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Cell phones and CHWs: a transformational marriage?

Mobile phones can be transformative for community health workers (CHWs) in enhancing their influence and status and helping to solve practical problems. While formal intervention research can help advance mHealth application, most progress will come through a “diffusion of innovation” process.

Community health workers (CHWs) have a key role to play if we are to achieve our ambitious goals to reduce child and maternal mortality globally. A wide diversity of CHW cadres have been established in many countries, both in the public sector and with non-governmental organizations, yet several major challenges have emerged:

- Limited population coverage
- Motivation and retention (especially when CHWs are volunteers)
- Supervision
- Quality of service
- Best constellation of services for the most impact, without overburdening the CHW

While mHealth is no panacea, it can help address each of these challenges substantially, notably via one simple technology—the increasingly ubiquitous cell phone. One of the strengths of CHWs is their presence in, and connection with, their communities. Among other things, this link enables them to promote crucial behavior change interventions. But ironically, being in the community can also isolate them from the rest of the health system. Moreover, despite their key service delivery role, their typically low education, skill level, and social status can limit their influence and effectiveness within the overall health system.

In this issue of GHSP, however, Campbell et al. demonstrate that use of mobile phones, accompanied by provision of good technical content, can markedly strengthen the role that CHWs play in delivering services in Malawi.¹ Using the Net-Map methodology, which assesses the roles and influences in the health system’s social network, the authors find that providing CHWs with a cell phone plus content relevant to their jobs transformed the role of the CHW, from almost a social nonentity to a major hub in the health system’s social network. Crawford and colleagues, also in Malawi, find that SMS messaging

for pregnant women and caregivers of children under 1, often sent through CHWs as intermediaries, was effective in improving both the knowledge and intended positive behavior of clients.² Lastly, Brunie and colleagues examine what motivates volunteer CHWs in Uganda.³ They find that provision of cell phones is itself a motivator. But more importantly, mobile phones can enhance many of the other key motivators: gains in knowledge and skills, social status, and client appreciation as well as ability to ameliorate challenges such as commodity stockouts, emergencies, and even disease outbreaks. So yes, it seems the cell phone can be a transformative technology for the CHW.

But this immense potential for mobile phones raises the question of how best to promote mHealth more generally. Clearly, there is an important place for formal intervention research. However, because situations vary so widely and technology is exploding and changing so rapidly, most progress will likely come through a “diffusion of innovation” model,⁴ where knowledge of successful implementation diffuses rapidly through less formal channels and people try out new approaches and adapt quickly and flexibly to their specific situation.

We must rely on human ingenuity to adapt and apply mHealth in a continuous fashion in each country context. It is already happening spontaneously across the world and that will only accelerate. For example, social media has already become a popular way to share health information with a wide range of audiences and networks; it seems plausible in the future that some social media tools could build on the existing network of CHWs and enhance their connectedness even more. As a global health community, our best role is to facilitate such innovation, by helping to connect the innovators and early adopters and through ongoing assessments of what is and isn’t working well. Formal intervention research has a definite role, but it takes considerable time to carry out. Above all, we must not allow it to stand in the way. – *Global Health: Science and Practice*

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A bright future for IUD use in Africa?

High uptake of IUDs under the mobile outreach service delivery model in Kenya bodes well for IUDs in sub-Saharan Africa, if delivered with good access and quality.

Intrauterine devices (IUDs) have many positive attributes for clients, including high effectiveness and long duration of effectiveness. They are used very widely globally, yet not in Africa.

A number of factors contribute to this low use, but the perspective of providers is one major cause. Some providers have incorrect beliefs about high health risks associated with IUDs. Also, while IUD insertion is not terribly difficult compared with many medical procedures, provision of IUDs takes considerable wherewithal: competence, self-confidence, supplies and equipment, and, most importantly, sufficient time. In the context of a busy clinic that often provides a multitude of maternal and child health and other services, it is much easier for a provider to give an injection or a package of oral contraceptives than to interrupt the rhythm of work flow to provide counseling and insertion of an IUD. Low provider motivation and support reinforce low client demand. And even when providers are well-trained, low frequency of provision leads to a downward spiral of lost confidence and skill.

Enter the “dedicated provider.” Such providers are well-trained and well-supplied, are mentally oriented to take the time to provide IUDs, and provide them with a high enough frequency so as to have high confidence and proficiency. But does deploying IUDs in such a fashion, such as through the mobile outreach model employed by Marie Stopes and others, translate into high popularity in sub-Saharan Africa?

In this issue of GHSP, David Hubacher et al.,¹ provide good evidence that this can indeed be the case, in the context of mobile outreach for both IUDs and implants by Marie Stopes Kenya. The authors’ main purpose was to assess what effect might result from simple introduction of a discrete quantity of a newer IUD that releases the progestin levonorgestrel, called the levonorgestrel intrauterine system (LNG IUS). The

findings are pretty modest. Providers tended to like the LNG IUS, and there was perhaps a small uptick in overall IUD use. However, the most remarkable finding was that the overall IUD (predominantly copper IUD) share of all mobile outreach provision was over 40%! And the rate of IUD provision for the mobile outreach teams combined was about 30,000 per year.

We already know that implants are extremely popular,^{2,3} but at least in this context, IUDs too can be very popular. In addition to accessible and quality service, it is likely that provision of IUDs over a long period of time by Marie Stopes Kenya has also built up a clientele of satisfied users, so that the positive attributes of IUDs have become more widely known. This bodes well for IUD popularity in Africa.

Mobile service delivery is one (albeit a potent one) service delivery approach. Others include postpartum and postabortion provision, social franchising, and fixed-facility services. It’s approaches like these that can build a large contingent of satisfied IUD users, who will contribute a substantial share to the FP2020 goal of reaching 120 million new family planning clients by 2020. —*Global Health: Science and Practice*

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COMMENTARY

It's about time: WHO and partners release programming strategies for postpartum family planning

Mary Eluned Gaffield,^a Shannon Egan,^b Marleen Temmerman^a

The postpartum period is a critical time to address high unmet family planning need and to reduce the risks of closely spaced pregnancies. Practical tools are included in the new resource for integrating postpartum family planning at points when women have frequent health system contact, including during antenatal care, labor and delivery, postnatal care, immunization, and child health care.

Since 2010, the World Health Organization (WHO) has been receiving an increasing number of requests from country programs for strategies to create or strengthen voluntary family planning programs for women in the first year after childbirth. During this extended postpartum period, 95% of women in low- and middle-income countries want to avoid a pregnancy within the next 2 years, but 70% are not using contraception.¹

In collaboration with the Maternal and Child Health Integrated Program (MCHIP) of the U.S. Agency for International Development (USAID) and several other partners, WHO produced the “Statement for Collective Action for Postpartum Family Planning” to emphasize the importance of postpartum family planning (PPFP) and to offer general approaches for addressing unmet need and expanding the range of contraceptive options during the postpartum period.² The global health community rallied in support of this obvious, but often overlooked, group of women in need of services. The Statement received official endorsements from additional donor governments, including Australia and the United Kingdom, and from family planning stakeholders, such as the United Nations Population Fund and the International Planned Parenthood Federation.

The 2012 London Summit on Family Planning coalesced renewed international commitment for family planning and highlighted PPFP's potential in accelerating progress toward Millennium Development Goals 4 and 5 (to reduce child mortality and improve

maternal health, respectively). Some policy makers and program managers expressed uncertainty, however, about incorporating PPFP into their unique national and local contexts, especially in areas with cultural barriers to family planning for postpartum women and with low facility-based delivery coverage. (Facilities would provide entry points for integrating PPFP.) Others misunderstood or underestimated the risk of pregnancy in the postpartum period and believed that PPFP was either unnecessary or a less important investment than family planning for non-postpartum women.

To ensure that decisions about PPFP programs are informed by the best evidence and field-tested practices, WHO, with support from USAID and MCHIP and through contributions from a large community of PPFP technical experts, launched a highly anticipated companion piece to the Statement for Collective Action at the 2013 International Conference on Family Planning in Addis Ababa, Ethiopia. The resource, “Programming Strategies for Postpartum Family Planning,” provides a detailed reference for PPFP program design for a variety of cultural contexts (see [supplementary material](#)). It informs policy makers and program managers about the unique family planning needs of postpartum women, describes assessment methods to comprehensively identify PPFP programming opportunities, and presents illustrative strategies, complete with activities and measurable indicators, to integrate PPFP programs into multiple health system entry points.³

The document is specifically geared toward supporting program managers' efforts to:

- Mitigate missed PPFP opportunities across the continuum of care

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- Organize health services to allow time for family planning counseling
- Maximize the availability of community-based care
- Expand the available range of family planning options and services

POSTPARTUM WOMEN NEED FAMILY PLANNING, TOO

Although the postpartum period is clinically defined as the first 6 weeks following childbirth, **PPFP is the initiation of family planning services within the first 12 months following childbirth to prevent closely spaced and unintended pregnancies.** Pregnancies within the first 12 months after a birth—in other words, a birth-to-pregnancy interval of less than 12 months—are at highest risk for adverse health outcomes to the mother and child⁴; are much more likely to end in potentially unsafe induced abortion⁵; and are at elevated risk for stillbirth, preterm birth, low birth weight, and small size for gestational age.⁴ Closely spaced births are also correlated with increased likelihood of chronic undernourishment, stunted growth, and infant mortality.⁶ Because of these serious health risks, spacing pregnancies at least 2 years apart can avert an estimated 10% of infant deaths and 21% of deaths in children ages 1 to 4 globally.⁴

As a group, postpartum women have high unmet need for family planning, defined as the percentage of fecund and sexually active women who report not wanting any more children or wanting to delay the birth of their next child but are not using any method of contraception.⁷ One analysis of 27 low- and middle-income countries estimated that 65% of postpartum women had unmet need.¹ A more recent analysis of data from 17 low- and middle-income countries found even higher unmet need estimates when women were asked about *prospective* need—that is, to express their fertility preferences looking into the future, instead of at the time of their previous pregnancy.⁸

HOW POSTPARTUM WOMEN ARE DIFFERENT

Family planning services for postpartum women require unique physiological considerations. Postpartum women experience amenorrhea, or

the absence of menses, for varying lengths of time, and their fertility can return before menses resumes, even when breastfeeding.⁹ PPFP programs also must understand the clinical safety standards applied to different contraceptive methods across the 12-month period following birth, taking the mother's breastfeeding status into special consideration.³ The Programming Strategies resource includes a tool for determining the appropriate method options throughout the first year postpartum, following the WHO Medical Eligibility Criteria for Contraceptive Use¹⁰ (Figure). These criteria are periodically reviewed to ensure that they are consistent with the latest evidence.

MITIGATING MISSED OPPORTUNITIES

Integrating PPFP services into antenatal care (ANC), labor and delivery, postnatal care (PNC), and well-child health visits allows programs to deliver family planning counseling and services during the points at which couples have the most frequent contact with the health care system, without substantial increases in staff or infrastructure.^{2,9} Effective PPFP use, however, relies on adaptation to established or developing health systems within each country, particularly in terms of the services that can be offered immediately after delivery, such as insertion of postpartum intrauterine devices (IUDs) post-delivery versus post-discharge. As a result, it can be difficult to effectively transfer models, even when they are employed successfully in other contexts. Nevertheless, careful planning and learning from challenges faced by PPFP programs in similar settings can overcome these obstacles.

Qualitative analysis on perceptions of effective access to and provision of PPFP services in Ethiopia and Kenya identified certain consistent programmatic requirements:

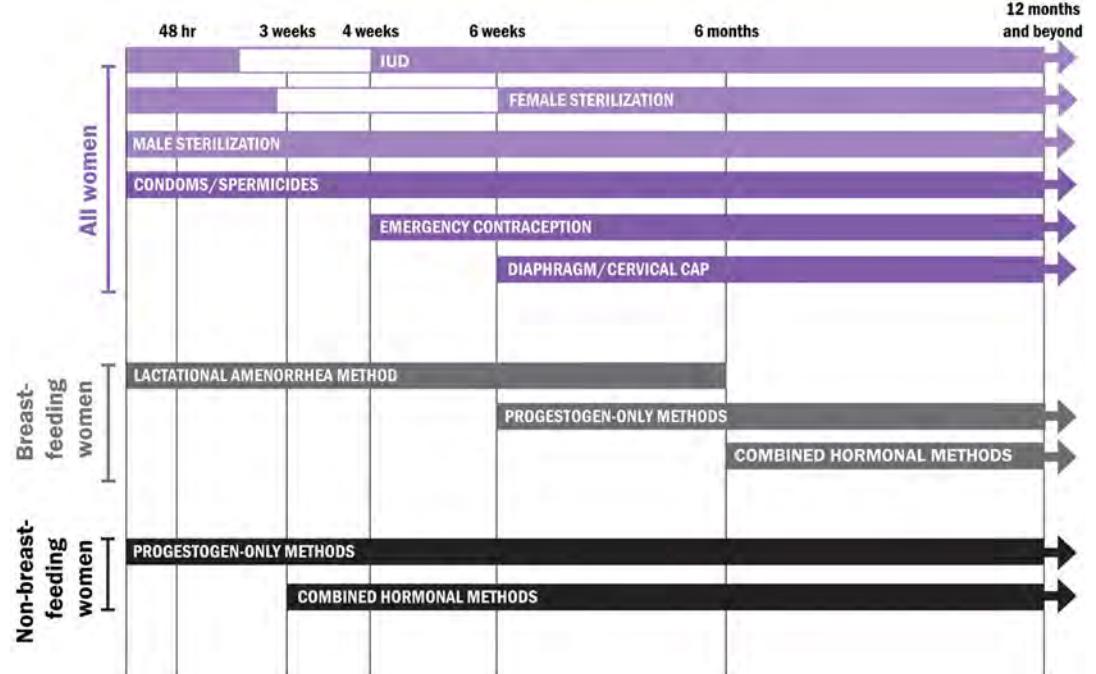
- **Tracking of postpartum contraceptive use** allows health workers, governments, and organizations to ensure the steady supply and distribution of contraceptive commodities, especially in rural areas.
- Availability of **high-quality, easy-to-understand informational materials** about PPFP and contraceptive options can help women and their families make informed choices.
- **Consistent health worker training and use of global PPFP best practices** ensure that service delivery is consistent with global standards for care.¹¹

Postpartum family planning has the potential to accelerate progress toward Millennium Development Goals 4 and 5.

Spacing pregnancies at least 2 years apart can avert about 10% of infant deaths and 21% of deaths in children ages 1–4.

An estimated 65% of postpartum women have unmet need for family planning.

FIGURE. Use of Contraceptive Methods in the Postpartum Period, According to WHO’s Medical Eligibility Criteria



Source: World Health Organization³

Government support for PFPF is critical to ensuring proper funding of programs.

Government support is also a critical component of PFPF programming and can help ensure that voluntary family planning services are well-funded; are delivered consistently, safely, and effectively; and are technically and clinically sound. In cases where the government relies on or collaborates with funding sources from nongovernmental or private-sector partners, program managers may be able to advocate increased PFPF attention and support by leveraging these relationships.³

APPLYING PROGRAMMING STRATEGIES FOR POSTPARTUM FAMILY PLANNING

The new resource, “Programming Strategies for Postpartum Family Planning,”³ adapts the assessment questions identified by WHO’s health systems framework,¹² and it includes an additional element for determining community and sociocultural obstacles. It helps readers identify programmatic weaknesses related to the essential elements of any health system and provides

examples of evidence-based interventions that program managers can adopt, depending on the findings in their assessments (Box). Although not intended to be exhaustive, these approaches should help direct attention toward interventions that strengthen service delivery, human resources, or financing. For example, if high rates of breastfeeding are noted, program planners can ensure that the Lactational Amenorrhea Method (LAM), and counseling on the transition from LAM to other effective contraceptive methods, are part of routine PNC and infant health care.

Irrespective of the policy and programmatic choices made to capitalize on entry points across the continuum of care—ANC, labor and delivery, PNC, or infant health and immunization services—the document provides ample references to potential program goals, outcomes, strategies, activities, and indicators for each contact point. Of particular note, the document cites WHO’s recently updated recommendations that women receive PNC for at least 24 hours after birth and

BOX. Examples of PFP Program Interventions

Illustrative Assessment Findings	Potential PFP Program Interventions
<ul style="list-style-type: none"> High unmet need for limiting future pregnancies High percentage of births in facilities Health system with district-level infrastructure for IUD and female sterilization services 	<p>Facility-Based Intrapartum Services:</p> <ul style="list-style-type: none"> Expand counseling and method mix to include long-acting reversible contraceptives (LARCs) and permanent methods (PMs), access, affordability, and choice. Integrate immediate postpartum IUD insertion, postpartum tubal occlusion, and exclusive breastfeeding (EBF) within labor and delivery units and in postpartum maternity wards at facilities at the district or sub-district level, if appropriate.
<ul style="list-style-type: none"> Low modern contraceptive prevalence High use of traditional methods Short birth intervals High percentage of home births 	<p>Community:</p> <ul style="list-style-type: none"> Train community health workers to integrate community education and individual counseling about healthy timing and spacing of pregnancy (HTSP), EBF, and the Lactational Amenorrhea Method (LAM) with referral for other contraceptive methods as a routine part of care. Promote early PNC visits for home births to provide essential newborn care and EBF/LAM. Focus on LAM as a gateway method to using other modern contraceptives. Discuss women's reproductive intentions for spacing or limiting, and provide information on contraceptive methods and where to get them. Use community-based integrated maternal, newborn, child health, and family planning (MNCH/FP) services.
<ul style="list-style-type: none"> Existence of insurance or other finance mechanisms, such as vouchers, for basic maternity services and PNC 	<p>Financing:</p> <ul style="list-style-type: none"> Bundle PFP with the birthing package to ensure that all contraceptive methods are covered during the extended postpartum period.
<ul style="list-style-type: none"> High breastfeeding rates Successful routine immunization sessions at health centers 	<p>PNC and Infant Care:</p> <ul style="list-style-type: none"> Introduce LAM and transition to other contraceptive methods. Add a dedicated family planning provider to existing routine immunization programs or link/refer women to the family planning unit at the clinic.
<ul style="list-style-type: none"> High rates of staff rotation within and among facilities Lack of skills and knowledge about PFP among facility staff, including the provision of LARCs/PMs Facilities lack available and trained staff to provide MNCH/FP services 	<p>Strengthening Human Resources Capacity:</p> <ul style="list-style-type: none"> Strengthen policies and practices to address staff development and retention to ensure that providers with family planning skills are available within ANC, labor and delivery, and PNC. Introduce or strengthen a comprehensive reproductive health education curriculum that addresses safe motherhood, family planning, and neonatal and child health training issues. Integrate concepts of PFP within preservice education and ensure that PFP and HTSP are well-covered in teaching curricula, practical training, and examinations. Dispatch mobile outreach teams to facilities in the short term in order to provide services while building capacity of staff for the long term. Focus on community-based PFP interventions, including EBF, LAM, pills, injectables, and condoms, while addressing health worker and capacity needs at the facility level.
<ul style="list-style-type: none"> High HIV prevalence and existence of PMTCT services 	<p>Meeting the Needs of People Living With HIV/AIDS:</p> <ul style="list-style-type: none"> Integrate PFP with PMTCT services and promote use of EBF and LAM, as well as appropriate complementary feeding at 6 months, with transition to another effective contraceptive method.

additional PNC contacts on day 3, between days 7–14, and at 6 weeks after birth.¹³

To support programming decisions, several examples of programs with targeted PPFPP components that have been implemented in multiple cultural contexts are provided in the resource. Brief descriptions of program efforts and observed results are included, and supplemental information on program indicators for monitoring and evaluation purposes is also outlined.

TIME FOR ACTION ON PPFPP

In July 2012, bold global goals were announced during the London Summit on Family Planning, where 32 countries and numerous donors, foundations, and organizations, including WHO, made global political commitments to expand access to voluntary family planning for 120 million more women and girls around the world by 2020 (the “FP2020 goals”). The momentum of the Summit and the commitments that followed have not only renewed global attention on family planning as a key element in achieving development targets but also underscored the importance of coordinated action among various ministries and government entities, private and public sectors, stakeholders, and donors. The development of strong programs that can effectively meet the family planning needs of postpartum women while maintaining high-quality counseling and service delivery requires multisector collaboration among stakeholders at a variety of programmatic levels—ranging from facility directors, community health workers, and national program managers to private donors and international nongovernmental organizations. The careful coordination of these entities advances program practices that are based on sound sexual and reproductive health policies and standards of care and establishes robust, sustainable programs that have the ability to withstand and adjust to contextual changes. “Programming Strategies for Postpartum Family Planning” makes it easier to develop family planning programs by providing practical assessment tools for each step of the process, helping countries to identify the right solutions for their problems and employ the best strategies in their unique situations.

Research Agenda Essential for PPFPP

Monitoring and evaluation of program activities and outcomes—an often overlooked and underfunded

aspect of program design—must be an essential component of strengthening programs. Improved measures and evaluations of an intervention’s feasibility, cultural and contextual acceptability, and cost-effectiveness are critical to ensuring that PPFPP programs are implemented rationally and expeditiously. Such measurements inform policy and ongoing learning, enable improvements in service delivery models, and allow programs to maximize benefit while minimizing known challenges. “Programming Strategies for Postpartum Family Planning” underscores the importance of holistic monitoring and evaluation and recommends valuable data collection methods and analytic metrics that are cost-effective and evidence-based and that address the most demanding programmatic obstacles.

Interest in family planning has also received substantial attention from the research community. Respondents to a recent WHO research priority setting exercise scored implementation issues related to PPFPP among the highest of family planning research priorities.¹⁴ The expert group of 180 stakeholders identified PPFPP service integration mechanisms and the development of effective strategies to overcome barriers to contraceptive uptake during the postpartum period as the second and fourth highest research priorities among a list of 47 topics. A new review of 34 PPFPP programs confirms the difficulty of assessing program effectiveness without rigorous research designs and outlines the plethora of PPFPP interventions that have not been studied systematically.¹⁵ There is an urgent need to scientifically investigate why certain PPFPP interventions work—and why others do not—and why some integration opportunities that seem obviously beneficial, such as those at immunization visits, have shown weaker results than expected. By documenting and analyzing early findings of different PPFPP models,¹⁶ and by following the research practices recommended by “Programming Strategies for Postpartum Family Planning,” we will be able to enhance best practices and develop stronger recommendations on how to direct human and financial resources.

CONCLUSION

Given the few short years for us to reach FP2020 goals, we must take immediate action to encourage country programs to offer the family planning services that postpartum women want and deserve. The release of “Programming Strategies

Comprehensive PPFPP programming requires many types of health worker involvement at each point of interaction along the prenatal-to-postpartum continuum of care.

for Postpartum Family Planning” will help propel these programs in the right direction and enable the international community to reach this large and important population.

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COMMENTARY

The imperative for health promotion in universal health coverage

Gloria Coe,^a Joy de Beyer^b

Health promotion and disease prevention have huge impact on health, yet given low priority, risk being overlooked in universal health coverage efforts. To effectively prioritize promotion and prevention, strong cadres of personnel are needed with expertise in legislation and health policy, social and behavior change communication, prevention and community health, health journalism, environmental health, and multisectoral health promotion.

Universal health coverage (UHC) centers on delivering effective, affordable health care, and the policy focus is often heavily on curative care. Health promotion, on the other hand, centers on keeping people well, largely through promoting healthy behavior and environments. Implementing robust, effective evidence-based health promotion programs would improve people's health profoundly and also help ensure the financial viability of UHC. The emerging importance of noncommunicable diseases and injuries (NCDIs) in the developing world increases the imperative for prevention and health promotion. Fortunately, vibrant examples with strong impact are emerging both in the West and in developing countries.

Health promotion programs implement a broad array of interventions to ensure optimal health and to prevent illness across the life span, at national, provincial, and community levels, involving multiple sectors of Government, notably Ministries of Education, Finance, Transportation, and Communication. Successful health promotion programs rely on qualified professionals specialized in areas as diverse as policy analysis, legislation, social psychology, social and behavior change communication, economics, sociology, and health journalism.

This article advocates that national policy and decision-makers should rebalance efforts in the health field to do far more to promote health and prevent disease. This will require: raising competencies, profiles, and incentives for health promotion and disease prevention professionals; a stronger health promotion curriculum in schools of public health and far more

attention to health promotion and disease prevention in the training of doctors and other health care providers; and an improved legal, operational, and management framework of health promotion units in health ministries at national and provincial levels, with clearer roles and responsibilities and adequate budgets.

THE DILEMMA OF UNIVERSAL HEALTH COVERAGE — HEALTH VS. HEALTH CARE

Global health faces a major dilemma. On the one hand, the World Health Organization (WHO) defines health as a “complete state of physical, mental and social well-being.”¹ On the other hand, universal health coverage tends to focus on health “care” and health “services,” often in the context of health “insurance.”² That leads to an emphasis on curative care. Ironically, health promotion generally takes a back seat, despite its enormous importance for well-being. We assert health promotion should be front and center. And the surging rates of NCDIs in developing countries only strengthen the need for health promotion.

Keeping People Well Vs. Caring for the Sick

Health promotion comprises interventions intended to keep people well, as opposed to interventions designed to improve health once people are sick—essentially curative care. We recognize some overlap between prevention and curative care, but that has little or no effect on our assessment.

The key distinction between “sick care” and promotion of good health has long been recognized.^{3–5} Harvey V. Fineberg, President of the Institute of Medicine and former Dean of the Harvard School of Public Health for 13 years, contrasted traditional curative “sick care” and

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preventive approaches and gave reasons why prevention gets little attention (Box 1).

In curative care, the principal professional responsibility is to the individual patient, whereas in preventive care, focus is often at the population level and entails a responsibility to the entire community. In curative care, solutions involve prescribing medication, performing operations, or delivering other clinical therapies; in prevention, there is a much wider array of possibilities, from changing behavior choices to altering social conditions, in addition to clinical interventions such as immunizations. Ensuring the health of a population is more difficult than delivering health care to an individual.⁶

Health Promotion and Health Care Form Two Arms of the Health System

The 2 major “arms” of the health system over the life of an individual are:

1. Health promotion and disease prevention
2. Personal health care services (mostly curative)

The y-axis in the [Figure](#) represents health and illness; the x-axis is our full expected life span. Health care services are in the lower half of the figure, where individual clients who are ill receive personal health care, aiming to recover, as much as possible, their optimal health. Health promotion and disease prevention are in the upper half—generally population-based interventions provided to large numbers of people who are healthy.

About 85% to 90% of newborns are born healthy (lower in developing countries), and, clearly, one role of the health system is to help keep infants, children, adolescents, and adults in optimal health across their life span. Should an individual become ill, s/he may need medical care including diagnosis and treatment that will lead to her/his recovery and hopefully to optimal health. The more effective and efficient the intervention to maintain health and prevent illness, the less the demand for (often costly) health care. Health promotion has a huge agenda, covering both infectious diseases and the emerging priorities related to NCDs (Table).

Health Promotion Interventions Are Diverse

The following is a simplified list of health promotion interventions:

BOX 1. Why Prevention Gets Little Attention

Prevention all too often gets little attention, despite being culturally ingrained, as typified by Benjamin Franklin’s proverb “an ounce of prevention is worth a pound of cure,” and although it is often highly effective and cost-effective. Harvey Fineberg, President of the Institute of Medicine, suggests that among these reasons are⁶:

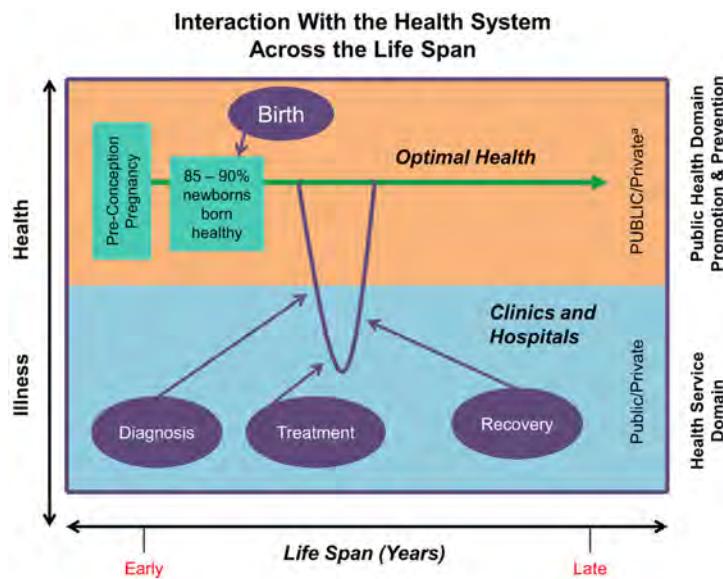
- The success of prevention is invisible, lacks drama, often requires persistent behavior change, and may be long delayed.
- Statistical lives have little emotional effect, and benefits often do not accrue to the payer.
- Avoidable harm is accepted as normal.
- Preventive advice may be inconsistent, and bias against errors of commission may deter action.
- Prevention is expected to produce a net financial return, whereas treatment is expected only to be worth its cost.
- Commercial interests as well as personal, religious, or cultural beliefs may conflict with disease prevention.

Universal health coverage tends to focus on curative care without enough focus on health promotion and disease prevention.

- “Medical” such as immunization, well-baby clinics, or the nicotine patch
- Persuasion or direct behavior change, such as mass media to promote breastfeeding
- Policy/regulatory, such as a tobacco tax or speed limits
- Environments and physical structures conducive to health, such as latrines, speed bumps, and standards for food service

The “medical” field of health promotion and disease prevention is being quickly and greatly transformed by the opportunities brought by the dramatic progress in genomic, proteomics, and pharmacogenomics. The potential to anticipate risks and individualize disease prevention and health promotion interventions is undeniable, although many technological and financial barriers still exist, particularly for low- and middle-income countries (LMICs). However, with the rapid progress in laboratory technology, the

FIGURE. Two Major Arms of the Health System



^a Health promotion activities are considered public goods: goods that are available for the benefit of all, and where the use by one individual does not reduce availability to others. In contrast, with clinical care, the supply is limited by available resources, and provision to one person reduces the quantity available to others. Since public goods are available to all and it is difficult to charge or exclude users, they are undersupplied by private markets, making it essential for governments, or the public sector, to promote health and prevent illness. World Bank. Annual review of development effectiveness 2008: shared global challenges. Washington (DC): World Bank; 2008.

IMPACT OF PREVENTION ON CORONARY HEART DISEASE IN THE WEST

In the 1960s, the Framingham Heart Study provided information on the important role of exercise, diet, tobacco, and obesity on coronary heart disease (CHD).⁸ To reduce the impact of CHD, health promotion and disease prevention initiatives implement policies and programs promoting healthy behaviors and creating environments conducive to health. Among the more important programs reviewed in this article are those implemented in the Province of North Karelia, Finland (Box 2), in New York City (Box 3), and in the workplace by the private sector (Box 4). Such employer-based wellness programs provide a high return on investment.²¹⁻²³ Employers invest generally around US\$100 to \$150 per participating employee each year; the health benefits are generally realized 3 years into the program. A 2008 literature review identified return on investment (ROI)* of worksite health promotion programs in the range of US\$3-\$10 for every \$1 invested²⁴; the European Agency for Safety and Health at Work estimates ROI 2.5-4.8 Euros per Euro invested.²⁵

Given that per capita incomes and health care costs are much lower in developing countries than in the United States, it would require a much smaller investment by developing-country employers to implement a similar program, suggesting a higher return. On the other hand, some of the benefits in developing countries

Employer-based wellness programs provide a high return on investment.

increased use of these laboratory resources, and the eventual reach of enough computational power, the accuracy, cost, and availability of these tests will no longer be a limitation. While many believe the widespread use of these methods will happen within the next 5 years,⁷ the other areas of health promotion in our simplified list will remain important.

Notice that many of these interventions lie outside the domain of clinical health services. Thus, they often call for diverse interventions, different expertise, and a population-level mindset. Behavior change and policy and legislative expertise are especially crucial.

*To estimate the ROI, baseline information on health costs are taken before the wellness program begins and again 3 years later, and a comparison is made between health costs of participating employees and of those that are not participating; the difference provides an estimate of the return. The experience of U.S. employers is that about half of employees participate in company wellness programs.

TABLE. Major Health Promotion Categories for the Developing World

Traditional Agenda	Emerging Agenda
• Immunization	• Tobacco
• Family Planning	• Alcohol
• Breastfeeding	• Overnutrition
• Undernutrition	• Physical Activity
• Water and Sanitation	• Salt Consumption
• Safe Sexual Behavior	• Drug Use
• Bed Nets	• Injury
• Gender-Based Violence	

BOX 2. Health Promotion and Disease Prevention in North Karelia, Finland

Remarkable impact achieved: The North Karelia Project started in 1972. By 2006, the mortality rate from CHD in men 35–64 years old in North Karelia had declined 85% and the cancer mortality rate by 67%, particularly for cancers related to tobacco use. The project increased life expectancy by 8–11 years over a 35-year period (1971–2006)—from 66.4/74.6 years in men/women to 75.8/82.8 years nationally, and from 64/72 years to 75/81 years in North Karelia—and became a blueprint for Finnish public health interventions.^{9,10}

What North Karelia did: The project promoted healthy lifestyles and changes in risk factors associated with NCDs using a 2-pronged approach of community organization strategies and health promotion programs.⁹ To achieve optimal health, the focus was on specific behaviors to reduce fat and salt consumption, increase fruits and vegetables eaten, reduce smoking and alcohol use, and increase physical activity.^{9,11}

Community organization strategies include:

- Plan, implement, and evaluate programming with the community
- Increase physical activity, harvest wild berries, lower cholesterol through competitions between villages, education of community opinion leaders
- Healthy meals at schools and workplaces
- Increase access to low-fat, nonfat, and low-salt products, and to fresh fruits and vegetables during the winter, in supermarkets

Health promotion programs include:

- Health journalism in the broadcast media, including televised smoking cessation programs
- Basic health services and health promotion for large stratum of population
- Development and marketing of healthy foods by the Finnish food industry
- Shift in agricultural subsidies from high-saturated fat dairy products to low-fat and vegetable-fat options
- Prohibition of tobacco advertising and enforcement of smoke-free areas
- Worksite health promotion, diet, and exercise

Most importantly, the project was supported by the Governor of North Karelia as well as provincial and national political, civic, and health leaders and the WHO.

might be lower, reflecting the lower productivity compared with U.S. employees, although other benefits might be greater. On balance, it is probably reasonable to assume that the return on investment in developing countries would be at least as great as in the United States and could possibly be greater.

Mathematical Modeling of Results of Primary Prevention Efforts

Results of mathematical modeling²⁶ of risk factor reduction in apparently healthy people (primary prevention) and risk factor reduction in patients with CHD (secondary prevention) undertaken in England and Wales,²⁷ Europe,²⁸ New Zealand,²⁹ and the United States³⁰ show

very powerful effects of primary prevention, equal to or greater than the reduction in deaths achieved by secondary prevention.

England and Wales²⁷:

- CHD mortality has halved since 1981 in the United Kingdom, resulting in 68,230 fewer deaths in 2000.
- Current government initiatives favor risk factor reduction in CHD patients (secondary prevention), but population-based primary prevention might be more powerful.
- Approximately 45,370 fewer CHD deaths were attributable to reductions in smoking, cholesterol, and blood pressure in the whole population.

Mathematical modeling shows very powerful effects of primary prevention.

BOX 3. Health Promotion and Disease Prevention in New York City

Remarkable impact achieved: In December 2011, New York City (NYC) Mayor Michael Bloomberg issued an invitation: “If you want to live longer and healthier than the average American, come to New York City.”¹² Research on life expectancy in 3,147 independent cities and counties in the United States estimated that Manhattan’s life expectancy rose 10 years between 1987 and 2009, the largest increase of any county. In addition, the other 4 counties that make up New York City were all in the top percentile. In contrast, national life expectancy increased by only 3.06 years over the same period.¹²

What New York City did: In the early 2000s, the NYC health department began strong innovative programming through policy change and improved health care.¹³ Key actions were to:

- Discourage smoking by increasing the tax on cigarettes from US\$0.08 to \$1.50/pack, prohibiting smoking in indoor workplaces, offering smoking cessation clinics, and distributing nicotine gum and patches
- Improve nutrition and physical activity by requiring restaurants to phase out trans fats, establishing standards for food service, and developing safe places for physical activity, such as cycle lanes¹⁴
- Improve child health through home visits by nurses every 1–2 weeks to high-risk first-time mothers during pregnancy and for 2 years after birth
- Control communicable diseases through widespread condom distribution, and set up a drug overdose prevention program¹⁵
- Promote healthy behaviors through communication campaigns and public policies,¹⁶ and increase health care insurance coverage

Most importantly, Mayor Bloomberg consistently provided the enlightened robust political leadership needed for city-wide progress in public health.

Future plans: The NYC health department created a Division of Health Promotion and Disease Prevention with increased focus on information, communication, data to track impact, and sound policy with the vision of keeping an increasingly larger proportion of the population in optimal health.¹³

- Some 36,625 (81%) of these fewer deaths occurred in people without recognized CHD and 8,745 (19%) in CHD patients.
- Compared with secondary prevention, primary prevention achieved a 4-fold larger reduction in deaths.

Europe²⁸: The risk of developing a chronic disease decreased progressively as the number of healthy factors increased, after adjusting for age, sex, educational status, and occupational status.

New Zealand²⁹: In Auckland, approximately half the reduction in CHD mortality rate was attributed to medical therapies and half to reductions in major risk factors.

United States³⁰: There were 745 deaths among the 8,375 people aged 20 years and older who participated in the 1999–2002 U.S. National Health and Nutrition Examination Survey, who were followed through 2006. Deaths were most likely to have occurred among study participants with no healthy behaviors; the more healthy

behaviors people had, the lower their risk of being among those who died.

All-Cause Mortality³¹: A 2012 meta-analysis of 15 prospective studies on the combined effects of healthy lifestyle behaviors on all-cause mortality comprised 531,804 people with a mean follow-up of 13.24 years. The meta-analysis found that the more healthy lifestyle behaviors people had, the lower the risk of all-cause mortality. None of the studies included in the meta-analysis were conducted in LMICs; 7 were conducted in Europe, 5 in the United States, 2 in Japan, and 1 in China. Healthy lifestyle was defined as not or never smoking, optimal weight, physically active, a healthy diet, and moderate consumption of alcohol—behaviors relevant to both CHD and NCDs.

The mathematical modeling and meta-analysis confirm the importance, effectiveness, and cost-savings of population-based health promotion and disease prevention programs to facilitate optimal health of large numbers of people across their life span.

SUCCESSFUL HEALTH PROMOTION IN THE DEVELOPING WORLD

Health promotion and disease prevention programs and interventions to increase the health and well-being of their populations are growing in the developing world. We highlight programs in Malaysia and Thailand as well as 4 global efforts: against tobacco, to promote physical activity, against obesity, and to promote healthy settings.

Malaysian Health Promotion Board

The Malaysian Health Promotion Board³² is a statutory body in the Ministry of Health established by an Act of Parliament in June 2006. It is governed by an independent body with members from relevant ministries, nongovernmental organizations (NGOs), and health promotion professionals. Its primary role is to define “the health promotion agenda across different sectors and settings,” primarily through building capacity and funding grants.

The priority areas for health promotion are:

- Prevention and control of tobacco and alcohol
- Promotion of healthy lifestyles, including exercise and healthy eating
- Environmental health
- Mental health
- Prevention of cancer, diabetes, cardiovascular disease, and obesity
- Sexual health, including HIV/AIDS
- Research
- Promoting health through sport, cultural, and arts activities

Malaysia's Remarkable Achievements

Among the results of the Smoke-Free Initiative, a survey of youth (13–17 years) and adult smokers and nonsmokers, found³³:

- Since the 2004 smoke-free regulations came into force, there has been a doubling of bans against smoking in the workplace between 2005 and 2009, as reported by smokers who work indoors.
- The percentage of smoke-free homes increased dramatically from 7% in 2005 to 40% in 2009, as reported by adult male smokers.
- Three of four smokers support stronger government control of tobacco, even if it means paying more for cigarettes.

BOX 4. Health Promotion and Disease Prevention by the Private Sector

For more than 30 years, progressive employers have invested in health promotion wellness programs in the workplace.¹⁷

Remarkable benefits achieved for employees^{18,19}:

- Increased well-being, self-image
- Improved health status and reduced health risk factors
- Reduced out-of-pocket expenses for health care and medication
- Enhanced job security and satisfaction
- Avoided disability

Benefits for employers^{18,20}:

- Lowered absenteeism costs to employers by about US\$2.73 for every dollar spent on wellness programs
- Enhanced employee productivity
- Decreased losses from illness and injuries
- Enhanced corporate image
- Improved employee recruitment and retention
- Lowered health care costs by about US\$3.27 for every dollar spent on wellness programs

- Forty-three percent of smokers and quitters said that antismoking campaigns made them more likely to quit smoking or to stay tobacco free.

Health promotion programs are growing in the developing world.

Thai Health Promotion Foundation

ThaiHealth,³⁴ an independent state agency established in 2001, is funded by a 2% tax on tobacco and alcohol, yielding an annual budget of about US\$100 million; its Governing Board is chaired by the Prime Minister. ThaiHealth works with multiple partners and funds more than 1,000 projects each year. It is a member and Chair (2010–2012) of the International Network of Health Promotion Foundations that works to enhance the performance, and support the establishment of health promotion foundations based on innovative financing.

A 10-year review of ThaiHealth³⁵ (2001–2011) identified the following achievements and challenges resulting from policy initiatives such as tobacco- and alcohol-free zones; behavior change communication campaigns coordinated with

religious, community, and civil society leaders; and creating environments conducive to health.

Thailand's Remarkable Achievements

- **Tobacco:** Between 1991 and 2009, the number of smokers was reduced by 12.26 million.
- **Alcohol:** Between 2008 and 2009, sales of beer and whisky dropped by 178 million liters, reducing domestic expenditures by almost 8%.
- **Road safety and accident prevention:** Fatal accidents declined from 22.9/100,000 in 2003 to 16.82/100,000 in 2010.
- **Sports and physical activity:** Weekly physical education in schools increased from 1 to 2 hours, and 15% of the budget for this effort is for disabled persons and disadvantaged groups.
- **Child health:** In 2008, schools became carbonated-beverage free, and a ban was instituted on adding sugar to formula and supplemental foods for infants and young children.

Challenges

- Maintain and extend relevance of strategic health promotion interventions
- Develop rigorous approach to evaluation, and connect learning, knowledge, and capacity building
- Ensure process and procedure for granting awards are scrupulously fair, clear, and transparent
- Focus more on disadvantaged population groups

Global Efforts Against Tobacco

The Framework Convention on Tobacco Control entered into force in 2005, reflecting broad consensus and strong evidence on effective, cost-effective interventions to reduce the massive and growing burden of disease caused by tobacco products.³⁶ Powerful, practical summaries of the evidence and guidance provided by the World Bank,^{36,37} WHO,³⁸ and other groups, and committed effective action by Australia, Brazil, Canada, South Africa, Thailand, and other countries, have enabled some countries to:

- Raise taxes to make tobacco products progressively less affordable

- Reduce tobacco product advertising
- Educate people—especially smokers through graphic labeling on cigarette packs—on the risks of use and benefits of quitting
- Reduce exposure to cigarette smoke by ensuring smoke-free public places
- Offer effective support to people who want to quit

The impact of determined, evidence-based antismoking measures is clear. A recent estimate finds that 41 countries that implemented, between 2007 and 2010, at least 1 of 5 key interventions to a level that met WHO criteria, will have reduced the number of smokers by 14.84 million and averted an estimated 7.42 million smoking-attributable deaths (range: 4.6–10.4 million) among smokers alive in 2007.³⁹ There are other concomitant benefits, too—for example, Turkey cut smoking-related hospital admissions by 20% over 8 years.⁴⁰

Global Efforts Promoting Physical Activities

Regular physical activity is important for health. The benefits include weight control; stronger bones and muscles; longer life expectancy; and lower risk of cardiovascular disease, type 2 diabetes, and some cancers.⁴¹

Governments in Brazil, Canada, Chile, Colombia, France, Mexico, the United States, among many others, actively promote physical exercise through “Ciclovía” bicycle programs that are funded primarily by public funds.⁴² In general, Ciclovías use existing streets that are temporarily closed to motorized vehicles during weekends and holidays, although some cities develop special bicycle lanes used throughout the week.⁴³ Cost-benefit ratios of 4 Ciclovía programs were 3.23–4.26 in Bogota, 1.83 in Medellin (both in Colombia); 1.02–1.23 in Guadalajara, Mexico; and 2.32 in San Francisco.⁴⁴ The programs have strong popular support.

Global Efforts Against Obesity

Brazil, Chile, Colombia, Costa Rica, and Peru⁴⁵ have passed laws that focus on improving healthy food choices offered to children, generally in schools. Some countries control the advertising of food in schools, regulate food labeling, and limit advertising especially on television.

Brazil’s approach to promoting healthy food in schools includes setting nutrition standards

and requiring that 30% of food in school meal programs be locally grown or manufactured and 70% be unprocessed.⁴⁵

Peru has implemented nutritional education in schools, information campaigns by the education and health ministries, monitoring nutrition, overweight, and obesity among children and adolescents, healthy food in school kiosks or cafeterias, more physical activity, and controls on advertising aimed at children and adolescents younger than 16 years.

In Mexico, one of the most obese nations according to a United Nations report,⁴⁶ legislators approved an 8% tax on soft drinks and high-calorie foods such as fried foods and sweets.⁴⁷ Mexican lawmakers are also requiring 30 minutes of daily physical education classes in schools.⁴⁸

Global Efforts Promoting Healthy Settings: Cities, Municipalities, Communities

“Healthy Settings” is a strategy supported by WHO to implement intersectoral health promotion partnerships including local governments to create environments conducive to health.⁴⁹ “Healthy Cities,” among the best-known and largest of the settings approaches launched in the 1980s, is defined as a city that is:

*continually creating and improving those physical and social environments and expanding those community resources which enable people to mutually support each other in performing all the functions of life and developing to their maximum potential.*⁵¹

The movement is considered a success. Thousands of cities around the world are implementing Healthy Cities partnerships, generally involving distal interventions, such as community organization and social development, organizational and infrastructure development, and policy development. The focus of this collaborative action often includes bike lanes and safe public space for walking and other physical exercise, better public transport, smoke-free public spaces and other pollution reduction, and healthy and affordable housing. Evaluations of the Healthy Cities project in Europe found that an appropriate mix of distal interventions for health provides a broad and sustainable effect on population health, whereas proximal interventions (for example, health and patient education, health care) yield focused health gains (often disease, gender, and age-group specific) at relatively high cost.^{51,52}

STATUS OF HEALTH PROMOTION AND DISEASE PREVENTION IN AFRICA

In 2001, the Member States of the World Health Organization Regional Committee for Africa (WHO AFRO) approved a health promotion strategy “to foster actions that enhance physical, social and emotional well-being.”⁵³ Among the activities suggested were to provide technical support and capacity-building workshops and to form partnerships and alliances. In its review of the 10-year progress report,⁵⁴ WHO AFRO recognized that implementation of the regional health promotion strategy revealed several gaps and challenges:

- Weak leadership and stewardship among ministries of health to coordinate health promotion activities across sectors
- Low level of involvement of various players, including civil society and communities, in advocacy actions to regulate and legislate for good health governance
- Inadequate evidence on the effectiveness of health promotion
- Lack of a sustainable financing mechanism
- The need to build a critical mass of health promotion practitioners, including at the community level

In view of these challenges, WHO AFRO passed the Health Promotion: Strategy for the African Region Resolution in November 2012.⁵⁵ Among the objectives of the strategy is:

... to strengthen the capacity of Member States to develop, implement, monitor and evaluate health promotion strategies, policies, and regulatory and legislative frameworks that address the risk factors and the determinants associated with communicable diseases and non-communicable diseases, violence and injuries, maternal and child health conditions, and new and re-emerging threats to health.

The Consortium for Non-Communicable Diseases Prevention and Control in sub-Saharan Africa (CNCD-Africa),⁵⁶ established in July 2009, aims to underscore the role of health promotion in addressing NCDs in Africa and to develop advocacy strategies for addressing NCDs using a health promotion approach. When asked about the state of health promotion in Africa, Jared Odhiambo Owuor, Executive Secretary of CNCD-Africa, replied:

Most health systems in Africa operate from a reactive standpoint when responding to public health needs. This approach pushes health promotion to the fringes. There is currently a need for the reorientation of healthcare staff and the sensitization of the public on the benefits of health promotion, as well as the need to proactively work towards healthy outcomes.⁵⁷

In 2010, the African Centre for Global Health and Social Transformation and The New York Academy of Medicine with the support of The Rockefeller Foundation noted the relatively low investment in public health:

In LICs [low-income countries], 70 to 80 % of the disease burden is attributable to preventable infectious diseases for which the most effective intervention is public health action. Despite this, less than 10% of national health expenditures ... are invested in public population health services (according to national health accounts data).⁵⁸

Among the challenges mentioned by Ministers of Health were:

We have lots of human resources, but they're poorly trained.

Health promotion and disease prevention present particular challenges, due to the traditional emphasis on direct medical services and development and maintenance of medical facilities.

[Ministries] struggled to effectively disseminate health messages to positively influence the public's value on health.

Many African countries spend little on health promotion.

Low Spending on Prevention and Public Health

To a degree, the shortfalls mentioned above reflect low spending for health promotion. A recent report⁵⁹ analyzes trends in prevention and public health (PPH) expenditures from 2005–2010 in 16 African countries with National Health Accounts (NHAs).[†] (The 16 countries are: Benin, Burkina Faso, Botswana, Côte d'Ivoire, Democratic Republic of the Congo, Ethiopia, Kenya, Liberia, Mozambique, Malawi, Namibia, Nigeria, Rwanda, Senegal, Tanzania, and Zambia.)

Across the 16 countries, PPH expenditures per capita vary from US\$4 in Burkina Faso to

US\$64 in Botswana. In 13 of the 16 countries, spending for curative care accounts for the largest percentage of total health expenditures (THE); in 9 countries, PPH services are the second largest expenditure. Expenditures for prevention of NCDs account for less than 3% of THE in every country. Only 9 countries provide data on how PPH expenditures are spent: most goes for prevention of communicable diseases, and about 10% is classified as "other."

Data on the financing agents of PPH, defined as institutions or entities that channel funds provided by financing sources to pay for, or purchase, health services,⁶⁰ are available in 13 countries. In 4 countries, the primary financing agent managing PPH expenditures is the government, in another 8 it is NGOs (both local and international) and donors.

Data on providers of PPH services are available in 8 of the 16 countries. In 6 countries, providers of PPH programs received a majority (45% to 96%) of PPH expenditures, while in 2 countries the majority of PPH expenditures are used by ambulatory care providers.

Ministry of Health policy and decision-makers in the African Region recognize the importance of implementing health promotion programs to "foster actions that enhance physical, social and emotional well-being."⁵³ To achieve this important goal, the countries also recognize they need undergraduate and graduate educational programs and highly specialized personnel. Yet the National Health Accounts indicate low per capita spending for PPH for NCDs by LMICs, compounding future challenges for health systems to maintain their populations in optimal health.

HEALTH PROMOTION: A CALL FOR SPECIALIZED SKILLS FOR HUMAN RESOURCES

As demonstrated by the case studies reviewed in this article, ensuring healthy populations across their life span requires government to implement integrated health promotion and disease prevention interventions in the 5 action areas suggested in the Ottawa Charter⁴:

1. Build healthy public policy
2. Create supportive environments
3. Strengthen community action
4. Develop personal skills
5. Reorient health services

[†] National Health Accounts is a standardized framework for tracking health sector financial resource flows from sources, to agents that manage funds, to providers and consumers of care. Health promotion and disease prevention expenditures are classified as prevention and public health in this framework.

Health promotion and disease prevention is achieved by persuading, enticing, and requiring people to adopt healthy behaviors, and by changing environments to enable and be conducive to healthy individual and collective behaviors. Among the goals of health promotion is to ensure a health-literate society, with the “ability to obtain, process and understand basic health information and services needed to make appropriate health decisions and follow instructions for treatment.”⁶¹

Three groups have important roles in health promotion and disease prevention:

1. Policy makers and practitioners in health and other sectors (especially finance, infrastructure, and education) that have opportunities to adopt and implement health-promoting policies and actions
2. Specialists in health promotion and disease prevention
3. Health care providers who need to mainstream health promotion and disease prevention in their health care

A stronger cadre of health promotion personnel could support and guide their colleagues working in nutrition, maternal and child health, family planning, mental health, tuberculosis, malaria, dental health, emergency care, and others areas.

Physicians, nurses, and others health sector workers need far more understanding of how they can promote health in the course of all their patient contacts. Typically, medical training gives this scant attention, despite the evidence that, for example, even brief interventions by physicians can have a significant impact on smoking behavior.

The specialized skills needed in health promotion and disease prevention programs include 5 areas:

- **Legislation and health policy:** the ability to analyze health promotion, disease prevention, and health care from the health policy perspective and to identify the policies and interventions most likely to achieve a given set of goals
- **Social and behavior change communication:** the ability to plan, implement, and evaluate persuasive communication programs to change individual and collective behaviors; increase awareness, knowledge, perception of risk, confidence to take action, and intention to act; create more favorable attitudes; influence social norms and policies;

and improve interpersonal communication skills of health professionals

- **Prevention and community health:** the ability to empower community leaders, create awareness, and stimulate community commitment to health and action, to ensure community health services and programs meet community needs
- **Health journalism:** the ability to regularly place information on health at no cost in broadcast, print, and online media, and training for health care personnel to become media spokespersons
- **Multisectoral health promotion:** the ability to work at high levels of government and with NGOs and the private sector to address important risk factors influencing national and sub-national epidemiological profiles

Important areas of interministerial action include:

- Ministry of Finance to set taxes to make tobacco and other harmful products progressively less affordable
- Ministry of Education to develop age-appropriate health content for primary and secondary schools, ensure healthy schools, healthy meals, and physical education programs; include health promotion and disease prevention theory, methods, and practices in the curricula of schools of medicine, nursing, dentistry, and allied health professionals and paraprofessionals
- Ministry of Labor and Commerce to promote healthy smoke-free workplaces, promote healthy options at workplace cafeterias, and push the food industry to provide healthy products
- Ministry of Transportation to ensure safe road construction, especially for pedestrians and cyclists, car safety, and safe driving
- Ministry of Communication to prohibit tobacco advertising and promotion, and sexual and violent content in programming for children
- Private sector, such as restaurants, to include healthy menu options, limit excess salt and fat, and provide smoke-free environments

Specialized skills needed in health promotion programs include: legislation and health policy, social and behavior change communication, community health, health journalism, and multisectoral health promotion.

Policy makers, health promotion and disease prevention specialists, and health care providers have important roles in health promotion programs.

CONCLUSION

UHC will be financially feasible only when governments implement robust evidence-based

health promotion programs, staffed by a cadre of professionals with specialized skill sets and appropriate levels of financial and political support to implement broad, effective programs. Effective health promotion and disease prevention makes economic sense, relieves pressure on the clinical health system, and directly improves people's well-being and optimal health across the life span. We urge developing:

1. Curriculum in health promotion and disease prevention in schools of public health that encompass broad specialized skills
2. More promotion and prevention in curricula of medical, nursing, and allied health professional schools
3. Clear job profiles and attractive salary levels for health promotion and disease prevention professionals
4. Legal, operational, and management frameworks for health ministry health promotion units (national and sub-national), including clear roles and responsibilities and adequate budgetary allocations

To be financially feasible, universal health coverage requires robust evidence-based health promotion programs.

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ORIGINAL ARTICLE

Taking knowledge for health the extra mile: participatory evaluation of a mobile phone intervention for community health workers in Malawi

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A participatory evaluation process called Net-Map showed that providing community health workers (CHWs) with mobile phones and essential technical information changed CHWs, from passive recipients of information with little influence to active information agents who sought and provided information to improve health services.

ABSTRACT

In Malawi, where the majority of the population resides in rural areas, community health workers (CHWs) are the first, and often only, providers of health services. An assessment of health information needs, however, found that these frontline workers often lacked essential health information. A pilot project, implemented in 2 rural districts of Malawi between 2010 and 2011, introduced a mobile phone system to strengthen knowledge exchange within networks of CHWs and district staff. To evaluate the mobile phone intervention, a participatory evaluation method called Net-Map was used, an approach built on traditional social network analysis. Together, CHWs and district personnel discussed information needs and gaps and the roles of different actors in their information networks. They then used drawings and 3-dimensional objects to create baseline and endline maps showing the linkages and levels of influence among members of the information network. Net-Map provided them with powerful evidence of differences before and after the mobile phone initiative. At baseline, CHWs were not mentioned as actors in the information network, while at endline they were seen to have significant connections with colleagues, beneficiaries, supervisors, and district health facilities, as both recipients and providers of information. Focus groups with CHWs complemented the Net-Map findings with reports of increased self-confidence and greater trust by their communities. These qualitative results were bolstered by surveys that showed decreases in stockouts of essential medicines, lower communication costs, wider service coverage, and more efficient referrals. As an innovative, participatory form of social network analysis, Net-Map yielded important visual, quantitative, and qualitative information at reasonable cost.

BACKGROUND

Malawi, one of the world's poorest countries, has health indicators that are consistent with a weak economy, particularly in the 2 health areas addressed by the Knowledge for Health (K4Health) Malawi project—family planning/reproductive health and HIV/AIDS. Four examples illustrate the situation:

- Malawi's total fertility rate is 5.7.¹
- Despite considerable progress in reducing maternal mortality over the past few years, 460 women still die from pregnancy-related causes per 100,000 live births.^{1,2}
- In 2011, Malawi's HIV prevalence rate was 10%,³ the ninth highest in the world.⁴
- Between 2007–2012, the contraceptive prevalence rate was 46%.⁵

Of the 16 million people in Malawi, 85% reside in rural areas, where health conditions are generally worse and where vital family planning/reproductive health and HIV/AIDS services are not readily accessible. The

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In Malawi, community health workers are the first, and often only, providers of health services.

HIV epidemic has taken a particularly large toll in rural communities that have limited access to prevention and treatment and that are often bearing the brunt of caring for people living with HIV/AIDS who move back to their villages from an urban residence.

Malawi has approximately 2 doctors per 100,000 population,⁶ far fewer than neighboring African countries such as Zambia, with 10 doctors per 100,000, Botswana with 30, and Namibia with 40. The ratio of nurses to population in Malawi is equally low: 37 per 100,000 compared with 70 per 100,000 in Zambia and 280 in Botswana and Namibia.⁷ In rural areas, community health workers (CHWs) are the first—and often only—providers of health services.

Interventions by CHWs have repeatedly demonstrated the potential to reduce mortality and morbidity in sub-Saharan Africa. The World Health Organization (WHO) and the Millennium Villages Project have called for the rapid scale up of CHWs in sub-Saharan Africa.^{8,9} In March 2013, a Technical Taskforce of the Earth Institute at Columbia University released a report calling for the training and deployment of 1 million CHWs in sub-Saharan Africa by 2015.¹⁰ These recommendations are particularly appropriate in Malawi, given the shortage of higher-level health professionals and the acute health needs of people living in rural areas.

Malawi has a countrywide system of CHWs, classified as either community-based distribution agents (CBDAs) or health surveillance assistants (HSAs). CBDAs are volunteers selected by their communities to provide family planning counseling, oral contraceptives, and condoms. HSAs are salaried community-based health workers who deliver immunizations, family planning (including injectables), well-child visits, and disease surveillance. They play a critical role in linking residents of remote villages with formal health services located a considerable distance away.

An assessment of health information needs conducted early in the K4Health Malawi project showed that in Nkhhotakota and Salima Districts, these frontline workers often lacked essential up-to-date knowledge about the health areas for which they were responsible.¹¹ Although there was frequent communication and knowledge exchange between national and district levels, this did not hold true between districts and communities. There was no coherent system or central location where CHWs could find complete and current information about family planning/reproductive health and HIV/AIDS.

Community health workers often lack essential health information needed to do their work.

Mobile phone towers exist throughout Malawi, and some service providers own mobile phones and use them for both short message service (SMS) text messages and voice calls.¹¹ Although very few CHWs in Nkhhotakota and Salima Districts personally owned and used mobile phones at the time of the needs assessment, project staff agreed that the large and growing use of the SMS technology offered great potential as a channel for knowledge exchange.

Other projects in sub-Saharan Africa have been successful with using mobile phones to advance health goals. Among the successful applications most relevant to the K4Health Malawi project were those to promote adherence to antiretroviral treatment,^{12,13} to ensure compliance with malaria treatment guidelines,¹⁴ and to facilitate surveillance and data collection.¹⁵ A pilot study of mobile phone use for treatment of tuberculosis in Malawi found savings in workers' time and money and a doubling of treatment capacity.¹⁶ Furthermore, a review article on the use of mobile phone messaging in South Africa concluded that mobile phones are a practical, low-cost tool to deliver information that supports high-quality health care.¹⁷

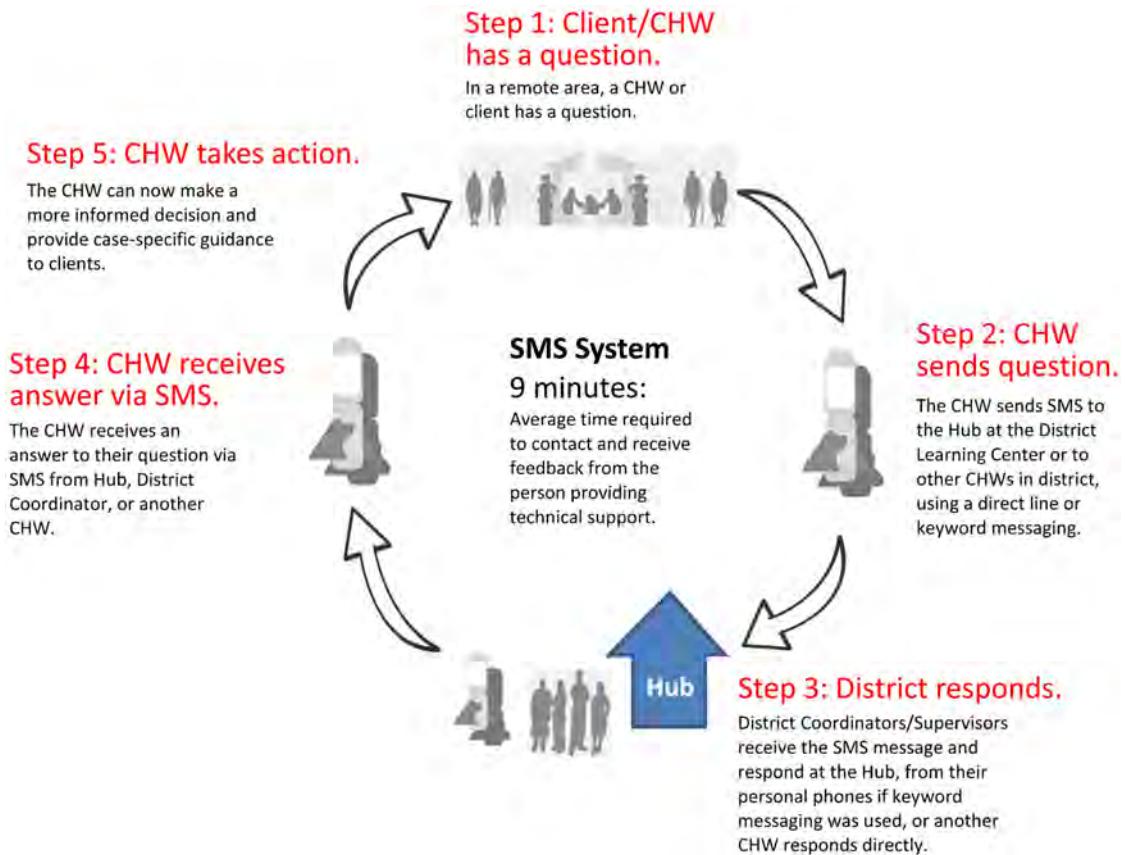
This article briefly describes the mobile health intervention of the K4Health Malawi project and explores the effects of the intervention on knowledge exchange, focusing particularly on the qualitative and quantitative data collected through a participatory action research methodology called Net-Map. The article also explores some of the impacts that the Net-Map sessions had as interventions in and of themselves.

PROGRAM DESCRIPTION

Between June and October 2010, the project trained and provided mobile phones, solar chargers, and airtime to 253 CHWs in Nkhhotakota and Salima Districts—30% of all CHWs in the 2 districts combined. An additional 385 CHWs received phones, chargers, and training during a second distribution in November 2010, bringing SMS coverage to 77% of health workers in both districts, targeting those whose homes were farthest away from health centers. About two-thirds of the participating CHWs were HSAs, and about one-third were CBDAs.

The mobile phones linked CHWs with each other and with district supervisors/coordinators through an SMS hub located at the 2 District Hospitals (Figure 1).

FIGURE 1. SMS Network in Nkhotakota and Salima Districts of Malawi



Abbreviations: CHW, community health worker; SMS, short message service.

In addition to providing new channels for communication (mobile phones and the SMS Hub), the system also filled these channels with essential technical information. The communication flow encompassed requests from health workers as well as prompt replies from district supervisors and coordinators. When clients approached health workers with urgent questions, or when workers needed to restock contraceptives, the workers could use their mobile phones to send a text message to the Hub, where a district coordinator or supervisor would be assigned to read and respond to messages. Alternately, a worker could reach a specific supervisor directly by using defined keywords, which the Hub would recognize and forward to

the phone of the supervisor. The CHW could also use the system to contact a fellow worker within the network to ask a question or make a request.

One of the reasons that the project chose this mHealth intervention was because of its low cost. The mobile phones were US\$27 each, and the solar chargers were US\$7 each. Compared with other projects using more sophisticated and expensive phones, these phones allowed project costs to remain low.

METHODS

To assess outcomes of the K4Health Malawi project, we implemented a comprehensive evaluation plan that used several qualitative and

quantitative methodologies, including Net-Map research, Lot Quality Assurance Sampling (LQAS), and focus group discussions. This article provides an in-depth description of the Net-Map methodology because of its innovative nature and of the rich findings that it produced.

What Is Net-Map?

Net-Map is a process adapted from social network analysis, a key technique used in modern sociology. The basic idea of social network analysis is that people do not act alone; their actions and the impact of those actions are determined by the social network structure in which they are embedded. This structure is viewed as a group of related actors, represented as nodes, and their interactions, represented as links between those nodes.¹⁸

Net-Map starts with a simple pen and paper-based form of social network mapping, designed to highlight formal and informal interactions among key actors in a network.¹⁹ Net-Map extends the traditional scope of social network analysis by including power or influence mapping, a method by which actors in a network discuss and analyze the different kinds of influence that exist within their network, reach agreement on the extent to which each actor in the network exerts his/her influence, and use a simple visual tool to show what they have found.²⁰ The definition of influence in a Net-Map context is based on Max Weber's definition of power—that is, the ability of an actor to achieve one's goal in a social setting, irrespective of the means used.²¹

Because participants draw network maps together, Net-Map promotes knowledge exchange among varied actors or stakeholders. They have to discuss, debate, and come to agreement before they draw the connections. Their discussion provides rich data about the way the network functions. The process helps participants to understand, visualize, monitor, evaluate, and improve situations in which many different actors influence outcomes.

In this way, Net-Map combines visual results (network maps), quantitative results (network data), and qualitative results (network narratives). It creates a setting in which network members are participants in, rather than objects of, research.

Net-Map Participants

We conducted Net-Map through half-day workshops held in Nkhotakota and Salima at the

beginning of the project in May 2010 and at endline in June 2011. In 2010, the workshops in each district supplemented the K4Health Malawi needs assessment and yielded baseline information for the mobile phone intervention; participants provided rapid appraisals, or snapshots, of the flow of technical health information to and from CHWs within their networks and assessed bottlenecks, strengths, and opportunities in information flows. In the 2 endline workshops in 2011, participants reviewed these factors and tracked how they had changed since the beginning of the mobile phone intervention.

Participants were selected based on their membership in key stakeholder groups related to the technical focus of their work in HIV/AIDS and family planning/reproductive health in Malawi, including both types of CHWs (HSAs and CBDAs) as well as representatives of district health offices and health facilities. The same stakeholder groups were represented in both the 2010 and 2011 workshops, although in some instances different individuals represented the stakeholder group. A limit of 15 participants per workshop was necessary to ensure substantive discussions and output.

Net-Map Procedures

The Net-Map process consisted of 4 steps in both the 2010 and 2011 workshops (Table). In 2011, one additional question in Step 4 and one extra step was added to allow for comparisons from baseline to endline.

Step 1: Identifying the actors in the network. Participants identified all actors in their networks who were involved in the production, exchange, and storage of information on family planning/reproductive health and HIV/AIDS on labeled notes and placed the notes on a large sheet of paper.

Step 2: Linking the actors. The participants described the connections between the actors in terms of the flow of technical information that CHWs send or receive in the context of their jobs. The facilitator drew arrows to depict these connections, using different colored arrows for family planning/reproductive health and HIV/AIDS information. Drawing these links help identify providers, conduits, and recipients of knowledge. If participants disagreed about whether to draw a link, the facilitator encouraged them to discuss, explain, and reach agreement in the group. The maps that they drew were the result of this deliberative process.

Net-Map helps to identify the social network structure in which certain stakeholders operate as well as levels of influence.

Net-Map is both a research and knowledge exchange tool, because participants discuss and draw the network maps together.

Step 3: Mapping the influence. In this step, participants used checker pieces to create “influence towers” next to the label representing each actor. The facilitator clarified that “influence” in this sense did not just represent formal decision-making authority but also more informal ways of influencing, such as giving advice or incentives or bending the rules. The question was: “How strongly does this actor influence knowledge flow on family planning/reproductive health and HIV/AIDS in the Malawi health system?” This reflects the insight that one major problem in the Malawi health system is the asymmetry of information and lack of knowledge flow between the most and least knowledgeable parts of the system. The participants ranked each actor with an influence value from 0 to 10—the greater the influence, the higher the tower. Through facilitated in-depth discussion, workshop members came to agreement about the perceived influence level of each actor.



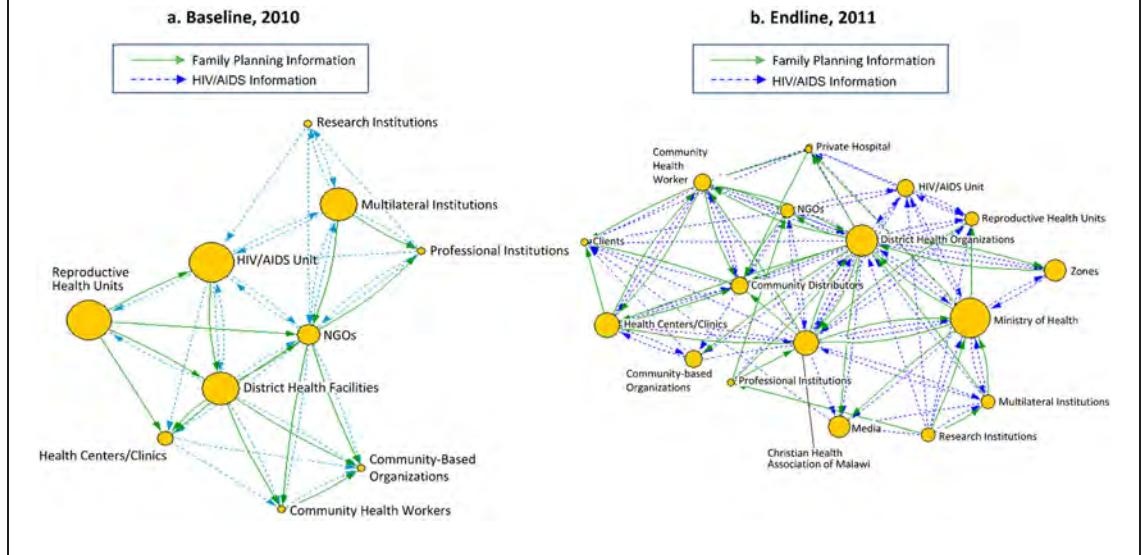
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Net-Map participants in Nkhotakota, Malawi, produce a 3-dimensional drawing of their knowledge exchange network.

TABLE. Net-Map Interview Structure

Steps	Questions
Overall Question	Who plays a role in improving flows of technical information on HIV/AIDS and reproductive health to health care service providers?
Step 1	Name generator: List the actors involved.
Step 2	Link generator: What are the critical information flows for Malawi in improving health care for HIV/AIDS and reproductive health? Specific links: <ul style="list-style-type: none"> • Who provides technical information on HIV testing? • Who provides technical information on family planning?
Step 3	How influential is each actor in improving these information flows?
Step 4	Discussion questions In 2010: <ol style="list-style-type: none"> Who are the critical actors? What are the critical linkages? How can we ensure improved information flows? In 2011: a, b, and c, with an added question: Of the links, which have been strengthened due to the mobile phones?
Step 5	Comparison of maps between 2010 and 2011 <ul style="list-style-type: none"> • What are some of the significant changes you see? • What do you think are the reasons for these changes?

FIGURE 2. Baseline and Endline Net-Maps of Information Flows With District-Level Stakeholders in Nkhotakota, Malawi



Step 4: Facilitating the discussion. The facilitator led a discussion focused on the 3-dimensional depiction of the network just created: the actors, their links, and their level of influence. Using this visual tool as a reference, the facilitator asked about the “how” and “why” of the network as it evolved in front of participants’ eyes.

Step 5: Comparing the maps. At the 2011 workshop, participants compared the map they drew with the map of their network from 2010. The facilitator again guided the discussion of changes between the maps and possible reasons for these changes. In addition to asking about the “how” and “why” of the network, the participants focused on a new question: “Of the links, which have been strengthened as a channel for information and knowledge flow due to the mobile phones?”

Analysis of Net-Map Data

After each workshop, project evaluators entered the data from the hand-drawn maps into Visualizer™ software to create computer-generated maps. The size of each node on the maps corresponded to the height of the influence tower for that actor, as seen in the baseline and endline maps for Nkhotakota (Figure 2) and Salima (Figure 3).

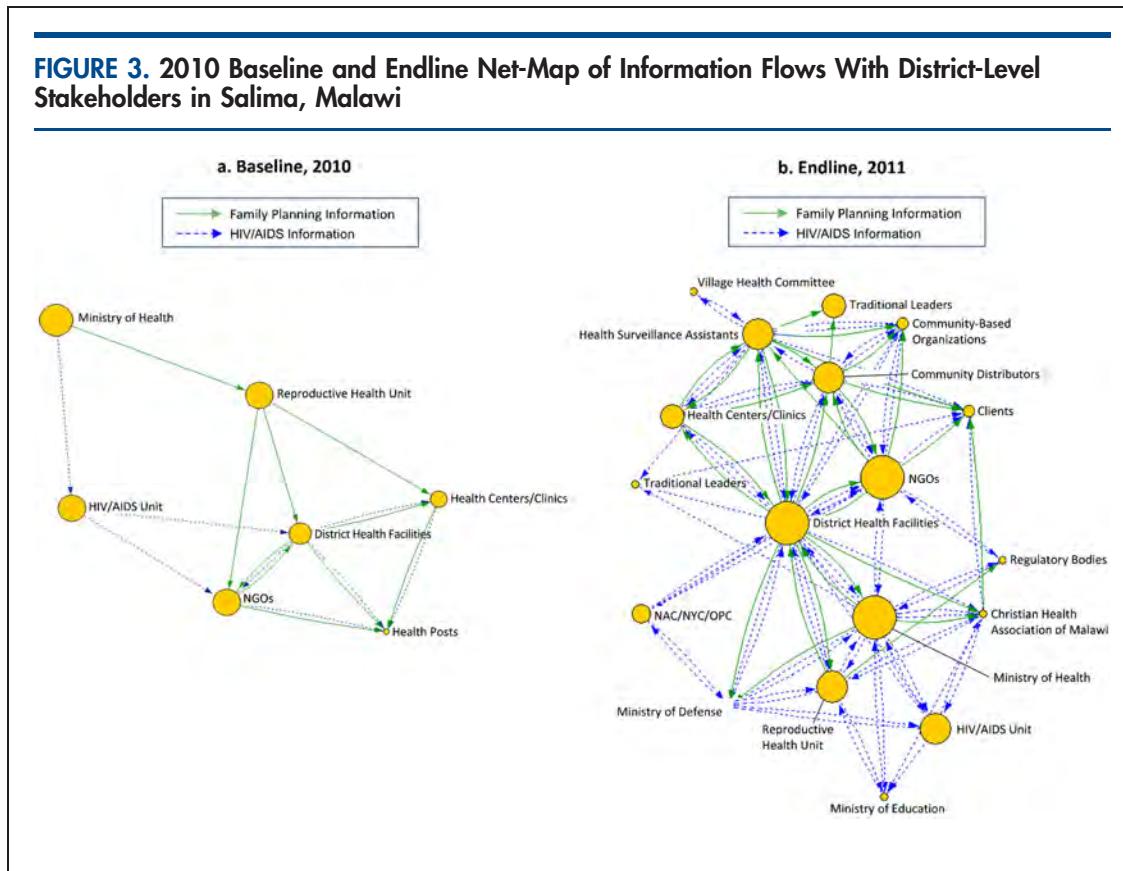
The evaluators then used the data on the maps to calculate degree centrality for Nkhotakota and

Salima in 2010 and 2011. Degree centrality is a quantitative measure that is basic to social network analysis. It defines the positions of the actors in a network by a score that indicates the number of links each actor has with other network members. In this way, it is a measure of connectedness: the extent to which the actor can access needed information from and provide relevant information to other network members.

In the Nkhotakota and Salima degree centrality graphs, scores are expressed in the percentages along the y axis. A score of 100%, for example, would indicate that an actor was linked to 100% of the network members and was, thereby, a critical recipient and provider of information; a very low score would indicate few network linkages, little access to essential information, and minimal or nonexistent involvement in the flow of information.

As the graphs demonstrate, the measure of degree centrality can be split between in-degree (how many links are directed to each actor) and out-degree (how many links each actor directs to others). In both Nkhotakota and Salima, the Net-Map workshop discussions confirmed that having a high out-degree (giving information to many actors) was an indication of higher status, while having a high in-degree (being mainly the recipient of information) was typical for lower-status actors.

FIGURE 3. 2010 Baseline and Endline Net-Map of Information Flows With District-Level Stakeholders in Salima, Malawi



Other Evaluation Methods

In addition to the Net-Map research, the project conducted LQAS surveys with CHWs in the 2 intervention districts as well as in a control district with a similar socioeconomic profile but without access to SMS technology. These surveys were carried out before expansion of the SMS network (November 2010) and at endline (May–June 2011).

For the pre-expansion LQAS, each of the 3 districts was divided into 5 supervision areas. By endline, the project understood how the districts actually worked through the SMS activities, and the 2 intervention districts and control district were divided into 4 supervision areas.

For both LQAS surveys, respondents were sampled from each supervision area using a random number table and Ministry of Health lists of all HSAs and CBDAs. For the pre-expansion survey, this yielded a total sample size of 285, of which 65% were HSAs and 35% were CBDAs. At endline, it yielded a total sample size of 228, of which 63% were HSAs and 37% were CBDAs.

To supplement the quantitative data, we also conducted focus group discussions, before and

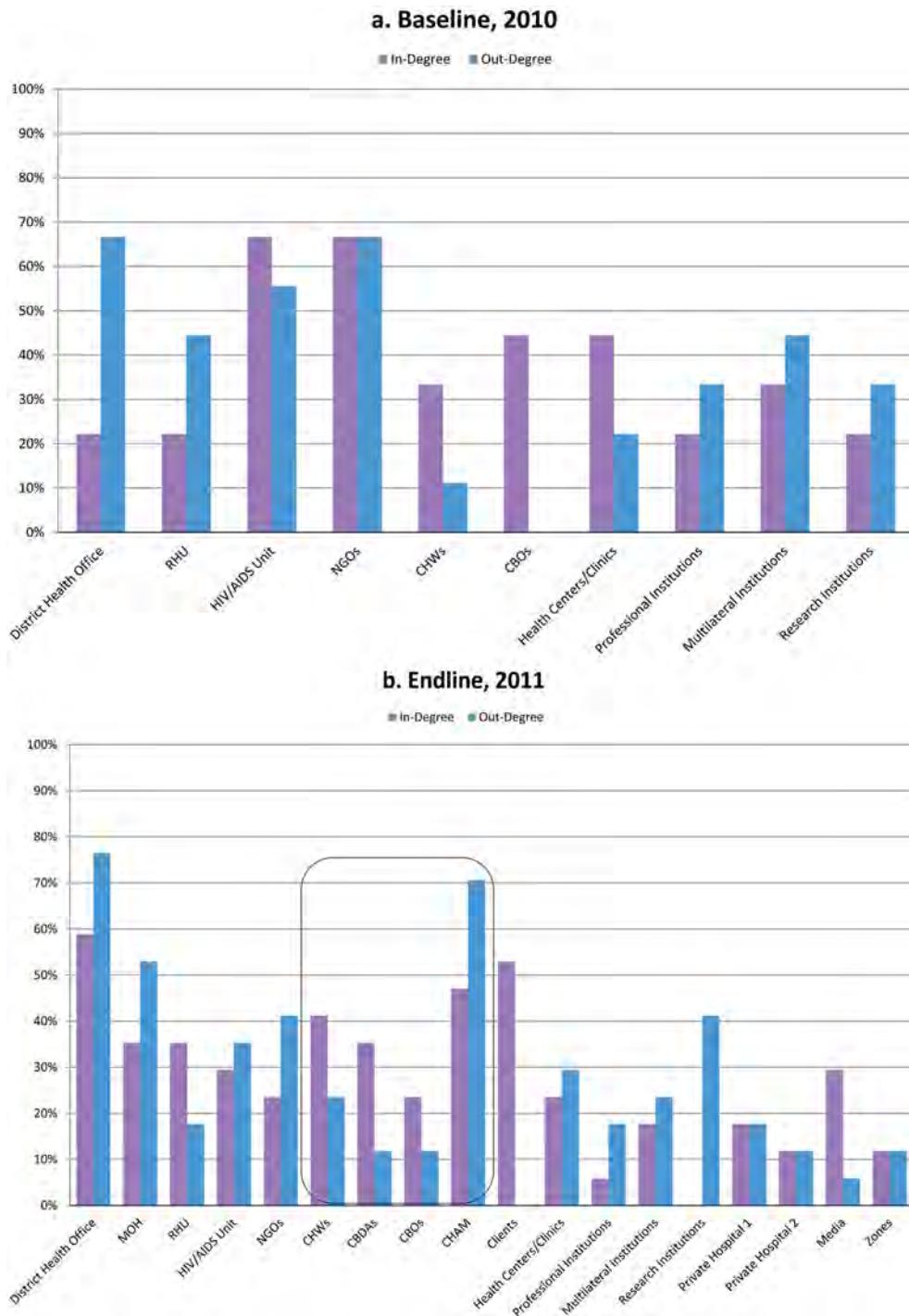
after the intervention, with CHWs who had been given mobile phones but had not participated in the Net-Map workshops. In these discussions, the participants described how often, for how long, for what purpose, and at what cost they communicated with each other and with their district-level supervisors before and after having mobile phones.

RESULTS

Effects on Knowledge Exchange

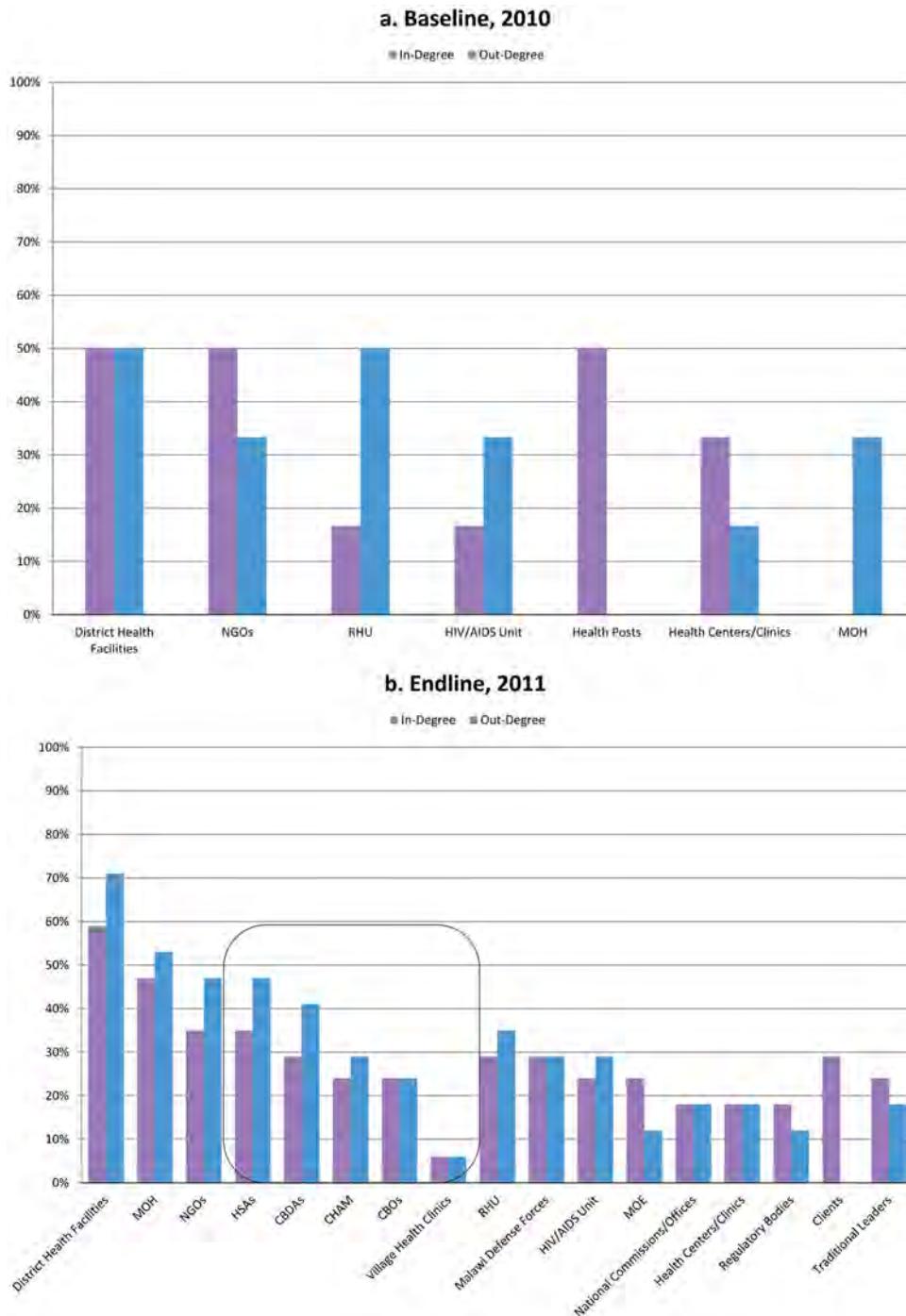
The Net-Map process clearly demonstrated the effects of the mobile phone intervention, which was reinforced by the supporting quantitative results from the LQAS methodology. Both baseline district network maps in 2010 (Figure 2a and Figure 3a) revealed that knowledge exchange was extremely hierarchical; high-level actors had high influence, and information flowed from top to bottom. The maps and degree centrality values showed minimal communication, primarily in-degree at the district level; the only exception was for HIV/AIDS information going to community-based organizations, which were equally remote from the actors of greatest

FIGURE 4. Baseline and Endline In-Degree and Out-Degree Centrality Values for Nkhotakota, Malawi



Abbreviations: CBDAs, community-based distribution agents; CBOs, community-based organizations; CHAM, Christian Health Association of Malawi; CHWs, community health workers; MOH, Ministry of Health; NGOs, nongovernmental organizations; RHU, Reproductive Health Unit.

FIGURE 5. Baseline and Endline In-Degree and Out-Degree Centrality Values for Salima, Malawi



Abbreviations: CBDAs, community-based distribution agents; CBOs, community-based organizations; CHAM, Christian Health Association of Malawi; HSAs, health surveillance assistants; MOE, Ministry of Education; MOH, Ministry of Health; NGOs, nongovernmental organizations; RHU, Reproductive Health Unit.

Before the mobile phone intervention, community health workers had virtually no influence in the knowledge exchange network.

influence. In addition, the baseline maps were very sparse, with few actors and few linkages between actors, indicating weak information flows around family planning/reproductive health and HIV/AIDS. The CHWs were particularly affected by this situation: they were barely represented by a small node in Nkhotakota and were completely absent in Salima. The small size of their nodes (indicating low influence) and the largely in-degree centrality (Figure 4a and Figure 5a) showed that before the mobile phone intervention, CHWs had virtually no influence and were largely recipients of information from very few sources.

After the mobile phone intervention, community health workers had turned into active information agents.

The contrast with the complex flow of information seen in the 2011 endline maps (Figure 2b and Figure 3b) and degree centrality graphs (Figure 4b and Figure 5b) was striking. In both districts, the nodes for CHWs on the maps were considerably larger, and the degree centrality graphs identified different types of CHWs at varied work sites where mobile phones had been distributed (outlined with a box in Figure 4b and Figure 5b). These CHWs—who had not shown up at all in the centrality graphs a year earlier—now had considerable presence and a balance of in- and out-degree centrality. CHWs who were using mobile phones had turned from passive recipients of information to active information agents who sought and provided information back up the hierarchy and across the network to one another as colleagues on the front lines. The arrows on the 2011 maps (Figure 2b and Figure 3b) showed information from most actors feeding into the nodes for CBDAs and HSAs, and similarly many arrows feeding back out from these agents to district health facilities and NGOs as well as to traditional leaders and clients.

In addition to improving knowledge exchange, the mobile phone intervention also had direct effects on use of health services.

The centrality graph for Salima in Figure 5b shows that in 2011, CHWs were not only included in the network but were differentiated as either HSAs or CBDAs. Their out-degree centrality was higher than their in-degree, reflecting their new status as sources of important information for each other and for their supervisors, most often regarding the health status of a community member, the vital statistics of a sick child, or low stocks of contraceptives.

On the 2011 map for Nkhotakota (Figure 4b), several new actors appear, and the arrows depicting knowledge exchange are far more extensive. Participants in that Net-Map workshop added CBDAs to their map as a separate

entity within the broad category of CHWs. They also added the Christian Health Association of Malawi (CHAM) and private hospitals to the map, a reflection of the fact that HSAs stationed in private and CHAM hospitals were among the health workers equipped with mobile phones—thus giving them a new voice and role within the network.

In workshop and focus group discussions, participants pointed out that the use of mobile phones gave them the means to communicate not only with supervisors at the district hospital, the CHAM hospital, and private hospitals but also with their colleagues. CHWs could now get immediate help for their clients by sending a message to the Hub and getting a rapid response or by sending questions to district hospital staff and receiving important technical information with little delay.

Participants in workshop and focus group discussions in 2011 described the increased influence of CBDAs and HSAs in the past year. They explained that all actors in the district were now relying on these workers to provide clients with HIV/AIDS and reproductive health information.

Effects on Health Services

The Net-Map workshops and focus group discussions also revealed the direct effect of the mobile phone intervention on health services. The CHWs cited their ability to get immediate help for their clients by sending a message to the Hub and getting a rapid response. CHWs explained that timely responses from district hospital staff to CHWs' requests for important technical information resulted in gains in expertise. They also described the reduction in stock-outs that resulted from expediting the timely reporting of family planning/reproductive health and HIV/AIDS commodity shortages.

Equally important were the less tangible results that the CHWs reported: increased self-confidence and increased trust between them and their communities. There was an increase in prompt responses to emergencies (obstetric) and outbreaks (measles) and to queries from CHWs to their supervisors. CHWs reported a wider service coverage accompanied by lower costs. The LQAS study also confirmed a 90% decrease in travel costs because health workers could text, instead of renting a bike, to obtain technical support. Additionally, the intervention reduced the time spent getting information from 1.2 days

to 9 minutes, with cost savings from, on average, 200 Malawian kwachas to 10 kwachas to get technical support.

Limitations

When drawing the information flow networks during Net-Map sessions, participants lumped together a number of different kinds of “information flow,” from information about stockouts to information concerning treatment methods. Finer differentiation between different kinds of information and a discussion about the quality of information exchanged would have deepened the insights from the workshops. Ideally, a control group would have been included to strengthen the case for causal attribution.

With the LQAS, we could not compare pre-expansion and endline supervision areas individually due to the change in methodology in identifying supervision areas between the 2 time periods. However, we were able to aggregate data across all the supervision areas and compare indicators. The project also used endline data to determine the degree to which individual supervision areas in the 2 intervention districts met coverage benchmarks for key project indicators.

CONCLUSIONS

The ability of the K4Health Malawi project to provide 77% of the CHWs in both intervention districts with mobile phones and to successfully train them in using the phones within 1 year is a remarkable outcome in such a short time frame. The most important shift that occurred due to the mobile phone intervention was that instead of being only occasional recipients of information from the district level, CHWs became initiators of information flows through their stockout messages and clinical questions. This is perhaps the greatest legacy of this project in a predominantly rural country where CHWs serve as a crucial link with clients.

These results were achieved through a 2-pronged approach: providing new channels for communication (mobile phones and SMS Hub) and supplying these channels with content and processes for knowledge sharing (requests from health workers and prompt replies from the district supervisors and coordinators). The Net-Map workshop discussions confirmed that neither of these 2 interventions alone—merely giving out mobile phones or compiling information without

developing channels for knowledge exchange—would have been as effective. Future projects aiming to improve knowledge flows through information technologies should focus both on developing technically feasible and robust channels and on encouraging knowledge sharing behavior.

As a tool for action research, the Net-Map process yielded visual, quantitative, and qualitative evaluation data, and it also enhanced the sense of shared purpose among network members. The 2010 workshops fostered understanding among the actors of constraints to the flow of information. The participatory nature of the workshops helped mobilize all the actors in the network and gain their buy-in for the SMS initiative. Participants in the 2011 workshops produced a graphic demonstration of striking differences in knowledge exchange in the very short time between baseline and endline. Discussions of Net-Map findings made it clear to participants that the impressive changes in the communications network for frontline health workers were due to the use of mobile phones and links made through the Hubs to the district supervisors and coordinators as sources of information and assistance.

These workshops paved the way for sustaining the SMS initiative beyond the life of the project. The District Hospitals assigned individuals to monitor the Hubs, and they set aside funding for airtime. Ultimately, they were unable to maintain virus-free computers necessary to support the Hubs at the District Hospitals. Nevertheless, community health workers in both districts are continuing to use their mobile phones—at their own cost—to communicate with each other and with their supervisors.

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Future knowledge exchange projects should focus on developing appropriate communication channels as well as on encouraging knowledge sharing behavior.

Net-Map is an important tool for action research that produces robust data while enhancing knowledge sharing among research participants.

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ORIGINAL ARTICLE

SMS versus voice messaging to deliver MNCH communication in rural Malawi: assessment of delivery success and user experience

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Mobile SMS health messages had higher successful delivery and led to higher intended or actual behavior change among subscribers than voice messages. Providing multiple delivery modalities led to greater overall access.

ABSTRACT

Objective: To determine the difference in delivery success of health messages delivered through pushed SMS, pushed voice messages sent to personal phones, and voice messages retrieved from a community phone (“retrieved voice messaging”), as well as the difference in quality of the user experience.

Methods: We analyzed the project’s electronic monitoring data between September 2011 and June 2013, including demographics, enrollment data, and messages sent and successfully delivered. We also collected and analyzed information from quarterly phone-based surveys with users to assess quality of the user experience, including acceptability, comprehension, new information learned, and reported behavior change.

Results: More than half of subscribers enrolled in the retrieved voice messaging service while nearly one-third enrolled in the pushed SMS service and less than 10% in pushed voice messaging. Message delivery success was highest among pushed SMS subscribers and lowest among retrieved voice subscribers. Overall, 99% of survey respondents reported trusting messages they received, and about 75% of respondents recalled the last message they received and learned something new. Almost 75% of respondents reported that they had already changed or intended to change their behavior based on received messages. Intended or actual behavior change was significantly higher among pushed SMS enrollees than among pushed or retrieved voice messaging enrollees ($P=.01$).

Conclusion: All message modalities led to high levels of satisfaction, comprehension, and new information learned. Due to lower cost, higher delivery success, and higher levels of intended or actual behavior change, SMS is the preferred delivery modality. However, the majority of users included in this study did not have access to a personal phone, and retrieved voice messages provided an opportunity to access a population that otherwise could not be served. Providing multiple methods by which users could access the service was crucial in extending reach beyond literate personal phone owners.

BACKGROUND

Despite significant progress toward improving maternal and child health, Malawi still has high maternal and infant mortality; the maternal mortality ratio is 675 maternal deaths per 100,000 live births and

the under-5 mortality rate is 112 deaths per 1,000 births.¹ Underlying causes of poor health for women and children include limited availability of timely and reliable health information for decision-making and poor access to and use of health facilities.² Knowing when and where to go for care is integral to maximizing health care access and use and to reducing maternal and child mortality.

With increased availability and use of mobile technology, mHealth is becoming a widely used

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Mobile health messaging has been successful in public health programs, such as for smoking cessation and weight loss.

strategy to address barriers to accessing health information and care.^{3–5} mHealth is the use of mobile phones to promote healthy behavior, increase use of health services, improve adherence to health advice, and increase access to health information. One growing application of mHealth is mobile messaging, whereby health information and promotion messages are sent directly to clients. Previous studies have highlighted ways in which mobile messaging can be successful in smoking cessation, weight loss, diet and physical activity, treatment adherence, and disease management.^{6,7}

Mobile messaging is increasingly being applied to improve reproductive, maternal, neonatal, and child health (RMNCH), and there is growing evidence of its effectiveness.^{8–11} For example, a U.S.-based program, text4baby, sent text messages to traditionally underserved pregnant women encouraging them to adopt healthy attitudes, beliefs, and behaviors during pregnancy. The program was effective in increasing agreement with the statement, “I am prepared to be a new mother.” However, it did not lead to significant behavior change among enrollees.¹⁰ The effects of the intervention were greater among enrollees with more education, suggesting that literacy and comprehension of messages may play crucial roles in the effectiveness of mHealth projects.

Literacy may be a critical factor in the effectiveness of mHealth projects.

An mHealth project in Zanzibar called Wired Mothers sent pregnant women text messages with appointment reminders and health education information, and it also gave enrollees phone vouchers to call health care providers directly with questions. The project significantly increased facility-based births among urban women but had no significant effect on rural women.¹¹

In Thailand, the “Better Border and Healthcare Program” found that sending users text messages regarding antenatal care visits and immunizations increased the number of mothers and children attending scheduled appointments.¹²

SMS has several advantages over voice communication, but voice messages may provide accessibility to illiterate populations.

Mobile messages are generally delivered by either short message service (SMS) or voice messaging; both offer distinct advantages and disadvantages. SMS is available on an estimated 98% of mobile phones, does not require technical expertise to use, and is adaptable to multiple mHealth purposes.¹³ SMS messages can be accessed at user convenience and can be delivered to phones that are turned off or have flat batteries. In addition, telecom costs for SMS are

generally less expensive than costs for voice communication. Given these advantages, it is not surprising that SMS is the most common delivery method for mobile development services.¹³

Voice messages, although used less often in mHealth projects, offer the advantages of accessibility to illiterate populations, ability to contain more information per message than SMS, and ability to be recorded in any language (not all languages/characters are supported by SMS).¹⁴ In addition, recorded voice messages allow information to be conveyed by a clinical “character,” as used in Bangladesh by the Mobile Alliance for Maternal Action (MAMA), to build rapport and trust over time.¹⁵

Research comparing the outcomes of voice versus SMS messaging is limited in the mHealth literature, although user preference has been examined in a small number of studies. A U.S.-based study among literate English speakers found that 72% of participants in an mHealth program targeting exercise, diet, and smoking preferred to enroll in automated voice messages over SMS. Those who preferred SMS tended to be younger and to have higher levels of comfort with computers and higher levels of SMS use.¹⁶

The Mobile Technology for Community Health (MOTECHE) initiative in Ghana used a “Mobile Midwife” application to provide pregnant women with health education and reminders to access necessary medical services. Messages could be received in voice or SMS format, depending on the enrollees’ preference; 99% of enrollees chose voice.¹⁷

Questionnaires administered to potential mHealth users in Argentina, however, found that the users were similarly open to receiving SMS and voice messages during pregnancy, with 96% of participants willing to receive SMS messages and 87% willing to receive voice messages.¹⁸ To our knowledge, no studies have been conducted to determine the difference in acceptability, comprehension, or behavior change between users receiving messages through voice compared with SMS formats.

This article describes the messaging component of an mHealth pilot project in Malawi aimed at improving knowledge and uptake of home- and facility-based MNCH care practices using both SMS and voice message delivery modalities. We report findings from the pilot examining differences between SMS and voice messaging with regard to delivery success and quality of user experience, including acceptability,

comprehension, new information learned, and reported behavior change.

PROJECT DESCRIPTION

Chipatala Cha Pa Foni (CCPF) (“Health Center by Phone”) is a mobile health project of Concern Worldwide’s Innovations for Maternal, Newborn & Child Health initiative, and its partners VillageReach and the Malawi Ministry of Health (MOH). A nationwide campaign generated more than 6,000 ideas of how to improve quality of health services from community members in Malawi; one of the winning ideas became CCPF.

CCPF consists of a toll-free hotline offering protocol-based health information, advice, and referrals as well as a mobile messaging service offering automated tips and reminders for pregnant women, guardians of young children, and women of childbearing age. Starting in 2011, CCPF was piloted in 4 rural health center catchment areas in Balaka District in Southern Malawi, representing a population of 32,000 women of childbearing age, 24,000 children under 5, and 7,000 expected pregnancies per year. The pilot project aimed to improve the coverage and quality of RMNCH in Balaka District. Early success and interest has resulted in scale up to an additional 3 districts.

The hotline component of CCPF is staffed by individuals trained in RMNCH using modules from the MOH’s curriculum for community health workers (CHWs). When answering calls, hotline workers are prompted by software on touch screen devices to identify clients’ symptoms and/or information needs. They answer the questions, offer health advice, and provide information on when and where to seek care if clients have symptoms or danger signs that cannot be treated safely at home.

Hotline workers also offer eligible clients the opportunity to enroll in the tips and reminders mobile messaging service where they can access voice or SMS messages on a weekly basis. Messages offer timely information and reminders about important health services, based on the estimated date of delivery for pregnant women or the child’s age for caregivers of children under 1. The tips and reminders are intended to elicit behavior change by helping clients understand their susceptibility to and seriousness of common maternal and child health illness, and they provide cues to action, reminding pregnant women and caregivers of children to seek timely

When should I take my child for immunization?

My child has a fever, what should I do?

What can I feed my child to make him healthy?

Have questions about your child?
Call the toll-free hotline at 54747 from any Airtel phone.

54747

VILLAGE REACH

INNOVATIONS for maternal, newborn & child health

CONCERN WORLDWIDE

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A communication poster encourages caregivers of children to call the *Chipatala Cha Pa Foni* hotline to get answers to their health-related questions.

preventive care. Messages for women of childbearing age were added later in implementation.

During project design, we found that low literacy and phone ownership among the target population may limit access to the service. Although an estimated 75% of women over 15 years old in Balaka District are literate,¹ poor women and women living in rural areas are less likely to be literate than their wealthier and urban counterparts.¹⁹ Furthermore, a baseline assessment found that only approximately one-third of women of childbearing age in the catchment area owned a mobile phone.²⁰ Thus, we developed 3 message delivery modalities in



A hotline worker answers an incoming calling using a touch screen device that prompts the worker to identify the client's symptoms and information needs.

SMS messages were delivered more frequently than voice messages because they were shorter than the voice messages.

order to better accommodate individuals with low literacy or without access to personal phones:

1. **Pushed SMS Messages:** Clients with access to a personal or household mobile phone can automatically receive SMS messages on their mobile phones.
2. **Pushed Voice Messages:** Low-literacy clients with access to a personal or household phone can receive weekly recorded voice messages that are sent to the phone at a specific time each week.
3. **Retrieved Voice Messages:** Clients without access to a personal phone can access their weekly messages by calling the toll-free hotline from any phone and entering an appropriate code to hear their message.

Voice messages are more expensive to deliver so clients with personal phones who identified as being literate were generally encouraged to register for SMS. Low-literacy clients were offered the option of registering for voice messages. Prior to launch, each message delivery option was pilot tested among a small group of users in Balaka to ensure delivery and accessibility.

Due to low phone ownership in Balaka, we provided an additional point of access to CCPF. We originally planned to distribute phones to Malawi's paid cadre of CHWs. However, given the large number of potential users without access to a personal phone, community volunteers from each village were instead recruited in consultation

with traditional leaders in the area and provided with a low-cost phone. The volunteers were oriented to the program and provided with small incentives throughout the pilot period to encourage their continued participation. In order to provide phones to all volunteers, we sought partnerships that would allow us to stretch the budget to provide phones to a larger number of people than originally anticipated. Our telecom partner agreed to provide a discount on their basic low-cost promotional phones, which were ultimately purchased for the project.

Message Development and Content

Messages were developed in collaboration with MOH staff with different areas of expertise, with technical support from PATH, the Grameen Foundation, and BabyCenter. The content was designed to complement national policies and to address local myths and traditions around pregnancy and child rearing. The final content was reviewed and revised by a group of women from Balaka with experience working on RMNCH issues at the community level. Messages were initially developed in English and later translated to Chichewa and Chiyao, the primary local languages spoken in Balaka.

The final content was the same for both voice and SMS messages. However, SMS messages were delivered more frequently than voice messages because SMS messages were shorter than voice messages. Messages were delivered once or twice per week depending on the stage of pregnancy or age of the child. [Table 1](#) provides examples of SMS and voice messages.

Content was reviewed periodically and updates were made to include new information. For example, new information was added in mid-2012 about the launch of a new pneumococcal vaccine in Malawi.

Originally, CCPF relied on volunteers to advertise the service in the community. Later, CCPF staff started to attend antenatal care clinics to inform pregnant women about CCPF and to help them sign up for the service. In addition, large community events were held to inform community members about CCPF and how to access the service.

DATA AND METHODS

To understand the difference in delivery success and quality between the 3 different messaging modalities (pushed SMS, pushed voice messages,

TABLE 1. Sample SMS and Voice Messages

Subscriber	Message Type	
	SMS	Voice
Pregnant Women	<p>Message 1: When you and your family know that you are pregnant, a visit to ANC will help you understand everything you need to do to keep the baby healthy.</p> <p>Message 2: You and your growing baby need food for energy, body building, and protection. Meat, eggs, greens, vegetables, rice, and fruits help your baby grow.</p>	<p>The ANC is your partner in the pregnancy. It is important to go to all 4 of your visits and to use the tablets that they have given to you. Your baby is continuing to grow! Your baby's fingernails and fuzzy hair are appearing and it's able to do things like swallow and kick. In the next 3 weeks, your baby will double in size. Body building foods like meat, beans and eggs are important for you and your baby. Try to take some every day. And remember; only take medicines given to you by a nurse. Traditional medicines can be dangerous for your baby. You might be feeling that you need to urinate a lot. This is a normal part of pregnancy. Try to drink less water before bed. If you feel pain or burning when you urinate you may have infection.</p>
Caregivers of Children Under 1	<p>Message 1: Make sure your baby has its vaccination. In the first week, your baby should get polio vaccine by mouth and the BCG vaccine against TB by injection.</p> <p>Message 2: Keep the cord stump clean and dry. Do not force it to fall off. If there is discharge or redness visit the clinic. Infections can be serious.</p>	<p>Congratulations on being a new mom! This week, make sure your baby has all its vaccinations, including the polio vaccine and the BCG vaccine against tuberculosis. You should start breastfeeding immediately and remember to only give your child breast milk for the first 6 months of his life. Carry your baby close to your breasts because it will help give your baby good physical and emotional conditions and help you to grow close. Keep your baby's cord stump clean and dry and do not force it to fall off. If there is discharge or redness visit the clinic. Infections can be serious. Your baby should be placed on his back for sleeping until he is strong enough to roll over himself.</p>

Abbreviations: ANC, antenatal care; BCG, bacille Calmette-Guérin; SMS, short message service; TB, tuberculosis.

retrieved voice messages), we collected and analyzed information from routine monthly monitoring data and quarterly phone-based surveys with users.

Routine Monthly Monitoring

Data from the messaging service were monitored monthly from 3 technology sources built to deliver the service:

- **Hotline Software.** Built by Baobab Health, a Malawian nongovernmental organization providing eHealth solutions, the hotline software is protocol-based and guides hotline workers through each call according to information collected through interactions with the client. The software includes demographic information and tips and reminders enrollment.
- **Notification Application.** Built by Village-Reach, the application connects the hotline software to a communications server and pushes voice and SMS messages to enrollees with personal phones. This application records data on messages sent and successfully delivered.

- **INTELLIVR (IVR) Software.** Built by Yo! Uganda, a software company in Uganda, IVR hosts incoming calls and also serves as the outgoing-voice gateway for the tips and reminders service.

Monthly data for all enrolled clients from September 2011 through June 2013 were analyzed to describe the number and characteristics of enrollees by delivery modality as well as delivery success rates.

Quarterly Phone-Based Surveys

Starting roughly 3 months following the launch of CCPF, periodic phone-based surveys were conducted among a sample of enrollees. Clients enrolled in pushed SMS and voice messaging services were randomly selected from a list of all enrollees and were contacted directly using the phone number for message delivery. Because we did not have phone numbers for clients enrolled in the retrieved voice message service, random selection was not feasible. Instead, we sent community volunteers an SMS asking them to identify a woman in their area who had used the service and

to notify hotline staff once they gave the community phone over to the client. At that time, the client was contacted directly for the survey.

For all participants, a hotline worker or volunteer administered the questionnaire, which collected information on frequency of messages received and quality of the experience. Quality of user experience was measured as:

- **Acceptability:** proportion of respondents who indicated they trust the messages
- **Comprehension:** proportion of respondents who could describe the last message they received; the description given by the respondent was then checked in the analysis phase against the messages the respondent should have received
- **New information learned:** proportion of respondents who indicated they learned new information about their pregnancy or child's health and could list topics they deemed to be new information
- **Reported behavior change:** proportion of respondents indicating a health behavior change or intent to change behavior based on the messages received. Behavior change intent was scored according to a series of questions regarding specific behaviors targeted in the

The majority of subscribers enrolled in the "retrieved voice messaging" service because they did not own a personal phone.

messaging. For pregnant women, these behaviors include number of antenatal care visits, food and medicine consumption, and place of delivery. For caregivers of children, these behaviors include medicine and vaccinations for the child, exclusive breastfeeding, and number of postnatal care visits.

The survey was implemented at 3, 6, 12, and 18 months following the launch of the service. Data from 266 questionnaires were entered into an Excel spreadsheet and analyzed using STATA version 10.

RESULTS

Routine Monthly Monitoring

During the first 2 years of implementation (through June 2013), more than 5,000 pregnant women and caregivers of children under 1 registered for the tips and reminders service. Client registration data were collected starting in July 2011, when clients could begin registering for the service, while monitoring of delivery success rates started in September 2011 when the messaging service was officially launched.

Table 2 displays the number of registered clients and demographics by content type and delivery method. More than half of clients enrolled in the retrieved voice service, nearly one-third enrolled in the pushed SMS service, and less than 10% enrolled in the pushed voice message service. The mean age of pregnant enrollees was 25, and they registered, on average, 16 weeks before their estimated due date. Caregivers of children under 1 registered, on average, 36 weeks before their child's first birthday.

Characteristics of clients were similar across service types with the exception of occupation. Pregnant women who registered for pushed SMS messages were more likely to be employed in the formal sector than those who registered for (pushed or retrieved) voice messages. Formal sector includes those who reported their occupation as "business," "health care worker," or "teacher." Informal sector includes those who reported their occupation as "farmer," "housewife," "student," or "other."

The proportion of messages successfully pushed and retrieved varies by month. For pushed messages (SMS and voice), success rates represent the number of messages successfully received after 3 attempts divided by the number of messages attempted. For retrieved voice

TABLE 2. Demographics of Registered Users, by Subscriber Type and Delivery Method (July 2011–June 2013)

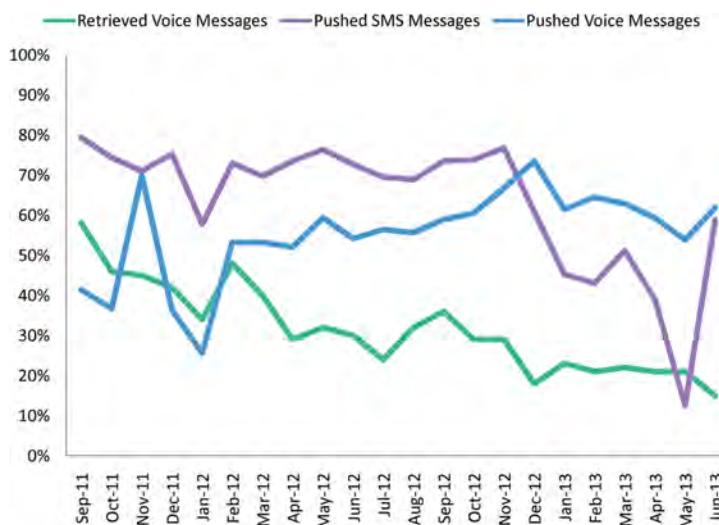
	Pushed SMS	Pushed Voice	Retrieved Voice
Pregnant Women			
No. of registered users	704	238	1,559
Age, mean, y	25	26	25
Employed in formal sector, %	13	9	8
No. of weeks eligible for messages, mean	16	16	16
Caregivers of Children Under 1			
No. of registered users	733	224	1,654
Age of child, mean, mo	4	4	4
Female, %	54	53	55
No. of weeks eligible for messages, mean	36	35	36

messages, success rates represent the number of messages successfully retrieved from the IVR menu divided by the number of messages we estimate should have been retrieved each month. Overall success rates for pushed SMS and voice messages ranged from 54% to 64% and were higher for pushed SMS than for pushed voice messages (Table 3). Success rates for retrieved voice messages were lower, at 27% to 38%.

Delivery success changed over time, with the proportion of pushed voice messages successfully delivered to a personal phone increasing slightly over time, and the proportion of retrieved voice messages successfully delivered decreasing over time (Figure 1). Pushed SMS delivery success rates remained relatively stable over time, with a decline in the beginning of 2013, as a result of a number of technical issues. For example, configuration changes by the telecom provider unintentionally reduced the number of times our system attempted to send messages, resulting in messages being attempted less than 3 times. The issue has since been rectified, but it affected success rates for January–May 2013.

To better understand voice message retrieval rates, we also calculated the proportion of messages successfully played based on the number of attempts (Figure 2). This proportion is calculated from the number of times the message menu is reached (that is, a person calls CCPF’s toll-free number and enters “2” to hear a message and then “1” to hear a pregnancy message) and how many times messages are played. Using this definition of delivery success for retrieved voice messages, messages were successfully played in 56% of the instances when the message menu was reached, and success was slightly higher for messages played from the

FIGURE 1. Delivery Success Rates of Messages Over Time, by Delivery Method, September 2011–June 2013



Success rate for pushed SMS and voice messages is the percent of messages successfully received within 3 attempts; for retrieved voice messages, the success rate is the percent of expected messages successfully retrieved.

child message menu than messages played from the pregnancy message menu (60% versus 54%).

The SMS service had higher delivery success rates than the pushed or retrieved voice messaging services.

Phone-Based Surveys

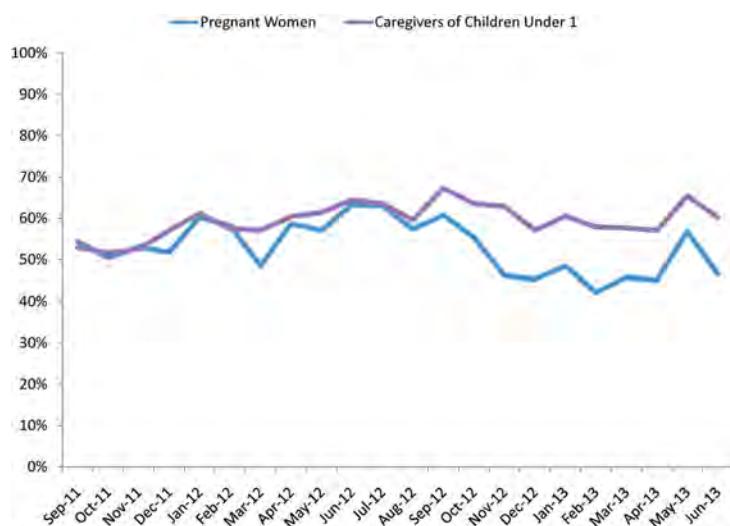
Hotline workers and volunteers were able to reach 266 total clients for the phone survey. Of those, 96 were enrolled in the pushed SMS service, 30 in the pushed voice service, and 140 in the retrieved voice service (Table 4).

TABLE 3. Delivery Success of Messages, by Delivery Method and Subscriber Type (September 2011–June 2013)

Messages	Pushed SMS		Pushed Voice		Retrieved Voice	
	Pregnancy	Child	Pregnancy	Child	Pregnancy	Child
No. attempted or expected ^a	19,356	20,363	3,022	2,815	32,054	52,829
No. successfully received or retrieved	11,825	13,053	1,820	1,515	12,257	14,455
Percent success	61%	64%	60%	54%	38%	27%

^a For retrieved voice messages, the expected number of messages retrieved is calculated weekly based on the number of current subscribers. For pushed SMS and voice messages, the number of messages attempted was based on actual number of attempts.

FIGURE 2. Percentage of Successful Message Retrieval Attempts Among Retrieved Voice Message Subscribers, by Type of Subscriber, September 2011–June 2013



SMS subscribers were significantly more likely to report intended or actual behavior change than voice subscribers.

Slightly more clients enrolled to receive messages about child health than about pregnancy were included in the survey. At the time of the survey, SMS enrollees reported the highest number of messages received, at an average of 6.9 messages. Pushed voice and retrieved voice enrollees included in the survey had received an average of 3.1 and 3.7 messages, respectively, at the time of survey. Overall, 19% (51) of respondents indicated that they had not yet received any messages, the majority of which (29) were among pushed voice enrollees.

TABLE 4. Phone-Based Survey Sample Characteristics, by Delivery Method

	Pushed SMS (n=96)	Pushed Voice (n=30)	Retrieved Voice (n=140)	Total (N=266)
No. of subscribers				
Pregnancy messages	48	13	66	127
Child messages	48	17	74	139
No. of messages received, mean	6.9	3.1	3.7	4.7

Overall, 99% of respondents reported trusting messages they received (acceptability), and 75% recalled the last message they received (comprehension) (Table 5). Pushed SMS and retrieved voice enrollees were more likely than pushed voice enrollees to recall the last message received, but the observed differences were not statistically significant.

Just over three-quarters of enrollees indicated that they had learned something new from the messaging service and were able to describe the new information. Pushed SMS enrollees were more likely to respond that they had learned something new.

Almost three-quarters of respondents reported that they had already changed or intended to change their behavior based on the messages they received. Pushed SMS enrollees were significantly more likely to report intended or actual behavior change than voice enrollees ($P=.01$). See box for examples of behaviors that respondents said they intended to change.

DISCUSSION

Understanding the effects of message modality is important when deciding between SMS or voice message services in mHealth programs. Although SMS is a common and effective method, voice messages may be a desirable option based on literacy levels and mobile phone access.

The data presented in this article reveal that delivery success rates for all message modalities are less than ideal. Phone network challenges in rural Balaka were commonly reported by community volunteers and clients throughout the pilot period and likely contributed to the overall low success rates.

Message delivery rates are far more successful among SMS than voice enrollees. Pushing voice messages to clients with personal phones is a complex process, requiring the client to answer the phone at the time of delivery, whereas SMS messages can be delivered at any time, including when the phone is turned off. We believe this is the major reason that SMS messages pushed to personal phones have a higher delivery success rate than voice messages.

During the first few months of implementation, we varied the times that we pushed voice messages to users to find times that clients were most likely to be available to answer the phone. When tips and reminders were launched, voice messages were attempted hourly between 12:00

pm and 6:00 pm local time (CAT) because anecdotal reports indicated that phones were most likely to be charged and switched on during daylight hours. In November 2011, we pushed the voice messages between 2:00 pm and 6:00 pm because we noted more successful attempts occurred during that timeframe. In early 2012, we discovered a configuration problem between the telephone card and the telecom provider that was also contributing to the low delivery success rate. After changing the timing that we pushed the voice messages and fixing the configuration problem, delivery success rates for pushed voice messages increased, but the delivery success rate remained highest for pushed SMS messages.

Retrieved voice messages have the lowest delivery success rate, and this rate decreased over time. Retrieving voice messages from the IVR menu using a community phone requires initiative on behalf of the client who must seek out a volunteer in order to access the community phone. In addition, it requires the volunteer to be available. There were some instances where volunteers moved away from their assigned village or became inactive over time. It is also possible that some community volunteers acted as gatekeepers to the service. We heard anecdotal reports of a small number of volunteers refusing to give out the CCPF telephone number or telling clients that the service must be accessed through a community phone rather than a personal phone.

Furthermore, many community phones broke during the project period, limiting access to the service for community phone users. The phones given to community volunteers were low cost, and approximately 60% of the phones distributed to volunteers were not working 2 years after the original implementation began. It is likely that the unreliability of community phones played a role in the low delivery success of retrieved voice messages in 2 ways:

- Malfunctioning keypads made it difficult to enter an accurate estimated due date or child’s birthday in order to hear a message. This is a major reason stated by both volunteers and users for why numerous calls that reached the voice message menu never successfully heard a message.
- Clients who signed up for voice messages in a village where the phone eventually broke were unlikely to find another way to access the service. Some users stated that after the community phone in their village broke, they

TABLE 5. Quality of User Experience, by Delivery Method

Outcome	Pushed SMS (n=96)	Pushed Voice (n=30)	Retrieved Voice (n=140)	Total (N=266)
Acceptability	99%	94%	100%	99%
Comprehension	75%	63%	76%	75%
New information	79%	76%	71%	77%
Behavior change (intended or actual)	91%	56%	66%	74%

Missing information was excluded from the analysis. If respondents answered that they had not received any messages, they were not asked questions about the message service.

no longer accessed the CCPF hotline or voice messages.

The data also reveal that delivery success for retrieved voice messages is significantly higher among users subscribed to pregnancy messages than users subscribed to child messages (based on the definition of success used in Table 3). Pregnant users registered an average of 16 weeks before their estimated due date while caregivers of children registered an average of 36 weeks before their child’s first birthday. It is possible that the average pregnancy-message enrollee was more likely to take the initiative to visit a community volunteer because the eligibility period was shorter than for the average child-message enrollee. Similarly, it is less likely that a community volunteer would become inactive or the community phone would break during a shorter eligibility period. For pushed message enrollees, there is no clear relationship between message type and success rates because delivery success of voice messages was significantly higher among pregnancy-message enrollees than child-message enrollees, but the opposite was true for pushed SMS messages.

Although delivery success was higher among pushed SMS messages compared with other delivery modalities, the data reveal that clients were highly satisfied with and trusted the voice and SMS messages equally and were likely to learn new information and recall messages regardless of message delivery modality. SMS enrollees, however, were significantly more likely to report intended or actual behavior change than pushed voice enrollees. We suspect that this

Shorter and more frequent messages in the form of SMS may be more effective at prompting behavior change than longer voice messages.

may be because voice messages can only be heard once while SMS messages can be saved in the client's inbox and read multiple times, and even shared with others. It is also possible that shorter and more frequent messages in the form of SMS are more effective at eliciting intended behavior change than longer voice messages that are delivered once per week. Finally, the differing characteristics of individuals who sign up for SMS messages might make them more willing or able to change their behavior.

At baseline, this mHealth project discovered that most women in the project area did not own a mobile phone. To address this problem, we provided an additional access point by providing community volunteers with mobile phones. Although the solution was not perfect, our study demonstrates that it is feasible to provide low-literate clients without a personal phone with mobile health information and to stimulate behavior change. Although delivery success was the lowest for retrieved voice message subscribers, approximately 1,200 voice messages were successfully retrieved each month. A similar number of pushed SMS and voice messages were successfully delivered each month. This finding emphasizes the importance of recognizing that mobile health messaging can potentially marginalize populations without access to mobile phones if efforts are not made to adapt mHealth projects to meet the needs of the population. Not surprisingly, phone ownership is inversely correlated

with poverty,²¹ and women and people living in rural areas are also less likely to own mobile phones than their male and urban counterparts.¹⁹ Thus, offering a retrieved voice message option for those without personal phones is an important strategy to deliver health messages to an otherwise hard-to-reach population.

Limitations

There are a number of important limitations to consider when interpreting the data. First, data from the hotline software (such as demographic data and tips and reminders enrollment status) were entered by hotline workers during calls with clients, and mistakes were common. Implausible data points, such as estimated due dates that were more than 9 months from the call date, had to be excluded. In addition, the data available from the IVR software are by call and cannot be grouped by unique caller, making it difficult to draw conclusions about individual behavior.

Second, our calculation for the number of messages retrieved by voice message subscribers provides only an estimate and is not completely analogous to the success rate for pushed messages. Pushed message success rates are based on 3 attempts while the retrieved message success rate is based on an unknown number of attempts since a subscriber can attempt to retrieve a message an unlimited number of times. Furthermore, some subscribers likely do not try

BOX. Quality of User Experience: Selected Examples Reported by Survey Respondents

Recalled messages:

- I should breastfeed my child up to 6 months without giving supplementary foods.
- If the child has shown signs of drying in the mouth, I should run to the hospital.

New information:

- I have learnt how to solve small problems without going to hospital.
- The child is supposed to receive measles vaccine.

Intended or actual behavior change themes:

- The number of antenatal care visits I plan to attend.
- The types of foods I am eating.
- The age I will give my baby food other than breast milk.
- How often my child sleeps under a bed net.

at all. The proportion of message retrieval attempts where a message is successfully played (Figure 2), however, is based on only 1 call attempt and cannot tell us about individual behavior. For example, if 50% of message retrieval attempts are successfully played, we cannot determine whether this translates to 10 unique callers attempting to retrieve a message and only half are successful, or 5 unique callers each trying to retrieve a message twice and failing once and successful on their second try.

There were also a number of limitations to the type of study design used for the phone-based surveys. First, the characteristics of enrollees that largely determined their enrollment type, such as literacy level and access to a personal phone, could be associated with their level of trust, comprehension, and knowledge, and/or behavior change reported during the survey. Thus, any differences observed in survey responses between the different delivery methods may be attributable to characteristics of the sample and not necessarily the delivery method. In addition, among retrieved voice message enrollees, the sample was not randomly selected. Although the community volunteers did not know the purpose of their assignment to identify a client, it is possible that they chose women according to certain characteristics that may bias the sample. We did not collect enough demographic information during the phone surveys to be able to control for potential confounding characteristics. Also, information collected about the enrollees' maternal and child health knowledge and/or behavior change intent relied on self-report, which may present an additional form of bias. Because surveys were conducted by CCPF staff or volunteers, respondents may have wanted to provide answers that they felt were acceptable to the surveyor. Thus, satisfaction, trust, and behavior change indicators may be inflated. On the other hand, respondents were asked to describe their last message and new information learned. Because the information provided was cross-checked against messages sent to the respondent, these indicators are less susceptible to bias. Finally, the sample size is small, making detection of small differences in outcomes difficult.

CONCLUSION

Mobile technology, specifically SMS and voices messages, can be successfully used to extend health information services to pregnant women



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A woman uses a community volunteer's mobile phone to access the health message delivered by the *Chipatala Cha Pa Foni* project.

and caregivers of young children in rural Malawi. All 3 message modalities led to high levels of satisfaction, comprehension, and new information learned. Due to lower cost, higher delivery success, and higher levels of intent to change behavior, SMS is the preferred delivery modality when possible.

Implementing mHealth projects in areas with low phone penetration creates unique challenges in ensuring access and generating demand. By adapting the service to the context—allowing users to retrieve voice messages from the IVR system without a personal phone and providing community volunteers with phones to serve as access points to the service—this rural population gained access to the mHealth service that would not otherwise have been possible. Although these adaptations presented their own challenges, particularly apparent in the low success rate of retrieved messages, availability of community volunteers, and the difficulty sustaining the volunteer model over time as phones began to break, providing multiple methods by which users could access the service was crucial in extending reach beyond literate personal phone owners.

Further research to understand potential models for increasing access to mobile phones among low-literate, rural populations is warranted. Prior to implementing a similar service, it is important to understand the cost-effectiveness of the intervention and cost implications at

scale. At the time of this study, an economic evaluation of CCPF was underway. Finally, further research examining the translation of health information transmitted through mobile phones into healthy behaviors is needed to understand the potential impact of mHealth interventions on their intended health outcomes.

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ORIGINAL ARTICLE

Introduction of the levonorgestrel intrauterine system in Kenya through mobile outreach: review of service statistics and provider perspectives

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Limited introduction of the LNG IUS through mobile outreach in Kenya, without any special promotion, resulted in good uptake. And providers viewed it positively, particularly because of its noncontraceptive benefits. Increased provision of the LNG IUS can improve options for women needing highly effective reversible contraception.

ABSTRACT

Background: The levonorgestrel intrauterine system (LNG IUS) was developed over 30 years ago, but the product is currently too expensive for widespread use in many developing countries. In Kenya, one organization has received donated commodities for 5 years, providing an opportunity to assess impact and potential future role of the product.

Methods: We reviewed service statistics on insertions of the LNG IUS, copper intrauterine device (IUD), and subdermal implant from 15 mobile outreach teams during the 2011 calendar year. To determine the impact of the LNG IUS introduction, we analyzed changes in uptake and distribution of the copper IUD and subdermal implant by comparing periods of time when the LNG IUS was available with periods when it was not available. In addition, we interviewed 27 clinicians to assess their views of the product and of its future role.

Results: When the LNG IUS was not available, intrauterine contraception accounted for 39% of long-acting method provision. The addition of the LNG IUS created a slight rise in intrauterine contraception uptake (to 44%) at the expense of the subdermal implant, but the change was only marginally significant ($P=.08$) and was largely attributable to the copper IUD. All interviewed providers felt that the LNG IUS would increase uptake of long-acting methods, and 70% felt that the noncontraceptive benefits of the product are important to clients.

Conclusions: The LNG IUS was well-received among providers and family planning clients in this population in Kenya. Although important changes in service statistics were not apparent from this analysis (perhaps due to the small quantity of LNG IUS that was available), provider enthusiasm for the product was high. This finding, above all, suggests that a larger-scale introduction effort would have strong support from providers and thus increase the chances of success. Adding another proven and highly acceptable long-acting contraceptive technology to the method mix could have important reproductive health impact.

INTRODUCTION

In many countries, the levonorgestrel intrauterine system (LNG IUS) has become an important reproductive health commodity. The most recent example is from the United States, where it was approved 13 years ago. The LNG IUS is now more popular in the United States than any new contraceptive product introduced since 1992, including the DMPA (depot medroxyprogesterone acetate) injectable

(1992), the vaginal ring (2001), the contraceptive patch (2002), and the etonogestrel implant (2006).^{1–3} In resource-poor countries, the commercial LNG IUS product may be available in the private sector, but only the highest socioeconomic classes can realistically afford it. In Kenya, for example, the commercial product costs approximately US\$200.

Cost is not the only consideration when contemplating the potential role and impact of the LNG IUS. Although the LNG IUS is a form of intrauterine contraception, as is the copper intrauterine device (IUD), it should not be viewed as simply another IUD. The LNG IUS and the copper IUD have striking

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TABLE 1. Comparing the LNG IUS and the Copper IUD

Points of Comparison	LNG IUS	Copper IUD
Main difference	Hormonal (levonorgestrel)	Nonhormonal
Main effects on menstruation	Generally <i>decreases</i> menstrual blood loss	Generally <i>increases</i> menstrual blood loss
Duration of use	5 years	10–12 years
Noncontraceptive benefits (stemming from reduced uterine bleeding)	Treats menorrhagia, increases hemoglobin, and likely alleviates anemia and problems with uterine fibroids	...
Effectiveness	Both in the highest tier of contraceptive effectiveness	
Continuation rates	Both have similar, high continuation rates	

Abbreviations: IUD, intrauterine device; LNG IUS, levonorgestrel intrauterine system.

differences in side effects and noncontraceptive benefits. However, in terms of effectiveness and other factors, the products have important similarities as well (Table 1).^{4,5}

A noncommercial LNG IUS product is currently being introduced on a very limited basis into some programs in resource-poor countries through donations from the International Contraceptive Access (ICA) Foundation (a partnership between Bayer Healthcare Pharmaceuticals and the Population Council). Since inception in 2003, the ICA Foundation has donated nearly 50,000 LNG IUS devices to 19 countries.⁶ In recipient programs, the LNG IUS is provided free-of-charge alongside established contraceptives so women can have expanded choice. Programs are embracing the donations so their clients can benefit from state-of-the-art contraception.

When new contraceptives become available, they generally improve reproductive health in the affected population. In a multicountry analysis, Jain found that overall contraceptive use rises with increased method choice,⁷ and a review of international data over 27 years showed that as each additional contraceptive method became available to most of the population, overall modern contraceptive use rose.⁸ A systematic review found that increased choice raises contraceptive uptake, improves health outcomes, and improves adherence.⁹ In contrast, Sutherland et al. analyzed data from 13 countries and found that the rise in injectable use was partially offset by declines in use of other methods,¹⁰ whereas Ross found macro-level evidence that expansion of injectables attracted new users to family

planning.¹¹ Recent introduction of a natural family planning method resulted in sizeable uptake in 3 country programs.¹²

At the family planning program level, it is important to know how a new product might alter the pattern of method uptake and services. For example, a new method might attract new clients and overburden the service delivery system, particularly if the new method requires more time and effort to provide. If a new method becomes popular, a program will need to purchase enough product to satisfy demand, and potentially decrease orders of other products if a contraceptive substitution effect occurs.

During any product introduction process, providers' opinions are critical. Given their important role in contraceptive counseling,¹³ providers can help shape the impact of a new product. Previous research has shown that family planning counselors are more likely to recommend methods that they use themselves,¹⁴ and client uptake of methods is also linked to providers' personal method use.¹⁵ Similar patterns have been seen in the use of hormone replacement therapy.¹⁶ In many settings, decades can pass before initial introduction leads to widespread national availability.

Since 2008, the Marie Stopes affiliate in Kenya (MSK) has provided free LNG IUS services to approximately 5,000 women. Thus, during this time, some clients had one additional long-acting reversible contraceptive (LARC) choice, which also includes subdermal implants and all types of intrauterine devices. We undertook this project at MSK to better

The more contraceptive methods available, the greater the contraceptive prevalence generally.

understand the impact of the LNG IUS introduction efforts.

METHODS

We used anonymous MSK service statistics and interviews with MSK providers to evaluate the LNG IUS introduction activity. This research was approved by the Protection of Human Subjects Committee (of FHI 360) and the Kenya Medical Research Institute's Ethical Review Committee. The MSK providers voluntarily agreed to be interviewed through an informed consent process that was approved by these committees.

The LNG IUS product was used in MSK's outreach program, which consists of 15 teams in different geographic regions of Kenya. Each team has 2 clinicians (1 medical doctor and 1 nurse) and 2 care assistants; the teams visit catchment public-sector health facilities on a rotating basis to provide family planning services.

We reviewed MSK's existing (internal) reporting systems to tabulate the monthly number of contraceptive method insertion procedures for each of the 15 outreach teams during the 2011 calendar year. We developed an electronic database and entered into a spreadsheet the number of insertions for the LNG IUS, copper IUD, and subdermal implant. Of the 15 teams, 4 did not receive any LNG IUS in the study period and were excluded from the analysis. Of the possible 132 total available months across the 11 teams, 2 months with no LARC insertions (all 3 methods combined) were excluded from the calculations. Thus, a total of 130 months of data were included in the analysis.

For each team, we computed the mean number of monthly product insertions. In some months and in some teams, the LNG IUS was not available. Thus, we examined how the average proportions of total IUD (copper IUD plus LNG IUS) versus subdermal implant insertions varied per month, by whether or not the LNG IUS was available. We used a *t* test to determine whether availability of the LNG IUS increased total IUD insertions, relative to the subdermal implant.

For feedback on the LNG IUS product, we interviewed 27 MSK providers. We asked a variety of questions to characterize their views and their clients' views on the new product.

RESULTS

During the 2011 calendar year, the outreach program provided over 67,000 women with

TABLE 2. LARC Insertions Performed by 11 Outreach Teams of Marie Stopes/Kenya, 2011

Device	Total No.	Mean ^a (range)
Copper IUD	26,070	201 (20, 509)
Subdermal implants	40,146	309 (25, 772)
LNG IUS	1,030	8 (0, 116)

Abbreviations: IUD, intrauterine device; LARC, long-acting reversible contraceptive; LNG IUS, levonorgestrel intrauterine system.

^a Per outreach team, per month.

LARCs: 39% chose the copper IUD, 60% the subdermal implant, and 1% the LNG IUS (Table 2). During this time period, 11 outreach teams provided a total of 1,030 LNG IUS insertions. On a monthly basis, the mean number of insertions per team varied considerably for each product: 201 for the copper IUD, 309 for the subdermal implant, and 8 for the LNG IUS.

During months when the LNG IUS was not available, IUD services accounted for an average of 38.9% of total LARC services (Table 3). The average proportion of women selecting an IUD (copper IUD or LNG IUS) rose slightly (to 44.3%) when the LNG IUS was available, but the change was only marginally significant ($P = .08$). The modest increase was largely attributable to the high volume of copper IUDs relative to the volume of the LNG IUS. The relative importance of the IUD versus the implant varied considerably across the different teams, regardless of whether the LNG IUS was available.

In the survey of MSK providers, varying experiences with the LNG IUS were noted (Table 4). For example, nearly half of the MSK providers inserted 51 or more LNG IUS while 11% had not inserted even 1 device. About half of providers felt equally comfortable describing and providing all 3 long-acting methods (the implant, the copper IUD, and the LNG IUS). For the half who were not equally comfortable with describing/providing all 3 long-acting methods, they were most comfortable with the subdermal implant and least comfortable with the LNG IUS. All respondents felt that the LNG IUS would attract new clients to long-acting methods, and 70% believed that the noncontraceptive benefits of the product were very important to their clients.

The average proportion of women selecting either a copper IUD or LNG IUS rose slightly when the LNG IUS was available.

All interviewed providers felt that the LNG IUS would attract new clients to long-acting methods.

TABLE 3. Mean Number of Monthly LARC Insertions and Proportion of IUD Insertions per Marie Stopes/Kenya Outreach Team, by LNG IUS Availability,^a 2011

Team	LNG IUS Not Available				LNG IUS Available					
	No. of Months	Implants	Copper IUD	% IUD ^b	No. of Months	Implants	Copper IUD	LNG IUS	Total IUD ^c	% Total IUD ^b
1	4	566	227	29.5	8	424	242	5	247	37.3
2	10	329	165	38.3	1	416	147	3	150	26.5
4	5	273	164	43.5	6	352	138	9	147	29.5
7	8	278	159	37.4	4	368	174	3	177	32.8
8	1	285	193	40.4	11	227	128	14	142	43.0
9	10	447	188	31.4	2	306	205	10	215	42.7
11	6	391	215	33.5	6	408	291	9	300	41.9
12	2	147	268	66.4	10	229	281	38	319	60.7
13	6	254	310	59.1	6	328	314	14	328	52.1
14	2	185	486	72.4	10	181	205	19	224	54.9
15	9	210	72	26.9	3	273	45	10	55	19.2
Total	63	322	191	38.9	67	296	210	15	225	44.3

Abbreviations: IUD, intrauterine device; LARC, long-acting reversible contraceptive; LNG IUS, levonorgestrel intrauterine system.

^a *P* value=.08 for testing whether the relative monthly distribution of IUD vs. implants is different depending on availability of the LNG IUS.

^b Mean of the proportion of women receiving IUDs per month.

^c Total IUD is the sum of copper IUD and LNG IUS insertions.

Dedicated LARC providers can help improve access to contraceptive methods.

In distinguishing the LNG IUS from the copper IUD, providers cited these main features: hormonal product (85%), reduces bleeding (52%), and 5-year duration of use (44%) (Table 5). Nearly 60% of providers cited reduction in menstrual bleeding as a key “attractive” attribute for clients. Forty-four percent of providers reported that the hormonal content of the product is a feature that clients find unattractive. Reduction of menstrual blood loss was the primary noncontraceptive benefit reported by 52% of providers.

DISCUSSION

Introduction of the LNG IUS through the Marie Stopes/Kenya outreach program had mixed impact. On the one hand, availability of the LNG IUS did not appear to alter provision of standard long-acting reversible methods (the subdermal implant and the copper IUD); the pattern of service statistics did not change for

the program as a whole and for most of the outreach teams that provided the LNG IUS. However, MSK providers unanimously believed the LNG IUS would attract new clients to long-acting methods, at least partly due to the important and unique noncontraceptive benefits that the technology offers. The high volume of copper IUD services (typical for this program) demonstrated high acceptability of this product among both providers and clients. Thus, this is another example of how dedicated LARC providers are successful at making important technologies available.

A previous introduction assessment of the LNG IUS in Ghana had similar results to ours.¹⁷ For example, availability of the product did not significantly alter provision of other methods. (However, the small quantity of product may have made this difficult to assess adequately.) Another similarity was found in terms of positive provider feedback about the LNG IUS; all Ghanaian providers found the product easy to

TABLE 4. Experiences With the LNG IUS Among Marie Stopes/Kenya Providers (N=27)

Provider Experiences	% Distribution
Number of LNG IUS insertions performed since completing training	
0	11
1–10	26
11–50	15
51+	48
Method <i>most</i> comfortable describing and providing	
Copper IUD	0
Subdermal implant	48
LNG IUS	0
All the same	52
Method <i>least</i> comfortable describing and providing	
Copper IUD	4
Subdermal implant	0
LNG IUS	44
All the same	52
Do you think clients easily understand the difference between the copper IUD and the LNG IUS?	
No	30
Yes	70
Is the 10+ years duration of use for the copper IUD a significant reason women will choose it instead of the LNG IUS that only lasts for 5 years?	
No	52
Yes	44
Do not know	4
Did you ever have a stockout of the LNG IUS?	
No	4
Yes	96
If the LNG IUS is not available, what method do women choose instead?	
Subdermal implant	70
Copper IUD	30
Other	0
Will the LNG IUS attract new clients to long-acting contraception?	
No	0
Yes	100
How important are noncontraceptive benefits of the LNG IUS to your clients?	
Very important	70
Somewhat important	30

Abbreviations: IUD, intrauterine device; LNG IUS, levonorgestrel intrauterine system.

TABLE 5. Main Attributes of LNG IUS Cited by Marie Stopes/Kenya Providers (N=27)

Attribute	% Distribution
Key information provided to clients to distinguish the LNG IUS from the copper IUD ^a	
Hormonal product	85
Reduces bleeding	52
Duration of use	44
Works locally in uterus	15
Prevents cancer	15
Aspects of the LNG IUS that are <i>attractive</i> to clients ^a	
Reduction of excessive menstrual bleeding	59
5-year product	15
Hormonal effect	15
Plastic/nonmetallic	15
Duration of use	15
Aspects of the LNG IUS are <i>unattractive</i> to clients ^a	
Contains hormones	44
Insertion procedure/modesty issues	22
Strings cause discomfort during sex	19
What are the most important noncontraceptive benefits of the LNG IUS? ^a	
Reduces menstrual blood loss	52
Prevents cancer/uterine disease	22
Prevents anemia	22
Treats heavy menstrual blood loss	22
Alleviates pain during menses	15

Abbreviations: IUD, intrauterine device; LNG IUS, levonorgestrel intrauterine system.

^a Multiple responses allowed; only responses garnering at least 1.5% (n=4) are shown.

insert, and all stated that their clients were satisfied with it. A more general assessment of the global LNG IUS donation activities highlighted the importance of working with in-country “product champions” and committed service-delivery counterparts with IUD insertion experience.¹⁸

Providers in our study candidly reported being most comfortable describing and providing the subdermal implant; this finding exposes some of the challenges for wider provision of intrauterine contraception. Reasons for being more comfortable with subdermal implants could simply be a

function of higher client demand and thus more frequent counseling about and insertion of implants. However, if providers are reluctant to offer intrauterine contraception, due to perceived lack of expertise or for other reasons, a feedback loop of diminished contraceptive choices could develop. Although there is certainly no evidence that this is occurring at MSK, it is critical that providers maintain skills and confidence with all LARCs.

A larger contemporary concern across sub-Saharan Africa is widespread absence of LARC services in public-sector settings, where providers

and health systems as a whole typically rely on provision of short-acting methods. Providers are subject to many personal and external influences that can ultimately limit contraceptive choice for their clients.¹⁹

Limitations and Strengths of the Study

Our study in Kenya had important limitations. First, this introduction of the LNG IUS was not conducted in a promotional or scientifically rigorous way to measure the impact. For example, clients were probably not aware of the product until they spoke to the provider; thus, it is not possible to conclude anything about true demand for the LNG IUS. However, it is feasible that unmeasured word-of-mouth could have prompted some women to visit the clinic on MSK outreach days. Second, we did not conduct an experiment on the impact of the product introduction; the work was retrospective and observational of a program and not of a controlled intervention. Lastly, the quantity of LNG IUS (1,030 units) was very small relative to the other products (over 66,000 units); if unlimited supplies of the LNG IUS were available, it is possible that a different picture would have emerged. For purposes of the analysis, we assumed that zero LNG IUS insertions in a given month meant that the product was not available at that time.

The major strength of this LNG IUS introduction project is that it was done in a natural program setting, where clinicians simply offered the new product without a research aim or protocol. Also, MSK had several years of experience with the LNG IUS before data collection and interviews took place. Thus, perhaps the provider feedback is a more experienced and reflective view of the LNG IUS technology.

CONCLUSION

The LNG IUS was developed in the 1970s and is long overdue for introduction into resource-poor settings. High product cost is the current barrier to more widespread use. New LNG IUS products made by Indian companies are currently available in India,^{20,21} and a U.S.-based company is currently seeking approval from the U.S. Food and Drug Administration for its version of the LNG IUS technology.²² These products hopefully will become available to resource-poor countries at a reasonable cost to international donor agencies. In summary, the results from this

study suggest that the LNG IUS will have provider support and enthusiasm, which in turn can improve options for women needing highly effective reversible contraception.

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ORIGINAL ARTICLE

Moving malaria in pregnancy programs from neglect to priority: experience from Malawi, Senegal, and Zambia

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Program areas that were generally working well in malaria in pregnancy programs (MIP) included: (1) integration of MIP interventions into antenatal care; (2) development of up-to-date policies; (3) active involvement of communities; and (4) development of capacity-building materials for training. Challenges remain in the areas of: (1) commodities; (2) quality assurance; (3) monitoring and evaluation; and (4) financing.

ABSTRACT

Background: Pregnant women and infants are particularly vulnerable to malaria. National malaria in pregnancy (MIP) programs in Malawi, Senegal, and Zambia were reviewed to identify promising strategies that have helped these countries achieve relatively high coverage of MIP interventions as well as ongoing challenges that have inhibited further progress.

Methods: We used a systematic case study methodology to assess health system strengths and challenges in the 3 countries, including desk reviews of available reports and literature and key informant interviews with national stakeholders. Data were collected between 2009 and 2011 and analyzed across 8 MIP health systems components: (1) integration of programs and services, (2) policy, (3) commodities, (4) quality assurance, (5) capacity building, (6) community involvement, (7) monitoring and evaluation, and (8) financing. Within each program area, we ranked degree of scale up across 4 stages and synthesized the findings in a MIP table of analysis to reveal common themes related to better practices, remaining bottlenecks, and opportunities to accelerate MIP coverage, strengthen MIP programs, and improve results.

Findings: Each of the 3 countries has malaria policies in place that reflect current MIP guidance from the World Health Organization. The 3 countries successfully integrated MIP interventions into a platform of antenatal care services, but coordination at the national level was disjointed. All 3 countries recognized the importance of having a MIP focal person to ensure collaboration and planning at the national level, but only Malawi had appointed one. Commodity stockouts were frequent due to problems at all levels of the logistics system, from quantification to distribution. Lack of support for quality assurance and weak monitoring and evaluation mechanisms across all 3 countries affected optimal coverage.

Conclusions: MIP programs should address all 8 interconnected MIP health systems areas holistically, in the context of a health systems approach to building successful programs. The MIP table of analysis can be a useful tool for other malaria-endemic countries to review their programs and improve MIP outcomes.

BACKGROUND

Pregnant women are particularly vulnerable to malaria infection, which has a “trickle-down” negative effect from the mother to the fetus and newborn. Malaria in pregnancy (MIP) contributes to maternal anemia, maternal death, stillbirth, spontaneous abortion, and low birth weight.^{1–3} In areas of stable malaria transmission, babies are more likely to be small for gestational age, and in areas of unstable

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Malaria in pregnancy contributes to both maternal and infant mortality and morbidity.

malaria transmission, they are more likely to be born preterm. One-third of all newborn deaths and an estimated 11% of neonatal deaths in malaria-endemic regions of Africa are due to low birth weight associated with *Plasmodium falciparum* infections during pregnancy.⁴ Approximately 125 million pregnancies occur each year in areas with *P. falciparum* and/or *Plasmodium vivax* malaria transmission; 10,000 of these women and 200,000 of their newborns will die as a result of MIP.^{5,6}

In 2004, the World Health Organization (WHO) Regional Office for Africa developed a framework to prevent and control malaria during pregnancy. The framework promotes a 3-pronged approach in stable malaria transmission areas²:

1. Intermittent preventive treatment of pregnant women (IPTp) with the antimalarial drug sulfadoxine-pyrimethamine (SP)
2. Use of insecticide-treated bed nets (ITNs)
3. Effective case management among pregnant women showing signs and symptoms of malaria

Reflecting the latest evidence that frequent dosing of IPTp-SP is effective in reducing the consequences of MIP,⁷ WHO updated its guidance in October 2012 to recommend IPTp with SP in areas of moderate to high malaria transmission for all pregnant women at each scheduled antenatal care (ANC) visit.⁸ (WHO recommends at least 4 ANC visits.) WHO also recommends:

- The first IPTp-SP dose should be administered as early as possible during the second trimester of gestation.
- Each SP dose should be given at least 1 month apart.
- The last dose of IPTp-SP can be administered up to the time of delivery without safety concerns.

At the 2000 African Summit on Malaria held in Abuja, Nigeria, 44 African nations committed to the goal that 60% of pregnant women at risk of malaria would be covered with the above MIP interventions by 2005.⁹ Since 2005, global targets for IPTp have been set even higher at 85% and 100% by the President's Malaria Initiative (PMI) and the Roll Back Malaria Initiative, respectively.^{10,11}

In the last decade, 39 African countries,¹² in which malaria transmission ranges from

moderate to high and the dominant malaria species threat is *P. falciparum*, have revised national policies and supported MIP programs in line with WHO's 3-pronged approach. However, many countries are far from achieving their targets for both IPTp uptake and ITN use. Van Eijk et al. found 45 of 47 countries surveyed (96%) had a policy for distribution of ITNs for pregnant women; 39 of 47 countries (83%) had an IPTp policy; in 2007, an estimated 6.4 million of 25.6 million pregnant women (25%) received at least 1 treatment dose and 19.8 million (77%) visited an antenatal clinic (31 countries). Estimated coverage was lowest in areas of high-intensity transmission of malaria.¹²

Hill et al. systematically examined both demand and supply factors associated with low coverage of IPTp uptake and ITN use. In some countries, they found poorer women, women with no education, and women living in rural areas were significantly less likely to have IPTp coverage or an ITN. Also, not surprisingly, women's pattern of ANC use was a more important determinant of IPTp uptake than for ITN ownership. ANC use was affected by provider performance, organizational problems at the facility, health system weaknesses beyond ANC, and factors that cannot be controlled by the health system, such as pregnant women delaying ANC attendance.¹³

In light of most countries' suboptimal progress, we conducted MIP case studies in Malawi (2011),¹⁴ Senegal (2011),¹⁵ and Zambia (2010)¹⁶ to learn more about what is needed to enable health systems to meet MIP targets. (Malawi adopted an IPTp policy in 1993 and an ITN policy for pregnant women in 2002. Senegal and Zambia adopted IPTp policies in 2001 and ITN policies for pregnant women in 2000.¹²)

In addition to being PMI focus countries, these 3 countries were selected because, although they have not achieved target MIP goals, they have been more successful than other sub-Saharan African nations in increasing IPTp uptake and, to some extent, ITN use. Using a positive deviance approach,¹⁷ the purpose of the case studies was to assess how these 3 countries were able to achieve relatively greater progress in MIP control, as well as to understand how the countries ranked in terms of readiness with respect to 8 key MIP health systems areas that are building blocks within any MIP program (Box).

The global health community has committed to achieving at least 85% coverage of intermittent preventive treatment of pregnant women with antimalarial drugs.

BOX. Malaria in Pregnancy Program Areas

INTEGRATION

MIP is a core component of focused antenatal care (FANC) services.^{18,19} For MIP programs, integrated services include collaboration between national reproductive health programs and national malaria control programs as well as other national programs delivering care through comprehensive reproductive, maternal, and child health services—such as national HIV/AIDS and tuberculosis programs—to: (1) ensure harmonized policies, guidelines, and training material; and (2) coordinate effective program implementation.

POLICY

Country MIP policies that are based on the latest scientific evidence and include defined goals as well as national guidelines to achieve those goals set the stage for effective MIP implementation. Policies need to be harmonized and effectively integrated across different divisions of the health sector as described under “integration.”

COMMODITIES

Commodities include not only correct medicines and medical products but also having systems in place to ensure availability of commodities at the point of service. For MIP, this includes availability of SP, cups and water for IPTp, and long-lasting ITNs at ANC. It also includes diagnostic tools, rapid diagnostic tests and/or microscopy, and treatment medicines to effectively provide case management to pregnant women with signs of malaria.

QUALITY ASSURANCE

Quality assurance is a wide-ranging concept covering all matters that individually or collectively influence the efficacy, safety, appropriateness, and acceptability of services. For MIP, this includes performance standards to measure quality of care, supervision support to improve the quality of care, and self-assessment by health care providers to monitor their own delivery of services.

CAPACITY BUILDING

Capacity building is defined as strengthening human resources by improving knowledge and skills. For MIP, this includes competency-based preservice and in-service training that reflects current WHO guidance and national policies.²⁰

COMMUNITY AWARENESS AND INVOLVEMENT

Community engagement is defined as the involvement of communities in the promotion and/or delivery of health services. For MIP, this includes raising awareness about MIP prevention and control; for example, early attendance at ANC, promotion of IPTp and ITNs, and effective case management. Availability of resources and effective monitoring of health promotion are key components of this program element.²¹

MONITORING AND EVALUATION

Monitoring and evaluation, when effective, will capture MIP service delivery indicators correctly and will, on a regular basis, feed into a national health management information system. These data will be used for decision-making at all points of care and at the national level for policy formulation. National-level surveys to evaluate the coverage and health impact of MIP programs are a critical component of programs to help understand trends in health outcomes and drive program decision-making.²²

FINANCING

Financing includes a combination of national government and donor funding that guarantees MIP programs receive the support and resources they need to consistently reach all pregnant women.

The specific case study objectives were to identify:

1. Promising practices/strategies that have supported MIP programming success
2. Existing bottlenecks in MIP program implementation and how these are addressed
3. Lessons learned that can inform future MIP programming in other countries

METHODS

Study Design

We used a systematic case study research methodology to analyze the factors contributing to successes in national MIP programs in Malawi, Senegal, and Zambia, based on the 8 health system areas, as well as challenges that have hindered further progress. This type of research is well-suited for exploring complex issues in depth, such as health systems functioning, and can help illuminate findings from previous quantitative research, such as household and facility surveys.²³ In addition, this approach allowed us to draw general conclusions while comparing different countries.

Data Collection

Data collection methods in each country consisted of a comprehensive desk review of the literature and secondary data, followed by qualitative key informant interviews with national MIP stakeholders, including representatives from the National Malaria Control Programme (NMCP), National Reproductive Health Programme (NRHP), staff from the U.S. Agency for International Development (USAID) and PMI, and implementing organizations supporting the Ministry of Health. Key informants were selected using both purposive and snowball sampling techniques.

For the desk review, we identified such documents as national policies and guidelines—for both malaria and reproductive health, where comprehensive ANC services, including MIP, are provided to pregnant women—as well as national progress reports and assessments. We also reviewed applications and progress reports for the Global Fund to Fight AIDS, Tuberculosis and Malaria (Global Fund), PMI Malaria Operational Plans, peer-reviewed articles, implementing partner reports, national health management information system (HMIS) reports and forms,

as well as Demographic and Health Surveys and Malaria Indicator Surveys.

Information from the initial desk review was used to identify gaps in program-related MIP information and areas requiring further elucidation. This informed the development of qualitative key informant interview guides with input from stakeholders from the NMCP and the NRHP. A set of questions, linking back to the 8 health system areas of MIP, was developed for the first country (Zambia). The questions were not pilot tested but were refined for use in subsequent countries, adapting them to the country context and to the specific stakeholder's area of MIP support and job function. For example, key informants from organizations supporting logistics management were primarily asked questions related to procurement and distribution of MIP commodities.

Data were collected in Zambia from September 2009 to October 2009; in Senegal, in March 2010; and in Malawi, in January 2011. The length of the interviews ranged from approximately 60 minutes to 90 minutes, and information from respondents was recorded on paper questionnaires and then transcribed on the same day into a Microsoft Word document. When information was unclear or information from stakeholders was conflicting, the interviewees were given the opportunity to review the draft report and provide clarification.

Data Analysis

The study team conducted content analyses for the secondary and qualitative data for each country using the 8 MIP health system areas. Within each MIP program area, the study team determined degree of scale up by ranking progress made along 4 stages (Figure). A rating of 1 means nothing to little had been done to support the health system area; 2 suggests some efforts supported the health system area; 3 means the country was supporting the health system area and some progress had been achieved; and 4 means the health system area had been fully scaled up. Generally, higher scores are identified with better practices and lower scores help to identify remaining challenges. This program rank, or “program effort score,” is derived from similar methodologies used in the fields of family planning and maternal health, which link program effort with outcome indicators, such as contraceptive prevalence and total

Degree of scale up within each MIP program area was ranked on a scale of 1 (nothing to little had been done) to 4 (full scale up).

fertility rate.^{24,25} In the case of the MIP case studies, the program rank is linked with IPTp uptake and ITN use.

Few differences in opinion among the study team were encountered in terms of how each health system area should be rated; however, when they did occur, discussions among researchers and authors of all 3 country case studies were held, using the MIP matrix as the guide to rate all countries and elements fairly. Information was coded and organized manually, and anonymous quotations were selected to illustrate key points while preserving participant privacy.

In this article, we synthesized the findings across the 3 MIP case studies conducted in Malawi,¹⁴ Senegal,¹⁵ and Zambia¹⁶ to draw together common themes related to: (1) better practices, (2) remaining bottlenecks, and (3) opportunities to accelerate coverage in MIP programming.^{19–21} This led to the development of an “Expanded MIP Table of Analysis” (Table 1), directly building on the “Stages of MIP Program Implementation Matrix.”²⁶ The “Expanded MIP Table of Analysis” includes key indicators for each health system area and objective ratings that allowed 5 reviewers to review the evidence in detail.

FINDINGS

A total of 43 key informants were interviewed across the 3 countries (15 in Malawi, 18 in Senegal, and 10 in Zambia), representing a diverse group of national stakeholders in each country involved in MIP service delivery. No one who was asked to participate refused, and no one ended their interview early.

Table 2 highlights key outcomes for MIP—uptake for IPTp uptake, ITN use, and ANC attendance—in Malawi, Senegal, and Zambia. ANC attendance (for at least 1 visit) was over 90% in all 3 countries, and at least half of pregnant women received 2 or more doses of IPTp for malaria prevention. ITN use among pregnant women, however, was much lower, ranging from 29% in Senegal to 46% in Zambia.

Table 3 shows each country’s stage of implementation by MIP health system area, based on the scale of 1 to 4 described earlier. Out of a perfect score of 4, the overall average score was 2.8 for Malawi, 3.1 for Senegal, and 2.9 for Zambia. Issues with **commodities, quality assurance, and financing** accounted for the

FIGURE. Stages of Malaria in Pregnancy Program Implementation



most significant challenges across countries, with scores generally ranging from 2.0 to 2.5 in these program areas. Each program area is described in more detail below.

Integration of Programs and Services

After the 2000 Abuja Summit, all 3 countries successfully brought together malaria control and reproductive health policy makers and program implementers, through malaria or MIP-specific working groups, to institute MIP policies and interventions. In line with WHO recommendations, the countries successfully integrated MIP interventions into a platform of

Problems with commodity stockouts, quality assurance, and financing accounted for the most significant MIP program challenges in the 3 countries.



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In Zambia, a counselor educates community members at an antenatal care clinic about use of insecticide-treated bed nets.

TABLE 1. Expanded MIP Table of Analysis

Indicator	Stage 1: Awareness of Need [Thinking]	Stage 2: Initial Startup [Planning]	Stage 3: Partially Implemented [Action]	Stage 4: Fully Implemented [Maintenance]
<p>Central-level MIP programming is harmonized among RH, malaria control, and HIV programs.</p>	<p>National stakeholders in RH, malaria control, and HIV are aware of the need to harmonize their materials.</p>	<p>National stakeholders in RH, malaria control, and HIV have discussed planning to harmonize their materials.</p>	<p>National stakeholders in RH, malaria control, and HIV have started to harmonize their materials.</p>	<p>National RH, malaria, and HIV materials have been harmonized.</p>
	<p>Central-level MIP programming is coordinated among RH, malaria control, and HIV programs.</p>	<p>National stakeholders in RH, malaria control, and HIV are aware of the need to coordinate program implementation.</p>	<p>National stakeholders in RH, malaria control, and HIV meet on a regular basis to share program strategies.</p>	<p>National stakeholders in RH, malaria control, and HIV meet on a regular basis to coordinate program implementation.</p>	National stakeholders in RH, malaria control, and HIV leverage resources across program areas and implement activities jointly.
<p>MIP services are integrated with FANC, PMTCT, and malaria control services at the facility level.</p>	<p>National stakeholders and relevant health care providers are aware of need to integrate MIP with FANC, PMTCT, and/or malaria control services.</p>	<p>MIP guidelines are standardized and integrated across FANC, PMTCT, and malaria control service delivery guidelines and preservice and in-service curricula.</p>	<p>Relevant health care providers have been trained in and are integrating MIP services with FANC and PMTCT but are constrained by commodity stockouts.</p>	<p>Relevant health care providers are trained in and are integrating MIP services with FANC and PMTCT.</p>
<p>National policy on MIP exists.</p>	<p>Relevant stakeholders in MCH/RH, HIV, and malaria are aware of need for MIP policy.</p>	<p>MIP policy has been drafted and includes WHO's 3-pronged approach, as appropriate, with involvement and acceptance of relevant stakeholders.</p>	<p>MIP policy has been disseminated to major stakeholder organizations.</p>	<p>All service units (public, nongovernmental, and private) are providing the components of care and services based on national MIP policy.</p>
	<p>National guidelines and/or performance standards have been developed.</p>	<p>Relevant stakeholders are aware of need for guidelines and standards for MIP.</p>	<p>MIP guidelines and standards have been drafted and include WHO's 3-pronged approach, as appropriate, with involvement and acceptance of relevant stakeholders.</p>	<p>MIP guidelines and standards have been disseminated to major stakeholder organizations and health care providers.</p>	All service units (public, nongovernmental, and private) are providing care and services in accordance with national MIP guidelines and standards.
<p>National strategy and action plans for malaria and RH include MIP programming.</p>	<p>Relevant stakeholders are aware that strategies and action plans for malaria and RH need to include MIP.</p>	<p>MIP programming has been integrated into strategies and action plans that include WHO's 3-pronged approach, as appropriate, with involvement and acceptance of relevant stakeholders.</p>	<p>MIP strategies and action plan components have been disseminated to major stakeholder organizations.</p>	<p>All service units (public, nongovernmental, and private) are implementing MIP activities in accordance and on schedule with strategies and action plans.</p>

TABLE 1 (continued).

Indicator	Stage 1: Awareness of Need [Thinking]	Stage 2: Initial Startup [Planning]	Stage 3: Partially Implemented [Action]	Stage 4: Fully Implemented [Maintenance]
The health system at all levels is procuring WHO-recommended commodities for prevention and case management of MIP.	MIP commodities and supplies appear in broad essential medicines lists but are not congruent with current WHO guidance.	Commodities	Antenatal and primary health care clinics stock WHO-recommended MIP commodities, but some unapproved medicines remain on shelves.	Only WHO-approved MIP medicines and supplies are stocked in antenatal and primary health care clinics.
Systems are in place to guarantee regular provision of MIP commodities to ANC clinics as part of routine service delivery.	Current procurement and supply system does not guarantee MIP commodities, but stakeholders are discussing problems in the system.	Improved supply chain management systems are being designed, including training on procurement for relevant staff at all levels.	Approved MIP medicines and supplies are being provided to ANC and primary health care clinics, but stockouts occur.	Approved MIP medicines and supplies are available on a regular basis at ANC and primary health care clinics.
Supervisory and performance assessment tools, including performance standards, are developed for MIP programming.	Relevant stakeholders are aware of the need for MIP supervisory and performance assessment tools that are based on MIP policies and guidelines.	Quality Assurance	Supervisory and performance assessment tools have been disseminated to all supervisors, in-charges, and health care providers.	Supervisory and performance assessment tools are consistently used in routine performance assessments.
Regular supervisory visits and quality assessments are being conducted.	Relevant stakeholders are aware of the need to conduct regular MIP supervisory visits and quality assessments for relevant health care providers, using tools based on MIP policies and guidelines.	Supervisory and performance assessment tools have been developed and harmonized in line with national MIP policies and guidelines.	Supervisors and trainers have been trained in supervisory and performance assessment tools and are supervising health care providers on a limited basis.	Supervisors are routinely providing supervision to health care providers based on national supervisory and performance assessment tools.
Self-assessments are being conducted.	Relevant stakeholders are aware of the need for ongoing self-assessment by relevant health care providers using MIP supervisory and performance assessment tools based on MIP policies and guidelines.	Supervisory and performance assessment tools have been developed and harmonized in line with national MIP policies and guidelines.	Relevant health care providers are trained in and are performing self-assessments using performance standards on a limited basis.	Relevant health care providers are trained in and are using self-assessment tools routinely.

TABLE 1 (continued).

Indicator	Stage 1: Awareness of Need [Thinking]	Stage 2: Initial Startup [Planning]	Stage 3: Partially Implemented [Action]	Stage 4: Fully Implemented [Maintenance]
IST on MIP is organized and provided.	Relevant stakeholders are aware of the need to adapt MIP policies and guidelines into IST for relevant health care providers.	Capacity Building MIP IST curriculum has been developed in line with national policies and guidelines with involvement and acceptance of relevant stakeholders.	Training is in initial phases of rollout with national plans for scale up.	IST training in MIP, in line with national policy and guidelines, is currently ongoing for relevant staff in all service units (public, nongovernmental, and private), including through integration with FANC, malaria control, and/or PMTCT.
PST on MIP is organized and provided.	Relevant stakeholders are aware of the need to adapt MIP policies and guidelines into PST for relevant service providers.	MIP PST curricula has been developed in line with national policies and guidelines with involvement and acceptance of relevant stakeholders.	Training of trainer teams from among the relevant stakeholders has been undertaken, and instructors, tutors, and preceptors have been trained.	Students in all training institutions (public, nongovernmental, and private) have received MIP PST in line with national policies and guidelines.
Community-Based MIP Programs				
Interventions are in place to promote community awareness, education, and communication about MIP and its control options.	No community awareness activities have been planned, but partners have been consulted about designing these.	MIP communication plan and guidelines have been developed, and materials are being designed and channels selected.	MIP communication activities are being aired and disseminated through mass media and community-based interpersonal communication.	MIP awareness and communication activities are sustained through the media, health centers, community volunteers, and other channels.
Resources are provided so that the community itself can take action to control MIP.	Policies are being debated to enable community involvement in MIP prevention and case management.	Community MIP prevention and case management guidelines are adopted; training and supply processes are being set up to ensure communities have the skills and resources needed for action in MIP prevention and case management.	Community members have been trained on MIP prevention and case management and provided initial resources and supplies to undertake MIP prevention and case management activities.	Wide coverage of MIP prevention and case management resources are sustained in the communities to guarantee universal access to MIP prevention and case management.
Data are collected and disseminated that show the community has increased uptake of MIP program interventions.	Partners are discussing ways to monitor the results of community awareness and action in MIP programming.	Specific data collection tools have been designed and pretested for documenting uptake of MIP interventions resulting from community action, including a process by which such data are incorporated into facility, district, and national HMIS.	Malaria data collection forms have been distributed to communities and community members have been trained on use of the forms.	Communities are submitting malaria forms regularly to nearest health facility where information is summarized and submitted to HMIS as well as being used to make decisions to improve community MIP interventions.

TABLE 1 (continued).

Indicator	Stage 1: Awareness of Need [Thinking]	Stage 2: Initial Startup [Planning]	Stage 3: Partially Implemented [Action]	Stage 4: Fully Implemented [Maintenance]
MIP control data are collected routinely and used for decision making at all points of care (facility, district, regional).	Partners are discussing ways to monitor the results of MIP care and action in MIP programming.	Data collection tools have been designed and pretested for documenting uptake of MIP interventions delivered at health facilities.	Malaria data collection forms have been distributed to health facilities, and health care providers have been trained on use of the forms and are using them routinely.	Health facilities are reporting MIP data regularly to the district level where the information is summarized and passed on to the national level. MIP information is being used to make decisions to improve MIP interventions and care at national and lower levels.
National population-based surveys are collecting data on trends in MIP intervention coverage and health outcomes.	National governments are aware of the need to prioritize MIP into national level surveys.	National governments and partners are committed to the inclusion of WHO-promoted MIP indicators into national surveys.	National surveys include WHO-promoted MIP indicators.	National surveys are being used to discern trends in MIP intervention coverage and health outcomes, and data are used for policy dialogue and planning.
National governments are providing funding to MIP programs.	National governments are aware of the need to prioritize MIP in their annual program funding.	National governments commit funding that is not yet adequate to support projected costs.	National governments contribute significant funding that supports majority of projected costs for MIP priorities in their national malaria strategies.	National governments have committed and disbursed funds to MIP programs that are adequate for all projected costs.
Donors are investing in national MIP programs.	Donors are aware of the need to prioritize funding for MIP programs.	Governments are submitting proposals for funding and limited donor funding exists.	Governments are successful in soliciting support and strong donor funding exists.	Ample donor funding exists for MIP and is being used effectively.
Financing				
Abbreviations: ANC, antenatal care; FANC, focused antenatal care; IST, in-service training; HMIS, health management information system; MCH, maternal and child health; MIP, malaria in pregnancy; PMTCT, prevention of mother-to-child transmission of HIV; PST, preservice training; RH, reproductive health; WHO, World Health Organization.				

TABLE 2. Key MIP Outcomes: National IPTp Uptake, ITN Use, and ANC Attendance

Indicator	Malawi	Senegal	Zambia
Pregnant women receiving 2 or more doses of IPTp for malaria prevention, %	60.3 ^a	52.2 ^c	70.2 ^a
Pregnant women sleeping under an ITN, %	35.3 ^a	28.5 ^c	45.9 ^a
Households with at least 1 ITN, %	56.8 ^a	63.3 ^c	64.3 ^a
Pregnant women attending at least 1 ANC visit, %	96.5 ^b	91.1 ^d	93.7 ^e
Pregnant women attending more than 1 ANC visit, %	94.9 ^b	87.3 ^d	94.3 ^e

Abbreviations: ANC, antenatal care; IPTp, intermittent preventive treatment of pregnant women; ITN, insecticide-treated bed net; MIP, malaria in pregnancy.

^a 2010 Malaria Indicator Survey.

^b 2010 Demographic and Health Survey.

^c 2008/9 Malaria Indicator Survey.

^d 2005 Demographic and Health Survey.

while services at the facility level remain integrated, national-level coordination and planning has become disjointed. At the time of data collection, MIP working groups in Malawi and Zambia were reported to be dissolved or inactive, not due to a conscious decision of stakeholders but due to competing health priorities. The Malawi NMCP did, however, have a MIP focal point person on staff who reportedly intended to revitalize the link between the NMCP and the Reproductive Health Unit (RHU). Zambia had been seeking funding for a MIP focal point person but, at the time of this writing, had yet to succeed. In Zambia, a lack of human resources in the Ministry of Health was reported to be a major constraint in cross-sector coordination. The RHU and the NMCP confirmed that although representatives of the other unit are invited to participate in joint annual planning, mutual participation in the planning process has been minimal for the last several years because there are not enough staff to attend each other's meetings. This reportedly resulted in the shifting of MIP funds to other priority areas of malaria implementation.

In Senegal, one interviewee noted:

... national-level integration may be less effective because coordination of national activities is not routine ... and the level of joint planning [between the NRHP and NMCP] is low.

This lack of coordination negatively affects program components, including training capacity, supervision, and availability of commodities. In Malawi and Senegal, lack of coordination has resulted in parallel, duplicative MIP trainings, conducted independently by different groups for the same health care providers. At the time of this article, a focused antenatal care (FANC) working group had been created in Zambia to address issues in MIP programming; however, the group has struggled to accomplish tasks because the RHU, NMCP, and implementing partners have limited funding and staff to support MIP and FANC.



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In Malawi, a pregnant woman receives intermittent preventive treatment for malaria at an antenatal care visit.

Stockouts of antimalaria drugs and bed nets were frequent.

ANC services at the facility level—a key step in reaching the current levels of coverage.

Since this initial rollout, however, political will has waned or been diverted elsewhere, and

Policy Processes

All 3 countries have malaria policies in place that reflect WHO MIP guidance. In Senegal and Zambia, national reproductive health and malaria control policies and guidelines have been harmonized through strong leadership by the

TABLE 3. National Stage of MIP Program Implementation by Health System Area, Malawi, Senegal, Zambia, 2010–2011

Country	MIP Health System Area							
	Integration	Policy	Commodities	Quality Assurance	Capacity Building	Community Awareness & Involvement	Monitoring & Evaluation	Financing
Malawi	Weak collaboration among MOH, RHU, and NMCP, resulting in disjointed and duplicative MIP programming IPTp	MIP policies in line with WHO guidelines but discrepancies across national documents in administration of IPTp	Frequent stockouts of SP and ITNs at ANC clinics hampering uptake of interventions	Limited diagnostic capacity, mistrust of SP efficacy, and irrational use of SP, leading to inconsistent application of clinical guidelines	Capacity-building efforts with current MOH/NMCP and health facility personnel have limited impact in situations of chronic understaffing	Late initiation of ANC (after first trimester), limiting number of IPTp doses administered to pregnant women	Weak HMIS and low provider investment in data management, leading to poor data quality	Government has committed some funds to MIP programs but still relies heavily on donor support
Score	2.5	3.0	2.5	2.5	3.5	3.0	3.0	2.5
Senegal	Joint program planning among NRHP, NMCP, and NACP is low, resulting in duplication of program efforts	MIP policies in line with WHO guidelines, with widespread dissemination to providers	Frequent stockouts of SP and ITNs at ANC clinics hampering uptake of interventions	MIP clinical performance standards developed but low level of supervision due to lack of human resources and logistical and financial constraints	MIP content up-to-date in preservice and in-service educational materials but redundancies in training among NRHP, NMCP, and NACP	Community groups are engaged in promotion of use of ITNs and IPTp; late initiation of ANC (after first trimester), limiting number of IPTp doses administered to pregnant women	Improved data quality through a web-based HMIS; 2 WHO-recommended MIP indicators not tracked	Government has committed some funds to MIP programs, fully funding SP, but still relies heavily on donor support, especially for ITNs
Score	3.0	4.0	2.0	2.0	3.0	3.5	4	3
Zambia	Weak linkages among MOH, RHU, NMCP, and MOH PMTCT Unit limit leveraging of funds and development of holistic MIP package	MIP policies updated in line with WHO guidelines and consistently integrated across national documents	Frequent stockouts of SP and ITNs at ANC clinics hampering uptake of interventions; lack of hemocues limiting hemoglobin testing	Routine, quality supportive supervision for service providers needed to ensure adherence to MIP guidelines	Capacity-building efforts with current MOH/NMCP and health facility personnel have limited impact in situations of chronic understaffing	Late initiation of ANC (after first trimester) limiting number of IPTp doses administered to pregnant women	Inconsistent and inaccurate recording of facility-level data by service delivery providers, leading to poor data quality	Government has committed some funds to MIP programs but still relies heavily on donor support
Score	3.0	4.0	2.0	2.0	4.0	3.0	3.0	2.0

Abbreviations: ANC, antenatal care; HMIS, health management information system; IPTp, intermittent preventive treatment of pregnant women; ITN, insecticide-treated bed net; MIP, malaria in pregnancy; MOH, Ministry of Health; NACP, National AIDS Control Programme; NMCP, National Malaria Control Programme; NRHP, National Reproductive Health Programme; PMTCT, prevention of mother-to-child transmission of HIV; RHU, Reproductive Health Unit; SP, sulfadoxine-pyrimethamine; WHO, World Health Organization.

NMCPs and commitment from partners to support the process. Dissemination of national guidelines in both Senegal and Zambia has been widespread. In Zambia, specifically, the NMCP conducted case management updates to reorient providers, addressing issues such as the correct use of SP, and, at the time of data collection, planned to distribute revised treatment guidelines with a memorandum to district-level staff for dissemination to providers.

In Malawi, there are inconsistencies between reproductive health and malaria guidelines. For example, the national reproductive health service delivery guidelines stipulate IPTp provision at defined week intervals, while the national malaria guidelines stipulate IPTp provision following quickening and giving at least 3 doses 1 month apart. The Malawi reproductive health guidelines also stipulate that providers should not administer SP after 36 weeks gestation, while the malaria guidelines note no such limitation. Providers may provide different care depending on which set of national guidelines they refer to. What providers actually practice in all 3 countries is unknown as documentation of findings during supervision visits was not available.

Commodities

Sulfadoxine-pyrimethamine: In each of the 3 countries, WHO-recommended medicines for malaria treatment for pregnant women and for IPTp are approved and available through ANC clinics. However, stockouts of SP at ANC clinics were frequent due to central-level stockouts and ineffective distribution systems. This problem was further exacerbated by the irrational use of SP (based on key informant interviews) to treat malaria cases in the general population, whereas SP should be reserved for preventing malaria in pregnant women. In Zambia, although NMCP partners routinely provided the Ministry of Health with early warnings of impending stockouts of SP, stockouts persisted. This happened in 2009, when one implementing partner had to shift US\$50,000 meant for rapid diagnostic tests to procure an emergency stock of SP.

One stakeholder interviewed in Zambia described the situation:

Sometimes you go to a clinic and they are stocked out of SP and they say it is because there isn't any at the district. Then, you go to the district and find

it. Sometimes, they are stocked out at the district, but you find it at the central level.

In Malawi and Senegal, stakeholders described similar issues with persistent SP stockouts. Stakeholders cited problems at all levels of the logistics management system for commodities, including quantification, ordering of drugs in a timely manner, tendering, receipt, storage, and distribution.

Insecticide-treated bed nets: In the 3 countries, distribution of nets to pregnant women free of charge at ANC clinics is considered an effective mechanism for increasing usage among pregnant women and for incentivizing ANC attendance. Nevertheless, as with SP, facilities often experienced ITN stockouts due to procurement shortfalls, central-level stockouts, and disjointed distribution systems.

In Malawi, it was reported that ITNs were frequently, but not always, available in ANC clinics. Facility supplies were based on estimated target populations rather than consumption, but recent changes from a single- to a multi-distributor system led to increased stockouts. At the time of data collection, all 3 countries were planning to implement universal ITN coverage campaigns, aimed at increasing net usage by the general population, and supplemental efforts targeting pregnant women and children under 5 years of age.

Quality Assurance

Due to lack of funding and competing responsibilities among Ministry of Health staff, comprehensive quality assurance systems were not currently functioning in any of the 3 countries. While MIP clinical performance standards had been developed in each of the countries, application of these standards was inconsistent. In large part, each country relies on routine supervision from national, provincial, or district-level supervisors; however, due to lack of human resources and logistical and financial constraints, these visits were not consistently conducted. In 2006, Zambia developed an integrated reproductive health tool composed of reproductive health standards that included MIP (for example, group and individual education on MIP, ITN use, and IPTp uptake). Provincial-level Ministry of Health staff were oriented to this tool with the intention that training would cascade down to district- and

Quality assurance systems for MIP programs were not functioning in any of the 3 countries.

facility-level staff. At the time of data collection, it was unknown if district-level orientations had been completed and, according to stakeholder reports, the tool was not in widespread use.

Although Malawi has designed an integrated tool for quarterly supervision visits that targets infection prevention, MIP, reproductive health, and prevention of mother-to-child transmission of HIV, these visits were occurring infrequently. In Malawi, one interviewee mentioned:

Donors place more emphasis on “number of persons trained” in program-reporting indicators than on the number supervised or the impact of training those persons, with program design following suit.

In Senegal, the program review revealed that 31% of health facilities did not receive any kind of supervision.

Lack of supervision has negative implications for consistent delivery of quality services for pregnant women as well as the general population. This can contribute to SP stockouts as well as to increased morbidity and mortality from improperly treated non-malarial fevers. For example, in Malawi and Zambia, stakeholders reported that SP was often used by providers to treat fevers in men, children, and non-pregnant women; in Zambia, SP was given when rapid diagnostic tests were negative; and in Malawi, SP was given when there were stockouts of artemisinin-based combination therapies (ACTs).

Capacity Building

Malawi, Senegal, and Zambia have all updated in-service training and preservice education materials with MIP content. This positions each country to focus training on evidence-based updates and maintenance of critical MIP competencies. However, as noted previously under the integration findings, at the time of data collection, there was a need to harmonize efforts further to avoid redundancies in training, both between preservice education and in-service training and within in-service training courses.

In Malawi, the RHU and NMCP were implementing parallel in-service training events. As one interviewee pointed out:

Where is the rocket science in MIP? We present focused ANC like it's something new, but it's the

same thing [health care providers] have been doing.

Human resource shortages are a major challenge in all 3 countries and affect access to quality of care. Zambia was 28,000 health professionals short of its Ministry of Health staffing targets. In Malawi, interviewed stakeholders said many providers were over-diagnosing malaria because of high client loads (implying not enough trained staff), lack of time or skills for proper clinical diagnosis, and the propensity for providers and clients alike to presume all fevers are malaria.

Community Engagement

All 3 countries were actively supporting community involvement to enhance and engender community education and mobilization. In Malawi, community groups (for example, village health committees and health surveillance assistants) actively partnered with health facilities to raise awareness in communities about health issues, including MIP; to refer women to ANC; and to identify key health problems in the community.

In Zambia, community groups (for example, neighborhood health committees and safe motherhood action groups) were trained to sensitize communities about a range of maternal health topics in order to promote healthy behaviors and improve care seeking, including for MIP. Although one program follow-up report noted increased ANC attendance in the year since the community program was implemented, no improvements were seen in IPTp coverage due to frequent SP stockouts and poor recordkeeping. At the time of data collection, support for community involvement was not consistent, and more strategies were required to adequately involve communities and foster links between communities and facilities in a sustainable way.

Although there is little documentation and assessment of these community-focused efforts, qualitative feedback suggests they were effective. For example, in Senegal, stakeholders attributed improved ITN use among pregnant women to the USAID-supported “Community Action against Malaria and Tuberculosis” program and in Malawi, to community involvement.

Monitoring and Evaluation

MIP indicators are generally tracked through a variety of sources in malaria-endemic countries,

Qualitative feedback suggests that community involvement helped to improve use of bed nets.

Lack of coordination at the national level contributed to redundancies in training.

including: (1) periodic household surveys, such as Demographic and Health Surveys, Multiple Indicator Cluster Surveys, and Malaria Indicator Surveys; (2) the routine national HMIS; and (3) sentinel site surveillance systems (now less common). In the 3 countries, health facilities routinely collected and reported data on IPTp uptake by dose during ANC services through the HMIS, which aggregates data into national coverage indicators. However, the WHO-recommended MIP indicators on “percentage of ANC staff trained in the control of MIP in the past 12 months” and “percentage of screened pregnant women with severe anemia in the third trimester, by gravidity”²² were notably missing from national data sources in all 3 countries, although data on anemia are recorded in some form at the facility level, most frequently in client records.

ITN indicators have been effectively integrated into the HMIS in Senegal but were absent from the HMIS in Malawi and Zambia. Instead, such information was collected on parallel, program-specific reporting forms. HMIS data quality in Malawi and Zambia was reported to be weak by key informants, but Zambia was making strides to train district medical offices and health facility staff in data management. Prior to data collection, Senegal had taken significant steps, including hiring of new staff and establishment of a web-based data management system, to improve data completeness, timeliness, and reliability.

While SP stockouts were reported to be a significant inhibiting factor for MIP programs, data on stock levels were not routinely made available to reproductive health and malaria control stakeholders. Additionally, at the time of data collection, no countries were reporting national data on MIP incidence or treatment—crucial indicators for measuring the effectiveness of MIP interventions.

Financing

All 3 national governments commit some funds to MIP programming but still rely heavily on donor support. The Senegalese and Zambian governments were providing funding for SP, with central-level shortages reportedly due more to poor quantification of necessary medicines than to lack of funding. For ITNs, the 3 countries relied entirely on donors, primarily the Global Fund and PMI, which has proved insufficient to cover all pregnant women. While the “Sector-Wide Approach”—a resource allocation system that pools all health sector

resources from all sources and allocates funds based on need—had been effective in Malawi for coordinating donor support, lack of accountability of funds provided directly to the government limited contributions to the basket fund. Delays in receipt of Global Fund monies in Malawi and Zambia further hindered program implementation. Across sub-Saharan African countries, funding to support malaria programming has increased since 2004; however, the currently available funding is far below the estimated US\$5.1 billion required each year to reach universal coverage of interventions. In 2012, the global total of international and domestic funding for malaria was US\$2.5 billion—less than half of what is needed.²⁷

DISCUSSION

Although each country’s MIP programming experiences, situation, and needs are unique, Malawi, Senegal, and Zambia all had issues in the areas of commodities, quality assurance, and financing that, with attention, could contribute to improved coverage and MIP outcomes. Careful consideration should be given to addressing all health system areas—even areas that rank high—since the elements are interconnected, and weaknesses in one area can negatively impact other areas. This is especially true in the area of integration, which includes the critical partnership between national reproductive health and malaria control programs to coordinate, plan, and harmonize policies and support synchronized implementation.

Even though the 3 countries studied were considered high-performing MIP countries, none had achieved full coverage of IPTp uptake and ITN use among pregnant women. This is not surprising given each country’s low scores in the crucial aspects of financing and commodities. The case studies highlight important lessons learned in each of the 8 MIP program areas that other countries can apply to improve their programs.

In the area of **integration**, lessons focus on strengthening or creating national technical working groups that include the NRHP, NMCP, and National AIDS Control Programme (NACP) to ensure harmonized policies, guidelines, and educational materials, as well as guarantee effective and coordinated (non-duplicative) implementation. A focal point person responsible for coordinating MIP programs across sectors can help ensure consistency and maintain political will.

For the **policy** component, the case studies demonstrated that MIP policy should not only be in

MIP programs should consider all areas of the health system to improve MIP outcomes.

A focal point person for MIP programming can help maintain political will.

line with WHO-recommended guidelines but also be interpreted and presented in a consistent manner across all MIP-relevant documents. The October 2012 updated WHO policy recommendation for IPTp-SP—recommending IPTp begin as early as possible in the second trimester and be given at each routine ANC visit at least 1 month apart thereafter—affords countries an excellent opportunity to reinvigorate their MIP programs and review and revise policies and service delivery guidelines. If led by the NRHP and properly coordinated with the NMCP, countries could attract the support—technical and financial—needed to harmonize and disseminate updated guidelines and ensure consistent delivery of MIP services.

Lessons about **commodities** include the value of well-circulated guidance and consistent supervision to ensure that SP is reserved only for pregnant women, thereby ensuring adequate commodities for IPTp and curtailing resistance due to SP misuse. Additionally, coordination of supply chain management and skills in quantification and distribution must be improved. Without consistent supplies of MIP commodities, all other program efforts to increase coverage of interventions will be rendered ineffective.

Quality assurance mechanisms that target onsite managers and providers with quality improvement tools that allow for self-assessment can alleviate the barrier of financial and human resource constraints. Self-assessment can further encourage health care providers to find local solutions to address performance gaps.

Capacity building was most successful when it focused on both preservice education and in-service training so that health care providers enter the workforce with up-to-date knowledge and skills, and costly in-service trainings can be reserved for periodic updates on MIP guidelines. Strengthened preservice training and alternative in-service capacity-building strategies, such as on-the-job training and mentorship, could contribute to improved training but currently lack emphasis in national programs.

Community involvement/engagement was a highly visible component of each country's program. While the programs focused primarily on traditional health messaging and communication to promote ANC attendance and use of ITNs and IPTp, there was also some evidence of efforts to link the community with facility-level care to support better delivery of commodities (for example, delivery of ITNs to communities through health facilities) and access to care. For community-level

interventions to be successful and sustained, the communities they serve need to take ownership of their activities and responsibility for supporting them.

In terms of **monitoring and evaluation** processes, MIP indicators related to IPTp and ITNs are being collected through routine and periodic mechanisms but not necessarily captured and aggregated through the HMIS. Since tracking of ITN provision during ANC was not integrated into the HMIS in 2 of the 3 countries, this created challenges for national synthesis and reporting. In addition, information on case management of MIP was lacking in all countries.

To improve MIP monitoring, including data quality and use, priority indicators related to WHO's 3 approaches to MIP prevention and control must be integrated into the national HMIS. District officers and providers must also be trained on data collection, aggregation, and use of data for decision-making, and routine monitoring support must be incorporated into supervision and quality assurance efforts.

Finally, **financing**, although a problematic area, was not without solutions. Lessons learned included the importance of advocacy to build in-country awareness from the community to the national level for more dedicated support to MIP programming. By gradually increasing national budgetary inputs to MIP interventions, countries can combat donor fatigue and improve program sustainability.

The Expanded MIP Table of Analysis used to synthesize the 3 country case studies can be adapted to the needs of other countries interested in assessing the status of their own MIP programs. Similar case studies have been conducted in Burkina Faso, India (Jharkhand State), and Rwanda to comprehensively review all technical aspects of their malaria program. This simple and straightforward matrix is a promising tool to help countries move their MIP programming forward and accelerate progress toward national scale up.

The findings from the case studies have been disseminated through workshops in Malawi, Senegal, and Zambia. Following the dissemination workshop in Senegal, country stakeholders began using the recommendations to inform development of its 2012 Roll Back Malaria roadmap. Specifically, Senegal planned to accelerate free distribution of ITNs during ANC and to integrate reproductive health and malaria programs by developing a joint coordination committee, with a special focus on training and community-level interventions. In Zambia, a FANC technical

Priority indicators must be integrated into the national health management information system.

working group was formed, with representation from the RHU, NMCP, and other relevant partners. This group is finalizing and moving forward an action plan of MIP program priorities, including introduction of the new WHO policy for IPTp.⁸

Limitations

The country case studies were limited to secondary data gathered through the desk review process, as well as qualitative data collected through in-depth interviews among key stakeholders at the national level. Due to time and resource constraints, the country case studies did not generally include interviews with key stakeholders at the regional, district, or facility levels. In Malawi, one District Medical Director was interviewed. Hence, the case studies present a limited but comprehensive picture of MIP prevention and control programming at the national level. Also, since the case studies only targeted better-performing countries, it is not possible to compare the findings to lower-performing countries that could reveal new insights to existing challenges in MIP programming.

Further, while the review is meant to focus on MIP comprehensively, the focus is primarily on IPTp uptake and ITN use and does not address case management in detail, because very little information about case management of pregnant women was found at the country level.

CONCLUSIONS

This review is particularly important now following the release of the new WHO IPTp guidance as countries review and update national MIP policies. The timing affords countries the opportunity to reprioritize MIP programming and reinvigorate partnerships between reproductive health and malaria control programs, to ensure effective technical oversight and program management. As countries move forward with MIP program acceleration and scale up, it will be important to keep in mind the 3-pronged approach to MIP control, comprising IPTp uptake, ITN use, and case management. Addressing the 3 approaches across each of the interconnected health system areas for MIP lends to a holistic approach to strengthening the health system and lasting results. With this in mind, countries should consider bolstering MIP case management—there is very little data or information to inform what is happening at the country level—as a core component of comprehensive MIP control. As malaria

transmission patterns change from high to low, case management of pregnant women will increasingly become more important. The findings from this review as well as the country application of the Expanded MIP Table of Analysis are important tools for countries to review and apply to continue increasing coverage and improving MIP outcomes, and for moving MIP from neglect to priority.

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ORIGINAL ARTICLE

Scaling up delivery of contraceptive implants in sub-Saharan Africa: operational experiences of Marie Stopes International

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Between 2008 and 2012, Marie Stopes International (MSI) provided 1.7 million contraceptive implants in sub-Saharan Africa as part of a comprehensive method mix, primarily through mobile outreach using dedicated MSI providers and also through social franchising and MSI-run clinics. Large-scale access, quality, and informed choice were key elements of MSI's strategy.

ABSTRACT

Contraceptive implants offer promising opportunities for addressing the high and growing unmet need for modern contraceptives in sub-Saharan Africa. Marie Stopes International (MSI) offers implants as one of many family planning options. Between 2008 and 2012, MSI scaled up voluntary access to implants in 15 sub-Saharan African countries, from 80,041 implants in 2008 to 754,329 implants in 2012. This 9-fold increase amounted to more than 1.7 million implants delivered cumulatively over the 5-year period. High levels of client satisfaction were attained alongside service provision scale up by using existing MSI service delivery channels—mobile outreach, social franchising, and clinics—to implement strategies that broadened access for underserved clients and maintained service quality. Use of adaptive and context-specific service delivery models and attention to key operational components, including sufficient numbers of trained providers, strong supply chains, diverse financing mechanisms, and implant removal services, underpinned our service delivery efforts. Accounting for 70% of the implants delivered by MSI in 2012, mobile outreach services through dedicated MSI provider teams played a central role in scale-up efforts, fueled in part by the provision of free or heavily subsidized services. Social franchising also demonstrated promise for future program growth, along with MSI clinics. Continued high growth in implant provision between 2011 and 2012 in all sub-Saharan African countries indicates the region's capacity for further service delivery expansion. Meeting the expected rising demand for implants and ensuring long-term sustainable access to the method, as part of a comprehensive method mix, will require continued use of appropriate service delivery models, effective operations, and ongoing collaboration between the private, public, and nongovernmental sectors. MSI's experience can be instructive for future efforts to ensure contraceptive access and choice in sub-Saharan Africa, especially as the global health community works to achieve its Family Planning 2020 (FP2020) commitments to expand family planning access to 120 million new users.

INTRODUCTION

Availability of contraceptive implants in sub-Saharan Africa expands the family planning options from which women of reproductive age can choose to limit or space their children. Currently,

nearly 1 in 3 sub-Saharan African women have an unmet need for family planning, the highest proportion (31%) of any region in the world.¹ Moreover, only 16% of women in sub-Saharan Africa use modern methods of contraception compared with 67% in Latin America and 60% in Asia.² Yet many women want to use contraception. The demand to limit births has risen among married women in a number of countries in East and Southern Africa and is rising more slowly in West and Central Africa.^{3–6}

Implants, a long-acting and reversible contraceptive method (LARC), offer women a viable and highly

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effective hormonal method for family planning, providing 3 to 5 years of protection against pregnancy (depending on the type of implant used). With a rate of just 1 unintended pregnancy per 2,000 women, implants are more effective than any other reversible method, including the intrauterine device (IUD).⁷ Easily inserted into the arm by a trained health worker, implants are convenient, discreet, and suitable for nearly all women and family planning intentions (delaying, spacing, and limiting childbearing).⁷

In sub-Saharan Africa, a growing number of women and sexually active adolescents are using family planning, and many are choosing contraceptive implants. While implants account for just 7% of all contraceptive methods used in the region, interest in implants has risen sharply in less than a decade.⁸ For example, between 2004–05 and 2010–11, use of implants rose 17-fold in Ethiopia, 16-fold in Rwanda, 5-fold in Tanzania, and 2.5-fold in Malawi.⁷

A number of factors help explain this dramatic increase:

1. Women's desire to limit family size and growing acceptability of modern methods⁶
2. Wider availability of implants through the introduction of the cost-competitive implant, Sino-implant (II), and the subsequent launch of public-private partnerships,^{7,9,10} resulting in price-volume guarantees for Implanon and Jadelle
3. Growing awareness of the benefits of implants among sub-Saharan African women and growing interest in long-acting methods^{5,7}
4. Prioritization of family planning and increasing availability of implants by the donor community and development organizations, including government policy makers^{7,11,12}

Within this favorable environment, Marie Stopes International (MSI), an international nongovernmental organization (NGO) committed to broadening women's contraceptive choices around the world, has successfully scaled up its delivery of implants in recent years to meet growing demand in sub-Saharan Africa and help clients gain access to information to make informed family planning choices. (We define scale up as an increase in the number of clients using implants, measured by the number of implants delivered.) MSI offers implants as one of many family planning options, including other LARCs, voluntary permanent methods,



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In Nigeria, a family planning client has her contraceptive implant inserted by Marie Stopes International (MSI) providers. Provision of implants by MSI increased more than 10-fold in Nigeria between 2009 and 2012.

and short-acting methods. MSI counsels clients on the full range of available methods, so they can choose the method that best fits their lifestyle and family planning goals in accordance with the principles of informed choice and reproductive rights outlined at the Cairo International Conference on Population and Development and underpinning U.S. Government support for voluntary family planning programs.^{13,14}

Implants are more effective than any other reversible method.

MSI HELPS TO EXPAND ACCESS TO IMPLANTS

In 2008, MSI provided 80,041 implants in the 15 sub-Saharan African countries where we work. In just 5 years, we increased this number considerably to 754,329 implants provided in 2012 (Table 1). Cumulatively, during the 5-year period, MSI delivered more than 1.7 million contraceptive implants in these countries.

Rapid expansion occurred in several key East and Southern African countries as well as in West Africa, a region where MSI began intensifying its presence as recently as 2007. Kenya, Madagascar, Malawi, and Uganda scaled up provision of implants considerably from 2008 to 2012, resulting in growth rates near or well over 1,000%, with a 49-fold increase in Malawi and an 18-fold increase in Kenya (Table 1). In Uganda, the number of implant users grew from under 20,000 in 2006 to more than 140,000 in 2011 (Box 1). The high growth rates from 2011 to 2012 in all countries

Between 2008 and 2012, MSI provided more than 1.7 million contraceptive implants in 15 sub-Saharan African countries.

TABLE 1. Number of Implants Provided by MSI in Selected sub-Saharan African Countries,^a 2008–2012

MSI Country Program	2008	2009	2010	2011	2012	% Growth (2011–12)
Burkina Faso	N/A	2,440	7,835	7,086	14,386	103%
Ethiopia	14,286	31,953	45,737	68,347	88,206	29%
Ghana	2,602	5,549	3,117	14,433	23,162	60%
Kenya	6,652	43,330	69,651	72,477	117,106	62%
Madagascar	6,206	17,535	26,899	34,175	65,229	91%
Malawi	1,719	1,369	2,595	21,691	84,389	289%
Mali	30	3,295	10,588	17,649	33,019	87%
Nigeria	N/A	1,184	5,944	6,388	12,749	100%
Senegal	N/A	N/A	N/A	535	6,600	1,134%
Sierra Leone	N/A	8,387	21,792	29,257	37,672	29%
South Sudan	N/A	N/A	N/A	153	1,138	644%
Tanzania	25,457	28,157	24,465	36,705	64,752	76%
Uganda	13,730	29,875	42,498	81,544	143,762	76%
Zambia	639	3,037	4,724	4,457	9,900	122%
Zimbabwe	8,720	16,166	24,862	40,107	52,259	30%
TOTAL	80,041	192,277	290,707	435,004	754,329	73%

Abbreviations: MSI, Marie Stopes International; N/A, not available (because the MSI country program had not yet begun providing implants).

^a Data from MSI's service delivery statistics for MSI country programs in sub-Saharan Africa that were active in implant service delivery in 2012. Data from Sudan and Swaziland recorded in 2010 and 2011 are not included because these country programs were closed in 2012. (The 2 countries contribute an additional 864 implants in 2010 and 486 in 2011.)

The high growth rates in implant provision between 2011 and 2012 in sub-Saharan Africa indicate that implant service delivery has room to expand further.

indicate that implant service delivery still has room for further expansion.

The steep increase in implant provision between 2008 and 2012 (more than 9-fold) demonstrates a marked difference from our provision of other long-acting and permanent methods (LAPMs) during the same period (Figure 2). Like implants, use of IUDs has steadily increased in sub-Saharan Africa since 2008 due to MSI's overall family planning program scale up in the region. However, stronger demand for implants resulted in a much faster pace of growth in comparison with IUDs. For tubal ligations, the number of services provided per year remained fairly steady over the 5 years. The number of female sterilization users, however, still accounts for the highest proportion of MSI family planning users in the region (Figure 3), because MSI has delivered more tubal ligations than other LAPMs historically; therefore,

the estimated number of sterilization users in 2012 reflects these past trends.

MSI's capacity to deliver implant services—and to scale up efforts in response to client demand—complements the existing method mix provided by the public sector and other private-sector providers, helping to meet the needs of clients who prefer implants. Public-sector facilities in sub-Saharan Africa often face constraints in providing LARCs, including implants, on a reliable basis. A lack of adequate infrastructure, frequent commodity stockouts, and a lack of skilled providers hinder public-sector provision.^{15,16} Moreover, many public- and private-sector family planning programs deliver predominately short-acting methods, and, commercial pharmacies, social marketing programs, and public facilities often offer better access to short-acting methods than to long-acting methods, including implants.

BOX 1. Marie Stopes Uganda Scales Up Provision of Implants

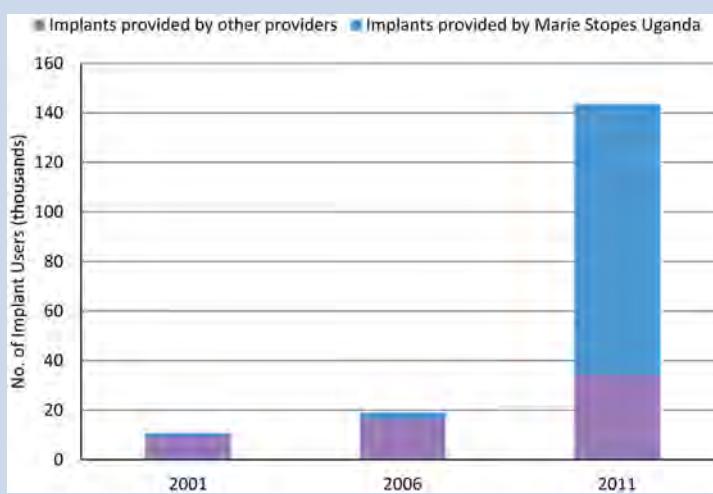
Between 2006 and 2011, Marie Stopes Uganda scaled up provision of implants and, in so doing, increased the size of the overall market for implants in the country. In 2001 and 2006, the total number of implant users in Uganda—comprised of new users and those who had their implants inserted in years prior—remained under 20,000 (Figure 1). Between 2006 and 2011, the number of users expanded more than 7-fold to more than 140,000 users.

By 2011, Marie Stopes Uganda had become the dominant implant provider in the country. We estimate that approximately 3 of every 4 women using an implant in Uganda in 2011 received their method from MSI. When we consider that the number of women choosing family planning in the general population increased by 60% between 2006 and 2011 and that the proportion choosing implants also expanded greatly (from 1 in 50 to 1 in 10), the role of Marie Stopes Uganda in reaching 76% of these users is significant.⁸ These data suggest that our scale-up efforts in implant services likely changed Uganda's national pattern of contraceptive use by 2011.

A number of factors contributed to the growth in implant provision by Marie Stopes Uganda:

1. Strong mobilization of donor resources, including bilateral funding from the U.S. Agency for International Development (USAID)
2. A large expansion in the number of service delivery sites
3. An increase in the number of community campaigns to generate demand for the contraceptive options available from Marie Stopes Uganda, including implants

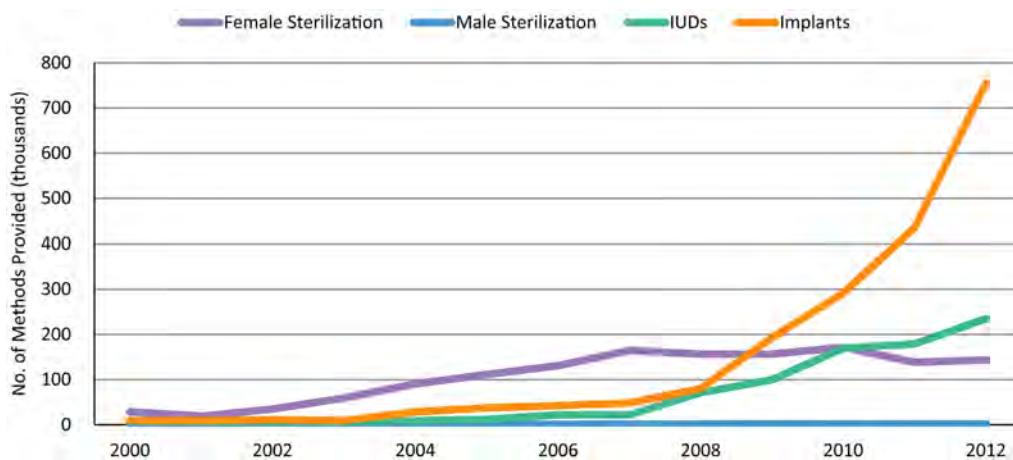
FIGURE 1. Number of Women Using an Implant Provided by Marie Stopes Uganda Versus Other Providers,^a 2001, 2006, and 2011



^a "Other providers" includes all private-sector organizations offering implants, other than Marie Stopes Uganda, and all public-sector providers, including Ministry of Health facilities.

Data for Marie Stopes Uganda users are from Marie Stopes International (MSI) service statistics and are modeled using MSI's Impact 2 model. These estimated user numbers include women who received an implant supplied by MSI that year as well as women who received implant services from MSI in past years who are modeled to still be protected by the implant. Data for implants provided by other providers are from 2001, 2006, and 2011 Uganda Demographic and Health Surveys and 2010 UN Population Prospects.

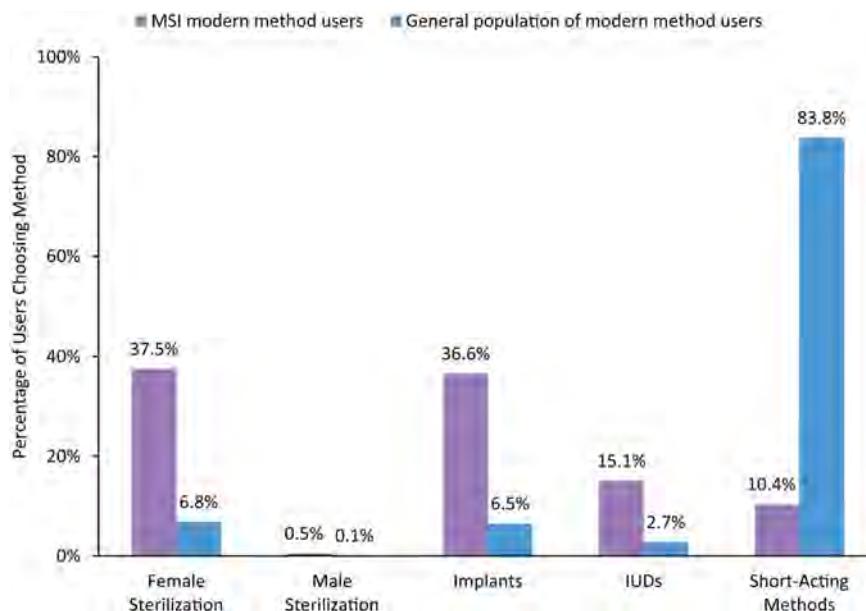
FIGURE 2. Number of LAPMs Provided by MSI in sub-Saharan Africa, by Method, 2000–2012



Abbreviations: LAPMs, long-acting and permanent methods; MSI, Marie Stopes International.

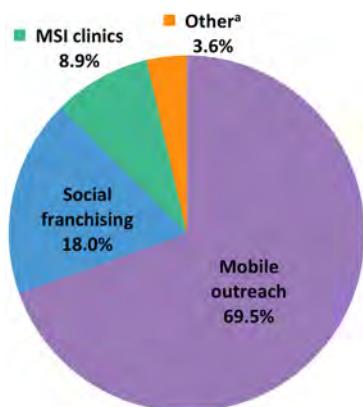
Data from MSI service statistics.

FIGURE 3. Method Mix Among Modern Method Users, Marie Stopes International (MSI) Users Versus the General Population, in African Countries Where MSI Operates, 2012



Data for MSI users are from MSI service statistics, with user numbers modeled using MSI’s Impact 2 model. As explained in the footnote to Figure 1, LAPM users include those who received their method in prior years who continue to be protected. Because sterilization protects women for a longer duration than IUDs and implants, previous sterilization clients remain in the total “user” number for more years (until aging out at 49, based on median age of sterilization). Data for the general population are from Demographic and Health Surveys for those sub-Saharan African countries where MSI operates.⁸ For MSI user numbers, short-acting methods exclude condoms to avoid the risk of overestimating condom use because of user wastage and dual protection.

FIGURE 4. Proportion of Implants Delivered by MSI in sub-Saharan Africa, by Service Delivery Channel, 2012



Abbreviations: MSI, Marie Stopes International.

^a "Other" includes community-based distribution, community health workers, and miscellaneous providers.

Data from MSI service statistics. Data do not include 1,898 implants delivered through social marketing in Mali.

As a result, the method mix of women in the region using an MSI-provided method differs considerably from the method mix of the wider sub-Saharan African population as a whole. In 2012, whereas 83.8% of women of reproductive age in sub-Saharan Africa overall were using a short-acting method, only 10.4% of MSI users were.⁸ In contrast, a far greater proportion of MSI users (36.6%) than the general population (6.5%) were using implants and other LAPMs for their family planning needs (Figure 3).

MSI SERVICE DELIVERY CHANNELS

MSI has successfully delivered family planning services through a number of channels, including the 3 main channels of:

1. Mobile outreach
2. Social franchising
3. Static clinics

Using more than one service delivery channel broadens the access points for a client, thereby increasing the likelihood that information about family planning choices will reach her and that she will have access to choose a method she wishes.^{1,6}

In 2012, the largest proportion of MSI's implant provision in sub-Saharan Africa was through mobile outreach services (Figure 4). Accounting for nearly 70% of all implants delivered, our outreach services provided almost 4 times as many implants as our social franchisees (18.0%) and nearly 8 times as many as our static clinics (8.9%). Still, the social franchising proportion is notable, since half of our social franchising programs in sub-Saharan Africa were recently established in the latter half of 2012. These results underscore the importance of mobile outreach and social franchising for expanding access to implants as part of a comprehensive method mix.

Typically, variations or service delivery innovations build on 1 of these 3 channels. The scale of each of these channels also varies by country, depending on client needs and infrastructure availability. Table 2 contains a summary of our country program operations in those sub-Saharan African countries active in implant service delivery in 2012.

When determining which channels to use, MSI considers the efficiency and reach of each one within the specific country context. Monitoring both efficiency and reach are essential considerations for enabling service delivery scale up and ensuring scale up is equitable.¹ **Efficiency** refers to allocating time, effort, and resources strategically in service delivery to maximize the greatest program impact.¹⁷ Matching the size of a clinic or provider team to client demand and service patterns of a facility or catchment area is one example of efficiency. To measure efficiency, MSI teams use cost per couple-year of protection (CYP), a metric that shows the average cost of delivering a contraceptive method relative to the number of years the method protects against pregnancy. Currently, MSI uses cost per CYP for internal program monitoring and decision making; costing data will be made available in future studies focused on service delivery and scale-up costs. It is important to note that this metric is not simply about minimizing the cost per CYP, but rather about ensuring we use our resources to achieve the most impact—accounting for our role in expanding access and choice, improving quality, and ensuring equity.

Reach refers to expanding access to family planning services, meaning that every potential client can obtain services regardless of financial, geographical, and/or cultural barriers.¹⁷ We select service delivery channels that will reach clients

70% of MSI's implant clients in sub-Saharan Africa were reached through mobile outreach. Social franchising also showed promise, accounting for 18% of implant clients.

TABLE 2. Summary of MSI Country Programs Active in Implant Service Delivery in sub-Saharan Africa, 2012

MSI Country Program	Month/Year Program Opened	No. of FP Clients (all channels)	No. of Implants Provided	No. of Mobile Outreach Teams	No. of Clinics	No. of Social Franchisees	Month/Year Social Franchising Started
Burkina Faso	07/2009	24,517	14,386	4	1	N/A	N/A
Ethiopia	09/1990	206,723	88,206	10	31	443	10/2008
Ghana	10/2006	39,798	23,162	6	5	106	03/2008
Kenya	03/1986	229,836	117,106	15	25	279	04/2004
Madagascar	06/1992	147,661	65,229	46	14	127	11/2009
Malawi	09/1987	229,310	84,389	39	31	54	06/2008
Mali	11/2008	45,787	33,019	7	3	34	06/2012
Nigeria	04/2009	16,446	12,749	5	1	51	09/2012
Senegal	11/2011	9,989	6,600	3	1	10	10/2012
Sierra Leone	03/1988	127,148	37,672	13	12	100	12/2008
South Sudan	08/2011	1,778	1,138	2	2	N/A	N/A
Tanzania	09/1990	149,252	64,752	26	12	N/A	N/A
Uganda	07/1993	260,466	143,762	24	15	419	06/2012
Zambia	06/2008	18,261	9,900	7	3	7	07/2012
Zimbabwe	04/1988	146,680	52,259	9	9	61	08/2012

Abbreviations: FP, family planning; MSI, Marie Stopes International; N/A, not applicable.

Data from MSI service statistics. Number of FP clients were estimated from MSI service statistics, in which each service for a longacting and permanent method is equal to 1 client and each year's supply of shortacting methods is equal to 1 client.

affected by gaps in service outlets or contraceptive methods. At the same time, we consider channels that will enable existing clients to continue and/or switch their methods, if they choose. MSI monitors a program's reach through indicators such as the number of CYPs generated or the number of service delivery sites established. Recently, MSI also began monitoring the number of high-impact CYPs generated by different service delivery channels. Developed by MSI, this indicator measures a program's ability to deliver services to those facing the highest barriers to access, such as the poor, young women, those who have not previously been using family planning (called "adopters"), and users of short-acting methods who seek services at MSI to meet their desire for a LAPM (called "switchers").

Mobile Outreach

MSI's mobile outreach services deliver implants and other contraceptive methods through a team of MSI dedicated providers that brings equipment and commodities directly to clients. The use of these dedicated providers—those who fill a specific service delivery gap by focusing primarily on the provision of certain contraceptive methods, such as LAPMs—is a key component of MSI's mobile outreach strategy.¹⁸ Unlike some dedicated provider models, we employ MSI staff, not external providers. These teams visit outreach sites on a regular basis, ranging from every 4 to 6 weeks to once per quarter in the most remote regions, expanding access to contraceptive choice through provision of LAPMs during these visits. (In support of informed choice, our dedicated providers refer clients who want short-acting methods to their public-sector counterparts located at the same site when available, or they furnish these methods directly in cases of stockouts at the public facility.)

To help achieve equity, MSI provides underserved clients who do not otherwise have access to implants or other LAPMs with free or highly subsidized family planning services. As a result, the mobile outreach channel often generates high demand and commonly attracts new family planning adopters, a key metric for monitoring scale-up efforts.^{19–21}

In 2012, 41% of mobile outreach family planning clients were adopters, reached through our 216 mobile outreach teams in the sub-Saharan African countries offering implants (Table 2). Moreover, and importantly for implant scale up, 39% of our outreach clients switched

from short-acting methods to LAPMs, indicating client preference for longer-acting contraception.⁸

Mobile outreach services can also be an effective channel for program scale up in terms of efficiency. By strategically using existing community infrastructure, small teams, and outreach schedules that coincide with client demand, mobile teams can maximize impact from its program inputs. For areas that are not too rural but still hard to reach, this channel has proved to be cost-effective.²² Teams of dedicated providers also have been shown to increase the number of IUD and implant insertions, and therefore, program scale up.¹⁸

Depending on the geography of a particular catchment area, MSI uses either a mobile clinical service team or a mobile community outreach worker team, its 2 primary outreach models.²³ The **mobile clinical service team** model deploys small teams, typically 3 MSI dedicated providers and a driver, to rural areas for delivery of family planning services in existing health centers (usually public facilities) where possible. Through a collaborative process with local governments, MSI chooses these clinics because of their infrastructure, their ties to the community, and their visibility among clients. Some women also prefer to access family planning at a health center in order to disguise the reason for their visit. If needed, a team uses other community facilities (for example, schools and community centers), or sets up a low-cost, temporary structure such as a tent.

In an effort to serve densely populated urban and peri-urban areas, our second model, the **mobile community outreach worker team**, is a flexible, low-cost adaptation of the clinical service team model. In the community outreach worker team model, a smaller team—often consisting of just 1 or 2 MSI dedicated providers of lower-level cadres—provides implants and other contraceptive methods, often in client homes or other non-health facility locations. A typical example is when 1 paramedic or nurse and 1 family planning counselor will use local transport, rather than MSI-owned vehicles, to reach clients (Box 2). Although the teams for both models are based out of an MSI clinic, they mobilize interest in their services in advance of their arrival in the community through a variety of demand-generation activities (Table 3).

Both of these outreach program models are examples of how MSI collaborates with the

41% of MSI's mobile outreach family planning clients in 2012 were adopters and 39% switched from short-acting methods to long-acting and permanent methods.

BOX 2. Marie Stopes Tanzania Develops Innovative Urban Outreach Model

Throughout its 30-plus year history, Marie Stopes Tanzania reached middle-income urban clients through MSI clinics and low-income rural clients through mobile outreach. However, by 2010, we had identified a growing gap in contraceptive-seeking behavior: our static clinics were not adequately reaching many low-income urban and peri-urban women wishing to use injectables and LARCs, including implants.

MSI's existing rural outreach model consisted of MSI-owned 4x4 vehicles and large clinical teams. Such a model would be too cumbersome in a peri-urban context, and so Marie Stopes Tanzania set out to innovate urban outreach. In 2010, we launched a pilot *bajaji* (motorized auto-rickshaws) outreach model in Zanzibar, with support from USAID. This new urban outreach model, using a team consisting of 1 MSI nurse and 1 *bajaji* driver, is a streamlined and more flexible version of MSI's rural outreach model.

The *bajaji* outreach model significantly reduces startup and operational costs due to lower staffing, fuel, and vehicle expenses. *Bajaji* nurses deliver contraceptive methods directly in clients' homes, in addition to providing family planning services at standard mobile outreach model sites (public health facilities or other community-based static sites). Clients report that these home-based services allow them to circumvent key access challenges, including lack of time to attend clinics, need for discretion in seeking family planning, and, in some contexts, cultural norms requiring women to be accompanied when traveling outside the home.

Within several months of starting *bajaji* services in Zanzibar, the Ministry of Health in Mwanza City invited Marie Stopes Tanzania to expand the model for its underserved urban neighborhoods.

In the 12-month pilot period in Zanzibar, *bajaji* teams delivered family planning services to 3,650 clients, of which 2,122 chose implants. In the 7-month pilot in Mwanza City, *bajaji* teams delivered family planning services to 2,531 clients, of which 1,432 chose implants. Client interest in voluntary permanent methods resulted in 86 referrals to MSI clinics for tubal ligations (73 in Zanzibar and 13 in Mwanza City).

Several MSI country programs in Africa and Asia are currently replicating this model to reach underserved urban and peri-urban clients.

public sector, building the clinical competencies of public-sector providers and creating synergies between public and private systems. For example, we prepare public providers for assessing and handling any complications that may arise from implant insertions. Such training is critical to meet follow-up needs of clients between visits from the MSI team. To ensure clients receive high-quality follow-up care, MSI coordinates referral networks with higher-level facilities to manage side effects that infrequently arise and that are beyond the capacity of lower-level public-sector providers. In the event that a client experiences a severe side effect, defined as a frequent level of discomfort requiring medical attention, we provide technical expertise and pay for transport and hospital fees if higher-level facility referral is needed. Where possible, we also build the clinical skills of public-sector providers in other ways, focusing on specific areas that need reinforcement (such as client counseling techniques and implant removal protocols).

Social Franchising

MSI's *BlueStar* social franchise networks* engage existing private providers to deliver high-quality sexual and reproductive health services, including implants, in underserved areas. Contracted to MSI but operated and owned by private providers, these networks are organized under commercial franchising principles, which have been shown to facilitate standardization and increase client volume, including for family planning services.^{24–26} MSI has adopted a “partial franchising” model for our social franchise networks. In this model, we regulate and support only some of the franchisees' services and commodities, namely the reproductive health and family planning services; the franchisee may offer additional services that we do not oversee.

* MSI's social franchise networks are branded *BlueStar* with the exception of *Plan.It* (India), *Rayahen* (Yemen), *Suraj* (Pakistan), and *Amua* (Kenya). In this article, *BlueStar* is used to refer to all MSI franchise networks in sub-Saharan Africa, including *Amua* in Kenya.

TABLE 3. Demand-Generation Activities to Educate Clients About Family Planning and MSI Services, by Channel

Mobile Outreach Services	Social Franchising	Clinics
Delivery of high-quality services to enable word-of-mouth referrals	Delivery of high-quality services to enable word-of-mouth referrals	Delivery of high-quality services to enable word-of-mouth referrals
Educational outreach by community health workers (CHWs) or other community agents about importance of family planning and different methods through: <ul style="list-style-type: none"> • Door-to-door mobilization • Group information sessions • Educational/promotional communication and media 	Educational outreach about family planning and long-acting and reversible contraceptives (LARCs), including implants, as well as about <i>BlueStar</i> family planning services through: <ul style="list-style-type: none"> • CHWs and other community agents • Print or radio advertisements 	Educational outreach about family planning and MSI services through: <ul style="list-style-type: none"> • Kiosks at regular markets and popular events • Radio show appearances by MSI clinic staff • Flyers and promotional materials available at locations frequented by young women, such as markets, universities, and beauty salons
Designated day for team visit, making it a noteworthy and anticipated community event	Special discount days on LARC services	
Local media advertisements about voluntary family planning and LARCs, including implants	Promotion of <i>BlueStar</i> brand, as an overall sign of quality service delivery	Training for all clinic staff including receptionists and support staff to ensure client-friendly, non-judgmental environment
Where appropriate, referrals from other MSI service delivery channels	Referrals from: <ul style="list-style-type: none"> • Other non-MSI services at franchisee • Other MSI service delivery channels, where appropriate 	Where appropriate, referrals from other MSI service delivery channels
Announcement of upcoming mobile team visit via: <ul style="list-style-type: none"> • Town crier • Radio • CHWs or other community agents 		

In sub-Saharan Africa, franchisees are typically located in urban and peri-urban areas as well as towns and trading centers in rural areas. By engaging these existing providers, we leverage and strengthen the health infrastructure and aim to achieve greater health system integration between the public and private sectors. MSI gains access to an established clinic and existing client base in a community when we invite new members to the *BlueStar* network, obviating the need for the startup costs and effort associated with opening a new MSI clinic. At the same time,

we expand client access to key services that these private clinics would otherwise not be able to provide adequately, allowing health systems to make better use of the capacity in the private sector to achieve public health-sector goals, such as increases in contraceptive prevalence.

At the individual level, *BlueStar* franchisees increase options for existing contraceptive users as well as increase the market for family planning users and attract new users. In 2012, 78% of our *BlueStar* LAPM clients in sub-Saharan Africa chose implants—135,144 implant clients

In 2012, 78% of MSI's social franchising LAPM clients chose implants.

in 12 countries. Due to this demonstrated potential, social franchise networks will be key channels for scaling up implant services in many MSI country programs in the coming years.

To help family planning program scale up and to offer services at affordable prices to our clients at our 1,691 *BlueStar* clinics in sub-Saharan Africa, MSI facilitates access to high-quality implants (and other commodities for other franchised services delivered) in 2 ways. We either supply these implants at a reduced price or negotiate access to pooled commodities at the national level on behalf of franchisees. Discounts vary from country to country. For example, while an MSI subsidy enables our Ghana franchisees to receive implant commodities at the same price as their public-sector counterparts, we are able to supply our Madagascar franchisees with implants (and other contraceptive methods) free of charge.

Prior to joining the *BlueStar* network, individual clinics are not usually in a position to offer implants or other LAPMs to their clients; in most countries, there is no private-sector supply chain for implants outside of social franchise networks. By joining *BlueStar*, the benefits of supply-chain support—namely, more reliable and affordable access to consumables and implants themselves—enable *BlueStar* clinics to provide a wider range of contraceptive methods. These economies of scale result in cost savings for our clients, thereby increasing access for lower-income clients and scaling up equitable service provision.

MSI Clinics

Clinics have been our longest-standing service delivery channel. Owned and operated by MSI, our clinics are located in cities, towns, and peri-urban areas throughout 42 countries worldwide, with 165 delivering reproductive health and family planning services in the 15 sub-Saharan African countries that provided implants in 2012 (Table 2).

In many of these countries, our clinic services augment the contraceptive method mix available from the public and private sector in urban and peri-urban areas, attracting new clients because of the different services that MSI offers, including implants. In fact, in 2012, 38% of our clinic clients in sub-Saharan Africa were family planning adopters.⁸ Therefore, these clinics are important for expanding implant access to women in their respective catchment areas.

MSI clinics offer some advantages to scaling up access to implants over other service delivery channels in terms of efficiency and reach. Because the clinics are well-established in their catchment areas, with appropriate equipment and trained providers, our clinics can offer implant services in a manner that uses program inputs strategically to maximize impact. For example, we can scale up implant service delivery without significantly increasing overhead costs, such as transport with mobile outreach services. In terms of reach, these clinics tend to serve a population that is relatively wealthier than those served by our mobile outreach channel; in 2012, approximately 17% of our clinic clients in sub-Saharan Africa lived on less than US\$1.25 per day compared with 42% of our mobile outreach clients.⁸ At the same time, income generated from the sliding scale fees charged by our clinics helps subsidize our outreach service delivery, in which fees are typically not charged.

QUALITY ASSURANCE MEASURES

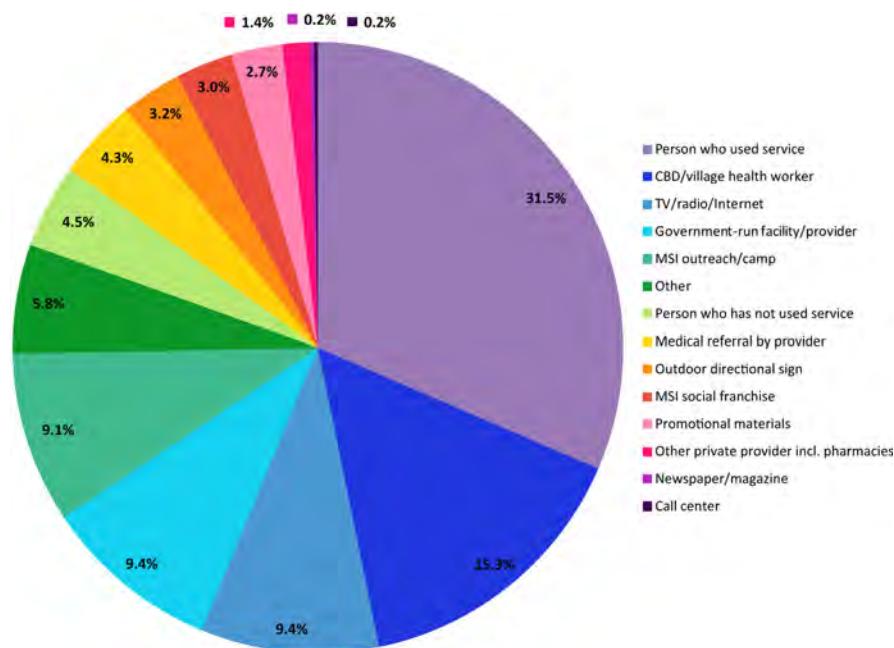
All MSI delivery channels prioritize service quality when providing clients with contraceptive methods. High-quality programs yield high levels of client satisfaction, a principal determinant of a client's initial and continued use of family planning services.^{27–30} The quality level of family planning service delivery, including implant provision, also directly influences the demand generation facilitated by client experiences and word-of-mouth communication, and, in turn, program scale-up efforts.

MSI implements various quality-control activities, such as competency-based training and refresher courses, to train providers on MSI standards. We also train facility staff and outreach teams on how to use MSI's management information system to record client visits, services provided, expenditures, and stock of commodities and equipment. We then use various tools, such as mystery clients, supportive supervision, and audits, to monitor and ensure these service standards are met. See the Appendix for a complete list of MSI's quality-assurance activities. Through these measures, our staff and partners pay attention to quality throughout each stage of service delivery.

As a result of this rigorous attention to quality, MSI clients have reported high rates of satisfaction with the services received, regardless of the channel from which they obtained family planning services. In 2012, MSI family planning clients across 11 sub-Saharan African countries

In 2012, 38% of MSI's clinic clients in sub-Saharan Africa were family planning adopters.

FIGURE 5. Most Influential Source of Information Affecting Decision to Choose MSI Services Among sub-Saharan African Clients^a Across All Service Delivery Channels,^b 2012 (N=6,225)



Abbreviations: CBD, community-based distribution; MSI, Marie Stopes International.

^a Data from exit interviews in 11 sub-Saharan African countries, from August 2012 through December 2012.

^b Results were weighted by region and delivery channel where appropriate. When weighting by delivery channel, data were only used from countries where the relevant delivery channel had been surveyed.

gave our services an average rating of 4.4 on a 5-point Likert scale, in which 5.0 signified “very good.” The highest-rated aspect of service delivery was “friendliness and respect from the health care provider,” followed by “friendliness and respect from staff.” These data are potentially subject to “courtesy bias,” in which the clients are reluctant to express negative opinions to the interviewer.

Other sources of data, however, support these positive findings. For example, when asked which source of information was most important in influencing their decision to choose MSI services, 31.5% of our sub-Saharan African clients cited a “person who used the service” (Figure 5). Furthermore, 29.9% of our clients in sub-Saharan Africa from across all delivery channels noted that MSI’s “good reputation” was the driving force behind their decision to visit an MSI service site (Figure 6). The proportion citing our “good reputation” was

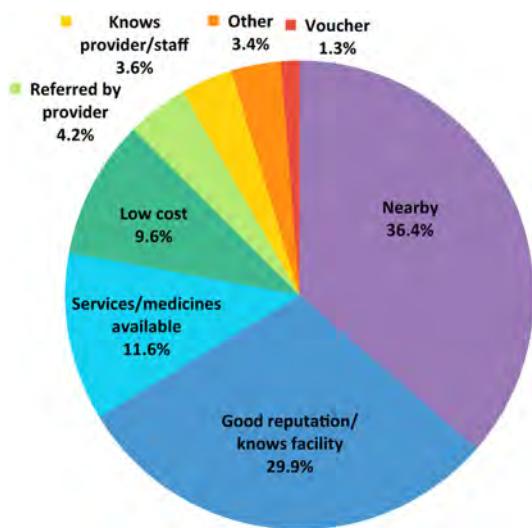
also substantial by service delivery channel: 44% of clinic clients, 32% of social franchise clients, and 23% of mobile outreach clients. Such evidence underscores the importance of informal demand generation, based on client acknowledgment of high-quality services and word-of-mouth communication, in influencing MSI client health-seeking behavior for family planning. It also underscores how high-quality service delivery is necessary for expanding access to family planning and scaling up programmatic efforts.

INFRASTRUCTURE AND IMPLEMENTATION STRATEGIES REQUIRED FOR SCALE UP

Underlying MSI’s multichannel approach to scaling up delivery of implant services in sub-Saharan Africa were 3 strategies that leveraged and supported key country infrastructure:

Satisfied clients can help generate demand for family planning services through informal word-of-mouth communication.

FIGURE 6. Most Important Reason for Choosing Services From Marie Stopes International Among sub-Saharan African Clients^a Across All Service Delivery Channels,^b 2012 (N= 6,225)



^a Data from exit interviews in 11 sub-Saharan African countries, from August 2012 through December 2012.

^b Results were weighted by region and delivery channel where appropriate. When weighting by delivery channel, data were only used from countries where the relevant delivery channel had been surveyed.

WHO recommends task shifting or sharing for implant service delivery to address health worker shortages.

1. Provider supply
2. Commodity supply chains
3. Program financing mechanisms

In addition, our experience points to a number of key implementation strategies that should be considered when planning and rolling out programs (Box 3). Finally, operational issues such as access to implant removal services must be planned for in the initial design phase. Each of these factors can pose a barrier to family planning program implementation and expansion if they are not sufficiently addressed.

Sufficient Provider Supply

Sufficient health workforce availability and distribution within countries is a key requirement for scaling up implant service delivery.⁴ Unlike condoms or other short-acting methods, implants require a skilled health worker in order for clients to use them. To address health worker deficits, many sub-Saharan African governments have

implemented task-shifting and task-sharing initiatives, which increase a country's service delivery capacity by delegating some health care delivery tasks from higher-level to less-specialized health workers.³¹ Various studies have demonstrated the feasibility of these practices for family planning service delivery, and they have proved effective in the scale up of family planning programs, including delivery of implants.^{19,32–36} As a result, the World Health Organization (WHO) currently recommends the use of task shifting/sharing for implant delivery, recently endorsing 2 new cadres, auxiliary nurses and lay health workers, for this practice.³⁷

Where allowed by national guidelines, MSI employs task sharing and task shifting to deliver reproductive health and family planning services.^{19,36} In Ethiopia, Malawi, Mozambique, and Uganda, mid-level providers routinely deliver implants. For example, MSI Ethiopia has dramatically increased its implant delivery capacity through participation in the Integrated Family Health Program, supported by USAID, which has trained more than 10,000 health extension workers to provide implants.

Strong Supply Chains

Successful health interventions that deliver products to clients in the developing world require robust and predictable commodity supply chains.³⁸ Stockouts can reduce service uptake; conversely, a reliable supply of commodities is an important component of high-quality service delivery and can increase uptake and loyalty. MSI's 2012 client exit interview data show that 11.6% of sub-Saharan African clients reported that "services or medicines available" was the most important reason for choosing MSI services (Figure 6).

To ensure a steady supply of implants to its programs in sub-Saharan Africa, MSI uses a **multipronged procurement strategy**. First, MSI country programs work to integrate their supply chains into national supply chains to the greatest extent possible. Large quantities of implants are sourced through Ministry of Health central supplies, many of which are funded by USAID. As funding permits, MSI global headquarters in London also procures implants at bulk prices through international tenders. Implant price-volume guarantees from donors and Implanon and Jadelle manufacturers Merck and Bayer, respectively, allow MSI to secure many more implant units with a finite budget. Additionally, MSI receives a global

BOX 3. Key Implementation Strategies for Scaling Up Delivery of Implants

Focus on clients with unmet family planning need. In order to successfully expand reach, programs must identify and focus on serving prospective users who lack access to a broad range of contraceptive methods, including implants. MSI identifies areas of unmet need through site visits, Ministry of Health input, and analysis of the latest health service and Demographic and Health Survey data.

Devote resources to raising awareness and diffuse communications through multiple channels. Sustained awareness-raising activities are critical for attracting new family planning users, including those who choose implants from a wide array of options. Clients may be spread out across a large geographical area and may have limited access to mainstream media channels. Thus, health promotion messages about family planning and implants must be disseminated through different communication channels. Data from MSI client exit interviews in sub-Saharan Africa indicate clients have access to various communication channels, including: community health workers, radio, newspapers, community events, and friends or satisfied clients (Figure 5).

Deliver high-quality services. Ensuring high-quality service delivery, at clinical and operational levels, serves as a catalyst for future demand and expansion of service delivery. A positive reputation among clients creates a feedback loop in which existing clients refer new clients. See the Appendix for specific activities MSI uses for establishing service quality.

Deliver implants through multiple, interconnected service delivery channels. Using a multipronged strategy to deliver implants helps: (1) ensure the program reaches women of reproductive age in different geographic areas and social strata, as well as with different preferences for health care delivery; (2) generate demand; and (3) ensure comprehensive family planning care for follow up, eventual implant removal, and continued contraceptive use, including family planning counseling and services for clients who do not choose implants. In Madagascar, MSI successfully increased implant uptake and reached the poorest and least accessible women of reproductive age, through its USAID-funded SHOPS (Strengthening Health Outcomes through the Private Sector) program, by using and linking outreach and social franchising channels.³⁹

Build and leverage public-private partnerships. Given the central role of the Ministry of Health in the health system and its high community visibility, successful private programs work with and strengthen the public health system by: (1) filling gaps in contraceptive method availability, which is sometimes limited to short-acting methods; (2) training public providers in contraceptive counseling and implant removals; and (3) establishing a robust referral system for follow-up care and implant removals. In MSI's SHOPS program in Madagascar, public facilities or providers proved to be the most common referral source for outreach clients and contributed substantially to scaling up implant provision.³⁹

allocation of implants from the United Nations Population Fund (UNFPA). Together, these international supplies provide the flexibility to smooth out individual countries' implant supplies when shortages occur.

MSI's **product registration initiatives** are another way we strive to ensure availability of implants. MSI works to increase the number of implant brands registered and available in countries. Working in partnership with FHI 360, MSI has registered Sino-implant (II) implants under its branded name Femplant in Burkina Faso, Ghana, and Mali. We have also supported Pharm Access Africa Ltd. in introducing Sino-implant (II) in Kenya, Madagascar, Malawi, Nigeria, Senegal, Sierra Leone, and Tanzania. MSI providers are not limited to using Sino-implant (II) implants, however. They use Implanon and Jadelle brands as well, aiming to meet client preferences regarding the duration of contraceptive protection.

However, as MSI typically sources implants through Ministries of Health, the registered brands vary by country, and procurement decisions between brands are often outside of MSI's direct influence. To date, MSI's experience in sub-Saharan Africa shows that demand for implants, and thus program scale up, has occurred regardless of brand.

Diverse Program Financing Mechanisms

For program scale up in sub-Saharan Africa to be successful, it is essential to reach those underserved clients with the highest unmet need. Unmet need for family planning is higher among low-income sub-Saharan African women than among middle- and higher-income groups.¹ With 81% of the sub-Saharan African population (in the countries in which MSI works) living on less than US\$2.50 per day, the cost of delivering implants must be subsidized to ensure price does

Ensuring reliable implant removal services is essential to maintain client trust in family planning services.

not become a barrier to client uptake.⁸ Client exit interview data from 2012 indicate that 9.6% of clients across all service delivery channels in sub-Saharan Africa cited “low-cost” services as the reason why they chose MSI for their family planning services (Figure 6).

MSI uses various financing mechanisms to reduce costs to clients and ensure equity in scale up:

- Part of the surplus generated from clinic operations in developed countries (for example, Australia and the United Kingdom) helps fund the cost of programs in developing countries.
- Any surpluses generated from services for wealthier clients at developing-country clinics help to subsidize services for lower-income clients, primarily mobile outreach services.
- Donor subsidies reduce the true cost of implant service delivery, which encompasses both commodity and operations costs.
- Program efficiencies such as bulk pricing and good logistical management further reduce the cost of service delivery.
- Vouchers distributed in catchment areas with high unmet family planning need and low access to services direct subsidies specifically toward lower-income clients. (MSI uses a needs test to determine eligibility.⁴⁰)

Vouchers enable clients to choose from any participating, accredited provider to receive free family planning services. Over the last 5 years, MSI has piloted and scaled up the use of vouchers in its social franchising networks in certain countries, including Ethiopia, Madagascar, Sierra Leone, and Uganda. In the USAID-funded SHOPS program in Madagascar, the vast majority of social-franchising clients receiving vouchers chose implants. Between January and September 2011, 3,467 LARCs were provided, 3,001 of which were implants (87%). The number of services delivered to non-voucher clients during the same time period remained fairly stable. Thus, the voucher clients did not significantly displace non-voucher clients, indicating market expansion.³⁹

Implant Removal Services

Contraceptive implants have either a 3-, 4-, or 5-year life span, and clients may decide to discontinue use at any time. Thus, it is essential to have infrastructure in place for implant removals to maintain client trust in the program’s family planning services.⁷ Robust and reliable removal services can also help maintain a

client as a contraceptive user; removal poses an opportune time to counsel the client on method switching or continuation.

Clients who receive their implants through an MSI clinic or *BlueStar* franchisee typically return to the same location for their removal service or other follow-up care. Outreach clients, however, must be linked to a static site to access removal services or follow-up care when needed. Mobile outreach teams do offer removal services; however, a client may require a removal in the weeks between outreach visits to her catchment area. As part of comprehensive counseling, MSI providers counsel clients on where to go when a removal or follow-up care is required. For clients living far from an MSI clinic or *BlueStar* franchisee, MSI maintains active referral networks of public-sector and, in some cases, other NGO facilities that are trained in implant removal. Clients incur no additional charge for removals as this procedure is considered part of service delivery for implants.

To ensure provider willingness to deliver these removal services, MSI requires that all staff and all social franchise service providers complete competency-based training on implant and IUD removals as well as on management of side effects. Refresher courses occur at regular intervals and are mandatory. Combined with ongoing provider mentoring by MSI’s clinical services managers from the country office, these courses aim to bolster provider confidence and knowledge of the procedures for removal and other follow-up care. To date, MSI has not experienced widespread provider reluctance to remove implants, although continued monitoring of this issue is needed.

Maintaining contact with clients after insertion is a key challenge, however. Until recently, MSI, like other family planning service delivery organizations, relied on paper reminder cards to remind clients when to seek implant removals. Since 2012, MSI has been developing a client registration system called the Client Information Center, or CLIC. The system is a combination of software and paper tools that track client profile information including the services and products received during client-provider interactions and any adverse events experienced during the visits.

CLIC has been designed to function in the MSI clinic and at outreach delivery channels, ultimately allowing MSI to track clients between facilities when they present in one location and

In Madagascar, almost 90% of family planning clients receiving vouchers chose implants.

later in another. Built-in reports allow staff to access information on which clients are due for return visits as well as view user-friendly statistical information on who our clients are and what services they receive over time. If clients wish to share their phone number, it is entered into CLIC so that providers can follow up with appointment reminders, information on minor side effects such as changes in menstruation patterns, information on the timing and location of removal services, and post-removal contraceptive choices. To safeguard confidentiality, clients are contacted by phone only with their permission. Thus, this new system provides MSI with a powerful yet easy-to-use tool to track clients post-procedure, ensuring timely removals of implants at the end of their life span and enabling a better understanding of client follow-up behavior. The use of CLIC may also help mitigate any provider reluctance to perform removals as the electronic record may standardize and normalize removal protocols.

Discontinuation and Side Effects

MSI has tracked discontinuation rates and side effects experienced by outreach clients in some sub-Saharan African countries. Only a small proportion of clients surveyed in Ethiopia (0.4%), Sierra Leone (0.7%), and Uganda (2.7%) had discontinued use of implants after 3 months, with rates increasing at later intervals but still remaining low (Table 4).

In terms of side effects, only 1.1% of Ugandan clients experienced severe side effects 15 days following insertion; however, none had complications and all received follow-up care.⁴¹ Severe side effects were defined as a frequent level of discomfort that required medical attention to determine whether a complication had arisen. A much larger proportion, 61.9%, also reported pain around the insertion area at this interval, although these clients did not find it severe. At 6 months post-insertion among clients in Ethiopia and Sierra Leone, the proportion of clients reporting they had ever experienced side effects was 40% and 45%, respectively.¹⁹ These side effects included cramping and changes in menstrual bleeding that many implant users experience.

IMPLICATIONS OF MSI'S SERVICE DELIVERY APPROACH

With a cumulative 5-year yield of more than 1.7 million contraceptive implants distributed in

TABLE 4. Implant Discontinuation Rates Among Clients Receiving Implants From MSI in Ethiopia, Sierra Leone, and Uganda, 2010

Duration of Use	Discontinuation Rate		
	Ethiopia ^a (N=562)	Sierra Leone ^a (N=433)	Uganda ^b (N=470)
3 months	0.4%	0.7%	2.7%
6 months	0.7%	3.0%	N/A
8 months	5.7%	6.2%	N/A

Abbreviations: MSI, Marie Stopes International; N/A, not applicable.

^a Data from Ethiopia and Sierra Leone were collected in April 2010 during retrospective follow-up studies on women who received implants in 2009 at mobile outreach sites.¹⁹

^b Data from Uganda were collected in a prospective cohort study among women receiving implants, IUDs, or tubal ligations between February and April 2010 at mobile outreach sites.⁴¹



In Zambia, Marie Stopes International clients examine contraceptive implants during a group counseling session about the variety of family planning methods from which women can choose.

sub-Saharan Africa, MSI's family planning service delivery approach can be useful for governments and other organizations aiming for similar program expansion. MSI's experience demonstrates that service delivery expansion can be done successfully in sub-Saharan Africa by leveraging existing service delivery channels that many implementing organizations already use: clinics owned and operated by NGOs, social franchising networks, and mobile outreach

TABLE 5. Key Components of Mobile Outreach and Implications for Scale Up, Replication, and Sustainability

Mobile Outreach Component	Implications for:		
	Scale Up	Replication	Sustainability
Free or highly subsidized services	Helps facilitate rapid expansion, since poor and rural clients have highest unmet need	Requires adequate financing mechanisms to subsidize costs	Requires continued investment and greater role of country governments, through contract arrangements and other innovations
Teams of dedicated providers	Can encourage expansion in areas of high demand by filling service gaps at existing public and private clinics, particularly with high-quality services that can be monitored more easily with such providers	Requires trained staff who can be deployed to remote areas	Greater emphasis on integrated service delivery models may generate hybrid models. As public-sector capacity develops, dedicated providers may shift their role to a support function.
Public-private partnerships	Must be in place for channel to operate properly, and therefore, for service delivery expansion to occur	Requires collaborative relationships with public sector and robust referral systems	Possible to sustain over the long term, although dynamics may change with the private sector mentoring public-sector providers who assume a larger role in service delivery (presuming the supply of competent public providers increases)

teams of dedicated providers that work in partnership with the public sector.

Underlying our channel operations is a strong infrastructure that enables channels to complement each other in user reach and operational structure. Key elements of this infrastructure include a sufficient number of trained providers, strong commodity supply chains, and diverse financing mechanisms. MSI's implementation experience underscores that quality assurance also matters, in the interest of clinical standards but also to help ensure that clients are satisfied with their experience and that they communicate their satisfaction to generate further demand for services.

These systems and strategies have enabled our sub-Saharan African country programs to be nimble in responding to the rising demand for implants over the last 5 years. Governments and organizations wishing to scale up their own programs will likely recognize that the infrastructure investments required to deliver implants as part of a comprehensive method mix can also be leveraged to deliver and expand the uptake of other contraceptive methods.

The adaptive quality of MSI's service delivery models is also an important component of its

scale-up efforts in sub-Saharan Africa. In response to changing demand, MSI modified its models to best meet the specific context where family planning service delivery was needed. For example, the mobile community outreach worker team emerged as a low-cost alternative to our original clinical services outreach model, enabling MSI to reach underserved communities in urban and peri-urban areas. A new MSI initiative with the government of Ghana offers another example of a model variation. In this expansion of the public-private partnership component of our outreach model, Ghana Health Services will assume MSI's demand-generation costs for MSI Ghana's mobile outreach channel. Other variations include contracting out opportunities, in which governments contract private-sector implementing organizations to deliver specific services, as MSI has recently established with the government of Tanzania for our outreach services. This adaptation responds to the evolving shift occurring in public-private partnerships, in which governments are assuming greater responsibility for the strategic direction of NGO-provided services (Table 5).

Looking forward, the increasing availability of implants will generate demand, and growing

numbers of women in sub-Saharan Africa are likely to choose this method. Our recent results in the region, in which every country where we work produced steep rates of growth, demonstrate this demand; our data also show that implant service delivery, among other contraceptive methods, still has room to expand. Concurrent with this rising demand for implant insertion services will be an increase in the need to remove implants. As early users reach the end of their implant's life span, clients will seek removals in greater numbers than before. Such demand for removals will need to be met with additional family planning services in the context of informed choice; post-removal contraceptive counseling services and method choice availability are key for women who wish to continue using a contraceptive method following the removal.

Meeting sustained demand for implant insertion, removal, and post-removal services in the long term will require MSI and other service delivery organizations to develop innovative responses to changing needs and to forge strategic partnerships between stakeholders, including clients. The public-private partnerships that have brought us to the current stage in implant scale up—including the price-volume guarantees and the partnerships between NGOs and local governments that underpin outreach and dedicated provider models—set the tone for further collaboration. Rather than viewing mobile outreach, dedicated provider, and social franchising models as stop-gap measures to support shortfalls in public- or private- (commercial) sector capacity, organizations may be able to integrate these models into the existing health system. MSI's new contract models with the governments of Ghana and Tanzania are examples of this integration. Other sustainability strategies include the incorporation of social franchise clinics in national and social health insurance schemes, and publicly funded voucher programs delivering free or very low-cost services for the poorest clients.

As donors, governments, and implementing partners work to reach 120 million additional contraceptive users by 2015 as part of the Family Planning 2020 (FP2020) goals, responsiveness within the global health community will be essential. With the recent price-volume guarantees on implants from manufacturers and donors, important progress has already been made in reducing the financial burden of implant procurement. However, continued investment in the implementation costs required

for reaching the client is essential—as a “service-volume guarantee” to meet demand among all current and future clients. Taken together, such investments in commodity supplies and effective, high-quality service delivery will enable all of us to deliver on our FP2020 commitments, and ultimately, ensure that all individuals have access to their contraceptive method of choice.

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Appendix. Quality Assurance Measures and Monitored Service Delivery Components by Marie Stopes International (MSI)

Quality Assurance Measures

Clinical protocols and franchise operational procedures

- All MSI providers in all channels adhere to MSI's Clinical Standards and Guidelines as well as their country's Ministry of Health protocols
- Comprehensive follow-up care required, including referrals to MSI or public-sector facilities for complications or implant removal
- All social franchisees are trained in operational, marketing, and quality-control protocols, such as record keeping and commodity management
- Interactive, competency-based, and up-to-date trainings and refresher courses

Regular supervision

- Supportive supervision to all provider and operations teams in all channels, including social franchising, by MSI country program offices, regionally-based clinical staff, and London headquarters staff
- Some social franchisees engage providers in regular network meetings
- Programs operate under measurable quarterly and annual goals established under MSI's monitoring and evaluation framework

Intermittent quality checks

- Random spot checks from MSI clinical services managers, typically each quarter
- Mystery client visits for family planning services, including implants
- Anonymous complaint and support telephone lines for MSI clinic and social franchisee clients
- Comprehensive Quality Technical Assistance audits by MSI London's Medical Development Team to review clinical quality, on an annual basis

Service Delivery Areas Monitored

Clinical quality of implant service provision

- Client family planning counseling
- Implant insertion
- Infection prevention
- Management of follow-up care, including referral systems

Service delivery environment

- Customer service
- Facility cleanliness
- Privacy

Program operations

- Personnel management
- Commodities management
- Record keeping
- Demand generation
- Collaboration with local Ministry of Health facilities and staff, when applicable

ORIGINAL ARTICLE

Safety of adult medical male circumcision performed by non-physician clinicians in Kenya: a prospective cohort study

Vera Frajzyngier,^a George Odingo,^b Mark Barone,^a Paul Perchal,^a Melinda Pavin^a

Trained, experienced nurses and clinical officers provided safe voluntary medical male circumcision (VMMC) in public health facilities in Nyanza Province, Kenya, as evidenced by the low 2% adverse event rate (most commonly, excess swelling). Task shifting for male circumcision can improve access to quality VMMC services.

ABSTRACT

Background: Male circumcision reduces the risk of heterosexually acquired HIV infection in men by approximately 60%. The Government of Kenya is rolling out voluntary medical male circumcision (VMMC) services, but struggles with health worker shortages, particularly with physician shortages.

Objective: To evaluate the safety of male circumcision performed by non-physician clinicians in Kenya.

Methods: Between December 2009 and December 2010, we conducted a prospective study of VMMC procedures performed by 15 nurses and 11 clinical officers, all trained to competence, in 11 public health facilities in Nyanza Province, Kenya. Providers reported surgical complications and adverse events (AEs), based on standardized definitions, immediately after the procedure and at 7 days and 60 days post-circumcision. We also assessed clients' satisfaction with the circumcision at 60 days.

Results: We recruited 2,244 men and boys, ages 13–54. The retention rate was high, with 2,192 participants (98%) returning for the 7-day follow-up visit and 1,845 (82%) for the 60-day visit. There was no difference in rates of moderate and severe AEs between participants whose circumcision was performed by a nurse (2.1%) or a clinical officer (1.9%) at 7 days post-circumcision. The most common AE was excess swelling (1.1%). Risk factors associated with an AE at 7 days post-circumcision included being employed and participant age \geq 18 years. Participants circumcised by a provider with \geq 6 years of professional experience were less likely to have an AE. Nearly all participants reported being satisfied with their circumcision at the 60-day follow-up visit.

Conclusions: Trained nurses and clinical officers provided safe VMMC in Nyanza Province, Kenya. AE rates in this study were similar to those reported in typical service-delivery settings. These results add to the current body of evidence suggesting that trained non-physicians can provide safe medical male circumcision, thereby facilitating increased availability and access to circumcision services.

INTRODUCTION

In 2007, based on results from 3 randomized controlled studies,^{1–3} the World Health Organization (WHO) and the Joint United Nations Programme on HIV/AIDS (UNAIDS) determined there was compelling evidence that male circumcision reduces the risk

of heterosexually acquired HIV infection in men by approximately 60%.^{4,5} Later studies found that this protective effect against HIV is sustained over extended follow up (up to 6 years in the studies).^{6,7} As such, in countries with high HIV prevalence, a generalized heterosexual HIV epidemic, and low rates of male circumcision, WHO and UNAIDS recommend safe, voluntary circumcision for adult men as one important component of a comprehensive strategy to prevent HIV.⁴

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Male circumcision reduces the risk of heterosexually acquired HIV infection in men by about 60%.

Nyanza Province in Kenya meets these criteria for voluntary medical male circumcision (VMMC) services. In 2008, the overall HIV prevalence rate in Kenya was 5%, with approximately 83% of men circumcised, while in Nyanza Province, HIV prevalence was 12%, with only 46% of men circumcised.⁸ Luos, an ethnic group of Kenya concentrated in Nyanza Province,⁹ had the highest rate of HIV (20%), with only 22% of Luo men circumcised.⁸

In 2009, the Kenyan Ministry of Health rolled out a policy for adult male circumcision in response to the WHO/UNAIDS recommendation. The goal was to provide a framework to ensure safe, accessible, and sustainable male circumcision services.^{10,11}

Although Kenya is committed to rolling out VMMC services, availability of health care providers, particularly physicians, is limited.^{10–12} Clinical officers were initially trained as the primary provider of male circumcision services. These are mid-level, non-physician clinicians, similar to physician assistants, whose preservice training focuses on clinical skills, often including minor surgeries. In 2009, the government approved nurses to also perform the procedure.¹³

Task shifting to include nurses as circumcision providers may be one short-term strategy for addressing the gap in human resources, especially in rural communities where there tend to be fewer clinical officers and physicians. Indeed, by the end of 2011, 10 of the 14 sub-Saharan African countries where scale up of VMMC services was deemed to be a priority had implemented task shifting, and 4 of these countries had explicit task-shifting policies.¹⁴

Ensuring safety of the male circumcision procedure is of critical importance, particularly when implemented as part of mass campaigns or when conducted by lower-level cadres. Adverse event (AE) rates in controlled trials have ranged from 1.5% in Kisumu, Kenya,² to 3.6% in Rakai, Uganda,³ and 3.8% in Orange Farm, South Africa.¹ Adverse events reported in these studies included pain,¹ bleeding,^{1,2} swelling,^{1,2} and infection,^{1–3} among others. A recent systematic review and meta-analysis of circumcisions conducted in the context of task shifting or task sharing found AE rates ranging from 0.70% (95% confidence interval [CI]=0.44%–1.02%) to 37.36% (95% CI=27.54%–47.72%), with an overall pooled proportion of 2.31% (95% CI=1.46%–3.16%).¹⁵

This article reports findings from a study conducted by EngenderHealth, under the umbrella

of the Male Circumcision Consortium, to assess the safety of circumcisions performed by non-physician clinicians (clinical officers and nurses) as part of routine service provision, to better inform the Government of Kenya and the Ministry of Health regarding the feasibility of rolling out circumcision services by non-physicians. The Male Circumcision Consortium worked closely with the Kenyan Ministry of Health to help inform the provision and scale up of safe VMMC services.

The objectives of the study were:

1. To determine the proportion of men experiencing AEs at surgery and at 7 days and 60 days post-circumcision, by cadre
2. To evaluate risk factors associated with AEs post-circumcision
3. To assess client satisfaction with circumcision at 60 days post-surgery

METHODS

Study Participants

Between December 2009 and December 2010, men seeking circumcision at 11 health care facilities (6 hospitals, 4 health centers, and 1 dispensary) in Nyanza Province, Kenya, that provided integrated VMMC services were recruited for the study. Inclusion criteria included:

- 13–54 years old (reflecting ages of the boys and men seeking circumcision services at the sites)
- In good general health (per clinician assessment)
- Able to understand the study procedures and requirements
- Willing to return to the health care facility for follow up 7 days and 60 days after the procedure
- No contraindications to circumcision per the WHO male circumcision manual¹⁶

Informed consent was obtained from all participants in their local language prior to participation in the study. Minors (those under age 18) were asked to sign an assent form with consent provided by a parent.

Study Procedures

Circumcision procedures and all associated VMMC services were carried out in accordance with the “Policy on Male Circumcision in

Task shifting for male circumcision may help address the health worker shortage problem in many countries.

Kenya.”^{10,11} All providers in this study were trained on male circumcision techniques, through a training program in Nyanza, based on the WHO/UNAIDS “Manual for Male Circumcision Under Local Anaesthesia.”¹⁶ The manual covers screening, preparation for surgery, surgical procedures, postoperative care, infection control, management of complications, and follow-up care. All providers were trained to competence in male circumcision per Kenya’s policy on VMMC—that is, competency is achieved after following a formal training based on the WHO/UNAIDS manual and after performing 40 circumcisions under supervision; proficiency is achieved when a provider performs about 200 circumcisions.

The facilities involved in the study had adequate equipment and supplies as well space where confidential counseling and safe and hygienic procedures could be provided. Per Kenya’s policy on male circumcision, in addition to the circumcision procedure, all study sites provided comprehensive HIV-prevention services, including:

- Behavior change communication and risk reduction counseling about safer sex practices
- Provision of male condoms and education about the need to use condoms consistently and correctly
- HIV testing and counseling
- Counseling and services for sexually transmitted infections (STIs)
- HIV care and treatment services, as appropriate

Providers were asked to complete a questionnaire about their demographic, educational, and professional profiles. Using standardized case report forms, trained research assistants and male circumcision providers collected data on clients’ sociodemographic background, details of the pre-operative clinical examination, procedures used during the circumcision, and surgical complications/AEs experienced immediately after the circumcision, as well as 7 days and 60 days following the procedure.

All clients were interviewed about satisfaction with their circumcision 7 days and 60 days following the procedure. A 7-day follow-up visit is standard in the Kenya VMMC program. A follow-up visit at 60 days was included in the study to evaluate AEs that may not have been apparent until healing was advanced or complete (such as torsion, excessive skin removal) and to

gather information on client satisfaction after healing was complete.

Participants were given a modest travel allowance (the equivalent of approximately US\$3.00) at their 7-day and 60-day follow-up visits to enhance retention throughout the study.

The study was approved by the Institutional Review Board at the Kenya Medical Research Institute as well as the Protection of Human Subjects Committee at FHI 360.

Study Measures

We defined AEs based on standardized definitions outlined in the WHO male circumcision manual¹⁶ and listed on Kenya’s VMMC Adverse Events reporting form,¹⁷ as well as based on definitions used by other researchers.^{2,3} Each post-discharge AE was graded on level of severity (mild, moderate, or severe) by the male circumcision provider examining the study participant. We then convened a panel of research, HIV, and clinical experts to review the AEs in order to avoid inclusion of events that were not considered causally associated with the circumcision procedure or were within normal limits. We report only moderate and severe AE rates because most mild AEs are generally considered within normal limits; this has become the standard for reporting clinical outcomes of male circumcision studies.^{18–22}

We examined both provider- and client-related factors as possible risk factors associated with AEs.

Provider factors included:

- Cadre (clinical officer, nurse)
- Sex
- Years of professional experience (< 6 , ≥ 6)
- Number of procedures conducted during the course of the study (< 100 , ≥ 100)
- Duration of the surgery (continuous variable, as well as categorized: < 19 minutes, 19–23 minutes, > 23 minutes)

Client factors included:

- Age (13–17 years, 18–54 years)
- Education (no secondary, at least some secondary)
- Marital status (single, married or living with partner)
- Employment status (employed, unemployed, student)
- Distance traveled to clinic (≤ 5 km, > 5 km)

All non-physicians in this study were trained on male circumcision techniques to the level of competence.

Adverse event reports were based on standardized definitions.

- Mode of transportation to the health facility (walk, car or bus, motorcycle or bicycle, other)
- HIV status (negative, positive)

At 7 days post-circumcision, we asked men about resumption of routine activities, and at 60 days post-circumcision, we assessed men's satisfaction with their circumcision through responses to the following interview questions:

- Would you recommend male circumcision to others?
- How satisfied are you with the circumcision? (very satisfied, somewhat satisfied, very dissatisfied, somewhat dissatisfied)
- How satisfied is your partner with the circumcision? (very satisfied, somewhat satisfied, very dissatisfied, somewhat dissatisfied)

Statistical Analysis

We calculated the proportion of men who experienced an AE associated with the circumcision prior to discharge and at 7 days and 60 days post-circumcision. We compared provider and client characteristics of those who presented with an AE at 7 days post-circumcision with those who did not by calculating odds ratios (ORs) and corresponding 95% confidence intervals. Odds ratios were derived using generalized estimating equations (GEE) to account for clustering of client outcomes within facilities.

Variables eligible for inclusion in multivariate analysis were conceptually associated with risk of AEs and statistically associated ($P < .20$) with the procedure in bivariate analysis. Adjusted ORs were also generated using GEE, accounting for clustering by facility. No AEs were reported when men were discharged following their circumcision, and few AEs were reported at 60 days post-circumcision, which precluded us from evaluating risk factors for AE at those points in time.

RESULTS

Provider Characteristics

A total of 26 trained circumcision providers (15 nurses and 11 clinical officers) performed VMMC on study participants. The number of procedures performed by nurses ranged from 5 to 206, and by clinical officers, from 2 to 259. All the clinical officers were male; 10 of the nurses were male and 5 female. On average, nurses were

approximately 5 years older than clinical officers (average age of nurses, 39.3 years; clinical officers, 34.6 years).

Nurses worked, on average, about 4 more years in their profession than clinical officers (nurses, 13.7 years; clinical officers, 10.1 years). Somewhat before the study began, nurses' official scope of work did not include minor surgeries including male circumcision. However, they reported, on average, roughly the same number of years' experience performing minor surgeries as clinical officers (nurses, 10.1 years; clinical officers, 9.9 years) and male circumcisions (nurses, 4.3 years; clinical officers, 5.3 years).

In this study, clinical officers performed 818 (36%) circumcisions and the nurses, 1,426 (64%). On average, nurses conducted the surgery in slightly less time than clinical officers (mean, 22.4 minutes versus 24.5 minutes, respectively).

Participant Characteristics

The study recruited 2,244 men and boys. Most study participants were ethnically Luo (98%) and were Christian (96%) (Table 1). Mean age was 22.7 years. The majority (72%) were single (not married, divorced, or widowed, or not living with a partner). Most men had at least some primary education (98%), and over 70% had at least some secondary education. Most of the participants were either students (42%) or employed (39%). In general, the study participants lived relatively close to the health care facility where they had their circumcision performed, traveling on average about 5.5 kilometers, and 58% walked to the clinic. About 6% reported they had HIV infection, and about 3% reported they had a sexual partner (wife, primary partner, or any other partner) who had HIV infection. According to the participant-reported data, among the men who had HIV infection, one-third had a discordant partner. Of the 2,244 men who were circumcised during the study, 2,192 (98%) returned for the 7-day follow-up visit, and 1,845 (82%) returned for the 60-day follow-up visit.

Participants Experiencing an Adverse Event

No study participant experienced surgical complications or immediate postoperative AEs.

At 7 days post-circumcision, 2.0% of the men experienced a moderate or severe AE; the rates were similar between nurses and clinical officers (2.1% vs. 1.9%, respectively) (Table 2). The most common AE 7 days post-circumcision was excess

At 7 days post-circumcision, only 2.0% of the men experienced either moderate or severe adverse events.

TABLE 1. Sociodemographic Characteristics of Study Participants (N=2,244)

Characteristics

Age, y, n (%)	
13–17	517 (23.0)
18–25	1,137 (50.7)
26–35	440 (19.6)
36–54	150 (6.7)
Age, y, mean (SD)	22.7 (7.4)
Ethnic group, n (%)	
Luo	2,191 (97.6)
Other	53 (2.4)
Religion, n (%)	
Christian	2,151 (95.9)
Muslim	18 (0.8)
Other	75 (3.3)
Marital status, n (%)	
Single	1,618 (72.1)
Married or living with partner	606 (27.0)
Unknown	20 (0.9)
Education, n (%)	
No secondary education	656 (29.2)
At least some secondary education	1,588 (70.8)
Employment status, n (%)	
Unemployed	401 (17.8)
Student	950 (42.4)
Employed	883 (39.3)
Unknown	10 (0.4)
Distance to clinic, km, mean (SD)	5.5 (6.5)
Mode of transportation to clinic, n (%)	
Walking	1,274 (57.7)
Car or bus	389 (17.6)
Motorcycle or bicycle	482 (21.8)
Other/unknown	99 (4.4)
HIV positive, ^a n (%)	
Self	131 (5.8)
Partner (primary or other)	57 (2.5)

Abbreviations: SD, standard deviation.

^a Self-reported by participants.

swelling (about 1% among both nurses and clinical officers). There were no severe AEs, other than 2 cases of severe pain, as self-reported by men.

Men 18 years and older were significantly more likely than boys under 18 years old to experience an AE at 7 days post-circumcision. Specifically, compared with younger participants, men 18 years and older were significantly more likely to experience bleeding (0.5% versus 0%) and swelling (1.3% versus 0.2%) at the 7-day follow-up visit.

At 60 days post-circumcision very few men (0.2%) experienced moderate AEs, and no men had a severe AE (Table 2). There was no difference in AEs at 60 days between circumcisions performed by nurses and clinical officers.

At 7 days following their circumcision, 89% of the men reported they had resumed work, and 76% had resumed their leisure activities. Among those who had not resumed *work* activities by this time, 28% said they had too much pain or discomfort to do so. Among the men who had not resumed *leisure* activities by 7 days, 10% reported they had not done so due to pain and discomfort.

Factors Associated With Adverse Events

In bivariate analyses, client age of 18 years and older was predictive of experiencing a moderate or severe AE, while students were less likely to experience a moderate or severe AE. Provider professional experience 6 years or higher was also associated with a lower likelihood of a participant experiencing a moderate or severe AE ($P < .05$) (Table 3).

In multivariate analysis, after controlling for clustering by health facility, circumcisions performed by a provider with 6 or more years of professional experience were *less* likely to be associated with a moderate or severe AE at 7 days (OR=0.39, 95% CI=0.17–0.89; $P < .05$) (Table 3). Circumcision clients who were employed (OR=2.41, 95% CI=1.06–5.51; $P < .05$) and 18 years and older (OR=3.75, 95% CI=1.92–7.33; $P < .05$) were *more* likely to experience a moderate or severe AE at 7 days post-circumcision.

Client Satisfaction With the Circumcision

At 60 days post-circumcision, over 99% of study participants said they were satisfied; 99% reported their partner was satisfied; and over 99% said

At 60 days post-circumcision, very few men experienced moderate adverse events, and none had severe events.

Participants circumcised by providers with 6 or more years of professional experience were less likely to have an adverse event.

TABLE 2. Adverse Events at 7 Days and 60 Days Post-Circumcision, by Type of Provider and Severity

Adverse Event	7 days			60 days		
	Clinical Officer (n=807)	Nurse (n=1384)	Total (n=2191)	Clinical Officer (n=694)	Nurse (n=1151)	Total (n=1845)
Any moderate or severe AE	15 (1.9)	29 (2.1)	44 (2.0)	2 (0.29)	1 (0.09)	3 (0.16)
Pain						
Moderate	...	...	...	...	1 (0.07)	1 (0.05)
Severe	1 (0.12)	1 (0.07)	2 (0.09)	...	...	...
Infection						
Moderate	...	4 (0.29)	4 (0.18)	...	...	...
Severe	...	...	...	...	...	...
Excess swelling						
Moderate	8 (0.99)	15 (1.1)	23 (1.1)	...	...	...
Severe	...	...	...	...	...	...
Bleeding						
Moderate	1 (0.12)	...	1 (0.05)	...	...	...
Severe	...	...	...	...	...	...
Problems with appearance						
Moderate	2 (0.25)	5 (0.36)	7 (0.32)	1 (0.12)	...	1 (0.05)
Severe	...	...	...	...	...	...
Hematoma						
Moderate	2 (0.25)	1 (0.07)	3 (0.14)	...	...	...
Severe	...	...	...	...	...	...
Delayed wound healing						
Moderate	...	3 (0.22)	3 (0.14)	...	...	...
Severe	...	...	...	...	...	...
Injury to penis						
Moderate	...	...	...	1 (0.12)	...	1 (0.05)
Severe	...	...	...	...	...	...
Insufficient skin removed						
Moderate	1 (0.12)	...	1 (0.05)	...	...	...
Severe	...	...	...	...	...	...

Abbreviations: AE, adverse event.
Data are shown as n (%).

TABLE 3. Risk Factors for Moderate/Severe Adverse Events at 7 Days Post-Circumcision

	No. of AEs/Total	Unadjusted OR ^a (95% CI)	Adjusted OR ^b (95% CI)
Provider Characteristics			
Sex			
Male	30/1833	Reference	...
Female	4/358	1.03 (0.40, 2.65)	...
Cadre			
Clinical officer	13/807	Reference	...
Nurse	21/1384	1.04 (0.42, 2.60)	...
Professional experience, y			
< 6	21/808	Reference	...
≥ 6	13/1383	0.45 (0.17, 1.17)	0.39^c (0.17, 0.89)
Procedure duration, min			
< 19	3/526	0.22 (0.01, 5.9)	...
19–23	13/689	0.77 (0.36, 1.63)	...
> 23	18/961	Reference	...
No. of procedures conducted during the study			
< 100	14/554	Reference	...
≥ 100	20/1637	0.64 (0.31, 1.32)	...
Client Characteristics			
Age, y			
13–17	2/505	Reference	...
18–54	32/1686	5.59 (1.48, 21.1)	3.75^c (1.92, 7.33)
Education			
No secondary education	13/626	Reference	...
At least some secondary education	21/1550	0.63 (0.35, 1.12)	0.61 (0.34, 1.11)
Employment status			
Unemployed	4/395	Reference	...
Employed	21/867	1.27 (0.86, 1.89)	2.41^c (1.06, 5.51)
Student	9/919	0.65 (0.43, 0.97)	1.34 (0.76, 2.53)
Marital status			
Single	22/1572	Reference	...
Married or living with partner	12/599	1.38 (0.52, 3.62)	...

TABLE 3 (continued).

	No. of AEs/Total	Unadjusted OR ^a (95% CI)	Adjusted OR ^b (95% CI)
Distance traveled, km			
≤ 5	16/1143	Reference	...
> 5	7/491	1.05 (0.46, 2.38)	...
Mode of transportation to the facility			
Walking	12/1246	Reference	...
Car or bus	10/379	2.66 (0.98, 7.2)	2.52 (0.94, 6.72)
Motorcycle or bicycle	9/474	1.99 (0.86, 4.59)	1.56 (0.78, 3.12)
Other	1/56	2.38 (0.62, 9.11)	1.56 (0.37, 6.54)
HIV status			
Negative	26/1775	Reference	...
Positive	4/130	2.09 (0.65, 6.65)	...

Abbreviations: AE, adverse event; CI, confidence interval; OR, odds ratio.

^a Bivariate analysis.

^b Multivariate analysis; includes only those variables that were associated with AEs in unadjusted bivariate analysis at $P < .20$.

^c Significant at $P < .05$.

Nearly all men were satisfied with their circumcision.

they would recommend medical circumcision to a friend or family member.

DISCUSSION

The intent of this study was to evaluate the safety of trained non-physician clinicians—nurses and clinical officers—performing adult male circumcisions. These clinicians already had experience conducting minor surgeries and were trained on male circumcision techniques until they achieved competency. Men in this study experienced no immediate adverse outcomes associated with the circumcision or with post-operative procedures. Some did present with AEs at 7 days post-circumcision; fewer presented with AEs at 60 days post-circumcision. There was no difference in the rate of moderate and severe adverse events between participants who were circumcised by a nurse or a clinical officer.

Our findings of AE rates of 2.1% and 1.9%, for nurses and clinical officers, respectively, are lower than moderate/severe AE rates (3.8%) reported by Gray et al. in the clinical trial setting.³ AE rates in such controlled trials may be higher than those found in observational studies, due to heightened vigilance. However, our findings are also similar to those found in a

more typical service-delivery setting with circumcisions performed by trained non-physicians; Herman-Roloff and colleagues reported an AE rate (moderate and severe) of 2.1% in the context of passive surveillance (routine clinical data reported by providers) and 7.5% in the context of active surveillance (outreach by research staff to identify and report events) in Nyanza Province, Kenya.¹⁹ While our detection of AEs was passive (that is, among participants returning to the clinic), 98% of participants returned for the 7-day follow-up visit. AE rates in this study were thus within an acceptable level compared with data from both the clinical-trial and service-delivery settings.

Our findings are supported by similar studies evaluating the provision of circumcision by non-physician providers. Buwembo and colleagues found no significant differences in moderate or severe AE rates between men whose circumcision was performed by physicians versus clinical officers (1.5% and 0.68%, respectively), after adjusting for other factors.²⁰ Herman-Roloff and colleagues found no difference in the odds of experiencing an AE when providers of any type had reported previously performing at least 100 circumcisions.¹⁹ Others have also found that AE rates decreased as experience increased

Adverse event rates for non-physicians in this study were similar to rates reported in typical service-delivery settings.

(based on number of male circumcisions performed).^{23–25} In our study, having conducted at least 100 circumcisions during the study period did not predict moderate or severe AEs; although participants circumcised by providers with less professional work experience (< 6 years) had increased risk of experiencing moderate or severe AEs.

We also investigated client-related risk factors for AEs, as some of these may be predictors or proxies for clients' behavior and risk post-surgery. Adult men, ages 18–54 years, were at higher risk of experiencing moderate or severe AEs than youth, ages 13–17 years. Adult men were more likely to experience bleeding than young men, which may not be surprising given differences in vascularization in pre-adolescents compared with adults. Adult men were also more likely to experience swelling (but not hematoma). From our data we cannot say why this occurred, and further investigation is warranted. Being employed was a risk factor for experiencing an AE. It is possible that employed men returned to work soon after the procedure, and in so doing disrupted the healing process.

Limitations and Strengths of the Study

Some limitations should be kept in mind. We did not have data on the number of circumcisions performed by each provider prior to participating in the study. Thus, we cannot evaluate provider proficiency prior to starting the study, although we know that providers were deemed competent at completion of their training. In addition, although we report AEs that we deemed to be causally associated with the circumcision, the rates we found may either overestimate or underestimate truly causal AE rates. We may have been underpowered to detect small significant differences, and results of our multivariate analysis are limited by wide confidence intervals and potentially unstable estimates. Finally, findings with regard to provider skill and experience must be interpreted with caution given the small number of providers who conducted circumcisions in the study. Our findings may not be generalizable to other service-delivery settings.

This study also has several strengths. Our retention rate at the 7-day follow-up visit was exceptionally high, and considerably higher than 7-day follow-up rates in the routine service-delivery setting, which averaged 27.5% from 2008 to 2011,²⁶ decreasing the possibility that men returning for follow up were more likely to

be those experiencing AEs. Further, as male circumcision is a key preventive measure for HIV, it is imperative to better understand risk factors associated with AEs after the procedure in order to make it as safe as possible. Information on such risk factors is currently limited in the literature.^{19,20} Our study contributes to a better understanding of these risk factors, and as such provides information that can strengthen male circumcision services. Our study also adds to the current body of evidence regarding task shifting for male circumcision in the routine service-delivery setting, further suggesting that trained nurses and clinical officers can provide safe medical male circumcision, and thereby facilitate increased availability and access to circumcision services.

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ORIGINAL ARTICLE

Keeping community health workers in Uganda motivated: key challenges, facilitators, and preferred program inputs

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In Uganda, community-based health programs using volunteers should focus on strengthening support systems to address transportation and stockout issues and on improving links with the health structure while reinforcing effort recognition, status, and acquisition of new skills.

ABSTRACT

Introduction: In the face of global health worker shortages, community health workers (CHWs) are an important health care delivery strategy for underserved populations. In Uganda, community-based programs often use volunteer CHWs to extend services, including family planning, in rural areas. This study examined factors related to CHW motivation and level of activity in 3 family planning programs in Uganda.

Methods: Data were collected between July and August 2011, and sources comprised 183 surveys with active CHWs, in-depth interviews (IDIs) with 43 active CHWs and 5 former CHWs, and service statistics records. Surveys included a discrete choice experiment (DCE) to elicit CHW preferences for selected program inputs.

Results: Service statistics indicated an average of 56 visits with family planning clients per surveyed CHW over the 3-month period prior to data collection. In the survey, new skills and knowledge, perceived impact on the community, and enhanced status were the main positive aspects of the job reported by CHWs; the main challenges related to transportation. Multivariate analyses identified 2 correlates of CHWs being highly vs. less active (in terms of number of client visits): experiencing problems with supplies and not collaborating with peers. DCE results showed that provision of a package including a T-shirt, badge, and bicycle was the program input CHWs preferred, followed by a mobile phone (without airtime). IDI data reinforced and supplemented these quantitative findings. Social prestige, social responsibility, and aspirations for other opportunities were important motivators, while main challenges related to transportation and commodity stockouts. CHWs had complex motivations for wanting better compensation, including offsetting time and transportation costs, providing for their families, and feeling appreciated for their efforts.

Conclusion: Volunteer CHW programs in Uganda and elsewhere need to carefully consider appropriate combinations of financial and nonfinancial inputs for optimal results.

INTRODUCTION

Global discussions and initiatives underscore renewed interest in the role of community health workers (CHWs) in strengthening health systems and

increasing availability of community-level primary health care services, including family planning.¹⁻⁶ In 2004 in Uganda, the physician-population ratio was 1 to 12,500.⁷ Moreover, 70% of medical doctors and 40% of nurses and midwives work in urban areas, where only 12% of the population lives.⁸ Modern contraceptive prevalence is 26%.⁹ In this context, involving CHWs through task sharing provides a mechanism for expanding family planning services to underserved populations.

Although models vary globally, studies have shown that CHW programs promote the adoption of healthy behaviors and improve access to and use of a range of

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Community health workers help to promote healthy behavior, but keeping them motivated is often a challenge.

health services.^{1,10–13} However, years of program experience also reveal performance and retention problems. Reported attrition rates in CHW programs range between 3% and 77% and tend to be particularly high when CHWs are volunteers.¹⁴ Moreover, CHWs who stay on the job do not necessarily perform to their full potential.

Motivation reflects the degree of willingness to apply and maintain efforts toward program goals.¹⁵ As with other health cadres, individual motivation for CHWs drives performance and job continuation, all 3 of which, in turn, are affected by individual, program/health system, and contextual factors.^{15–22} Yet CHWs are qualitatively different from professional health workers in that they typically lack formal nursing or medical training, are embedded in the community, and often are volunteers.

The evidence base to inform normative guidance specific to CHW programs remains limited. The broad categories of factors underlying CHW level of activity and continuation on the job are known and include^{14,20–24}:

- Social responsibility
- Self-efficacy
- Desire for achievement
- Recognition
- Workload and responsibilities
- Training
- Supportive supervision
- Equipment and supplies
- Peer support
- Personal growth and career development opportunities
- Financial and nonfinancial incentives

However, these factors are complex, and rigorous analyses of the specific ways in which they operate and of their relative importance are lacking. Moreover, many studies focus on one specific program, while managers throughout sub-Saharan Africa are increasingly challenged to harmonize a legacy of parallel CHW programs into a coherent national system. In Uganda, for example, the Ministry of Health has begun implementing a nationwide Village Health Team strategy whereby teams of volunteers provide a government-endorsed platform for all community-based programming.²⁵

This study assessed factors affecting the motivation and level of activity of CHWs providing

family planning services in 1 public-sector program and 2 programs supported by nongovernmental organizations (NGOs) in Uganda. Specific objectives were to examine key challenges and facilitators to CHWs being active and staying in service and to quantify the relative importance of specified program inputs from CHWs' perspectives.

METHODS

Design and Selection Procedures

We conducted a cross-sectional, mixed-methods study, including a structured survey and in-depth interviews (IDIs) with CHWs from 3 family planning programs covering 7 districts in Uganda. We selected family planning programs purposively to represent different cultural and programmatic realities, while taking into account program manager support for research and logistics. We included a public-sector program (active in 2 districts), an NGO-supported program (2 districts), and a program that had recently transitioned from an NGO to the public sector (3 districts). All programs offered the same contraceptive method mix, including condoms, pills, and injectables (although not all CHWs within a program provided injectables) (Box).

CHWs are linked to a nearby health center for supervision, referral management, and commodity supply. We listed all supporting health centers and obtained from program managers the

BOX. Key Responsibilities of Community Health Workers

- Promote family planning through health education talks with community members.
- Conduct health talks on family planning at health centers with mothers attending different clinics (for example, outpatient department, antenatal care, and postnatal care).
- Distribute contraceptive methods, including condoms, pills, and, for CHWs who are trained, injectables.
- Refer clients to the health center for management of side effects and other contraceptive methods.
- Mobilize communities for surgical camps that offer long-acting and permanent methods.

estimated numbers of eligible CHWs linked with each health center. Eligibility criteria included: (1) having 1 year of experience distributing contraceptives, and (2) attending the last supervisory meeting or having a documented excuse for missing it.

The NGO-supported program had the most CHWs; the public-sector program was the smallest. In the largest program, we randomly selected health centers sequentially until the cumulative number of CHWs reached the target sample size; all CHWs reporting to those health centers were invited to participate, along with all CHWs in the other 2 smaller programs. For each program, we randomly assigned a subset of CHWs from each health center in the largest district to participate in an IDI; all others participated in a survey. Within these same districts, convenience samples of former CHWs from the public-sector and NGO-supported programs who still resided in their community of origin were also selected for an IDI.

Sample Size and Data Collection

Based on estimates of the number of eligible CHWs, we assumed that 39 and 80 surveys, respectively, could be completed in the 2 smaller programs. We estimated that completing 76 surveys in the largest program would permit detecting a meaningful effect size (a 0.45 standard deviation difference between the 2 larger programs and a 0.55 standard deviation difference when compared with the smallest program) for the primary outcome, CHW level of activity, with 80% power and 5% significance level. Target numbers of IDIs were set to 14 per district in order to reach saturation.²⁶

Data were collected in Luganda, Lusoga, and Samia in July and August 2011. Trained research assistants interviewed active CHWs at their supporting health center at a prearranged time. Health center supervisors helped contact former CHWs, who were interviewed in their homes.

As per local ethics guidelines, all participants received a small stipend to compensate them for their time (approximately US\$4); the amount is consistent with the refund CHWs typically receive for attending program meetings.

IDIs were recorded, translated into English, and typed into word-processing files. We extracted service statistics from CHW records at the time of the interview. When CHWs failed to bring their records, we made a second attempt to

collect service data at a subsequent supervisory meeting.

The Uganda National Council for Science and Technology and FHI 360's Protection of Human Subjects Committee approved this study.

Quantitative Analysis Methods

The survey included questions on sociodemographic characteristics, supporting mechanisms (training, supervision, and supplies), recognition and incentives, and perspectives on CHW work. Fifty-one Likert-scale items examined CHW motivation (15 items) and factors thought to influence it (36 items).

The main outcome was CHWs' level of activity (highly active versus less active). We used service statistics to calculate the total number of visits with new or revisit family planning clients receiving any method between April and June 2011. To ensure that CHWs are classified fairly based on the setting in which they operate, we identified groupings of health centers located in sub-counties with comparable terrain and population density profiles. Within each grouping, we classified CHWs whose number of visits fell above or at the median for the CHWs associated with the facilities in the group as highly active, and others as less active. Our initial intent was to derive this measure from survey data on clients served adjusted by catchment area size. However, descriptive statistics raised concerns regarding the reliability of those survey items, and due to a redistricting process, it was also not possible to obtain catchment population data from other sources.

We conducted 2 exploratory factor analyses, one on motivational outcomes and one on motivational determinants, using principal factors extractions with oblique promax rotations to reduce Likert-scale data. Criteria for extraction included the scree test and percentage of variance (75%).^{27,28} We discarded items with little or no variation, factor loadings under 0.3, or cross-loadings. We used scoring coefficients to estimate factor scores to serve as variables in subsequent analyses. Bivariate analyses using chi-square tests examined the association between 18 variables and level of activity. Variable selection was informed by the available literature and descriptive analyses. Multivariate analyses using logistic regression included variables found significant ($P < .10$) in bivariate analyses and controlled for 7 other variables we identified as theoretically important. Bivariate

and multivariate analyses adjusted for sampling weights and clustering effects at the health center level.

The survey included a Discrete Choice Experiment (DCE) to determine the relative importance CHWs place on selected program inputs that may affect motivation. DCE is a stated preference method, whereby respondents are asked to choose their preferred alternative between pairs of hypothetical scenarios (here, competing programs) characterized by several attributes (here, program inputs).^{29–32} Based on a literature review and a meeting with stakeholders working with CHWs in Uganda, we selected 5 program inputs and 2 to 3 appropriate levels for each (Table 1). We used a SAS macro (%ChoiceEff) to select 24 program profiles constructed from these attributes and levels and organized them into 12 choice pairs to produce a fractional factorial design.³³ We evenly divided the 12 pairs into 4 groups of 3, and randomly assigned each CHW to one group for the survey. Mixed logit modeling produced a weighted ranking of program inputs. This approach models the choice probabilities with a

mixture of logits and accounts for the paired data and multiple responses per CHW.^{34,35} We included all attributes as random effects, except for mobile phone, which we included as fixed effect to simplify the model and improve convergence in subgroup analyses (results not presented). This was justified by the small variance estimate of estimated coefficients for this attribute in the overall model. We adjusted DCE data analyses for sampling weights but ignored clustering by health center to simplify the models.

DCE data were analyzed in Stata 10; all other analyses were conducted in SAS 9.2.

Qualitative Analysis Methods

We uploaded IDI data in NVivo 9 for analysis. We followed an iterative process of reading, coding, data display, and reduction.³⁶ We developed matrices in Excel to summarize participants' responses to important thematic concepts and to examine similarities and differences between CHWs across programs and between men and women. Findings that differ across these groups are noted in the results section.

Overall data quality was high. Following initial questions guided by the study's themes, interviewers solicited richer responses through probing in a manner that was responsive to participants' answers. Biased responses arising from leading questions were noted. Upon completing quantitative and qualitative analyses, we compared results thematically.

RESULTS

Completed interviews with active CHWs included 183 surveys and 43 IDIs (Table 2); the combined response rate was 91%. We obtained complete service statistics for 157 of the survey participants. Five former CHWs participated in an IDI.

Survey respondents, on average, were 41.3 years old and had 5.5 children. Half were women, and 82.8% were currently married or cohabitating. All had attended at least primary school, with 72.6% continuing to secondary education or higher. On average, they had been providing family planning for 5.6 years; 54.4% of CHWs in the NGO program and nearly all in the other 2 programs offered injectables in addition to condoms and pills. Most (92.7%) provided other services besides family planning. Service statistics showed an average of 56 client visits per CHW between April and June 2011. The mean

TABLE 1. Program Inputs and Levels Used in the Discrete Choice Experiment (DCE)

Program Inputs	Level 1	Level 2	Level 3
Training	5-day initial training and 3-day supervised practicum at health center	Same as Level 1 + 3-day refresher training once a year	N/A
Supervision	Monthly CHW meetings at health center	Same as Level 1 + quarterly visit by health center staff in the community	N/A
Incentives	CHW kit with gumboots, raincoat, job aids, and stationery	CHW kit + T-shirt + badge	CHW kit + T-shirt + badge + bicycle
Transportation refund	5,000 UGX for each meeting	10,000 UGX for each meeting	N/A
Communication	No mobile phone	Mobile phone without airtime	N/A

Abbreviations: CHW, community health worker; N/A, not applicable; UGX, Ugandan Shilling.

TABLE 2. Program Characteristics and Number of Interviews Conducted, by Program Type

Program Type	Active CHWs			Former CHWs
	No. of Surveys ^a	No. of IDIs	Total No. Interviewed/ Total No. in Program	No. of IDIs
Public sector (2 districts)	35	13	48/48	3
Former NGO (3 districts)	82	14	96/112	0
NGO (2 districts)	66	16	82/203	2
Total	183	43	226/363	5

Abbreviations: CHWs, community health workers; IDIs, in-depth interviews; NGO, nongovernmental organization.

^a Surveys included a Discrete Choice Experiment (DCE).

number of visits was the highest in the former NGO program (68), followed by the NGO (52) and public-sector (42) programs.

Survey Results

The **positive aspects** of the work CHWs reported most frequently were:

- Acquiring new skills and knowledge (73.9%)
- Perceived impact (67.4%)
- Enhanced status (66.1%)
- Helping community members (53.7%)
- Working with health care professionals (38.2%)
- Feeling competent (20.9%)

While there were commonalities across programs, specific factors varied in relative importance. For example, enhanced status and new skills were mentioned equally in the former NGO program (79.3%), whereas the feeling of having an impact was the most important (73.5%) in the public sector.

The **most common challenges** were transport-related:

- Transport/difficulty reaching clients (74.4%)
- Insufficient transport refund for supervisory meetings (60.1%)

In the former NGO program, stockouts of contraceptive commodities were also frequently mentioned (50%), while lack of compensation was important among public-sector CHWs (50%).

Most CHWs (89.2%) had received some recognition or support from their community in

the past year. The main examples were being called “doctor” (73.5%), being consulted for advice on a range of health issues (70.5%), time to address family planning at community meetings (48.4%), gifts/food/labor support (35.8%), and being thanked publicly (33.7%).

Similarly, 70.9% of CHWs had received recognition or support from a supporting health facility in the past year; 21.5% of CHWs, mostly from the NGO-related programs, reported having no supporting health center. Among those linked to a facility, the main signs of appreciation were priority treatment for self or family (73.5%), priority treatment for clients referred (57.8%), acknowledgments (52.4%), being asked to provide family planning services at the health center (35.1%), selection for paid activities (26.6%), and receiving supplies for personal use (18.3%).

Most survey respondents (89.9%) had never thought of leaving the program. This was particularly high in the public sector (97.1%). Among those who had thought about leaving, dissatisfaction with compensation was the most common main reason; an obligation to serve the community was the most common main reason for staying. Factor analysis results on motivation indicate that motivation was high overall. For example, 98% of CHWs agreed with the statement, “I am satisfied with being a family planning CHW.” For motivational determinants, 10 items were arranged in 2 factors interpreted as barriers and facilitators (Table 3).

In bivariate analyses, highly active CHWs were more likely than less active CHWs to have no prior volunteer experience, to have experienced problems resupplying from the health center, and to not collaborate with other CHWs

Main positive aspects reported by CHWs included acquiring new skills, impact on the community, and enhanced status.

Main challenges reported by CHWs related to transport.

TABLE 3. Item Means, Grouped by Factor, by CHW Level of Activity

	Total (N=183)	Highly Active (n=88)	Less Active (n=69)
Motivational Outcomes			
Overall, I am very satisfied with being an FP CHW.	3.78	3.73	3.85
I would recommend to my children that they become CHWs.	3.50	3.57	3.48
I am glad to be working as an FP CHW rather than in some other volunteer position in the community.	3.20	3.13	3.40
I feel very little commitment to the FP CHW program. ^a	1.35	1.39	1.33
I enjoy working in my community to make it better, even if it is without pay.	3.77	3.81	3.74
I do not think that it makes good sense to spend any time working in my community without payment. ^a	1.55	1.46	1.57
I have no intention to keep doing my FP CHW work without pay. ^a	1.42	1.36	1.40
Motivational Determinants			
Barriers			
My FP CHW work takes so much time that I am worried about how to support myself and my family. ^a	2.13	2.03	2.07
My family complains about the demands of my FP CHW work. ^a	1.53	1.65	1.39
Serving as an FP CHW will not help my chances of getting a better job in the future. ^a	1.45	1.51	1.47
Talking about FP with my clients is very embarrassing. ^a	1.27	1.24	1.33
It is difficult to help clients find the method that is right for them. ^a	1.54	1.37	1.59
Contraceptive use often makes people sick. ^a	2.16	2.21	2.05
Facilitators			
Overall, my supervisors provide helpful feedback and support.	3.77	3.72	3.74
I can probably perform most of my activities without additional training.	2.51	2.50	2.58
The FP CHW program provides all the equipment and material I need to do my job well.	3.19	3.12	3.35
It is easy to find women who are interested in receiving an FP method in this community.	3.67	3.64	3.75

Abbreviations: CHW, community health worker; FP, family planning.

Level of activity of CHWs was based on data from service statistics, which were available for 157 CHWs.

Items were scored from 1 = "Disagree a lot" to 4 = "Agree a lot." Nonresponses varied across items. Weighted means are reported.

^a Item was reverse-scored before factor analysis.

CHWs preferred a package with a T-shirt, badge, and bicycle, followed by a mobile phone.

(Table 4). In the multivariate model, only problems with supplies and collaboration with peers retained significance (Table 5).

Table 6 presents estimated means and standard deviations of the mixed logit model coefficients for program inputs included in the DCE. Mean coefficient estimates indicate the relative importance of program inputs; ranks were based on significance first and mean

coefficient magnitude second. Four inputs were statistically significant factors influencing the choice of program. Provision of a package with T-shirt, badge, and bicycle had the largest influence on CHWs' choice, on average. A mobile phone (without airtime) ranked second. The ratio of the mean coefficients permits comparing inputs directly; overall CHWs preferred the first incentive package 4 times more than the mobile

TABLE 4. Selected Characteristics of Survey Respondents, by Level of Activity

Characteristics	Total (N=183)	Highly Active (n=88)	Less Active (n=69)	P Value
Age, y, mean (SE)	41.3 (0.8)	41.1 (1.1)	40.9 (1.2)	.89
No. of living children, mean (SE)	5.5 (0.2)	5.2 (0.2)	6.0 (0.5)	.23
Education, %				
Primary	27.4	26.1	37.4	.17
Secondary or higher	72.6	73.9	62.6	
Sex, %				
Female	49.8	59.1	48.8	.47
Male	50.2	40.9	51.2	
No. of years as an FP CHW, mean (SE)	5.6 (0.4)	5.5 (0.4)	5.3 (0.4)	.83
Provides other services besides FP, %				
No	7.3	4.8	9.4	.31
Yes	92.7	95.2	90.6	
Prior volunteer experience, %				
No	10.9	12.2	5.3	.05
Yes	89.1	87.8	94.7	
Received refresher training in past year, %				
No	26.1	27.2	32.9	.50
Yes	73.9	72.8	67.1	
Ever received supervision from HC staff, %				
Never	34.0	39.4	36.7	.82
Ever	66.0	60.9	63.3	
Received supervisory visits in community in the past year, %				
No	41.3	36.0	50.8	.23
Yes	58.7	64.0	49.2	
Problems with supplies, %				
No	36.1	26.7	41.2	.01
Yes	63.9	73.3	58.8	
Received recognition/support from community in the past year, %				
No	10.9	10.0	12.0	.75
Yes	89.1	90.0	88.0	
Received incentive from NGO or district in the past year, %				
No	46.2	45.2	47.4	.81

TABLE 4 (continued).

Characteristics	Total (N=183)	Highly Active (n=88)	Less Active (n=69)	P Value
Yes	53.8	54.8	52.3	
Collaboration with other CHWs, %				
No	37.1	46.8	24.7	.03
Yes	62.9	53.2	75.3	
Time to HC, h, mean (SE)	1.2 (0.1)	1.3 (0.1)	1.3 (0.1)	.88
Motivation, mean (SE)	-0.08 (0.1)	-0.05 (0.1)	-0.04 (0.1)	.95
Barriers, mean (SE)	-0.05 (0.1)	-0.04 (0.1)	-0.04 (0.1)	.96
Facilitators, mean (SE)	-0.02 (0.1)	-0.05 (0.1)	0.07 (0.1)	.41

Abbreviations: CHW, community health worker; FP, family planning; HC, health center; NGO, nongovernmental organization; SE, standard error. Level of activity of CHWs was based on data from service statistics, which were available for 157 CHWs. Nonresponses varied across items. Weighted percentages and means are reported.

TABLE 5. Factors Associated With CHW Level of Activity in Logistic Regression Analysis (N=156)

Characteristics ^a	Odds Ratio (95% CI)
Demographic	
Male ^b	0.63 (0.23–1.76)
Secondary or higher education ^b	2.30 (0.75–7.01)
Age, y	1.04 (0.99–1.08)
Situational	
Prior volunteer experience ^b	0.67 (0.26–1.72)
Travel time to health center, h	0.98 (0.68–1.43)
Work	
Problems with supplies ^b	2.22 (1.32–3.75)
Collaboration with other CHWs ^b	0.33 (0.13–0.86)
Motivational outcomes and determinants	
Motivation	1.25 (0.70–2.23)
Barriers	1.07 (0.67–1.72)
Facilitators	0.67 (0.40–1.14)

Abbreviations: CHW, community health worker; CI, confidence interval.
^a Control variables were education, sex, age, time to health center, motivation, barriers, and facilitators.
^b Indicator variable. For male/sex, the reference is female. For education, the reference is primary education. Other variables are yes/no binary variables, with “no” as the reference level.

phone. An increased transport refund and the addition of a yearly refresher training were also significant in persuading CHWs to select a program. When compared with the mean estimates, the standard deviations suggest fairly homogeneous preferences for the T-shirt, badge, and bicycle package, but more heterogeneity for other attributes.

In-Depth Interviews With Active CHWs Challenges

Transport was a major factor influencing CHW activities and their motivation. Nearly three-quarters of IDI participants said they experienced transport challenges, including trips to the health center and movements within the community to visit clients. Such challenges appeared related to livelihood concerns. Visiting clients or going to the health center for supervisory meetings or supplies took CHWs away from their other domestic or work responsibilities. Hiring a *boda boda* (bicycle taxi) to the health center reduced fatigue and travel time but had financial implications. Echoing the experiences of many others, a 49-year-old woman said:

Our main challenge is transportation. Sometimes it might be far, you might have to walk. In case you have got some money, you might hire a boda-boda when going or coming back so that you can reach faster.

Although CHWs receive some **money** when they attend supervisory meetings (typically

TABLE 6. Mixed Logit Model Results for Program Inputs Influencing CHW Preferences in the Discrete Choice Experiment (N=182)

Program Input	Model Coefficients	
	Mean Estimate (SE)	Standard Deviation Estimate (SE)
T-shirt, badge, and bicycle	3.90 ^a (1.41)	1.24 (1.45)
Mobile phone, no airtime	0.99 ^b (0.41)	...
10,000 UGX transport refund	0.77 ^b (0.35)	1.06 (0.77)
Yearly refresher training	0.73 ^b (0.34)	1.22 (0.63)
T-shirt and badge	1.97 (1.02)	1.51 (0.86)
Quarterly supervisory visits in community	0.70 (0.38)	1.15 (0.70)

Abbreviations: CHW, community health worker; SE, standard error; UGX, Ugandan Shilling.

Number of observations=1,092.

^a P < .01.

^b P < .05.

between 5,000–10,000 shillings, or about US\$2–4), many perceived the amount to be insufficient. Some CHWs interpreted the purpose of this transport refund as mere compensation for travel expenditures while others had expectations of being able to purchase small items for home use.

CHWs understood that their position was voluntary, but two-thirds felt they deserved some payment through an increased transport refund, or even a regular salary. These feelings were particularly prevalent in NGO-related programs. CHWs raised issues related to the opportunity cost of volunteer work and to buying necessities for their families. Some said money was important to ensure continued family support or to keep up with increased costs of living. For example, a 65-year-old man with 7 children said:

I just wish the people concerned help us with some monthly compensation because we at times quarrel with our women when you get home at the end of the day without anything, day after day, week after week, and year after year. ... If there can be something small in monetary terms to help us take care of our families, even if it is not so much [that is] provided, it can help in buying some essential good at home.

At the same time, a number of CHWs suggested that payment would make them feel appreciated and boost their morale. For a few CHWs, all from NGO-related programs, this was linked to feelings of deservingness in light of their efforts, and to equity in relation to health workers. One-fifth of

IDI participants said that lack of salary or insufficient transport refund had caused them to think about dropping out, particularly when they had to encroach on their personal resources.

Over half of CHWs described **stockouts** as another critical and demoralizing issue, particularly in the NGO program. Lack of supplies affected CHWs’ ability to conduct their work and the relationship with clients; it also magnified transport problems when CHWs made trips to the health center in vain. For instance, a 44-year-old man said:

Every month, when we come here [at the health center], we usually go back with them [supplies] although sometimes we don’t find them and it requires that you come back to the health center another day. ... Transport is hard because from my home to here, I use 8,000 shillings and you may find that sometimes, I don’t have it.

Facilitators

The relationship with the community was a key factor in keeping CHWs motivated. Nearly all IDI participants reported an **enhanced status** not only among clients but also in the larger community. Many described being called *musawo* (health professionals)—a term from which they derived pride. Other related motivators included greater access to help or information and being consulted on a range of problems.

Commitment to serving the community emerged as a clear theme, particularly among

Many CHWs thought the transportation refund they received was insufficient.

women. Over one-third of CHWs described some initial tensions, primarily with men, that typically eased over time—although some reported occasional ongoing resistance to family planning.

Close to half of women and one-third of men expressed **satisfaction with helping others**. While this often counterbalanced frustration over voluntarism or other challenges, data suggest that loyalty sometimes bordered on pressure. For instance, a 30-year-old man who had thought of dropping out said:

Personally, I have got so many clients so leaving the program became so hard for me. Sometimes, I would think about that, but when you are still thinking about quitting, the client would call you, “Musawo, this and that ...,” and therefore you would feel so bad to quit since people needed your services.

CHWs were split between those primarily driven by a desire to serve the community and those with particular **interest in family planning**. Although a number of CHWs indicated they did not know that volunteer work would be about family planning when they agreed to being trained, over half said that this new knowledge had contributed to improving their personal lives or those of their family.

Acknowledged **aspirations for other opportunities** also contributed to keeping CHWs in service and provided an incentive in order to increase visibility. The majority of IDI participants said they hoped their work would lead to other opportunities with NGOs or with the district. Capturing the sentiments of many others, a 45-year-old woman said:

I am hopeful that if I perform well like the way my basawo [health center midwives] trained me ... I am very hopeful that I will advance. I have a feeling that my opportunities are still increasing. ... I am known and I have acquired more knowledge.

Relationship With Other Health Staff and NGOs

CHWs interfaced with health center supervisors and with district-level and/or NGO staff. Overall, CHWs felt well-treated by health center staff. A number of CHWs said they felt part of a team. Several CHWs sometimes provided family planning services at the health center and enjoyed this, because it made them feel trusted by the staff and served to build community confidence in them. Yet a number of CHWs mentioned challenges, typically related to staff's lack of availability or to feeling unappreciated. In both

NGO-related programs, the initial rapport was poor, and CHWs struggled to get supplies. However, CHWs said that the situation improved after NGO staff intervened.

IDIs suggest that CHWs perceived interactions with higher-level district or NGO staff as particularly important. In fact, when asked about supervision, some CHWs in NGO-related programs exclusively referred to NGO personnel, although they acknowledged also having contacts with health center staff. In one program, the supporting NGO had recently pulled out; in another, it was preparing to leave. In both cases, several CHWs identified pull-out as a discouraging factor for continuing on the job. In addition to feeling demoralized, their main issues or concerns had to do with the effect on their ability to continue receiving a transport refund and with losing the practical support received from NGO staff. In one program, for example, CHWs explained that NGO extension workers facilitated the reporting and resupply process by acting as a bridge between them and health centers.

In-Depth Interviews With Former CHWs

Former CHWs included 4 men and 1 woman; 3 were from the public-sector program and 2 from the NGO-supported program. The challenges and facilitators they described were generally similar to those identified by active CHWs. The rationale former CHWs provided for leaving related to 1 or more of 5 factors: (1) transport; (2) supplies and related relationship issues with health center staff; (3) pursuit of personal work; (4) family relations; and (5) health problems. For example, a 52-year-old man who reported transport as one of his main challenges was eventually discouraged because of the way the midwife treated him when he went to get supplies. Explaining that she would make him wait only to tell him that supplies had run out, he said:

For me the this kind of treatment from someone who is supposed to be guiding us was a very big blow to my work and this really made me lose all the strength I had for serving my community people for free ... Much as she was the supervisor, she should have showed some respect to us in order to earn ours, but she kept treating us like we never mattered in any way. If the medicine was not there, then it would cost her nothing to tell you that instead of making you wait for long hoping to get the medicine and yet she knows it is not there.

Aspirations for other work motivated many CHWs to stay in service.

DISCUSSION

Transportation and Stockouts Hinder CHW Motivation

This study identified several factors affecting CHW motivation and level of activity. Transportation and stockouts were the main problems CHWs faced in performing their responsibilities, highlighting weaknesses in infrastructure and logistics support. By bringing services closer to communities, CHW programs eliminate transportation barriers for community members that limit their access to care. However, transportation problems are essentially shifted onto CHWs who have to travel long distances for work. In our study, challenges ensued due to a lack of adequate resources for visiting clients or reaching health centers for supervision or supplies.

Inconsistent commodities and issues with restocking hindered CHWs' ability to complete their tasks. Contraceptive stockouts, particularly for injectables, are a chronic issue in Uganda. Highly active CHWs were more likely to experience problems with supplies, perhaps because they needed to resupply more often. Qualitative data illustrate how, even when drugs are available, long distances and timing of shortages add to challenges in ensuring a regular supply. Although CHWs are supposed to pick up commodities when they convene at the health center for supervision, they may not always be able to get the necessary supplies because of health system shortages. Since programs provide a transport refund only for attending supervisory meetings, CHWs are not compensated for the time or expenditures associated with additional trips.

Issues with transportation and commodities in CHW programs have been reported elsewhere.^{10,22,24,37} However, qualitative findings add some depth to the understanding of their implications for CHWs by showing how both issues can compound each other. Moreover, DCE results suggest ways to decrease such challenges. In particular, findings indicate that CHWs value the provision of a bicycle over a small increase in transport refund.

Volunteerism Has Both Benefits and Costs

Voluntarism among CHWs is a matter of much debate. Findings provide important insights regarding what CHWs themselves see as the benefits and costs of volunteering. Survey and IDI data indicate that the relationship to communities and acquired

skills and knowledge contributed to positive attitudes toward volunteer work and mostly positive intentions to remain in service. CHWs felt recognized and appreciated by their community and displayed a strong commitment to their clients. Enhanced status and the receptivity of others to their advice galvanized intrinsic feelings of altruism and satisfaction with helping others. Other studies also highlight social prestige and social responsibility as enabling factors.^{21–23,38} Our findings reinforce the potential of public recognition as a strategy for magnifying the positive behavioral traits that underlie CHWs' commitment.

CHWs considered family planning volunteer work as an opportunity for personal growth. Training improved competencies, bringing about personal benefits through contraceptive use and hope for future work. In rural contexts with few job opportunities, acquisition of skills is often seen as a springboard for employment, and lack of career evolution can be demoralizing.^{14,24,39,40} In this study, aspirations for NGO or government work encouraged CHWs to be active and remain in service.

IDIs highlight how weaknesses in support mechanisms can increase the costs of volunteering and can demotivate CHWs. In particular, CHWs experienced frustration at expending personal resources to cover transportation costs. CHWs considered the refund insufficient to offset actual expenditures, let alone fulfill their desire to provide for their family, at least in some small way, through their work. Despite widespread awareness of the volunteer nature of the CHW role, aspirations for a regular salary were not uncommon. The importance of income was an underlying theme, with CHWs crystallizing their expectations on the transport refund as the only existing financial incentive. This is consistent with previous studies highlighting that despite being volunteers, CHWs may see their role as income-generating.^{21,38,41} Prior research has also shown that CHWs often feel disgruntled at the lack of material benefits.^{22,38,39} Our findings add to the evidence base emphasizing the complex processes underlying CHW motivation for wanting better compensation and other opportunities.

Relationship Between CHWs and Health Structure Are Ambivalent

CHWs act as a bridge between communities and the health structure. NGO involvement adds a third element. Our sample spanned

Public recognition of CHWs can help keep them motivated.

Transportation problems were essentially shifted from community members to the workers who had to travel long distances to people's homes and to health centers.

3 programmatic contexts: public sector, NGO, and NGO turned public. CHW level of activity was the highest in NGO-related programs. However, this finding must be interpreted cautiously because of the potentially better quality of reporting in NGO-related programs and of contextual differences.

Quantitative and qualitative data show that the relationship with the community trumped recognition by supervisors for CHWs across programs, as was also found in Colombia.⁴² Moreover, although CHWs were eager to be identified with the health structure for enhanced status, relations with health center supervisors were ambivalent as volunteers sometimes felt unappreciated or struggled to obtain supplies. NGO involvement has potential for addressing some resource constraints in CHW support systems. However, findings highlight the risk of substituting rather than complementing support functions, leading to a greater sense of accountability to NGOs than to district health staff. For example, CHWs in NGO-related programs did not always identify with a supporting health facility or recognize interactions with health center staff as supervision. In addition, there was some indication that NGO support might affect financial expectations, perhaps because of greatest exposure to incentives. NGO pull-out was an important discouraging factor, stressing that sustainability in this approach is also problematic.

Strengths and Limitations

The mixed-methods approach and the range of programs included in the study sample strengthen our ability to confidently pinpoint key challenges and facilitators for CHWs in Uganda. First, the use of mixed methods allows for a deeper understanding of the dynamics underlying CHWs' motivation to perform and remain in service. Second, the convergence of findings across methods provides confidence in the results. Third, some generalizability beyond the study sample is supported by the important commonalities in the thematic structure of results across programs. However, although they offer insights for the current rollout of the Village Health Team strategy, findings may not be directly applicable to the entire country. Our study spans 7 of Uganda's 112 districts. Moreover, recruitment of volunteers is done by communities and may or may not absorb CHWs trained earlier in sub-national programs.

Information gathered separately from program records (results not shown), although

imprecise due to different record-keeping procedures and variable time frames across programs, indicate that retention rates exceeded 80% over a 2-year period. Because our study was mostly conducted with active CHWs, and because of the high retention rate in the sampled programs, we are limited in our ability to understand reasons for not continuing. While IDIs with active and former CHWs revealed similar challenges, further research including larger samples of former CHWs is needed to identify the tipping point that causes CHWs to go from feeling discouraged to actually leaving. Our measure of CHW level of activity is a crude, intermediate measure of performance that includes aspects of service use but does not capture quality of care or more distal outcomes in terms of contraceptive use dynamics or population health. Moreover, it is expressed as number of visits, rather than clients; does not include referrals; and gives equal weight to new family planning users, clients switching methods, and clients coming to resupply although the demands placed on CHWs in each case may be different.

CONCLUSION

While specific measures must be tailored to the local context and programmatic structure, this study provides important insights for sub-Saharan Africa on the underlying dynamics affecting CHW performance and retention, and on the relative importance of program inputs from CHWs' perspectives. Upon presenting results to implementing partners working with CHWs in Uganda, a number of recommendations arose from this study. First, standard provision of a bicycle would alleviate transport challenges. Second, CHWs should receive an allowance for attending meetings; this should be separated from reimbursement for actual transport costs. Third, accountability to the community and to the health structure, as opposed to NGOs, needs to be reinforced. Fourth, better integration of CHW supplies into forecasting is needed. Finally, prominent display of CHWs' contributions to service statistics should be promoted as a motivational tool.

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ORIGINAL ARTICLE

Meningococcal vaccine introduction in Mali through mass campaigns and its impact on the health system

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The meningococcal A vaccine campaign led to major disruption of routine vaccination services and reduced other services, notably antenatal care.

ABSTRACT

Objective: To evaluate the impact of the meningococcal A (MenA) vaccine introduction in Mali through mass campaigns on the routine immunization program and the wider health system.

Methods: We used a mixed-methods case-study design, combining semi-structured interviews with 31 key informants, a survey among 18 health facilities, and analysis of routine health facility data on number of routine vaccinations and antenatal consultations before, during, and after the MenA vaccine campaign in December 2010. Survey and interview data were collected at the national level and in 2 regions in July and August 2011, with additional interviews in January 2012.

Findings: Many health system functions were not affected—either positively or negatively—by the MenA vaccine introduction. The majority of effects were felt on the immunization program. Benefits included strengthened communication and social mobilization, surveillance, and provider skills. Drawbacks included the interruption of routine vaccination services in the majority of health facilities surveyed (67%). The average daily number of children receiving routine vaccinations was 79% to 87% lower during the 10-day campaign period than during other periods of the month. Antenatal care consultations were also reduced during the campaign period by 10% to 15%. Key informants argued that, with an average of 14 campaigns per year, mass campaigns would have a substantial cumulative negative effect on routine health services. Many also argued that the MenA campaign missed potential opportunities for health systems strengthening because integration with other health services was lacking.

Conclusion: The MenA vaccine introduction interrupted routine vaccination and other health services. When introducing a new vaccine through a campaign, coverage of routine health services should be monitored alongside campaign vaccine coverage to highlight where and how long services are disrupted and to mitigate risks to routine services.

INTRODUCTION

As countries introduce new vaccines at an ever-increasing pace, there have been concerns about the effect on immunization programs and health systems.¹ There is limited evidence, however, on the effects of introducing new vaccines on health systems. A recent review found this was rarely the main focus of

studies and that research seldom focused on low-income countries, such as Mali, where health systems are generally weaker.²

Broader studies have shown that vertical disease control programs can have both positive and negative effects on the wider health system.^{3–7} Such findings have led to regular calls for a more integrated approach to implementing communicable disease programs.^{4,8–13}

New vaccines may be introduced into the health system through a variety of strategies. They can be added to the routine immunization schedule (delivered in health facilities or through routine outreach), through targeted mass campaigns, or a combination of both.

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Between 2010 and 2011, Mali vaccinated 10 million people with the meningococcal A vaccine through 3 campaigns.

Starting at the end of 2010, the meningococcal A (MenA) vaccine (MenAfriVac) has been introduced through phased mass campaigns in the high-prevalence meningococcal belt in West Africa.^{14,15} (MenAfriVac presents in a 10-dose lyophilized vial and needs to be preserved at temperatures between 2°C–8°C. Once open, a vial should be used within 6 hours.) Several studies have scrutinized vaccination campaigns, some of them pointing to a possible disruption of routine services.^{16–19}

Between September 2010 and November 2011, Mali introduced the MenA vaccine over 3 separate campaigns. The first pilot phase occurred in 2 districts, followed by a second phase in Bamako, Ségou, and Koulikoro regions in December 2010. In November 2011, the third phase covered the remaining 6 regions. The campaigns targeted all people 1–29 years old, and each campaign ran for 10 days, vaccinating a total of 10 million people. Vaccination took place at health facilities and through outreach in community settings, in both rural and urban areas.

The Health Setting in Mali

Mali, a low-income country in West Africa, has a population of 14.85 million (Table 1). It has a young population, with 46% of the country's population under 15 years old.

Health care is delivered through community-owned health facilities (*Centres de Santé Communautaires*, also called CSCOM). Key health care professionals, such as head doctors and nurses,

are usually employed by the government while other staff and operational costs are supported by the local community. Vaccination is provided free of charge, but user fees are charged for most other services.

In Mali, the Expanded Programme on Immunization (EPI) delivers 10 different antigens to children under 5 years old, through a combination of fixed immunization sessions at health facilities, outreach services to community sites, and campaigns. In 2011, the vaccination coverage rate of the third dose of diphtheria-tetanus-pertussis (DTP3) vaccine was 74%.²¹

Many health interventions in Mali are delivered through campaigns, rather than through routine services. During 2010 and 2011, 28 health campaigns were conducted, totaling 134 days (Table 2). Twenty-one were national campaigns and were used to deliver a range of interventions, such as vaccinations, insecticide-treated bed nets, deworming drugs, and nutritional supplements; 6 had a regional focus; and 1 was conducted in only 2 districts (Table 2). The campaigns typically lasted 2–10 days, with an average of 1 campaign every 3 weeks.

This study aimed to evaluate the impact of introducing the MenA vaccine on the routine immunization program and the wider health system in Mali during the second phase of the MenA vaccine introduction (in 3 regions). It was part of a larger study that explored the impact of a range of new vaccine introductions in 6 low- and middle-income countries.²³

TABLE 1. Mali Country Profile, 2012

Key Indicators		Source
Population	14.85 million	World Bank ²⁰
Life expectancy at birth	54 years	World Bank ²⁰
Under-5 mortality rate	176/1,000 live births	WHO ²¹
Maternal mortality rate	464/100,000 live births	Ministry of Health (Mali) ²²
Fertility rate	6.6 children/woman	Ministry of Health (Mali) ²²
Population living in rural areas	70%	Ministry of Health (Mali) ²²
DTP3 coverage rate (national)	74%	WHO ²¹
GNI per capita	US\$660	World Bank ²⁰

Abbreviations: DTP3, 3rd dose of diphtheria-tetanus-pertussis vaccine; GNI, gross national income; WHO, World Health Organization.

TABLE 2. Public Health Campaigns in Mali, 2010–2011

Campaign	Geographic Focus ^a	Dates
2010		
Polio NID (Sikasso region), 1st round	1 Region	Mar 6–9
Polio NID (Sikasso region), 2nd round	1 Region	Mar 26–28
Polio NID, 1st round	National	Apr 24–27
Polio NID, 1st round	National	May 28–31
NTDs (distribution of ivermectin and albendazole)	National	Jun 14–16
NTDs (distribution of praziquantel and azithromycin)	National	Jun 18–20
Polio NID, 2nd round	National	Jun 25–28
MILDA (distribution of bed nets)	National	Jul 17–20
Preventative campaign for severe malnutrition	National	Sep 16–18
MenAfriVac , 1st phase	2 Districts	Sep 13–20
Polio NID, 3rd round	National	Oct 28–31
Polio NID, 3rd round	National	Nov 25–27
National Week of Nutrition (SIAN)	National	Dec 1–7
MenAfriVac , 2nd phase, Koulikoro, Ségou, and Bamako regions	3 Regions	Dec 14–23
2011		
Measles SIA	National	Feb 28–Mar 6
Polio NID, 1st round	National	Mar 25–28
Polio NID, 2nd round	National	Apr 29–May 2
Polio NID, 3rd round	National	Jun 3–6
National Week of Nutrition (SIAN)	National	Jun 4–10
Polio NID, 4th round	National	Jun 23–26
NTDs (distribution of ivermectin and albendazole)	National	Jul 14–19
NTDs (distribution of praziquantel and azithromycin)	National	Jul 27–Aug 1
Polio NID	4 Regions	Jul 29–Aug 1
Polio NID	5 Regions	Aug 20–23
Polio NID, 4th round	National	Sep 30–Oct 3
Polio NID, 5th round	National	Oct 28–31
MenAfriVac , 3rd phase, other regions	6 Regions	Nov 15–24
Polio NID, 6th round	National	Nov 26–29

Abbreviations: MILDA, moustiquaire imprégnée d'insecticide à longue durée d'action (long-lasting insecticidal net); NID, National Immunization Days; NTDs, neglected tropical diseases; SIA, supplementary immunization activities; SIAN, Semaine d'Intensification des Activités de Nutrition (Child Nutrition Week).

Data from the Expanded Programme on Immunization (EPI) of Mali.

^a Mali has 9 regions.

METHODS

We used a mixed-methods study design, combining semi-structured interviews with stakeholders, a health facility survey, and analysis of routine health facility data. Fieldwork was conducted in July and August 2011, with additional national stakeholders interviewed in January 2012.

Data were collected at the national level and in 2 of the 3 regions (Bamako and Koulikoro) in which the second phase of the MenA vaccination campaign took place. In both regions, 3 districts were purposively selected to reflect different ranges of vaccination coverage and profiles of urbanization/rurality.

Conceptual Framework

Our analytical framework, developed by the World Health Organization (WHO) ad-hoc working

group on new vaccines and health systems, was an adapted version of the WHO Health Systems Framework.^{1,24} It consisted of the same 6 “building blocks” from the WHO Health Systems Framework but with the addition of vaccination-specific elements within these (Table 3).

Stakeholder Interviews

Thirty-one stakeholders at national, regional, and district levels were interviewed (Table 4). Most interviewees were purposively selected because of their involvement in the vaccine introduction process. In addition, stakeholders with responsibilities outside the EPI were interviewed to seek their perception of the impact on the broader health system and to explore the extent to which they had collaborated with those involved in the campaign. Interview questions aimed to investigate critical aspects of each of the

TABLE 3. Framework for Assessing the Health Systems Impact of New Vaccine Introduction

Health System Building Block	Examples of Vaccination-Specific Elements
Service delivery	<ul style="list-style-type: none"> • Demand and acceptance • Access and utilization • Quality of care • Delivery modalities
Health workforce	<ul style="list-style-type: none"> • Availability and distribution of staff • Training and capacity of staff • Remuneration and satisfaction • Performance and supervision
Health information system	<ul style="list-style-type: none"> • Routine data collection and reporting • Disease surveillance
Medical products, vaccines, and technologies	<ul style="list-style-type: none"> • Forecasting of vaccines and injection supplies • Procurement and stock management • Cold chain management and waste disposal
Financing and sustainability	<ul style="list-style-type: none"> • Affordability • Domestic financing • External financing
Leadership/governance	<ul style="list-style-type: none"> • Regulatory policy • Political commitment • Organization, structure, reform, negotiation, stewardship

Source: WHO Ad-hoc Working Group on Impact of New Vaccines on Health Systems²⁵

TABLE 4. Number and Types of Key Informants, by Health System Level

Health System Level and Type of Respondent	Data Collection Method	Number
National		
EPI, MOH	Interview	2
Other, MOH	Interview	8
Civil society and international agencies	Interview	5
Academics/other domestic agencies	Interview	4
Regional		
Regional head doctor	Interview	3
District		
District head doctor and other staff involved in vaccination activities	Interview	9
Facility		
Health facility staff	Questionnaire	18
Total		49

Abbreviations: EPI, Expanded Programme on Immunization; MOH, Ministry of Health.

6 building blocks that may have been affected either positively or negatively by the new vaccine introduction. They also aimed to understand how various stakeholders were involved in the introduction process.

Health Facility Surveys

In each district, 3 health facilities were selected based on increasing distance from the district's main urban center. The aim was to survey a variety of urban, semi-rural, and remote health care facilities in each district. Staff from 18 health facilities were surveyed using a researcher-administered questionnaire (Table 4), adapted from the Post-Introduction Evaluation (PIE) methodology used in the vaccination field.²⁶

Routine Health Facility Data

Routine data were collected on the number of children vaccinated and antenatal care (ANC) visits per day during the campaign and one month before and after, in order to explore the continuity of health services during the campaign.

Data Collection and Analysis

Prior to administering the interviews and facility questionnaires, the aim of the study was explained to participants and an information

sheet was provided. After discussing any questions or concerns, participants signed a consent form. Where permitted, interviews were recorded and transcribed. When they were not recorded, notes were taken and typed up in detail afterwards. Survey responses were recorded directly onto the paper questionnaires. The interviews and surveys were conducted in French.

Framework analysis was used to explore the interview data.²⁷ An initial coding framework was developed based on preliminary assessment of the transcripts and the building-blocks framework. These codes were applied to all the interview transcripts, and the data within each code were then explored for themes and patterns. The software Open Code was used to manage the data.²⁸ Survey data were entered into SPSS and analyzed using descriptive statistics.

Ethical approval was obtained in Mali and from the London School of Hygiene & Tropical Medicine.

FINDINGS

The surveyed facilities had between 2 and 16 staff members. In their normal practice outside campaigns, almost all the facilities reported having 1 or 2 routine vaccination sessions per week, with 2 of 18 facilities holding sessions only every 4 weeks.

Routine clinic and outreach services were discontinued during the MenA campaign in most facilities.

The introduction of the MenA vaccine had no effect (either positive or negative) on many aspects of the health system. Some aspects did improve, however, while others suffered. The majority of effects were felt on the EPI, rather than on the broader health system. The findings are presented below according to the 6 building blocks.

Service Delivery

High Demand and Acceptance

Interviewees and health facility staff universally reported that there was high demand for the new vaccine. Social mobilization raised awareness about the vaccine, and rumors were well-managed. Because of its large reach, respondents felt that the MenA vaccine campaign had improved awareness of the benefits of vaccination and had increased credibility of the EPI.

Reduced Access to and Use of Routine Services

Of the 18 surveyed health facilities, 12 had either no record of any routine vaccination activities during the 10-day MenA vaccine campaign or, when records were not available, stated they had stopped routine vaccination (Table 5). In the Koulikoro region, only 2 of 9 health centers (22%) provided routine vaccination services during the campaign. Among the 6 facilities in the 2 regions that continued routine vaccination services, 1 facility vaccinated only 1 child while another continued as usual only because Médecins sans Frontières (MSF) staff had undertaken the MenA vaccine campaign independently in the Kati District. However, even though MSF carried out the campaign, staff from

2 of the surveyed health centers in the Kati District were sent on supervision duties, which affected routine activities.

Likewise, during the campaign, routine outreach vaccination services were discontinued in 5 facilities, while 2 facilities with infrequent outreach services were able to accommodate or postpone the work. (The remaining facilities did not conduct outreach.) Many interviewees, notably at national and regional levels, stated that routine vaccination had been maintained during the campaign, but findings from the facility survey and routine data showed that this was not the case. The number of staff per health center did not seem to affect whether vaccination services continued, as the median number of staff did not differ between those facilities that continued vaccination services and those that did not.

Data collected from health facilities before, during, and after the MenA vaccine campaign suggest that the campaign had considerable impact on routine vaccination activities and, to some extent, on ANC consultations. The average daily number of children vaccinated during routine services was 79% lower during the 10-day campaign period in December 2010 than during the first 13 days of the month before the campaign started, and 87% lower than during the last 8 days of the month when the campaign was over (Table 6). While fewer children were vaccinated per day during the mid-period of all 3 months (14th through 23rd), the average number was 71% and 74% less during the campaign days than during similar days in November and January, respectively. Antenatal care consultations also decreased during the campaign but not as severely—there were 10% and 15% fewer consultations compared with the same days of the month during November and January, respectively.

There was less impact on the delivery of other health services, but nonetheless one-third of facilities (6 of 18) reported a reduction in services, and 2 facilities closed their ANC services for the duration of the campaign. Most of the facilities that reported a reduction in ANC and outpatient services were situated in the Koulikoro region where staffing levels were lower than in Bamako.

At health facility level, there is an impact [on other activities] because these have only 2 staff in most cases ... the workload is much increased and some activities are reduced because all the staff are involved [in the campaign].

–District official, Koulikoro

TABLE 5. Continuity of Routine Vaccination Activities at Health Facilities During Meningococcal A Vaccine Campaign (N=18 Facilities)

Region	No. of Facilities	
	Discontinued Routine Vaccination	Continued Routine Vaccination
Bamako	5	4
Koulikoro	7 ^a	2
Total	12	6

^a In 3 of the 7 facilities, data were based on health facility staff recall because records of routine vaccination activities were not available.

TABLE 6. Average Daily Number^a of Routine Services Before, During, and After the MenA Vaccination Campaign

Days of the Month	Nov 2010	Dec 2010	Jan 2011
Average Daily No. of Children Vaccinated^b (in 15 health facilities)			
1–13	82	62	62
14–23	45	13	50
24–30/31	70	99	81
Average Daily No. of ANC Consultations (in 18 health facilities)			
1–13	88	91	90
14–23	63	56	66
24–30/31	90	94	121

Abbreviations: ANC, antenatal care; MenA, meningococcal A.

Cells in boldface pertain to the MenA vaccine campaign period (December 14–23, 2010).

^a Only working days were considered in the calculation of the average daily service activity to make comparisons between months meaningful.

^b Children receiving routine vaccinations.

Many interviewees noted the regular discontinuation of routine services for a range of health and immunization interventions during the numerous campaigns that were organized throughout the year. Some interviewees criticized the frequency of campaigns; others underlined their negative impact on the health system.

It [the effect of the campaign on health services] is immaterial [that is, difficult to measure] but this is significant; it is an issue that can lead to loss of trust in the service.

–National Ministry of Health (MOH)

Two interviewees commented that the new vaccine improved equity, notably for specific groups for which meningitis would pose a greater risk, such as people affected by sickle cell anemia.

Vertical Delivery Modality

The campaign was organized similarly to other vaccination campaigns, with a combination of fixed posts and outreach teams. It did not involve any co-delivery of other interventions (for example, bed nets, deworming), nor did it involve catch-up of defaulters for other vaccines. Furthermore, once over, the campaign did not lead to a deliberate change in how either the EPI or other health services were delivered. The majority of interviewees and some facility staff felt that this was a missed opportunity. Some interviewees suggested that a more integrated

approach with other services might have been positive while others commented that the high resulting workload would have made co-delivery of other services impossible.

Many people come during the campaign, and this would be a unique opportunity to do more interpersonal communication and to raise awareness on vaccination.

–District official, Bamako

We would like to use the vaccination campaign to provide other services for children such as vitamin A and deworming ... it only happened once in 2007 during a measles campaign. We need to provide a more integrated service and the spirit of integration is not always shared.

–National MOH

Considering the workload, if we combined the MenA campaign with other services, that would not work.

–District official, Koulikoro

Health Workforce Increased Workload

Additional staff members were called upon for the duration of the MenA vaccination campaign, and workload was reported to be high during the period. Staff numbers and workload returned to normal levels once the campaign ended. It was mentioned that the workload impact was substantial in remote regions.

The MenA campaign did not deliver other health services to people, nor did it provide missed vaccinations for other vaccines.

If in the North you have 3 persons, these will do only the campaign during 10 days.

–National MOH

Enhanced Training and Capacity of Staff

National and sub-national health service managers overwhelmingly stated that training for the MenA vaccine introduction had enhanced provider skills, often beyond those required for the specific vaccine, acting as a general refresher on vaccination skills. They commented that a particular emphasis had been placed on adverse events following immunization (AEFI), waste management, surveillance, and social mobilization.

This is thanks to MenAfriVac that I received a theoretical training for the first time, although I had been working in EPI since 2008.

–District official, Bamako

It was quite a comprehensive training ... a training like that is always useful, unlike for polio for which we have no more training, and people tend to do a bad job.

–Regional official, Bamako

However, a large majority of health facility staff (15 of 18) reported that training had focused primarily on the new vaccine, possibly reflecting the fact that the new vaccine was a “one-off campaign” and was not yet introduced into the routine schedule.

Motivated Staff

Interviewees generally felt that the introduction of the MenA vaccine had motivated staff, because of the expected outcome of reduced child morbidity and mortality, or because the campaign was associated with the payment of a per diem. The per diem received ranged from 2,500 to 5,000 CFA Francs (approximately US\$5 to \$10) per day.

During the campaign, staff is motivated, unlike during the routine [service period] when there is no financial motivation.

–District official, Bamako

Health Information Systems

All respondents reported that there were no fundamental changes to the health information system as a result of introducing the new vaccine. However, a strong emphasis was placed on AEFI surveillance during the introduction itself, including strengthening the skills of health

workers to recognize and report AEFI and training of laboratory staff. Despite perceived better awareness, interviewees at the national and regional level acknowledged that AEFIs were still not routinely reported.

Medical Products, Vaccines, and Technologies

Interviewees explained that in 2010, prior to the introduction of the MenA vaccine and another new vaccine (pneumococcal conjugate vaccine), the cold chain was strengthened in 4 regions (including our study regions) and 1,050 vaccine carriers were provided to health facilities. Overall, interviewees reported that the cold chain capacity was sufficient to handle the MenA vaccination campaign. They explained that this was because routine vaccination had been discontinued, routine vaccine stocks were temporarily relocated to alternative (regional and district) places, and other temporary cold storage was used.

Two of our fridges were full with the MenAfriVac vaccines, so our routine vaccines were stored at regional level and that was not an issue because we did not do any routine vaccination apart from BCG [bacille Calmette-Guérin] and polio birth doses. This is similar during the measles campaign but not for polio, as in general we do not stop routine vaccination.

–District official, Bamako

The introduction of the MenA vaccine had no impact on forecasting and procurement. It had some limited positive impact on waste disposal, with reports of several upgrades to waste management equipment. However, one district noted a major delay in disposing of a large amount of injecting materials.

Financing and Sustainability

The introduction of the MenA vaccine was mainly funded by external partners, such as the Global Alliance for Vaccines and Immunisation (GAVI), WHO, the United Nations Children’s Fund (UNICEF), and the Canadian International Development Agency (CIDA), although the government of Mali also committed funds. There was no indication that resources for the new vaccine had displaced other investments, although several interviewees noted that funding was easier to commit for vaccination than for many other health services.

Training for the MenA vaccine served as a general refresher on vaccination skills for providers.

The total cost of the campaign amounted to US\$9.4 million, according to the EPI.²⁹ A few interviewees suggested that the introduction of 2 new vaccines (the MenA vaccine and the pneumococcal conjugate vaccine) in 2011 could have negatively impacted overall EPI operational costs.

A major positive effect noted by both interviewees and facility staff was the expected sharp decrease in meningococcal disease that enabled a shift from epidemic response to prevention. This was considered beneficial and cost-effective for the health system.

The meningitis outbreak response in Bamako in 2009 lasted over 10 days and had to mobilize a lot of resources and a high number of vaccinators.

–National MOH

The majority of interviewees and respondents at facilities felt that the funds planned for the implementation of the campaign were sufficient to cover its costs. Only a few interviewees commented that additional funds drawn from the routine budget were used to pay for transport, fuel, and communication costs and, in one district, to supplement staff per diems for implementing the campaign.

Interviewees and some facility staff reported that the cancellation or reduction of routine activities during the campaign had, in some cases, caused a reduction in fee-for-service revenues.

Campaigns reduce routine activities because staff deserts the facility. On one hand, this has an impact on financial revenues of the facility, and on the other hand, it benefits staff through per diem. That is why staff do not usually complain about campaigns.

–National MOH

Leadership and Governance

Interviewees noted that the government had demonstrated high political commitment to the vaccine introduction and that some aspects of governance were strengthened. For instance, AEFI surveillance was developed through the activation of national and sub-national committees on AEFI. Capacities were further enhanced through locally conducted clinical trials to assess the safety and efficacy of the new vaccine and participation in multicountry studies.^{30,31}

Regulatory norms and standards were updated in preparation for the introduction of the MenA vaccine, including guidelines and training modules.

However, regulatory approval for MenAfriVac was bypassed because of time pressure.

Collaboration among the National Communication Agency for Health, the Centre for Vaccine Development, and the Ministry of Health was established or strengthened during the preparatory phases of the introduction, which was judged to have long-term positive effects. This resulted in the use of scientific evidence, including formative research, for communication, which benefited the broader EPI communication strategy and helped to focus on aspects such as safety and preventing rumors. Multidisciplinary teams for hospital surveillance studies were also established. However, enhanced collaboration did not occur between departments within the Ministry of Health; there was no involvement of other service delivery departments in planning for the campaign and no discussion of co-delivering other interventions with the new vaccine.

Usually everybody remains in their own silo ... for instance, before [the MenA vaccine introduction] we were not interested in post-marketing surveillance ... but this is key for effective communication.

–National stakeholder

I wish we would have been associated with the new vaccine activities ... the spirit of integration is not always well-understood because each service thinks they can achieve their results separately.

–National MOH

DISCUSSION

Our study is the first to triangulate findings about stakeholders' perceptions of the effect of introducing the new MenA vaccine on health services with routine health facility data. The study found that many aspects of the health system were not affected by the MenA vaccine introduction, either positively or negatively, while some aspects improved and others— notably, continuity of routine services—suffered.

Positive Effects of the Vaccine Campaign

Some of the perceived positive effects of the new vaccine introduction on the routine immunization program included improved governance and collaboration, communication and social mobilization, surveillance, and provider skill strengthening (particularly those relevant to EPI, such as AEFI surveillance and waste management). In addition, a separate evaluation of the campaign

Collaboration between health agencies improved during the MenA campaign but not between departments within the Ministry of Health.

Reduction of routine services, which usually involve user fees, during the MenA campaign sometimes resulted in reduced facility revenue.

showed high recognition of the disease, with 80% of people in the community surveyed knowing the disease prevented by the new vaccine.³² Furthermore, a widely perceived positive effect was the reduction of disease and, to a lesser extent, recognition that equity had been improved at the population level. The MenA vaccination also led to expectations of future resource savings and service planning improvements due to the avoidance of costly outbreak responses and reactive vaccination campaigns.

Routine Services Reduced Due to Vaccine Campaign

The main negative effect identified by the interviewees was the discontinuation or sharp reduction in routine vaccination services and, to a lesser extent, reduction in the availability of other health services, such as ANC, during the 10 days of the campaign. Analysis of routine health facility data confirmed this finding. It is worth noting that some interviewees believed that routine vaccination continued as usual during the campaign, but this was not confirmed by routine data. A recent quantitative study carried out in South Africa found a similar association between measles campaigns and decreased routine immunization coverage.³³ There is a risk that the MenA vaccine introduction may have had a negative effect on routine vaccination coverage due to the disruption in routine services.

However, some interviewees argued that a countrywide vaccination campaign using the new conjugate MenA vaccine would prevent repeated, reactive epidemic outbreaks that also interrupt routine health services. For example, in its 2007 outbreak response, Burkina Faso spent US\$6.08 million (3% of the health care budget) on vaccinating 4.1 million people plus another US\$3 million on meningitis case management. It is worth noting that because of the short duration of protection provided by the polysaccharide vaccine used during this outbreak response, such costs would occur regularly.³⁴

The effects of the MenA vaccine campaign on routine health services should be examined in the broader context in which as many as 14 vaccination campaigns occur each year. Although the effect of an individual campaign might seem limited in the short term, the impact of multiple campaigns is cumulative. In fact, interviewees stressed that the high frequency of campaigns

had an adverse effect on the availability and credibility of routine health services. Previous studies have described drawbacks and benefits of mass vaccination campaigns,^{18,35,36} and they have pointed out that countries with weaker health systems are more likely to experience adverse effects of campaigns, such as disruptions to health services.^{17,37,38}

In line with a recent study, we found there was a tension between the personal financial benefit (per diems) received by staff during the campaign and the recognition that the campaign may disrupt health services.³⁹

Lack of Integration of Vaccination Campaign With Other Services

As far as the authors are aware, no other study has yet reported on the effects of new vaccine introductions by mass campaign on health systems.² Overall, the meningococcal vaccine introduction in Mali was implemented in a conventional vertical manner. The introduction did establish some valuable collaborations, but it was generally not used as a means to strengthen the health system. Our study provides some evidence that the mass-campaign delivery mode may disrupt the provision of routine services and reduce fee-for-service revenues linked to routine medical services, although our methodology was not designed to answer the latter. This aspect needs to be investigated further, particularly in terms of the possible impact on those routine activities traditionally financed using fee-for-service revenues.

The MenA vaccine campaign in Mali was successfully resourced, planned, and delivered, and it achieved high coverage.³² Mass campaigns are generally considered an effective means of achieving high coverage rates.⁴⁰ However, the reach to a large target population—and to subgroups, such as young people, that seldom use health services—was not used to provide other benefits or services to this population, particularly in more remote regions where contact with health services is rare. We found that this was likely to be caused by insufficient coordination between departments within the Ministry of Health and because of earmarked funding for the vaccination campaign.

The lack of consideration of a more integrated approach and the lack of involvement of other partners in the planning process were seen by some as a missed opportunity. Strong tension remains between the ambition to achieve expected

The impact of multiple vaccination campaigns each year on routine health service delivery can add up.

coverage in order to prevent epidemic outbreaks and the opportunity to use the campaign to bring other services to the population, such as health promotion or nutrition. Both perspectives were cited by respondents in our study. Delivering other interventions during the MenA vaccine campaign would have involved important challenges (such as logistical, financial, and communication), as other researchers have also noted.^{41–43} However, the overall lack of discussion at the level of the Ministry of Health for such activities meant that the campaign remained very vertical. Other researchers have also noted that there are many missed opportunities for using campaigns to strengthen integrated service delivery.^{37,38,41,44}

Relevance of Findings to Other Vaccine Initiatives

The MenA vaccine introduction may be seen as having unique features that are not typical of either a routine vaccine introduction or a regular supplementary immunization activity. However, it does have broader relevance given that other new vaccines in the next few years are likely to follow the MenA vaccine introduction model of starting with a catch-up campaign before introducing the vaccine into the routine schedule. This could be the case with human papillomavirus (HPV), Japanese encephalitis, and measles-mumps-rubella vaccines.

CONCLUSION

Recommendations to promote health systems strengthening with vertical disease control activities are not new.^{16,19} However, as long as financing remains vertical, with each program setting its own specific objectives, it will be difficult to mitigate the adverse effects of vaccine campaigns on routine services. If countries and international partners truly want to promote health systems strengthening with new vaccine introductions, they should start by measuring not only vaccine campaign target coverage but also its effect on the use of routine health services. This would enable EPI staff to take stock of existing disruptions, adapt planning, and reallocate resources to ensure that routine services continue to be delivered during campaigns.

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RESOURCES

mHealth resources to strengthen health programs

Kelly L'Engle,^a Laura Raney,^b Margaret D'Adamo^c

A suite of resources provides implementation guidance for mHealth initiatives, particularly in less developed countries. The suite includes an eLearning course, online guide, evidence database, and a High-Impact Practices brief, along with the mHealth Working Group and website.

We note with interest that the article “mHealth innovations as health system strengthening tools: 12 common applications and a visual framework,” by Labrique et al.¹ is the most viewed article in *Global Health: Science and Practice* to date. We believe this is indicative of the high level of interest in using mobile technology to strengthen health service delivery and to expand the reach of health promotion activities in countries around the world.

We would, therefore, like to introduce your readers to a suite of mHealth resources developed by the U.S. Agency for International Development (USAID) and its partner, the Knowledge for Health (K4Health) Project, with input from FHI 360 and the mHealth Working Group. The resources are designed to strengthen mHealth capacity of health program implementers and managers, particularly in less developed countries.

First, we have developed a new online eLearning course as part of USAID's Global Health eLearning Center (www.globalhealthlearning.org/course/mhealth-basics-introduction-mobile-technology-health). This self-directed course, **mHealth Basics: Introduction to Mobile Technology for Health**, explains the potential uses, benefits, and limitations of mHealth. It also highlights some existing applications, draws some preliminary conclusions from the evidence, and shares recommended best practices for mHealth program planning, design, monitoring and evaluation, scale up, and sustainability. It takes about 3 hours to complete the course.

The mHealth Planning Guide: Key Considerations for Integrating Mobile Technology into Health Programs is an online guide to help global health practitioners implement mHealth solutions in

health programs in low-resource settings. The Guide is an interactive, electronic resource that outlines key considerations and resources for planning an mHealth intervention, from concept development and technology design to implementation. Each section provides an overview of key concepts, a summary checklist of considerations, relevant examples, and recommended tools and resources. The guide can be accessed at: www.k4health.org/toolkits/mhealth-planning-guide.

The **mHealth Evidence Database** (www.mhealthevidence.org/) is designed to bring together published reports and articles on mHealth effectiveness, cost-effectiveness, and program efficiency. This collection of resources makes it easier for researchers, program managers, funders, and other key decision-makers to quickly get up to speed on the current state-of-the-art. It includes peer-reviewed and grey literature from high-, middle-, and low-resource settings. Materials are classified using a new mHealth Evidence Taxonomy, developed in coordination with the World Health Organization, and are easily filtered and searched to facilitate the identification of evidence-based, high-impact mHealth practices.

An 8-page brief, **mHealth: Mobile Technology to Strengthen Family Planning Programs**, was recently published as part of USAID's High-Impact Practices in Family Planning series, which identifies mHealth as an emerging practice. This brief highlights evidence in mHealth and family planning programs to date and contains a synthesis of lessons learned for implementation of mHealth programs. The brief can be accessed at: www.fphighimpactpractices.org/resources/mhealth-mobile-technology-strengthen-family-planning-programs

In addition to these 4 tools, another relevant resource is the **mHealth Working Group and website** (www.mHealthWorkingGroup.org). Started in 2009 with 20 members based in Washington, DC, the mHealth Working Group has grown into an international community of over 1,500 members representing more than

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450 organizations in 70 countries. The group's mission is to frame mobile technology within a larger global health strategy and to build capacity, encourage collaboration, and share knowledge. Monthly meetings are held in Washington, DC, with invited speakers. Virtual participation in the meetings is also an option. The group's website contains presentations from the monthly meetings along with other resources.

We look forward to seeing more new research related to the roll out and scale up of mobile

health applications in *Global Health: Science and Practice*.

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LETTER TO THE EDITOR

The centrality of behavior change in health systems development

The *Global Health: Science and Practice* editorial, “The 6 domains of behavior change: the missing health system building block,”¹ serves as a welcome reminder of the pivotal role of behavior change in health systems development. Moreover, we agree that serious attention to health systems strengthening (HSS) and behavior change is necessary to achieve the ambitious Millennium Development Goals (MDGs) for health by 2015 and beyond. The editorial makes certain assumptions, however, about HSS and behavior change that we believe merit a response and clarification.

First, the editorial assumes that the absence of a “building block” on behavior change in the World Health Organization HSS framework² represents a failure of the framework to adequately address the importance of behavior change in health systems development. Yet even a cursory review of the building blocks (governance, financing, service delivery, human resources, information, and medicines/vaccines/health technologies) reveals the crucial role of behavior change and the presence of behavior change interventions in each of the 6 subsystems represented by the framework. The targets of behavior change are not limited to individuals but include the full spectrum of health system actors, including client groups, communities, governments, non-governmental organizations, and other entities.

For example, to increase transparency, accountability, and responsiveness to citizens, governments in low- and middle-income countries (LMICs) throughout the world are adopting new policy and regulatory interventions to alter the way they conduct business in the health sector to improve governance. In health financing, LMICs are using financial and nonfinancial incentives to encourage the adoption of health-promoting practices by providers, provider cooperatives, and consumers of health services. Many countries are adopting innovative health workforce and organizational change strategies to improve the delivery of health services that target multiple diseases. LMICs are increasingly recognizing that ensuring citizens’ appropriate use of medicines, vaccines, and technologies is equally as important as guaranteeing their timely access to high-quality, efficacious products.

Second, by focusing solely on the building blocks framework, the editorial seems to imply, perhaps unintentionally, that professionals working to improve health

systems—a diverse community that draws upon multiple social science disciplines—subscribe to a single approach or framework for HSS. Shakarishvili and colleagues have identified at least 11 different health systems frameworks that are in use by the global health community.³ We cite one example of an alternative framework that explicitly addresses behavior change and that has influenced the thinking of health systems experts and practitioners from LMICs for close to 2 decades.

Since the mid-1990s, the World Bank Institute, in collaboration with the Harvard School of Public Health, has been offering a “Flagship Course on Health Sector Reform and Sustainable Financing,” which uses an adaptable “control knobs” health systems framework.⁴ The control knobs are discrete areas of health system structure and function—financing, payment, organization, regulation, and behavior—which can be adjusted by various country actions to improve health system performance (access, coverage, efficiency, quality, and equity) to ultimately achieve long-term positive outcomes (health status, client satisfaction, and risk protection). The inclusion of a behavior control knob provides further evidence of health system analysts’ acknowledgment of, and vigorous commitment to, the need for behavior change at all levels of the health system for continued growth and development. The control knobs framework reflects an emerging common theme, shared by many analysts, of a health system as a complex, dynamic whole: the constituent functional components of the health system are interconnected and interact to produce a range of effects, both positive and negative, intended and unintended.^{5,6}

Third, the editorial’s presentation of 6 domains of behavior, which include a mix of behaviors that influence, both positively and negatively, the health of individuals, communities, and the broader society, is a useful contribution. The subsequent list of bulleted “principles,” however, does not adequately reflect the systematic approach to, or address the complexities and challenges of, effective behavior change practice (from design to implementation to evaluation) for achievement of good health within any HSS framework. We recognize that an editorial cannot provide a full exposition of behavior change practice; nevertheless, we offer several caveats about practice as complementary information to ensure clarity.

Behavior change interventions must be tailored to the behavioral changes being sought, should be guided by behavior change theories,⁷ and will always have to be adapted to the particular situations in which they need to be considered, selected, and applied after careful assessment. Assessment requires, at a minimum, a clear articulation of the behaviors to be changed; an analysis of the characteristics of the individuals, groups, organizations, or populations that are the targets of change; and analysis of the factors influencing the behaviors. Assessment results enable scientists to identify and apply the appropriate theoretical framework(s) and the practical strategies most likely to achieve the desired outcomes.

In conclusion, frameworks for health systems strengthening are all serious, good-faith, albeit imperfect, efforts to understand complex dynamics. We would argue that most frameworks and health system practitioners recognize and embrace the importance of behavior change. The pressing challenge is to find and apply sufficient evidence and/or theory to justify the choice of the most cost-effective behavior change interventions that can be mounted, individually or together, in different settings, under different circumstances, to improve system performance and achieve the kinds of results that will improve people's health.

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LETTER TO THE EDITOR

The centrality of behavior change in health systems development – Author's response

I heartily welcome Naimoli, Parker, and Heiby's endorsement of behavior change interventions,¹ as well as their elaboration on behavior change best practices. I maintain my view, however, that behavior change is underappreciated: (1) in its crucial role across all the 6 domains of health interventions, and (2) specifically in the way health systems are conceptualized.

I also admire Naimoli and colleagues' enlightened view in seeing elements of behavior in each of the World Health Organization (WHO) health system building blocks. One can indeed thus say behavior change is "everywhere." But it is all too often true that things can be categorized as everywhere, or "over-arching," yet be easily overlooked and neglected. One example is the area of nutrition. It pervades virtually every aspect of health and indeed, according to a recent review in the *Lancet*, accounts for a full 45% of child mortality.² Yet partly because it lacks specific focus, emphasis, and funding in global health, it is considerably neglected.

Actually, my concerns about the WHO health system building blocks extend beyond the lack of definitive inclusion of behavior change, to the way health systems under any framework are often conceived. I worry that, all too often, thinking around health systems centers on medical/clinical and often curative services. This should not be the case, of course, since most of the determinants of health relate to lifestyle, and many crucial health services can be provided in the community. So the health system should be broadly defined but still focus on specific, effective interventions. In my experience, the elements I often find get short shrift in discussions of health systems are: behavior change, community-based services, private-sector service delivery, structural/policy approaches such as safe air, water, and roadways and tobacco taxation, and, ironically, even bricks and mortar infrastructure.

I appreciate that Naimoli and colleagues direct us to alternative and arguably more appropriate health

system formulations. It is interesting, however, that while the paper they cite by Shakarishvili et al.³ does indeed add one additional building block in its composite health system formulation, that additional building block is simply "demand creation." That addition, of course, only captures 1 of the 6 domains of behavior change. Moreover, it is closely related to clinical/medical service delivery and actually illustrates my concern about the medical/clinical orientation of most thinking about health systems.

I remain concerned that the WHO building-block model remains the predominant health systems conceptual model. One recent example is the landmark Global Health 2035 report from the *Lancet* Commission, summarized in a mere 58 pages in the *Lancet*.⁴ In their section on health systems, they build their analysis around the WHO building blocks. Notably, behavior change gets little attention or credence, although to their credit, the authors do include community-based and structural approaches. I hope the way we think of health systems continues to evolve and to prioritize most explicitly those interventions that have the most impact on health. – James D Shelton, Editor-in-Chief

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