached but declined to talk to the HW); from 8 different PHU catchment areas (2 urban, 2 semi-urban, 2 remote, 2 near the feeder road) |

| | | | | |
|-------------------------|--|---------------------------|--|--|
| Objective 1 (see above) | Community views on client-initiated and provider-initiated communication; and related improvements in access to information, advice and referral and perceived changes in health-seeking behaviour (including national information line, client calls to PHUs and interaction/communication) | Focus group discussion | FGD-1 Topic guide community | 4 PHUs catchment areas selected (1 urban, 1 semi-urban, 1 remote, 1 near the feeder road). Each area 1 male and 1 female FGD, total 4 F + 4 M = 8 FGDs; each with about 8–10 participants |
| | Non-enrolled women's views on improved communication options, whether they have made use of them, whether have been reached by HW/TBAs, and why this has not led to them using relevant services | Semi-structured interview | SSI-6 Topic guide non-enrolled clients | 20–25 pregnant women who were eligible (=having (access to) a phone) but declined, from same 8 different PHU catchment areas as SSI-1. |
| | TBA views on usefulness of phones to strengthen their work and improve clients' earlier use of services and self-reported changes (including national information line, client calls to PHUs and interaction/communication) | Semi-structured interview | SSI-2 Interview guide TBAs | 15 TBAs with intervention phone in TBA intervention area (from 4–6 different PHUs) |
| | HW views on client-initiated and provider-initiated communication; and related options to improve clients' use of services and self-reported changes | Semi-structured interview | SSI-3 Interview guide HW | Total 15–20 health staff (working at PHUs, various levels of staff; from same chiefdoms of SSI-1, SSI-6 and FGD-1) until no new information emerges for both intervention and non-intervention areas |
| | | Survey | SUR-1 Questionnaire HW | All PHU clinical health workers in Bombali District (includes MCH Aides, SECHNs, CHOs, CHAs), total around 150 |
| | | | | |

| | | | | |
|---|--|---------------------------|-------------------------------------|---|
| Objective 1 (see above) | Health manager (HM) views on client-initiated and provider-initiated communication; and related options to improve clients' use of services and self-reported changes | Semi-structured interview | SSI-4 Interview guide HM | Total 5 district health managers (various types, e.g. DMO, DHS, M&E officer, Hospital manager etc.) |
| | Male partners' perspectives on benefits and issues regarding their wives' more intense involvement in communication with health staff | Semi-structured interview | SSI-5 Interview guide male partners | Total 20–25 male partners of female clients enrolled in mobile phone reminders (but not partners of female clients interviewed) |
| | HW use of mobile communication options; perceptions on benefits and challenges of the new options available; on improvements in their job satisfaction and control at work; and ultimate benefits to clients | Survey | SUR-1 Questionnaire HW | All PHU clinical health workers in Bombali district (includes MCH Aides, SECHNs, CHOs, CHAs) |
| | Same – more in-depth | Semi-structured interview | SSI-3 Interview guide HW | Total 15–20 health staff (working at PHUs, various levels of staff; from same chiefdoms of SSI-1, SSI-6 and FGD-1) until no new information emerges for both intervention and non-interventions areas |
| | | Semi-structured interview | SSI-4 Interview guide HM | Total 5 district health managers (various types, e.g. DMO, DHS, M&E officer, Hospital manager etc.) |
| 2. To assess changes in health workers' job satisfaction and control at work, and self-reported changes due to expanded options for provider–provider communication | | Semi-structured interview | SSI-1 Interview guide clients | Total 25–30 clients enrolled in mobile phone reminders, divided between responders (clients who could be reached) and non-responders (clients who could not be reached by phone or who were reached but declined to talk to the HW); from 8 different PHU catchment areas (2 urban, 2 semi-urban, 2 remote, 2 near the feeder road) |
| | 3. To assess changes in MNH referral systems due to expanded mobile communication options | | | |

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|---|--|--|---|---|
| 4. To assess changes in maternal death reporting | | Semi-structured interview | SSI-2 Interview guide TBAs | 15 TBAs with intervention phone in TBA intervention area (from 4–6 PHUs) |
| | | Semi-structured interview | SSI-3 Interview guide HW | Total 15–20 health staff (working at PHUs, various levels of staff; from same chiefdoms of SSI-1, SSI-6 and FGD-1) until no new information emerges for both intervention and non-interventions areas |
| | | PHU/DHMT records analysis and calculations | DAT-2 Data collection tool for PHU/DHMT records | All PHUs and DHMT M&E office |
| | | Semi-structured interview | SSI-2 Interview guide TBAs | 15 TBAs with intervention phone in TBA intervention area (from 4–6 PHUs) |
| | | Semi-structured interview | SSI-3 Interview guide HW | Total 15–20 health staff (working at PHUs, various levels of staff; from same chiefdoms of SSI-1, SSI-6 and FGD-1) until no new information emerges for both intervention and non-interventions areas |
| 5. To identify implications for the health system of mobile communication initiatives | | Semi-structured interview | SSI-4 Interview guide HM | Total 5 district health managers (various types, e.g. DMO, DHS, M&E officer, Hospital manager etc.) |
| | | Semi-structured interview | SSI-3 Interview guide HW | Total 15–20 health staff (working at PHUs, various levels of staff; from same chiefdoms of SSI-1, SSI-6 and FGD-1) until no new information emerges for both intervention and non-interventions areas |
| | | Semi-structured interview | SSI-4 Interview guide HM | Total 4–5 district health managers (various types, e.g. DMO, DHS, M&E officer, Hospital manager etc.) |
| | | Semi-structured interview | SSI-4 Interview guide HM | Total 2–3 mHealth system managers (from RH/FP programme and Department of Planning and Information) |

Over the past decade, Sierra Leone has made progress in rebuilding its health system and offering its citizens better access to improved health care services. Yet, maternal and child mortality figures remain unacceptably high.

The use of mobile communication technologies for health (mHealth) has the potential to transform health services and improve health outcomes, among others by strengthening communication between clients, providers and managers. The evidence base for this claim, long unsustained, has slowly grown over the past years.

It is against this background of challenges and opportunities that the Sierra Leonean Ministry of Health and Sanitation embarked on the intervention research reported on in this publication, aiming to contribute to improving maternal and newborn health, including family planning, while at the same time adding to the evidence for mHealth effectiveness. This was done in close collaboration with its partners the Medical Research Centre, the University of Sierra Leone, KIT Royal Tropical Institute, Mannion Daniels and Text to Change.

This report covers the context, study design, methodology and findings of a mixed-methods, quasi-experimental study that aimed to assess the effect of integrating mobile communication strategies on maternal and newborn health service utilization in the Sierra Leonean district of Bombali. It ends with formulating recommendations on the scaling up of low-technology mobile communication between health workers, their managers, traditional birth attendants and clients, the role of mobile communication in health information and promotion, a number of logistical issues around network coverage and phone battery charging, and further research. It thereby also dwells on equity concerns, highlighting the risks of unacknowledged selection mechanisms that may accompany innovative, technology-driven tools such as mobile communication.



Royal Tropical Institute