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EDITORIALS

New Ways of Approaching Indoor Residual Spraying for Malaria

Using health extension workers in Ethiopia as supervisors of the spray team reduced operational costs while maintaining quality. But rethinking IRS calls for (1) adapting equipment and procedures to ensure higher-quality spray applications, and (2) empowering decentralized targeting against malaria transmission foci.

Michael Macdonald
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Vasectomy: A Long, Slow Haul to Successful Takeoff

Vasectomy use is plagued by low demand among men. Nevertheless, its compelling advantages make substantial investment worthwhile. On the supply side, a priority is to actively link vasectomy with service delivery approaches for the other highly effective long-acting and permanent clinical methods. Robust demand generation should include messaging specific to vasectomy, but should also draw on broader social and behavior change communication efforts increasingly aimed at engaging men in family planning.

James D Shelton, Roy Jacobstein
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Limits of “Skills And Drills” Interventions to Improving Obstetric and Newborn Emergency Response: What More Do We Need to Learn?

A “skills and drills” intervention in 4 hospitals in Karnataka, India, produced modest improvement in provider knowledge and skills but not in actual response to obstetric and newborn emergencies. We explore possible explanations, which include (1) the need for a more intensive intervention; (2) other weaknesses in the health system; and (3) behavioral or organizational barriers related to hierarchical structures, roles, and team formation.

Jim Ricca
http://dx.doi.org/10.9745/GHSP-D-16-00372
VIEWPOINTS

Improving the Safety and Security of Those Engaged in Global Health Traveling Abroad

We need to improve the safety and security of global health students, faculty, residents, and workers who travel abroad, particularly those affiliated with smaller organizations or educational programs that lack resources and protocols. We offer a checklist covering 6 core elements: (1) institutional commitment, (2) trainee and faculty participation, (3) safety and security assessment and analysis, (4) risk and hazard prevention, (5) safety training, and (6) program evaluation.

Ranit Mishori, Andrew Eastman, Jessica Evert
http://dx.doi.org/10.9745/GHSP-D-16-00203

ORIGINAL ARTICLES

Indoor Residual Spraying Delivery Models to Prevent Malaria: Comparison of Community- and District-Based Approaches in Ethiopia

Integrating indoor residual spraying into the institutionalized community-based health system in 5 districts was more efficient than the district-based model and did not compromise quality or compliance with environmental standards.

Benjamin Johns, Yeman Yeebiyo Yihdego, Lena Kolyada, Dereje Dengela, Sheleme Chibsa, Gunawardena Dissanayake, Kristen George, Hiwot Solomon Taffese, Bradford Lucas
http://dx.doi.org/10.9745/GHSP-D-16-00165

Pilot Research as Advocacy: The Case of Sayana Press in Kinshasa, Democratic Republic of the Congo

The pilot study obtained Ministry of Health approval to allow medical and nursing students to provide the injectable contraceptive Sayana Press and other methods in the community, paving the way for other task-shifting pilots including self-injection of Sayana Press with supervision by the students as well as injection by community health workers.

Arsene Binanga, Jane T Bertrand
http://dx.doi.org/10.9745/GHSP-D-16-00236
Benefits and Limitations of a Community-Engaged Emergency Referral System in a Remote, Impoverished Setting of Northern Ghana

A low-cost emergency and communication transportation system used 3-wheeled motorcycles driven by trained community volunteers. Delivery referrals were redirected from health centers to hospitals capable of advanced services including cesarean deliveries, which was associated with reduced facility-based maternal mortality.

Sneha Patel, John Koku Awoonor-Williams, Rofina Asuru, Christopher B Boyer, Janet Awopole Yepakeh Tiah, Mallory C Sheff, Margaret L Schmitt, Robert Alirigia, Elizabeth F Jackson, James F Phillips

http://dx.doi.org/10.9745/GHSP-D-16-00253

Strengthening Government Leadership in Family Planning Programming in Senegal: From Proof of Concept to Proof of Implementation in 2 Districts

Based on a previous pilot experience, in a next proof-of-implementation phase, district authorities enthusiastically assumed leadership and mobilized local resources to implement a simplified package of family planning interventions, with outside technical support. Comparing a 6-month baseline period with a 6-month implementation period, couple-years of protection increased from about 2,000 to about 4,000 (82% increase) in one district, and from nearly 6,000 to about 9,000 (56% increase) in the second. Longer implementation periods could further support institutionalization and sustainability.

Barry Aichatou, Cheikh Seck, Thierno Souleymane Baal Anne, Gabrielle Clémentine Deguenovo, Alexis Ntabona, Ruth Simmons

http://dx.doi.org/10.9745/GHSP-D-16-00250

Limited Effectiveness of a Skills and Drills Intervention to Improve Emergency Obstetric and Newborn Care in Karnataka, India: A Proof-of-Concept Study

Skills refresher training combined with emergency drills improved knowledge, skills, and confidence of providers but was not sufficient to improve diagnosis and management of maternal and newborn complications. Systems-level changes, including consistent availability of equipment and supplies, adequate human resource staffing, and supportive supervision, are likely needed to improve maternal and newborn outcomes.

Beena Varghese, Jayanna Krishnamurthy, Blaze Correia, Ruchika Panigrahi, Maryann Washington, Vinotha Ponnuswamy, Prem Mony

http://dx.doi.org/10.9745/GHSP-D-16-00143
Key Role of Drug Shops and Pharmacies for Family Planning in Urban Nigeria and Kenya

Pharmacies and drug shops provide a rich opportunity for expanding family planning access to urban women, especially unmarried and younger women. In urban Nigeria and Kenya, drug shops and pharmacies were the major sources for most short-acting methods, including oral contraceptive pills, emergency contraceptives, and condoms.

Meghan Corroon, Essete Kebede, Gean Spektor, Ilene Speizer
http://dx.doi.org/10.9745/GHSP-D-16-00197

Referral Systems to Integrate Health and Economic Strengthening Services for People with HIV: A Qualitative Assessment in Malawi

Two types of referral systems were implemented in this low-resource context: (1) a simple paper-based system connecting clinical HIV and nutrition support to village savings and loans services, and (2) a complex mHealth-based system with more than 20 types of health, economic strengthening, livelihoods, and food security services. Clients reported the referrals improved their health and nutrition and ability to save money in both models but more with the simple model. Providers had difficulty using the mobile app under the mHealth system, even after repeated trainings, considerable ongoing technical assistance, and multiple rounds of revisions to the interface.

Clinton Sears, Zach Andersson, Meredith Cann
http://dx.doi.org/10.9745/GHSP-D-16-00195

Social Mobilization and Community Engagement Central to the Ebola Response in West Africa: Lessons for Future Public Health Emergencies

Key lessons for the crucial components of social mobilization and community engagement in this context:
- Invest in trusted local community members to facilitate community entrance and engagement.
- Use key communication networks and channels with wide reach and relevance to the community, such as radio in low-resource settings or faith-based organizations.
- Invest in strategic partnerships to tap relevant capacities and resources.
- Support a network of communication professionals who can deploy rapidly for lengthy periods.
- Balance centralized mechanisms to promote consistency and quality with decentralized programming for flexibility and adaptation to local needs.
- Evolve communication approaches and messaging over time with the changing outbreak patterns, e.g., from halting disease transmission to integration and support of survivors.
- Establish clear communication indicators and analyze and share data in real time.

Amaya M Gillespie, Rafael Obregon, Rania El Asawi, Catherine Richey, Erma Manoncourt, Kshiti Joshi, Savita Naqvi, Ade Poyre, Naqibullah Safi, Ketal Chitnis, Sabeeha Quereishi
http://dx.doi.org/10.9745/GHSP-D-16-00226
A Review of 10 Years of Vasectomy Programming and Research in Low-Resource Settings

Reviewed areas included misconceptions and lack of knowledge among men, women, and providers; approaches to demand generation including community-based and mass media communications; service delivery innovations consisting of the no-scalpel vasectomy technique, whole-site training, cascade training, task shifting, and mobile outreach; and engagement of religious and community leaders to create an enabling environment.

Dominick Shattuck, Brian Perry, Catherine Packer, Dawn Chin Quee
http://dx.doi.org/10.9745/GHSP-D-16-00235

Mobile-Based Nutrition and Child Health Monitoring to Inform Program Development: An Experience From Liberia

Monitoring behavior using mobile phones at food distribution points allowed managers to rapidly adapt project activities. Self-reported breastfeeding, complementary feeding, and use of insecticide-treated nets improved. Applying the same methodology at the household level proved unsuccessful.

Agnes Guyon, Ariella Bock, Laura Buback, Barbara Knittel
http://dx.doi.org/10.9745/GHSP-D-16-00189

Web-Based Quality Assurance Process Drives Improvements in Obstetric Ultrasound in 5 Low- and Middle-Income Countries

Newly trained sonographers improved performance through a quality assurance process that merged (1) evaluation by remote experts of images uploaded to a website, with (2) periodic in-person skill tests. To promote sustainability, in-country supervisors gradually assumed more responsibility for image evaluation. The user-friendly and efficient interface used simple menus and forms, customized based on the user’s role.

Jonathan O Swanson, David Plotner, Holly L Franklin, David L Swanson, Victor Lokomba Bolamba, Adrien Lokangaka, Irma Sayury Pineda, Lester Figueroa, Ana Garces, David Muyodi, Fabian Esamai, Nancy Kanaiza, Waseem Mirza, Farnaz Naqvi, Sarah Saleem, Musaku Mwenephamba, Melody Chiwila, Dorothy Hamsumonde, Elizabeth M McClure, Robert L Goldenberg, Robert O Nathan
http://dx.doi.org/10.9745/GHSP-D-16-00156
METHODOLOGIES

Qualitative Assessment of the Application of a Discrete Choice Experiment With Community Health Workers in Uganda: Aligning Incentives With Preferences

Conducting a discrete choice experiment (DCE) with CHWs via survey versus interviews gave similar findings: the most appealing attributes for these CHWs were a bicycle, transportation refund, and mobile phone. To promote meaningful and valid results, particularly when applying DCEs to lower-literacy populations such as CHWs, DCEs should (1) use a small number of job attributes to facilitate comprehension, (2) choose attribute levels (e.g., mobile phone vs. no mobile phone) that are realistic yet show sufficient range, and (3) clearly define attributes and their levels.

Aurélie Brunie, Mario Chen, Angela Akol
http://dx.doi.org/10.9745/GHSP-D-16-00070

LETTERS TO THE EDITOR

An Implementer’s Perspective on Vouchers for Sexual and Reproductive Health Services
Matthew Wilson, Caitlin Mazzilli
http://dx.doi.org/10.9745/GHSP-D-16-00373

Zika Travel Policies May Reduce Women’s Leadership in Global Health
Emma Richardson
http://dx.doi.org/10.9745/GHSP-D-16-00282
New Ways of Approaching Indoor Residual Spraying for Malaria

Michael Macdonald

Using health extension workers in Ethiopia as supervisors of the spray team reduced operational costs while maintaining quality. But rethinking IRS calls for (1) adapting equipment and procedures to ensure higher-quality spray applications, and (2) empowering decentralized targeting against malaria transmission foci.

The article by Johns et al. on indoor residual spraying (IRS) for malaria control in Ethiopia, published in this issue of GHSP, presents a variation on standard IRS operating procedures by essentially replacing the “squad leader,” usually recruited from the district town, with the health extension worker (HEW) from the community. The squad leader supervises the spray operators, who are also recruited from their own communities rather than from various parts of the district as in standard operations. In this new community-based IRS model, other supervisory structures above the level of the squad leader—from the district, zonal, and regional offices—were kept in place. The stated goal of moving from district-based to community-based IRS implementation was cost savings, and indeed there were marginal savings to the operational costs associated with this change. In this era of new, more costly insecticides developed to manage insecticide resistance while programs simultaneously shift from broad implementation of malaria “control” to more targeted malaria “elimination,” the work by Johns and colleagues raises several important issues.

COSTS

Indeed, the average cost per person protected in the community-based IRS districts was lower than in the district-based model—US$0.87 vs. $1.00, respectively, in 2013 and $0.86 vs. $1.03 in 2014. Moreover, there was a shift in costs from transportation expenses (with the money presumably going to a vehicle rental company) to the daily wages of workers (which benefited the local economy). It appears these figures may just be for the cost of the spray campaign itself and not the overall cost of the program. From a separate report, the same author indicated the overall cost per person protected in Ethiopia was $5.33, of which the spray campaign itself comprised 18.7% of the total cost while the cost of the bendiocarb insecticide was 52.1% of the overall cost. As programs shift to the newer “next generation” insecticides, unit costs for insecticide could increase over and above the cost of bendiocarb, and certainly over the cost of earlier insecticides including DDT and pyrethroids. While the Ethiopian community-based IRS model showed incremental cost savings and it was also good to shift input to local wages, there are two other issues this strategy bring up.

QUALITY

Quality of the spray application is the Achilles’ heel of IRS operations. Most programs use compression sprayers first developed in the 1940s; some still use a “stirrup sprayer” developed even decades earlier. Furthermore, our multimillion dollar IRS operations still remain entirely dependent on the diligence of the spray operators, temporary workers often paid less than $5/day, to apply the right dose to the right surface. Concern over quality led to much skepticism on the use of HEWs as squad leaders, but the results reported in this issue of GHSP suggest that HEWs are able to deliver a quality spray operation comparable with their district-level counterparts.
Still, we need to develop application equipment less prone to “operator error.” In the more than 60 years since the compression sprayer was developed, there has been a revolution in spray application technology in agriculture, automotive painting, ink-jet printers, and facility disinfection. Some of these include incremental improvements to the existing compression sprayers with Constant Flow Valves (now used by programs supported by the U.S. President’s Malaria Initiative), to radically different technologies such as electrostatic spray nozzles that produce charged spray droplets to get up and under to stick to the target surface. Investments in malaria diagnosis, treatment, and prevention must also focus on disruptive technologies for this oldest mainstay of malaria control, the hand compression sprayer.

**FLEXIBILITY AND TARGETING FOR MALARIA ELIMINATION**

The third issue touched on in the Ethiopian IRS project was flexibility and the ability of HEWs, as members of the community, to “use their local knowledge of the demarcations of malaria-affected and malaria-free parts of villages to target spray areas more effectively than in the DB [district-based] model.”

Like the compression sprayer itself, the structure and functions of IRS operations come from the 1950s post-war environment where many of the malarialogists were former members of the military medical corps, and so adopted much of the language and logistical structures of a military campaign: centrally planned “geographical reconnaissance,” “attack phase, consolidation and maintenance phase,” “squad leaders,” etc. And like large military campaigns, most IRS operations follow a rigid timetable of operations set in motion months in advance.

Shifting from “control” to “elimination” requires a quantum leap forward in our use of epidemiological, entomological, and environmental mapping to target interventions and eliminate foci. On the national scale, we consider epidemiological and entomological surveillance systems, GIS, and remote sensing technologies for risk-area stratification. In the Ethiopian communities using the community-based IRS model, it was the knowledge and experience of the HEW that provided the flexibility and ability to target spray operations. Now that a pocket-size mobile phone has as much computing power as a desktop from a decade ago, we need to link the two—the mobile phone with the community worker.

**RETHINKING IRS**

One must recognize that Ethiopia’s Health Extension Program is exceptionally strong, and establishing such community-based structures may be a challenge in other malaria-endemic areas. One must also be cognizant that HEW supervision of IRS implementation may have an opportunity cost—taking time away from their other essential duties. And finally, of course, “pilot projects” always run the risk of not being sustainable when taken to a larger scale. Nevertheless, the project shows that in addition to the incremental cost savings from the community-based model, there could be some new thinking in the way we have approached IRS for the past 6 decades.

Recognizing that quality of the spray application is the critical element of our multi-million dollar investments, we need to develop or adapt spray technologies from other sectors to enable decentralized, minimally trained and supervised operators to deliver a correct dose of insecticide to the appropriate surface. The same is true for *Aedes* control where “standard” IRS is of limited efficacy; dengue, chikungunya, and Zika control programs are exploring new ways for “targeted IRS” for the particular indoor harborage of *Aedes*, such as closets and behind furniture. New application equipment that can deliver a more quality-assured spray would enable programs more flexibility and confidence that much of the operations can be decentralized to more community-based structures, including the HEWs in Ethiopia.

**Competing Interests:** None declared.

**REFERENCES**


Vasectomy: A Long, Slow Haul to Successful Takeoff

James D Shelton,a Roy Jacobsteinb

Vasectomy use is plagued by low demand among men. Nevertheless, its compelling advantages make substantial investment worthwhile. On the supply side, a priority is to actively link vasectomy with service delivery approaches for the other highly effective long-acting and permanent clinical methods. Robust demand generation should include messaging specific to vasectomy, but should also draw on broader social and behavior change communication efforts increasingly aimed at engaging men in family planning.

Despite vasectomy’s well-recognized benefits including high contraceptive effectiveness, convenience, permanence, relative ease of provision, few side effects, and high levels of satisfaction, use of the method has plateaued globally (Figure)1–3 and continues to languish in most low- and middle-income countries, including having a 0.0% prevalence in Africa.4 This issue of GHSP includes a review by Shattuck et al. of program reports and research on vasectomy, in which the authors also advocate increased support for vasectomy.5 The review has some gaps, in part because of limitations of the review criteria. Nevertheless, we publish the article because we believe it is important to share such evidence as widely as possible, particularly since vasectomy is one of only two modern male contraceptive methods available (along with condoms). Moreover, we provide our own additional perspective here because we believe vasectomy merits more attention and advocacy—recognizing that fulfilling the potential for vasectomy will require long-term and substantial investment.

LOW DEMAND FROM MEN IS THE OVERRIDING ISSUE

Let’s put front and center the fundamental underlying constraint to vasectomy uptake—low demand for the method among men in low- and middle-income countries. Among the many reasons for low demand:

• First and foremost, men and women typically see contraception as women’s responsibility, partly because women bear the brunt of childbearing—thus a gender-equality issue.
• Simple awareness of vasectomy is the lowest, by far, among all highly effective methods.
• Even when men and women know of the method, their knowledge is fraught with myths and misconceptions—notably that vasectomy is castration or makes men weak.
• Couples often do not discuss any kind of contraception, including vasectomy, among themselves.
• Men are squeamish about physical contact with the area of the scrotum and testes.
• Men seek routine health care less frequently than women and have little familiarity with the health system.
• Providers themselves often have poor knowledge about vasectomy or bias against it, and so they fail to discuss it or provide accurate information to clients.
• Deciding to have a vasectomy requires coming to a psychological resolution that one’s reproductive years have come to an end.
• Getting a vasectomy is a new and one-time act with which men have no familiarity and thus lack self-efficacy.
• As with adoption of any method of contraception, potential clients may sometimes have many other priorities in their lives that take precedence.

THOUGHTS ON THE REVIEW

We appreciate the contribution Shattuck and colleagues have made in assembling their review, including reaching deeply into the gray literature, framing the findings according to the Supply–Enabling Environment–Demand (SEED) model, and providing productive insights. And the authors do address the
pivotal demand conundrum. Still, we would have preferred if they had taken on more fully the overriding issue of weak demand, laying out its complete scope and challenges. Another concern is that their analysis largely lacks program outcome results. The reality is that vasectomy programming has generally been carried out through modestly resourced pilot programs of short duration—yielding very modest results. We need to acknowledge that reality.

Also, since the overriding problem is very low demand, supply-side issues such as task shifting, training, vasectomy technique, and mobile outreach that were covered in the review have some relevance but are still rather secondary. Focusing on them can detract from attention to the main issue of limited demand. Moreover, focusing on those supply-side issues can foster the misapprehension that if only we could make vasectomy more accessible, its use would rise substantially.

Lastly, we see little merit in the article’s proposal of active integration of vasectomy with current male circumcision programming. The large majority of male circumcision recipients for HIV prevention currently are very young men—even boys. Conversely, the main audience for vasectomy is much older men who are interested in having no additional children.

Likewise, male circumcision providers, particularly those working on programs offering voluntary medical male circumcision for HIV prevention, are often fully occupied with providing male circumcision and may have little knowledge of family planning provision. Merely training them in vasectomy, especially in the nearly universal context of low vasectomy demand, doesn’t seem very worthwhile. We do see value, however, in trying to reach these boys and young men with messages on contraception and reproductive health in general and on positive gender norms.

**WHY INVEST IN VASECTOMY?**

It is reasonable to ask how much investment in vasectomy currently makes sense, compared with alternative investments, recognizing that resources are limited. For example, long-acting reversible contraceptives (LARCs), particularly implants, have many of the same positive attributes as vasectomy, are in high demand, and are being effectively provided at very large scale. Nevertheless, in our view, the following points argue for increased attention to vasectomy:

- Men’s and women’s fertility preferences are generally now comparable in many countries.
• Demand for effective modern contraception in general will continue to rise.

• Demand for limiting further births is already very high, exceeding demand for spacing among married women in most regions of the world and rising in Africa.10,11

• Female sterilization is the most widely used contraceptive method in the world—more than 235 million women rely on it (Figure), and it has substantial use even in some very low-income African countries via mobile services.12

• Vasectomy has the many positive method characteristics we noted above, and is easier and safer to provide than female sterilization.

• Social norms on gender equality are changing in a positive direction and that change will probably accelerate.

• Supporting wider individual and couple choice promotes better client satisfaction and use of contraception, as well as individual rights.

Notably, evidence from a number of countries demonstrates that over time vasectomy can account for a significant component of contraceptive use. It comprises 24%–31% of such use in some countries with high socioeconomic development, such as Canada, New Zealand, South Korea, and the United Kingdom, and it also has sizable use in several low- and middle-income countries, including Brazil, Bhutan, Iran, and Nepal.4

GETTING BEYOND THE SMALL PILOT PARADIGM BY PACKAGING VASECTOMY WITH OTHER CLINICAL METHODS

Clearly, getting to a vasectomy takeoff requires emphasis on good-quality services and wide access on the supply side as well as a robust demand component. Heretofore, the typical approach to vasectomy has been to nurture a selected number of dedicated champion providers, intended to become a hub of expanded programmatic activity. But these efforts have been small and limited in funding, scope, duration, and priority. Establishing a nucleus of committed, well-supported vasectomy providers who can serve as champions for the method and a platform for expansion continues to make sense. This model appears to be beginning to take hold in Rwanda, which (albeit an exceptional country for health service delivery) has 0.2% contraceptive prevalence for vasectomy (2014-15 DHS), compared to 0.0% in 2010.13,14

But linking vasectomy more squarely to existing service delivery platforms such as mobile outreach, which is currently providing widespread, high-quality access to LARCs and female sterilization, offers another major opportunity. We have already seen that making intrauterine devices (IUDs) available in the context of high-quality provision of implants improves use of IUDs—which have long tended to be underutilized.15

HARMONIZING VASECTOMY DEMAND GENERATION WITH BROADER FAMILY PLANNING COMMUNICATION AIMED AT MEN

Since demand is clearly the overriding constraint, intensive and sustained demand generation must be a key part of the solution. Some of that demand support, of course, needs to be specifically about vasectomy including promoting the benefits of vasectomy and dispelling misconceptions about it. But men are increasingly the target audience of social and behavior change communication efforts for family planning more generally. Given limited resources, the effort to increase vasectomy demand should draw on harmonized broader family planning demand support aimed at men. Examples of this broader messaging include:

• Promoting a positive image for family planning

• Increasing couple communication

• Advancing the advantages of healthy timing and spacing of pregnancies, including limiting fertility for those who have reached desired family size

• Promoting an active role for men in pregnancy planning

• Projecting images such as the “permanent smile” of vasectomy users16

• Projecting the potential better sexual satisfaction when the couple is freed from the worry of unwanted pregnancy
Moreover, broader development efforts to advance gender equality should, in turn, promote the appropriate role for men in family planning as a client, supportive partner, and advocate.

CONCLUSION

We believe serious, increased, and sustained support to vasectomy is warranted. But no one should harbor any illusion that substantial impact will occur quickly. Rather, it calls for plugging away, year after year, until takeoff is reached and a substantial proportion of men in low- and middle-income countries opt for vasectomy.

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Limits of “Skills And Drills” Interventions to Improving Obstetric and Newborn Emergency Response: What More Do We Need to Learn?

Jim Ricca

A “skills and drills” intervention in 4 hospitals in Karnataka, India, produced modest improvement in provider knowledge and skills but not in actual response to obstetric and newborn emergencies. We explore possible explanations, which include (1) the need for a more intensive intervention; (2) other weaknesses in the health system; and (3) behavioral or organizational barriers related to hierarchical structures, roles, and team formation.

PREVIOUS RELATED WORK

Teamwork and emergency preparedness have been shown to be key determinants of successful obstetric emergency response. Therefore, in addition to coordinating the technical aspects of care, “skills and drills” interventions, including realistic simulation exercises for obstetric and neonatal emergencies, have been used for several decades in a variety of clinical settings in high-income countries to improve the quality of providers’ responses as they work as a team in stressful and time-sensitive situations. Such simulation approaches focus on procedures for preparation and coordinated clinical response. Facilitators set a scripted realistic emergency scenario, and providers respond as they would in a real situation. The simulation is often videotaped, and the clinical team debriefs afterward to review and reflect on what could have been done differently to improve the response.

A low-technology obstetric emergency simulation-based course named Advance Life Support in Obstetrics has been in use in North America since 1993. Over the last 10–15 years, use of obstetric simulation in high-technology simulation centers has become more common. There has been increasing interest in the use of simulation approaches in low- and middle-income countries as well, usually done on-site in a facility rather than in a special simulation center. For example, PRONTO International has introduced simulation-based training in 7 countries, much of it focusing on improving obstetric emergency care.

See related article by Varghese.
addition, the Expanding Maternal and Newborn Survival (EMAS) Program, a bilateral maternal newborn care project in Indonesia supported by the U.S. Agency for International Development, introduced emergency preparedness and simulation approaches at moderate scale.9

There is evidence that such simulation approaches can improve provider knowledge, skills, and confidence, but current evidence is thin that these approaches improve provider practices, especially when implemented at larger scale.10,11 A current Cochrane protocol seeks to explore this gap in knowledge (or possibly enlighten us on the extent to which this knowledge gap has been addressed).12 It is interesting that even in high-income settings, there is interest in implementing simulations as they are usually done in low- and middle-income countries—that is, as more realistic on-site simulations instead of being conducted in a simulation center—because there is some indication that this may give better results in terms of system-oriented improvements.13

POSSIBLE REASONS WHY THE INTERVENTION IN INDIA HAD LIMITED EFFECT

There are several possible explanations for the negative results reported by Varghese et al. First, the authors suggest, as a possible explanation for the lack of practice improvement, that the intervention did not address other systems weaknesses (beyond provider skills and team functioning) such as commodity stock-outs or human resources shortages and turnover. The presence of a provider with knowledge and skills is a necessary but not a sufficient condition for the delivery of quality care. If a skilled provider does not possess a needed commodity, then clearly she will not be able to perform a lifesaving practice that depends on that commodity. Although the authors assert that this may account for the lack of improved care, they do not present data to show how much of a role systems weaknesses such as commodity supply might have played. However, the fact that the diagnosis of reported complications was not better than the comparison facilities suggests that commodity issues do not fully account for the negative results, as diagnosis and reporting requires nothing more than provider knowledge, skills, and motivation. So this underreporting of complications remains unexplained. Providers told the mentoring teams that they only report emergencies when something is done. This leaves open an important set of questions. Are providers still not recognizing problems and so not intervening? Or are they recognizing problems but still not thinking them serious enough to intervene? Or did providers intervene in some cases but did not report them because of poor outcomes?

We should also consider other possible explanations for the negative results, related to provider motivation and behavior. This may have been a well-designed and suitable intervention, but there simply might not have been enough of it. As an intervention to change provider behavior and encourage teamwork, this was a relatively light-touch intervention. Supervisory and simulation visits happened only once every 2 months, were externally driven, and were not reinforced by more frequent on-site, peer-to-peer mentoring. So it is possible that this intervention was on the right track, but the dose was too low to have the desired effect. Emergencies happen infrequently, are high-risk situations, and require rapid responses. In order to build confidence, the desired behavior may simply need to be modeled and practiced more often to truly cement it.

Another possible explanation for the negative results could be that the intervention did not effectively address important barriers to teamwork. How improvement goals are set has been shown to be critical.14 Teams also function best in situations where there is a flat, non-hierarchical organizational structure.2 In a hierarchical health system, there may be hesitancy on the part of some providers to form, lead, or play an equal role on a team. Were there procedures and protocols for determining who would call for the formation of a team response and then lead it? Could a nurse lead a team in which a physician was a member, or play an equal role, for instance? Did lack of clarity about roles cause critical delays in emergency response? Providers may have been able to play non-traditional roles during simulations, but in actual practice they might well have reverted to usual behavior even when this may have blunted the effectiveness of the emergency response. In their debriefs, the teams noted the quality of communication and rapport, but it is not clear how much the training and mentoring directly

Simulation approaches can improve provider knowledge, skills, and confidence, but current evidence is thin that they improve provider practices.

Lack of improvement in provider practices in the India intervention may be due to other systems weaknesses, such as commodity stock-outs.
addressed possible organizational/behavioral barriers to team formation and functioning nor to the differentiation of roles within the team. In addition to modeling the desired behavior of team members during drills, it may be necessary to discuss with providers how team members ought to act, how this might be different from usual practice, and their reactions to this.

IMPLICATIONS FOR FUTURE EFFORTS

The authors have given us an example of an intervention designed to address the need for clinical practice improvement for obstetric and newborn emergencies. The failure to show an effect on this primary outcome opens up a set of questions that future investigations ought to address. Future investigations should systematically take account of other systems issues in order to better establish what incremental value there may be to a skills and drills intervention in terms of clinical practice improvement. But other questions also need to be answered, such as the “dose” of the activities needed to improve team formation and functioning in emergencies. At a minimum, it would be instructive for future investigations to “open the black box” of what actually is happening on the ward after the skills and drills training to see how teams are functioning in emergency situations and how, if at all, this has been influenced by the skills and drills initiative. Further formative inquiry is also warranted on barriers and facilitators to team formation and functioning, centering on the issues of hierarchy, role differentiation, and team communication. The issues identified are likely to be quite context-sensitive, with the consequence that those interested in skills and drills interventions will need to engage in implementation research on proposed solutions in their own environment. Finally, of course, we need to remain open to the idea that there may be other significant behavioral barriers to effective provider response to emergencies not addressed directly by skills and drills (e.g., fear of negative consequences for unsuccessful intervention, exacerbated by a perceived non-supportive and punitive organizational environment). Future investigators may also be able to address identified problems through “restructuring the incentive environment,” perhaps rewarding desired behavior through one or more mechanisms (e.g., peer recognition, financial incentives). To be effective, such restructuring of the organizational environment would require the inclusion of facility managers and health system leaders in the design at a level above that of individual providers and facilities.

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Improving the Safety and Security of Those Engaged in Global Health Traveling Abroad

Ranit Mishori,a Andrew Eastman,b Jessica Evertc

We need to improve the safety and security of global health students, faculty, residents, and workers who travel abroad, particularly those affiliated with smaller organizations or educational programs that lack resources and protocols. We offer a checklist covering 6 core elements: (1) institutional commitment, (2) trainee and faculty participation, (3) safety and security assessment and analysis, (4) risk and hazard prevention, (5) safety training, and (6) program evaluation.

INTRODUCTION

Thousands of students, residents, faculty, and other professionals travel around the world every year to work on global health issues—some for short-term assignments, conferences, or workshops and others for extended periods. Many of them travel through established organizations, programs, and universities that have existing resources dedicated to risk management or protocols for safety and security. This is often not the case, however, for learners and faculty from independent programs or higher-education organizations, or for those linked to post-graduate programs in the medical field—namely residency programs. Most residency programs are affiliated with universities or medical schools that have experience providing resources for global travelers or have well-established academic partners and sites internationally. Many other programs, however, are independent and loosely affiliated, or they are linked to smaller institutions, community-based hospitals, faith-based organizations, and hospital systems that lack institutional risk management experience, partnerships, and resources. Even among those programs and institutions who understand and value the need to properly prepare travelers for work in other countries, their plans for safety, security, and risk management may be lax or even absent.1,2 The critical need to safeguard the security of the global health trainees and practitioners, particularly those who do not have institutional backing, is falling through the cracks.

RISKS AND CHALLENGES

Students, residents, and faculty who travel for global health-related work—whether for clinical care, public health, research, development, training, or other purposes—may be exposed to various risks including infectious diseases,3–6 road traffic accidents and injuries,7–9 conflict-related violence, and deliberate attacks. Violent attacks are of particular concern because prevention and management require considerable institutional planning and resources—but it is also an area that often lacks forethought and attention. For those with mental health issues, the stress of travel itself, combined with the pressures of separation from known environments, cultural differences and expectations, and adjustment to different housing and the local environment, may exacerbate existing conditions.10

Risks to Personal Safety in the Context of Violence

Violence against foreigners (e.g., petty robbery, sexual violence, and carjacking) has always been a concern. Some health care professionals believe that their profession shields them from attacks, but they may be upset to know that attacks specifically targeting health care providers are increasing, particularly in conflict zones, but also in post-conflict and non-conflict zones.11–15 Acts of violence targeting health care providers violate international humanitarian laws16 and have caused innumerable losses, prompting an outcry among those who believe in medical neutrality.17–19 Between 2012 and 2014, of all armed violence...
incidents against the health care system, the majority of the targets were health care facilities, followed by medical transports.20

Increasingly, the primary motivation of many violent attacks is political. One study estimated a 55% increase in politically motivated attacks between 2004 and 2008.21 The authors of the study concluded that even though many organizations make considerable efforts to dissociate themselves from political actors and project an image of neutrality . . . organizations are being attacked not just because they are perceived to be cooperating with Western political actors, but because they are perceived as wholly a part of the Western agenda.21

In Mali and Burkina Faso in late 2015 and early 2016, al Qaeda terrorists killed nearly 50 people from various parts of the world in a series of coordinated attacks targeting hotels frequented by businesspeople and foreigners, and injured many more. These attacks brought to light the potential dangers to national and international health and development workers regardless of the purpose of their visit or work. These kinds of attacks are worrisome even to the most experienced and savvy global health professionals.22,23 No longer can those engaged in global health work expect to stay safe even in locations outside of direct service sites such as hotels, malls, and conference centers. Some major international organizations have updated safety security protocols and now require training for their staff.23

Personal safety is an integral component of guidelines created by the Working Group on Ethics Guidelines for Global Health Training to introduce trainees and others involved in global health to ethical issues that may arise during short-term training experiences abroad.24 The Association of Medical Education in Europe also addresses the issue of personal safety among its undergraduate medical students, acknowledging the crucial importance of risk management for those students who study internationally.25 These guidelines, however, do not include safety and security measures in the context of conflict, political, or terrorism-related violence. The U.S. Peace Corps requires all Peace Corps Volunteers to participate in up to 12 weeks of intensive preservice training in their country of service, which covers risks associated with serving abroad, coping with unwanted attention, promoting country-specific strategies and best practices to manage risks, and identifying emergency plans.26

**Insufficient Resources and Barriers to Improvement**

Some smaller programs with partial or no security risk management systems have access to resources through membership organizations, such as InterAction’s minimum operating security standards and training course for security management.27 However, many students, staff, and faculty engaged in global health do not have the backing of international health and development organizations, or even universities, with established safety and security planning, protocols, and dedicated staff.

Common barriers that smaller organizations face in improving preparedness for safety and security may include:

- General lack of awareness of safety and security threats depending on the region, political stability, practice setting, type of work expected, and residential setting
- No independently developed institutional safety and security protocols
- Lack of capacity to develop and manage safety and security programs
- Lack of funding to create a training and support infrastructure
- Lack of information on the effectiveness of existing security training
- Lack of funding for security training by outside or independent companies that specialize in security training
- Lack of knowledge of existing standardized protocols used by other organizations and programs, such as InterAction’s minimum operating security standards28
- No access to credible and timely security risk and threat assessment
- Lack of guidance about whether individuals with certain profiles or characteristics (health, or otherwise) should be advised not to go to certain locations.

**Lack of Pre-Departure Training**

Few published articles exist that document safety and security training as part of predeparture preparations for students, residents, or faculty involved in global health work abroad.29–31 Even fewer studies document

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**Many global health-related programs lack institutional risk management experience, partnerships, and resources to properly prepare travelers for work in other countries.**

**Attacks specifically targeting health care providers are increasing, particularly in conflict zones, but also in post-conflict and non-conflict zones.**

**Smaller organizations face many barriers in improving preparedness for safety and security, such as lack of capacity and funding.**
whether programs have any impact on mitigation of adverse events. One study concluded that "medical students are often poorly prepared for the...safety dilemmas they encounter during these electives" based on a survey of 23 medical students returning from international study. Another study, focusing on accidents among medical students studying abroad, mentioned that there is often a lack of advice on personal safety issues. A Canadian study of medical school faculty also noted gaps in pre-departure planning and concluded that reviews of health and safety should be mandatory for all international electives. A few studies have documented student satisfaction with health and safety training, but they lack details about what safety training their programs covered.

**Gender Differences**

Some studies have noted gender differences in security risks and training. For example, a study using the Security in Numbers Database looked at the risk profile of 1,361 staff members affected in 615 security incidents and found that women were targeted more frequently for petty crime and sexual assault. Women, however, were more likely to be involved in violent encounters—and more likely to be killed or injured. Another study of security perceptions among NGO workers around the world found that a greater proportion of men than women received security training.

**WHAT CAN BE DONE**

Global health institutions and programs of all types and sizes can plan more carefully for the safety and security of students, residents, and faculty with the help of existing resources and the guidance provided in this article. We aim to offer a way forward for sponsor organizations (that is, the institutions and programs that send travelers abroad), with specific actions to take and questions to ask to increase awareness and prompt conversations about this topic, while recognizing that host (in-country) organizations also bear responsibility for risk management.

According to the United Nations Office for Disaster Risk Reduction (UNISDR), being fully prepared includes "a sound analysis of disaster risks and good linkages with early warning systems, and includes such activities as contingency planning, stockpiling of equipment and supplies, the development of arrangements for coordination, evacuation and public information, and associated training and field exercises. These must be supported by formal institutional, legal, and budgetary capacities." The following sections cover some of the aspects of being fully prepared to send students and faculty on global health rotations.

**Emergency Management Planning**

When planning for emergency management, it is helpful to consider the following 4 phases:

1. **Mitigation**: refers to activities that may help prevent or reduce the chances of an emergency from happening, or to reduce the harmful effects of unavoidable emergencies
2. **Preparedness**: consists of strengthening individual and institutional capacities to effectively anticipate, respond to, and recover from hazardous events or conditions
3. **Response**: details what actions to take during an emergency to save lives, reduce health impacts, ensure public safety and basic needs, and prevent further harm or damage
4. **Recovery**: refers to activities carried out after the emergency to return to a safer environment or to normal operations

Organizations should consider each of the 4 phases as they create their overall safety and security plans, including strategies and policies as well as individual and institutional responsibilities—from what the ultimate individual beneficiary (student, resident, faculty member) should know, to what protocol should be developed by organizations and programs, to setting national or specialty- and discipline-specific standards for security and safety and sharing resources among various stakeholders.

**Specific Actions to Take at All Levels**

To overcome some of the common barriers faced by organizations, we propose a checklist of specific actions for institutions and individuals at all levels (Table). The list of actions is divided into 6 core elements: (1) institutional commitment, (2) trainee and faculty participation, (3) safety and security assessment and analysis, (4) risk and hazard prevention, (5) safety training, and (6) program evaluation. These actions can serve...
### TABLE. Checklist of Specific Actions for Developing Safety and Security Plans

<table>
<thead>
<tr>
<th>Core Element</th>
<th>Suggested Actions</th>
</tr>
</thead>
</table>
| **Institutional commitment**         | • Ensure that safety and security are institutional priorities  
• Identify a safety and security champion or team and an institutional liaison  
• Create a mission statement related to security, specifically related to the institution’s commitment to the safety and security of the students and staff  
• Establish goals and objectives for the global health program  
• Identify what resources and institutional support are needed to ensure the security of staff and students  
• Create open communication avenues with leadership on security and safety during international travel |
| **Trainee and faculty participation** | • Secure and mandate full participation from all trainees and faculty  
• Establish a culture of expecting safety and security  
• Consider requiring participants to sign safety and security pledges |
| **Safety and security assessment and analysis** | • Create processes and procedures to continuously monitor and evaluate risks and assess threats at destination sites  
• Conduct an initial assessment of safety and security at destination sites and update these assessments regularly  
• Create incident reporting protocols  
• Create databases for reporting incidents (e.g., injuries, accidents, incidents and near misses, police reports, daily logs)  
• Consider identifying trainee and faculty safety and security profiles (e.g., related medical, cultural, and psychological profiles) and an algorithm for matching individuals to appropriate destination, training, and work sites |
| **Risk and hazard prevention**        | • Create processes and programs to mitigate and control known hazards (e.g., physical changes to compounds such as gates, fences, barriers, window bars, and improved lighting)  
• Create and implement communication response and recovery procedures and protocols  
• Assess what supplies and kits are needed at various work locations, lodgings, and health or medical work sites  
• Identify partners that provide travel insurance and evacuation services  
• Ensure travelers have received appropriate immunizations and required medications  
• Inform travelers about what to do if they become ill at the destination site  
• Work with the local organizations where faculty and students are placed to ensure they also have safety and security plans in place  
• Ensure that trainees and faculty have received appropriate immunizations and have all recommended medications and medical supplies (e.g. malaria prophylaxis, for travelers’ diarrhea, HIV PEP-kits, gloves, syringes, etc.) |
| **Safety training**                  | • Provide pre-departure travel safety and security training to all staff (whether they travel or not) involved, in classrooms, hands-on workshops, or online  
• Consider having access to trauma-informed care for returning travelers who may need it  
• Provide training in risk recognition and control, and what to do in an emergency  
• Provide a written safety and security plan to all travelers that includes all policies and procedures  
• Make sure security policies address country-specific issues as well as problems that may arise among team members, such as sexual assault  
• Provide frequent opportunities to discuss safety and security concerns, practice skills, and demonstrate competency |
| **Program evaluation**               | • Create mechanisms for recordkeeping and accurate logging of injuries, illnesses, fatalities, incidents, assaults, hazards, corrective actions, interventions, and training  
• Create protocols for regular assessment of incident severity, and identify trends, patterns, and methods of addressing incidents  
• Continuously monitor and modify methods of risk assessment, intervention, and training needs to identify deficiencies and opportunities for improvement  
• Design surveys and post-travel debriefing for all returning staff  
• Create success measures and outcomes and work on tracking successful implementation  
• If feasible, request outside consultation from law enforcement or safety and security experts  
• Beyond checking whether safety and security training programs exist, assess the quality and effectiveness of the programs |
We propose a list of specific actions for institutions and individuals at all levels to help jumpstart the process of developing a comprehensive safety and security plan.

**Individual Responsibility**

Travelers themselves must be prepared before departure, understand the risks, plan for emergencies, and understand their roles and responsibilities in emergencies. It is the duty of supervisors and program directors to ensure that students, residents, and faculty are empowered to ask questions—and that host institutions (e.g., schools, agencies, programs, facilities) are prepared to answer them.

Questions that prospective travelers should consider asking their host and sponsoring institution:

- What are you doing to enhance my safety and security?
- What are the threats I may face where I am going?
- What safety and security questions should I ask?
- How do I find out if now is the right time to go?
- What should I look out for (regarding safety and security protocols) when selecting a small organization to travel with?
- What should I look for in regard to food and lodging?
- What are the communication procedures should problems arise?
- Are there added services and costs for enhanced safety measures?
- Should I engage in safety and security training with an outside group?
- Should I purchase travelers insurance?
- Does my health insurance cover conditions encountered abroad?
- Should I purchase security evacuation insurance? Are there protocols for medical evacuation?
- What security responsibilities will be required of me?
- What incidents have you had in the past and how did you handle them?
- What safety and security protocols are in place in case of an unexpected event?

The U.S. Department of State issues travel warnings and alerts online to assist travelers with travel plans to any country in the world (see https://travel.state.gov/content/passports/en/alertswarnings.html). For example, travel warnings are issued when there are unstable government conditions, civil war, ongoing intense crime or violence, or terrorist attacks, while travel alerts are for short-term events such as election seasons when strikes and demonstrations are likely to happen and health alerts such as disease outbreaks. It also hosts a free service called “Smart Traveler Enrollment Program” (STEP) that allows U.S. citizens and nationals traveling abroad to enroll their trip with the nearest U.S. Embassy or Consulate (see https://step.state.gov/step/). The service provides travelers important information about safety conditions in the destination country and helps the U.S. Embassy, family, and friends contact the traveler in an emergency.

The U.S. Centers for Disease Control and Prevention provides a host of travel resources on its website, including information about vaccinations (see http://wwwnc.cdc.gov/travel/page/resources-for-travelers).

**CONCLUSION**

As the number of students, residents, and faculty engaged in global health grows, we need to promote a serious dialogue on the topic of safety and security abroad. We must exchange ideas and best practices, conduct joint research, and learn from each other and from organizations with a proven track record of ensuring the safety and security of their staff.

A recent webinar by the Consortium of Universities for Global Health addressed some of these issues and is a welcome step in the right direction (http://www.cugh.org/events/rules-road-global-health-safety-and-security-deploying-students-staff-and-clinicians-overseas). However, more needs to be done. We urge global health program directors of all disciplines and specialties to take this issue very seriously. We encourage all health profession education organizations, specialty societies, and global health organizations to start synchronizing preparedness efforts and create unified protocols, manuals, checklists, standardized security procedures, or best practices and share them freely with those who lack the capacity to create their own.
We also call on global health and health profession education conference organizers to make this issue a routine part of their call for proposals. Additionally, researchers and scholars should be encouraged to collect and publish case reports, develop best practice recommendations, and design studies looking at the effectiveness of safety plans and security training for the global health workforce at large.

Acknowledgments: Small portions of this manuscript were included in the following presentation. Eastman A, Mishori R. Violence towards health care workers in conflict and non-conflict global health settings: current trends, operating environment, and situational awareness. Presented at: AAFP Annual Global Health Workshop; 2015 Oct; Denver, CO.

Competing Interests: None declared.

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Indoor Residual Spraying Delivery Models to Prevent Malaria: Comparison of Community- and District-Based Approaches in Ethiopia

Benjamin Johns, a Yemane Yeebiyo Yihdego, b Lena Kolyada, a Dereje Dengela, a Sheleme Chibsa, c Gunawardena Dissanayake, c Kristen George, d Hiwot Solomon Taffese, e Bradford Lucas a

ABSTRACT

Background: Indoor residual spraying (IRS) for malaria prevention has traditionally been implemented in Ethiopia by the district health office with technical and operational inputs from regional, zonal, and central health offices. The United States President’s Malaria Initiative (PMI) in collaboration with the Government of Ethiopia tested the effectiveness and efficiency of integrating IRS into the government-funded community-based rural health services program.

Methods: Between 2012 and 2014, PMI conducted a mixed-methods study in 11 districts of Oromia region to compare district-based IRS (DB IRS) and community-based IRS (CB IRS) models. In the DB IRS model, each district included 2 centrally located operational sites where spray teams camped during the IRS campaign and from which they traveled to the villages to conduct spraying. In the CB IRS model, spray team members were hired from the communities in which they operated, thus eliminating the need for transport and camping facilities. The study team evaluated spray coverage, the quality of spraying, compliance with environmental and safety standards, and cost and performance efficiency.

Results: The average number of eligible structures found and sprayed in the CB IRS districts increased by 19.6% and 20.3%, respectively, between 2012 (before CB IRS) and 2013 (during CB IRS). Between 2013 and 2014, the numbers increased by about 14%. In contrast, in the DB IRS districts the number of eligible structures found increased by only 8.1% between 2012 and 2013 and by 0.4% between 2013 and 2014. The quality of CB IRS operations was good and comparable to that in the DB IRS model, according to wall bioassay tests. Some compliance issues in the first year of CB IRS implementation were corrected in the second year, bringing compliance up to the level of the DB IRS model. The CB IRS model had, on average, higher amortized costs per district than the DB IRS model but lower unit costs per structure sprayed and per person protected because the community-based model found and sprayed more structures.

Conclusion: Established community-based service delivery systems can be adapted to include a seasonal IRS campaign alongside the community-based health workers’ routine activities to improve performance efficiency. Further modifications of the community-based IRS model may reduce the total cost of the intervention and increase its financial sustainability.

BACKGROUND

Indoor residual spraying (IRS) is one of the primary methods, along with long-lasting insecticide-treated nets, used to control and reduce the burden of malaria.1,2 IRS involves spraying insecticide on the walls, ceilings, and other indoor resting places of mosquitoes that transmit malaria. In most cases, eligible structures targeted for spraying are the sleeping and...
Indoor residual spraying (IRS) campaigns to prevent malaria are often complex operations involving hundreds of personnel.

living rooms of a household. On average, an effective IRS campaign, regardless of the size of the operation, requires 30–35 days and takes place once or twice a year based on the malaria transmission season and the duration of effective action of the insecticide used in a country. It is a complex operation that often involves hundreds of personnel, including seasonal workers and full-time government employees.

In recent years, use of IRS has expanded in many African countries, primarily through support from the United States President’s Malaria Initiative (PMI) and the Global Fund to Fight AIDS, Tuberculosis and Malaria. The population at risk for malaria protected by IRS increased from about 5% in 2005 to about 37% in 2013, according to the World Malaria Report 2014.

In Ethiopia, IRS has been continuously implemented since it was introduced in the 1950s. PMI started supporting IRS in Ethiopia in 2008. Survey data show that in 2011, through PMI’s and the national government’s spray program, IRS protected about 17% of the 50 million people at risk of malaria.

Growing vector resistance to DDT (dichlorodiphenyltrichloroethane) and pyrethroid insecticides in Ethiopia has resulted in the need to switch to more expensive insecticide classes (carbamates and organophosphates). This has stressed limited budgets and may result in a decline of coverage. Further, international funding for malaria control may have plateaued, and therefore countries may have to deploy (already limited) domestic resources to expand IRS protection.

In the face of these fiscal pressures, improving the efficiency of delivering IRS is a means of increasing coverage without increasing the resources needed. A recent review suggested that community-based malaria interventions, including bed net distribution, IRS, intermittent preventive therapy, and education, may be more efficient than routine or facility-based modes of implementation. However, the review found only one study that assessed IRS—a study in China evaluating a program that implemented IRS while delivering insecticide-treated nets at the same time. Preliminary evidence from Tanzania suggests that community-based approaches for IRS show promise both in terms of coverage and costs, but a full evaluation has not yet been completed. The purpose of this study is to compare a community-based approach to IRS used in Ethiopia with the traditional district-based approach.

Ethiopia’s Community-Based Health Extension Program

Over the last several decades, there has been an expansion of community-based programs employing multiple interventions to achieve population-level impact on disease prevention and health promotion. Community participation and ownership are vital for generating community support and capacity for engaging in prevention activities.

Ethiopia has been implementing community-based health services through its Health Extension Program (HEP) since 2005. The HEP is a government-funded health service delivery program that aims for universal coverage of primary health care and equitable access to health services. The program prioritizes prevention and control of communicable diseases and has shown remarkable achievements in the reduction of maternal and child mortality and in the number of communicable disease cases.

As a preventive program, the HEP focuses on 4 areas of care provided at the community level: disease prevention and control; family health; hygiene, and environmental sanitation; health education; and communication. Key health areas under the HEP’s aegis are: HIV/AIDS, tuberculosis, malaria, and first aid. To deliver these services, the HEP is expanding its health infrastructure and developing a cadre of paid health extension workers (HEWs) who provide the services to the communities. The HEWs are typically young women with a high school diploma, whom the Government of Ethiopia employs after they complete a 1-year HEP training course. The HEP deploys 2 HEWs in every village of about 5,000 residents. Currently, there are about 34,000 HEWs in 15,000 rural communities in Ethiopia.

The District- and Community-Based IRS Models in Ethiopia

In Ethiopia, district health offices have traditionally planned and implemented IRS with guidance from regional and central health offices. Similarly, PMI-supported areas use a district-based IRS (DB IRS) model—that is, district health offices are in charge of planning and implementing IRS with technical and logistical support from PMI partners. Each district, on
average, includes 2 centrally located operational sites, where the spray teams stay for the duration of the IRS campaign. Camping accommodations include tents, mattresses, and other items. The spray team comprises a team leader, up to 4 squad leaders and porters, and 16–20 spray operators (SOPs). The number of spray teams depends on the number of structures to be sprayed in the district. SOPs require vehicles on a daily basis to travel from the operational sites to villages to conduct spraying.

The Government of Ethiopia has started to shift implementation of IRS to the community level by incorporating the planning and execution of the operation into the HEP. The main reasons for this shift are: (1) increase spray coverage; (2) increase community participation and ownership; and (3) reduce costs and make IRS more sustainable. Where IRS is integrated into the HEP, HEWs fulfill the role and responsibilities of the squad leaders. They manage all IRS processes at the village level, which usually last for 1–2 months a year. The main duties that HEWs assume are to lead the squad in spraying the community and ensure SOPs follow safety procedures and clean their equipment per standard requirements. In consultations with village leadership, the HEWs select 5 SOPs to train and to conduct the spraying. HEWs also assume responsibility for mobilizing the community; managing store rooms and insecticide stocks, washers, and operators; and overseeing the data collection and reporting processes for their squad. Both HEWs in each village are trained on IRS techniques and management. However, to avoid any disruption with routine HEP activities, only 1 HEW per village leads the spray squad during the spray operation while the other HEW carries out routine HEP duties.

Because in this community-based IRS (CB IRS) implementation model SOPs and squad leaders are hired from the communities in which they operate, there is no need for transport or for camping facilities as required in the district-based model. However, the district health office continues to plan IRS activities, allocate resources, and supervise spraying operations and the members of the spray squads. The CB IRS model has never been systematically evaluated.

**Purpose of the Study**

The PMI Africa IRS (PMI AIRS) Project assists Ethiopia with IRS planning, operations, environmental compliance, vector monitoring, and logistics. As part of these efforts, the project conducted this study to compare DB IRS and CB IRS approaches. By comparing the performance of the districts under the new model of CB IRS with the traditional model of DB IRS, the study aimed to assess if using the HEP platform could reduce costs, increase community acceptance, and make operations more sustainable while maintaining high quality and compliance with safety and environmental standards.

**METHODOLOGY**

**Selection of Districts**

In 2012, the PMI AIRS Project collaborated with the Government of Ethiopia to pilot the CB IRS model in Kersa district, located in Jimma Zone, Oromia Region, one of 36 PMI-supported districts (Figure 1). PMI and government officials deemed that the CB IRS pilot showed proof of concept that CB IRS could be implemented feasibly, and thus in 2013 they selected 5 more districts to shift from DB IRS to CB IRS to further test the CB IRS model: Bako Tibe, Chewaka, Hawa Galan, Manasibu, and Sasiga. The selection of the 5 additional districts to start CB IRS was primarily based on the districts with the highest number of structures found by the project in 2012, which was used as a target for the following year’s spray operations. These 5 CB IRS districts were matched with 5 DB IRS districts that had a comparable number of structures found in 2012: Borecha, Dano, Sekoru, Tiro Afeta, Wayu Tuka, (Supplementary Material 1). Proximity and accessibility of the districts were also considerations in matching the 2 sets of districts. Matching was done before the start of CB IRS in the 5 selected districts.
The project collected data on spray coverage (eligible structures found and sprayed), the quality of spraying, safety and environmental compliance, and cost. The sampling for each data collection method is provided in Table 1.

### Selection and Training of HEWs and Spray Teams

Two HEWs from each village in all CB IRS districts received 6 days of training on IRS techniques and management. In general, all IRS

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**TABLE 1. Data Collection Sampling and Methods, Community- vs. District-Based IRS, Ethiopia, 2012–2014**

<table>
<thead>
<tr>
<th>Purpose of Evaluation</th>
<th>Data Collection Method</th>
<th>Districts</th>
<th>Sites</th>
<th>Process/Outcome Indicators</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spray coverage</td>
<td>Spray Operator Form, data collected daily</td>
<td>CB IRS 5</td>
<td>DB IRS 5</td>
<td>Number of eligible structures found; number of eligible structures sprayed; spray coverage rate; total population protected</td>
</tr>
<tr>
<td>Quality of spraying</td>
<td>Wall bioassays, 2013/2014</td>
<td>CB IRS 6/2</td>
<td>DB IRS 2/2</td>
<td>Mortality rate of mosquitoes</td>
</tr>
<tr>
<td>Environmental compliance</td>
<td>13-item checklist</td>
<td>CB IRS 6</td>
<td>DB IRS 30</td>
<td>Compliance with best management practices</td>
</tr>
<tr>
<td>Cost analysis</td>
<td>Before-after analysis in CB IRS districts (2012 vs. 2013 and 2014) and comparison of CB IRS with matched DB IRS districts (2013 and 2014)</td>
<td>CB IRS 5</td>
<td>—</td>
<td>Total costs; cost per structure sprayed; cost per person protected</td>
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</table>
actors must receive training every year before a spray campaign. Because many of the actors continue with the spray campaign year after year, the annual trainings often serve as refresher trainings for experienced implementers including HEWs. At the same time, the training program has a special focus on new actors, who are usually SOPs and squad leaders.

The PMI AIRS Project tested the length of the training in a number of countries over the years and confirmed that a 6-day curriculum is sufficient to ensure comprehension of IRS standards and to offer sufficient practice time of the spraying techniques. In Ethiopia, this approach has been in use for several decades, and revisions to the curriculum are made when the World Health Organization (WHO) or the Ministry of Health issues additional guidance.

District malaria teams organized and facilitated the training for HEWs with technical and logistical support from the PMI AIRS Project. Following the training at the district level, HEWs returned to their respective villages and, in collaboration with community leaders, selected 5 members of the community to be trained as SOPs. Literacy, acceptance by the community, physical fitness, and previous experience as an SOP were criteria in the selection process. Then, in each village, 2 HEWs trained the selected SOPs on techniques and related aspects of IRS. District health offices provided minimal supervision to the training.

Spray Coverage

In both IRS delivery models, squad leaders (HEWs in the CB IRS model) collected data on number of structures sprayed on a daily basis using the Daily Spray Operator Form. At the end of the day, seasonal data entry clerks located at the district data centers entered data into an electronic database. The project used 3 data quality assurance tools (the Error Eliminator Form, Data Collection Verification Form, and Data Entry Verification Form) to ensure proper supervision of data collection and data entry. Additionally, the PMI AIRS project used the AIRS Access Database Cleaning/Reporting Tool, which is linked to the PMI AIRS database backend (i.e., the spray data) and has 2 functions: generating district-level reports and data cleaning. The district-level reports provide spray progress to date, per day, per week, per squad, per administrative level (district, village), per spray operator, etc., with the refined data.

Quality Control

To compare quality of spraying between the 2 models, the study team used a test method (WHO wall bioassays) to measure the response of living mosquitoes to the toxicity of insecticide on sprayed surfaces. The mortality rate of exposed mosquitoes serves as a proxy to indicate how well an SOP applied insecticide on the walls of a house.27 Each district used the same insecticide from the carbamate class (bendiocarb).

In 2013, the study team selected 1 village from each of the 6 CB IRS districts (including the pilot district Kersa) and 1 village each from 2 of the matched DB IRS districts to assess the quality of spraying. With a limited number of mosquitoes available to perform the quality checks, the emphasis in 2013 was to ensure that the quality of IRS in the CB IRS model was good; thus, all CB IRS districts were assessed. In 2014, the study team continued the quality check tests in the same 2 districts from the DB IRS model and in 2 of the 6 districts from the CB IRS model.

For the CB IRS model, in 2013 the study team used a 2-stage random sampling method to select the villages and then the houses in each village to conduct the quality control tests using wall bioassays. In 2014, the study team purposively selected 2 districts from the CB IRS model that were adjacent to the 2 districts from the DB model, and then applied the same 2-stage random sampling method to select the villages and then the houses in each village.

For the DB IRS model, the study team used a multi-stage random sampling method to select the districts, then the villages, and then the houses in each village. In the second stage, the study team randomly picked 1 village from the list of all sprayed villages in the district. In the third stage, the team randomly selected 10 houses per village in 2013 and 12 houses per village in 2014. In 2014, the sampling of 12 houses enabled the study team to select 2 houses from each of the 3 common types of wall surfaces (dung, mud, and painted) for separate tests using either susceptible or wild mosquitoes in the selected districts. In all cases, the team conducted wall bioassays 1–7 days after the spraying, using a laboratory-raised colony and wild mosquitoes. The team conducted the wall bioassays as described in the WHO test
procedure for bio-efficacy and persistence of insecticides on treated surfaces. The outcome variable was the number of dead mosquitoes post-exposure to the sprayed wall in the CB and DB IRS districts. Where appropriate, OpenEpi 2 x 2 tables were used for test of significance in mortality differences between the sprayed houses in CB and DB IRS sites.

**Compliance Assessment**

The team developed a paper-based checklist that analyzed 13 key questions to compare the compliance with environmental health and safety standards between the 2 IRS modalities. External supervisors collected the data during the 2 years of spray campaigns. Six of the PMI AIRS Ethiopia permanent staff served as external observers and conducted supervisory visits. The sampling for this assessment included 1 operational site from each of the 30 DB IRS districts and 5 operational sites (villages) from each of the 6 CB IRS districts (again, including the pilot district Kersa). In total, the external supervisors collected compliance data from 60 operational sites. Where appropriate, OpenEpi 2 x 2 tables were used for test of significance in compliance differences. The technical quality of the spray operation and adherence to environmental compliance measures were ensured through intensive supervision by the district, zonal, and regional health offices as well as by PMI AIRS Project staff. Both CB and DB IRS districts followed the same standard operating procedures.

**Cost Assessment**

The objective of the cost assessment was to compare CB IRS with DB IRS in terms of overall costs, coverage, cost per structure sprayed, and cost per person protected.

The cost assessment combines (1) a before-after analysis of districts transitioned to CB IRS (i.e., costs in 2012 before CB IRS was implemented compared with costs in 2013 and 2014 after CB IRS was implemented), and (2) a comparison of costs in CB IRS districts with the matched DB IRS districts in 2013 and 2014. The team did not include the initial CB IRS pilot district of Kersa in these analyses because pre-CB IRS data from 2011 were not available. Cost data were collected from the financial systems of the PMI AIRS Project. To the extent possible, quantities (e.g., number of SOPs and number of days each SOP was paid a per diem) were separated from the costs (e.g., the amount of the per diem). The team completed separate cost templates for the years 2013 and 2014 for the DB IRS comparison districts, and for 2012 through 2014 for the CB IRS districts. The team first collected data in 2013 for retrospective costs in 2012 (if applicable) and for costs in 2013. A second round of data collection occurred at the end of 2014. The team converted costs for capital items into annual equivalent costs. The team did not include costs for insecticides in these analyses because they vary directly with the number of structures sprayed. All costs are in 2014 US dollars. The team conducted cost-driver analyses, separating recurrent and capital costs, and assessed the difference in costs associated with inputs that changed with the switch from DB IRS to CB IRS. We used t-test to determine statistical significance. The study team extracted the coverage data from the project database that tracks all key IRS indicators on an annual basis. For details on the costing methodology and cost categories, see Supplementary Materials 2 and 3.

**RESULTS**

**Spray Coverage**

In the 5 districts that transitioned to CB IRS in 2013, the average number of eligible structures found increased by 19.6% between 2012 (before CB IRS) and 2013 (during CB IRS), from 19,085 structures to 22,843 structures ($P=.02$) (Table 2). The number of eligible structures sprayed increased by 20.3%, from 18,958 structures to 22,809 structures ($P=.02$). Meanwhile, there was an 8.1% increase in eligible structures found in the DB IRS districts, from 18,797 structures to 20,322 structures ($P=.11$ for the comparison between DB IRS and CB IRS). The number of people protected increased by 8.5% in the CB IRS districts between 2012 and 2013, from about 55,000 people to about 60,000 ($P=.055$).

Between 2013 and 2014, the number of structures found and the number of structures sprayed in the CB IRS districts increased again by a similar order of magnitude (Table 2). The number of people protected increased by 2%, on average. In the 5 comparison DB IRS districts, between 2013 and 2014 the average number of structures found increased by 0.4% ($P<.001$ for comparison between DB IRS and CB IRS), and the number of structures sprayed increased by 0.5% ($P=.002$ for comparison between DB IRS...
and CB IRS). The number of people protected in the DB IRS districts decreased by 3% between 2013 and 2014 ($P=.09$ for comparison between DB IRS and CB IRS).

**Quality of Spray Operation**

In the 2013 spray quality assessment, the mortality of susceptible and wild mosquitoes exposed to sprayed walls 1–7 days after spraying was 99.5% (597/600) in DB IRS districts and 99.9% (1860/1862) in CB IRS districts. There was no significant difference in results between CB and DB IRS ($P=.18$). These results demonstrate comparably good IRS quality in both implementation models.

In 2014, mortality of mosquitoes exposed to sprayed surfaces was 100% on dung and painted surfaces in both the CB and DB IRS districts. There was no difference between CB IRS and DB IRS model sites for the mortality rate of mosquitoes exposed to sprayed houses (96.3% for CB IRS and 95.9% for DB IRS; $P=.62$) (Table 3).

**Compliance With Standard Procedures**

As shown in Table 4, in 2013, compliance with standard procedures in the CB IRS districts was lower compared with the DB IRS districts (80.8% vs. 91.6%, respectively), and the difference was statistically significant (Yates corrected chi-square=18; $P<.001$). At the time of supervisory visits in 2014, the compliance rate in the CB IRS districts (98.5%) was more or less similar to the compliance rate in the DB IRS districts (100%). The difference between the 2 was not statistically significant (Yates corrected chi-square=3.1; $P=.07$). The following compliance issues were identified: (1) in 1 of 30 supervisory visits to CB IRS districts in 2014, an observer noted an issue with insufficient understanding of procedures for updating stock cards and insecticide tracking forms, (2) in 4 other visits,
observers noted an issue with the provision of sufficient washing facilities/showers for the spray operators.

**Cost and Efficiency**

**Before-and-After Transition from DB IRS to CB IRS in CB IRS Districts**

Total amortized costs increased, on average, by 11.5% per district when the districts transitioned from DB IRS to CB IRS between 2012 and 2013 \((P=.36)\) (Table 5). However, increased coverage more than offset the increased cost. Thus, the cost per structure sprayed decreased 9.8% \((P=.31)\), and the cost per person protected decreased 1.3% \((P=.91)\). Cost per district remained relatively constant in CB IRS districts between 2013 and 2014, increasing 0.6%, while cost per structure sprayed and cost per person protected continued to fall (none of results were statistically significant).

The reduction in cost per person protected and per structure sprayed was due to the continued increases in coverage, suggesting greater efficiency. In the DB IRS districts, the costs changed 3% or less between 2013 and 2014 for all 3 indicators (none was statistically significant), similar to the coverage indicators.

In 3 CB IRS districts, costs decreased between 2013 and 2014 compared with 2012 (when the districts were still using the DB IRS model), while in the 2 other districts, the cost per structure sprayed increased compared with 2012. The 2 districts that had increased cost per structure sprayed had the highest absolute increase in both capital and recurrent costs. Analysis of the quantities of inputs employed showed that these 2 districts had the highest increase in the number of SOPs deployed in association with CB IRS. For a cost breakdown per district and per year for all study districts, see Supplementary Material 4.
Cost and Efficiency

**CB IRS Districts Compared With Matched DB IRS Districts**

The CB IRS districts had higher amortized costs by about US$3,000 per district compared with their matched DB counterparts (e.g., in 2013 US$52,609 vs. US$48,990, respectively) (Table 5). However, the CB IRS districts were better at finding structures and thus sprayed more structures than the DB IRS districts. In 2013, CB IRS districts’ average cost per person protected was US$0.13 lower than in DB IRS districts (US$0.87 vs. US$1.00, respectively; \( P=.34 \)), and the difference rose to US$0.16 in 2014 (US$0.86 vs. US$1.03, respectively; \( P=.15 \)) (Figure 2).

**DISCUSSION**

**Quality and Compliance**

This study shows that the quality of CB IRS operations is good and comparable with the DB IRS model. It suggests that training quality in CB IRS districts was as good as in DB IRS districts. In fact, supervisors noted that in CB IRS, SOPs had more time for interaction with trainers. While the trainings under DB IRS were conducted centrally at the district level with tens, or at times hundreds, of SOPs at one place, under CB IRS the SOP training was done at the village level for only 5 SOPs at a time. The closer interaction between the SOPs and their HEW trainers in the CB IRS model is expected to result in higher-quality training. Another observation was that fewer SOPs used the same washing area compared with the crowded washing areas used in the DB model, which may have been a contributing factor in compliance with performance standards related to the end-of-day cleanup procedures. Rinsing IRS equipment and personal protective equipment is a standardized procedure, requiring a certain number of barrels, that is closely supervised. The CB IRS model, with fewer SOPs per washing area, allows for better clean-up as well as closer supervision, and thus compliance with standards, compared with the DB IRS washing area, which has a substantially higher number of SOPs.

The study team used wall bioassay to assess the quality of the spray operation. Underdosing can be detected using the wall bioassays method and is sufficient to determine if any overdosing occurred. There are currently no effective or cost-efficient methods that can measure the amount of insecticide deposited on a wall surface. Research institutions are working on developing tools to measure insecticide quantification on sprayed surfaces. The PMI AIRS Project does have a routine monitoring tool to check that SOPs are not
using excessive insecticides (overdosing). Each day the number of sachets of insecticides used by each SOP is compared against the number of structures sprayed on the same day. If the average number of sachets used exceeds the expectation, the work of the SOP is closely supervised the next day and corrective measures are taken as needed. No such instances occurred during this study.

Although there were some compliance issues during the first year of the CB IRS implementation, these were corrected during 2014 and compliance increased to the DB IRS model level. Compliance improved in the second year of implementation due to corrective measures taken on location during supervision and retraining of the HEWs the following year. HEWs receive 6 days of refresher training each year before the start of the spray operations.

**Coverage**

CB IRS appears to result in higher structure and population coverage than DB IRS. In a situation such as that in Ethiopia, where part of a district and even part of the village can be malaria-free and not targeted for IRS, the CB IRS model employs HEWs who use their local knowledge of the demarcations of malaria-affected and malaria-free parts of villages to target spray areas more effectively than in the DB model. This most likely contributed to the increased number of found and sprayed structures under the CB IRS model in both 2013 and 2014. While the study included a relatively small number of districts, the pre-post comparison data from 2012 and 2013/2014 represent a strong counterfactual of the costs of DB IRS since there have been few

**FIGURE 2.** Average Amortized Cost of IRS per Person Protected by Delivery Model, Selected Districts of Ethiopia, 2013 and 2014

<table>
<thead>
<tr>
<th></th>
<th>2013</th>
<th>2014</th>
</tr>
</thead>
<tbody>
<tr>
<td>DB IRS (N=5)</td>
<td>$1.00</td>
<td>$1.03</td>
</tr>
<tr>
<td>CB IRS (N=5)</td>
<td>$0.87</td>
<td>$0.86</td>
</tr>
</tbody>
</table>

Abbreviations: CB IRS, community-based indoor residual spraying; DB IRS, district-based indoor residual spraying; IRS, indoor residual spraying.
changes to the DB IRS implementation model since 2012. The counterfactual for the effectiveness of DB IRS is less certain, but the results from the matched comparison indicate that it is unlikely that DB IRS would have had the same increases in coverage as experienced in the CB IRS districts. The results from the second year of CB IRS implementation suggest that the gains in coverage found in the first year of CB IRS will continue in following years.

The findings suggest overall that CB IRS is, under the right conditions, one possible means of increasing the efficiency of malaria control programs.

Costs
While there were no statistically significant differences in costs between DB IRS and CB IRS, this appears to be due to the fact that costs associated with CB IRS increased in some districts and decreased in other districts. CB IRS appears to result in lower transportation and mobilization costs than DB IRS, but higher costs for training and IRS equipment and supplies. The quantities of inputs employed differ between CB IRS and DB IRS. CB IRS employs more SOPs (mainly reflective of the number of villages in a district), which increases the cost of training, IRS equipment, and supplies. On the other hand, DB IRS has higher transportation costs, reflected in the number of days of rented transport. An increase in the number of SOPs escalates the costs of CB IRS compared with DB IRS, while more days of rented transport under DB IRS indicate more potential savings for CB IRS compared with DB IRS.

The cost analysis suggests that in some settings, CB IRS results in lower total costs and greater coverage. Namely, districts that incur relatively high transportation costs under the DB IRS model and/or that require hiring fewer than 35 additional SOPs to implement CB IRS compared with DB IRS likely will have lower total costs with CB IRS. However, in districts with higher increases in SOP numbers, CB IRS might be more costly overall than DB IRS.

The current analysis suggests that districts that require fewer than 40 additional SOPs for CB IRS than for DB IRS are strong candidates for CB IRS. However, when assessed as a relative or percentage increase in the number of SOPs employed, no clear categorization emerged since districts with the largest increase in SOPs under CB IRS also had the most SOPs under DB IRS. Thus, if CB IRS is expanded in Ethiopia or elsewhere, we suggest conducting a needs assessment based on programmatic realities and detailed analysis of what level of staffing is needed under each method.

Cost Reduction Opportunities
Modifying how SOPs are deployed in the CB IRS model might reduce costs of the model. The main cost drivers of CB IRS are training, supplies, and equipment to ensure each SOP is well equipped and trained. Currently, more of these inputs are needed in the CB IRS model than in the DB IRS model. While designing the CB IRS model, the study team kept the IRS organizational structure the same as in the DB IRS model: every squad consisted of 4 SOPs in both models. The “community-based” aspect of the design was that 1 squad of 4 SOPs sprayed 1 village irrespective of the number of unit structures found, unlike under the DB IRS model, where a squad sprays more than 1 village over the period of spray operations. As a result, data from 2014 showed that the average number of spray days was 30.5 for DB IRS but only 19.7 days for CB IRS (range, 8 to 34 days). In the DB IRS model, the spray campaign is often completed in about 30 working days uniformly across all districts. Thus, although a larger number of SOPs were trained and provided with the required equipment in the CB IRS districts than the DB IRS districts, the SOPs in many of the CB IRS villages were deployed for a shorter time than their counterparts in the DB IRS model.

If the Government of Ethiopia were to expand the CB IRS model to new districts, we suggest further discussions and analysis on the feasibility of hiring the same number of SOPs as in the DB IRS model and extending the operational time in all areas to around 30 working days. Small villages may use only 1–3 SOPs per squad to finish operations in 30 working days. To spray larger villages, squads may consist of up to 6–7 SOPs. However, of the 6 CB IRS districts in this study, none would have required more than 5 SOPs.

CONCLUSION
The quality of the spray operation with the community-based IRS model was comparable with the long-established modality of organizing the campaign at the district level. The new
community-based model adequately met environmental compliance and safety requirements. The results of the cost analyses suggest that, due to capital costs associated with SOPs, the CB IRS model had, on average, higher total costs but lower unit costs per structure sprayed and person protected than the DB IRS model. Further efforts to rationalize the CB IRS model may reduce the total cost of the intervention and increase its financial sustainability.

During the post-spray review meetings, stakeholders said that communities were more satisfied with CB IRS, and that the quality of training and operation is possibly better than in DB IRS. These findings suggest that CB IRS could be more sustainable and efficient than DB IRS, although further experimentation and testing is needed. The CB IRS model benefited from a preexisting community-based HEP. Moreover, Ethiopia has a history of IRS implementation, and malaria prevention is a routine HEW responsibility. Organization and implementation of IRS through the HEP could enhance efficiency and sustainability of the Ethiopian malaria control and elimination program. However, additional research may be needed to assess whether involvement in IRS impacts other activities of the HEW.

This study provides important lessons for countries that have HEP-like systems and government-supported IRS programs, namely that the government system allows leveraging existing human resources at low or no cost and that these resources (the HEWs) are well trained and educated, which contributes to more efficient performance under the CB IRS model. Countries without an institutionalized community health service system will need to factor in costs and time to establish a function similar to the HEWs to ensure smooth and timely performance of IRS or other public health campaigns. Established community-based service delivery programs can adapt to include a seasonal IRS campaign as part of their routine health prevention activities. Additional research may be appropriate on strategies for further cost reduction and for increasing community contributions. A beneficiary survey comparing the 2 models could also provide insights into the community perception of each model.

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REFERENCES


Pilot Research as Advocacy: The Case of Sayana Press in Kinshasa, Democratic Republic of the Congo

Arsene Binanga, Jane T Bertrand

The pilot study obtained Ministry of Health approval to allow medical and nursing students to provide the injectable contraceptive Sayana Press and other methods in the community, paving the way for other task-shifting pilots including self-injection of Sayana Press with supervision by the students as well as injection by community health workers.

ABSTRACT
In the Democratic Republic of the Congo (DRC), the Ministry of Health authorizes only physicians and nurses to give injections, with one exception—medical and nursing students may also give injections if supervised by a clinical instructor. The emergence of the injectable contraceptive Sayana Press in some African countries prompted the DRC to test the acceptability and feasibility of distributing Sayana Press and other contraceptive methods at the community level through medical and nursing students. Sayana Press is similar in formulation to the injectable contraceptive Depo-Provera but contains a lower dose and is administered subcutaneously using a single-use syringe with a short needle called the Uniject system. The Uniject system allows Sayana Press to be administered by community health workers without clinical training or by self-injection. In this pilot, the advocacy objective was to obtain approval from the Ministry of Health to allow medical and nursing students to inject Sayana Press, as a first step toward authorization for community health workers to provide the method. The pilot described in this article documents a process whereby an innovative approach moved from concept to implementation to replication in less than 2 years. It also paved the way for testing additional progressive strategies to increase access to contraception at the community level. Because the pilot project included a research component designed to assess benefits and challenges, it provided the means to introduce the new task-shifting approach, which might not have been approved otherwise. Key pilot activities included: (1) increasing awareness of Sayana Press among family planning stakeholders at a national conference on family planning, (2) enlisting the support of key decision makers in designing the pilot, (3) obtaining marketing authorization to distribute Sayana Press in the DRC, (4) implementing the pilot from July to December 2015, (5) conducting quantitative and qualitative studies to assess acceptability and feasibility, and (6) disseminating the findings to family planning stakeholders. Before the pilot, Sayana Press was relatively unknown in the DRC, and there was no precedent for medical and nursing students providing family planning methods or giving injections at the community level. In less than 12 months, the approach gained legitimacy and acceptance. The key Ministry of Health decision maker orchestrated the closing session of the dissemination meeting on next steps, paving the way for pilot tests of 3 new task-shifting approaches: insertion of Implanon NXT by medical and nursing students, self-injection for Sayana Press with supervision by students, and injection of Sayana Press by community health workers with no formal clinical training.

BACKGROUND
The purpose of this article is to highlight the potential of pilot research studies to achieve advocacy objectives. Although the concept is not new, there is little in the published literature to indicate its use as a best practice in international family planning. Research is usually viewed as a means of generating relevant data on the topic, but this case study describes a pilot study that served as the catalyst to achieving change in regulations governing family planning service delivery in the Democratic Republic of the Congo.
(DRC). The pilot study used medical and nursing students to provide the injectable contraceptive Sayana Press (as well as other methods) as a means to increase family planning uptake and the modern contraceptive prevalence rate. Ultimately, the pilot study was designed to pave the way toward subsequent authorization for community health workers to provide Sayana Press.

Advocacy addresses different audiences at different levels. At the global level, family planning advocacy aims to increase investments from multilateral and bilateral donors as well as the private sector in a particular area (e.g., family planning in general or for a specific issue such as contraceptive security). Global advocacy efforts also aim to set health and development goals to which countries will aspire, as in the process surrounding the Sustainable Development Goals. At national and subnational levels, advocacy is frequently used to increase government commitment toward family planning objectives, such as a budget line item for contraceptive procurement or removal of tariffs on the import of contraceptives. It may also be directed to changes in policy or regulations that directly affect the delivery of family planning services, including task shifting to enable lower-level health workers such as nurses to perform clinical procedures previously reserved for physicians.1

The global health community increasingly considers advocacy an essential tool to influence financial and political decisions that support access to and use of voluntary high-quality family planning services. Family planning advocacy toolkits present guidelines for developing communication strategies and materials designed to influence policy decisions, including developing an advocacy strategy; engaging policy makers, health sector leaders, community leaders, and the private sector; working with the news media; and other resources.2 Best practices indicate the need to present reliable data that frame the issue in terms consistent with national priorities, while presenting the material in simple, easy-to-comprehend formats.

Advocacy generally employs a combination of evidence and emotional triggers. Advocates seek to gather and analyze existing data (e.g., Demographic and Health Surveys, Multiple Indicator Cluster Surveys, and other country-level studies) to inform their strategies, rather than generating their own data.2 Information alone, however, rarely achieves an advocacy objective. Qualitative research and the stories of those most affected by a specific policy or programmatic barrier usually complement quantitative data. Well-known and highly respected personalities can bring attention to an issue and deliver messages to a larger and wider audience (e.g., Angelina Jolie as a U.N. Ambassador). According to a 2006 survey in sub-Saharan Africa, respondents trusted faith-based organizations more than they trusted their own national governments; religious leaders are therefore uniquely positioned to reach both men and women to promote family planning and healthy reproductive behaviors.3

Despite available guidance on how to use family planning advocacy to achieve objectives, there is limited documentation on the results of these efforts. According to Smith and colleagues,4 no studies have specifically investigated decision makers’ views on and use of family planning research and advocacy.

THE ADVOCACY OBJECTIVE OF THE DRC PILOT STUDY

In early 2011 Sayana Press emerged as a promising means of increasing access to modern contraception at the community level in developing countries.5 Although its formulation (104 mg of depot medroxyprogesterone acetate per 0.65 mL dose) is similar to Depo-Provera, it contains a lower dose and is administered subcutaneously using a single-use syringe with a short needle called the Uniject system, which can be administered by trained community health workers and clients.

A World Health Organization (WHO) consultation in 2009 approved the use of injections by community health workers, even before Sayana Press became available,6 and successful pilots using Depo-Provera have been reported from other countries.7-9 Studies in Senegal and Uganda have explored acceptability and feasibility of introducing Sayana Press using community health workers,10 and a study in Ethiopia explored attitudes toward self-injection.11

In the DRC, a regulation limiting the provision of injections to only physicians and nurses represented a major barrier to community-level delivery of Sayana Press. An important exception, however, provided an open door to test an innovative approach—medical and nursing students are allowed to give injections if supervised by a clinical instructor. Thus, in the case study

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**Effective advocacy efforts usually require quantitative data complemented by qualitative research and stories.**

**Sayana Press is similar to Depo-Provera, but contains a lower dose and is administered subcutaneously using a single-use syringe with a short needle, which can be administered by community health workers.**

The first objective of the pilot was to obtain approval from the DRC Ministry of Health to allow medical and nursing students to distribute Sayana Press at the community level.
presented here, the advocacy objective was to obtain approval from the DRC Ministry of Health to distribute Sayana Press—a new method that was not currently part of the approved method mix—at the community level using medical and nursing students, as a first step toward subsequent testing and eventual authorization for community health workers to provide this method. Not only would this mechanism contribute to increasing access to this new method in the short term, it would also give future doctors and nurses a solid foundation in contraceptive technology and service delivery.

**PLANNING PHASE**

Before the pilot began, a series of key activities paved the way to making it a reality: (1) a commitment to community-based distribution of contraception in the national strategic plan for family planning, (2) increased awareness of the new Sayana Press method among stakeholders, (3) the support of key decision makers in the design of the pilot, (4) legal authorization from the Ministry of Health to distribute Sayana Press, and (5) a donation of 60,000 doses from Pfizer through the United Nations Population Fund (UNFPA).

**Commitment to Community-Based Distribution**

The Multisectoral Strategic Plan for Family Planning in the DRC: 2014–2020 identified community-based distribution as a key strategy for the country to accelerate achievement of its objective of 19% modern contraceptive prevalence use by 2020. This call for expansion of community-based distribution by the family planning stakeholder community was an important first step leading to the pilot.

**Increased Awareness of Sayana Press**

In the months leading up to the pilot, Tulane University, the organization responsible for its implementation, sought opportunities to increase awareness of this new contraceptive method and the studies taking place in other sub-Saharan African countries. At the Third National Conference on Repositioning Family Planning in the DRC in December 2014, the researchers who also participated in organizing the conference seized the opportunity to widely diffuse information about Sayana Press and present the pilot experiences in other countries to the community of family planning stakeholders in the DRC. A physician from Senegal leading the Sayana Press initiative in that country gave an overview of the new contraceptive method at one of the early plenary sessions, and a UNFPA consultant working in Burkina Faso led a more clinically oriented session on the method. Seminars were organized in parallel with the conference for the local obstetrics and gynecology, nursing, and midwives societies to further disseminate information about this new method, including the ease of application by non-clinically trained personnel.

**Support of Key Decision Makers**

Because of the regulation that only physicians and nurses can give injections in the DRC, it was unclear whether the Ministry of Health would give its approval to pilot test the use of medical and nursing students to give injections at the community level. It was therefore essential to enlist the support of the Ministry of Health, and in particular 2 departments (Directions) that had jurisdiction over the organizations involved in the pilot: the 10th Direction (10ème Direction) which oversees the National Program of Reproductive Health (Programme National la Santé de la Reproduction, or PNSR), and the 6th Direction (6ème Direction), which oversees the training institutes for nursing through the country.

The researchers obtained agreement from the director of the 10th Direction that he would chair a meeting of key stakeholders in January 2015. The objectives of the meeting were to (1) present the implementation and study design plans for the pilot introduction of Sayana Press; (2) solicit feedback from stakeholders; (3) encourage an open exchange of opinions on the benefits and challenges of this approach; and (4) obtain buy-in among family planning stakeholders for the pilot. Organizing the pilot as a research study that would assess the benefits and limitations of the approach enabled the decision makers to authorize this innovative approach to service delivery, but on a limited scale; further expansion of the approach would depend on the results of the research. Stakeholders were supportive overall and provided valuable feedback and opinions; however, they called for several changes to the plans, including the inclusion of both urban and rural health
zones to make the results more generalizable for subsequent replication. At a follow-up meeting in February 2015, the director of the 10th Direction approved the research pilot.

Given that the research team intended to work through local medical and nursing schools, another key decision maker enlisted for support was the 6th Direction, which oversees nursing training institutes throughout the country. The proposed pilot was expected to appeal to the 6th Direction in several ways. Medical and nursing training institutes traditionally use a curriculum that focuses primarily on clinical care in hospitals and health facilities. The proposed activity would provide students with the experience of working at the community level, thus preparing them for a broader array of tasks in the future. Moreover, it would put students in direct contact with clients and enhance their skills in both counseling and service provision.

A local NGO, Association de Santé et Développement (Association for Health and Development), was hired to implement the pilot and entered into discussions with the director of the 6th Direction. The initial inquiries met with considerable enthusiasm, for the reasons noted above. The director’s support was so enthusiastic that he offered the NGO affordable office space to oversee the initiative in the same building.

Legal Authorization to Distribute Sayana Press

At a roundtable for government, donors, and partner organizations in December 2014 (in conjunction with the Third National Conference on Repositioning Family Planning in the DRC), the minister of health publicly announced a 1-year approval (also called a waiver) to allow the distribution of Sayana Press in the DRC. In that same month, the 3rd Direction (responsible for pharmaceutical products) issued the marketing authorization (known as AMM, l’autorisation de mise sur le marché) for a 12-month period. With this authorization in place, Pfizer donated 60,000 doses of Sayana Press in March 2015 for the pilot.

IMPLEMENTATION

In early 2015, 10 medical and nursing training institutes were selected to participate in the pilot. Each one nominated a member of its clinical faculty to serve as a focal point to supervise the students involved in the pilot. Members of the PNSR and several family planning implementing organizations developed the training curriculum and materials. In April and May 2015, 135 medical and nursing students received 7 days of training on multiple aspects of service delivery: contraceptive technology, management of side effects, eligibility and delivery of 4 methods (condoms, pills, CycleBeads, and Sayana Press), and procedures for referring interested clients to a nearby health center for clinical methods (e.g., intrauterine devices and implants). The students also participated in a 1-day field practicum, in which they gave family planning counseling, screened clients for eligibility, provided the 4 contraceptive methods to interested clients, and made referrals in a real-life community setting.12

The pilot officially began in July 2015. The delivery of contraceptive methods took several forms: (1) campaign days, in which a group of approximately 15 to 20 medical and nursing students provided counseling and contraception to women from the community who had been informed of the opportunity to get free contraceptive services on a specific day; (2) house-to-house visits to counsel women and couples on the use of family planning (with delivery of methods to interested, eligible women); and (3) distribution of contraception on campuses or other sites in the community.12 The medical and nursing students were referred to as community-based distribution agents (distributeurs à base communautaire, or DBC). When given the choice of 4 methods available on-site and others available through referral to a nearby health facility, approximately one-quarter of clients chose Sayana Press on-site.

During the implementation of the pilot and related research, the researchers regularly updated the directors of the 6th and 10th Directions, but did not involve them directly in the routine operations of the pilot.

KEY FINDINGS FROM THE RESEARCH COMPONENT

The research component of the pilot used mixed methods. The quantitative research consisted of 3 surveys: one among acceptors of Sayana Press (n = 374) who were interviewed directly after receiving Sayana Press, a second among 252 of the original 374 respondents at a 3-month follow-up, and a third among 124 of the 135 medical and nursing students who had

Service provision took several forms: through specific campaign days, house-to-house visits, and distribution on campuses or other community sites.

Critical milestones for the pilot included temporary legal authorization from the Ministry of Health allowing distribution of Sayana Press, marketing authorization for the method, and a donation of 60,000 doses from Pfizer.
Among all Sayana Press acceptors, about half had never used contraception, including traditional methods. The vast majority expressed satisfaction in serving as community-based distributors, and more than 95% would recommend it to others. Their primary complaint was lack of remuneration, followed by insufficient supervision and contraceptive stock-outs.

**Key Informants**

Overall, key informants in decision-making positions (Ministry of Health personnel, chief medical officers for selected health zones, nurses in fixed facilities, and staff from the organizations that implemented the pilot.

Key findings from the quantitative surveys and qualitative in-depth interviews are summarized below. Full results from the quantitative surveys will be published separately.

**Acceptors of Sayana Press**

Among all Sayana Press acceptors, 51.6% had never used contraception, including traditional methods. Overall, their experience with Sayana Press was positive; 87.4% encountered no problems. Just over half (58.5%) felt some pain at the time of the injection, but only 9.7% reported pain afterward and 3.4% had side effects. Among acceptors who attended their follow-up appointment 3 months after the first injection, 92.3% received a second injection. The large majority was satisfied with the counseling and services received from the medical and nursing students.

**Medical and Nursing Students**

Six months after implementation began, 92% of students were still participating in the project. Of these, 46.8% were medical students and 53.2% were nursing students. The median age was 22 years old and most of the students (71.8%) were women. More than 90% reported that the community was favorable toward their services. The vast majority expressed satisfaction in serving as community-based distributors, and more than 95% would recommend it to others. Their primary complaint was lack of remuneration, followed by insufficient supervision and contraceptive stock-outs.

**DISSEMINATION OF THE FINDINGS**

In December 2015, the research team held a 1-day dissemination event at a hotel in Kinshasa with more than 80 participants. The audience for this event included the primary family planning stakeholders: representatives from the PNSR and the Programme National de Santé de l’Adolescent (National Program for Adolescent Health), other Ministry of Health authorities, family planning implementing organizations, military and police, faith-based-organizations, donors (e.g., U.S. Agency for International Development [USAID], UNFPA, WHO), and university researchers, among others.

The moderator was a well-known and highly respected figure in the local family planning community, which enabled the director of the 10th Direction to focus on presentations and provide commentary during the event. The program covered a series of topics: Sayana Press as a new method, details about the pilot implementation process, testimonials of focal points (supervisors) from several training institutes, and testimonials of 4 participating medical and nursing students. In later sessions, the research team presented highlights from the surveys of acceptors (on the day of the injection and 3 months later), the survey of students participating in the pilot, and a summary of the key informant interviews. From the tone of the
discussion, the majority of the audience seemed amenable to the use of medical and nursing students to deliver Sayana Press. A highlight of the advocacy process was in the final session of the dissemination event on next steps, led by the director of the 10th Direction. Rather than having the director or research team outline possible next steps, the director encouraged stakeholders to recommend possible variations for further testing. The audience collectively volunteered 17 approaches, for example, replicating the model in other provinces, using a similar approach in military and police health zones, having community-based workers (who receive short-term training to perform a specific task) deliver Sayana Press at the community level, piloting self-injection of Sayana Press, and conducting a similar pilot introduction of Implanon NXT (a contraceptive implant preloaded in a disposable applicator) by medical and nursing students, among others. Participants publicly endorsed the use of students as distributors of Sayana Press at the community level and called for replicating variations of the pilot.

### Figure 1

Steps Leading to the Democratic Republic of the Congo Government’s Approval of Community-Based Provision of Sayana Press by Medical and Nursing Students, December 2014–December 2015

<table>
<thead>
<tr>
<th>Event</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ministry of Health (MOH) authorizes registration and marketing of Sayana Press</td>
<td>December 2014</td>
</tr>
<tr>
<td>Meetings on Sayana Press gain support of MOH, Directions, technical partners, and donors</td>
<td>January–February 2015</td>
</tr>
<tr>
<td>Meetings with medical and nursing schools urge provision of Sayana Press by medical and nursing students</td>
<td>February–March 2015</td>
</tr>
<tr>
<td>Pfizer donates 60,000 doses for Sayana Press pilot</td>
<td>March 2015</td>
</tr>
<tr>
<td>10 supervisors and 135 medical and nursing students recruited and trained to provide Sayana Press at community level</td>
<td>April 2015</td>
</tr>
<tr>
<td>Result: Medical and nursing students implement pilot introduction of Sayana Press</td>
<td>July–December 2015</td>
</tr>
</tbody>
</table>

At an event to disseminate the findings of the pilot, 80 key family planning stakeholders publicly endorsed the use of students as distributors of Sayana Press at the community level and called for replicating variations of the pilot.
community-based provision of Sayana Press by medical and nursing students. Figure 2 illustrates how this type of policy change influences access to contraception and increases contraceptive uptake.

**RAPID DIFFUSION, REPLICATION, AND TESTING**

In early 2015 before the pilot, Sayana Press was relatively unknown, and there was no precedent for having medical and nursing students give injections at the community level. In less than a year, the approach gained legitimacy and acceptance. Both the 6th and 10th Directions were anxious to know what plans were under way to expand the use of students as community-based providers of Sayana Press (and other contraceptive methods) and when the next round of pilot introductions would begin. Within 12 months of the results dissemination, multiple activities were under way that built on the original pilot:

- **Institutionalizing the use of medical and nursing students within the 6th Direction.** A private donor came forward to fund the institutionalization of the approach through the 6th Direction, which will involve developing a more comprehensive module on contraceptive technology as part of preservice training and making community-level service provision a routine part of the students’ training and as part of the health information system.

- **Replicating the approach in another province.** In October 2016, 119 nursing students received training as community-based distributors in Matadi, provincial capital of Kongo Central, and began providing Sayana Press, Implanon NXT, pills, male condoms, and CycleBeads at the community level.

- **Recruiting similar cadres of workers to distribute Sayana Press.** Several organizations funded by USAID recruited students...
and similar cadres (Red Cross workers) in other provinces to undertake community-level work in their projects.

- **Conducting additional pilot research projects.** Two new research pilots began in Kinshasa in late 2016 to test the use of medical and nursing students to (1) train women in self-injection of Sayana Press, and (2) insert Implanon NXT at the community level. A third pilot will begin in early 2017 to test the use of community health workers (who receive short-term training to perform specific tasks) to provide Sayana Press as part of an ongoing community-based distribution program. The Secretary General for Health authorized these 3 new pilots in a letter dated June 29, 2016 (NoMS.1251/SG/GM/1486/MK/2016).

- **Training medical and nursing students to deliver an expanded package of services.** A major donor came forward with additional funding to test the effectiveness of students in the provision of integrated maternal and child health and family planning services for first-time mothers ages 15 to 24. This gender-transformative project also incorporates the fathers of the babies as part of the population that would benefit from the intervention.

There were other positive outcomes from the Sayana Press pilot. The inclusion of the larger family planning stakeholder community in the initial deliberations over the pilot engendered support for and use of the final results. The positive findings from the pilot encouraged 2 major contraceptive donors—USAID and UNFPA—to procure larger quantities of the product to respond to the potential large demand for Sayana Press generated through other projects. The 2 social marketing projects based in Kinshasa also intensified their promotion of Sayana Press following the pilot.

**KEY SUCCESS FACTORS**

There is nothing novel in the concept of doing local research on issues that have been researched elsewhere as a means of obtaining local buy-in for innovative approaches. What is remarkable in this particular pilot is how fast the change took place. Although one cannot say with certainty what triggered the rapid change, several factors appear to have played a role.

First, the environment was ripe for innovation in the area of family planning. Since 2012, the DRC government has shown increasing political will toward family planning. The Prime Minister’s Office has repeatedly linked the demographic dividend to the country’s aspirations to be an emerging nation by 2030. The international donor community has reacted very favorably, both in terms of additional financial support to family planning initiatives and visibility in international fora (e.g., the invitation of the prime minister to address the closing plenary session at the 2016 International Conference on Family Planning in Nusa Dua, Indonesia). The DRC has often lagged in development initiatives, as reflected by its high maternal and infant mortality rates. Yet in family planning, the DRC is emerging as a regional leader. The momentum around family planning in the DRC created an environment that was ripe for another progressive step in family planning: authorization of the distribution of Sayana Press at the community level.

Second, the research component of the pilot allowed for experimentation with the approach on a limited basis without requiring a large-scale policy change. Policy makers could reduce their political liability by withholding authorization on a larger scale, pending results of the pilot. If successful, they had evidence with which to support the expansion of the approach beyond the pilot sites. If unsuccessful, they could withhold approval, either entirely or pending modifications to the design.

**LESSONS LEARNED**

Advocacy efforts require tailoring to specific countries because of differences in political, social, legal, and economic contexts. However, certain lessons from this experience in Kinshasa are likely applicable to other advocacy efforts:

1. There was clear political commitment to family planning and to community-based distribution as reflected in the National Multisectoral Strategic Plan for Family Planning: 2014–2020, which called for community-based distribution as a means to increase contraceptive access and thus increase the modern contraceptive prevalence rate to 19% by 2020.
2. A clear and achievable advocacy objective was set and informed by a group of influential and knowledgeable stakeholders.

3. Relevant decision makers were identified and enlisted from the start, not only to participate but to take a lead role in shaping the design of the research pilot.

4. The involvement of family planning stakeholders (including policy makers) in developing consensus on the design contributed to the success of this pilot and opened doors to next steps.

5. The research team cleared the necessary legal hurdles (obtaining authorization for the entry of Sayana Press into the local pharmaceutical market) with the support of local officials.

6. The pilot involved 3 Directions within the Ministry of Health, all of whom played a key role in its success.

7. The design lent itself to replication to other provinces and institutionalization within the Ministry of Health.¹⁵

**FINAL REFLECTIONS**

We acknowledge that advocacy has limitations. It relies on a range of expertise to inform objectives and to implement policies and programs. Rarely do we have a counterfactual of what would have happened in the absence of the advocacy initiative. Moreover, serendipitous events can occur that either facilitate or hinder an advocacy effort. As a result, evaluation of the role of advocacy in improving health conditions may not be definitive. For example, Figure 2 points to plausible pathways by which advocacy influences behavioral outcomes among the target population, but it does not demonstrate cause and effect.

Curiously, the strength of this pilot was not in the precise findings it obtained but rather the process used in designing, implementing, researching, and disseminating the results publicly to a large group of relevant stakeholders. This being said, it is essential that the research methodology used to support advocacy objectives be of the highest quality, and that results—both positive and negative—be disseminated.

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Benefits and Limitations of a Community-Engaged Emergency Referral System in a Remote, Impoverished Setting of Northern Ghana

Sneha Patel, a John Koku Awoonor-Williams, b Rofina Asuru, b Christopher B Boyer, c Janet Awopole Yepakeh Tiah, d Mallory C Sheff, e Margaret L Schmitt, e Robert Alirigia, f Elizabeth F Jackson, e James F Phillips e

A low-cost emergency and communication transportation system used 3-wheeled motorcycles driven by trained community volunteers. Delivery referrals were redirected from health centers to hospitals capable of advanced services including cesarean deliveries, which was associated with reduced facility-based maternal mortality.

ABSTRACT

Although Ghana has a well-organized primary health care system, it lacks policies and guidelines for developing or providing emergency referral services. In 2012, an emergency referral pilot—the Sustainable Emergency Referral Care (SERC) initiative—was launched by the Ghana Health Service in collaboration with community stakeholders and health workers in one subdistrict of the Upper East Region where approximately 20,000 people reside. The pilot program was scaled up in 2013 to a 3-district (12-subdistrict) plausibility trial that served a population of approximately 184,000 over 2 years from 2013 to 2015. The SERC initiative was fielded as a component of a 6-year health systems strengthening and capacity-building project known as the Ghana Essential Health Intervention Program. Implementation research using mixed methods, including quantitative analysis of key process and health indicators over time in the 12 intervention subdistricts compared with comparison districts, a survey of health workers, and qualitative systems appraisal with community members, provided data on effectiveness of the system as well as operational challenges and potential solutions. Monitoring data show that community exposure to SERC was associated with an increased volume of emergency referrals, diminished reliance on primary care facilities not staffed or equipped to provide surgical care, and increased caseloads at facilities capable of providing appropriate acute care (i.e., district hospitals). Community members strongly endorsed the program and expressed appreciation for the service. Low rates of adherence to some care protocols were noted: referring facilities often failed to alert receiving facilities of incoming patients, not all patients transported were accompanied by a health worker, and receiving facilities commonly failed to provide patient outcome feedback to the referring facility. Yet in areas where SERC worked to bypass substandard points of care, overall facility-based maternal mortality as well as accident-related deaths decreased relative to levels observed in facilities located in comparison areas.

INTRODUCTION

African nations achieved considerable progress in child health during the Millennium Development Goal era. Despite this progress, maternal and perinatal mortality remain among the leading causes of death throughout Africa. According to the World Health Organization, approximately 800 women die from pregnancy or childbirth-related complications every day.1 Nearly 99% of these deaths occur in developing...
countries and over half occur in sub-Saharan Africa, where only 7% of the global population resides. Most maternal deaths could be prevented if women received timely care when emergencies arise from associated causes, such as hemorrhaging, unsafe abortions, obstructed labor, infection, or eclampsia.\(^2\)

Nearly all maternal deaths are accompanied by associated neonatal deaths. Although most neonatal deaths are preventable if skilled attendants assist during deliveries,\(^3,4\) rates remain high even where child health and survival are otherwise improving. Yet evidence repeatedly shows that facility delivery and appropriate support for newborn care can reduce neonatal mortality if referral services are functioning and attendants are skilled in recognizing problems and immediately providing post-delivery interventions such as “Kangaroo Mother care,” asphyxia management, care for febrile illness, and tetanus prevention.\(^5–8\)

Public health systems in Africa are therefore making the development of emergency care systems a priority.\(^6,7\) The World Health Organization defines 3 core components of emergency care: care provided in the community, during transportation, and at the health facility.\(^8,9\) Each component incurs corresponding sources of risk that elevate death and disability: delays in (1) seeking care,\(^10\) (2) reaching care,\(^11,12\) and (3) receiving care upon arrival at the referral facility.\(^13\) In rural Ghana, and elsewhere in Africa, these delays are driven, respectively, by (1) lack of awareness of the importance of emergency care,\(^4\) (2) lack of family resources to cover referral costs,\(^15,16\) and concerns about the quality of care\(^17\); (2) poor road conditions,\(^18\) a scarcity of vehicles\(^19,20\) and limited means of communication\(^21\); and (3) inaccessibility of competent providers of essential acute care.\(^20–22\)

While Ghana has a well-organized, decentralized primary health care system, the country has yet to develop clear emergency referral service guidelines. The Upper East Region is one of Ghana’s most impoverished and remote localities: The 13 districts of the region are characterized by a scarcity of vehicles, poor road networks, impassible terrain, and geographic barriers to reaching health services.\(^23,24\) Patients in urgent need of acute care reach health facilities by walking or riding bicycles, donkey carts, or motorbikes. In all districts of the Upper East Region, ambulances are typically absent, in disrepair, or located so remotely from communities that they fail to address emergency needs. Even where equipment is available, there is no organized emergency communication system to link one level of care to another and ensure that referrals are successfully executed. Cultural norms can also constrain timely care seeking behavior. Moreover, since Ghana’s National Health Insurance Scheme does not cover costs associated with emergency transportation, referral can be prohibitively expensive, with costs further increasing people’s hesitation to seek acute care.

The Ghana Essential Health Intervention Programme (GEHIP) is a systems-strengthening initiative that was designed to increase universal access to health care.\(^25\) GEHIP’s aims are to expand coverage of the national primary health care system with the Community-Based Health Planning and Services (CHPS) initiative at the community level,\(^26\) and to identify gaps in care for newborns, children, and pregnant women at multiple levels of the health system. In addition to addressing issues that had hindered CHPS scale-up, GEHIP has trained midwives in neonatal resuscitation, provided frontline CHPS community nurses with skills in emergency delivery, and trained CHPS community nurses and community volunteers in community-based newborn care.\(^25\)

GEHIP also documented the urgent need for emergency referral services, including emergency obstetric care, in the Upper East Region. In response, the Ghana Health Service (GHS) pilot tested an emergency referral program, the Sustainable Emergency Referral Care (SERC) initiative, for all types of medical emergencies. This article provides a summary of the initiative components and evaluates the effectiveness of the program using results from mixed-methods implementation research.

**THE SERC INITIATIVE**

The SERC initiative aimed to develop a community- and subdistrict-level emergency referral system that would improve survival in impoverished rural Ghanaian communities. To address common access, organizational, and knowledge barriers to emergency care services, SERC was designed as a low-cost emergency transportation and communication system together with community education activities. The program aimed to facilitate rapid transport of patients from their community locations or subdistrict health center to higher levels of care.

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**Most maternal deaths could be prevented if women received timely care during medical emergencies.**

**Public health systems in Africa are making development of emergency care systems a priority.**

**In Ghana’s Upper East Region, ambulances are absent, in disrepair, or located so remotely that they fail to address emergency needs.**

**SERC was designed to address barriers to emergency care services through a low-cost system of transportation, communication, and education.**
GEHIP used the tools and methods of participatory planning\textsuperscript{27–29} to design and implement SERC in collaboration with community members as well as community, subdistrict, district, and regional health system officials. GEHIP research staff held meetings, focus group discussions, and in-depth interviews with community members, frontline workers, and supervisors throughout the planning process to solicit stakeholder advice. Project research assistants were recent graduates of local universities who were hired by GEHIP and assigned to each District Health Management Team to support SERC implementation activities and liaise across levels of the health system.

SERC was conducted initially as a 5-month pilot program with community stakeholders and health workers in a subdistrict of Bongo District in 2012. In July 2013, the program added 12 subdistricts of the Upper East’s Bongo, Builsa North, and Builsa South districts for a trial that served a population of approximately 184,000. Remaining districts of the Upper East Region, where social, economic, and ecological conditions are comparable to the SERC coverage areas, served as comparison areas for evaluating the program. The SERC interventions included a referral strategy informed by an assessment of population needs and health systems capabilities; adequately resourced referral centers; active collaboration between referral levels and across sectors; formalized communication and transportation arrangements, with specific protocols specified for referrer and receiver and mechanisms for ensuring supervision and accountability; affordable service costs; capacity to monitor effectiveness; and policy support.

SERC was developed as a component of the health systems development program GEHIP, and SERC scale-up was led by GEHIP staff based at the Upper East Regional Health Directorate (RHD).

**Transportation**

For the expanded pilot study that began in 2013, GHS procured a fleet of 3-wheeled motorcycles known as Motorkings to serve as emergency transport vehicles. The 24 SERC Motorkings were distributed among 12 subdistricts of Bongo, Builsa North, and Builsa South districts in the Upper East Region. Based on driver advice from SERC’s pilot phase, structural modifications were made to the Motorkings to enhance patient safety and comfort. These adjustments involved installing a welded frame and tarpaulin to provide privacy and protection for patients during transport, extended rearview mirrors for maximum visibility, a mattress and safety belt for patients, a seat for an accompanying health worker, and a hook for intravenous drips. To identify the Motorking vehicles as ambulances, each was marked with the GHS logo and a red cross. Each vehicle was equipped with a first aid kit, a spare tire and jack, and protective rain gear for drivers. Recognizing the importance of vehicle maintenance, vehicles were routinely serviced by staff mechanics from the Upper East RHD. Spare parts were procured and kept in stock at the RHD to ensure timely repair in the event of breakdowns.

Geographic information systems (GIS) data were used to estimate the optimal placement of ambulance stations and configuration of catchment areas to ensure community access to an ambulance.\textsuperscript{28} The SERC ambulances were deployed to 9 subdistrict health centers, 12 community health posts, and 3 communities that lacked facilities or community resident nurses. In Ghana, community health posts function as the first point of care, but only half of the planned locations for these facilities are functional. In the 3 locations that lacked health facilities, community leaders were engaged to determine an appropriate location for the community-based ambulance station. In each of
these 3 villages, the community chose an assemblyman’s or subchief’s home as the station due to its centrality, relative security, and social acceptability for this responsibility. The number of Motorkings was based on an appraisal of the equipment required to effectively cover all communities of the 12 subdistricts. The size of the study area, in turn, was determined by the volume of referrals that would be required to provide statistical power for evaluation.

The community selected 48 volunteers (2 per ambulance), who were trained to serve as drivers. Drivers varied in age, but were typically literate young adult men. A collaboration of the RHD’s Transport Unit, the Motorking vendor, the Driver and Vehicle Licensing Authority, and the Ghana Red Cross provided training to all drivers in basic first aid, infection prevention, defensive driving, basic maintenance, transport policies, communications protocols, and recordkeeping.

Communication
Before SERC, no integrated emergency communication system had been established to link patients to emergency care services at the community and subdistrict levels. Therefore, the RHD procured communication equipment: dual-SIM mobile phones were distributed to health facilities, health workers, and volunteer drivers. Emergency phones were assigned to nurses called community health officers who were based at community facilities, in subdistrict health centers, or in district hospitals’ outpatient departments. In communities that lacked a resident nurse, a volunteer was provided an emergency phone and cell phone time for calls to emergency numbers. This collaboration with a cell phone vendor ensured that every community had access to a mobile phone for eliciting rapid referral. At the tertiary referral point, the regional hospital designated a phone line in emergency for incoming calls about emergency numbers. This collaboration with a cell phone vendor ensured that every community had access to a mobile phone for eliciting rapid referral. At the tertiary referral point, the regional hospital designated a phone line in community and facility setting.

Protocols specified various emergency scenarios in the community and facility setting. Key guidelines included verification of emergency by a health worker and alerts to facilities to prepare for incoming patients and minimize delays. Frontline workers at community health posts were trained in basic triage procedures. All patients being transported were to be accompanied by a health worker. Facilities that received an emergency case were required to provide feedback to the referring facility upon discharge to facilitate follow-up scheduling. The program design included routine monitoring of resources and supplies to assess availability of human resources, equipment, medication, and forms.

GHS supported the operating costs of the SERC emergency referral system. Pregnant women and children under 5 years of age were provided free emergency transport. To encourage facility-based delivery, normal labor cases were transported free of charge. Other ambulance users were charged a nominal cost recovery fee (US$2.50–$5.00) that was determined by each District Health Management Team. In one district, the district assembly covered maternal and child referral fuel costs.

Health worker feedback was solicited on SERC to continually inform strategies for educating communities about emergencies. Qualitative appraisal methods were used to determine what community members needed to learn regarding emergencies and to identify strategies for...
DHIMS data are aggregated at the facility level and provide indicators of the monthly care caseload by indicator and by type of facility (e.g., CHPS, subdistrict health center, or hospital). Monthly DHIMS data are routinely available for all primary health care service points in Ghana, including the community health posts and community nurses involved in SERC, and we used these aggregated data to support the program evaluation. For the purpose of this analysis, the 12 SERC-exposed “treatment” subdistricts provided a basis for assessing the effect of the program. District facilities in the Upper West Region and the remaining subdistricts of the Upper East Region served as comparison areas. The dependent variable was monthly case volume of each relevant indicator; exposure versus nonexposure to SERC in the facility catchment area was the key independent variable.

For the SERC evaluation, we compared DHIMS time series data from SERC facilities with data from facilities located in unexposed districts of the Upper East and Upper West regions. The comparison applied generalized linear mixed models with an exchangeable covariance structure to account for repeated observations. This basis for inference ensures simultaneous adjustment for autoregressive error in time series models and hierarchical adjustment for multilevel clustering. For each dependent variable of interest, a model of monthly time series data takes the form:

\[ y_{ij} = \beta_0 + \beta_1 x_{ij} + \beta_2 t_{ij} + \beta_3 x_{ij} t_{ij} + u_j + \varepsilon_{ij} \]

where

- \( y_{ij} \) is a DHIMS-reported value of outcome \( y \) from facility \( j \) at time \( i \),
- \( x_{ij} \) is a dummy variable defining whether facility \( j \) is in the SERC area or in a control area,
- \( t_{ij} \) is a dummy variable defining whether time \( i \) is before or after the start of the SERC intervention,
- \( u_j \) is a random intercept for facility \( j \), and
- \( \varepsilon_{ij} \) is a random error term for facility \( j \) at time \( i \).

The parameters \( \beta_0 \), \( \beta_1 \), \( \beta_2 \), and \( \beta_3 \) are estimated by maximum likelihood, with \( \beta_3 \) estimating the difference-in-difference association of SERC exposure with the number of events of interest recorded by 14 hospital facilities over 70 months of observation. This

developing a culturally appropriate community education program. The aim was to increase capacity in the community to recognize signs and symptoms of emergencies, encourage prompt decision making to seek care, and increase use of SERC. Opinion leaders and community members contributed to the development of educational materials, which were translated into local languages. These materials included educational flip charts (for use by health workers) and informative songs played on local radio stations and on speaker systems in outpatient hospital wards. Dramas depicting emergency scenarios were developed, filmed, and shown at evening durbars, and posters displayed in health facilities and meeting points depicted actions to be taken in emergency situations. Discussions of the possible harm to SERC that could arise if equipment was misused were integrated into community education sessions.

**METHODS**

An iterative systems development approach was employed to continuously refine the SERC initiative in response to community reactions and administrative realities. GEHIP staff and consultants conducted implementation research to identify operational challenges and potential solutions. Methods included a quantitative analysis of key process and health indicators over time, a survey of health workers, and continuous qualitative systems appraisal with frontline workers and community members.

**Time Series Analysis of Key Indicators**

Volunteers, health workers, and district supervisors completed monthly SERC monitoring records and submitted them to GEHIP staff at the RHD, who created visualizations of results to help supervisors assess both referral volume by location and the types of cases associated with referral operations. Monitoring included station-specific information on distances traveled, transit times, adherence to protocols, types of emergency, and patient outcomes. The monitoring used technology designed to integrate SERC monitoring into the routine GHS data system operations known as the District Health Information Management System (DHIMS). Educational aids and training sessions were developed to help regional and district-level managers use the DHIMS database for practical decision making.
approach to evaluation represents a regression extension of the Heckman procedure for estimating the impact of interventions in nonexperimental designs.33,34

The sign of the $\beta_3$ coefficient in the equation indicates the direction of the net change in expected monthly case volume between treatment and control: A positive sign implies a positive SERC effect on case volume (i.e., an increase in the treatment facility volume relative to the control), and a negative sign implies a negative SERC effect on case volume (i.e., a decrease in the treatment facility volume relative to the control). For example, a value of $+6$ for $\beta_3$ in the equation for an analysis of facility-based delivery would indicate that the expected mean number of monthly deliveries in the treatment facilities increased by 6 deliveries relative to the mean volume of deliveries in the comparison area between the pre- and post-intervention periods. Statistical tests for this coefficient assess whether this relative change is significant. We employed a similar difference-in-difference approach to evaluate the effect of SERC on maternal mortality; however, we substituted a generalized linear Poisson model to properly estimate the maternal mortality ratio. Repeated observations within a facility were adjusted by assuming an exchangeable correlation structure.35,36 Table 1 reports robust standard errors obtained via the sandwich operator.37 Although the time series models in this analysis have employed conventional adjustments and statistical safeguards, all such models incur an element of instability. Results therefore merit further investigation and validation.38

Survey of Health Workers
A survey was administered to health workers by trained professional interviewers in December 2013 to assess their perspectives on SERC components and challenges. The questionnaire was pretested and then revised based on feedback provided. The sampling frame comprised all staff based at subdistrict- and community-level health facilities that were involved in the SERC program, including staff affiliated with ambulance stations, responsible for referral operations at ambulance stations, or charged with receiving SERC referrals. This yielded a list of 124 health workers and a response rate of 89% ($N = 110$), as 14 potential respondents were on annual leave during the week the survey was administered. During that 1-week period, the 110 respondents completed the survey instruments as self-administered questionnaires. Respondents were encouraged to provide candid feedback, and were provided with de-identified forms and blank envelopes to preserve anonymity. These procedures assured respondents of confidentiality so that they could answer questions without risk that critical comments would incur supervisory concern or reprisal.

Qualitative Systems Appraisal
Trained professional facilitators conducted a qualitative systems appraisal in March 2014 to assess community stakeholder, patient, and volunteer experiences with SERC, employing qualitative research procedures that have been applied to CHPS assessment in the past.28,29 An analysis of focus group discussions (FGDs) and in-depth interviews (IDIs) with community stakeholders assessed the acceptability of the intervention at the community level. IDIs were also used to examine patient experiences with SERC, satisfaction with care, and suggestions for improvement. A total of 16 FGDs were conducted with men, women, drivers, and volunteers from the subdistricts implementing the SERC program. Twenty-three IDIs were conducted with chiefs, emergency referral users, and volunteers equipped with emergency phones. To enhance representativeness, each focus group category (i.e., women, men, community health volunteers) was sampled in a different community, and each FGD was held within the community to promote discussion. Respondents provided written consent; all IDIs and FGDs were conducted in local languages Buili and Guruni; and all interviews were tape-recorded, transcribed, and analyzed using the NVivo 9 software package.39

RESULTS
Findings From the Time Series Analysis of Key Indicators
From July 2013 through June 2015, 1,290 patients used SERC transport services. The average trip time and distance traveled were 56.6 minutes and 9.92 kilometers, respectively. Most referrals were to higher levels of care at subdistrict health centers and district hospitals, with a high concentration of care occurring at 2 facilities that are well staffed.
and equipped to manage emergencies (Figure 1). The next most common reasons for referral included malaria, anemia, diarrhea, acute respiratory illnesses, and injury. Most patients (98%) were treated and discharged successfully, while 2% of all emergency referrals resulted in death.

The referral profile changed over time as SERC progressed (Figure 2). However, regardless of time period, obstetric cases were the predominant type of referral. Consequently, nearly three quarters of patients were women. Although inappropriate use of the referral system could not be monitored directly, care for minor situations that were not emergencies tended to be labeled as “other” types of referrals. As Figure 2 shows, the proportion of such referrals declined with time, suggesting that the high initial frequency of inappropriate SERC referrals may have diminished as operations progressed.

Table 1 presents the association of SERC exposure with facility output indicators. At baseline, before the introduction of SERC services, there were approximately 53 fewer deliveries per month in hospitals in the SERC intervention area. These facilities also received fewer referrals and reported fewer upper respiratory tract infections at baseline than the facilities serving the comparison area. Cesarean delivery rates were no different between facilities in the SERC and comparison areas at baseline. SERC had no statistically significant effect on the number of deliveries; the cesarean delivery rate; the number of referrals “out” from sub-district clinics to district hospitals or the number of pneumonia cases, other respiratory tract infections, septicemia cases, or diarrheal disease cases. However, SERC did increase the number of referrals into district hospitals from CHPS workers and clinics by more than 12 patients per month and the number of accidents treated by almost 21 per month.

<table>
<thead>
<tr>
<th>Treatment area</th>
<th>Deliveries</th>
<th>-52.93*</th>
<th>-0.00651</th>
<th>-12.08**</th>
<th>-6.499</th>
<th>-4.537</th>
<th>-100.5**</th>
<th>2.555</th>
<th>-15.35</th>
<th>20.96</th>
</tr>
</thead>
<tbody>
<tr>
<td>(26.18)</td>
<td>(0.0113)</td>
<td>(4.345)</td>
<td>(3.735)</td>
<td>(8.015)</td>
<td>(37.8)</td>
<td>(25.98)</td>
<td>(8.088)</td>
<td>(36.05)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Time period</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>32.55***</td>
<td>0.025**</td>
<td>-3.05*</td>
<td>-6.80***</td>
<td>0.687</td>
<td>35.57</td>
<td>23.64*</td>
<td>-3.24</td>
<td>18.12</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(9.55)</td>
<td>(0.00964)</td>
<td>(1.435)</td>
<td>(1.87)</td>
<td>(12.75)</td>
<td>(47.67)</td>
<td>(11.9)</td>
<td>(3.209)</td>
<td>(19.13)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SERC*</td>
<td>-4.88</td>
<td>0.0035</td>
<td>12.27*</td>
<td>1.60</td>
<td>10.99</td>
<td>22.57</td>
<td>35.09</td>
<td>20.52*</td>
<td>11.71</td>
<td></td>
</tr>
<tr>
<td>(12.76)</td>
<td>(0.015)</td>
<td>(5.18)</td>
<td>(3.52)</td>
<td>(12.92)</td>
<td>(49.82)</td>
<td>(41.91)</td>
<td>(9.90)</td>
<td>(33.54)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>89.73***</td>
<td>0.12***</td>
<td>17.45***</td>
<td>12.18***</td>
<td>46.96***</td>
<td>237.40***</td>
<td>28.38</td>
<td>28.17***</td>
<td>72.04***</td>
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</tr>
<tr>
<td>(23.81)</td>
<td>(0.02)</td>
<td>(4.17)</td>
<td>(3.04)</td>
<td>(14.13)</td>
<td>(58.81)</td>
<td>(30.88)</td>
<td>(6.84)</td>
<td>(14.96)</td>
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<td></td>
</tr>
<tr>
<td>Observations</td>
<td>861</td>
<td>795</td>
<td>361</td>
<td>500</td>
<td>787</td>
<td>748</td>
<td>237</td>
<td>796</td>
<td>804</td>
<td></td>
</tr>
<tr>
<td>Number of hospitals</td>
<td>14</td>
<td>13</td>
<td>13</td>
<td>14</td>
<td>14</td>
<td>14</td>
<td>10</td>
<td>14</td>
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</tbody>
</table>

Abbreviation: SERC, Sustainable Emergency Referral Care.
Note: Estimates are from multilevel linear regressions of outcomes from monthly hospital records in the Upper East and Upper West Regions of Ghana. Regressions include random facility intercepts to account for clustering at the facility level. Standard errors are calculated assuming an exchangeable correlation structure and are reported in parentheses.
* P < .05; ** P < .01; *** P < .001.
* The SERC effect (difference-in-difference) is given by the interaction of treatment area with time period.
There was a shift in the location of delivery care within districts where SERC was introduced. In the SERC area, more deliveries occurred at facilities capable of acute care (i.e., district hospitals), displacing delivery care at health centers and clinics where surgical procedures are not performed (Figure 3). Hospitals staffed and equipped to provide acute care also received more referrals where SERC was operative than elsewhere (Table 1, column 3). This relocation of care was associated with a reduction in facility-based maternal mortality (incidence rate difference, $-352; 95\%$ confidence interval, $-639$ to $-65; P<.05$) (Table 2), although there was no significant effect on the cesarean delivery rate (Table 1, column 2).

There were several specific indicators of volume of acute care episodes, and only the volume of care for accidents and for maternal emergencies appear to have been affected (Table 1, columns 3 and 8, respectively). The impact of SERC on acute care for accident victims is important, not only for the evidence shown in Table 1 but also because evidence now suggests that modest economic gains in the region have led to dramatic increases in the purchase of motorbikes, with accident-related morbidity and mortality rapidly expanding as a consequence.$^{18}$ Time series regression results can be unstable owing to autoregressive error.$^{38}$ Nevertheless, the relationships demonstrated in Table 1 suggest that SERC has had effects on mortality.

The information monitored included process indicators such as staff compliance with protocols. Contrary to guidelines, less than half (49%) of the patients transported were accompanied by referring health workers, and receiving facilities were alerted to incoming patients in only 46% of the monitored referral episodes.

**Findings From the Health Worker Survey**

Of the 110 survey respondents, over half were community health officers (56%); the remainder were...
Clinic-based nurses (25%), midwives (13%), or physician assistants (6%). Places of work included community health posts (69%), subdistrict health centers (27%), and hospitals (4%). Nearly three-quarters (74%) of the respondents had personally referred patients using SERC’s transport service since the program launched.

Perceived Effectiveness and Safety of Motorking Ambulances
The majority of health workers (66%) considered SERC to be “very effective” in improving the community- and subdistrict-level emergency referral system, and 33% considered Motorkings to be “somewhat effective.” Most health workers perceived the Motorking to be safe, with 26% categorizing the vehicle as “very safe” and 61% considering it to be “somewhat safe.”

Driver Dedication and Availability
Respondents generally perceived drivers to be dedicated to their roles (56% reported finding them “very dedicated”); 41% found them “somewhat dedicated,” and only 3% found them “not at all dedicated”). However, there were instances when health workers were unable to promptly contact the volunteer drivers. When asked whether health workers at ambulance stations should be trained to drive Motorkings in such instances, the majority of respondents (75%) said yes.

Protocol Adherence
Protocol noncompliance was evident for some aspects of care. For instance, referring facilities often failed to call in advance to alert receiving facilities of an incoming patient. Moreover, many patients transferred were unaccompanied by a health worker despite the protocol requiring it. Although surveyed health workers nearly universally affirmed the importance of these procedures, 67% of the referred patients who were interviewed reported that they had been transferred without accompaniment. When workers were asked why they were unable to accompany the patient, the most commonly

Two-thirds of health workers considered SERC to be “very effective” in improving the emergency referral system.

Referring facilities often failed to alert receiving facilities of an incoming patient, and many patients were unaccompanied by a health worker during transit.

Abbreviation: SERC, Sustainable Emergency Referral Care.
FIGURE 3. Trends in the Location of Facility Deliveries, SERC Intervention Areas vs. Comparison Areas, 2009–2015

Abbreviations: CHPS, community-based health planning and services; SERC, Sustainable Emergency Referral Care.

Differences between the baseline and intervention period were statistically significant at $P < .001$ for health centers and district hospitals.


<table>
<thead>
<tr>
<th></th>
<th>MMR (95% CI)</th>
<th>Differences</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pre-SERC</td>
<td>Post-SERC</td>
</tr>
<tr>
<td>Comparison district hospitals (n = 12)</td>
<td>326 (272, 380)</td>
<td>261 (194, 328)</td>
</tr>
<tr>
<td>Intervention district hospitals (n = 2)</td>
<td>618 (392, 844)</td>
<td>201 (22, 381)</td>
</tr>
<tr>
<td>Difference-in-differences (SERC effect)</td>
<td>$-352* (-639, -65)$</td>
<td></td>
</tr>
</tbody>
</table>

Abbreviations: CI, confidence interval; IRD, incidence rate difference (deaths per 100,000 live births); IRR, incidence rate ratio; MMR, maternal mortality ratio; SERC, Sustainable Emergency Referral Care.

Note: Estimates are from multilevel Poisson regressions of monthly hospital records of births and maternal deaths at 14 facilities in the Upper East and Upper West Regions of Ghana from 2009 to 2015. The hospital MMR is calculated as the number of facility-based deaths per 100,000 live births. The 95% confidence intervals were calculated using robust standard errors accounting for clustering at the facility level. 

* $P < .05$; ** $P < .01$; *** $P < .001$; † $P < .10$. 

Abbreviations: CI, confidence interval; IRD, incidence rate difference (deaths per 100,000 live births); IRR, incidence rate ratio; MMR, maternal mortality ratio; SERC, Sustainable Emergency Referral Care.
cited reasons (respondents could choose more than one) were that another health worker accompanied the patient (37%); the respondent was the only staff member at the facility and could not leave the post (35%); or the respondent was attending another patient (32%). Some respondents reported that they did not accompany the patient because they did not feel comfortable riding in the ambulance (16%), while 4% thought the patient would not benefit from riding with a health worker. Protocols also obligate receiving facilities to provide patient outcome feedback to the referring facilities for every case, but this requirement was typically ignored.

Frontline Worker Perspectives
Surveyed health workers were asked to identify the primary challenges to effective emergency referral services (the health workers could choose more than one challenge). Poor road conditions (95%) was the most commonly reported challenge, followed by lack of driver motivation (59%); cultural practices that delay care seeking and lack of knowledge of the importance of seeking care (40%); poor communications networks (32%); and adverse weather conditions (29%). Less frequently reported responses included patient inability to take time away from work or family obligations (20%); the cost or unavailability of fuel (19%); poor communication between health facilities (18%); lack of readily available transport options (13%); or lack of Motorking acceptability (12%).

Findings From the Qualitative Systems Appraisal
The qualitative systems appraisal shed light on the acceptability of services and on community perspectives on potential areas for improvement. Four main categories of themes emerged during data analysis: community endorsement of SERC; logistical challenges; communication challenges; and interpersonal relationships.

Community Endorsement of SERC
Overall, community members strongly endorsed SERC and expressed appreciation for the service. SERC was generally perceived as reliable and reactive, with a committed staff that supported the system. For instance, a woman who had used SERC said this:

> It sent me to the clinic to deliver and I did that safely without any bad thing happening to me. I delivered safely. That is the beauty of it.

Several users reported that they would recommend SERC services to anyone in need of emergency care. The removal of fees for pregnant women and children under 5 was seen as a key contributor to high SERC uptake. Although some participants preferred 4-wheeled ambulances, respondents generally believed that the 3-wheeled ambulance was better than the available alternatives, such as walking, bicycles, donkey carts, or motorbikes:

> It has been so beneficial to the pregnant women and the children under 5 because they do not pay when the vehicle is transporting them. In the past, we used to transport pregnant women in donkey carts and on bicycles but today there is ready and reliable means of transport for them in emergencies. —Community volunteer participating in an FGD

Some participants acknowledged that 3-wheeled vehicles such as the Motorking can traverse narrow passages that are inaccessible to 4-wheeled vehicles:

> If not for the Motorking, women, especially pregnant women and children, would have been suffering a lot. . . . It is able to go to the interior [of communities] to carry cases like the one I told you about with the woman who was in labor and nearly died if not for the sake of the Motorking ambulance. —Community subchief, in an IDI

Perceptions of reduced delays and increased numbers of facility-based births as a result of SERC were mentioned by several participants, along with the impression that SERC services were helpful, safe, quick, and lifesaving:

> When a woman is in labor and is not quickly sent to the health facility, she might deliver. She might also lose either the baby or even herself. Kids like this, once they are weak, they can easily pass on. So the impact I see is that the emergency referral saves lives. —SERC driver participating in an FGD

Community and household consensus endorsing SERC was uniformly evident in each FGD and IDI and was a key determinant of the sustainability of the system.

Logistical Challenges
While communities were receptive to SERC services, several logistical challenges were
identified. Some intervention areas remained inaccessible due to harsh weather and terrain, especially during the rainy season. (These challenges were perceived to affect all vehicle types, not just the Motorkings.) Some communities conveyed interest in overcoming logistical or geographical barriers through collective action or political advocacy. As 2 FGD respondents suggested:

I am of the view that the community members can contribute something, however little, and seek assistance from the authorities to work on our routes or roads for us.

Our youth, if they could help us to repair our roads small, small [bit by bit], and when the motors come, they can be running without problems.

Although concerns about roads did not constrain SERC use, some participants noted that communities that were remote from an ambulance station anticipated delay and often sought alternative means of emergency care. Indeed, this observation is consistent with GIS data analyses showing that communities located far from ambulance stations had lower use rates than proximate communities.

Communication Challenges
Communication problems introduced further complications. Poor phone networks, which are common in rural Ghana, exacerbated service delays. Although this did not compromise care seeking resolve, solutions to communication gaps sometimes involved walking great distances to alert a health worker or volunteer.

Patient perspectives on comfort during transport varied. Some patients described the vehicle as being unstable and uncomfortable, while others described feeling very safe, with minimal discomfort. This problem was associated with poor road quality. Any discomfort, however, did not appear to be severe enough to deter people from using SERC in the event of emergencies:

There are issues like discomfort, safety, and others when you are being transported, but as a sick person you do not have those issues in mind when there is an emergency. Anything that can hurriedly get you to the place on time is what you will be looking for. All vehicles have the tendency of falling when transporting people so it will not be fair relating safety issues to the Motorking alone. —Man participating in an FGD

Community members also expressed support for improving the work conditions for drivers. There were concerns over drivers being exposed to unfavorable weather and the risk of robbery during late-night service. Although no such incidents were reported, a few drivers worried about driving at night:

There are beasts at night and also ghosts. From where I come, there are so many spirits that it is not advisable to move out at night. The people sit protected in the vehicle while you are left alone in front. In addition to that you are not supposed to speed the vehicle, and you can imagine how exposed you are if someone intends to harm you. —SERC driver participating in an FGD

Drivers advised SERC to develop roadside repair protocols for addressing unanticipated mechanical problems. Drivers also noted that personal transportation was a challenge, as many drivers had no means of personal transportation home following late-night referrals. Drivers were provided with 2 bars of soap monthly as a token of appreciation, and this was universally perceived as being insufficient. Cash incentives were preferred by all drivers who were interviewed. Staff participating in an FGD considered cash payments as being critical to sustaining driver motivation in the future. Some community members recommended that SERC choose drivers from the ranks of existing community health volunteers, given prevailing volunteer commitment to community health.

Community Trust and Expectations
Some participants noted instances of mistrust between health workers and drivers. For example, a driver mentioned an episode where the network was down but a health worker accused him of having turned off his phone. In another example, a man explained during an FGD how at times users might misconstrue basic triage practices as health worker neglect:

Some of the pregnant women will be complaining that they came and they are thrown away, they don’t care —Woman who had used SERC, in an IDI

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about them. Because there is no understanding between the pregnant women and the midwife when she tells them it’s not time for them to deliver and they should wait. Because of that, the women say the workers are not serious, but for me, the way I know about the work, I know they are serious.

Although some patients experienced negative interactions with health workers, many described satisfaction with their performance during emergencies:

We think that the child was saved by the nurses because of the timeliness of our arrival. We were happy when we got into the hands of the nurses.
—Woman who had used SERC, in an IDI

Drivers expressed concern that the community lacked respect for their contribution. Some community members believed that drivers were paid employees rather than volunteers, and some drivers reported frustration over receiving dismissive and ungrateful comments. Although most community members interviewed indicated gratitude for drivers’ services, some complained that drivers operated Motorkings at unsafe speeds.

DISCUSSION

Mixed-methods implementation research enriched learning about the scalability, acceptability, and potential impact of implementing a community-based emergency referral system in a severely resource-constrained setting. The findings suggest that the strategies used for the emergency referral system can be adapted to the needs of impoverished, remote communities elsewhere in Ghana.

Overall, the SERC system was well received by communities and health workers alike as an effective means of reducing acute care risks. A key lesson learned was the importance of people-centered planning for obtaining and sustaining community endorsement and use of services. Without the engagement of community leaders from the very beginning, acceptance of the program would have been limited. Focused outreach targeting heads of household and familial gatekeepers is also crucial to ensuring continued support and understanding of services. Moreover, the collaborative role of transportation authorities and vehicle manufacturers in the planning, training, and implementation processes proved vital to program success.

While SERC aimed to use process evaluation results to improve system functioning, the pursuit of such improvements was constrained by resource limitations, poor communication network infrastructure, and impassible roads. Nearly all the health workers consulted in this appraisal expressed willingness to use emergency radios to offset poor mobile phone coverage. However, given limited funds for equipment purchases and lack of locally available communication equipment, use of radio devices could not be implemented. Instead, workers were obligated to develop improvised solutions when networks were not functioning.

The Motorking was locally available, affordable, and suitable for traversing rough terrain. Nonetheless, Motorking ambulances received mixed reviews for comfort and safety, indicating a need to explore additional equipment options. A costing analysis that compares 3-wheeled motorcycle ambulances with enhanced Motorkings or higher-quality vehicles is warranted. Similarly, strategies should be investigated for determining an appropriate and sustainable incentive and recruitment system for drivers in order to minimize turnover, improve motivation, and optimize efficiency.

Quite apart from equipment considerations, the quality of emergency care services will be limited by the poor state of infrastructure more generally. Several of the community members who were interviewed expressed concern about the status of the development of primary health care facilities and the slow pace of CHPS implementation, highlighting the fact that effective referral care requires a fully functioning primary health care system.

The SERC experience attests to the value of routine monitoring and evidence-based supervision, in conjunction with refresher training for health workers and volunteers. Lack of accountability mechanisms, supervision, and training can lead to poor adherence to protocols.

Feedback mechanisms are needed to foster timely implementation of systems improvements. For instance, after it was discovered that 30% of the trip report forms were incomplete, the forms were simplified, the format of review meetings was revised, and GIS-based vehicle tracking procedures were instituted to facilitate practical use of data for decision making. Similarly, adhering to a routine vehicle maintenance protocol that ensures prompt repairs was
found to be crucial for preventing breakdowns and minimizing service disruptions.

Training for quality assurance is important. Although most patients reported positive experiences with staff involved in facilitating referrals, some patients experienced negative or insensitive comments. While clinical skills are crucial to operations, it is equally essential to foster health workers’ patience and understanding of patients’ perspectives on the quality of emergency care operations.

Some volunteer drivers perceived community members to be unappreciative of their services. Although FGD participants may have been reluctant to criticize drivers, the general discussion suggests that drivers were, in fact, appreciated, and participants generally agreed that the incentives provided to drivers should be increased. The exchanges among FGD participants nonetheless suggested a need for durbars and other means of community engagement that would promote awareness of the lifesaving service and dedication of volunteers.

Remote communities sometimes preferred to find their own means of transport to offset ambulance delays. This fact attests to the need for implementation research that investigates the mechanisms such communities use for emergency referral and transport. Community-based solutions to referral problems may be relevant to operations more generally.

SERC has made its impact by transporting emergency cases, at considerable cost, to distant hospitals where physicians are available to provide essential acute care. However, bypassing subdistrict clinics and relocating care to hospitals is less sustainable than developing service capability at the subdistrict level. While bypassing for delivery is a logical and common strategy in Ghana and elsewhere in Africa, the implication of this finding is clear: A new round of implementation research is needed to explore implementing SERC in concert with a program that trains midlevel providers to manage emergencies directly.

**CONCLUSION**

While facility-based emergency health care is important to reducing mortality, facility-focused approaches can fail to achieve their full lifesaving potential in the absence of effective referral. Moreover, if receiving facilities are poorly equipped, inadequately staffed, and unable to respond to clinical emergency needs, effective referral will be little more than a program for relocating mortality. The SERC time series research presented in this article attests to the lifesaving potential of redirecting referral to facilities where emergencies can be competently managed. In the areas where SERC rechanneled acute care to specified facilities, we found decreased facility-based maternal mortality and accident-related deaths relative to comparison facilities. In the future, SERC could expand its intervention regimen with training and capacity building to enable more frontline care providers in smaller facilities to more effectively manage emergencies that arise. This strategy would offset the existing strategies for bypassing substandard care facilities.

Just as SERC’s success was dependent on implementation research and evidence, effective scale-up of these results will require effective systems approaches to replication trials in other regions of Ghana, with contrasting social, economic, and ecological conditions. The need for reform of referral systems persists throughout the country, but care should be taken to develop solutions that are informed by SERC, yet tailored to local contexts in the central and southern regions. The transition from pilot to trial clarified training and engagement requirements; replication of SERC elsewhere in Ghana could clarify the practical milestones in establishing a large-scale system of referral care.

The Ghana Health Service has adopted the SERC model and has included it in the national CHPS implementation guidelines. Donors including the Japan International Cooperation Agency, the Korean International Cooperation Agency, and the U.S. Agency for International Development have funded the purchase of Motorings, which are being used in 4 of Ghana’s 10 regions, with plans to use them in 2 additional regions.

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**Competing Interests:** None declared.

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Benefits and Limitations of an Emergency Referral System in Northern Ghana


Strengthening Government Leadership in Family Planning Programming in Senegal: From Proof of Concept to Proof of Implementation in 2 Districts

Barry Aichatou, Cheikh Seck, Thierno Souleymane Baal Anne, Gabrielle Clémentine Deguenovo, Alexis Ntabona, Ruth Simmons

Based on a previous pilot experience, in a next proof-of-implementation phase, district authorities enthusiastically assumed leadership and mobilized local resources to implement a simplified package of family planning interventions, with outside technical support. Comparing a 6-month baseline period with a 6-month implementation period, couple-years of protection increased from about 2,000 to about 4,000 (82% increase) in one district, and from nearly 6,000 to about 9,000 (56% increase) in the second. Longer implementation periods could further support institutionalization and sustainability.

ABSTRACT

Given Senegal’s limited resources, the country receives substantial support from externally funded partner organizations to provide family planning and maternal and child health services. These organizations often take a strong and sometimes independent role in implementing interventions with their own structures and personnel, thereby bypassing the government district health system. This article presents findings from the Initiative Sénégalaise de Santé Urbaine (ISSU) (Senegal Urban Health Initiative) that assessed in 2 districts, Diamniadio and Rufisque, the extent to which it was feasible to create stronger government ownership and leadership in implementing a simplified package of family planning interventions from among those previously tested in other districts. The simplified package consisted of both supply- and demand-side interventions, introduced in October 2014 and concluding at the end of 2015. The interventions included ensuring adequate human resources and contraceptive supplies, contraceptive technology updates for providers, special free family planning service days to bring services closer to where people live, family planning integration into other routine services, household visits for family planning education, religious sermons to clarify Islam’s position on family planning, and radio broadcasts. District leadership in Diamniadio and Rufisque were actively involved in guiding and implementing interventions, and they also contributed some of their own resources to the project. However, reliance on external funding continued because district budgets were extremely limited. Monitoring data on the number of contraceptive methods provided by district facilities supported by a sister project, the Informed Push Model project, indicate overall improvement in contraceptive provision during the intervention period. In Diamniadio, contraceptive provision increased by 43% between the 6-month period prior to the ISSU interventions (November 2013 through April 2014) and a 6-month intervention period (November 2014 through April 2015), from about 8,000 units to nearly 12,000 units. In Rufisque, contraceptive provision increased by 30%, from more than 17,000 units to more than 22,000 units. Couple-years of protection provided in Diamniadio increased by 82% and in Rufisque by 56%. The experience in these 2 districts in Senegal suggests that it is feasible for districts to play a leadership role in implementing family planning services and mobilizing some of their own resources and that international projects can facilitate capacity building and sustainability within public-sector systems.

INTRODUCTION

The literature on implementation science and scale up argues that unless global health projects implement interventions within routine public- or private-sector systems, and with at least a significant portion...
of their own resources, accomplishments will be short-lived and will at best benefit only a limited number of people. As Madon and colleagues argue, “Many evidence-based innovations fail to produce results … largely because their implementation is untested, unsuitable or incomplete.”

The Initiative Sénégalaise de Santé Urbaine (ISSU) (Senegal Urban Health Initiative), an urban reproductive health project implemented initially in 10 urban districts of Senegal, addressed these scale-up issues when authorities from the Dakar Medical Region approached the project to add the 2 remaining districts of the region, Diamniadio and Rufisque, to the project. ISSU used this opportunity to conduct a proof of implementation, assessing whether it was feasible for district authorities to lead the introduction of a simplified package of interventions, partially with their own resources. Interventions were selected from among those previously tested by ISSU with strong project leadership and a substantial amount of external resources in the 10 other districts. In initiating this new approach in the 2 new districts, the ISSU project took a major step toward preparing the ground for future scale up.

ISSU was a 6-year project (2010–2015), funded by the Bill & Melinda Gates Foundation, which sought to significantly increase Senegal’s low contraceptive prevalence rate of 12% in 10 urban districts—8 in the Dakar Medical Region and 2 in other regions. ISSU supported the Ministry of Health and Social Action in its effort to strengthen the country’s family planning program, with the ultimate goal of reducing high rates of maternal and infant mortality. The project’s focus on the urban population sought to address the high rates of unmet need for family planning in a country with one of the highest rates of urbanization in the region and one of the lowest contraceptive prevalence rates. The project was led by IntraHealth International working in a consortium with partner organizations to introduce a broad range of interventions to improve service delivery, community-based interventions, and advocacy for family planning. ISSU played a leading role in developing interventions, as well as in financing and guiding their implementation. An evaluation conducted in 6 districts using a longitudinal survey showed increases in modern contraceptive use between baseline and endline, with baseline rates among all women ranging from 13%–19% and endline rates ranging from 19%–32%. The initiative in Diamniadio and Rufisque, which ISSU began in its last 2 years of the project cycle, represented a departure from such a project-driven approach.

FROM PROOF OF CONCEPT TO PROOF OF IMPLEMENTATION

Three developments in the ISSU project led to the decision to assess the feasibility of scaling up the project to 2 additional districts. First, the ISSU team had been introduced to ExpandNet’s principles and approaches of scaling up, which emphasized that it is insufficient to provide only a proof of concept, i.e., to prove that a well-implemented package of interventions can achieve substantial results. Rather, ExpandNet, along with others in the scale-up field, argue that “we are faced with the challenge of determining how the conditions needed for effectiveness can be met within the real-world constraints of health systems operating at large.” In other words, we need proof of implementation demonstrating how successfully tested interventions could be implemented under the leadership and with the resources of the organizations that are intended to scale them up in a routine program context. A proof of implementation is the first step toward ensuring future sustainable, large-scale expansion and institutionalization of tested interventions.

Second, the project had previously undertaken an exercise referred to as capitalization. This exercise involved a systematic analysis to determine the most successful interventions undertaken by ISSU in the original 10 districts which had high potential for sustainable implementation within the national family planning program. The analysis used 4 criteria: relevance, effectiveness, efficiency, and sustainability. This exercise resulted in a smaller package of interventions that became the focus of subsequent activities in the 10 original project districts. The process of capitalization had prepared the project team to further reduce the package of interventions, together with district authorities, to facilitate implementation with fewer resources within the routine program in Diamniadio and Rufisque but with greater involvement of district leadership, mobilization of district resources, and better synergy among externally funded partner organizations.

Third, following dissemination of evidence from the midterm evaluation showing that

ISSU conducted a proof of implementation to assess whether it was feasible for district authorities to lead the introduction of a simplified package of interventions with some of their own resources.
substantial improvements in contraceptive prevalence had been achieved, the national Directorate of Reproductive Health and Child Survival and the Directorate of the Dakar Medical Region asked ISSU to add the 2 remaining districts of the Dakar Medical Region to the project. The intent was to help these 2 districts reach their expected achievements in contraceptive use.

The 2 contiguous districts are situated 25 km east of Dakar capital. Their population has grown substantially in the past 2 years with a combined population of over half a million. They are predominantly urban but also contain a rural portion. Their economic activities consist of mining, fisheries, poultry farming, vegetable cultivation, and tourism. The public-sector health system in the 2 districts has fewer human and financial resources than the other districts of Dakar Medical Region.

Innovative project-led approaches, such as those pioneered by ISSU, can demonstrate the “efficacy” of interventions. Where the need for these interventions persists beyond the life of a project—as is the case with family planning in Senegal—finding ways of institutionalizing them within the government systems is a critical step toward ensuring that people’s needs will continue to be met. Institutionalizing interventions locally can also be a first step toward building capacity within a health system to scale up successful family planning interventions to benefit more people and to foster policy and program development on a sustainable basis.

The purpose of this article is to describe the approach that ISSU used when working in Diamniadio and Rufisque with district health authorities to transition the project from a proof of concept to proof of implementation, that is assessing the extent to which district health authorities were capable of leading implementation of the family planning interventions and reaching the desired outcomes related to service delivery improvements and family planning uptake.

**METHODS**

This article uses a case study methodology to assess changes in the mode of implementation as ISSU moved from an initial phase of multiple interventions and strong project leadership by an international NGO to a second phase with a simplified intervention package with strong district leadership. The case study is based on participant observation by the authors, representing the ISSU team, ExpandNet, and district leadership. Collectively these participant observers represent senior Senegalese and external experts with many years of experience in support of family planning and reproductive health project development in Senegal and elsewhere. Their insights were complemented by data gathered from the following sources:

- Informal interviews conducted over the course of the project by the ISSU team and ExpandNet in Diamniadio and Rufisque with the chief medical officers of the districts, reproductive health coordinators, health educators, community health worker (CHW) supervisors, providers, and religious leaders
- The diagnostic assessment undertaken in Diamniadio and Rufisque to determine which supply- and demand-side interventions should be included in the simplified and reduced package
- A simple qualitative tool that documented increased leadership by the district health management teams in the areas of planning, monitoring, supervision, coordination among partners, and mobilization of health systems resources, as well as the changing role of ISSU facilitators
- District-level monitoring related to implementation of the simplified package of interventions (based on CHW records of household visits, the number of referrals from communities for family planning services, and outputs from the special service days) as well as other relevant government service statistics
- Information on the provision of contraceptive products at health facilities collected by the Senegal Informed Push Model project, which focused on improving the contraceptive logistics system

**ISSU’S APPROACH TO WORKING IN DIAMNIADIO AND RUFISQUE**

Given that the major purpose of the work in Diamniadio and Rufisque was to assess whether the districts could provide greater leadership in implementing family planning innovations, different approaches were needed from those used in the original ISSU-supported districts. This new approach consisted of 4 key elements: (1) conducting a diagnostic assessment; (2)
strengthening district ownership; (3) changing ISSU’s role from leadership to facilitation and technical assistance; and (4) creating synergies with partner organizations.

**Conducting a Diagnostic Assessment**
The purpose of the diagnostic assessment was to identify:

- A reduced and simplified package of interventions with significant potential to contribute to improved family planning performance, from among those identified in the capitalization process
- The District Health Management Team’s (DHMT’s) interest and ability to lead the initiative
- The existing conditions of service delivery, particularly the training and supervision needs for family planning
- The needs and perspectives of the community
- The availability and interest of other partners who could assist with family planning program implementation

This diagnostic assessment was essential because Diamniadio and Rufisque had not been included in the diagnostic assessment of the original ISSU study, which had included a population-based longitudinal baseline survey. The assessment in Diamniadio and Rufisque, undertaken in the early months of 2014, was conducted by ISSU with participation from both the DHMT and the Dakar Medical Region.

**Strengthening District Ownership**
The country receives substantial support from externally funded partner organizations to implement its family planning and maternal and child health programs, and these organizations not only finance and provide technical support to the programs but also take on a strong and at times independent role in implementing interventions with their own structures and personnel. As a consequence, involvement of district authorities often remains limited. As has been discussed in the literature, this leads to little ownership, limited strengthening of the district health system, and lack of sustainability of the results over the longer term.15

Thus, a key objective of the initiative in Diamniadio and Rufisque was to empower the districts to lead the initiative and to assess the extent to which local authorities could guide and supervise the implementation of selected interventions to improve access to quality family planning services while also providing at least some of the resources needed.

**Changing ISSU’s Role**
Creating district ownership implied a change in the role of ISSU. Although ISSU closely coordinated activities with the DHMTs in the original project districts, it played a strong leadership role by using the human resources and structures of consortium partners to manage and at times implement activities. For example, Marie Stopes International, the Association Nationale des Sages Femmes d’Etat du Sénégal (ANSFES) (Senegal’s national organization of midwives), and Environment and Development Action in the Third World (ENDA) (an international non-profit organization), provided clinical outreach services in the communities. ISSU’s coordinator for each district played the lead role in ensuring that interventions were coordinated, appropriately implemented, and documented.

In contrast, in Diamniadio and Rufisque the approach was to encourage a shift in ISSU’s role from leadership to facilitation and technical assistance. It was clear from the outset, however, that a substantial amount of financial and technical resources from the ISSU project would still be required to implement activities. Such external support was particularly needed during the initial phase of implementation, but it was expected that ISSU support would gradually diminish over time. Examples of costs that needed to be covered externally included:

- Contraceptive technology updates for district providers
- Compensation for household visits undertaken by the volunteer CHWs (the so-called relais)
- Some costs for the special free family planning service days; these included the medical supplies associated with contraceptive service provision (which patients themselves had to pay for during routine service delivery but which were waived when services were provided free of charge), payments for lunch, and special compensation for midwives and CHWs
• Training for *imams* (prayer leaders) and for religious relais (community workers who support *imams*) conducted by the *Réseau Islam et Population* (the Islam and Population Network) and the small payments to *imams* for sermons and community talks supporting family planning

• Broadcasts on the local radio station

**Creating Synergy With Partner Organizations**

Externally funded organizations tend to work in isolation from each other and often in isolation from the district authorities. A key component of the overall effort was therefore to identify which partners working in the 2 districts were willing to change this pattern and support the initiative.

**THE INTERVENTIONS**

From among the package of successful ISSU interventions selected through the capitalization process, ISSU and the DHMT chose an even smaller set of interventions to implement and adapt through a participatory process led by the DHMT (Box). Results from the diagnostic assessment, along with consideration of the capacity of

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**BOX. The Simplified Intervention Package Implemented in Diamniadio and Rufisque Districts of Senegal and Interventions From the Main ISSU Package Not Implemented**

**Simplified Intervention Package**

Note: In addition to reducing the number of interventions from the main ISSU package, the simplified package of interventions was implemented with less intensity than in the original ISSU project districts.

• Existing midwives assume increased responsibility
• Contraceptive supplies ensured through the Informed Push Model project
• Family planning technical updates for providers
• Free special family planning service days organized by district authorities take the place of mobile outreach from partner organization
• Integration of family planning with other services
• Family planning educational home visits by CHWs
• Family planning talks by Muslim scholars
• Family planning radio broadcasts

**ISSU Interventions Not Implemented**

• Recruitment of additional midwives
• Quality assurance committees
• Mobile clinic outreach organized by partner organization
• Private-sector interventions
• Community-based distribution of oral contraceptives
• Conversations with community groups
• Theater forums
• TV spots
• Work with journalists

Abbreviations: CHW, community health worker; ISSU, *Initiative Sénégalaise de Santé Urbaine* (Senegal Urban Health Initiative).
the district to manage certain interventions, were major factors in this selection process. Both supply- and demand-side components were selected.

Supply-Side Interventions

- Basic supply-side preconditions consisting of human resources and contraceptive supplies: Two interventions in the original package were considered to be basic prerequisites without which other interventions should not be started: (1) ensuring adequate human resources including the recruitment of additional midwives, and (2) the availability of contraceptive supplies. Recruitment of additional personnel in Diamniadio and Rufisque was neither feasible nor sustainable, so existing district midwives made a commitment to assume the additional burden of work. Regular availability of contraceptive supplies was ensured through the Informed Push Model, a project designed to improve the contraceptive supply chain. This project had evolved from ISSU, and its interventions were already being expanded more broadly in Senegal, including in Diamniadio and Rufisque. Thus, ensuring contraceptive supplies required no additional effort from the 2 districts.

- Contraceptive technology updates for all 51 providers: In accordance with guidance from the Ministry of Health, the DHMT, with support from ISSU and some assistance from the Dakar Medical Region, organized the contraceptive technology updates which included both didactic and practical components.

- Special family planning service days: In ISSU’s original 10 project districts, major efforts were made to bring family planning services to the urban poor by providing services free of charge and closer to their areas of residence. This was achieved through collaboration among several ISSU partners involving the use of their mobile clinics and midwives. In Diamniadio and Rufisque, the DHMT used their own limited resources to organize service days at a designated health post or lower-level facility on a rotating basis in poor urban areas where midwives from several nearby health posts joined together to provide free family planning services. Four such special service days were provided per month in each district.

A district vehicle was used to transport midwives and needed equipment. Family planning services provided free of charge during these special days included counseling and the full range of available methods comprising oral contraceptives, condoms, intrauterine devices (IUDs), injectables, and implants. CHWs conducted household visits to inform the community of the upcoming special family planning service days.

- Integration of family planning into other routine services at the health post: A simple screening tool, also introduced in the original project districts, helped to identify the family planning needs of women of reproductive age who came to the health post to use other services. The tool consisted of 4 basic questions/instructions to assess whether women were ready to adopt a contraceptive method: (1) Do you know about family planning? (2) Are you using contraception? (If yes, advise and thank her.) (3) If not, inform/sensitize her about family planning; and (4) Do you wish to use a contraceptive method? All nurses and midwives of the health posts (including a few from private-sector facilities) in Diamniadio and Rufisque were trained to use this tool by the DHMT, which had received training on this approach from ISSU.

The supply-side interventions that were previously implemented in the original 10 ISSU districts but excluded from Diamniadio and Rufisque consisted of recruitment of additional midwives, quality assurance committees, community-based provision of oral contraceptives, interventions with the private sector, and mobile outreach.

Demand-Side Interventions

- Household-based family planning education by CHWs: Household visits by CHWs to create demand for family planning was introduced by ISSU in Senegal and was identified as a critical need in the diagnostic assessment in Diamniadio and Rufisque. In ISSU’s original 10 project districts, groups of CHWs subcontracted by consortium partner organizations made household visits to promote demand for family planning. Adaptations of this approach had to be made to accommodate the implementation realities of the
government system in Diëmiadio and Rufisque. For example, these visits were assigned to 2 of the CHWs attached to each of the health posts to avoid the need for subcontracting. CHWs are volunteers who exist in all districts in Senegal and are routinely used by various programs to support health interventions with a community mobilization component. They generally receive special training on the subject and a small compensation. The household visits consisted of preparatory contacts with households to schedule a time convenient for the woman to receive the CHW, followed by the visit itself, during which the worker provided family planning education within the broader context of maternal and child health. When appropriate, the CHW referred women to the health post or to a special family planning service day. If needed, the worker made subsequent follow-up visits. CHWs received special training for this activity from the district health team, with technical support from ISSU, and were paid US$1 compensation for each visit to cover their transportation costs. Diamniadio and Rufisque had fewer CHWs than the original 10 districts. Because these were community volunteers rather than full-time paid workers, they were expected to make only 20–30 visits per month on average. Another key adaptation was that the visits were planned together with the chief nurse of the health post. Arrangements were made to ensure each worker was supervised on a monthly basis for monitoring the quality of interactions with women, data collection, and reporting.

- **Islamic sermons and talks on child spacing:** The purpose of this intervention was to clarify the position of Islam on child spacing in the course of sermons, which precede Friday prayer in the large mosques. The intervention was organized in collaboration with key DHMT members and with the Islam and Population Network, the only other ISSU consortium partner participating in Diamniadio and Rufisque. The Network provided training to the *imams* and religious relais as well as materials on family planning and Islam developed by ISSU.

- **Radio broadcasts:** The broadcasts included brief radio spots or musical entertainment on family planning.

ISSU’s demand-side interventions that were not included in Diamniadio and Rufisque consisted of conversations with community groups, theater forums, activities with journalists, and TV spots. Moreover, the included interventions were more limited in numbers than what was implemented in the original project districts.

**FINDINGS**

**Strengthening District Ownership and Changing Roles of ISSU and Partners**

Activities in Diamniadio and Rufisque began between February 2014 and April 2014 with the development of the baseline assessment protocol, and they ended at the same time as the ISSU project at the end of 2015. During the course of this work, the roles of ISSU and the DHMT changed substantially, demonstrating the possibility for a project to make progress toward transferring ownership to district authorities and transitioning to sustainability and eventual broader scale up.

**Empowerment of district authorities:** From the outset, the chief medical officer and other members of the DHMT who participated in the discussions with ISSU were pleased to take an active role in guiding the project. One of the members of the DHMT expressed her enthusiasm about working in this new way by stating:

> ISSU came and asked us to take on ownership of the interventions and not only to implement them. We have never had the opportunity to be involved in the conception of a project. We have always been working like robots.

There was never any expectation of special remuneration for this increased level of leadership responsibility because the project helped them reach their own program objectives of increasing contraceptive prevalence. Although district authorities were eager to assume ownership of the initiative, some members of the team were initially worried whether, given the additional burden of work, they would be able to take on this role. However, with time their confidence and creativity to handle the new activities grew, and they were convinced that they could take charge and lead the interventions.

Such confidence and creativity are reflected in how the district team organized itself to take charge and manage the new activities. Key in this process was the team’s decision to engage in a broad-based participatory approach to plan and
coordinate the family planning innovations that coincided with the development of their annual work plan. In this process they began the systematic use of data for decision making. They committed themselves to monitoring the changes occurring during implementation of new interventions, to analyze results, and to use them to further refine the interventions. As one chief medical officer said:

The DHMT has organized itself to benefit from what ISSU has provided us. We have divided the labor and assigned responsibilities to each person.

One of the key objectives was to mobilize, to the extent possible, district resources. This was primarily feasible in regard to the human resources, and in particular in terms of the midwives of the health posts who joined forces to provide services for the special family planning days. Similarly, the districts also provided vehicles and gasoline when needed to transport midwives and equipment to the places where the free service days were organized. These additions were not major, but they demonstrated that with the motivation generated by encouraging local authorities to take the lead in integrating innovations into the health system, some additional resources could be generated from within.

More generally, the DHMT took full responsibility for organizing the special family planning service days. They scheduled these days for the whole district; coordinated the human resources and other logistics, and integrated them into their monthly work plans.

The district team also took charge of organizing the CHWs to implement the family planning educational household visits and to report to the district. Recognizing that the head nurse of the health posts would not be able to adequately supervise the CHWs, the team identified supervisors from among the CHWs who could take charge of this task. This new form of supervision made it feasible to integrate family planning data collected by the CHWs into district service statistics and to include them in district reports.

Another impressive development was that the district teams began to strategize about how the gains made with support from ISSU in Diamniadio and Rufisque could be maintained in the future. Regular meetings between the DHMT, key providers and CHWs, the ISSU team, and other stakeholders were held. In this participatory process, the district began to reorganize available resources and mobilize new ones. For example, the team considered how the local branch of ANSFES could be involved and how resources could become available through the contributions of local health committees.

A chief medical officer best expressed the overall change experienced by members of the district teams:

The approach and the methodology are good because they allow us to be better organized in terms of work and activities. Before, there was insufficient supervision, and not enough attention to what the providers and above all the community workers did. But once the package was there, we could accomplish many things, due to better organization and coordination. Thus, we now have good involvement of key actors in the fight against maternal and infant mortality and for birth spacing.

Nonetheless, there were also limits to the extent to which the districts took ownership of the simplified package of interventions. In particular, there were frequent scheduling conflicts at the district level due to the multiplicity of health programs that had to be coordinated and inadequate human resources in terms of the DHMT, chief nurses at the health post, and midwives.

The team noted that a stronger level of support in the process from the higher-level health management team of the Dakar Medical Region would have been appreciated, although the regional reproductive health coordinator participated in several key initial activities, including one of the training sessions.

**Changing role of ISSU district coordinators:** Empowering the district team to take ownership of the interventions in Diamniadio and Rufisque required a change in the role of the ISSU district coordinators. The 2 coordinators had previous responsibility in other ISSU-supported districts where they provided strong leadership in the implementation of interventions.

For the district team to take on ownership, the coordinators were now required to step back and learn how to act as facilitators or coaches. They had to ensure that both the knowledge and the skills they had acquired previously in other ISSU-supported districts were transferred to the district health team. At the same time, the coordinators had to provide the needed encouragement or even pressure to the district team to move the interventions...
forward so that the leadership role would not fall back on their shoulders. For example, one of the district health team members mentioned that the ISSU coordinator pushed her to find supervisors for the CHWs. In many other cases, the coordinators deliberately stepped back and referred any inquiries or supervisory issues to the district health team, thereby ensuring that leadership rested with the district.

Overall, the coordinators succeeded in transferring their knowledge and skills effectively to the district teams. This was a reflection of the deep commitment of the district teams to demonstrate that they could take on the leadership of this initiative.

Synergy with other partner organizations: As previously discussed, several partner organizations worked independently of the DHMT and each other in the districts on various reproductive health and health interventions. As part of their effort to assume greater leadership, the DHMT used their district coordination meetings to encourage collaboration. This effort was successful with regard to other projects from IntraHealth International and from ChildFund International. Thus, a close partnership existed with the Informed Push Model project during the diagnostic assessment and in terms of follow-up for contraceptive supplies as well as with the Projet de Renforcement des Prestations de Services (Health Services Integration Project), also led by IntraHealth International. The latter conducted contraceptive technology updates for providers and supplied the necessary equipment for service delivery points, including insertion and removal equipment for long-acting methods. However, other partner organizations working in the districts did not join the collaboration.

Demand-Side Interventions
The quantitative results presented here cover the period from November 1, 2014, through April 30, 2015.

Household visits: The district team, together with the ISSU coordinators, had targeted a total of 6,000 household visits to be conducted by the 50 CHWs in each of the districts during the 6-month implementation period (20 visits per month per CHW). Actual performance was considerably higher, reaching more than 7,000 visits in each district (Table 1). The CHWs averaged 27 visits per month in Diamniadio and 24 in Rufisque. In addition to contacts with women, the CHWs also reached men during these household visits with brief conversations about family planning.

Similarly, service referral for family planning exceeded the targeted number considerably, amounting to over 200% of targets in each district. A major reason why the CHWs exceeded the referral targets was because there was considerably more interest in adopting family planning in these communities than had been anticipated. The CHWs, who received $1 for each household educational family planning visit, were able to satisfy this interest and they provided referrals when needed. Household educational visits did not include community-based contraceptive distribution.

Sermons and religious conversations: The 50 imams and religious community workers who had been trained by the Islam and Population Network in the 2 districts conducted

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<th>TABLE 1. Family Planning Household Visits and Service Referrals by District, Senegal (November 1, 2014 – April 30, 2015)</th>
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14 sermons and 15 religious conversations in Rufisque and 2 sermons and 6 religious conversations in Diamniadio. These relatively low numbers have to be understood in a context where it is still unusual for imams to speak publicly about family planning and where support must be built up slowly.

**Radio broadcasts:** The radio station Jokko had been identified by the district teams as having a relevant audience among the local populations of the 2 districts. Therefore, IntraHealth International had signed a contract with the station to transmit family planning messages and together with the district teams they decided the program. In total, Jokko transmitted 5,400 radio spots, 24 musical entertainment segments, and 10 health programs. In the latter, midwives, traditional communicators, and religious community workers as well as religious leaders participated. The following themes were covered in these broadcasts:

- Importance of family planning for infant, child, and maternal health
- Family planning from the perspective of tradition and religion
- Role of political and community leaders and providers in the promotion of family planning
- Treatment of infertility

**Supply-Side Interventions**

**Special family planning service days:** 
Diamniadio held all 4 of the planned special family planning service days per month (24 total over the 6-month implementation period). Rufisque also held most of the planned service days (16 of the planned 24), but not as consistently as Diamniadio. Diamniadio was more successful than Rufisque in recruiting family planning acceptors (total, 768 vs. 470, respectively) (Table 2). Each special family planning day served about 30 new contraceptive users, including a substantial number who selected long-acting methods.

**Integration of family planning into other services:** In total, 139 providers, as well as 9 DHMT members, were trained in the use of the integration screening tool. Data collected between January 2015 and March 2015 indicate that in the 14 facilities of Diamniadio, 375 women were screened with the tool, of whom 104 adopted family planning. In the 24 facilities of Rufisque, 179 of the 2,071 women screened adopted a method. The difference observed between the 2 districts requires further exploration. More generally, it was clear that, similar to the experience within the original ISSU project districts, the providers had considerable difficulties with reporting results from this particular component of the simplified package. In order to address these reporting issues, efforts to incorporate use of the integration questions into registers for prenatal care, postnatal care, curative services, and child care were subsequently piloted.

**Provision of contraceptive methods:** Representative household surveys were not conducted in Diamniadio and Rufisque as was the case in the original ISSU project. Therefore, baseline and endline contraceptive prevalence data are not available for the 2 new districts. However, data on the number and types of contraceptive methods provided by the district facilities covered by the Informed Push Model project are available, from which the couple-years of protection (CYP) can be calculated to provide an estimate of contraceptive coverage. These data confirm the overall improvement in
the provision and uptake of family planning services when comparing the 6-month period prior to full implementation of interventions in Diamniadio and Rufisque and a 6-month intervention period 1 year later (Table 3).

Over this period, in Diamniadio, the number of contraceptives provided increased by 43%, from about 8,000 to nearly 12,000 (Table 3). Rufisque saw a 30% increase in overall contraceptives provided, from more than 17,000 units to more than 22,000 units. Provision of long-acting methods, in particular, increased by 131% in Diamniadio and by 79% in Rufisque. In total, the CYP provided in Diamniadio increased by 82% and in Rufisque by 56% (Table 3). These results reflect accomplishments both with regard to the special free family planning service days, as well as for the increased family planning activity during regular service provision at health posts and other facilities. These results could not have been achieved without the regular availability of contraceptive supplies ensured by the Informed Push Model project.

Cost Containment
Compared with project costs in the original ISSU project districts, considerable cost reductions were achieved in Diamniadio and Rufisque.
These reductions were possible for 3 main reasons:

- Reduction in the number of interventions undertaken and the frequency with which they were implemented
- Mobilization of resources from the districts, particularly in the area of human resources
- Increased synergy among IntraHealth International partners supporting the districts in the promotion of family planning activities

Reductions were also achieved in terms of management costs, as well as the institutional and administrative support provided by partners and other community-based organizations in the original project districts. For example, the cost of the special free family planning service days in Diamniadio and Rufisque was only half that of the mobile outreach activity of MSI in the original 10 project districts.

**DISCUSSION**

This article is not the first to make a case for strong government ownership and leadership in implementing health innovations. However, case studies of how to improve family planning services in urban areas and in particular of how to move from a proof of concept to a proof of implementation as demonstrated in Diamniadio and Rufisque are not available for Senegal. Additional initiatives are needed because this case study presents only a beginning. The experience of Diamniadio and Rufisque and its results are encouraging, but questions remain and much needs to be learned including the following:

**Further simplifying the intervention package:** A key question relates to the intervention package—whether it should be further simplified if continued scale up proceeds and whether and how interventions can continue to be improved. As described previously, the package implemented in the 2 new districts resulted from a lengthy process of simplifying a broad range of interventions initially implemented by the ISSU project. The literature on scaling up has pointed out repeatedly that simplifying originally tested interventions is critical for achieving implementation on a larger scale. Lessons from Diamniadio and Rufisque should be used to assess areas in which further simplification or improvements should be undertaken before scaling up to other areas.

**Institutionalizing interventions:** An important component of scale up is ensuring that interventions are institutionalized in government policies and programs. The project period in Diamniadio and Rufisque was insufficient to focus on such institutionalization. Future efforts to provide a proof of implementation should be conducted over a longer period of time to test the ability of district leadership to assume responsibility for the interventions more systematically and widely. In addition, future efforts should focus on making needed changes in government policies, regulations, and especially budgets to ensure these innovations are sustainable in the long run.

**The role of partners and facilitators:** ISSU coordinators learned a great deal as they shifted toward the role of facilitator, taking a backstage rather than the leading role to which they were accustomed. Efforts to scale up family planning interventions from this experience in Diamniadio and Rufisque or other family planning projects will have to ensure that partner organizations are committed to working in a facilitative rather than dominant role. Moreover, better synergy among partner organizations that support government initiatives is essential, as is commitment from partners and donors to move from proofs of concepts to proofs of implementation. Their commitment to support genuine government ownership is a precondition for future sustainable scale up.

**The need for continued external financial and technical support:** The districts were able to mobilize some of their own resources to implement new family planning interventions, to organize these activities effectively, and to use data for decision making. Nonetheless, major input of external resources, including transportation costs for community health workers, was essential to implement the interventions and to technically support the process. In countries where governments are able to commit more resources to family planning, as is the case in India for example, mechanisms exist for districts to obtain additional funding for the public-sector program. This is not the case in Senegal, and therefore sustainability and scalability of program innovations require external support.

**The need for longer implementation periods combined with more extensive...**
**Public-sector systems suffering from extensive resource constraints nonetheless have substantial leadership potential.**

**evaluation:** The current case study presents an important first step in moving toward a pattern where family planning innovations are introduced under the direction and with the resources of the DHMTs. The many questions that remain can only be answered with longer periods of implementation, as well as with more extensive evaluation using both qualitative and quantitative methods.

**CONCLUSION**

Among the several outcomes of this case study, none is more important than the extraordinarily positive response from the DHMTs in Diamniadio and Rufisque. Not only were they willing to assume leadership to put in place a range of new family planning interventions, but they were also enthusiastic about the initiative and fully appreciative of the importance of looking for ways to ensure at least some degree of sustainability.

The Diamniadio and Rufisque experience demonstrates that a public-sector system suffering from extensive resource constraints nonetheless contains substantial leadership potential and possibility for mobilizing resources. This potential has been underutilized by externally funded partner organizations who often set up parallel structures to organize family planning services. This is not to imply that such parallel structures are irrelevant. However, government leadership, ownership, and participation must be more deliberately engaged in family planning initiatives at the district level than is often attempted. As Goosby et al. argued in the case of HIV prevention and treatment, “the overall leadership role belongs to the country, not to the external partners.”

The case of Diamniadio and Rufisque shows that it is feasible for districts to play this leadership role in implementing family planning innovations in Senegal, to adapt them where needed, and to mobilize at least some resources from within the health system (i.e., to conduct a proof of implementation). The experience demonstrates that international projects can do more than take the lead in organizing effective interventions; they can also facilitate capacity building within public-sector systems to achieve sustainable interventions, even though a considerable level of external resources may still be essential. The family planning needs of women, men, and adolescents would be better served if such an approach were more widely practiced.

We hope this experience will receive wide discussion and that similar efforts will be undertaken by others. The results and lessons learned are likely to be highly relevant in other countries in Francophone West Africa with low modern contraceptive use and relatively weak family planning programs that are dependent on external support. Wider adoption of the Diamniadio and Rufisque approach could lead to the much-needed institutionalization and subsequent sustainability of successfully tested family planning interventions in countries of the region.

**Acknowledgments:** The authors would like to thank the Bill & Melinda Gates Foundation for funding the ISSU Project, as well as ExpandNet’s support to ISSU, and for their flexibility in allowing the project to explore a new approach in Diamniadio and Rufisque. The authors also gratefully acknowledge the support from the Senegalese Ministry of Health and Social Action, the Directorate of Reproductive Health and Child Survival, and the Directorate of the Dakar Medical Region. The enthusiastic collaboration of the district teams from Diamniadio and Rufisque and their ISSU counterparts as well as the encouragement from Dr. Babacar Gueye and the IntraHealth International team were essential for the work described here. Carol Cissé’s comments and contributions were much appreciated. The authors would like to especially thank Peter Fajans and Sarah Ismail, who provided extensive and extremely valuable support in the preparations and revisions of this paper.

**Competing Interests:** None declared.

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Limited Effectiveness of a Skills and Drills Intervention to Improve Emergency Obstetric and Newborn Care in Karnataka, India: A Proof-of-Concept Study

Beena Varghese,a Jayanna Krishnamurthy,b Blaze Correia,c Ruchika Panigrahi,b Maryann Washington,c Vinotha Ponnuswamy,c Prem Monyc

Skills refresher training combined with emergency drills improved knowledge, skills, and confidence of providers but was not sufficient to improve diagnosis and management of maternal and newborn complications. Systems-level changes, including consistent availability of equipment and supplies, adequate human resource staffing, and supportive supervision, are likely needed to improve maternal and newborn outcomes.

ABSTRACT

Objective: The majority of the maternal and perinatal deaths are preventable through improved emergency obstetric and newborn care at facilities. However, the quality of such care in India has significant gaps in terms of provider skills and in their preparedness to handle emergencies. We tested the feasibility, acceptability, and effectiveness of a “skills and drills” intervention, implemented between July 2013 and September 2014, to improve emergency obstetric and newborn care in the state of Karnataka, India.

Methods: Emergency drills through role play, conducted every 2 months, combined with supportive supervision and a 2-day skills refresher session were delivered across 4 sub-district, secondary-level government facilities by an external team of obstetric and pediatric specialists and nurses. We evaluated the intervention through a quasi-experimental design with 4 intervention and 4 comparison facilities, using delivery case sheet reviews, pre- and post-knowledge tests among providers, objective structured clinical examinations (OSCEs), and qualitative in-depth interviews. Primary outcomes consisted of improved diagnosis and management of selected maternal and newborn complications (postpartum hemorrhage, pregnancy-induced hypertension, and birth asphyxia). Secondary outcomes included knowledge and skill levels of providers and acceptability and feasibility of the intervention.

Results: Knowledge scores among providers improved significantly in the intervention facilities; in obstetrics, average scores between the pre- and post-test increased from 49% to 57% (P=.006) and in newborn care, scores increased from 48% to 56% (P=.03). Knowledge scores in the comparison facilities were similar but did not improve significantly over time. Skill levels were significantly higher among providers in intervention facilities than comparison facilities (mean objective structured clinical examination scores for obstetric skills: 55% vs. 46%, respectively; for newborn skills: 58% vs. 48%, respectively; P<.001 for both obstetric and newborn), along with their confidence in managing complications. However, this did not result in significant differences in correct diagnosis and management of complications between intervention and comparison facilities. Shortage of trained nurses and doctors along with unavailability of a consistent supply chain was cited by most providers as major health systems barriers affecting provision of care.

Conclusions: Improvements in knowledge, skills, and confidence levels of providers as a result of the skills and drills intervention was not sufficient to translate into improved diagnosis and management of maternal and newborn complications. System-level changes including adequate in-service training may also be necessary to improve maternal and newborn outcomes.

a Public Health Foundation of India, Gurugram, India.
b Karnataka Health Promotion Trust, Bangalore, India.
c St. Johns Research Institute, Bangalore, India.
 Correspondence to Beena Varghese (beena.varghese@phfi.org).
BACKGROUND

Over the last decade, the maternal mortality ratio in India has declined by about 35%, from 254 per 100,000 live births in 2005–2007 to 167 in 2011–2013, and the neonatal mortality rate has declined by 28%, from 39 per 1,000 live births in 2005 to 28 in 2015. Levels vary widely across states within the country.2,3

To achieve further declines, both central and state governments have been shifting their focus toward improving the quality of institutional delivery care. The Seventh Common Review Mission of the National Rural Health Mission reported that, although there has been improvements in the labor room conditions and in the availability of essential drugs and supplies, the status of emergency obstetric and newborn care needs further attention in many states, especially in terms of providers’ skill levels in treating maternal and newborn complications.4 A facility assessment conducted during 2010 in Karnataka, a southern state in India, highlighted that non-availability of competent staff and of supplies were the major gaps in emergency obstetric care provision. The assessment recommended improving clinical skills competencies and facility preparedness, especially emergency preparedness through a continuous support mechanism.5 Recent studies on emergency preparedness have reported that emergency obstetric drills have resulted in improvements in the knowledge and skill levels of providers as well as in facility preparedness.6–9

It was thus envisaged that a “skills and drills” intervention—that is, combining refresher training with a series of emergency drills—would help improve the skill levels of providers and strengthen system preparedness to handle obstetric and newborn emergencies. The goal of this proof-of-concept study was to test the feasibility and effectiveness of a skills and drills intervention. The specific objectives were to:

1. Understand acceptability and feasibility of the skills and drills intervention at public facilities in Karnataka, India.
2. Assess the effectiveness of the skills and drills intervention to improve the diagnosis and management of selected maternal and newborn complications consisting of pregnancy-induced hypertension (PIH), postpartum hemorrhage (PPH), and birth asphyxia.

METHODOLOGY

Study Setting and Design

The study was conducted in 2 northern districts (Bagalkot and Koppal) of Karnataka, India. Among the southern states of India, Karnataka reports the highest maternal mortality ratio, at 133 per 100,000 live births (2012–2013), and the second highest infant mortality rate, at 31 per 1,000 live births (2013).2,3 Within Karnataka, the 8 northern districts are economically disadvantaged and have significant disparities in health infrastructure and service delivery compared with the rest of the state.10,11

We used a quasi-experimental design with 4 intervention and 4 comparison facilities within these 2 districts over a 14-month time period (July 2013 to September 2014) to test the effectiveness of the skills and drills intervention. The facilities were sub-district-level government health facilities with basic emergency obstetric and newborn capabilities, with 2 facilities equipped to handle cesarean deliveries. The intervention and comparison facilities were comparable in terms of delivery load, type of deliveries, infrastructure, and human resource capacity (Table 1). We hypothesized that the planned intervention would improve the skill and knowledge levels of providers, improve emergency preparedness, and strengthen team work, resulting in improved diagnosis and management of selected maternal and newborn complications at the intervention facilities.

Intervention

The intervention (at the 4 intervention facilities) included a skills refresher session and emergency drills held every 2 months combined with supportive supervision provided by an external team of trainers who were obstetric and pediatric specialists and nurses. This external team consisted of 10 obstetrics specialists and 10 pediatric specialists along with 8 nurses selected from medical colleges across 3 cities or towns of Karnataka (Bangalore and Mysore cities and Bagalkot town). Each of the selected specialists had more than 10 years of clinical experience in their respective fields and most of them were professors or associate professors at medical colleges; the obstetric and pediatric nurses had more than 5 years of experience in their respective fields and had some public health experience, either serving at public facilities or working in the past with research teams. They
were all apprised of the travel requirement to study facilities, which required an overnight journey for all except for those from Bagalkot. The team of trainers received an orientation over 2.5 days prior to the intervention; the orientation covered disease management protocols, skill stations demonstrations, and drill exercises. The Institute for Clinical Effectiveness and Health Policy, Argentina, provided the training on the emergency drill exercises.

The intervention activities consisted of:

1. **Clinical skills refresher session:** The skills refresher training session (conducted by the external team of obstetricians and pediatricians) was a one-time activity held over 2 days at the 4 intervention facilities. The session focused on technical skills and competence building through didactic sessions and skill stations, covering topics related to physical examination of a woman in labor, active management of third stage of labor (AMTSL), emergency preparedness for complications, immediate newborn care, warm chain and feeding of the newborn, neonatal resuscitation, and supportive care for a sick newborn. Participants included all nurses in the labor rooms as well as medical doctors and specialists (if any were available at these facilities).

2. **Emergency drills:** Once every 2 months, emergency drills for one obstetric complication (either PPH or eclampsia) and one neonatal complication (birth asphyxia) were simulated using a prewritten script; the drills were conducted by a team of 3 trainers (from the external team) comprising an obstetric or pediatric specialist and 2 nurses. The specialist facilitated the drill exercise by providing clinical information relevant to the enacted case scenario while one of the nurses acted as the patient and the other nurse as the patient’s relative; health facility staff members were instructed to respond to the simulated emergency situation as close to the real-life local context as possible. The facilities did not receive any prior notice of when the drills would be conducted. The simulation exercises related to birth asphyxia used a NeoNatalie simulator from Laerdal—an inflatable simulator designed to teach basic neonatal resuscitation skills. Each drill, lasting about 45 minutes, was videotaped and played back to the facility staff. The trainers

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Intervention (n = 4)</th>
<th>Comparison (n = 4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type of facility</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sub-district hospital</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Community health center</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Human resource capacity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Obstetrician/trained in EmOC</td>
<td>6</td>
<td>3</td>
</tr>
<tr>
<td>Pediatrician</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>Physician</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Anesthetist</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Nurses</td>
<td>64</td>
<td>68</td>
</tr>
<tr>
<td>No. of deliveries per quarter, 2013, mean</td>
<td>1,840</td>
<td>1,680</td>
</tr>
<tr>
<td>No. of cesarean deliveries per quarter, 2013, mean</td>
<td>119</td>
<td>98</td>
</tr>
</tbody>
</table>

Abbreviation: EmOC, emergency obstetric care.
conducted a detailed debriefing to identify both health systems issues (such as availability of drugs and supplies) and gaps in skills and team preparedness (such as communication or team rapport).

3. **Supportive supervision:** While the team of trainers conducted the drills, a second team of trainers provided supportive supervision to the facility staff on duty by observing practices such as deliveries, newborn feeding, infection control, and availability of critical drugs and supplies, and reviewing delivery and complication case sheets. Based on observations made during the drills and the supportive supervision, the trainer team then debriefed the facility staff and developed a joint action plan for the next cycle. Each subsequent visit started with a review of the action plan and gaps identified during the previous visit.

### Outcome Measures

The primary outcome measure was the timely and correct diagnosis and management of direct obstetric complications (PPH and pre-eclampsia/eclampsia) and the newborn complication of birth asphyxia. PPH was defined as the loss of 500 mL or more of blood during or within 24 hours of childbirth; pre-eclampsia was defined as systolic blood pressure $\geq 140$ mm Hg or diastolic blood pressure $\geq 90$ mm Hg with proteinuria after 20 weeks gestation in women with a previously normal blood pressure; eclampsia was defined as the presence of convulsions with signs of pre-eclampsia; and birth asphyxia was defined as the failure to establish breathing at birth or not crying at birth.

Secondary outcomes included knowledge and skill levels of the providers related to maternal and newborn care. For obstetrics, we focused on assessment of labor and initial management of hypertensive disorders of pregnancy and post-partum hemorrhage; for newborn care, we focused on infection control, neonatal resuscitation, and care of low birthweight babies. In addition, we measured the acceptability and feasibility of the intervention as perceived by facility providers.

### Data Collection and Data Analysis

Prior to the start of the intervention, a team of specialists along with the project staff introduced a new case sheet in all 8 facilities through a one-day on-site training. This team provided a brief refresher on skilled birth attendance as part of the orientation process and focused on the use of the case sheet as a job aid and for documentation of the delivery process. The case sheet had 2 components: (1) delivery record providing clinical information relevant to delivery care, and (2) complication case sheets providing information on diagnosis and management of maternal and newborn complications, specifically focused on PPH, PIH/eclampsia, and birth asphyxia. Photocopies of the completed case sheets from all 8 study facilities were sent monthly to the project office, which remained the primary source of data on maternal and newborn care practices. Independent obstetric and neonatal experts who were oriented about the study protocols reviewed these case sheets and marked the diagnosis (per study definition) and management (per national health mission protocols) of a complication (primary outcome) as correct, incorrect, or incomplete.

For the secondary outcome of provider knowledge, the providers completed a knowledge questionnaire before and after the intervention. The questionnaire consisted of 21 items on obstetric content (initial assessment and labor, PIH, and PPH) and 15 items on newborn content (infection control, neonatal resuscitation, routine care, and care of low birthweight babies). The maximum score that providers could obtain was 50 (29 points from the obstetric component and 21 points from the newborn component), and they had up to 30 minutes to complete each section. Specialists involved in the development of the training content validated the questionnaire. In the intervention facilities, all participants completed the pretest before the skills refresher session ($n = 73$). The post-intervention test was restricted to those who had taken the pretest and had attended one of the drills sessions ($n = 50$). In the comparison facilities, all nurse providers and medical doctors associated with maternal and newborn care ($n = 36$) took the knowledge tests at the beginning and at the end of the study.

To assess provider skills, we used an objective structured clinical examination (OSCE). For obstetric content, we had 6 observed (32 points) and 4 unobserved (18 points) stations focused on assessing the ability of the staff nurses to identify maternal complications and to begin initial management based on guidelines. For newborn skills, there were 5 observed (36 points) and 5 unobserved stations (14 points) that focused
on assessment of a newborn, resuscitation steps, and care of a low birthweight baby. Participants were expected to complete the tasks in 4 minutes. A team of 4 assessors conducted the skills assessment: at the intervention facilities, 50 staff members who had attended the skills session and at least one drill session took the test; in the comparison facilities, 35 staff associated with labor and newborn care took the test. All assessors (obstetricians, pediatricians, and nurses) attended a standardization workshop and received a checklist so that observations were reliable.

At the end of the intervention period, a descriptive qualitative study involving in-depth interviews (one-on-one and group-based) with the health care providers was carried out at 3 intervention and 2 comparison facilities. The interviews helped understand the experiences of these providers, capture best practices, and highlight some of the main challenges with the intervention. The team of interviewers (4 nurses along with project staff) underwent a 2-day orientation and training process on qualitative methods of data collection and note taking. Teams of 2 interviewers plus 1 project staff member (who served as an observer and note taker) conducted in total 12 semi-structured interviews with 19 participants comprising medical doctors (one-on-one interviews) and staff nurses (group interviews). Informed written consent was obtained from all providers with clear information and instructions provided regarding the objectives and their rights of participation in the interviews. All interviews were recorded except interviews with 2 medical doctors who did not want to be recorded. Most interviews with the doctors were in English while those with the nurses were in the local language of Kannada.

All data from cases sheets were entered into a database using Epi Info (version 3.5.2, 2008). For evaluation purposes, data from November 2013 to October 2014 were analyzed. Descriptive statistics were reported using mean and standard deviation for all the continuous variables and number and percentages for categorical variables. Cross-tabulations were used to compare the categorical variables. For all outcomes of interest, numbers and percentages were compared between 2 groups using a Z test of proportion. A P value less than .05 was considered statistically significant. All the analyses were performed using SPSS 18.

Completed knowledge questionnaires were scored by project staff using an answer key, and completed OSCE sheets were collated and individual scores compiled. The individual knowledge scores and OSCE scores were then entered into Microsoft Excel.

The recordings of the interviews were translated and transcribed; the transcriptions along with the interview notes were analyzed to create topical summaries of the discussion with a special focus on the feasibility and acceptability of the intervention as well as documentation of any changes in obstetric and newborn care practices in the intervention facilities compared with comparison facilities. Figure 1 provides a summary of the overall study design and timeline.

Approval for this study was obtained from the Institutional Ethics Committee at St. Johns Medical College and from the Department of Health and Family Welfare, Karnataka, India. Consent was obtained from each facility in charge prior to the start of the intervention at each facility.

**RESULTS**

**Coverage and Use of Case Sheets**

The large majority of providers in the intervention facilities attended the skills and drills sessions: 97% of the eligible doctors and nurses (9 doctors and 64 nurses) attended the skills refresher session, while 90% of them participated in at least one drill session. From November 2013 to October 2014, 6,452 deliveries were recorded in the 4 intervention facilities and 6,329 deliveries in the 4 comparison facilities. Spontaneous vaginal deliveries were significantly higher in the intervention facilities than in the comparison facilities (78% vs. 67%, respectively) (Table 2). No significant differences in the percentage of maternal or newborn complications were recorded—the percentages ranged around 1%–2% for PPH and birth asphyxia and 4%–5% for PIH. The rate of stillbirths was 9.6 per 1,000 births in the intervention facilities compared with 12.4 per 1,000 births in the comparison facilities (P=.87).

Both intervention and comparison facilities used delivery records for almost all deliveries; however, 87% of records from intervention sites had analyzable data compared with 82% from comparison facilities (Table 2). The use of complication sheets to record diagnosis and management of complications was similar.
**FIGURE 1. Flow Chart Depicting Study Design, Timeline, Tools, and Study Outcomes**

**Intervention**
- 4 sub-district facilities

Delivery and complication case sheets introduced (July 2013)

Pre-intervention provider knowledge test (August 2013)

2-day didactic and skill refresher training in obstetrics and newborn care (August 2013)

4–5 obstetric and newborn drill sessions and supportive supervision visits per facility (every 2 months) (September 2013 to August 2014)

- Case sheet analysis and expert review for PPH, PIH, and birth asphyxia (November 2013 to October 2014)
- Post-intervention knowledge test (September 2014)
- OSCE: observed and unobserved obstetrics and newborn stations (September 2014)
- In-depth interviews with 19 providers from 3 intervention and 2 comparison facilities (October 2014)

**Comparison**
- 4 sub-district facilities

**Usual care**

**Outcomes:**
- Diagnosis and management of selected maternal and newborn complications (PIH, PPH, birth asphyxia)
- Provider knowledge and skill scores
- Acceptability and feasibility of intervention

Abbreviations: OSCE, objective structured clinical examination; PIH, pregnancy-induced hypertension; PPH, postpartum hemorrhage.
across intervention and comparison facilities, except for PIH cases (78% completed in intervention facilities vs. 52% in comparison facilities; \( P < .05 \)). The case sheet analyses showed that the rate of recording of individual parameters was significantly higher in intervention facilities than comparison facilities for almost all maternal and newborn parameters (details available elsewhere).\(^{14}\)

**Correct management of complications**

Correct management of complications was lowest for pregnancy-induced hypertension, at around 20% of cases.

**Secondary Outcomes**

Average knowledge scores among providers were similar between intervention and comparison facilities both before and after intervention (Table 4). However, providers in the intervention facilities showed significant improvement between pre- and post-intervention in their average scores for both obstetric (49% to 57%; \( P = .006 \)) and newborn care practices (48% to 56%; \( P = .03 \)). No such significant changes in knowledge scores were noted among providers across intervention and comparison facilities, respectively, compared with a range of 80% to 92% of PPH and birth asphyxia cases in intervention and comparison facilities. Correct management of complications was lowest for PIH cases (18% in intervention facilities and 20% in comparison facilities) compared with a range of 49% to 60% of PPH and birth asphyxia cases in intervention and comparison facilities.
### TABLE 3. Diagnosis and Management of Maternal and Newborn Complications, Selected Districts of Karnataka, India, November 2013 to October 2014

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Intervention n/N (%)a</th>
<th>Comparison n/N (%)a</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Correct diagnosis</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PIH</td>
<td>107/165 (64.8)</td>
<td>77/128 (60.2)</td>
<td>.43</td>
</tr>
<tr>
<td>PPH</td>
<td>37/42 (88.1)</td>
<td>23/25 (92.0)</td>
<td>.79</td>
</tr>
<tr>
<td>Birth asphyxia</td>
<td>72/90 (80.0)</td>
<td>63/72 (87.5)</td>
<td>.29</td>
</tr>
<tr>
<td>Correct diagnosis and management</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PIH</td>
<td>29/165 (17.6)</td>
<td>25/128 (19.5)</td>
<td>.79</td>
</tr>
<tr>
<td>PPH</td>
<td>25/42 (59.5)</td>
<td>13/25 (52.0)</td>
<td>.72</td>
</tr>
<tr>
<td>Birth asphyxia</td>
<td>52/90 (57.8)</td>
<td>35/72 (48.6)</td>
<td>.40</td>
</tr>
</tbody>
</table>

Abbreviations: PIH, pregnancy-induced hypertension; PPH, postpartum hemorrhage.

a Denominator is the total number of delivery records and complication sheets reviewed.

### TABLE 4. Maternal and Newborn Knowledge and Skills of Providers, Selected Districts of Karnataka, India, Before (August 2013) and After (September 2014) the Skills and Drills Intervention

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Intervention Mean (SD)</th>
<th>%</th>
<th>Comparison Mean (SD)</th>
<th>%</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knowledge scoresa</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pre-test</td>
<td>N = 73</td>
<td>N = 36</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Obstetric (maximum score = 29)</td>
<td>14.2 (4.3)</td>
<td>49</td>
<td>15.2 (3.6)</td>
<td>52</td>
<td>.21</td>
</tr>
<tr>
<td>Newborn (maximum score = 21)</td>
<td>10.2 (3.9)</td>
<td>48</td>
<td>11 (3.0)</td>
<td>52</td>
<td>.30</td>
</tr>
<tr>
<td>Post-test</td>
<td>N = 50</td>
<td>N = 36</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Obstetric (maximum score = 29)</td>
<td>16.4 (4.3)</td>
<td>57</td>
<td>16.6 (3.9)</td>
<td>57</td>
<td>.84</td>
</tr>
<tr>
<td>Newborn (maximum score = 21)</td>
<td>11.6 (3.3)</td>
<td>56</td>
<td>10.4 (3.3)</td>
<td>49</td>
<td>.09</td>
</tr>
<tr>
<td>OSCE scores</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Post-test</td>
<td>N = 50</td>
<td>N = 35</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Obstetric (maximum score = 50)</td>
<td>27.5 (4.9)</td>
<td>55</td>
<td>22.9 (5.8)</td>
<td>46</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Newborn (maximum score = 50)</td>
<td>29 (5.2)</td>
<td>58</td>
<td>24.2 (6.2)</td>
<td>48</td>
<td>&lt;.001</td>
</tr>
</tbody>
</table>

Abbreviations: OSCE, objective structured clinical examination; SD, standard deviation.

a There was a significant increase between pre- and post-test knowledge scores in the intervention group for both obstetric content (49% vs. 57%, respectively; P=.006) and newborn content (48% vs. 56%, respectively; P=.034). In contrast, there were no significant changes between pre-and post-test knowledge scores in the comparison group: obstetric content (52% vs. 57%, respectively; P=.12); newborn content (52% vs. 49%, respectively; P=.42).
in the comparison facilities (Table 4). Providers in the intervention facilities scored significantly higher on the OSCEs than providers in the comparison facilities for both the obstetric skills (55% vs. 46%, respectively; \( P < .001 \)) and newborn skills (58% vs. 48%, respectively; \( P < .001 \)) (Table 4). Within obstetric skills, improvement in skills-related PIH management (62% vs. 44%; \( P < .001 \)) contributed the most to this difference (Figure 2a). In terms of newborn care, all 3 components showed significant differences in scores between intervention and comparison facilities: essential newborn care (55% vs. 47%; \( P < .001 \)); newborn resuscitation program (58% vs. 48%; \( P < .001 \)); and care of low birthweight babies (61% vs. 52%; \( P < .001 \)) (Figure 2b).

During the in-depth interviews, the nursing staff indicated this intervention was acceptable and feasible, especially the drills component. They also reported on the usefulness of case sheets in improving documentation, although they all reported having had concerns initially.
with regard to workload. Almost all the respondents said that the case sheets had all the details required for assessment and management of the cases, which guided them further. Two of the senior staff nurses from a Taluk hospital said:

Actually, it [the case sheets] has helped us in our work. We can be acquainted with what we are doing. ... We can decide what we should do further. ... So it guides us as to how to proceed in a case.

With regard to skills refresher sessions, most of the nurses found the demonstration of the activities and practical sessions at the skills stations to be useful for refreshing their knowledge and skills.

It [the skills refresher sessions] was useful because it refreshes our skills since we forget some of the skills. We can remember all such skills and apply [them] into our regular practice.

The providers reported that drills training was very different from any other training they had received previously because the drills training focused on and improved their teamwork. Most of the nurses said that their teamwork and confidence level for managing complications had improved, which in turn reduced the need for referrals of some of the complications. They also highlighted that the drills prompted them to prepare emergency trays for PPH and PIH.

Prior to the training we were not aware of effective teamwork. ... Some of us would have forgotten a few things, but yesterday [during PPH case management drills] as it was teamwork, even if one of us forgot something, others would remind them about those things.

Medical doctors, administrators, and many of the nurses focused on some of the major health systems challenges that hindered their ability to function optimally, including shortage of trained staff, rotation of nurses across departments, and inconsistent availability of drugs and supplies.

**DISCUSSION**

This proof-of-concept study showed that the skills and drills intervention resulted in some improvement in knowledge, skills, and confidence of providers (as depicted from knowledge and OSCE scores, as well as in-depth interviews). However, it was not adequate to result in significant improvements in diagnosis and management of maternal and newborn complications. It is, however, important to note that the level of documentation of maternal and newborn complications (as a percentage of total deliveries) was low and remained similar in both intervention and comparison facilities. The recorded rates of complications were 1% for PPH, 2% for birth asphyxia, and 4%–5% for PIH. This was much lower than the reported rates of 10%–15% from surveys done elsewhere in India. This may be due to a variety of reasons. For example, many of the nurse providers mentioned that they usually do not record complications that they manage successfully. In addition, they mentioned that with improved management of third stage of labor, PPH cases have dropped significantly. Other reasons may include the punitive nature of the health care system, which discourages staff members from documenting events accurately for fear of being penalized.

On the other hand, the average knowledge and OSCE scores at around 50% to 60%, even after the intervention, and correct management of complications at around 20% are perhaps indicative of the need for a more comprehensive systems-wide approach, including but not limited to improved content, methods, and evaluation of both pre-service and in-service training of these providers. A recent study in Uganda showed that to improve nurses’ documentation, apart from documentation redesign and continuous trainer support, broader changes were necessary including building a critical mass of competent staff, continuous education, and changes in nurse skill.

Reports from studies that have evaluated training programs in India have emphasized the need for dedicated personnel and a trainee tracking system to ensure quality training management and implementation. They have also showed that strengthening essential supplies and supportive supervision is critical to practice and to retain the newly acquired skills. In other words, systems-level inadequacies related to human resources, governance, and supplies contribute to poor adherence to guidelines, which affects quality of care. Such issues were reported across various facilities in this study including unavailability of specialists, vacancies in key positions, rotation of nursing staff between departments, lack of clear accountability within the system due to

Although the skills and drills intervention results in some improvement in knowledge, skills, and confidence of providers, it was not sufficient to improve diagnosis and management of maternal and newborn complications.
inadequate supervision, and inconsistent availability of equipment and supplies.

Limitations
Our study findings are limited by the following issues:

- A quasi-experimental evaluation design, in which intervention and evaluation occurred simultaneously during a 1-year time frame: Ideally, a longer intervention period followed by evaluation perhaps would have provided more clarity on the impact of such an intervention. However, as a proof of concept, the intervention was not designed for full-scale evaluation.
- Insufficient focus on the skills of providers: The state government preferred a short skills refresher session over a week-long training session. It is unclear, however, if a 1–2-day skills refresher session along with 4–5 visits by experts over the 1-year period was sufficient to bring about the minimum change in provider behavior necessary to have an impact on the defined outcomes.
- Inadequate monitoring system: The study could have benefited from a more robust monitoring and feedback system from trainers, so that issues with management of complications could have been identified during their visits.
- Other limitations related to study design include the absence of baseline OSCE scores, the inability to link knowledge scores with individuals, and the paucity of information on mortality outcomes. The focus of the study was on ensuring that the drills—a new concept for facilities—were planned and executed properly; thus, some of the monitoring aspects of the intervention were lacking.

CONCLUSION
The skills and drills intervention designed as a proof-of-concept study was feasible and acceptable and had some positive impact on maternal and newborn knowledge and skills of providers. However, although all nurses reported a marked improvement in their capacity and confidence to handle complications, this did not translate to improved diagnosis and management of maternal and newborn complications. For long-term and sustainable improvements in quality of maternal and newborn care, changes in knowledge and skills of providers, although necessary, may not be sufficient unless combined with policies to address systems-level inadequacies such as those related to supportive supervision and availability of drugs and supplies.

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Key Role of Drug Shops and Pharmacies for Family Planning in Urban Nigeria and Kenya
Meghan Corroon,a Essete Kebede,b Gean Spektor,a Ilene Speizer,a,c

Pharmacies and drug shops provide a rich opportunity for expanding family planning access to urban women, especially unmarried and younger women. In urban Nigeria and Kenya, drug shops and pharmacies were the major sources for most short-acting methods, including oral contraceptive pills, emergency contraceptives, and condoms.

ABSTRACT
Background: The Family Planning 2020 initiative aims to reach 120 million new family planning users by 2020. Drug shops and pharmacies are important private-sector sources of contraception in many contexts but are less well understood than public-sector sources, especially in urban environments. This article explores the role that drug shops and pharmacies play in the provision of contraceptive methods in selected urban areas of Nigeria and Kenya as well as factors associated with women’s choice of where to obtain these methods.

Methods: Using data collected in 2010/2011 from representative samples of women in selected urban areas of Nigeria and Kenya as well as a census of pharmacies and drug shops audited in 2011, we examine the role of drug shops and pharmacies in the provision of short-acting contraceptive methods and factors associated with a woman’s choice of family planning source.

Results: In urban Nigeria and Kenya, drug shops and pharmacies were the major source for the family planning methods of oral contraceptive pills, emergency contraceptives, and condoms. The majority of injectable users obtained their method from public facilities in both countries, but 14% of women in Nigeria and 6% in Kenya obtained injectables from drug shops or pharmacies. Harder-to-reach populations were the most likely to choose these outlets to obtain their short-acting methods. For example, among users of these methods in Nigeria, younger women (<25 years old) were significantly more likely to obtain their method from a drug shop or pharmacy than another type of facility. In both countries, family planning users who had never been married were significantly more likely than married users to obtain these methods from a drug shop or a pharmacy than from a public-sector health facility. Low levels of family planning-related training (57% of providers in Kenya and 41% in Nigeria had received training) and lack of family planning promotional activities in pharmacies and drug shops in both countries indicate the need for additional support from family planning programs to leverage this important access point.

Conclusions: Drug shops and pharmacies offer an important and under-leveraged mechanism for expanding family planning access to women in urban Nigeria and Kenya, and potentially elsewhere. Vulnerable and harder-to-reach groups such as younger, unmarried women and women who do not yet have children are the most likely to benefit from increased access to family planning at drug shops and pharmacies.

INTRODUCTION
The Family Planning 2020 (FP2020) initiative aims to expand access to family planning information, services, and supplies with the ambitious goal of increasing the number of new family planning users by 120 million women and girls by 2020. This initiative builds upon the wider ongoing global movement toward reproductive rights and universal access to...
sexual and reproductive health services, as also seen in the recent Sustainable Development Goals.\(^2\)

As focus countries of the FP2020 initiative, Nigeria and Kenya made commitments to improve access to family planning at the London Summit on Family Planning in 2012. Specifically, the government of Nigeria committed to increasing the national contraceptive prevalence rate to 36% by 2018.\(^3\) In 2013, 10% of currently married women ages 15–49 were using modern contraceptive methods, representing an increase of nearly 6 percentage points from 1990 and 2 percentage points from 2003.\(^4,5\) Unmet need for family planning— that is, the percentage of married women who report that they want to delay or limit childbearing but are not using a family planning method— was 16% in 2013.\(^6\) While this unmet need level combined with low CPR suggests low overall demand for family planning, with a projected growth in population to almost 400 million people by 2050, the family planning needs become immense.\(^6\)

The Government of Kenya committed to increasing the contraceptive prevalence rate from 46% in 2009 to 56% in 2015 and 70% in 2030. In 2014, 53% of currently married women ages 15–49 were using modern contraceptive methods; this is an increase of 21 percentage points from 2003 and 14 percentage points from 2008–09.\(^7,8\) Unmet need was 18% in 2014, suggesting continued demand for family planning even in the context of higher use.

In both Nigeria and Kenya in the most recent Demographic and Health Surveys, most of the method use is comprised of shorter-acting methods, such as injectable contraceptives, condoms, and oral contraceptive pills, rather than long-acting reversible contraceptives (LARCs) or sterilization. In Nigeria, about 86% of current contraceptive users ages 15–49 are using one of the following short-acting modern methods: male condoms (44%), injectables (24%), or oral contraceptive pills (18%).\(^6\) Likewise in Kenya, 80% of women ages 15–49 using a modern method are using either injectables (54%), pills (17%), or male condoms (9%).\(^8\) These methods are often available outside formal medical facilities and expansion of access to these methods by the non-medical sector could lead to significant increases in method use.\(^9\)

Expanding access to contraceptive methods through the private sector and community-based sources—which includes task sharing (or task shifting)—is an important strategy to help achieve national FP2020 goals and, in particular, aims to reduce barriers to access for youth and lower-income and other marginalized groups of potential family planning users.\(^10\) Pharmacies and drug shops (also known as chemists or proprietary patent medicine vendors [PPMVs] in Nigeria) are often preferred by young, single, and other underserved populations.\(^11,12\) Shifting contraceptive services across different types of supply outlets can increase access for potential family planning users.\(^13\) Pharmacies and drug shops offer easy access to a number of common contraceptive methods including condoms, oral contraceptive pills, and emergency contraception. Women are able to purchase injectable contraceptives in some contexts in the private non-medical sector, but they are often not able to obtain the injection at the same site; however, regulations are beginning to change to expand access.\(^9,14\)

Drug shops are privately owned outlets that sell nonprescription drugs. While the legal criteria of drug shops vary by country, usually they are permitted to sell prepackaged patent drugs that are considered to be safe for public use.\(^12,14,15,16\) Notably, they are generally not allowed to dispense drugs outside of their manufacturer package unlike pharmacies.\(^9,12,16\) In the context of Nigeria, pharmacies and drug shops are distinct. Kenyan law recognizes only pharmacies as a component of the private health sector; however, unregistered pharmacies, also called chemists or drug shops, are widespread.\(^16,17\) These drug shops are not in the Kenyan legal structure and thus are not overseen by government regulatory agencies.

Pharmacies in sub-Saharan Africa are usually larger in size than drug shops, carry a wider array of products, and are operated by licensed pharmacists who are authorized to sell both prescription and non-prescription medicines.\(^18\) Compared with pharmacies, drug shops frequently operate with staff with lower levels of training.\(^18\) Shortages of trained manpower have limited the number of pharmacies in sub-Saharan Africa; consequently, many countries permit licensed drug shops to offer a limited range of medicines to increase access to more medicines.\(^18\) In general, drug shops and pharmacies are convenient because they are usually neighborhood-based; sometimes more affordable compared with other private facilities; have
the ability to provide services rapidly; operate long hours including weekends; and sometimes offer services in a more confidential manner than other types of sources.9,12,15

In many cases, drug shops and pharmacies are more accessible to marginalized groups including rural populations and the urban poor.9,11,12,15 A study among sexually active women in rural and urban Nigeria showed that younger respondents, single people, Catholics, and Muslims preferred to obtain contraceptives from drug shops than other sources; by contrast, older groups and married respondents made use of hospitals.10 A study among clients who purchased emergency contraceptives from private pharmacies in urban areas of Kenya shows that about three-fourths were between ages 20 and 29.17 These results are expected given that unmarried women tend to use short-acting methods such as oral contraceptives and condoms, and drug shops and pharmacies are important access points for these methods.12,15 Conversely, married women may be more likely to use long-acting methods, which are predominately available in clinics and hospitals. Moreover, in societies where premarital sex is strongly discouraged, adolescents and unmarried individuals are less likely to get services at conventional health facilities. In addition to provision of contraceptive commodities, evidence shows that drug shops provide family planning information and counseling to their clients.11,12,14,15,16 An observational study on interactions between drug shops and customers in urban and rural Nigeria showed that 25% of the clients interviewed saw drug shops as a source of advice.16

In this article, we examine the role of the private sector (drug shops and pharmacies) in the provision of family planning methods in selected urban areas of Nigeria and Kenya. We examine factors predictive of using a short-acting method and factors related to where women choose to obtain their method. We also incorporate facility-level data to examine the characteristics of drug shops and pharmacies in these urban settings. A better understanding of private-sector user characteristics along with a more detailed description of private-sector sources of contraceptives can inform programs and strategies to improve access to family planning services in complex urban environments.

METHODS

The Urban Reproductive Health Initiative, funded by the Bill & Melinda Gates Foundation, aimed to increase modern contraceptive use in selected urban areas of India, Kenya, Nigeria, and Senegal from 2009 to 2014. The initiative in Kenya, known as Tupange, undertook activities in 5 cities: Kakamega, Kisumu, Machakos, Mombasa, and Nairobi. In Nigeria, the initiative was known as the Nigerian Urban Reproductive Health Initiative, which worked in 6 cities: Abuja, Benin City, Ibadan, Ilorin, Kaduna, and Zaria.

The Measurement, Learning & Evaluation (MLE) project was the evaluation component of the Urban Reproductive Health Initiative. Led by the Carolina Population Center at the University of North Carolina (UNC) at Chapel Hill, MLE promoted evidence-based decision making for the initiative through rigorous evaluation methods including a series of longitudinal surveys conducted at baseline, mid-term, and endline. MLE received Institutional Review Board (IRB) approval to conduct the Kenya surveys by the Kenya Medical Research Institute as well as the UNC IRB. MLE received approval to conduct the Nigerian surveys from the Nigeria Ministry of Health Ethics Review Board and the UNC IRB.

Data and Measures

The MLE baseline surveys collected data on women and men of reproductive age as well as health facilities, health service providers, reproductive health clients, pharmacies, and drug shops. This study draws on data from women, men, pharmacies, and drug shops, collected as part of the MLE baseline surveys in Nigeria and Kenya in 2010/2011.

Both the Nigeria and Kenya women’s baseline surveys used a 2-stage cluster sampling approach to select a representative sample of households and women of reproductive age from each project city. In the first stage, a random sample of clusters (or primary sampling units) was selected for each city based on probability proportional to size of the population. In the second stage, a random sample of households was selected in each cluster (41 and 30 households per cluster in Nigeria and Kenya, respectively). All women ages 15–49 in the selected households were eligible for the interview. In Nigeria, a total of 16,144 women successfully completed an interview across the
6 cities between October 2010 and March 2011. In Kenya, a total of 8,932 women completed the interviews across the 5 cities between August 2011 and October 2011. Because of our interest in examining women’s use of short-acting methods and the sources of these methods, only women who had sex in the last year in Nigeria and Kenya were included in this analysis. The final weighted sample size of women who had sex in the last year in Nigeria was 11,930, and in Kenya 7,085.

The Nigeria PPMV and pharmacy data were collected between February 2011 and June 2011 from a total of 433 pharmacies and 555 PPMVs. A simple random sampling procedure was used to draw 100 pharmacies per city from an updated master list of pharmacies. However, this target was met only in Abuja and Kaduna, where the compiled list of pharmacies outnumbered the sample required. In the other 4 cities, a census of pharmacies was conducted. The pharmacy data were collected from 97 pharmacies in Ibadan, 96 pharmacies in Abuja, 89 pharmacies in Benin City, 80 pharmacies in Kaduna, 48 pharmacies in Ilorin, and 23 pharmacies in Zaria.

A sample of 100 PPMVs was randomly selected in each city from a compiled list of all PPMVs in Nigeria. However, in Abuja, where there were fewer PPMVs, all listed PPMVs were included in the survey sample. Ultimately, the PPMV data included 96 PPMVs in Zaria, 95 in Benin City, 94 in Abuja, and 90 each in Ibadan, Ilorin, and Kaduna. The total number successfully interviewed differs slightly from the intended 100 per city because some facilities on the list refused to participate in the survey or were closed.

In Kenya, the MLE baseline data collection combined both drug shops and pharmacies into one domain because we were not able to distinguish between drug shops and pharmacies for the purposes of this program evaluation. The Kenya baseline pharmacy/drug shop data were collected between August 2011 and October 2011 from a total of 223 pharmacies and drug shops across the 5 cities. In Mombasa and Nairobi, a random sample of 100 facilities was selected, whereas in Kakamega, Kisumu, and Machakos, a census of registered and operational pharmacies and drug shops was conducted. Ultimately, 62 pharmacies/drug shops completed interviews in Nairobi, 56 in Kisumu, 45 in Kakamega, 40 in Mombasa, and 30 in Machakos. Notably, the number of pharmacies/drug shops included in Mombasa and Nairobi was well below the 100 target because many of the smaller sites (i.e., drug shops) were not found, closed, or unavailable at the time of interview.

**Variables**

The primary outcome of interest in this study was women’s source of short-acting methods in selected urban areas of Nigeria and Kenya. As women who use these methods are likely different than women who use longer-acting methods or women who are non-users, we focused our attention on women using short-acting methods that can be supplied in pharmacies and drug shops. For descriptive purposes, we categorized women as short-acting method users versus long-acting method users, traditional method users, or non-users. Short-acting methods were defined as combined oral contraceptive pills, progestin-only contraceptive pills, male condoms, female condoms, injectables, emergency contraceptive pills, and spermicide. Long-acting methods included the implant, the intrauterine device (IUD), and the small number of women or their partners who were sterilized. Traditional method use included withdrawal, abstinence, and the Standard Days Method (SDM). Although SDM is generally considered a modern method, it was included as a traditional method in the baseline survey but was separated out in later rounds of data collection. For the purposes of this analysis, users of the lactational amenorrhea method (LAM) were coded as non-users (although it is also generally considered a modern method) since this is not a method that needs to be sourced from a facility.

Women’s sources of contraceptive methods were categorized as public facilities, private facilities, pharmacies, drug shops, and “other.” Public facilities included government hospitals, government health centers, government dispensaries, and other public-sector services. Private facilities included faith-based hospitals/clinics, private hospital/clinics, nursing/maternity homes, community health workers/traditional birth attendants, traditional healers, and other private facilities. “Other” sources included women who did not know where the method came from, such as women who acquired methods from husbands, boyfriends, fiancés, friends, or shops, or women who did
not respond to the question. As mentioned earlier, pharmacies and drug shops were not distinguished in Kenya while in Nigeria, these are classified as 2 distinct groups with drug shops also being called PPMVs or chemists. For the multivariate analyses for Nigeria, we grouped the pharmacies and drug shops together, while for descriptive analyses these are kept separate. This was based on the descriptive similarities between drug shops and pharmacies in Nigeria and to facilitate comparison with the Kenya results presented.

The independent variables in this analysis included women’s age, marital status, wealth, education, city of residence, religion, and whether or not she had any living children at the time of interview. As mentioned earlier, all women who had sex in the last year were included in the initial analysis of who was using a short-acting method; however, for the analysis of source of short-acting methods the sample was reduced to only women who reported a short-acting method as their current method.

Analysis
We used descriptive statistics to examine the sample of women in selected urban areas of Nigeria and Kenya who have had sex in the last year by background demographic characteristics, contraceptive use patterns, and source of contraceptive method. On the supply side, we described a variety of outlet characteristics for pharmacies and drug shops in both countries as well as provision of family planning, staff training, and family planning prescription requirements.

We used multinomial regression to analyze factors related to women’s choice of short-acting method source. All models controlled for demographic factors as outlined earlier. All women-level descriptive analyses were weighted using country-specific cross-city weights, and all multivariate analyses adjusted for clustering in the study design.

RESULTS
In this section, we begin by describing the sample of women living in urban study areas in Nigeria and Kenya including their background demographic characteristics and their patterns of contraceptive use, which is particularly relevant to private-sector provision. Then we examine women’s source of short-acting methods and factors associated with this choice.

Women’s Background Characteristics
Table 1 presents the background characteristics of the women who had sex in the last year in selected cities in Nigeria and Kenya. In both countries, a greater proportion of women were 25–34 years old compared with other age categories. The vast majority of women had some level of schooling (about 86% of the women in Nigeria and 94% in Kenya). Christianity was the predominant religion in Kenya (about 89%), whereas in Nigeria the distribution was split almost equally in half between Christians and Muslims. Most of the women who had sex in the last year in Nigeria (81%) and in Kenya (69%) were in union, and less than a quarter (15% in Nigeria and 22% in Kenya) had never been married. Similar proportions of women in Nigeria and Kenya (about 80%) had at least one living child. In Nigeria, the percentage distribution of women’s city of residence ranged from 12% in Zaria to 24% in Kaduna. In contrast, Kenya had a greater weighted proportion of women from Nairobi (73%), with the lowest percentage coming from Machakos (1%).

Contraceptive Use
Current use of a contraceptive method among women who had sex in the last year is shown at the bottom of Table 1. At baseline, 23% of women in Nigeria and 43% of women in Kenya were using a short-acting method. Use of natural or traditional methods was higher in Nigeria at 11%, compared with 6% in Kenya. Among short-acting method users in Nigeria, the majority (52%) were using the condom followed by injectables (26%) and the oral contraceptive pill (about 14%). In Kenya, the most commonly used short-acting method was the injectable (50%) followed by the oral contraceptive pill (28%) and then condoms (19%). The method distinction is relevant because, as mentioned earlier, drug shops and pharmacies have more regulatory barriers to the provision of injectables than other short-acting methods.

Women’s Method Source
Table 2 presents a description of where women obtained their short-acting methods at the time of the baseline survey. In Nigeria, drug shops were the major source of short-acting methods...
<table>
<thead>
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<th>Characteristic</th>
<th>Nigeria (N = 11,930)</th>
<th>Kenya (N = 7,085)</th>
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<tr>
<td></td>
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<td>No. (%)</td>
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<td>1584 (22.4)</td>
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<td>4884 (68.9)</td>
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</table>

*Continued*
including oral contraceptive pills, emergency contraceptives, and condoms. In Kenya, pharmacies/drug shops were the most common single source of these same short-acting methods. The majority of injectable users obtained their method from public facilities in both countries, with only about 14% of women in Nigeria and 6% in Kenya obtaining injectables from pharmacies or drug shops. Nearly 8% of women in Nigeria did not know the source of their method; this likely reflects the husband/partner obtaining condoms. Although results are not shown here, the MLE survey did collect data from men on source of contraceptive method and, similar to women, men reported that the majority of condoms were obtained from a pharmacy or drug shop.

Drug Shop and Pharmacy Characteristics

Characteristics of drug shops and pharmacies in selected cities in Nigeria and Kenya are presented in Table 3. In Nigeria, many characteristics of pharmacies and drug shops were similar, including operating times and days of the week, proportion of interviewed staff that have ever received family planning training, and distribution of number of years in operation; drug shops tended to be a bit newer than pharmacies with 32% less than 5 years old compared with 20% of pharmacies. The vast majority of both pharmacies and drug shops in Nigeria offered family planning (96% and 87%, respectively) but less drug shops had family planning promotional materials on

---

**TABLE 1. Continued**

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Nigeria (N = 11,930)</th>
<th>Kenya (N = 7,085)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>City (Nigeria/Kenya)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Abuja/Nairobi</td>
<td>1594 (13.4)</td>
<td>5150 (72.7)</td>
</tr>
<tr>
<td>Benin City/Mombasa</td>
<td>1564 (13.1)</td>
<td>1325 (18.7)</td>
</tr>
<tr>
<td>Ibadan/Kisumu</td>
<td>2487 (20.8)</td>
<td>382 (5.4)</td>
</tr>
<tr>
<td>Ilorin/Machakos</td>
<td>1993 (16.7)</td>
<td>103 (1.4)</td>
</tr>
<tr>
<td>Kaduna/Kakamega</td>
<td>2853 (23.9)</td>
<td>126 (1.8)</td>
</tr>
<tr>
<td>Zaria/NA</td>
<td>1440 (12.1)</td>
<td>NA</td>
</tr>
<tr>
<td><strong>Current contraceptive use</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No method</td>
<td>7409 (62.1)</td>
<td>3116 (44.0)</td>
</tr>
<tr>
<td>Long-acting method</td>
<td>406 (3.4)</td>
<td>508 (7.2)</td>
</tr>
<tr>
<td>Short-acting method</td>
<td>2750 (23.1)</td>
<td>3048 (43.0)</td>
</tr>
<tr>
<td>Natural/traditional methods</td>
<td>1365 (11.4)</td>
<td>413 (5.8)</td>
</tr>
<tr>
<td><strong>Type of short-acting method among short-acting method users</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Injectable</td>
<td>722 (26.2)</td>
<td>1511 (49.6)</td>
</tr>
<tr>
<td>Oral contraceptive pill</td>
<td>372 (13.5)</td>
<td>860 (28.2)</td>
</tr>
<tr>
<td>Emergency contraception</td>
<td>214 (7.8)</td>
<td>87 (2.9)</td>
</tr>
<tr>
<td>Condom</td>
<td>1440 (52.4)</td>
<td>589 (19.3)</td>
</tr>
<tr>
<td>Spermicide</td>
<td>3 (0.1)</td>
<td>0 (0.0)</td>
</tr>
</tbody>
</table>

Note: All analyses are weighted; unweighted total for Nigeria was 11,873, and for Kenya 7,226.

<table>
<thead>
<tr>
<th>Source</th>
<th>Injectable (n = 722)</th>
<th>OCP (n = 372)</th>
<th>EC (n = 214)</th>
<th>Condom (n = 1440)</th>
<th>Other modern (n = 3)</th>
<th>Total short-acting (N = 2750)</th>
<th>Injectable (n = 1511)</th>
<th>OCP (n = 860)</th>
<th>EC (n = 87)</th>
<th>Condom (n = 587)</th>
<th>Total short-acting (N = 3048)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Public facility</td>
<td>60.5</td>
<td>20.9</td>
<td>2.9</td>
<td>4.6</td>
<td>68.7</td>
<td>21.4</td>
<td>50.8</td>
<td>30.6</td>
<td>10.4</td>
<td>9.2</td>
<td>35.9</td>
</tr>
<tr>
<td>Private facility</td>
<td>22.3</td>
<td>4.2</td>
<td>3.3</td>
<td>2.4</td>
<td>31.3</td>
<td>8.0</td>
<td>42.7</td>
<td>25.5</td>
<td>9.0</td>
<td>10.1</td>
<td>30.6</td>
</tr>
<tr>
<td>Pharmacy (Nigeria); Pharmacy/drug shop (Kenya)</td>
<td>3.4</td>
<td>22.3</td>
<td>32.6</td>
<td>27.6</td>
<td>0.0</td>
<td>20.9</td>
<td>6.2</td>
<td>43.7</td>
<td>76.5</td>
<td>75.0</td>
<td>32.1</td>
</tr>
<tr>
<td>Drug shop/PPMV (Nigeria)</td>
<td>10.6</td>
<td>49.0</td>
<td>52.4</td>
<td>46.4</td>
<td>0.0</td>
<td>37.8</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>Other</td>
<td>0.6</td>
<td>0.3</td>
<td>1.0</td>
<td>7.5</td>
<td>0.0</td>
<td>4.4</td>
<td>0.0</td>
<td>0.2</td>
<td>0.0</td>
<td>1.4</td>
<td>0.4</td>
</tr>
<tr>
<td>Don’t know/missing</td>
<td>2.6</td>
<td>3.2</td>
<td>7.8</td>
<td>11.5</td>
<td>0.0</td>
<td>7.8</td>
<td>0.3</td>
<td>0.0</td>
<td>4.1</td>
<td>4.2</td>
<td>1.1</td>
</tr>
<tr>
<td>Total</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Abbreviations: EC, emergency contraception; OCP, oral contraceptive pill; PPMV, proprietary patent medicine vendor.

<table>
<thead>
<tr>
<th></th>
<th>% of Nigerian Pharmacies (n = 433)</th>
<th>% of Nigerian Drug Shops (n = 555)</th>
<th>% of Kenyan Pharmacies/Drug Shops (n = 223)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Number of years open/in operation</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Less than 5</td>
<td>19.6</td>
<td>31.9</td>
<td>42.2</td>
</tr>
<tr>
<td>5 to 10</td>
<td>31.2</td>
<td>34.8</td>
<td>21.1</td>
</tr>
<tr>
<td>11 to 15</td>
<td>15.9</td>
<td>14.8</td>
<td>15.7</td>
</tr>
<tr>
<td>More than 15</td>
<td>16.9</td>
<td>12.3</td>
<td>11.7</td>
</tr>
<tr>
<td>Don’t know</td>
<td>16.2</td>
<td>6.1</td>
<td>9.4</td>
</tr>
<tr>
<td>Missing</td>
<td>0.2</td>
<td>0.2</td>
<td>0.0</td>
</tr>
<tr>
<td><strong>Number of operating hours per day</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Less than 5</td>
<td>0.2</td>
<td>0.5</td>
<td>1.4</td>
</tr>
<tr>
<td>5 to 10</td>
<td>13.2</td>
<td>16.6</td>
<td>26.5</td>
</tr>
<tr>
<td>11 to 15</td>
<td>73.2</td>
<td>72.4</td>
<td>66.8</td>
</tr>
<tr>
<td>More than 15</td>
<td>13.4</td>
<td>9.9</td>
<td>4.0</td>
</tr>
<tr>
<td>Missing</td>
<td>0.0</td>
<td>0.5</td>
<td>1.4</td>
</tr>
<tr>
<td><strong>Number of operating days per week</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>1.2</td>
<td>0.7</td>
<td>2.7</td>
</tr>
<tr>
<td>6</td>
<td>47.1</td>
<td>41.8</td>
<td>45.7</td>
</tr>
<tr>
<td>7</td>
<td>51.7</td>
<td>57.3</td>
<td>49.8</td>
</tr>
<tr>
<td>Missing</td>
<td>0.0</td>
<td>0.2</td>
<td>1.8</td>
</tr>
<tr>
<td><strong>Number of regular, permanent staff</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Less than 5</td>
<td>69.8</td>
<td>92.4</td>
<td>79.8</td>
</tr>
<tr>
<td>5 to 10</td>
<td>22.6</td>
<td>1.6</td>
<td>11.7</td>
</tr>
<tr>
<td>11 to 15</td>
<td>1.9</td>
<td>0.0</td>
<td>5.4</td>
</tr>
<tr>
<td>More than 15</td>
<td>3.0</td>
<td>0.0</td>
<td>1.8</td>
</tr>
<tr>
<td>Missing</td>
<td>2.8</td>
<td>6.0</td>
<td>1.4</td>
</tr>
<tr>
<td><strong>Outlet provides family planning methods</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>95.8</td>
<td>87.0</td>
<td>98.2</td>
</tr>
<tr>
<td>No</td>
<td>3.0</td>
<td>12.6</td>
<td>1.8</td>
</tr>
<tr>
<td>Missing/Don’t know</td>
<td>1.2</td>
<td>0.4</td>
<td>0.0</td>
</tr>
</tbody>
</table>

Continued
display at the time of interview (33% of pharmacies and 20% of drug shops).

In Kenya, the pharmacies and drug shops were relatively newly established, with more than 40% in operation for less than 5 years. As in Nigeria, almost all of the Kenyan outlets were open 6 or 7 days a week and about 67% were open 11–15 hours per day. The majority (about 80%) of pharmacies and drug shops in Kenya were small with less than 5 employees, and almost all (98%) provided family planning methods. A greater proportion (about half) of outlets in Kenya had family planning promotional materials on display at the time of audit, and 57% of those interviewed had received family planning training compared with slightly lower rates (41%) in Nigeria.

**Drug Shop and Pharmacy Provision of Family Planning**

Pharmacies and drug shops that usually sell contraceptive methods were asked to list the modern methods they routinely provide in their shops.

<table>
<thead>
<tr>
<th>Method Offered</th>
<th>% of Nigerian Pharmacies (n = 415)</th>
<th>% of Nigerian Drug Shops (n = 483)</th>
<th>% of Kenyan Pharmacies/Drug Shops (n = 219)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Injectable</td>
<td>69.6</td>
<td>20.1</td>
<td>68.0</td>
</tr>
<tr>
<td>Combined oral pill</td>
<td>76.6</td>
<td>64.8</td>
<td>98.2</td>
</tr>
<tr>
<td>Progestin-only pill</td>
<td>4.3</td>
<td>1.9</td>
<td>14.6</td>
</tr>
<tr>
<td>Emergency contraception</td>
<td>70.4</td>
<td>37.9</td>
<td>92.7</td>
</tr>
<tr>
<td>Male condom</td>
<td>98.8</td>
<td>98.1</td>
<td>93.6</td>
</tr>
<tr>
<td>Female condom</td>
<td>31.8</td>
<td>14.1</td>
<td>5.9</td>
</tr>
<tr>
<td>Spermicide</td>
<td>1.5</td>
<td>0.4</td>
<td>NA</td>
</tr>
</tbody>
</table>
Male condoms were the most widely available method in Nigeria (>98%), whereas combined oral pills, condoms, and emergency contraception were all widely available (>90%) in Kenya (Table 4). Close to 70% of pharmacies in Nigeria and pharmacies and drug shops in Kenya offered injectables while only 20% of drug shops in Nigeria offered this method. Emergency contraceptives and progestin-only pills were more widely available in Kenya than in Nigeria; in contrast, a greater percentage of facilities (pharmacies at 32% and drug shops at 14%) in Nigeria offered female condoms compared with Kenya (6%).

Table 5 features information on prescription requirements by method and type of outlet. In Nigeria, regardless of facility type, 39% to 56% of interviewed staff reported requiring a prescription for injectables, progestin-only pills, or combined oral pills. While condoms were the least restricted method in both countries, 14% of pharmacy respondents and 12% of drug shops in Nigeria reported that a prescription was required to offer the male condom. In Kenya, 56% required a prescription for injectables, 34% required a prescription for progestin-only pills, and 25% for combined oral pills.

Factors Associated With Where Women Obtained Short-Acting Methods

Focusing now on users of short-acting methods who had sex in the last year, Table 6 and Table 7 present multinomial logistic regression results comparing sources of these methods in Nigeria and Kenya. The small number of women who did not know or did not respond to the question of where they obtained their method were included as a separate category in the model but are not shown in the comparisons presented.

Multiple comparisons are shown in both tables: drug shops/pharmacies compared with public facilities (Column 1); drug shops/pharmacies compared with private facilities (Column 2); and public vs. private facilities (Column 3). In both Nigeria and Kenya, unmarried women and women with no living children were significantly more likely to get their short-acting methods from a drug shop or pharmacy than from the public sector (and in Kenya, private facilities as well) compared with women in union or those with any children.

In Nigeria and Kenya, unmarried women and women with no living children were significantly more likely to get their short-acting methods from a drug shop or pharmacy than from the public sector compared with women in union or those with children.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Nigerian Pharmacies</td>
<td>Nigerian Drug Shops</td>
<td>Kenyan Pharmacies/Drug Shops</td>
<td></td>
</tr>
<tr>
<td>No. Providing Method (% Requiring Rx)</td>
<td>No. Providing Method (% Requiring Rx)</td>
<td>No. Providing Method (% Requiring Rx)</td>
<td></td>
</tr>
<tr>
<td>Injectable</td>
<td>289 (41.9)</td>
<td>97 (55.7)</td>
<td>149 (56.4)</td>
</tr>
<tr>
<td>Combined oral pill</td>
<td>318 (39.3)</td>
<td>313 (39.0)</td>
<td>215 (25.1)</td>
</tr>
<tr>
<td>Progestin only pill</td>
<td>18 (55.6)</td>
<td>9 (44.4)</td>
<td>32 (34.4)</td>
</tr>
<tr>
<td>Emergency contraceptives</td>
<td>292 (33.2)</td>
<td>183 (29.5)</td>
<td>203 (10.8)</td>
</tr>
<tr>
<td>Male condom</td>
<td>410 (14.2)</td>
<td>474 (12.2)</td>
<td>205 (1.0)</td>
</tr>
<tr>
<td>Female condom</td>
<td>132 (14.4)</td>
<td>68 (5.9)</td>
<td>13 (0.0)</td>
</tr>
<tr>
<td>Spermicide</td>
<td>6 (33.3)</td>
<td>2 (100.0)</td>
<td>NA</td>
</tr>
</tbody>
</table>

Abbreviation: Rx, prescription.
their method from a pharmacy/drug shop than elsewhere. Wealth status mattered in Kenya: the higher the wealth group of a woman, the more likely she was to purchase her method at a drug shop or pharmacy than a public-sector facility. There was no wealth effect observed in Nigeria.


<table>
<thead>
<tr>
<th></th>
<th>Pharmacy/Drug Shop vs. Public</th>
<th>Pharmacy/Drug Shop vs. Private</th>
<th>Public vs. Private</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Column 1</td>
<td>Column 2</td>
<td>Column 3</td>
</tr>
<tr>
<td>Marital status</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Never married</td>
<td>1.00 (0.41)*</td>
<td>0.10 (0.46)</td>
<td>−0.89 (0.57)</td>
</tr>
<tr>
<td>Divorced/separated/widowed</td>
<td>0.77 (0.41)*</td>
<td>−0.27 (0.45)</td>
<td>−1.04 (0.56)*</td>
</tr>
<tr>
<td>Religion</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Muslim</td>
<td>−0.33 (0.13)**</td>
<td>−0.11 (0.21)</td>
<td>0.22 (0.22)</td>
</tr>
<tr>
<td>No religion</td>
<td>0.54 (0.80)</td>
<td>−1.31 (0.67)</td>
<td>−1.85 (0.91)*</td>
</tr>
<tr>
<td>Age</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>&lt;25</td>
<td>1.13 (0.21)**</td>
<td>0.54 (0.31)*</td>
<td>−0.59 (0.34)*</td>
</tr>
<tr>
<td>25–34</td>
<td>0.66 (0.12)**</td>
<td>0.45 (0.18)*</td>
<td>−0.21 (0.18)</td>
</tr>
<tr>
<td>Education</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Primary</td>
<td>0.06 (0.26)</td>
<td>0.33 (0.38)</td>
<td>0.27 (0.38)</td>
</tr>
<tr>
<td>Secondary</td>
<td>0.26 (0.27)</td>
<td>0.12 (0.38)</td>
<td>−0.14 (0.38)</td>
</tr>
<tr>
<td>Higher than secondary</td>
<td>0.45 (0.28)</td>
<td>0.49 (0.41)</td>
<td>0.04 (0.42)</td>
</tr>
<tr>
<td>Wealth</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Poor</td>
<td>0.31 (0.19)</td>
<td>0.19 (0.28)</td>
<td>−0.11 (0.30)</td>
</tr>
<tr>
<td>Middle</td>
<td>0.26 (0.19)</td>
<td>0.14 (0.29)</td>
<td>−0.12 (0.30)</td>
</tr>
<tr>
<td>Rich</td>
<td>0.24 (0.20)</td>
<td>0.11 (0.31)</td>
<td>−0.13 (0.31)</td>
</tr>
<tr>
<td>Richest</td>
<td>0.42 (0.23)</td>
<td>−0.38 (0.31)</td>
<td>−0.80 (0.35)*</td>
</tr>
<tr>
<td>City</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Abuja</td>
<td>−1.05 (0.19)**</td>
<td>0.31 (0.34)</td>
<td>1.37 (0.36)**</td>
</tr>
<tr>
<td>Benin City</td>
<td>−0.15 (0.20)</td>
<td>−0.43 (0.27)</td>
<td>−0.27 (0.31)</td>
</tr>
<tr>
<td>Ilorin</td>
<td>0.13 (0.16)</td>
<td>−0.62 (0.26)*</td>
<td>−0.75 (0.27)**</td>
</tr>
<tr>
<td>Kaduna</td>
<td>−0.86 (0.18)**</td>
<td>−0.73 (0.28)**</td>
<td>0.13 (0.29)</td>
</tr>
<tr>
<td>Zaria</td>
<td>−1.35 (0.24)**</td>
<td>−1.32 (0.39)**</td>
<td>0.03 (0.32)</td>
</tr>
<tr>
<td>Any living children</td>
<td>−1.22 (0.43)**</td>
<td>−1.48 (0.52)**</td>
<td>−0.26 (0.65)</td>
</tr>
<tr>
<td>Constant</td>
<td>1.30 (0.56)*</td>
<td>2.98 (0.68)**</td>
<td>1.69 (0.81)*</td>
</tr>
</tbody>
</table>

Note: Don’t know, other, and missing options modeled but not shown in comparisons.

* P ≤ 0.10; † P ≤ 0.05; ** P ≤ 0.01; *** P ≤ 0.001.
Lastly, there were city-level differences in source of short-acting methods in each country. In Nigeria, women in the Northern cities—Abuja, Kaduna, and Zaria—were less likely to obtain their methods from a drug shop or pharmacy than from the public sector compared with women from Southern Ibadan city. In Kenya, women living in all of the cities (except

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Pharmacy/Drug Shop vs. Public</td>
<td>Pharmacy/Drug Shop vs. Private</td>
<td>Public vs. Private</td>
</tr>
<tr>
<td><strong>Column 1</strong></td>
<td><strong>Column 2</strong></td>
<td><strong>Column 3</strong></td>
</tr>
<tr>
<td><strong>Marital status (Ref: Married)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Never married</td>
<td>1.17 (0.15)** **</td>
<td>1.13 (0.19)** **</td>
</tr>
<tr>
<td>Divorced/separated/widowed</td>
<td>0.93 (0.18)** **</td>
<td>0.66 (0.21)**</td>
</tr>
<tr>
<td><strong>Religion (Ref: Christian)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Muslim</td>
<td>0.32 (0.23)</td>
<td>0.39 (0.25)</td>
</tr>
<tr>
<td>No religion</td>
<td>0.19 (0.48)</td>
<td>0.21 (0.46)</td>
</tr>
<tr>
<td><strong>Age (Ref: Age ≥35)</strong></td>
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</tr>
<tr>
<td>&lt; 25</td>
<td>−0.26 (0.16)</td>
<td>−0.17 (0.17)</td>
</tr>
<tr>
<td>25–34</td>
<td>−0.20 (0.14)</td>
<td>−0.17 (0.16)</td>
</tr>
<tr>
<td><strong>Education (Ref: None)</strong></td>
<td></td>
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</tr>
<tr>
<td>Primary</td>
<td>0.02 (0.30)</td>
<td>0.29 (0.31)</td>
</tr>
<tr>
<td>Secondary</td>
<td>0.22 (0.30)</td>
<td>0.52 (0.31)*</td>
</tr>
<tr>
<td>Higher than secondary</td>
<td>0.82 (0.32)*</td>
<td>0.74 (0.34)*</td>
</tr>
<tr>
<td><strong>Wealth (Ref: Poorest)</strong></td>
<td></td>
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<tr>
<td>Poor</td>
<td>0.24 (0.16)</td>
<td>0.13 (0.18)</td>
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<tr>
<td>Middle</td>
<td>0.35 (0.17)*</td>
<td>0.12 (0.18)</td>
</tr>
<tr>
<td>Rich</td>
<td>0.50 (0.16)**</td>
<td>0.27 (0.19)</td>
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<tr>
<td>Richest</td>
<td>1.24 (0.20)** **</td>
<td>0.26 (0.22)</td>
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<tr>
<td><strong>City (Ref: Kisumu)</strong></td>
<td></td>
<td></td>
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<tr>
<td>Nairobi</td>
<td>0.73 (0.17)** **</td>
<td>−0.17 (0.18)</td>
</tr>
<tr>
<td>Mombasa</td>
<td>0.63 (0.19)** **</td>
<td>−0.67 (0.21)** **</td>
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<tr>
<td>Machakos</td>
<td>0.13 (0.17)</td>
<td>0.70 (0.22)**</td>
</tr>
<tr>
<td>Kakamega</td>
<td>0.73 (0.19)** **</td>
<td>0.87 (0.24)** **</td>
</tr>
<tr>
<td>Any living children</td>
<td>−1.76 (0.19)** **</td>
<td>−1.25 (0.21)** **</td>
</tr>
<tr>
<td>Constant</td>
<td>−0.28 (0.38)</td>
<td>0.22 (0.43)</td>
</tr>
</tbody>
</table>

Note: Don’t know, other, and missing option modeled but not shown in comparisons.

+ P ≤ 0.10; * P ≤ 0.05; ** P ≤ 0.01; *** P ≤ 0.001.
Machakos) were more likely to get their short-acting method from a drug shop/pharmacy than the public sector compared with Kisumu.

**DISCUSSION**

Drug shops and pharmacies offer an important and under-leveraged mechanism for expanding family planning access to women in urban Nigeria and Kenya, and potentially elsewhere, to help meet FP2020 goals. Vulnerable and harder-to-reach groups, such as younger, unmarried women and women who do not yet have children, are the most likely to benefit from increased access to family planning at drug shops and pharmacies.

The results of this article show the crucial role drug shops and pharmacies play in the provision of short-acting methods to women in urban areas of Nigeria and Kenya. Pharmacies and drug shops are the dominant source for most short-acting family planning methods including pills, emergency contraception, and condoms for women in Nigeria and Kenya. While public facilities remain the main source for injectables, 6% of the women in Kenya and 14% in Nigeria obtain injectables from pharmacies and drug shops. Literature shows that regardless of the regulatory environment and the training level of staff, drug shops in Africa are providing injectable contraception. Major policy shifts in recent years toward expanded access to certain forms of family planning (such as implants and injectables) down to a community level, as well as successful trials of Sayana Press in multiple countries, indicate that drug shops and pharmacies may play an increasingly important role in the provision of new methods for certain populations. For instance, in 2012, Nigeria approved a policy to allow trained community health extension workers (CHEWs) to administer injectables and implants. This task shifting down to lower-level trained providers also presents an opportunity to continue to expand access points for injectables to drug shops and pharmacies in both Nigeria and Kenya.

This study also shows that pharmacies and drug shops in both Nigeria and Kenya were highly accessible to women in terms of their hours and days open. Further, since these facilities sell a variety of products in addition to contraceptives, young and unmarried women (and men) may feel increased comfort levels with obtaining their contraceptive method at these sites.

While drug shops and pharmacies represent the dominant source of certain contraceptive methods in both Nigeria and Kenya, there are some significant limitations to these outlets in terms of family planning-related promotion and training that could be addressed. The relatively low prevalence of pharmacies and drug shops that had family planning promotional materials on display in Nigeria (less than a third) and in Kenya (in about half) indicates a potential missed opportunity for increased education and promotion of methods. In addition, the low levels of reported family planning-related training by interviewed staff in these outlets is a significant area for possible program expansion and improvement.

Taking advantage of expanding access to family planning products and services through urban drug shops and pharmacies may be best optimized by understanding who is likely to benefit the most. This study shows that drug shops and pharmacies are the preferred choice for obtaining short-acting methods among younger women and women without children in both countries. These findings have significant program and policy implications when targeting particular profiles of users to increase access to family planning and are consistent with earlier studies that show that drug shops and pharmacies are more accessible to marginalized populations. We also show sociodemographic differences between women getting short-acting methods from public and private health facilities versus pharmacies and drug shops in both countries. In Kenya, more educated and wealthy women are already more likely to access short-acting methods through pharmacies and drug shops. Kenya also has overall much higher rates of modern contraceptive use and a more robustly integrated family planning program in public-sector facilities compared with Nigeria. This system in Kenya may better service women who have already been pregnant or had a birth while there is still an opportunity to expand access to family planning for youth and women who have not yet had a birth through drug shops and pharmacies.

In Nigeria, we see lower levels of modern contraceptive use than in Kenya and a much less integrated set of family planning services in public-sector facilities. That being said, particularly in the South of the country, there is an incredibly
active informal private sector for health services (including drug shops and pharmacies) that provides a unique opportunity to expand access to family planning methods to women who are less likely to visit a public health facility. This strategy may not be as appropriate (or is still more nascent) in the North of the country where women are more likely to obtain family planning services and most other health services through the public sector. This regional difference corresponds to existing and planned large-scale family planning program strategies that have been tailored to regional and cultural contexts through increased public sector and mobile outreach programs in the North and more private-sector access and programming in the South.19

It is worth noting that the distinctions found in women who choose drug shops over pharmacies may be related to choice of method. This may reflect that younger and unmarried women are using the more temporary methods (condoms, oral contraceptive pills, and emergency contraception) that are more accessible in these outlets, whereas older women who already have children are choosing more effective, longer-term methods, which are predominately available from a health facility (public or private). Further, women with any children may be more likely to get their short-acting method from a health facility if they are obtaining their method at the time of visiting a facility for a child health visit or some other service.

Limitations
This study is not without limitations. First, this is a descriptive study and we cannot determine causality with the data available. Second, given that there are different method mixes across the countries, some of the distinctions found by source relate to method choice and not just to source of the method. Third, in the Kenya context, it was not possible to distinguish drug shops from pharmacies in the data collected. Fourth, the measure of a facility’s prescription requirement for a given method is likely subject to social desirability bias given that the survey was interviewer administered.

CONCLUSION
Pharmacies and drug shops have an important role to play in urban areas in support of attaining FP2020 national goals, especially in serving women with unmet need for short-acting methods. Ensuring access to a full array of methods at drug shops and pharmacies should be an important goal of each of the FP2020 country implementation plans moving forward. These accessible outlets embedded in urban communities in Nigeria and Kenya elsewhere provide a rich opportunity to further increase access to much-needed contraceptive methods.

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REFERENCES


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Referral Systems to Integrate Health and Economic Strengthening Services for People with HIV: A Qualitative Assessment in Malawi

Clinton Sears, Zach Andersson, Meredith Cann

Two types of referral systems were implemented in this low-resource context: (1) a simple paper-based system connecting clinical HIV and nutrition support to village savings and loans services, and (2) a complex mHealth-based system with more than 20 types of health, economic strengthening, livelihoods, and food security services. Clients reported the referrals improved their health and nutrition and ability to save money in both models but more with the simple model. Providers had difficulty using the mobile app under the mHealth system, even after repeated trainings, considerable ongoing technical assistance, and multiple rounds of revisions to the interface.

ABSTRACT

Background: Supporting the diverse needs of people living with HIV (PLHIV) can help reduce the individual and structural barriers they face in adhering to antiretroviral treatment (ART). The Livelihoods and Food Security Technical Assistance II (LIFT) project sought to improve adherence in Malawi by establishing 2 referral systems linking community-based economic strengthening and livelihoods services to clinical health facilities. One referral system in Balaka district, started in October 2013, connected clients to more than 20 types of services while the other simplified approach in Kasungu and Lilongwe districts, started in July 2014, connected PLHIV attending HIV and nutrition support facilities directly to community savings groups.

Methods: From June to July 2015, LIFT visited referral sites in Balaka, Kasungu, and Lilongwe districts to collect qualitative data on referral utility, the perceived association of referrals with client and household health and vulnerability, and the added value of the referral system as perceived by network member providers. We interviewed a random sample of 152 adult clients (60 from Balaka, 57 from Kasungu, and 35 from Lilongwe) who had completed their referral. We also conducted 2 focus group discussions per district with network providers.

Findings: Clients in all 3 districts indicated their ability to save money had improved after receiving a referral, although the percentage was higher among clients in the simplified Kasungu and Lilongwe model than the more complex Balaka model (85.6% vs. 56.0%, respectively). Nearly 70% of all clients interviewed had HIV infection; 72.7% of PLHIV in Balaka and 95.7% of PLHIV in Kasungu and Lilongwe credited referrals for helping them stay on their ART. After the referral, 76.0% of clients in Balaka and 92.3% of clients in Kasungu and Lilongwe indicated they would be willing to spend their savings on health costs. The more diverse referral network and use of an mHealth app to manage data in Balaka hindered provider uptake of the system, while the simpler system in Kasungu and Lilongwe, which included only 2 referral options and use of a paper-based referral tool, seemed simpler for the providers to manage.

Conclusions: Participation in the referral systems was perceived positively by clients and providers in both models, but more so in Kasungu and Lilongwe where the referral process was simpler. Future referral networks should consider limiting the number of service options included in the network and simplify referral tools to the extent possible to facilitate uptake among network providers.

INTRODUCTION

Every week around the world, more than 3,600 children and 25,000 adults die from HIV.1 The
People living with HIV face both individual and structural factors that make reaching the 90-90-90 goals a challenge. Poverty, in particular, can exacerbate the challenges that PLHIV face when prioritizing scarce resources such as time, money, and energy. In Malawi, for example, the cost of ART is subsidized by the government, but there may be other costs involved in client care depending on the facility and whether it is public or private. Simply put, for impoverished PLHIV, the disease often forces a choice between accessing care and treatment or food. Poor health infrastructure, long wait times, distance between residences and clinical care, and decreased access to testing and care services worsen conditions and can contribute to a reshuffling of priorities in which ART adherence suffers. In a vicious cycle, the time, energy, and money often required for HIV care can directly strain such things as household food security and payment of school fees. These factors can lead to unhealthy acceptance of risk whereby clients either consciously decide they cannot make it to a clinic to collect their medicine or pick up their medicine only to discover that transport expenses or lost opportunity costs have made them unable to afford the food needed to avoid nausea and improve medicinal effectiveness.

Formalizing relationships between clinical and relevant community stakeholders, including economic strengthening, livelihoods, and food security organizations, while building the capacity and buy-in of these stakeholders around the potential benefits of sharing client information with each other to more holistically address client needs, is a relatively new concept. However, research has shown that targeting the multiple but interrelated needs of PLHIV can produce more sustainable results. Limited evidence on the effect of community linkages demonstrates important associations between community support and improved clinical outcomes for PLHIV.

Further, Okello et al. note that ... strengthening the capacity of community-based organizations to play a frontline role in implementing interventions in health, economic and social development is a prerequisite for transformational development. A randomized controlled trial conducted by Weiser et al. in 2012 demonstrated ... that a potentially sustainable agricultural and financial intervention improved immunologic and virologic outcomes, food security and diet quality for HIV-infected individuals. This supports previous research attesting the critical role of poverty and food security alleviation in improving health outcomes such as adherence to ART and retention in care. The psychological benefits derived from certain livelihood support opportunities, such as membership in a village savings and loan association (VSLA), should also not be discounted. As Yager and colleagues note, integrated HIV and livelihoods programs can help empower PLHIV and may indirectly bolster self-esteem, improve client standing in the community, and reduce stigma that can also influence client decisions to make healthy choices.

Several recent studies have examined how different types of economic incentives, such as cash payments, prize-based systems, and vouchers for goods, may affect ART adherence or virologic suppression. Bassett et al. reviewed four randomized controlled trials of conditional economic incentives and found that all showed significant increases in ART adherence (as high as 30%) compared with control groups. Unfortunately, some benefits faded as soon as 8 weeks after the incentive intervention stopped. Solomon et al. explained how modest nonmonetary voucher incentives as part of an intervention in Chennai, India, were associated with higher rates of linkage to care, ART initiation, and retention in care.

Whereas these incentive schemes reflect positive behavior change in the short-term, the Livelihoods and Food Security Technical Assistance II (LIFT) project hypothesized that formalizing and institutionalizing mechanisms for ongoing collaboration and referral between service providers from disparate sectors can contribute to the well-being of PLHIV in the long-run. LIFT, a global technical assistance project with experience in 7 countries, connects existing service providers from multiple sectors (e.g., health, economic strengthening, agriculture, social protection) to one another. Collectively,
LIFT, with support from the service providers, develops referral tools and standardizes a formal referral process that the providers use to track vulnerable clients through the referral system.

This article analyzes feedback from service providers and clients about how participation in integrated referral systems may contribute to improving client resilience and positive health outcomes. The LIFT team believes the assessment examined herein represents a unique venture—to the best of our knowledge, this has not been done before.

**PROGRAM DESCRIPTION**

Led by FHI 360 with partners CARE International and World Vision International, the LIFT project provides technical assistance in multiple sub-Saharan African nations. Recognizing that HIV is complex, LIFT was designed to improve health outcomes for PLHIV by linking them to nonclinical economic strengthening, livelihoods, and food security services. While LIFT’s focus is on improving the lives of PLHIV and orphans and vulnerable children, in practice the project’s referral work is open to both PLHIV and people without HIV to ensure that referrals are not stigmatized as an HIV service. This also helps improve sustainability by making referrals broadly applicable to all service providers that make up a referral network.

LIFT maps existing economic strengthening, livelihoods, and food security service providers in the catchment area of health facilities and invites those providers to form referral networks while offering technical assistance to the nascent network. (LIFT does not work directly with individual Malawian clients.) The locally managed referral networks offer bidirectional clinic-to-community referrals to improve the health of individuals and the communities in which they live. The particular goal of clinic-to-community referral networks is to create a sense of shared responsibility and establish a platform for ongoing dialogue between the health system and the community to reduce factors that can be barriers to care, whether they are related to the clients or to the support system. Referral networks can include government, civil society, and community-based service providers, and they provide an important forum for information, education, and communication across these entities, many of which would not otherwise interact.

From October 2013 to April 2015, LIFT staff worked directly with a diverse group of local service providers from multiple sectors (public, private, government) and program areas (e.g., health, nutrition, agriculture, finance) in Balaka district of Malawi. LIFT staff carried out an extensive service enumeration and organizational network analysis to highlight the state of coordination and collaboration among the service providers at that time. LIFT led development of referral tools, trained service providers on appropriate use of these tools, and launched a cloud-based referral database using CommCare, an mHealth application, to manage client cases in real time.

In the Balaka referral network model, service providers administered a food security and vulnerability diagnostic tool to appropriately counsel clients as they decided which services included in the network directory would be the most beneficial. Clients were adult Malawians (ages 18 and above) who were registered for and offered a referral from one stakeholder in the referral network to another stakeholder. The providers read a consent script to these clients when they registered the clients, which noted that the referral network (including the LIFT project in a technical assistance role) might follow up with them in the future to assess the value of referrals. The providers made the referrals through the mHealth app, so that the receiving provider could open the app to monitor which clients to expect and easily confirm if the clients received the service. Use of the mHealth app also proved beneficial for LIFT to track and monitor referral data, since the data were uploaded to a cloud-based server in real time, rather than collected monthly.

In July 2014, LIFT began to design and implement a simplified referral system model. This second model connected health sector clients from Nutrition Counseling, Support, and Treatment (NCST) facilities in Kasungu and Lilongwe districts directly to community-based VSLAs. The NCST facilities participated in the Ministry of Health’s NCST program to integrate nutrition and HIV services. LIFT capitalized on existing VSLAs in both districts by approaching them and successfully negotiating addition of the referral component to their portfolio. LIFT trained all referral stakeholders in Kasungu and Lilongwe to follow the NCST clinic-to-VSLA referral process and provided them with tools to help track clients to promote and verify referral...
completion. Whereas the Balaka referral network used a mobile phone-based data collection platform, the referral network in Kasungu and Lilongwe used a paper-based system. LIFT designed these two system models to achieve slightly different goals as summarized in Table 1.

Both referral models required ongoing technical assistance from LIFT for referral tool design and testing, data collection and management, and analysis. Although LIFT used the mHealth app for data management in Balaka, the service providers were slow to adapt to the smartphones and often preferred calling or sending an SMS to colleagues to check on client progress rather than using the tracking features of the app. This made it difficult to track clients and follow up with them in a timely manner in the event that they did not complete a referral. A further complication in Balaka was the sheer number of services available (more than 20), which had differing catchment areas, eligibility criteria, and funds available to serve clients. Despite the

<table>
<thead>
<tr>
<th>District</th>
<th>Referral Model Features</th>
<th>Referral Model Goals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Balaka</td>
<td>• Linked clients to all community services that chose to be members of the referral network. LIFT conducted a thorough mapping of services and invited all interested organizations (government, CSO, NGO, etc.) to participate. • Clients were expected to complete referrals themselves. • Used CommCare, an mHealth app, for data collection and management. • Providers made referrals for one service at a time to promote completion of the referral. • There was no limit on the number of referrals a client could be given over time, although few (&lt;1%) clients chose more than 1 referral. • Full range of ES/L/FS services were included, based on what already existed in the community. LIFT did not create new services. • Most popular services were microfinance, health, and government-supported services for agriculture and social welfare.</td>
<td>This first referral model was designed for local ownership and sustainability and featured a systems-level approach to referral network membership. This model also sought to accommodate clients across the vulnerability spectrum, offering referrals to existing economic strengthening services targeting less vulnerable households (such as microfinance), somewhat vulnerable households (such as savings groups or land rights education), and very vulnerable households (such as asset transfer).</td>
</tr>
<tr>
<td>Kasungu and Lilongwe</td>
<td>• Linked clients directly from NCST sites to VSLA (clinic to community referral). • When food aid was available at NCST sites, clients were also referred to food aid (within health facility referral). • Clients were guided to VSLA by a referral volunteer to ensure completion. • Used paper referral tools for data collection and management. • Each client received one referral only. • The options for referral were from the NCST site to VSLA, or vice versa, with referrals given to food aid on a limited basis. • LIFT created VSLAs if none existed.</td>
<td>This second referral model was designed to be simpler to implement, in that it connected NCST clients directly to VSLA (and food aid, when available). In addition, this model took advantage of existing VSLAs to accelerate start-up time and reduce management costs.</td>
</tr>
</tbody>
</table>

Abbreviations: CSO, civil society organization; ES, economic strengthening; FS, food security; L, livelihood; LIFT, Livelihoods and Food Security Technical Assistance II project; NCST, Nutrition Counseling, Support, and Treatment; VSLA, village savings and loan association.
complications, referrals in Balaka were mostly given to microfinance, health, and government-supported agriculture and social welfare services.

In Kasungu and Lilongwe, the providers quickly adopted the simple paper referral forms. The only referral options were to/from an NCST site (which also sometimes disbursed food aid) or a VSLA. In addition, these sites had referral volunteers who physically led the client from one service to another. These differences in referral models resulted in improved client tracking through the referral volunteer in Kasungu and Lilongwe compared with Balaka and more manageable client flow by virtue of having only one service outside the NCST site. At the time of the assessment, LIFT had been supporting all sites for at least 1 year.

**METHODS**

For this assessment, LIFT collected data from clients (adults ages 18 and above) who received a referral and from service providers who managed the referrals. We interviewed 152 clients (n = 60 from Balaka, n = 57 from Kasungu, and n = 35 Lilongwe) who completed referrals. LIFT randomly sampled these clients by selecting the nth client from a list of all 1,253 referral clients served at 9 NCST facilities across the 3 districts. In cases where at least 20 clients could not be identified from 1 facility, LIFT increased the sample size at another facility to meet the intended cumulative minimum sample of 100 clients.

We also conducted 2 focus group discussions (FGDs) with selected service providers from the referral network in each of the 3 districts, with group sizes ranging from 6 to 8 participants (Table 2). Certain stakeholders (such as Ministry of Health staff) were not local entities that participated in day-to-day referral activities and thus were not invited to participate in the FGDs. Non-health service providers were selected to participate in FGDs on the basis of demonstrated familiarity with and use of the referral tools. Health service providers were selected based on their commitment to regular use of referral tools, the extent of interaction with PLHIV clients, and their familiarity with clinic-to-community linkages. Selection ensured a balance between NCST facility and community staff, as well as equal representation of both men and women. Familiarity with and consistent use of the referral tool was a selection factor because we wanted to receive constructive feedback from providers with actual experience engaging clients through the referral process.

**Data Collection Instruments**

Client perception data were collected through structured interviews using a combination of Likert-scale, agree/disagree, and free-response questions. The intent was to collect data from clients (nearly 70% of whom were PLHIV) to help key stakeholders in Malawi improve current and future referral operations and to document the impact of referrals on client lives. The interviews sought to address how clients felt about referrals by asking questions such as, "What was your experience with the referral?", "Did you like it?", and "Did you understand it?" Interviews were

| TABLE 2. Focus Group Discussion Participants in Malawi, by District and Type of Service Provider |
|-------------------------------------------------|-------------------------------------------------|
| District                                      | Health Care Providers                           | Non-Health Care Providers                         |
| Balaka                                       | 7 individuals representing 5 service providers  | 7 individuals representing 7 non-health service   |
|                                               | (NCST facilities and community health organizations) | providers |
| Kasungu                                      | 8 individuals from 5 NCST facilities             | 9 individuals selected based on their role as     |
|                                               |                                                 | Referral Volunteers (trained to accompany referral |
|                                               |                                                 | clients) and Village Agents (savings group leaders) |
| Lilongwe                                     | 8 individuals from 3 NCST facilities             | 8 individuals selected based on their role as     |
|                                               |                                                 | Referral Volunteers (trained to accompany referral |
|                                               |                                                 | clients) and Village Agents (savings group leaders) |

Abbreviation: NCST, Nutrition Counseling, Support, and Treatment.
generally structured to elicit client perceptions of the referral process, impacts on savings and health, and ease of participation in the referral system. The interviews also asked questions related to quality of life, relations with community members, and perceived stigma.

To help ensure confidentiality and better understand the client perspective on referral impacts, LIFT hired and trained 5 data collectors to conduct the interviews with referral clients in the 3 districts. In Kasungu and Lilongwe, CARE staff coordinated the interviews, which were conducted on the grounds of the health facilities. In Balaka, district health facility staff were given lists of referred clients and tasked with contacting clients and scheduling interviews. The interviews in Balaka took place at health facilities as well as on the premises of Sue Ryder Foundation and Chinansi Foundation—2 community-based service providers active in health programming: In all 3 districts, one-on-one interviews were held between data collectors and clients in private settings to encourage clients to freely share their experience.

Prior to the first interview, the LIFT team developed a series of interview questions, loaded them into an Open Data Kit (ODK) survey, and deployed the survey on mobile tablets for use by data collectors. Question types included multiple choice, free answer, and a recorded story summarizing the client’s experience. The interviews were conducted in the local language of Chichewa; after each interview was completed, recorded client stories were uploaded from the tablets, translated to English, and transcribed by the data collectors.

Service provider perception data were collected through FGDs with health staff (from NCST sites) and non-health staff by a trained FGD facilitator and note taker. The FGD discussion guides varied based on whether the service providers worked in the health or non-health sector. For example, it was only relevant for health service providers to discuss impacts of referral system participation on clinical record-keeping and data collection, as non-health service providers do not maintain these client records. LIFT requested that staff who actively managed referrals (i.e., interacted with clients, explained the purpose and functions of the network, made referrals, received referred clients, etc.) participate in the FGDs.

The FGDs sought to address stakeholder feelings and perceptions of the value of referrals, asking questions such as, Has demand for your services increased as a result of participation in the referral network? Do clients know about the referral network and understand what it is?, and Do clients ask for referrals? FGD facilitators were instructed to probe for data on the following domains as well: (1) value of membership in the referral network for health service providers vs. other service providers; (2) major constraints faced by clients in attending clinical ART appointments; (3) role of VSLA meetings in fostering adherence to and retention in HIV care and treatment (for health FGDs only); (4) the role of VSLA meetings in addressing issues related to stigma and psychosocial support for PLHIV; and (5) social funds and use of savings for health expenses.

Ethical Approval and Training

The following key counterparts contributed to the initial design of referral systems and were informed about the purpose of this study: the Department of Nutrition, HIV and AIDS within the Ministry of Health (responsible for NCST sites); the District Councils of Balaka, Lilongwe, and Kasungu; and referral network service providers (with whom LIFT had a long-established relationship). The study team received ethical approval from Malawi’s National Commission on Science and Technology (NCST) on June 17, 2015, and from FHI 360’s Office of International Research Ethics (OIRE) on June 22, 2015. LIFT hired a team of 5 Malawian data collectors and trained them on proper research ethics, project background in Malawi, and assessment tools from June 22–26, 2015. Data collectors tested client interview questions and the FGD guide among themselves, allowing for refinement and accurate Chichewa language translation. Fieldwork began on June 29, 2015, and ended on July 17, 2015. Client interviews and FGDs were conducted by the data collection team in Chichewa. Interview responses were collected using Open Data Kit (ODK) on mobile tablets, and FGD audio was recorded after receiving the consent of the participants. LIFT’s partner in Malawi, CARE, managed English translation and transcription of FGD audio from Lilongwe after receiving recordings from the hired facilitator.

Fieldwork

Fieldwork took place from June 22 to July 17, 2015. All tools were implemented concurrently
to maximize efficiency of staff time. Table 3 provides a schedule of where and when each tool was implemented.

Data Management
LIFT staff in Washington, DC, managed analysis of English FGD transcripts and coded responses according to 7 general themes using Dedoose software: positive user experience; negative user experience; health (positive and negative); demand for and access to services; general awareness and comprehension of value; regular and appropriate use of referral tools following referral process; social impacts. Client interview data were compiled using ODK Aggregate and exported to Microsoft Excel for analysis by LIFT staff in Washington, DC.

FINDINGS
Client Perceptions
The following sub-sections present clients’ perceptions of the benefits of the referral system organized by subject matter: health benefits, savings benefits, household benefits, and perceptions of the referral process (Table 4).

Health Benefits
Client interview data suggest that the referral approaches used in Balaka and in Kasungu and Lilongwe were associated with different health and livelihoods effects. Nearly 70% of all clients interviewed had HIV infection. Many PLHIV attributed an improvement in their health to the services they received as a result of participating in the referral system. In Balaka, 72.7% of clients thanked referrals for helping them stay on their medicine. In Kasungu and Lilongwe this positive attribution soared to 95.7%. Equally important, 76.0% of clients in Balaka and 92.3% of clients in Kasungu and Lilongwe indicated they would be willing to spend their savings on health costs. When asked about improvement in health and nutrition that could be attributed to the referral(s), 60.9% of Balaka respondents reported improved health and 52.2% reported improved nutrition, while Kasungu and Lilongwe fared even better with 81.1% of respondents reporting improved health and 70.8% reporting improved nutrition.

Clients shared that referrals helped them better understand reasons to stay on their ART medications and cited positive results such as boosted immunity, less frequent illnesses, gained strength, and reduced viruses, among others. One client summarized the impact of his referral to a VSLA, saying:

I was sick for a very long time, and I did not have money. Since I joined the program, I am now able to borrow money to go to the hospital. I recommend that this program should continue because when I am in need, I am able to go and borrow money. (60–65-year old man with HIV infection; Kasungu District Hospital, Kasungu)

About 73% of PLHIV in Balaka and 96% in Kasungu and Lilongwe attributed their participation in the referral network to helping them stay on their medicine.
Another client explained how the economic service he received increased his ability to take food with his medications:

... [The project] has helped a lot of people to be linked to groups where they can find money to buy food that is scarce around the house. . . . the money we borrow from the [VSLA] allows us to buy the food we need so that the medicine is effective in our bodies. (45–50-year old man with HIV infection; Nathenje Health Centre, Lilongwe)

**Savings Benefits**

In Kasungu and Lilongwe, 85.6% of clients were able to save more money after they received their referral. One client explained the direct effect of her referral to a VSLA:

When I was linked to the CARE group, things improved in my house especially that now [I] am able to go to the group and borrow money for school fees and also buy household items. (40–45-year old woman with HIV infection; Kasungu District Hospital, Kasungu)

In Balaka, 56.0% of clients reported being able to save more money after their referral. It is important to reiterate that the service options available to referral clients through the Balaka referral approach were more diverse and included linkages to VSLA as well as other types of support, such as food and agriculture or education.

**Household Benefits**

In Balaka, 30.0% of clients reported having a family member who had HIV infection, and 8.3% reported that they or someone else in their family had been clinically assessed as malnourished at some point during the year prior to the interview. In Kasungu and Lilongwe, the household burden of HIV and malnutrition was much higher: 59.8% of clients reported another PLHIV in their household, and 46.7% reported at least one case of malnourishment in the household.

<table>
<thead>
<tr>
<th>Referral Benefit</th>
<th>Balaka</th>
<th>Kasungu and Lilongwe</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Health Benefits</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Feel they are better able to stay on medication as result of referral</td>
<td>72.7%</td>
<td>95.7%</td>
</tr>
<tr>
<td>Willing to spend savings on health costs after referral</td>
<td>76.0%</td>
<td>92.3%</td>
</tr>
<tr>
<td>Attribute improvement in health to service received via referral</td>
<td>60.9%</td>
<td>81.1%</td>
</tr>
<tr>
<td>Attribute improvement in nutrition to service received via referral</td>
<td>52.2%</td>
<td>70.8%</td>
</tr>
<tr>
<td><strong>Savings Benefits</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Able to save more money after referral</td>
<td>56.0%</td>
<td>85.6%</td>
</tr>
<tr>
<td><strong>Household Benefits</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Had household savings before referral</td>
<td>63.3%</td>
<td>41.6%</td>
</tr>
<tr>
<td>Had household savings after referral</td>
<td>66.7%</td>
<td>81.4%</td>
</tr>
<tr>
<td><strong>Referral Process and Service Access</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Knew of economic strengthening service availability before referral</td>
<td>65.0%</td>
<td>44.2%</td>
</tr>
<tr>
<td>Found referral process user-friendly</td>
<td>60.9%</td>
<td>81.1%</td>
</tr>
<tr>
<td>Reported they will continue using service after referral</td>
<td>68.3%</td>
<td>96.7%</td>
</tr>
</tbody>
</table>

56% of referral clients in Balaka and about 86% in Kasungu and Lilongwe reported being able to save money after their referral.
Before the referral, only 63.3% of clients in Balaka and 41.6% of clients in Kasungu and Lilongwe reported having household savings. After the referral, 66.7% of clients in Balaka and 81.4% in Kasungu and Lilongwe reported an improved household situation.

One client explained the new economic opportunities afforded to his family through a VSLA:

I belong to a VSL group and I have seen benefits from there. I am now weaving baskets and selling them. My wife is also doing business of brewing beer after giving her capital from the money I borrowed from the VSL group. Now my household has improved in terms of food security. (40–45-year old man with HIV infection; Diamphwe Health Centre, Lilongwe)

Another client explained how an entire family could benefit from the money saved and borrowed:

When I joined the referral process of LIFT II, I was connected to the VSL group and now I am able to borrow money from the group and use it for my household’s welfare, such that my household and I have improved. My family and I were undernourished. (35–40-year old woman with HIV infection; Nathenje Health Center, Lilongwe)

Referral Process

At the time of referral, only 65.0% of clients in Balaka and 44.2% of clients in Kasungu and Lilongwe reported knowing about an economic strengthening service available nearby. Clients generally found the referral process linking clinical care to community support to be easy to understand and not overly burdensome. In Balaka, 60.9% of clients found the process user-friendly, and 81.1% of clients in Kasungu and Lilongwe agreed. In Balaka, 68.3% of respondents said they intend to continue to use the services for which they were referred, suggesting high satisfaction and value. In Kasungu and Lilongwe, this rose to 96.7% of clients.

About 61% of referral clients in Balaka and 81% in Kasungu and Lilongwe found the referral process user-friendly.

Service Provider Perceptions

FGDs explored service provider roles as members of a referral network, particularly regarding the ease of operations and process adoption, level of effort required to carry out referral responsibilities, successes and failures witnessed or experienced, and the perceived utility of the system for their clients. In general, stakeholders felt the referral system connected clients to new services and they believed the system was positively affecting their clients’ lives.

Provider Perceptions of Health Benefits to Clients

The majority of health care providers participating in the FGDs attributed client participation in the referral system with improved client health. One provider from Diamphwe Health Centre in Lilongwe noted:

It has benefited people who are HIV positive to be open and they should not be afraid if they want to go to the hospital.

Improvements in social cohesion and psychosocial support were also cited, with a non-health care provider responsible for overseeing several VSLAs in Kasungu explaining:

In the past, people who are affected [by HIV] were just staying in darkness without knowing that in future there is peace … they are now staying without worries but before they were unhappy thinking of their status.

The providers indicated that the referral system helped them better understand the full array of services available to clients and how to adequately address client health and livelihood needs. One stakeholder from Kalembo Health Centre in Balaka said:

What makes me happy is that I remember we did a campaign; we found out that people had problems and we didn’t know where to take those problems to … When the organizations came together [in the referral system], it was like we have advertised them so that people should know what they do, and if they need a service they now know where to get it.

Health facility staff expressed how they believed referrals reduced the number of ART defaulters and allowed them to find lost clients more easily. One participant from Diamphwe Health Centre in Lilongwe said:

Those who stopped [attending their appointments] some time back, they started now coming because of the advantages of this project, and they are coming to the hospital to disclose themselves … [They say,] “I am your client and stopped coming for a couple of years because of other problems and now I am back.”

The health care providers reported being able to trace clients through VSLAs and more easily check in with their service provider colleagues. In Kasungu and Lilongwe, particularly,
training community-based referral actors, such as Referral Volunteers and Village Agents, to support the NCST staff in tracking and counseling PLHIV who have been lost to follow-up was seen as helpful by the majority of FGD participants. One from Matapila Health Centre in Lilongwe mentioned monthly coordination and follow-up meetings:

... we conduct meetings with the volunteers once a month when we discuss why so so person is not coming ... as a result of strategies to reach defaulters, a lot of who were not coming have started coming indeed.

In addition, health facility staff in all FGDs expressed positive value for the time required to participate in the referral system. A stakeholder from Kalembo Health Centre in Balaka explained:

I have seen that this program is not special work for us. We can say it is more like quality control, which can make us have good work, even though when you are working you think you are just wasting time but at the end you see the benefits of what you have done.

**Demand for Provider Services**

In Kasungu and Lilongwe, providers thought that demand for economic strengthening (particularly VSLA) and health services increased as a result of their participation in referral networks. Increased client interest in joining VSLAs was cited in all 4 focus groups. Several FGD participants took this a bit further by tying increased demand for and access to economic strengthening support directly to improved outcomes for PLHIV. One referral volunteer responsible for following up with clients to ensure referral completion in Kasungu explained:

It happens that a person is on medication, so because of how people in the village are treating the person, maybe he/she needs a little money to use it for milling, or when the child is sick, or for school fees. But the person fails to borrow or [others] refuse to lend to [the person] thinking, Is my neighbor going to manage to pay me back with the way she looks? Now because she has joined the group and she is allowed to borrow that [VSLA social fund] money, she can use that to pay school fees or for milling and has received help for her household.

**Referral Tools**

In Balaka, where paper tools and reference guides supplemented the mobile mHealth case management system, LIFT received automated reports documenting referral partner activity. Despite ongoing technical assistance and training, institutionalization of the technology was never fully maximized. This topic came up in each Balaka FGD, with one stakeholder from a community-based organization explaining:

... to follow up a client you have referred to a certain organization, sometimes it happens that you don’t have airtime.

However, the project gave all referral providers in Balaka data bundles specifically meant for mobile phone and mHealth app use, which should have allowed them to check referral completion in real time and indicate whether they were currently able to accept new referrals.

The use of mobile phones to collect data from clients was also an issue in Balaka. In both Balaka FGDs, providers reported that a small minority of clients were afraid of the mobile phones and connected them with Satanism, a belief that took time and energy to dispel during normal operations. Client culture and beliefs must always be considered to prevent project activities from causing alienation or fear.

A few Balaka FGD participants did not seem to understand how to properly apply paper tools to supplement the mHealth app in support of clients. One non-health care provider in Balaka suggested:

Maybe LIFT should have a directory by area. [So we can say to clients], You come from such and such area, so the organization that can help you is so and so.

In reality, LIFT helped develop and update a service directory in Balaka that was distributed to all referral network members. The network members were encouraged to use monthly meetings to inform one another of critical programmatic changes that would influence the appropriateness of referrals. These examples indicate insufficient understanding of app functionality, the purpose of supplemental paper tools, and the value of regular monthly meetings as fora for information sharing.

In contrast, few suggestions to improve the referral tools used in Kasungu and Lilongwe emerged during the FGDs. The tools used there were simple, consisting of an enrollment form, a
referral register, and a paper card that clients could carry to their referral appointment. Tools were entirely paper-based, so they did not require learning to use a mobile phone for referral data entry. Because the referral system linked clients from only clinics (for ART services or food aid) and VSLAs, no robust service directory was needed.

**Referral Level of Effort**

The burden of labor on the providers varied widely. Some FGD participants felt they did not have the time to appropriately follow the referral process from initiation to completion, while others found the set-up very user-friendly and simple. Most health care providers reported that they were not overwhelmed by added referral responsibilities, mentioning how they successfully integrated referral messaging into regularly scheduled group ART counseling sessions, and how individual referral sessions were not overly time-consuming. One health care provider from Kasungu District Hospital explained:

*With one person, you spend maybe 10 minutes.*

**Provider Perceptions of Client Understanding**

FGD participants believed that some of their clients misunderstood the referral process. For example, when a provider refers a client to a microfinance organization such as Vision Fund Malawi, the client may eventually be able to obtain a loan through the organization, but this is not guaranteed immediately. A non-health care provider from a community savings organization in Balaka explained:

*If we tell them that we are connecting you to food services, they think that they are going to receive food there.*

All providers have certain criteria that clients must meet to be eligible for their services, and LIFT worked with referral network members to capture this critical information in tools such as service directories. However, not all service providers referenced these tools effectively. As a result, some clients were frustrated when they realized that they must meet certain eligibility requirements before they could join a VSLA or receive other support, such as food. There is a need to understand, plan for, and balance what facilities counsel clients on during routine ART sessions, such as in this case where direct food aid was beyond the scope of the project.

**Requests Beyond the LIFT Project Scope**

On at least one occasion during all FGDs, the participants expressed a desire for material benefits to participating in the referral system, such as lunches and financial support, that are beyond the LIFT scope of work. For example, during an FGD with health care providers in Balaka, a provider from Balaka District Hospital said the following about monthly meetings:

*It happens that people who attend [the meetings] are few. . . . the problem is that in these meetings, most of the times they only have refreshments and maybe transport [allowances] for those from far. We stay at the meeting for hours, but if they can put in a lunch allowance it can encourage people to come.*

LIFT purposely limited meetings to discuss operational issues and review referral data to 1 hour only, because half-day meetings are costlier and there was often not enough to discuss to fill a longer agenda.

Many providers felt LIFT’s geographic focus was too limited and requested project expansion beyond our scope. For example, one non-health care provider in Balaka explained:

*The organizations that are in network do not cover all the areas in Balaka. Sometimes it happened that in the Traditional Authority [area] where the person is coming from, the area doesn’t have the [needed] services of an organization, so that was a challenge.*

This implies LIFT should expand coverage, but it also relates to use of referral tools mentioned previously, since all stakeholders were given a service directory that described geographic coverage for various programs. Most FGD participants saw the value of participating in referral networks supported by LIFT—for themselves and their clients—but wanted LIFT to work within a catchment area larger than was originally targeted so that more clients could benefit.

**DISCUSSION**

The findings from this assessment are useful for integrated, multisectoral development approaches that operate under the hypothesis that beneficiaries receiving a service in one sector will experience improved outcomes in another. In the case of the LIFT project in Malawi, clients...
received referrals to and from health, economic strengthening, livelihoods, or food security services, regardless of HIV status. We facilitated implementation of 2 types of referral models: (1) a robust model in Balaka district that included more than 20 types of service providers and that used an mHealth data collection and follow-up mechanism, and (2) a simplified model in Kasungu and Lilongwe that connected clients from nutrition support facilities to savings and loan associations using a paper-based referral system. While both referral models successfully linked clients to new services, and all interviewed clients reported positive experience and improvements, the referral models had key differences, discussed below in 4 areas: referral completion, client health outcomes, referral tools, and operational lessons for referral programming.

**Referral Completion**

The decision process employed by clients when weighing whether to spend their valuable yet limited resources (time, money, energy, etc.) in order to act on a referral is not always straightforward. While clients need the assistance offered through the referral, they likely face tradeoffs, such as using money for transport to travel to service provider locations versus staying home to tend to their children, business, or crops. It is vital for stakeholders to understand the choices clients confront. If providers refer clients to another service only to find upon arrival that the service is no longer available or that the client is ineligible for the service, the referral system will struggle and mistrust of service providers will build.

Barriers to completing referrals—whether from a health facility to the community or vice versa—are numerous and include food insecurity, transportation costs, income cuts, or lost opportunity costs from missing work, among others. It is beneficial to continuously map these barriers and discuss them with stakeholders in the planning stages of a referral network. In addition to understanding client barriers to referrals, objections may also come from the providers themselves who are new to the idea of multisectoral referrals. For example, some health facility staff may not see the benefit of providing referrals to non-health services, even if the expectation is that client participation in those services may improve health outcomes.

For staff managing referrals, it is essential to undertake a detailed analysis of client barriers from the start of fieldwork, ideally before referral tools are developed. In addition, network providers should discuss these barriers at regular referral network meetings. In LIFT’s experience, providers will be enthusiastic to begin referrals but may not fully be able to articulate the referral process to clients, including what kind of assistance may (or may not) be available to help overcome their barriers. All providers must know what incentives exist (such as transportation reimbursement or other schemes) that will help clients overcome barriers to referral completion. Further, clients who have completed referrals should be contacted to learn about their experience in the referral system. This can be done by a technical assistance partner such as LIFT, or the providers that make up the referral network can invite clients to participate in monthly meetings to share their stories.

**Client Health Outcomes**

The positive health benefits clients and providers attributed to referrals should not be ignored, yet it is important to ensure that perceptions are grounded in reality. A review of facility-level ART unit reports revealed that the clinical default rate remained consistently high (around 15% per quarter) over the study period, indicating that some providers participating in the FGDs were likely overeager to attribute a perceived change in the default rate to the referral system.

In Kasungu and Lilongwe, most referrals to VSLAs originated from health facilities where the referral sensitization process was part of the normal ART care and treatment protocol during clinic days. It is possible that because of the direct and central involvement of clinical staff in this referral work, clients felt more comfortable participating than if being engaged by staff from the community as a PLHIV.

For referral managers, it is important to collect data from multiple sources when assessing client outcomes. This is especially true regarding adherence to ART where social desirability bias can lead clients to indicate they comply with medication dosages and frequencies, but in reality do not do so based on a medical record completed by health facility staff. This kind of outcome data collection must be planned well in advance to ensure stakeholders understand why it is being done, and also to follow ethical
review processes and approval by local authorities.

**Referral Tools**

Design of integrated, multisectoral referral networks requires careful consideration of the kinds of data that stakeholders will need to collect and how. In Kasungu and Lilongwe, simple paper-based data collection booklets and referral cards were employed; in Balaka, LIFT worked with service providers to design mobile-based survey forms that could be linked as part of a digital case management system. The mobile system, housed on LIFT-provided smartphones, allowed functionality beyond that of paper-based tools, such as real-time data sharing, controlled question trees that limit user error, and incorporation of metrics that “diagnose” client needs and produce referral service recommendations based on client household food security and poverty levels. While this technology was received warmly by all referral network members and government stakeholders, in reality, comprehension of the effort needed in order to actualize the benefits was unbalanced. Even with ongoing technical assistance, repeated training on use of these tools, and incorporation of user feedback into tool revisions on multiple occasions, LIFT struggled to promote proper and sustained mobile-based tool usage by all referral network members in Balaka. In contrast, the Kasungu and Lilongwe paper-based referral tools required very little training for the providers to use.

Program managers should make referral tool design (including data collection and analysis) as participatory as possibly with local stakeholders. A pilot or trial phase is helpful because many stakeholders will not fully appreciate how referral logistics can or cannot be changed until they have several weeks or months of experience. It is also essential that managers clarify their role from the outset. LIFT communicated clearly from the beginning that as a technical assistance mechanism, the project’s role was to help equip existing service providers with the tools needed to formalize and augment relationships between each other, to promote collaboration and link vulnerable clients more easily and effectively to the services they need most. Throughout the period of engagement, LIFT stressed that the strength of the network would depend on not only the appropriate application of referral tools and processes but also the buy-in of local leaders and the members themselves. FGD responses, while positive in general, demonstrate a lack of comprehensive understanding of responsibilities on the part of some referral providers.

**Operational Lessons for Referral Programming**

The results of this qualitative data collection are in line with LIFT observations from routine technical assistance offered during project operations. At all referral network sites, LIFT carried out informal quality improvement actions on a continual basis to build capacity on tool usage and process application. Specific technical assistance was provided to the lead organization in Balaka and health facility referral hubs in Kasungu and Lilongwe to support their coordination roles. Data collected by frontline staff were compiled, analyzed, verified, and shared with all network members, often during regular monthly meetings. These monthly meetings served as fora to discuss what worked and did not work for providers, to share experiences among the members, and to review the most recent data to provide a picture of referral network strength and reach as well as to promote accountability among members.

LIFT considered these capacity building and data sharing activities integral to project plans, but the feedback collected during FGDs may have been different had quality improvement aims and objectives been tied more directly to network performance. In addition, it would have been helpful for LIFT to create data management dashboards and analysis tools as well as train local stakeholders to use them earlier on—these tools were eventually developed but only toward the end of LIFT’s engagement in the country. Each of these items could have helped promote accountability. LIFT sought to help stakeholders collectively develop action plans to set and achieve goals, but more could have been done in Malawi. LIFT is now incorporating quality improvement concepts within all current referral work in other countries.

LIFT always sought to be clear with stakeholders on the project’s role and purpose. Repetition and transparency were key to effectively communicate the message, yet LIFT still struggled to ensure uniform comprehension of the project’s responsibilities and limits to the support provided. During this assessment, providers in the FGDs brought up several instances...
where the scope of LIFT was not clearly understood.

Staff turnover is a reality in any line of work, and although it was not explicitly mentioned as a challenge in the findings of this assessment, LIFT’s experience demonstrates the importance of adequately planning for these transitions. Initially in Balaka, LIFT left the decision up to the network members regarding whom from their offices should serve as focal persons for referral work. In many cases, the person chosen was not well-positioned to assume added referral responsibilities, nor did they have regular interaction with prospective referral clients on a daily basis. Several focal persons held positions that required them to travel frequently and/or be present in town offices where client traffic was minimal. As implementation progressed, LIFT worked with the network members to train additional staff who were often better placed to manage direct client interaction. This lesson highlights the fine balance between referral network autonomy — allowing members the freedom to make their own choices — and LIFT assertively guiding stakeholders toward specific choices from the beginning.

In Balaka, LIFT sought to use an mHealth app that would be easy to adapt for referral purposes, provide value for money, and be user-friendly. While LIFT did seek out and incorporate stakeholder feedback from the beginning, this type of iterative process may not have been the most effective toward promoting local ownership and accountability. Alternatively, LIFT could have proposed other tool choices for referral stakeholders to assess and then worked at a slower pace to test and adapt until all stakeholders were comfortable and committed. The usage of technology necessitated constant follow-up and troubleshooting. As a technical assistance partner, LIFT had hoped to transfer capacity to local partners, yet the institutionalization of the mHealth tools proved to be a considerable challenge.

Related to this, LIFT’s ongoing technical assistance visits revealed how network members did not always honor referrals made to their organization. During training and the early months of referral work, LIFT helped the members think about their capacity to serve new clients. If they could not responsibly serve new clients, strategies to temporarily divert referrals were discussed — for example, attending monthly meetings and explaining this situation to the other network members.

This highlights the local ownership and management imperative of referral system development; network members themselves are responsible for updating tools and informing one another if they are unable to provide services to potential referral clients.

**Limitations**

This assessment has several limitations, yet provides a good deal of summative evaluation information for future multisectoral referral work, most notably how to engage stakeholders in tool development, referral operations, and understanding how referrals affect their clients. In order to make a claim of causation concerning referrals (i.e., that participation in a referral directly improved clients’ household resilience), more complex study designs are required. Other limitations include:

- Many clients who were registered and referred using materials provided by the LIFT project were encountered only once prior to being interviewed. LIFT did not track instances where stakeholders may have attempted to follow up with clients on any issues related to referrals.
- The majority of the clients interviewed were referred at some point within the year prior; depending on the referral service received, the time elapsed between the referral and the interview could have limited client perception of utility or benefit. For example, if clients were referred to a VSLA group within 6 months of the interview, they may not have had the opportunity to fully pass through a savings cycle to realize a discernible value.
- The data are not expected to be generalizable beyond the context of referrals in Balaka, Kasungu, and Lilongwe. They are being collected to help guide programming in the area, to produce recommendations for tools to be used, and ultimately to provide guidance that is useful for referral systems in Malawi.
- No audit or review of network provider service registers was conducted to verify statements made by FGD participants.

In the future, LIFT would recommend more statistically rigorous methods to explore the linkages between adherence and retention for PLHIV and participation in other activities...
and services. For example, a non-intervention community could be selected to serve as a counterfactual. LIFT project staff did complement this qualitative work with a longitudinal medical record check to determine if referral clients had improved adherence to and retention in care and treatment programs, which will be reported separately once endline data are collected and analyzed.

CONCLUSION
Integrated referral systems with formal processes and standardized tools that allow network providers to effectively track and monitor client participation and referral completion can improve the ability of service providers to meet more fully the holistic demands of their clients. Clients—both those with and without HIV infection—referred by LIFT-supported stakeholders in 3 districts of Malawi perceived their referral as positively influencing their own and/or their family’s health and wellness, specifically when it came to adherence to medications and ability to save money. The network providers, encompassing health facilities and community economic strengthening, livelihoods, and food security services, not only substantiated these self-reported client claims but also indicated that their active participating in the referral network has helped them promote their own work while broadening their client reach.

An important operational lesson for other multisectoral referral efforts is to limit the number of referral services available in the network. The Balaka referral network had more than 20 services, which made it difficult for network providers to keep track of important updates in service availability, program start and end dates, points of contact, etc., even with a printed service directory that contained that information. The Kasungu and Lilongwe referral networks technically had 3 services (nutrition support, food aid, and savings and loan support), but only 2 service delivery points since food aid (when available) was disbursed at the NCST facility. This more streamlined system was easier to administer and explain to clients. Further, referral tools should be as simple as possible to ease uptake and transfer of knowledge to staff supporting referrals. While the mHealth app used in Balaka was robust, it required significant training and a steep learning curve, while the paper forms used in Kasungu and Lilongwe (with the added support of referral volunteers) were easier for the providers to learn and use, even though the data entry and aggregation took more work.

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REFERENCES

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Social Mobilization and Community Engagement Central to the Ebola Response in West Africa: Lessons for Future Public Health Emergencies

Amaya M Gillespie, Rafael Obregon, Rania El Asawi, Catherine Richey, Erma Manoncourt, Kshiitij Joshi, Savita Naqvi, Ade Pouye, Naqibullah Safi, Ketan Chitnis, Sabeeha Quereshi

Key lessons for the crucial components of social mobilization and community engagement in this context:

- Invest in trusted local community members to facilitate community entrance and engagement.
- Use key communication networks and channels with wide reach and relevance to the community, such as radio in low-resource settings or faith-based organizations.
- Invest in strategic partnerships to tap relevant capacities and resources.
- Support a network of communication professionals who can deploy rapidly for lengthy periods.
- Balance centralized mechanisms to promote consistency and quality with decentralized programming for flexibility and adaptation to local needs.
- Evolve communication approaches and messaging over time with the changing outbreak patterns, e.g., from halting disease transmission to integration and support of survivors.
- Establish clear communication indicators and analyze and share data in real time.

ABSTRACT

Following the World Health Organization (WHO) declaration of a Public Health Emergency of International Concern regarding the Ebola outbreak in West Africa in July 2014, UNICEF was asked to co-lead, in coordination with WHO and the ministries of health of affected countries, the communication and social mobilization component—which UNICEF refers to as communication for development (C4D)—of the Ebola response. For the first time in an emergency setting, C4D was formally incorporated into each country’s national response, alongside more typical components such as supplies and logistics, surveillance, and clinical care. This article describes the lessons learned about social mobilization and community engagement in the emergency response to the Ebola outbreak, with a particular focus on UNICEF’s C4D work in Guinea, Liberia, and Sierra Leone. The lessons emerged through an assessment conducted by UNICEF using 4 methods: a literature review of key documents, meeting reports, and other articles; structured discussions conducted in June 2015 and October 2015 with UNICEF and civil society experts; an electronic survey, launched in October and November 2015, with staff from government, the UN, or any partner organization who worked on Ebola (N = 53); and key informant interviews (N = 5). After triangulating the findings from all data sources, we distilled lessons under 7 major domains: (1) strategy and decentralization: develop a comprehensive C4D strategy with communities at the center and decentralized programming to facilitate
flexibility and adaptation to the local context; (2) coordination: establish C4D leadership with the necessary authority to coordinate between partners and enforce use of standard operating procedures as a central coordination and quality assurance tool; (3) entering and engaging communities: invest in key communication channels (such as radio) and trusted local community members; (4) messaging: adapt messages and strategies continually as patterns of the epidemic change over time; (5) partnerships: invest in strategic partnerships with community, religious leaders, journalists, radio stations, and partner organizations; (6) capacity building: support a network of local and international professionals with capacity for C4D who can be deployed rapidly; (7) data and performance monitoring: establish clear C4D process and impact indicators and strive for real-time data analysis and rapid feedback to communities and authorities to inform decision making. Ultimately, communication, community engagement, and social mobilization need to be formally placed within the global humanitarian response architecture with proper funding to effectively support future public health emergencies, which are as much a social as a health phenomenon.

INTRODUCTION

In December 2013, an outbreak of Ebola Virus Disease (EVD) began in West Africa, spreading through Guinea, Liberia, and Sierra Leone. In July 2014, the World Health Organization (WHO) declared the outbreak a “Public Health Emergency of International Concern.”1 By March 2016, when the Emergency Committee on Ebola convened by WHO concluded that the outbreak no longer constituted a public health emergency,2 a total of 28,616 confirmed, probable, and suspected cases had been reported, more than 11,310 people had died, and 23,588 children had lost one or both parents or their primary caregiver.3,4 Although the region is now considered mostly Ebola-free, there is a general recognition that Ebola or other emerging public health issues will continue to pose a threat, highlighting the need for continued vigilance and preparedness.

Considered the most severe in the history of the disease, the 2013–2016 Ebola outbreak affected some of the world’s most vulnerable communities and countries recovering from years of destructive civil war and unrest. An initial underestimation of the scope of the outbreak contributed to delays in funding, which in turn contributed to a slow start to the response.

Once the response hit the ground, it was initially focused on containing EVD and establishing the supply-side pillars related to surveillance, logistics, and, in particular, burials. Communities had been taking action to manage their own risks, many of which paid dividends,5 but the formal response at that time paid little attention to working within community structures and did not acknowledge traditional community coping strategies and influences on behavior. Rumors and misconceptions circulated widely because community members mistrusted messaging from formal communication channels. These poor community linkages and poor quality of services as a result undermined community confidence, effective social mobilization, and ultimately the response itself.

As the outbreak progressed beyond initial projections, and given the limitations of clinical approaches and weak local systems, pressure increased for community engagement and social mobilization to be central to changing behavior to prevent and control the outbreak.6 According to one evaluation of this component of the global response7:

The predominance of top-down communication in the early stage of the response reflects the way the Ebola response initially sidelined community engagement as a critical operational tool. Early Ebola messaging and response strategies were symptomatic of this, and too often failed to meet the needs and realities confronting affected populations.

For the first time in emergency contexts, social mobilization and community engagement was included as a “cluster system” (also known as a “pillar”) in the 3 most affected countries, representing a key area of focus for the response. These cluster systems were led by the ministries of health and their corresponding technical units with support from United Nations (UN) agencies and civil society organizations. Although variations existed among the 3 countries, the other pillars commonly included media and communication, epidemiology/surveillance, case management/contact tracing, infection control, laboratories, burials, logistics/supplies, psychosocial support and child protection, and other sectors such as water and sanitation, HIV/AIDS, health, nutrition, and education.
The main function of the social mobilization and community engagement pillar was to coordinate efforts and design a strategy to focus on key behaviors, including measuring and reporting on key performance indicators. The United Nations Children’s Fund (UNICEF) was designated as co-lead for this pillar with government and civil society counterparts in each of the countries, while working closely with many other partners.

Various terminology is used to describe working with communities to achieve individual and/or collective change. The countries affected by Ebola used the terms social mobilization and community engagement almost interchangeably, in addition to the term communication for development (C4D). UNICEF uses the term C4D to encompass both social mobilization and community engagement. As such, C4D is a 2-way process for sharing ideas and knowledge, including social norms, using a range of communication tools and other approaches that empower individuals and communities to change behavior and take actions to improve their lives. In an emergency, C4D can help facilitate change at multiple levels—from leveraging support to influence and implement policies, to motivating and mobilizing civil society, to actively empowering households and communities to identify problems, propose solutions, and act upon them.

This article describes the lessons learned in social mobilization and community engagement in the context of the emergency response to the Ebola outbreak. These lessons draw primarily on an analysis of UNICEF’s C4D work in the 3 affected countries, but they also build on and are complemented by lessons and assessments conducted by other partners involved in the Ebola response.

**METHODOLOGY**

The purpose of this assessment was to identify lessons learned from the Ebola response in West Africa, with a particular focus on C4D, using a mix of the following 4 methods:

**Literature review:** We began with a desk review of key independent and interagency documents from UNICEF and partner agencies, such as the UN Mission for the Ebola Emergency Response (UNMEER), WHO, the UN Office for the Coordination of Humanitarian Affairs (OCHA), Health Policy Group, Oxfam, Médecins San Frontières, and Catholic Relief Services. We also drew useful insights from key meeting reports, such as the UNMEER/UNICEF regional consultation in Freetown, Sierra Leone, in March 2015 and the interagency meeting hosted by Oxfam in September 2015, which included a wide range of NGO partners. Finally, we conducted a wider online search of relevant peer reviewed articles and grey literature published between December 2013 and March 2016 focused primarily on lessons learned, community engagement, and communication and social mobilization in the Ebola response, and analyzed available Standard Operating Procedures (SOPs) on Ebola, with a specific focus on C4D (including social mobilization and/or community engagement).

**Structured expert discussions:** Based on the literature review and the analysis of SOPs, we conducted a structured discussion in June 2015 with more than 90 UNICEF and civil society participants across West and Central Africa to elicit key lessons learned. To further explore the lessons identified by this initial discussion and the literature review, we conducted a second structured discussion in October 2015 with 20 UNICEF staff directly involved in the Ebola response at the global, regional, and country level. This discussion incorporated a modified Delphi technique to gather qualitative responses to open-ended questions about the lessons learned. The discussion group sorted the responses into 21 sub-domains of interventions under 7 main domains of inquiry (Box 1).

**Survey:** We then used the 7 domains of inquiry and 21 sub-domains of interventions to frame a voluntary online survey with individuals who worked between July 2014 and April 2015 on Ebola with governments, the UN, or any partner organization in any of the 3 affected countries or in a regional or global support function. Respondents were asked to provide individual opinions and reflections on professional experience, not from an organizational point of view. We asked respondents to rate the perceived success of the 21 interventions using a 10-point scale (1 = “highly unsuccessful”; 10 = “highly successful”) during 2 phases of the outbreak: (1) when the outbreak was generally increasing in severity (July–December 2014), and (2) when the outbreak was generally coming under control (January–April 2015). We also asked respondents to prioritize interventions in the event of a new Ebola outbreak.
somewhere in the world and encouraged them to provide additional qualitative information for each question.

In September 2015, we pilot-tested the survey in English and French with UNICEF staff working in the same countries as the target audience and made editorial refinements afterward. We launched the final online survey in October and November 2015 using a snowball technique, starting with UNICEF and UNMEER staff. No incentives were provided for completing the survey.

**Confirmatory key informant interviews:** Using information from the literature review, the expert discussions, and an analysis of the survey results, we developed a draft set of lessons learned, which we validated through 5 confirmatory key informant interviews with UNICEF and UNMEER senior advisors conducted in December 2015. We also presented and discussed the draft lessons at the International Summit on Social and Behavior Change Communication in Ethiopia in February 2016. In both the interviews and at the summit, partners provided positive and confirmatory feedback on validity of the lessons.

**Limitations**
The majority of survey respondents were from UNICEF, with a minority from UNMEER, WHO, NGOs, and civil society organizations, because we used the snowball sampling method. In addition, we collected limited information about the respondents, so it is not possible to determine sex or age differences in the survey responses, nor differences related to position or time spent working on the Ebola response in West Africa. Furthermore, the data collection took place after Ebola was generally considered under control in Sierra Leone and Liberia, although less so in Guinea. Recall bias may therefore be evident given that the data were collected several months after the reporting period of interest. However, we triangulated data from multiple sources to consolidate themes that emerged from more than 1 source, thereby limiting the impact of bias.

**FINDINGS**
A total of 53 respondents from UNICEF, UNMEER, NGOs, government, and civil society organizations completed the survey (n = 43 English, n = 10 French). The majority reported working in one of the 3 affected countries during the outbreak: Liberia (n = 23), Guinea (n = 17), or Sierra Leone (n = 9). Five respondents reported working in the regional office...
and 3 at a headquarters location. (Respondents could report more than 1 duty station.)

According to survey respondents, the 5 most challenging elements during phase 1 of the response consisted of: (1) coordinating community engagement efforts; (2) working with survivors, counseling, or addressing stigma and discrimination issues; (3) developing community engagement indicators or other monitoring and evaluation issues; (4) decentralizing community engagement; and (5) tracking rumors (Figure 1). The elements considered most successful during phase 1 were: (1) working with journalists and community radio; (2) developing key messages; (3) building partnerships for community engagement; (4) funding for community engagement; and (5) working with religious leaders.

Respondents reported that all elements during phase 2 were overall more successful than during phase 1; the 5 most successful elements during phase 2 were: (1) building partnerships for community engagement; (2) working with local journalists and radio; (3) developing key messages; (4) working with religious leaders; and (5) decentralizing community engagement. The most challenging elements during phase 2 were: (1) research; (2) developing community engagement indicators or other monitoring and evaluation issues; (3) working with survivors, counseling, or addressing stigma and discrimination issues; (4) community engagement around community care centers (CCCs); and (5) providing supplies for community engagement. The elements that achieved the greatest improvement between phase 1 and phase 2 were: (1) decentralizing community engagement; (2) coordinating community engagement; (3) tracking rumors; (4) working with survivors, counseling, or addressing stigma and discrimination issues; and (5) implementing interventions for school children.

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**FIGURE 1.** Communication for Development Challenges and Successes in Phase I (July–December 2014) and Phase II (January–April 2015) of the Ebola Epidemic in West Africa

<table>
<thead>
<tr>
<th>Element</th>
<th>Phase I</th>
<th>Phase II</th>
</tr>
</thead>
<tbody>
<tr>
<td>Desentralization of CE</td>
<td>1</td>
<td>6</td>
</tr>
<tr>
<td>Coordination of CE</td>
<td>1</td>
<td>6</td>
</tr>
<tr>
<td>Working with survivors</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>Interventions to school children</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>Data collection &amp; availability</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>Child protection</td>
<td>4</td>
<td>6</td>
</tr>
<tr>
<td>Usefulness of CE SOPs</td>
<td>5</td>
<td>7</td>
</tr>
<tr>
<td>Management of staff</td>
<td>4</td>
<td>6</td>
</tr>
<tr>
<td>Capacity in CE</td>
<td>4</td>
<td>6</td>
</tr>
<tr>
<td>CE around CCCs</td>
<td>4</td>
<td>6</td>
</tr>
<tr>
<td>Research</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>Listening to communities</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>Working with religious leaders</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>Supplies for CE</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>Key messages</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>Funding for CE</td>
<td>3</td>
<td>5</td>
</tr>
</tbody>
</table>

Abbreviations: CCC, community care center; CE, community engagement; SOP, standard operating procedure.

In future EVD outbreaks, the majority of respondents prioritized coordination (77%), followed by listening to communities and building their trust (45%) and decentralization (30%), as the 3 elements to focus on. This was followed by timeliness and relevance of community engagement (23%), funding for community engagement (21%), and building capacity in community engagement (19%).

After triangulating the findings from all data sources, including the survey findings, expert discussions, and the literature review, we distilled lessons under the following 7 major domains.

1. Strategy and decentralization
2. Coordination and SOPs
3. Entering and engaging communities
4. Messaging
5. Partnerships
6. Capacity building
7. Data and performance monitoring

**Strategy and Decentralization**

**Lesson learned:** Establish a comprehensive strategy that focuses on key behaviors, places communities at the center during all phases of the response, and facilitates decentralization with high-quality C4D programming integrated across sectors.

Programmers in the 3 countries affected by the Ebola epidemic used a number of health-related behavior change theories to develop C4D strategies. For example, the socio-ecological model was used from the outset to understand and respond to the individual, community, social, and political dynamics driving EVD. However, during the first phase of the response, community demand for information and services was not matched with adequate supply, which initially undermined community engagement efforts. These negative community experiences generated mistrust and other barriers to behavior change, which once established were difficult to overcome. The Supply–Enabling Environment–Demand (SEED) model, which pertains to the influence of supply, the enabling environment, and demand for services on health behavior, was useful in Sierra Leone to bring these factors into balance. Similarly, the Stages of Change Theory was used to address the need for a differentiated response as the outbreak progressed; however, capacity limitations initially inhibited progress.

Identifying influential or trusted sources of information was reinforced as a prerequisite for building community confidence in both rural and urban settings. However, the respondents also suggested that community engagement in rural areas generally required different strategies than in urban centers. For example, in rural communities religious and other community leaders were very influential and had extensive reach, whereas different approaches were needed in densely populated urban settings with diverse information needs and living arrangements, such as informal settlements.

The need to adapt quickly to different contexts requires a decentralized approach to C4D programming. Respondents highlighted this importance and stressed that strategies need to address the complexities of community and cultural hierarchies and other local factors from the outset. As the Ebola response as a whole matured, including the C4D components, success was achieved through greater focus on customary burials and predicting related hot spots. At the same time, it was recognized that the approach must be tailored to the context. For example, different information and actions were required for different groups, such as survivors, pregnant women, or fishing communities, and these efforts needed to be well coordinated with community expectations regarding, for example, supplies in quarantine situations or safety concerns regarding “Back to School” initiatives during the later phase. It was not until several months into the epidemic that the national response in the 3 countries had the capacity, coordination mechanisms, and substructures in place to manage the necessary decentralized approach.

**Decentralization/community ownership including availability of funding and proper coordination of intervention activities were critical catalysts that facilitated the successful eradication of the Ebola Virus in Liberia.** (Survey respondent)

**Coordination and Standard Operating Procedures**

**Lesson learned:** Establish solid C4D leadership at all levels with the necessary authority to coordinate partners. Introduce and enforce SOPs for C4D from the outset as a central coordination and quality assurance tool. Dedicate attention to coordination capacity to manage
<table>
<thead>
<tr>
<th>Issue/Factor</th>
<th>Rural</th>
<th>Urban</th>
</tr>
</thead>
<tbody>
<tr>
<td>Socio-demographics (e.g., poverty, literacy, education)</td>
<td>Approaches need to be tailored to socioeconomic status and literacy, but can be managed.</td>
<td>Literacy tends to be higher and English understood more than in rural settings, but still difficult to cater for the diversity in socioeconomic status in densely populated urban settings.</td>
</tr>
<tr>
<td>Traditional, social government structures that provide potential for sustainability, but can sometimes marginalize groups of people or other times provide an opportunity for better reach</td>
<td>High</td>
<td>Low</td>
</tr>
<tr>
<td>Understanding and correcting rumors</td>
<td>Localized rumors can be settled with local leaders and/or in a community meeting more easily than in urban areas, but still hard if various rumors are circulating.</td>
<td>Very hard to correct misinformation once widely circulated. Mistrust tends to fuel further distortion and undermine efforts to correct misinformation.</td>
</tr>
<tr>
<td>Access and reach for supplies and logistics</td>
<td>Easier to distribute than in urban areas, although further away.</td>
<td>Hard to distribute due to congestion/population density.</td>
</tr>
<tr>
<td>Partner coordination between regional and local command centers</td>
<td>Very organized and responsive, once up and running.</td>
<td>Hard to cope with very high demand; needs additional contingency and resources.</td>
</tr>
<tr>
<td>Data collection and monitoring</td>
<td>Hard because communities can be cautious and it is hard to reach everyone.</td>
<td>Hard due to dense population, difficult living conditions, lack of trust. Data collection and feedback are usually too slow to keep pace with changing situations in communities.</td>
</tr>
<tr>
<td>Differences in Preparation, Response, and Recovery phases</td>
<td>Initially Ebola was concentrated in rural areas; response improved with decentralized command centers.</td>
<td>As Ebola intensified, it also reached urban areas and the response struggled to keep pace. Many areas had no prevalence for a long time. Hard to remain vigilant over protracted period.</td>
</tr>
<tr>
<td>Interpersonal vs. mass media communication approaches</td>
<td>Mass media (radio) worked well in rural areas (when tailored regarding language, messenger, etc.), with reinforcement from interpersonal approaches (e.g., chiefs, religious leaders, community groups).</td>
<td>Mass media in urban areas is hard to tailor to all needs; interpersonal approaches are very labor intensive for urban settings.</td>
</tr>
<tr>
<td>Incentives</td>
<td>Hard; incentives need to be set out clearly across organizations and functions, and consistently followed everywhere, from chiefs to volunteers.</td>
<td>Hard; consistency across organizations and administration is very complicated in densely populated areas.</td>
</tr>
<tr>
<td>Capacity of health staff, community mobilizers, and ability to work together in teams</td>
<td>Hard to recruit and support the full range of technical and management skills, local and international staff, etc., especially for long periods.</td>
<td>While more people are available in urban settings, it is still hard to recruit and support the full range of skills needed, especially for long periods.</td>
</tr>
</tbody>
</table>
decentralization of the C4D response and resources across all sectors, as well as to detailed planning during all stages of the response. Respondents suggested that a lack of high-level, trusted leadership during the early phase of the response delayed effective roll out and coordination of C4D across the response and identified effective leadership and coordination of the many partners working on C4D as central to overcoming challenges more quickly and improving the quality of programming. As the response decentralized to districts over the course of the epidemic, the need for clear leadership and strong protocols to guide all aspects of the response strategy with consistency was underscored even more, from how to enter communities, to micro-mapping of communities, to accurate data collection and beyond. Although local decision making can be more flexible and responsive to the local context, in the absence of SOPs, implementation can become fragmented and ineffectual. Therefore, a delicate balance needs to be achieved between an approach that is flexible, responsive, and decentralized on the one hand and well-coordinated, consistent, and streamlined on the other hand. Respondents noted that SOPs provided the necessary authority to demand that C4D be integrated and paired with other sectors and pillars to unify the emergency response, and they reiterated the need for SOPs on C4D to be available early—to all partners—and enforced to improve the quality and consistency of C4D.

I learned the challenges of coordination: each partner wanted to rule. Partners are not working hand in hand and are more likely to promote their own agendas than fighting the outbreak to release overwhelmed communities. It is important to recognize the capacity, strengths and competencies of others ... good coordination has shown its relevance in producing harmonized messages, joined and strong SocMob [social mobilization] campaigns, etc. Decentralizing the community engagement must be planned from the beginning of the outbreak to ensure [the] local level is truly involved and national level strategies are taken to [the] community level. (Survey respondent)

... without coordination of partners ... there will be duplication of others’ work ... (Survey respondent)

Ideally, all implementing partners would endorse the SOPs and conduct standardized training as a requirement for their personnel to participate in the formal response. While dedicated technical expertise in C4D is absolutely central, all sectors would benefit from improving skills in engaging with communities to create harmonized ways of working. For example, social mobilizers can be paired with surveillance officers and active case finders or quarantine teams (Figure 2) or female social mobilizers can be included in ambulance teams, especially when they are attending to female patients. SOPs will need to be routinely reviewed and adapted according to epidemiologic findings and other contextual factors.

**Entering and Engaging Communities**

**Lessons learned:** Invest in trusted local community members as mobilizers and strengthen broader community systems for long-term resilience. Identify key influencers and channels of communication with strong reach and relevance while considering more specialized communication for specific sub-groups.

Developing and using the knowledge, attitudes, and C4D skills in communities themselves to shape local solutions is critical, and it requires investment over time and genuine partnership, as well as openness to listen to communities and to take appropriate action in a timely manner. In fact, many communities and local organizations were already taking action to prevent and manage Ebola as the formal response was being developed. Building on existing community engagement platforms, such as the strong networks of religious leaders in West Africa, was integral to gaining entry and trust in communities. In some communities in Liberia, community engagement for the purpose of addressing open defecation was already in place well before Ebola hit. These communities were able to quickly transfer those skills to Ebola, suggesting that a small amount of additional support can significantly leverage existing community investments.

From my experience in Liberia, I see community engagement as key to fighting any other outbreak ... our people believe in their religious/spiritual/traditional leaders so much that they believe anything they [the leaders] say to them. Once funding is available
and the communities are engaged to have knowledge and take on the fight themselves, getting any outbreak under control is possible... for instance, Grand Cape Mount, a highly Islamic county, was able to defeat Ebola only after UNICEF engaged religious, traditional, and community leaders to take the key Ebola messages to their own people, thereby creating trust and understanding, which promoted acceptance of early treatment and care-seeking behavior. (Survey respondent)

In some cases, lack of coordination led to unannounced entry of outsiders to communities, which created anxiety. As noted in a reports by the Overseas Development Institute and Institute of Development Studies:
The Ebola outbreak could be described as an epidemic of mistrust: the flame of a virus hitting the tinder of suspicion.

Popular suspicion of the motives of foreign organizations and government is rooted in a long history of slavery, civil war, extraction, and, more recently, commercial and non-commercial foreign development efforts [that are] often diverted into the pockets of government and non-governmental organization (NGO) officials.

Local mobilizers—that is, existing community members who have been trained and supported in C4D—will have clearer insight and more community trust and sustainable networks than outsiders. They are essential for achieving genuine community ownership and influencing key behaviors such as care seeking, infection control, and burial practices. Local knowledge is also critical to effective surveillance, contact tracing, and other key aspects of the response. An UNMEER consultation report emphasized 3 particular areas where local mobilizers played a key role: (1) overcoming community resistance, (2) understanding local context, such as sociocultural norms, decision-making processes, urban and rural considerations, and cross-border issues, and (3) transition and emerging issues such as getting back to school, including vaccine trials and routine immunization.

Why is the debate being reopened on engagement? It is not new and has worked in many contexts over years . . . [but still] we failed to solve the local conflict because the solutions were not coming from the community itself. (Survey respondent)

Community engagement is an art and a science—forget precision. Community engagement takes time and we have to invest time, resources to gain respect/influence of the community. (Key informant, civil society)

In terms of channels of communication, in all 3 countries radio was acknowledged as having the most effective reach and greatest flexibility regarding languages and messages. Radio also facilitated 2-way communication with local leaders and networks through call-in sessions, which included religious leaders, chiefs, healers, mayors and councilors, and other community leaders. As effective as these channels were, men usually held these positions of authority. The experiences of Ebola survivors, including children, women, those with disabilities, and marginalized groups are distinct and require specific attention. For example, many children were left without caretakers when adults in the household fell ill. Pregnant women were stigmatized because of the potential for infection during delivery. Therefore, a mix of communication channels with tailored messages is essential.

Messaging

Lesson learned: As the patterns of the epidemic change over time, continually adapt messages and strategies that are most relevant to communities’ understanding of the health issue, to their information needs, and to what is most likely to prevent and control infections.

The dissemination of key messages was highlighted by respondents as one of the stronger elements of the response, especially in terms of basic knowledge of Ebola prevention practices. Four key desired behavioral outcomes were consistent across all 3 countries throughout the Ebola response: (1) prevention practices including hygiene and handwashing, (2) case and contact reporting, (3) safe and dignified burials, and (4) early treatment and care seeking (Box 2). However, qualitative comments from the
structured expert discussions and survey suggested that greater attention to the evolution of messages over time was needed. During the early stages of the epidemic, messages that focused on Ebola causing death and no cure being available frightened communities. Similarly, information toward the end of the epidemic that the virus could remain in body fluids for several months after recovery fueled stigma against survivors. These negative messages were perceived as driving people away from organized services and toward untested remedies.

While simplicity in messaging is important to understanding, oversimplified messages that did not provide sufficient information were widespread, especially as the epidemic progressed. Unhelpful rumors circulated in all 3 countries and confounded efforts to convey facts or clarify what was needed for and from communities. Survey respondents spoke of examples of people with suspected Ebola being transported in ambulances without adequate feedback to the community about where the patients were taken or how to receive updates on their condition. This lack of communication supported rumors that ambulances were a source of infection. Rumors spread quickly, also highlighting the need to match community demand for information with high-quality, well-communicated services to capture and maintain trust. Furthermore, communities complained of the lack of services for non-Ebola matters, such as antenatal care, malaria treatment, and services for heart conditions or other ailments. As the response matured, however, the approach became more proactive, particularly by using information from communities to more directly shape messaging and other interventions.

Recognizing these challenges, governments in all 3 countries coordinated with the U.S. Centers for Disease Control and Prevention (CDC), UNICEF, and other partners to improve information flow and address rumors through weekly updates around evolving themes. These messages were then synchronized with radio communication, religious sermons, and other community channels. For example, as more survivors returned to the community, more emphasis was placed on the reintegration and support of survivors. In communities where this mobilization and support was consistent, this facilitated survivors resettling into communities.

Listening to communities and building trust is the key to the success of community engagement strategies. We need to know the community and need them to trust us . . . [also] socio-anthropological expertise is very relevant. (Survey respondent)

**Partnerships**

**Lesson learned:** Invest in strategic partnerships to achieve short- and long-term goals, starting with communities themselves, to build strategies, skills, and other resources that

**BOX 2. Key Desired Behavioral Outcomes in Response to the 2013–2016 Ebola Epidemic**

Desired behavioral outcomes for prevention, detection, and treatment of Ebola Virus Disease were consistent across Guinea, Liberia, and Sierra Leone—the 3 countries most affected by the 2013–2016 Ebola epidemic. The behavioral outcomes spanned the following 4 main categories:

- Hygiene, handwashing, and other infection control practices
- Safe and dignified burials
- Case and contact reporting
- Early treatment and care seeking

See the Appendix at the end of this article for sample communication materials used in each country to address these desired outcomes. Additional samples are also provided as supplementary materials.

Girls from Lofa County, Liberia, read a poster on how to prevent spreading Ebola. Dissemination of key messages was recognized as one of the stronger elements of the Ebola response in West Africa.
are most relevant to community understanding of the health issue and to controlling the outbreak.

Survey respondents rated partnerships with community, religious leaders, journalists, and radio stations as key elements of success throughout the response, reinforcing the principle of communities being the central partner in C4D. Coordination among partners was also noted as critical, particularly given the large number of international and local NGOs involved in C4D and the nature of donor and government relationships. For example, in Liberia 76 partner organizations organized 830 public health trainers who trained 15,000 community educators. These community educators equipped more than 2 million Liberians with lifesaving information about how to protect themselves and their families from Ebola. It is important to note that a number of organizations withdrew from the affected countries as the Ebola outbreak spread while new organizations emerged on the scene and many new staff arrived. This created enormous challenges in coordination and establishing trust with different partners.

In reflecting on the first phase of the outbreak, survey respondents mentioned overemphasis by partners in all 3 countries on producing simple materials (e.g., posters, flyers) to convey key messages, such that some of these resources may have been better applied to more complex tasks including more intensive community engagement.

Some partners have put a lot of money in developing materials (posters, flyers, banners). However, no one among these partners has courage to assess the impact of these materials. Or even determine what could have been the right quantity to reproduce. Thousand[s] of [materials] are stored at the airport. (Survey respondent)

Respondents indicated that coordination among partners significantly improved during the second phase, and partnerships mechanisms, such as working groups, that were established to manage key messages, coordination, research, and other tasks became more efficient. Micromapping of communities was also conducted to improve targeting, with agreed division of labor from partners across geographical areas. This activity both required and built high levels of coordination and trust in these partnerships. These mechanisms and the pressure to use existing capacity wisely also imposed a level of discipline to engage only those partners who were necessary to the particular task.

Capacity Building

Lesson learned: Establish and support a network of local and international professionals with capacity in C4D, including both management and technical skills, who can be deployed rapidly and remain in place for significant amounts of time to supplement national systems.

Challenges in attracting and maintaining personnel with adequate capacity over time is commonly reported in emergency situations, as was the case during the Ebola outbreak. Many international organizations deployed staff for only weeks at a time, especially during the early phase. The high turnover of staff undermined continuity and frustrated coordination efforts. In addition, in the case of C4D, there was an insufficient range of capacities, resulting in too much “megaphone-style” mass communication and too little comprehensive health promotion and behavioral science, coordination, leadership, management, and strategy capacity. Finally, the sheer volume of organizations engaged in C4D to varying degrees in the 3 countries—more
than 30 international and many more local organizations—required very different skills related to central management compared with the technical skills required for fieldwork in urban, rural, or remote areas.

In the future, staff should be provided with a common orientation, trained in agreed SOPs and minimum standards (including safety), and given ongoing support, including supportive supervision. In addition to improving the quality and consistency of the emergency response, these measures help to keep staff healthy and to reduce turnover, especially considering the stress that emergencies can impose.

As part of efforts to formalize C4D as an integral element of the global humanitarian infrastructure, a global network of C4D specialists is needed to support the surge capacity, along with standardized procedures to address administrative issues, predemotion training, and fast-track recruitment. Harmonization of incentives and compensation to mobilizers at all levels, across organizations, and regardless of whether they are international or local should also be undertaken. Dr. Tom Frieden, Director of the CDC, commented on the need for capacity development to rapidly detect and respond to future outbreaks:

“We need rapid-response teams; one of the things we did in Liberia was to implement rapid-response capacity, so that when cases emerged in rural areas we sent a team out immediately and they were able to stop the virus within one or two generations of it. We need increased prevention wherever possible.”

Innovations in Data and Performance Monitoring

Lesson learned: Establish clear C4D process and impact indicators and an accessible harmonized data platform for monitoring, and strive for innovations in real-time data analysis and rapid feedback to communities and authorities to inform decision making.

There was a range of qualitative and quantitative data sources in the formal response, including field-based observational data, adapted mobile phone platforms, call-center data, and nationally representative surveys. In addition, individual partners conducted small- and large-scale studies, evaluations, and other reviews. Despite providing valuable information, synthesis from these various sources and dissemination of the data were inadequate and could not keep pace with the outbreak. Furthermore, because C4D is process-oriented, it was initially difficult to agree on useful indicators that could be applied across the affected countries.

Despite challenges, impressive achievements also emerged. Sierra Leone completed 3 nationally representative surveys of knowledge, attitudes, and practices (KAP) over 7 months of the outbreak, which provided strong evidence that C4D was having an impact, and was critical to improving decision making and program strategy. Innovations in open-source platforms for mobile phones, such as Rapid Pro and U-report, as well as mobile messaging (SMS) were deployed across all 3 affected countries to gather real-time community insights and attract underrepresented groups such as young people. These technologies enabled greater responsiveness to rumors that required rapid redress to prevent undermining the response.

Increasing partner access to common monitoring platforms with real-time analysis and clear feedback mechanisms to communities is essential to managing future outbreaks. There is also a need to agree on predefined C4D indicators and mechanisms, including strong coordination of key activities and monitoring of the response among partners. Establishing a monitoring and evaluation plan from the outset of the emergency to support the overall C4D strategy is also essential. Such a plan must be informed by a range of data, including anthropological, epidemiological, qualitative, and quantitative data, and show greater respect for community perceptions and rumors.

Difficult to reach scale at reasonable cost... Difficult to integrate [indicators] across sectors, partly because each sector wants to include so much detail. Also difficult to measure impact and cost-effectiveness [of C4D]. (Expert discussion participant)

Rumor tracking is also key; many people lost their lives because of rumors, myth, denial, etc. (Survey respondent)

OUTLOOK FOR FUTURE OUTBREAKS (AND OTHER EMERGENCIES)

Despite early warning signs, the Ebola outbreak took the world by surprise. The lack of preparedness, lack of acknowledgment of the potential spread of Ebola, and delays in funding resulted in a race to catch up to the virus,
rather than getting ahead of it from the start. Each of the 3 most affected countries struggled to simultaneously implement a myriad of approaches to address the varied challenges emerging in different parts of the country. As noted in a report on the Ebola response by the Overseas Development Institute:

"Ebola exposed much about the international aid community: it was dedicated, resourceful, and diverse, as well as ill-prepared, donor-dependent, and tested by the confrontation between technical approaches and the complexities of the sociocultural context.

The lessons learned from the Ebola response in West Africa, particularly the C4D response, are based on a very specific context: the situation was rapidly unfolding and full of surprises and the communities that were affected the most were largely low-income and remote, and they often held traditional practices and rituals that were difficult to change. Nevertheless, the basic principles uncovered from the Ebola response can be applied to future disease outbreaks, not least the need to focus on prevention as well as treatment. Furthermore, some of the lessons that emerged from this analysis, including engaging communities early on, understanding social and behavioral dynamics to shape the response, adapting to the evolution of the epidemic and to feedback from communities, and facilitating a more central and active role of communities with mutual accountability mechanisms, have been well known for some time and should not have been overlooked. Specifically, various conceptual and theoretical models have been applied in health and development programming, including in emergency responses, to better address social and behavioral dynamics. For instance, the socio-ecological model posits the need to understand drivers of behaviors and change across different domains of influence—from individual and interpersonal to community and social and political—which may require different types of communication and engagement. Similarly, the Stages of Change Theory has long espoused the need for different information and approaches as people and communities move through different stages in their experience of a health-related issue. At the same time, many of the “right things” were included in national strategies responding to the Ebola outbreak; implementation and adaptation over time, however, proved difficult. It was not until the response acknowledged the essential need for effective coordination and SOPs, integration of C4D with other components of the response, and enhancing local capacities that progress started to happen.

While differences exist, many similarities in lessons learned have been drawn from the Ebola outbreak in West Africa and other events, such as earthquakes in Haiti and Nepal, the Zika outbreak in Latin America, and longer-term challenges such as HIV or polio. The undeniable social dimensions of these public health issues highlight the centrality of community engagement as well as the wider implications of social and behavior change. We can look to the recent Zika outbreak as a specific case example of how lessons from the Ebola response also apply to this situation even though the virus, including transmission, symptoms, and treatment, are considerably different from Ebola. In early 2016, WHO declared a Public Health Emergency of International Concern due to the strong association between Zika virus infection during pregnancy and an increase in cases of microcephaly as well as other congenital complications, particularly in Brazil and other countries in Latin America. Because Zika is transmitted by the same mosquito that transmits dengue—an endemic disease in many Latin American countries—prevention efforts focused on engaging local communities to minimize exposure to the vector and to promote uptake of preventive behaviors including use of bed nets. As with Ebola, the Zika response has evolved from a primary focus on prevention to additional efforts to provide care and support to affected families. These developments require that communication and community engagement activities be flexible, adaptable, well-coordinated, and guided by data and evidence.

Communication, community engagement, and social mobilization proved their value to the individual and community behavior change objectives of the Ebola response. However, they are somewhat new to the global health emergency context and thus there is a need to formally place these approaches within the global humanitarian response architecture. Implementing organizations need to strengthen their capacity to fulfill C4D accountabilities as part of the formal cluster system, including clear SOPs, tools, training, and ongoing support. The Ebola experience also shined a strong light on the need to strengthen governance and accountability and wider systems strengthening, such as data systems, standardized indicators, supply chain, and use of real-time technology, ideally through a
common platform. Strengthening capacities of national and local governments to effectively address these types of emergencies, including a focus on C4D and risk communication, should be an important component of these efforts, which in turn could lead to greater accountability. This has been highlighted in multiple assessments, reports, and studies including the WHO Assessment of the Ebola response. These enhancements are already underway in the affected countries and elsewhere, in terms of risk-informed public health and resilience programming, including preparedness and readiness for potential public health threats—but they certainly will require long-term investments and focus. Ultimately, future success relies on a fully functional C4D coordination mechanism within the formal humanitarian infrastructure that is supported across the board and funded accordingly. This will be key to fulfilling the vision of the new “Grand Bargain” for humanitarian action endorsed at the 2016 World Humanitarian Summit, which seeks to more decisively put people and affected communities at the center of any response.

All of the above will require more predictable funding. Learning from other long-standing cross-cutting issues has shown that firm management agreements and practices are required. One possible approach, common in some fields such as evaluation and gender equity, involves designating a specific percentage of sectoral funds, likely between 10% and 20%, to support C4D efforts. Without formal action on such policies, the important benefits derived from social mobilization will remain ad hoc.

UNICEF has taken important steps to respond to lessons outlined in this article. Two important initiatives with implications for the broader humanitarian sector are worth highlighting. First, in coordination with other UN agencies, the Communicating with Disaster Affected Communities (CDAC) Network and other key stakeholders, UNICEF plans to establish a communication and community engagement platform within the global humanitarian architecture that will provide rapid access to surge capacity, greater predictability of response, common standards and tools, and clearly defined roles and responsibilities among humanitarian actors. The initiative will require long-term investments and funding linked to preparedness efforts. Second, UNICEF also plans to establish a global platform that will facilitate rapid synthesis of existing evidence and anthropological data that can quickly inform community engagement strategy and action. This platform will function as a global help desk, which will (1) identify and synthesize in advance relevant data and evidence on social and behavioral dynamics related to emergency response (e.g., engaging pastoralist communities in public health emergencies), and (2) respond to specific requests for available data and evidence in ongoing emergency situations. These efforts are not limited to public health emergencies but will function across different types of emergencies and humanitarian situations.

CONCLUSION

“Political and financial dynamics create a tendency towards cure, rather than prevention,” stated an Ebola evaluation report. However, in Guinea, Liberia, and Sierra Leone, a realization came about that Ebola is as much a social issue as a health issue, and, along with that, the countries realized the value of early, genuine engagement with communities. This is in essence the crucial lesson learned from the Ebola outbreak—one that should be carried forward, for when the legitimacy of C4D is recognized across the outbreak from the outset and organizations expand community systems fully, a range of issues beyond the specific emergency at hand will be supported effectively.

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APPENDIX. Sample Communication Materials Used in the 2013–2016 Ebola Response

The following samples are provided in English but were available in many languages. These samples are shown for illustrative purposes only and should not be considered better or worse than other materials that were used in the countries affected by Ebola. See the supplementary materials for additional samples.

Hygiene, Handwashing, and Other Infection Control Practices (poster from ActionAid, Liberia)
Safe and Dignified Burials (poster from the Ministry of Health, Sierra Leone, and the U.S. Centers for Disease Control and Prevention)

**Ensuring a Safe and Dignified Burial for your Loved One**

1. Always call 117 or a district alert line when someone is sick with Ebola symptoms or dies.

2. It is a sad and difficult time for you and your family when someone dies of Ebola.
   - Safe burials are a way to show respect and honor for those who have died and to protect others from Ebola.
   - Until Ebola is over, we must stop practices that spread Ebola.
   - The bodies of people who have died of Ebola have a lot of virus.
   - Do not touch the body or the body fluids of your loved one.
   - Do not touch, kiss, clean, wash, or wrap the body.

3. The burial team will talk to you about the steps they will take to provide a safe and respectful burial for your loved one.
   - The steps they take are to protect you and your family.

4. There are things you can do.
   - Family and community members may pay respects or pray at least 3 feet (1 meter) away from the body.
   - You may provide personal items and clean clothing to be buried with your loved one.
   - You may also provide a shroud (kasanke) or casket if you wish.

5. You may include your imam, pastor, counselor or other community leader in the discussions with the burial team and in the ceremony at the home or gravesite.

Created in collaboration with the U.S. Centers for Disease Control and Prevention
Ensuring a Safe and Dignified Burial for your Loved One

7. People who die must be buried quickly to protect others from Ebola.
   The burial team will place the body in a body bag and disinfect the home with a safe chlorine spray.

8. The burial team will take your loved one to the cemetery and you will be told where the burial will take place.

9. All items that were touched by the person who died such as a mattress, blankets and clothing should be taken from the house and not used by anyone else.

10. A small group of family members and religious leaders can meet the burial team at the cemetery to see the burial from a safe distance.
    If you are quarantined, you are welcome to have someone else go to the cemetery to pray for you.

11. You can give a plaque or marker to the burial team to place on your loved one’s grave.
    Otherwise, the burial team will mark the grave.
    Let the burial team know if you would like to throw the first dirt.

12. Important contact numbers

Local numbers

Other support services

MINISTRY OF HEALTH AND SANITATION

Created in collaboration with the U.S.
Centers for Disease Control and Prevention
Case and Contact Reporting (poster from the U.S. Centers for Disease Control and Prevention, Sierra Leone)

**What is contact tracing?**
Contact tracing can stop an Ebola outbreak in its tracks

**Contact tracing** is finding everyone who comes in direct contact with a sick Ebola patient. Contacts are watched for signs of illness for 21 days from the last day they came in contact with the Ebola patient. If the contact develops a fever or other Ebola symptoms, they are immediately isolated, tested, provided care, and the cycle starts again—all of the new patient’s contacts are found and watched for 21 days. **Even one missed contact can keep the outbreak going.**

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**Contact tracing finds new cases quickly so they can be isolated to stop further spread.**
Early Treatment and Care Seeking (poster from the U.S. Centers for Disease Control and Prevention)

VISIT YOUR NEAREST EBOLA TREATMENT CENTRE FOR HIGH QUALITY CARE

1. If you have fever, diarrhea, or vomiting, go to the nearest health facility. You will be welcome and will receive good care.
2. When you arrive, you can speak with your family on your own phone.
3. You will receive good, healthy food and treatment for other illnesses. You will be treated with respect and kindness.
4. Your family members can visit you and bring you food.
5. The beds are comfortable, and the fan will keep you cool.
6. If you recover from Ebola, you have no more virus and can join your family and community. You cannot transmit Ebola to them.

PROTECT YOURSELF • PROTECT YOUR FAMILY • PROTECT YOUR COMMUNITY
A Review of 10 Years of Vasectomy Programming and Research in Low-Resource Settings

Dominick Shattuck, a Brian Perry, b Catherine Packer, c Dawn Chin Quee c

Reviewed areas included misconceptions and lack of knowledge among men, women, and providers; approaches to demand generation including community-based and mass media communications; service delivery innovations consisting of the no-scalpel vasectomy technique, whole-site training, cascade training, task shifting, and mobile outreach; and engagement of religious and community leaders to create an enabling environment.

ABSTRACT

Vasectomy is a highly effective and safe contraceptive method for couples who want to stop childbearing, but only 2.4% of men around the world use this method. We conducted an extensive review of the vasectomy research literature and programmatic reports, published between April 2005 and April 2015, to synthesize barriers and facilitators to vasectomy adoption. Of the more than 230 documents initially retrieved in our search, we ultimately included 75 documents in our review and synthesized the findings according to the Supply–Enabling Environment–Demand (SEED) Programming Model. Regarding promoting demand for vasectomy services, we found there was a general lack of awareness about the method among both men and women, which often fueled erroneous assumptions about how vasectomy affects men. Several types of programmatic activities directly addressed knowledge gaps and negative misperceptions, including community-based and mass media communications, employer-based promotion, and group counseling. For supply of services, the lack of or inaccurate knowledge about vasectomy was also prevalent among providers, particularly among community-based health workers. Programmatic activities to improve service delivery included the use of evidence-based vasectomy techniques such as no-scalpel vasectomy, whole-site trainings, task shifting, cascade training, and mobile outreach. Finally, programmatic approaches to building a more enabling environment included engagement of governments and other community and religious leaders as well as campaigns with gender transformative messaging that countered common myths and encouraged men’s positive engagement in family planning and reproductive health. In summary, a successful vasectomy program is comprised of the mutually reinforcing components of continual demand for services and access to and supply of well-trained providers. In addition, there is an underlying need for enabling policies within the cultural and gender environments that extend beyond vasectomy and include men not just as default partners of female family planning clients but as equal beneficiaries of family planning and reproductive health programs in their own right. Accelerating progress toward meaningful integration of vasectomy into a comprehensive contraceptive method mix is only possible when political and financial will are aligned and support the logistical and promotional activities of a male reproductive health agenda.

BACKGROUND

Over the last several decades, national family planning initiatives have led to significant gains in many developing countries as exemplified through improvements in key Family Planning 2020 (FP2020) indicators. The initiatives continue to expand the quality of and access to family planning services, predominantly for women. More recently, research and programs that engage men in family planning and that combat inequitable gender norms have also increased in effectiveness and scope. A search of the abstracts accepted to the 2015 International Conference on Family Planning with the term “male involvement” resulted in 49 presentations across a
variety of aspects that included improving couple communication, improving service delivery for men, and looking for new ways to increase male involvement in family planning.\(^2\) With this growing support and refinement of gender and male involvement programming, now is an opportune time to incorporate voluntary vasectomy services into national family planning strategies.

Research suggests that demand for permanent methods may increase over time as the age when women desire to limit family size (that is, to stop childbearing) continues to decrease.\(^3\) Analysis of Demographic and Health Survey data from 18 countries between 2004 and 2010 found that the demand to limit births began to exceed the demand for spacing births, on average, at 33 years old. In some countries, however, the desire to limit births predominated at an age as low as 23 years.\(^3\)

When a couple desires to limit their family size, the most effective methods with the least side effects should be available. Vasectomy is one of these methods but is used little around the world. On the other hand, female sterilization (tubal ligation) is the most commonly used form of contraception worldwide: 19\% of women in union are sterilized versus 2.4\% of men globally.\(^4\) This is despite the fact that vasectomy has no side effects and, compared with female sterilization, is less risky of a procedure, provides a quicker recovery period, and costs the health system less per client. The correlation between the use of female sterilization and vasectomy is complex, as less developed countries contribute to the highest use of female sterilization but have the lowest prevalence of vasectomy.

Many other couples depend on short-acting methods (e.g., condoms, pills, injectables) to limit their births, which, when compared with long-acting or permanent methods (LAPMs), have greater costs for both governments and clients (time and money), are less effective due to potential product failure, and have higher rates of discontinuation and/or incorrect use.\(^5\)

Vasectomy, however, could be a viable option for many couples. Providers across the globe have been trained to perform no-scalpel vasectomies (NSV). This method requires only a small puncture in a man’s scrotum to access the vas deferens, with the client under local anesthesia. NSV has been found to be the preferred technique by physicians for isolating and accessing the vas deferens.\(^6\)–\(^9\) Cauterization of the lumen of the vas deferens combined with fascial interposition results in the lowest risk of occlusive failure (well below 1\%, according to post-vasectomy semen analysis).\(^7,8\) This technique is already widely used in North America.\(^10\) Recently, it was integrated within all district hospitals across Rwanda,\(^11\) suggesting that providers in low-resource settings can be trained in this method and that training in supplemental NSV with advanced occlusion (e.g., fascial interposition and thermal cautery) can maximize the effectiveness of ongoing vasectomy programs in low-resource settings.\(^12\)

In this article, we review recent literature related to voluntary vasectomy programs in low-resource settings to synthesize common barriers and facilitators to vasectomy uptake and identify recommendations to strengthen future vasectomy promotion efforts.

**METHODS**

In April 2015, we conducted a search of both the peer-reviewed and gray literature using 8 search engines: POPLINE, PubMed, Global Health, Cumulative Index to Nursing and Allied Health Literature (CINAHL), Africa-Wide Information, Academic Search Premier, Google Scholar, and the United States Agency for International Development’s (USAID’s) Development Experience Clearinghouse. Keywords used in the search were as follows: vasectomy OR “male sterilization” AND accept* OR “communication strategy” OR “contraceptive methods chosen” OR counsel* OR “delivery of health care” OR demand OR evaluat* OR “health services” OR implement* OR intervention* OR introduce* OR messaging OR program* OR promot* OR “scale up” OR “scaling up” OR “social marketing” OR success OR uptake. To limit our search to the most current and relevant literature, our inclusion criteria included documents published in English within the last 10 years (April 2005 to April 2015). We excluded documents describing vasectomy programs from Australia, Canada, the United Kingdom, or the United States. It is possible that some important resources published prior to April 2005 may not be reflected in this current review.

Our search retrieved more than 230 documents, of which approximately two-thirds were excluded because they were duplicates or did not meet our criteria. Two analysts categorized the remaining 75 documents according to their...
subject matter. We created matrices in Microsoft Excel to summarize and synthesize the content of the documents in each category, to highlight important barriers to and facilitators of vasectomy uptake, and to highlight key recommendations for future vasectomy programs. Finally, we applied the Supply–Enabling Environment–Demand (SEED) Programming Model to present the key findings from the 75 documents we reviewed. (See the supplementary material for a table of all 75 documents organized by region of the vasectomy program or research.) The SEED model has been established as a useful global framework for sexual and reproductive health programming. It is based on the principle that programs will be more successful and sustainable if they address the multifaceted determinants of health and if they include interventions that simultaneously (1) address the availability and quality of services and other supply-related issues, (2) strengthen the health system and foster an enabling environment for healthy sexual and reproductive health behavior, and (3) improve knowledge of sexual and reproductive health and promote demand for services. The SEED domains are—by design—overlapping and interrelated, as programmatic activities designed to address deficiencies in one domain can often improve conditions in other domains as well.

Information gathered from this review has been published in a final report for USAID and has been used to inform the development of 8 country-specific advocacy briefs (https://www.fhi360.org/resource/promoting-evidence-based-vasectomy-programming).

**FINDINGS**

**Demand for Vasectomy Services**

To be motivated to use vasectomy services, an individual or couple first needs accurate knowledge of and positive attitudes toward vasectomy. Potential vasectomy clients must also know where services are available, understand details about the procedure (e.g., side effects, recovery time, and time required for back-up contraception), and believe that services are confidential. Below, we outline barriers and facilitators related to demand for vasectomy services.

**Barriers to Promoting Demand for Vasectomy**

**Lack of knowledge.** Much of the literature we reviewed indicated there was a general lack of awareness about vasectomy and lack of basic knowledge about the procedure among prospective clients (both men and women), posing a major initial demand-promotion barrier. In 5 studies from Ethiopia, Nigeria, and Turkey, awareness of vasectomy as a family planning method ranged from 15.6% of Ethiopian women to 39.6% of unmarried Turkish men. However, awareness of vasectomy was high in India (97.4%) and Nepal (77%). Still, basic knowledge of how the procedure is conducted, requirements related to follow-up, or side effects from the procedure was still lacking across sites and studies. Disparities between men’s and women’s knowledge of vasectomy were rarely discussed in the literature. Among the few exceptions were two qualitative studies, from Malawi and Nigeria, that found that men were less knowledgeable than women about family planning methods in general and about LAPMs specifically.

**Negative attitudes.** Inaccurate knowledge often fueled erroneous assumptions about how vasectomy affects men physiologically and psychologically. In some studies, participants perceived that vasectomy hurt a man’s pride or caused a man to lose his “masculinity.” Men worried that others would view them negatively if knowledge of their vasectomy was public. In Ghana and India, participants felt that if a man got a vasectomy he would be viewed as “under the control of” or a “slave to” his wife. Another Indian study found that women preferred female sterilization over vasectomy because they felt it was better for a woman (than a man) to be “debilitated” since the economic contributions of men were more highly valued than those of women. A number of studies mentioned negative attitudes about the method because people thought vasectomy would lead to male infidelity or an inability to perform sexually, and some women feared men would retaliate or reject the possibility of method failure, resulting in negative consequences for women. Men and women generally lack knowledge about vasectomy, posing a major demand-promotion barrier.
68% of men found vasectomy acceptable, but only 34% suggested they would adopt it.20

We should note that acceptability and use of contraception is not solely dependent upon client (or provider) knowledge and attitudes toward the method. Behavioral theories abound describing the multitude of factors that contribute to client acceptance (e.g., opportunity and financial costs, social norms, perceived need, etc.), but accurate knowledge and positive attitudes are fundamental to ensuring informed and voluntary use of any method or health care procedure.

Facilitators to Promoting Demand for Vasectomy
Although documentation of knowledge and attitudinal barriers abounded in the literature, references to important facilitating factors were also present, including perceived benefits of the procedure among men and women as well as demographic information about the expected vasectomy client base. Programmatic activities that directly addressed knowledge gaps and rampant negative misperceptions toward vasectomy included community-based and mass media communications, an employer-based promotion intervention, and a group counseling approach.

Perceived benefits. Positive attitudes toward and perceived benefits of vasectomy—although mentioned in fewer than half of the articles reviewed—are important building blocks for increasing demand for services. Frequently cited benefits were related to the high contraceptive effectiveness of the method, clients’ quick recovery time, and the comparative safety and lower costs associated with the vasectomy procedure versus tubal ligation.16,20–22,24,25,29,30,37

Men and women in Cambodia and Malawi reported the benefits of sharing family planning responsibilities.24,36 Tanzanian women suggested that vasectomy would eliminate the possibility of having a child out of wedlock.29,30 In addition, Brazilian,38 Indian,12 Rwandan,39–41 and Tanzanian29,30 men described how vasectomy was beneficial to preserving the health of women (e.g., by avoiding frequent pregnancies and negative impacts of other forms of contraception) and that it was considered a minor procedure compared with female sterilization. Hearing positive testimonials was one of the main drivers of positive attitudes toward vasectomy in India—women felt encouraged and men were more open to the procedure.22

Overall, in articles related to vasectomy client perspectives, couples using vasectomy were satisfied with the fast recovery time and the maintenance of sexual function.39,42–44 Motivations leading to vasectomy uptake included the desire to limit births, limited financial resources (not being able to afford more children), concern for women’s health (desire to avoid pregnancies, births, and contraceptive side effects), and dissatisfaction with other contraceptive methods.29,30,33,39–42,45,46

Persuasive sources of vasectomy information for men include health workers, peers, and satisfied clients.31,32,39,43,45,47,48 Men in Ghana,49 Rwanda,41 and Turkey40 typically reported having heard about vasectomy through the media or from health care workers, which helped them learn how to access services.

Expected vasectomy clientele. Vasectomy—and sterilization in general—is not an appropriate family planning option for everyone. Therefore, it may be valuable for vasectomy programs to understand who their expected client base is. Based on our review, couples using vasectomy were generally older (over 30 years old), were married or in union, had multiple children (often 4 or more) and more children than couples using reversible methods, and had a history of prior contraceptive use.29,30,33,41,43,45,47,49,51 However, socioeconomic levels, education levels, and numbers of children of vasectomy clients varied within and between regions.45–47,50–52 Previous contraceptive use among wives of vasectomy clients varied from a low of 37% in Pakistan46 to 59.2% in Turkey45 and 87% in Rwanda.41 It is important to note that the range of potential vasectomy clients is likely more diverse than current users and that there may be a growing demand for limiting births (and resulting unmet need) among other demographics. Van Lith et al.4 for example, describe a landscape in which younger couples in sub-Saharan Africa are increasingly interested in limiting births.

Community-based and mass media communications. Community-based and mass media communications can increase awareness and drive demand for vasectomy. The Capacity Project’s pilot program in Rwanda developed robust communication materials to increase general knowledge and positive attitudes toward vasectomy. Communications strategies included outreach by community health workers (CHWs),47 formation of 12 vasectomy support cooperatives for male clients, video testimonials of clients that were used in education and communication campaigns,40,41,47 and dissemination of strategic
message through various media outlets, including radio, which informed potential clients of upcoming service days.53

The ACQUIRE Project led a vasectomy communication campaign called “Get a Permanent Smile” in several low-resource settings.54 The campaign countered pervasive myths and rumors about vasectomy using various media outlets such as posters and television broadcasts staggered to coincide with seasonal periods of high media attention (in Bangladesh) and television and radio ads complemented by an information “hotline” and community outreach (in Ghana).55 Spikes in demand for vasectomy were tied to the communication activities,55 which highlights the important link between mass media promotion and uptake of vasectomy services.

Employer-based promotion. The RESPOND Project engaged men and promoted male involvement in reproductive health, including vasectomy, in 10 Indian workplaces. The companies involved in this 18-month employer-based health promotional campaign ranged from waste management to manufacturing to beverage bottling. Through the program, employees were allowed to attend health-related activities during normal working hours. Educational materials focused on LAPMs, and strategies included training industry-related health coordinators on LAPMs and interpersonal communication, positioning health desks in well-trafficked areas of the company, establishing health (including family planning) referral systems, and establishing a hotline for family planning referrals.56 Employees who participated in the campaign reported a stronger intent to use family planning and were more likely to have discussed family planning with their partners than employees who did not participate.57 Additionally, many existing family planning users switched from short-acting or traditional methods to LAPMs after participating in the intervention.

Group counseling. In the Philippines, a group counseling intervention promoted open discussion with couples about NSV, which resulted in increased knowledge and acceptability of vasectomy among potential users.58 The authors suggested that as participants interacted, argued, and agreed or disagreed about certain issues, they encouraged each other to try particular contraceptive methods. They noted that the advantage of having couples together in the session was that after being exposed to the same information about

contraceptive methods, members of the couple were then able to discuss their own plans and make a decision together.59

Supply of Vasectomy Services

Provision of high-quality vasectomy services must include adequate infrastructure, supplies, and equipment as well as well-trained, skilled, motivated, and supported staff. It is also important to have administrative, financial, and management systems in place that are accountable to the communities they serve.

Barriers to Vasectomy Service Delivery

Lack of provider knowledge. Lack of provider knowledge of vasectomy or inaccurate knowledge was a major service delivery barrier identified in the literature. In one publication, Nigerian physicians were reported to have good general knowledge of vasectomy as a permanent method, but some thought that it would impair a man’s ability to ejaculate or would increase his risk for prostate cancer.60 Another study in Nigeria found that 90% of male health workers interviewed were aware of vasectomy, but they had varying degrees of knowledge as to whether local, general, or no anesthesia was used during the procedure.61 A qualitative study from Cambodia found that, in general, village-level providers had little or incorrect knowledge about LAPMs, including vasectomy.62 Two surveys conducted in India explored vasectomy knowledge of CHWs and found that there was a great deal of knowledge around a person’s eligibility for vasectomy as well as how long the procedure typically takes, but little knowledge of the details of the procedure (i.e., whether NSV requires stitches, the amount of time a man would need to take away from work, and post-vasectomy contraceptive requirements). In addition, some CHWs erroneously believed that after vasectomy a man would lose physical strength, become weak or get sick often, would not be able to have an erection or ejaculate, and would have reduced libido61,62—many of the same misconceptions held by men and women in general. It is evident from these studies that more needs to be done to improve provider knowledge about vasectomy, particularly among community-based health workers on the front lines of the health system. Community-level staff often provide people with their first exposure to new services that are available in health centers; their clear understanding and buy-in of methods

The “Get a Permanent Smile” campaign conducted in many low-resource settings resulted in spikes in demand for vasectomy.

Lack of knowledge about vasectomy is also prevalent among providers.
such as sterilization are essential to shaping the public knowledge and perceptions of vasectomy.

**Negative attitudes among providers.** Two studies that we reviewed explored how family planning providers’ negative attitudes toward vasectomy influenced their willingness to provide the method. Both studies described how some providers acknowledged counseling biases toward female sterilization and avoided counseling on vasectomy. Provider attitudes and individual perceptions of appropriate family planning methods for their culture (Nigeria) were juxtaposed against their fear of complications and limited financial gains from providing vasectomies (China).

Acceptability of vasectomy among providers was split between professional acceptability (i.e., willingness to refer clients for vasectomy) and personal willingness to use the method themselves. For example, in 2 Nigerian studies, a minority of providers (19.2%) accepted vasectomy as a contraceptive method and less than a minority of providers (19.2%) accepted vasectomy. Provider attitudes and individual perceptions of appropriate family planning methods for their culture (Nigeria) were juxtaposed against their fear of complications and limited financial gains from providing vasectomies (China).

**Facilitators of Vasectomy Service Delivery**

Programmatic activities geared toward creating or improving vasectomy service delivery included the use of evidence-based vasectomy techniques, whole-site trainings, task shifting, cascade training, mobile outreach, and tools to assist in program planning.

**Evidence-based vasectomy techniques.** Each of the programs in our review trained providers in NSV, highlighting the practicality of using this method to access the vas deferens in low-resource settings. Various methods were used by the different programs for occluding the vas once exposed, but Labrecque et al.’s review and evaluation of Asian vasectomy programs noted that most vasectomies were performed with NSV and simple ligation and excision technique for vas occlusion. This may be true in many low-resource countries due to the paucity of vasectomy services; however, to date no thorough review has been conducted.

From 2003 to 2004, the ACQUIRE Project visited vasectomy centers in Bangladesh, Cambodia, India, Nepal, and Thailand to observe vasectomy techniques and to demonstrate the novel occlusion techniques using handheld, battery-powered cautery devices and fascial interposition. ACQUIRE also conducted interviews with key informants in each country to gauge interest in the use of thermal cautery and/or fascial interposition techniques. The fascial interposition technique was largely known and even taught in the Asian countries visited but was seldom performed in Bangladesh, India, or Nepal. Barriers cited for not adopting fascial interposition included insufficient surgical skills, the additional time needed to perform the technique, and that it was not mandatory by country standards. Providers in these countries showed interest in the use of thermal cautery for vas occlusion.

**Whole-site training.** Beginning in 2005, FRONTIERS and local partners in Guatemala developed a systemic vasectomy introduction model for Ministry of Health hospitals and maternity clinics. The model involved training the entire health team—surgeons, nurses, receptionists, and others who might provide referrals—on the benefits, procedures, and side effects of vasectomy. This whole-site approach increased general knowledge about vasectomy for the site teams. However, in a post-training survey, knowledge gaps remained around post-procedure counseling guidelines and characteristics of potential vasectomy clients. After the end of this project, the ministry used the whole-site model to introduce services in 10 additional hospitals and maternity clinics.

Likewise, the ACQUIRE Project in Ghana offered whole-site trainings to establish “male-friendly” services, in which all health staff were trained in NSV counseling and services. The whole-site training resulted in staff being more receptive to offering men’s health services, a better understanding of male anatomy, fewer misconceptions about vasectomy, and more comfort in talking to men about vasectomy.

Other related research from Jharkhand, India, also found that training CHWs in NSV and male anatomy increased knowledge about the procedure and reduced misconceptions, which improved counseling for potential clients.

**Task shifting.** Vasectomy is considered a quick and routine procedure in most instances, which can be a benefit to physicians in low-resource settings who are extremely busy. For this reason, the discussion of task shifting vasectomy responsibilities to lower-level providers is common. In our search, we found some examples of this discussion and changes in policies. For example, Trollip et al. (2009) studied the safety

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**Most vasectomy programs in Asia use the no-scalpel vasectomy technique with simple ligation and excision for vas occlusion.**
and efficacy of vasectomy provision by junior-level doctors in South Africa. Procedure times and complication rates for 479 vasectomies were analyzed to assess the capacity of the physicians to perform the procedure, although they were not compared with those of more senior staff. Average operating times decreased significantly over time, but complication rates did not increase. This study suggests that with training and experience even junior-level medical staff may be able to efficiently provide vasectomy services without compromising the safety and efficacy of the procedure.

The low rate of complications in general for vasectomy clients suggests that more investigation is necessary to determine the appropriateness of task shifting this procedure. Alternatively, an indirect approach to increasing services is being implemented in Malawi, where long-acting methods, comprising intrauterine devices (IUDs) and implants, are provided by outreach staff. This task shifting allows CHWs to provide a wider array of services that, in turn, may afford more technically skilled providers greater availability to offer more permanent methods to clients who have reached their desired family size.

Cascade training. To systematically and cost-effectively build the capacity of clinics and service providers, many of the vasectomy programs we reviewed relied on a cascade approach to training. With the cascade approach, a small group of motivated providers and health staff are identified and trained to provide vasectomy service training. Once trained, this cadre is then trained as trainers. Over time, opportunities are provided for them to diffuse the knowledge and training to other providers and staff during the life of the program and after it ends (Figure).

Cascade training was implemented by the Capacity Project and PROGRESS in Rwanda. In both instances, the projects identified or developed curricula based on established procedures and created a skills checklist. This approach facilitated outreach visits by vasectomy teams from district-level hospitals to remote health centers to provide vasectomies and train other providers. Training under the PROGRESS Project took place over 5 days and included thermal cautery and fascial interposition. At the end of the training, the physicians successfully mastered the new occlusion technique. By 2012, the cascade training approach under the PROGRESS Project resulted in more than 64 physicians and 103 nurses trained in 42 hospitals, and 2,523 vasectomies were performed.

Mobile outreach. Mobile outreach services are often provided at static structures, in portable mobile health tents, or in vans. Our review identified several programs that used mobile outreach teams to expand the reach of vasectomy service provision. A key contribution to the success of the NSV program in Rwanda was the extension of service from hospitals to health centers. For example, 56% of vasectomies performed in a sample from one district were
conducted at a rural health center as opposed to a district-level hospital.\textsuperscript{40}

Padmadas et al. (2014) found that vasectomies were significantly more likely to be offered in a mobile clinic rather than a government hospital, particularly in remote locations.\textsuperscript{73} The Government of Nepal has mobilized outreach services for voluntary surgical contraception to rural areas of Nepal. Trained surgical teams travel to remote areas from a central location with necessary supplies. In locations where health facilities are not available, temporary settings such as schools and community centers are used.\textsuperscript{69} Wickstrom and colleagues from the RESPOND Project noted that community mobilization engages communities in discussing family planning; informs clients about all methods, including LAPMs; and ensures enough of a caseload of LAPM clients to make the outreach visit worthwhile.\textsuperscript{69}

**Tools to assist in program planning.** We identified a handful of tools created to assist vasectomy program planners when integrating vasectomy services.\textsuperscript{71–76} (This is not a comprehensive list of all available tools and training curricula related to vasectomy due to the search criteria used in our study.) The ACQUIRE Project developed 2 training curricula that were designed to instruct physicians and vasectomy assistants to provide safe and effective NSV services.\textsuperscript{71,72} One document includes curricula on counseling clients; verifying informed decision making and consent; preventing infection and managing complications, as well as supplemental materials on developing, maintaining, and publicizing a vasectomy service.\textsuperscript{76} The second document provides guidance for organizing and conducting training in NSV. In many areas, NSV services are provided as part of a team effort; thus, this course included instructions for training vasectomy assistants as well as physicians.\textsuperscript{72}

EngenderHealth published a checklist of the minimum number and types of medical instruments and supplies needed for provision of hormonal implants, IUDs, female sterilization, and vasectomy,\textsuperscript{75} which could be informative in future vasectomy programs and family planning/reproductive health costing studies.

The Johns Hopkins Information and Knowledge for Optimal Health (INFO) Project created a set of tools, checklists, and tables for program implementers and family planning providers to (1) counsel men about vasectomy, (2) identify men with conditions that require a delay or special consideration before vasectomy provision, and (3) explain to men what they should do before and after the vasectomy.\textsuperscript{74}

Our search did not identify any tools or guidelines to provide couples’ counseling, but one article previously discussed referenced use of a group counseling technique involving couples.\textsuperscript{61} Another INFO Project toolkit informs family planning/reproductive health program managers about the benefits of vasectomy and considerations for vasectomy integration.\textsuperscript{76}

**Enabling Environment**

Sociocultural, economic, and policy factors influence health services as well as social norms related to family planning in general and to vasectomy in particular. An enabling environment for vasectomy requires engagement of governments, communities, and civil societies to support and advocate gender-equitable norms, accountability, evidence-based policies, and high-quality vasectomy services.

**Barriers to Vasectomy Adoption**

**Social norms against vasectomy.** In many studies, vasectomy was viewed by people as the least preferred contraceptive method and was often used only as a “last resort” for women who have experienced side effects from hormonal methods or who might have potential health risks with another pregnancy, or for a couple who has reached or exceeded their desired family size.\textsuperscript{22,24,25,36} Across studies, the most commonly mentioned misperceptions about vasectomy among both men and women were (1) a man would become physically weaker after having a vasectomy; (2) a man would be unable to function sexually after having a vasectomy (e.g., would be unable to have an erection or satisfying a woman, or would have impaired ejaculation); and (3) vasectomy was the same as castration.

As mentioned earlier, the literature frequently cited prospective patient and provider reluctance to adopt vasectomy. This lack of acceptance among prospective clients and trusted health care providers perpetuates the intransigent social norm that family planning is a woman’s duty.\textsuperscript{15,16,18,31}
Facilitators for Vasectomy Services

Identifying appropriate areas in national and regional family planning strategies to highlight and support vasectomy integration is essential in formalizing support for the method. The literature we reviewed did not include effective messaging around economic benefits or direct links between programmatic activities and resulting policies. But the literature did include several program documents that described activities that were implemented with the goal of creating a more enabling environment for vasectomy adoption. Below, we combine different program activities around this goal.

Multi-level engagement. Gaining the support of governments and religious and community leaders and institutions can influence public attitudes toward public health campaigns, including vasectomy uptake. As an example, Simbar attributes Iran’s increased religious and political support of family planning programming over the last decade as a fundamental component to increased contraceptive uptake in the country. Currently, Iran’s vasectomy program is moderately robust with about 30,000 vasectomies provided annually and may provide a model for other countries in the region. Unfortunately, media reports from 2014 suggest that there was legislation passed by the government to ban vasectomy as a means to increase population. We are unaware of the current availability of the method in the country.

In Tanzania, the ACQUIRE Project identified Seventh-Day Adventists as advocates of all forms of contraception, including vasectomy, who even included information on contraception in their sermons. The Heri Seventh Day Adventist Mission Hospital in Tanzania, a focal point of the project’s vasectomy promotion and training activities, provided vasectomy services and educational seminars about the benefits of contraception. This hospital became a regional center of excellence in NSV and provided the majority of vasectomies over a 6-year period in the Kigoma region.

In Bangladesh, the ACQUIRE Project produced a book entitled Family Planning in the Eyes of Islam, designed to engage influential imams (Muslim religious leaders) in family planning, with a focus on LAPMs. This book situated the role of family planning in Islam and the stance taken on family planning in the Qur’an and Hadith, Islam’s 2 foremost sacred texts. In addition, the ACQUIRE Project sponsored interactive community forums, largely held in rural areas of Bangladesh, that brought together imams, teachers, businessmen, local politicians, and local family planning service providers to discuss family planning and the important role of LAPMs.

Gender transformative messaging. The “Get a Permanent Smile” campaign in Bangladesh and Ghana (as previously described) addressed the myths associated with vasectomy, particularly related to men’s interest in and knowledge of family planning. The program created posters and television commercials that contained the message “My husband is best,” which was highly regarded in the community. Men liked the fact that the materials clearly illustrated their role in family planning decision making and the notion that a wife would value the husband’s involvement. The materials challenged frequently cited concerns about vasectomy, promoted vasectomy in the communities, and highlighted couples’ shared decision making.

In Honduras, the “Permanent Smiles” campaign aimed to reposition vasectomy as a simple and effective male method of family planning. Key messages emphasized that vasectomy would have no negative effects on couples’ relationships and that vasectomy does not affect a man’s sexual performance.

In Ghana, the ACQUIRE Project’s vasectomy promotion included an emphasis on the benefits of vasectomy and promoted “satisfied users” through testimonials. Vasectomy was promoted as a contraceptive method that gives a man the ability to care for his partner and children while offering the freedom to enjoy life.

DISCUSSION AND RECOMMENDATIONS

This review identified factors that facilitate vasectomy integration into national family planning agendas from the experiences and evidence of recent vasectomy programs in low-resource settings. Vasectomy, like other contraceptive methods, benefits from well-integrated demand generation activities and adequately trained providers. Supportive policies are directly linked to the potential for vasectomy uptake. Government health agencies (if they have not done so already) must establish policies and political infrastructure that strategically engage and include men in a

Vasectomy, like other contraceptive methods, benefits from well-integrated demand generation activities and adequately trained providers.
Comprehensive reproductive health agenda, without undermining the gains made in increasing access to family planning for women. Policies that empower women and men to be supportive partners, continual family planning users, and reproductive health advocates lay a solid foundation for future vasectomy programs.

Unfortunately, current approaches to vasectomy integration are focused on the “quick win.” These approaches advocate the benefits of vasectomy to men and couples ready for a vasectomy right now. We suggest that vasectomy can be used to address the fundamental gap between reproductive health programming and men, a gap that exists in both high- and low-resource settings. These approaches would include educating men, including young men, on the range of methods available in their communities, their potential side effects, and their effectiveness. Research has shown that engaging men in family planning and reproductive health increases couple communication, facilitates male involvement in child care, and improves relationships.

Limited human resources continually limit the service provision, quality of care, and accuracy of clinical data. When considering vasectomy integration, governments should investigate the appropriateness of using health facility staff that are not physicians. It has been suggested that countries where nurses are already performing adult male circumcisions would be skilled enough to take on vasectomy provision. This is not to suggest that vasectomy clients would necessarily be the same men at the same time as circumcision clients, because circumcision clients may not be in the same life stage as vasectomy clients. Also, this would require clear delineation in counseling and promotion of the 2 methods.

Three reasons make a case for exploring this task-shifting option:

1. The 2 procedures are similar in surgical complexity.
2. Nurses who are already performing adult circumcisions have demonstrated the necessary surgical talent.
3. These nurses are accustomed to dealing with men in a reproductive health context.

The benefits of strong intake counseling cannot be understated for vasectomy services. Vasectomy’s global history and the mandate of informed choice should be considered when training health facility staff to counsel clients. Clear articulation of vasectomy as a permanent method should be included in counseling. Rates of dissatisfaction and/or regret with vasectomy range between 1% and 2%, and between 3% and 6% of men request reversals. In most low-resource countries, opportunities for a vasectomy reversal is not likely an option. Vasectomy counseling should also address emotional issues associated with the loss of fertility and the end of a couple’s reproductive life. The “maturational loss” associated with this change is well documented but seldom investigated in vasectomy research.

Universally, the studies and programmatic reports included in this review reflect positive and proactive approaches to vasectomy service provision. Unfortunately, there are also examples of misuse and abusive implementation in the past. Reflecting upon this history is key for program implementers, funders, and policy makers. It should also reinforce the principle of informed choice of family planning methods. Informed choice is one aspect of the growing “rights-based approach” that is currently being integrated into program planning that is being championed by global funders and initiatives including FP2020.

The program literature provides examples of channels and activities that changed perceptions of vasectomy and integration of men into reproductive health services. Countering misperceptions across multiple media channels was found to be effective at increasing vasectomy demand. Examples and materials to support vasectomy integration are well established. Use of testimonials, media campaigns, and strategic timing of service delivery was found to facilitate uptake, while training tools have been well established and easily available. At the grassroots level, cadres of existing vasectomy providers are linking themselves with physicians in low-resource settings. Training these providers in low-resource settings and...
providing them with the necessary equipment is important, but their small scale has limited impact on national contraceptive prevalence rates or on the associated benefits of integrating vasectomy into a national family planning agenda.

In conjunction with these somewhat grassroots efforts, World Vasectomy Day—the global campaign that fosters discussions about men’s role in reproductive health—held its fourth annual event on Friday, November 18, 2016, in Kenya.93 Momentum for vasectomy integration is rising and now the challenge is to appropriately pivot the focus of family planning and reproductive health services to include men in meaningful and impactful ways.

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Monitoring behavior using mobile phones at food distribution points allowed managers to rapidly adapt project activities. Self-reported breastfeeding, complementary feeding, and use of insecticide-treated nets improved. Applying the same methodology at the household level proved unsuccessful.

ABSTRACT

Background: Implementing complex nutrition and other public health projects and tracking nutrition interventions, such as women’s diet and supplementation and infant and young child feeding practices, requires reliable routine data to identify potential program gaps and to monitor trends in behaviors in real time. However, current monitoring and evaluation practices generally do not create an environment for this real-time tracking. This article describes the development and application of a mobile-based nutrition and health monitoring system, which collected monitoring data on project activities, women’s nutrition, and infant and young child feeding practices in real time.

Program Description: The Liberia Agricultural Upgrading Nutrition and Child Health (LAUNCH) project implemented a nutrition and health monitoring system between April 2012 and June 2014. The LAUNCH project analyzed project monitoring and outcome data from the system and shared selected behavioral and programmatic indicators with program managers through a short report, which later evolved into a visual data dashboard, during program-update meetings. The project designed protocols to ensure representativeness of program participants.

Findings: LAUNCH made programmatic adjustments in response to findings from the monitoring system; these changes were then reflected in subsequent quarterly trends, indicating that the availability of timely data allowed for the project to react quickly to issues and adapt the program appropriately. Such issues included lack of participation in community groups and insufficient numbers of food distribution points. Likewise, the system captured trends in key outcome indicators such as breastfeeding and complementary feeding practices, linking them to project activities and external factors including seasonal changes and national health campaigns.

Conclusion: Digital data collection platforms can play a vital role in improving routine programmatic functions. Fixed gathering locations such as food distribution points represent an opportunity to easily access program participants and enable managers to identify strengths and weaknesses in project implementation. For programs that track individuals over time, a mobile tool combined with a strong database can greatly improve efficiency and data visibility and reduce resource leakages.

BACKGROUND

Proper nutrition during the 1,000 days between the time of conception and a child’s second birthday sets the foundation for all the days that follow; it is considered one of the best interventions for ensuring optimum physical and cognitive development. The Preventing Malnutrition in Children Under 2 Approach (PM2A), used by the United States Agency for International Development (USAID) Office of Food for Peace, provides a blanket food supplementation approach to pregnant and lactating women and children under 2 years of age regardless of nutritional status.1–3

Implementing complex projects and tracking nutrition interventions, such as women’s diet and supplementation nutrition and infant and young child feeding practices, requires reliable routine data to identify potential program gaps and monitor trends in behaviors in real time. However, current monitoring...
and evaluation practices used in nutrition-related projects generally do not create an environment for this real-time tracking.\textsuperscript{4} The traditional baseline, midterm, and endline household-based surveys, used by most PM2A programs to track behavioral practices of program participants, are unable to provide routine and detailed nutritional information to effectively monitor project performance or trends in practices between time periods. In addition to the high costs and resources needed to reach individual households, these exhaustive surveys typically provide only general data that limit a manager’s ability to identify problems at the implementation level or allow for rapid programmatic adjustments. Conversely, routine reporting often established for monitoring activities typically collects process data, such as people reached or trained and numbers of participants receiving foods; it fails to capture information on how the program is used by the intended population or whether targeted behaviors are changing over time.\textsuperscript{5} Likewise, supportive supervision visits, another monitoring practice used by projects, often focus on micro-level behavior changes (i.e., the particular community or providers) and do not capture information in a systematic way, thereby restricting a program’s ability to generalize.

The purpose of this article is to describe the development and application of a mobile-based nutrition and health monitoring system, developed under the Liberia Agricultural Upgrading Nutrition and Child Health (LAUNCH) project, funded by the USAID Office of Food for Peace. The system collected monitoring data on project activities, women’s nutrition, and infant and young child feeding practices in real time. This article demonstrates how fixed programmatic points of contact, such as food distribution points (FDPs), can be used as an affordable and pragmatic alternative to household-based surveys to provide similarly useful and reliable data on key nutritional and health indicators necessary for many programmatic decisions.

**LAUNCH PROJECT**

The LAUNCH project, implemented by ACDI/VOCA and its partners Project Concern International, John Snow, Inc. (JSI), and Making Cents International, worked in 6 selected districts in Bong and Nimba counties in Liberia from June 2011 to June 2016. Selected districts included Gbor (Nimba), Salala (Bong), Sanoyea (Bong) Wee Gbey Mahn (Nimba), Yarpea Mahn (Nimba), and Zoe Gbao (Nimba). The project worked closely with the Ministry of Agriculture and the Ministry of Health and Social Welfare, and their respective county offices. The project applied an integrated PM2A approach to improve food security and reduce chronic malnutrition of vulnerable women and children under age 5. This entailed providing a comprehensive package of interventions that included supplementary feeding for pregnant or lactating women and children under 2 years (i.e., 6–23 months); increasing availability of and access to food through sustainable livelihoods interventions that included use of farmer groups, which cultivated group block farms using improved technology; strengthening facility and community health and nutrition services, including implementation of the Essential Nutrition Actions framework; and increasing access to primary education.\textsuperscript{6–8}

As part of the program, LAUNCH established FDPs where pregnant or lactating women and mothers of children ages 6–23 months from the selected districts collected food rations such as corn soya blend, bulgur, vegetable oil, and yellow split peas on a monthly basis. These same women were also members of LAUNCH community Care Groups that met twice a month to discuss health and nutrition practices.

**Nutrition and Health Monitoring System**

The LAUNCH project operated a nutrition and health monitoring system between April 2012 and June 2014 (9 quarters) to provide routine and detailed information to monitor performance and track key programmatic outcome indicators in the project’s communities (Box 1). The project collected information on a rolling basis through interviews with a random sample of program participants after they received their monthly food rations. Project food monitors collected data using mobile devices and uploaded it
to a cloud-based server, providing program managers with real-time program management metrics. The project analyzed the data each quarter and shared selected behavior and programmatic indicators with program managers through a short report, which later evolved into a visual data dashboard, during program-update meetings.

Key behavioral indicators captured by the monitoring system included variety and frequency of women’s nutrition practices; iron-folic acid supplementation during pregnancy; percentage of infants (ages 0–5 months) who are exclusively breastfed; variety and frequency of complementary feeding practices for young children (ages 6–23 months); percentage of young children (ages 6–23 months) who receive a minimum acceptable diet; percentage of caregivers demonstrating proper food hygiene behaviors; and percentage of households reporting an outbreak of diarrhea.

Program monitoring indicators:
- Mother’s nutrition and eating practices (e.g., variety, frequency, corn soya blend consumption, and iron-folic acid supplementation)
- Young child feeding practices (e.g., corn soya blend consumption, variety and frequency of complementary food, who feeds the child and how)
- Insecticide-treated net use (i.e., malaria and anemia prevention)
- Handwashing and hygienic food preparation
- Corn soya blend storage and preparation
- Participation in LAUNCH community groups
- Duration of rations
- Satisfaction with rations

The monitoring system relied on interviews conducted by food monitors with program participants at FDPs, before programmatic requirements shifted the point of contact to the household level (but still conducted by the same food monitors). A modified system continued to function for another 3 quarters (October 2013 to June 2014) until the Ebola outbreak led to the cancellation of food distribution and a substantial change in programming, effectively ending project monitoring related to food distribution and nutrition.

**Questionnaire and Mobile Data Platform**

LAUNCH developed a questionnaire that included both programmatic questions (Box 2) and nutritional behavior questions based on 24-hour recall (Box 2). The questions were based on the Demographic and Health Surveys and followed recommended indicators from the World Health Organization (WHO) (e.g., the minimum acceptable diet composite indicator). Survey administrators asked the questions using prescriptive WHO guidelines. The questionnaire was limited to 25 questions to keep interview times to less than 10 minutes, to avoid overburdening program participants and food monitors who had other responsibilities at the FDPs. When the point of contact shifted to the household level, the project added 15 more questions to the questionnaire.
questions; this increase did not have any significant impact on implementation.

The project chose to use smartphones (Nokia phones with a J2ME platform, later replaced with Samsung Android-based phones as the project expanded) and Magpi (formerly called EpiSurveyor), a digital data collection platform, to collect data. Using this platform, data from both the FDPs and household interviews were automatically transferred to a cloud-based server for storage and immediately available to download for analysis. Taking advantage of the increased power and availability of smartphone technology, digital data collection enables a user to collect data via mobile smartphone or tablet computer and store data offline (i.e., out of mobile network or Wi-Fi range). Once the user is back online, the data can be uploaded and saved to the cloud-based server. Digital data collection is generally associated with a cloud-based platform where a user designs data collection forms using a web-based application, and then downloads them to compatible devices. When the forms are filled in, the data are uploaded to a server using mobile phone data networks or Wi-Fi. The data can then be easily accessed online and are immediately available for supervisors to monitor and identify errors, then subsequently use for analysis and reporting (Figure 1).

Digital data collection applications use the advantages of computer programming to ensure better data quality and accuracy during data collection by making it possible to require respondents to answer a question before proceeding to the next question, skipping a question based on a response in a previous question, or adding constraints such as minimum and maximum values for numeric responses. Additionally, because

**BOX 2. Sample Questions Included in the Nutrition and Health Mobile Monitoring System**

**Sample Programmatic Questions:**
Q22: Are you part of a LAUNCH care group or mother group? Possible responses:
- Care group (lead mother)
- Mother group
- None  → Skip to #26

Q39: How do you store the CSB? Possible responses:
- In a plastic bag
- In a cloth
- In a bucket with a cover
- In a jar with a cover
- NA—First time receiving

**Sample Nutritional Behavior Questions:**
Q13: Yesterday, did you feed your child Tete Water (breast milk)? Possible responses:
- Yes
- No

Q15: Yesterday, did you feed your child any milk products, such as powdered milk, animal milk, or yogurt? Possible responses:
- Yes
- No  → Skip to #17

Q17: Yesterday, how many times did you feed your child? Possible responses:
- One time
- Two times
- Three times
- Four times
- More than four times

Abbreviations: CSB, corn soya blend; NA, not applicable.
data are entered directly into the mobile smartphone, the need for a separate data entry step is removed, reducing potential for error due to handwriting issues or mistakes during the data entry process. Data access privileges can also be customized in digital data collection, giving access for editing or downloading data to only those named, which reduces the opportunity to tamper with data and helps to ensure data integrity.

While many different digital data collection tools and applications existed, the LAUNCH project selected Magpi because it was user-friendly, easy to learn, required little to no programming experience to use, and was relatively inexpensive. Furthermore, Magpi had successfully been used in other JSI projects in Liberia and this experience proved that it could effectively avoid many of the challenges associated with paper-based data collection.
and that it was feasible for use in low-resource settings. The LAUNCH food monitors were responsible for the task of data collection. They participated in a week-long training to introduce them to the mobile devices, test the tool, and practice using Magpi. This was followed by frequent supervision visits, particularly during the first 6 months of implementation, as the food monitors grew accustomed to their additional responsibility. At the central level, data were reviewed online, and then downloaded into Microsoft Excel for further analysis. In addition to participants being selected at random, no personal information was collected. Once in Excel, data were then stored on the program computers and server, with the benefit of the original data backed up online. Processes, roles, and responsibilities were adapted throughout implementation, including restricting online access to the raw data to a select few. Box 3 includes a list of important factors to consider during the start-up phase of a digital data collection activity, based on the experiences of the LAUNCH project.

**Participant Selection, Analysis, and Confidentiality**

The nutrition and health monitoring system aimed to provide meaningful programmatic-level results that were statistically representative for each target group, as one would obtain through a household survey. Similar steps were therefore applied when designing the methodology. Using the sampling formula for cross-sectional surveys and the targeted population numbers used in the PM2A calculations, LAUNCH calculated the desired number of interviews needed for each quarter. The confidence level and margin of error for FDP-based results for all groups combined were set at 95% and 5%, respectively, whereas 90% and 8%, respectively, were used for the subgroups (pregnant women, lactating women with children under 6 months, and mothers of children...
ages 6–23 months). Based on these calculations, the project required a minimum of 377 interviews per quarter—including 102 pregnant women, 102 lactating women with children under 6 months, and 105 mothers of children ages 6–23 months. A data collection plan took into account specific logistical considerations, including frequency of point of contact (i.e., FDPs), existing and available staff (i.e., food monitors), staff responsibilities, and availability of project vehicles and motorbikes for movement between sites. For logistical purposes, the quarterly goal for food monitors was set at 400 interviews total.

Interviews were limited to program participants, as many of the questions were related to their behavior and based on a 24-hour recall. During the first 18 months of implementation, this meant conducting interviews with those who were physically present at FDPs to receive their food rations, excluding those who sent an alternate or those who did not attend the distribution in a given month. This was recognized as a potential limitation of the system; those sending alternates could potentially have very different feeding habits or other challenges that would not be captured and would therefore produce results that were not representative of the desired population (i.e., program participants). Discussions with community-level project staff indicated that alternates represented a small portion (less than 10%) of those collecting the food rations. This was later confirmed during a project assessment on commodity distribution and defaulters.

The project designed protocols to ensure representativeness of program participants. At each FDP, field staff randomly interviewed 5 women over the course of the day—2 mothers of children ages 6–23 months, 1 pregnant woman, 1 lactating woman with a child under 6 months, and then either another pregnant woman or lactating woman with a child under 6 months for the fifth interviewee. The composition of the sample was developed to align with the overall distribution of program participants obtained from the project’s commodity logistics management information system (CLMIS)—approximately 75% mothers of children ages 6–23 months and 25% pregnant or lactating women (half were assumed to be pregnant and the other half lactating). Interviews occurred throughout the 4- to 6-hour period that the FDP operated with field staff approaching program participants for interviews using the “spinning the pen” technique to help ensure randomization. To reduce response bias and avoid any notion that food rations would depend on their answers, interviews were conducted after program participants received their monthly food ration. During the analysis phase, probability weights were applied to the interview records so that results would be representative of all program participants who received food rations in the quarter. Program data on the number of participants receiving food from the CLMIS facilitated these weights.

For programmatic reasons, the point of contact shifted from the FDPs to the household level in October 2013, and slight adjustments were made to the sampling framework and implementation. To reduce some of the extra costs and resources required for the additional travel, the margin of error for results was increased to 6%, thereby reducing the overall sample size to 200. Additionally, the pre-conditions of attendance at the FDPs or receipt of food rations during the previous month were removed. Instead, each month, field staff visited a list of households located in 8 to 12 communities that were randomly generated from the project’s registered food recipient database. To provide a geographically representative picture of program activities, communities were linked to different FDPs that rotated each month, covering approximately 25% of the FDPs each quarter. The list generated from CLMIS consisted of an equal mix of pregnant or lactating women and mothers with children ages 6–23 months, plus a backup list of names, to ensure that meaningful programmatic-level results for each target group could still be calculated. Analysis of nutrition indicators followed WHO recommendations—for the minimum acceptable diet, breastfeeding practices, frequency of feeding per age group and food diversity—and were analyzed and computed to obtain the minimum acceptable diet composite indicator. Probability weights were also applied during the analysis so that results would be representative of all program participants. Project staff analyzed findings using SPSS v16 in 2012–2013 and STATA 12 in 2014.

Several steps were also taken to protect confidentiality. Each interviewee provided verbal consent before answering questions. No personal identifying information, such as name or age, was collected; the questionnaire collected only program ration card numbers—a unique
identifier provided to each household generated by the CLMIS, so that secondary analysis could be carried out. Furthermore, as part of the basic application and web-based server, Magpi provided advance security measures so the data remained secure in both the mobile application and cloud-based server. Food monitors could only view data gathered on their specific phone, while only a select few in Monrovia had the password to access the full data online.

**Data Use Approach**

The nutrition and health monitoring system provided LAUNCH with timely information that enabled program managers to track program performance in real time. Each quarter, project staff downloaded, cleaned, and analyzed data collected at the FDPs from Magpi. Staff then presented key program indicators in a short report for program managers to review. The report included a description of the interviewed respondents (i.e., background characteristics and distance to FDP sites), as well as program data on women’s nutrition, breastfeeding and complementary feeding practices, hygiene, and care group participation. The report presented indicators across time periods, allowing for comparisons and trends. It also included a brief set of recommendations highlighting programmatic issues to address in the following quarter.

In January 2014, LAUNCH shifted away from presenting data in a written format and began using an Excel-based dashboard (Figure 2). The motivation to present the data in a more visual format was to enhance the use of quarterly program data, making the information more accessible and comprehensible at a glance. The dashboard was organized by program topic (e.g., women’s nutrition, breastfeeding practices, hygiene) and included tables and graphs of key programmatic indicators across time periods.
periods. Staff could copy the graphs directly from Excel for use in presentations and other documents. The dashboards continued for 3 quarters until the outbreak of Ebola disrupted program activities.

FINDINGS

Throughout the first 6 quarters of the nutrition and health monitoring system, more than 2,700 participants were interviewed at the FDPs (Table 1). Food monitors consistently reached the quarterly goal of approximately 400 interviews and maintained an even distribution of target groups, despite frequent staffing shortages and excluded FDPs due to canceled distributions as a result of inclement weather or poor road conditions. However, during the final 3 quarters, when data collection shifted to the household level, food monitors had substantial challenges reaching the desired targets. Reasons provided by food monitors for missing the targets consisted of logistical challenges in reaching the selected households, including time and transportation constraints and the absence of the selected household member. Quarter 9 coincided with the outbreak of Ebola, thereby affecting some program activities including data collection.

LAUNCH made programmatic adjustments in response to findings from the monitoring system; these changes were then reflected in subsequent quarterly trends, indicating that the availability of timely data enabled the project to react quickly to issues and adapt activities appropriately. For example, in quarter 1 (April–June 2012), the findings revealed low participation in Care Groups, mother groups, and farmer groups. In the following quarters, there was a continual increase (more than doubling) in participation in these groups, from 30% to 80% and from 9% to 40%, respectively. This increase reflects

### TABLE 1. Number of LAUNCH Program Participants Interviewed per Quarter by Point of Contact, Liberia, April 2012–June 2014

<table>
<thead>
<tr>
<th>Quarter</th>
<th>No. of Pregnant Women</th>
<th>No. of Lactating Women</th>
<th>No. of Mothers of Children &lt;2</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Food Distribution Points</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Quarter 1 (Apr–Jun 2012), Lean Season</td>
<td>157</td>
<td>152</td>
<td>225</td>
<td>534</td>
</tr>
<tr>
<td>Quarter 2 (Jul–Sep 2012), Lean Season</td>
<td>79</td>
<td>105</td>
<td>221</td>
<td>405</td>
</tr>
<tr>
<td>Quarter 3 (Oct–Dec 2012), Non-Lean Season</td>
<td>69</td>
<td>116</td>
<td>210</td>
<td>395</td>
</tr>
<tr>
<td>Quarter 4 (Jan–Mar 2013), Non-Lean Season</td>
<td>109</td>
<td>112</td>
<td>189</td>
<td>410</td>
</tr>
<tr>
<td>Quarter 5 (Apr–Jun 2013), Lean Season</td>
<td>104</td>
<td>163</td>
<td>249</td>
<td>516</td>
</tr>
<tr>
<td>Quarter 6 (Jul–Sep 2013), Lean Season</td>
<td>81</td>
<td>144</td>
<td>282</td>
<td>507</td>
</tr>
<tr>
<td><strong>Households</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Quarter 7 (Oct–Dec 2013), Non-Lean Season</td>
<td>6</td>
<td>58</td>
<td>116</td>
<td>180</td>
</tr>
<tr>
<td>Quarter 8 (Jan–Mar 2014), Non-Lean Season</td>
<td>13</td>
<td>74</td>
<td>122</td>
<td>209</td>
</tr>
<tr>
<td>Quarter 9 (Apr–Jun 2014), Lean Season</td>
<td>4</td>
<td>21</td>
<td>66</td>
<td>91</td>
</tr>
</tbody>
</table>

Note: Lean season refers to the period from April to September; non-lean season to the period from October to March.
an adjustment made by management, using real-
time data, to actively focus on fostering better
integration between food distribution and com-
munity programs (Table 2). Similarly, as the pro-
gram scaled up food distribution and expanded
the number of food recipients, the system pro-
vided evidence to increase the number of FDPs
over time (from 9 to 14) and confirmed that their
locations were well placed with relatively short
distances for recipients to access, a project priority
to make food distribution easily available.

Likewise, the system captured trends in key
outcome indicators such as breastfeeding and
complementary feeding practices, linking them
to project activities as well as external factors
such as seasonal changes and national health
campaigns. The percentage of pregnant and lac-
tating women who reported taking iron-folic
acid supplements rose steadily over time, from
42% to 81% among pregnant women and from
10% to 40% among lactating women (Figure 3).
This progress directly reflected project messages,
through training of health care providers on
Essential Nutrition Actions and directed Care
Group activities about the importance of

<table>
<thead>
<tr>
<th>TABLE 2. Attendance at LAUNCH Community Groups and Travel to Food Distribution Points, by Quarter, Liberia, April 2012–June 2014</th>
</tr>
</thead>
<tbody>
<tr>
<td>% Participating in Care Group or Mother Group&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>---------------------------------------------------------------</td>
</tr>
<tr>
<td>Quarter 1</td>
</tr>
<tr>
<td>Quarter 2</td>
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<tr>
<td>Quarter 3</td>
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<tr>
<td>Quarter 4</td>
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<tr>
<td>Quarter 5</td>
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<tr>
<td>Quarter 6</td>
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<tr>
<td>Quarter 7&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>Quarter 8&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>Quarter 9&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

Abbreviations: FDP, food distribution point; LAUNCH, Liberia Agricultural Upgrading Nutrition and Child Health project.
<sup>a</sup> Participation in one of these groups was a prerequisite for receiving food rations. A mother group is a group of women that meets under the leadership of one lead mother. A Care Group is a group of lead mothers (around 20) that participates in training.
<sup>b</sup> In quarters 7, 8, and 9, the point of contact shifted to household level.

The percentage of pregnant and lactating women who reported taking iron-folic acid supplements rose steadily over time.

attending antenatal and postnatal visits and receiving iron-folic acid supplements. Likewise, the use of insecticide-treated mosquito nets by pregnant or lactating women decreased in the first 3 quarters of data collection, but subsequently increased over the following quarters. This increase happened concurrently with the relaunch of a nationwide campaign by the government to distribute insecticide-treated nets to pregnant women at their first antenatal care visit.

A key component of the project was to pro-
mote and support complementary feeding prac-
tices with breastfeeding, with particular focus
on fostering a diversified diet. The minimum ac-
ceptable diet estimated for breastfeeding and
non-breastfeeding children remained low, with
important variations across quarters (Figure 4).
Minimum acceptable diet measures, for both
breastfeeding and non-breastfeeding children
ages 6–23 months, consider both feeding fre-
quency and diversity; the barrier in achieving
this indicator is mainly due to inadequate die-
tary diversity. Notably, similar to women’s
diet, complementary feeding practices peaked

Abbreviations: FDP, food distribution point; IFA, iron-folic acid; ITN, insecticide-treated net; LW, lactating women; PLW, pregnant and lactating women; PW, pregnant women.


Abbreviations: FDP, food distribution point; MAD, minimum acceptable diet.
in the third quarter during the post-harvest period.

**DISCUSSION**

In this era of using data-driven approaches, simple and cost-effective solutions to routine program monitoring are important to program success. Using real-time data designed to be collected in a routine and systematic manner is an innovative approach to applying information for better, more flexible program management and assessing nutritional trends and outcomes. The LAUNCH experience demonstrates that programmatic matters, such as enrollment in community groups and the number of needed delivery points, can be improved by regularly and routinely tracking program data. Furthermore, while LAUNCH ceased after its project cycle, we expect that other projects will build on this experience and include real-time data collection in their management system.

The routine data also provided timely information and insight about the progress of project outcomes (e.g., pregnant or lactating women receiving iron-folic acid supplementation, practicing exclusive breastfeeding, and continuing breastfeeding) and alerted managers when stagnation in food diversity and minimum acceptable diet occurred. The increased frequency of available data shed light on variations that occurred among program participants across quarters. Understanding these changes—often due to seasonal differences or external matters—over time enabled program management to quickly adapt and better address food insecurity, health, and nutrition components. For example, while trends in breastfeeding practices (i.e., exclusive breastfeeding and continued breastfeeding) showed an overall positive trend throughout the project cycle, variations between quarters were evident. These variations were likely due to the project cycle of increasing (or decreasing) intensity in promoting and supporting breastfeeding at the health facility and community levels. More specifically, the drop in exclusive breastfeeding in the third quarter could be explained by women being busier during harvest time in October and November, whereas the sustained increase in the following quarters is consistent with the percentage of women participating in the Care Groups.

All too often systems fail for reasons that include funding scarcity, training shortages, lack of ownership, ineffective supervision, staff workload pressures, and a lengthy and confusing approach to entering data into the system.\(^\text{11}\) From the onset, the design of the nutrition and health monitoring system aimed to avoid many of these potential liabilities. By integrating routine data collection into project field staff responsibilities, thereby avoiding the need for additional staff and funding for implementation, the data could be collected in a more affordable and efficient manner with limited start-up costs. The tool itself collected the bare minimum information necessary for calculating key nutritional and programmatic indicators, thereby reducing burden and interviewer fatigue. Finally, the project provided continuous supervision and refresher trainings for staff using digital data collection as part of their daily tasks.

The digital data collection platform, Magpi, was also instrumental in the process, as it improved routine programmatic functions by providing timely data for better tailored decision making as the project evolved. The use of mobile phones and a cloud-based server allowed for real-time quality data collection in otherwise hard-to-reach project locations by reducing the time and resource burden of paper forms and data entry. Data were automatically cleaner as the advanced programming forced all required questions to be answered in the correct format and skipped non-applicable questions. Using mobile phones also proved to be a great motivator for LAUNCH staff and program participants sitting for interviews who were eager to learn about the technology. Applying a digital data collection approach, however, does not remove certain manual tasks also associated with paper-based data collection activities—data processing and descriptive data analysis were still necessary to present the quarterly data. Additionally, issues related to working in areas with suboptimal connectivity and processes aimed at protecting the electronic equipment must be considered and integrated into the system design and training.

Like all other routine monitoring systems, the validity and power of the results are only as good as the quality and consistency of the data. The routine component of the nutrition and health monitoring system consisted of conducting continuous quarterly surveys that were primarily successful when using the fixed delivery points to connect with program participants and

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**The routine data provided timely information and insight about the progress of project and alerted managers when stagnation in food diversity and minimum acceptable diet occurred.**

**The use of mobile phones and a cloud-based server allowed for real-time quality data collection in otherwise hard-to-reach project locations by reducing the time and resource burden of paper forms and data entry.**
conduct interviews. Staff easily reached their monthly interview targets even with other responsibilities on food distribution days. As a result, the indicators could be calculated accurately, using an appropriate number of program participants, and thus provide managers with statistically representative information for programmatic decision making on a quarterly basis. When the point of contact was shifted to the household level, however, staff fell short of their targets. Competing priorities for staff time, along with logistical issues such as transportation and reaching households in remote locations, resulted in far fewer interviews. This reduced the overall statistical power of results for both programmatic decision making and monitoring nutritional outcomes. Staff also struggled to locate pregnant women (6 in quarter 7, 13 in quarter 8, and 4 in quarter 9), undermining the ability of the system to monitor the nutritional practices of this vital group.

In addition, the FDPs were a reliable location for interacting with program participants. In a February 2013 post-distribution monitoring assessment, the vast majority of program participants (85% of respondents) reported collecting the food themselves rather than sending an alternate. The concerns, therefore, of the monitoring system missing out on significant portions of program participants by automatically excluding alternates did not represent a strong argument against the FDP as an appropriate point for data collection. While household-level surveys are still important for project evaluation purposes, as well as for tracking direct observational based indicators, the cost savings of using fixed points of contact, including staff time and fuel for transport, as well as the logistical ease, should outweigh concerns of selection bias when collecting good-quality monitoring data.

Finally, displaying data in an easily digestible format was important for the utility of the system. The data dashboards quickly and easily conveyed program achievements and helped managers discern important programmatic information for decision making at a glance. Dashboards also assisted program staff to engage with data visually, allowing for more interaction and greater insights into program results. Displaying key program indicators visually improved data use and empowered LAUNCH staff to use their quarterly data for decision making.

**CONCLUSIONS**

Digital data collection platforms can play a vital role in improving routine programmatic functions. LAUNCH’s experience using mobile technology to improve project management and to assess women’s and children’s nutrition-related progress has been successful and presents a model for managing and improving program implementation of similar projects. Fixed gathering points, in our example FDPs, represent an opportunity to easily access participants and allow managers to identify strengths and weaknesses in project implementation. For programs that track individuals over time, a mobile tool combined with a strong database can greatly improve efficiency and data visibility and reduce resource leakages.

**Acknowledgments:** The Liberian Agricultural Upgrading, Nutrition and Child Health (LAUNCH) project was a $40 million USAID Food for Peace Multi-Year Assistance Program that aimed to improve food security of vulnerable people living in the north-central counties of Bong and Nimba. This Title II program was awarded to AC DiVOCA in 2010 and was implemented for 6 years with sub-partners John Snow, Inc. (JSI), Project Concern International, and Making Cents International. JSI helped to implement nutrition activities and lead the distribution of food commodities under the subagreement number AID-FFP-A-10-00015-JSI.

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**REFERENCES**


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Web-Based Quality Assurance Process Drives Improvements in Obstetric Ultrasound in 5 Low- and Middle-Income Countries

Jonathan O Swanson, MD, David Plotner, MD, Holly L Franklin, MD, David L Swanson, MD, Victor Lokomba Bolamba, MD, Adrien Lokangaka, MD, Irma Sayury Pineda, MD, Lester Figueroa, MD, Ana Garces, MD, David Muyodi, MD, Fabian Esamai, MD, Nancy Kanaiza, MD, Waseem Mirza, MD, Farnaz Naqvi, MD, Sarah Saleem, MD, Musaku Mwenechanya, MD, Melody Chiwila, MD, Dorothy Hamsunonde, MD, Elizabeth M McClure, MD, Robert L Goldenberg, MD, Robert O Nathan, MD

Newly trained sonographers improved performance through a quality assurance process that merged (1) evaluation by remote experts of images uploaded to a website, with (2) periodic in-person skill tests. To promote sustainability, in-country supervisors gradually assumed more responsibility for image evaluation. The user-friendly and efficient interface used simple menus and forms, customized based on the user’s role.

ABSTRACT
High quality is important in medical imaging, yet in many geographic areas, highly skilled sonographers are in short supply. Advances in Internet capacity along with the development of reliable portable ultrasounds have created an opportunity to provide centralized remote quality assurance (QA) for ultrasound exams performed at rural sites worldwide. We sought to harness these advances by developing a web-based tool to facilitate QA activities for newly trained sonographers who were taking part in a cluster randomized trial investigating the role of limited obstetric ultrasound to improve pregnancy outcomes in 5 low- and middle-income countries. We were challenged by connectivity issues, by country-specific needs for website usability, and by the overall need for a high-throughput system. After systematically addressing these needs, the resulting QA website helped drive ultrasound quality improvement across all 5 countries. It now offers the potential for adoption by future ultrasound- or imaging-based global health initiatives.

BACKGROUND
Obstetric ultrasound is an important tool for determining gestational age and also for identifying medical conditions during pregnancy that, if addressed, can lead to improved maternal and fetal outcomes.1–9 Although the use of ultrasound is increasing in low- and middle-income countries, an important barrier to widespread implementation is the lack of trained sonographers. Furthermore, even when training is available, strategies for retention of skills are needed. Especially in rural settings, the availability of adequate oversight following training, including review of diagnostic accuracy and other quality assurance (QA) activities for newly trained health care professionals, is limited and frequently nonexistent.

However, technology, including increasing Internet capacity, can facilitate remote support of health care providers.10–12 Advances in communication technologies along with the development of reliable portable ultrasounds have created the opportunity to provide remote QA to rural sonography sites across the globe.
Given this context, we sought to develop a web-based tool to facilitate QA activities for newly trained sonographers.

This QA project was undertaken as part of the First Look trial of obstetric ultrasound to improve pregnancy outcomes. First Look was conducted by the Eunice Kennedy Shriver National Institute of Child Health and Human Development’s (NICHD’s) Global Network for Women’s and Children’s Health Research (Global Network) at sites in the Democratic Republic of the Congo (DRC), Guatemala, Kenya, Pakistan, and Zambia. RTI International served as the data coordinating center. Each study site employed both a centrally located supervising sonographer and several field sonographers who were newly trained for the study.

For First Look, the University of Washington (UW) Department of Radiology created a training course in screening obstetric ultrasound. The goal was for health care professionals with no prior ultrasound experience (e.g., midwives, nurses, clinical officers, radiographers, and medical officers) to screen for pregnancy complications as part of the clinical trial. The resulting training course differed significantly from traditional general diagnostic ultrasound training, which can span 3–4 years with built-in oversight and QA during the extended curriculum. In contrast, the First Look training curriculum was designed to avoid the opportunity costs to individuals and communities that occur when health care workers leave rural communities for extended training. The hands-on course was run by the QA team, which consisted of UW radiologists and/or sonographers in collaboration with the experienced sonographer at each country site, who then served as the in-country QA reviewer. The training consisted of a 2-week intensive course in basic obstetric ultrasound and a 12-week pilot phase in which trainees performed basic ultrasound exams on pregnant patients who presented to intervention health centers.

The 2-week basic obstetric ultrasound course, under the supervision of the UW Department of Radiology, was administered to 41 ultrasound-naïve health care workers at 5 sites: Karawa, DRC; Chimaltenango, Guatemala; Eldoret, Kenya; Karachi, Pakistan; and Lusaka, Zambia. The course was group-based and the curriculum was modified slightly for each country. Competency was assessed by written tests at the conclusion of the 2-week hands-on portion of the training. In addition, there was a timed scanning skills test at the conclusion of the course as well as after the 12-week pilot phase of the study. The results and success of this training are described in greater detail in a separate article currently in press at the time of this publication. Following the intensive 2-week hands-on training experience at each site, the 41 field sonographers then proceeded to conduct ultrasound examinations as part of antenatal care in health centers, with oversight by their in-country supervising sonographer and the UW, during the study’s 3-month pilot phase and then throughout the 18-month trial period, which concluded in August 2016.

During the pilot phase, every case (3,800 exams in total) was reviewed and rated by the off-site QA reviewers. After the pilot phase, 10%–20% of all study exams (an estimated 5,000 additional exams) were reviewed for the trial. The reviews were performed by radiologists based in the United States and by the in-country supervising sonographers, who were often based at a central academic center several hours or more away from the field sites where the ultrasounds were performed. Thus the review process required an efficient, effective, and user-friendly web-based QA system. We sought to provide the ability for experts, at the UW as well as at each study site, to review and provide rapid and specific feedback on ultrasound images to field sonographers working in remote regions. The Global Network ultrasound website was thus created to be the central hub for transmitting locally collected data to reviewing radiologists and sonographers, and for the in-country QA sonographers to target remedial training for the new sonographers. The primary objective of the website was to facilitate QA activities for the obstetric ultrasound scans.

The UW radiology team designated which images were required to be acquired and saved for each patient imaged—placental position, placental fluid evaluation, fetal position, cervix (with length, if applicable), and biometry measurements—and developed criteria for assessing the quality of submitted images. RTI International created the website and data management process and provided overall logistical coordination.

Funding for development of the First Look QA website was provided through grants from the Bill & Melinda Gates Foundation to RTI International and through support from the NICHD, with additional funding from GE Healthcare to support the UW activities.
study used the research infrastructure for and was carried out under the direction of the NICHD-funded Global Network for Women’s and Children’s Health Research.

### Intervention: Website as QA Tool

The prototype for the web-based QA system was developed by RTI International’s Data Coordinating and Analysis Center for the ongoing Nulliparous Pregnancy Outcomes Study: Monitoring Mothers-to-Be (nuMoM2b). nuMoM2b is an observational study, funded by NICHD, of approximately 10,000 women residing in the United States who are followed longitudinally through their first pregnancy.15 The original web application was created to facilitate a required central ultrasound credentialing process for cervical length measurement, uterine artery Doppler assessment, and fetal adrenal gland measurements. For the nuMoM2b study, authorized staff from the participating clinical sites upload deidentified images, measurements, and sonographer identification information through the study website. These data are managed by the web application, and each set of images and measurements is assigned to an appropriate expert certifier for review. The certifier is automatically alerted by email of a new applicant and views submission materials from the website. Results of the review are posted back to the website by the expert certifier for access by the coordinator at the local clinical site.

For the First Look ultrasound trial, the adapted QA website allowed staff at study sites to upload sonography exam data for review and evaluation. The data (images, report, and brief assessment) were deidentified but remained associated with the field sonographer who performed the ultrasound exam. An expert was then able to log in to the password-protected website to review and provide comments on the images. The website featured individual accounts and role-based security. The key roles in using the system included administrators (who had the ability to create and manage accounts), data center coordinators (responsible for uploading images for review), supervising sonographers (for in-country QA review), and UW-based QA reviewers.

### Image Creation and Transfer

As discussed previously, a team of developers at RTI International and radiologists at UW designed the QA system around the study expectations and prescribed images for each ultrasound exam. For second- and third-trimester exams, the field sonographer obtained images that demonstrated fetal number, fetal position, placenta position, cervical length (when appropriate), biometry measurements, and amniotic fluid volume. For a single-gestation pregnancy, the prescribed set of images included a midline sagittal image of the cervix (with measurement if earlier than 26 weeks), standard fetal biometric measurements (biparietal diameter, head circumference, abdominal circumference, and femur length), 1–4 images to measure amniotic fluid volume (for measurement of maximum vertical pocket or the amniotic fluid index, depending on gestational age), an image showing location of placenta, and an image demonstrating lie of fetus. For twin pregnancies, in addition to the above-mentioned images, the study required fetal position documentation, biometric measurements for each fetus, and an image documenting chorionic/ amniotic arrangement of the twin pregnancy. For each first-trimester exam, the field sonographers provided images documenting mean sac diameter or crown rump length. For each image, the QA team evaluated ultrasound technique in terms of zoom, depth, and focus, as well as measurement technique for biometry.

All field sites used the LOGIQ e Ultrasound BT12 for the First Look trial.13 The field sonographers used the LOGIQ e built-in obstetric summary sheet as a skeleton report to document biometry, including estimated dates and fetal weight, fetal presentation, and twin pregnancy. The field sonographers used the LOGIQ e anatomy worksheet to document impressions and next steps succinctly. For example, for a mother whose exam demonstrated a late third-trimester breech pregnancy or twins, the field sonographer documented that the patient was being appropriately referred. These worksheets were then saved as JPEG images and were included in the standard set of images that were centrally reviewed for each exam.

### Image Acquisition and Interpretation

The website was designed to require the fewest intermediate steps when delivering information from the ultrasound machine to the reviewer. The process involved an express examination export that created an easily accessible folder of JPEG images on the ultrasound hard drive with the exam identification number and the examination date as part of the folder name.

For each image, the QA team evaluated ultrasound technique in terms of zoom, depth, focus, and measurement technique.

The website was designed to transfer information from ultrasound machine to QA reviewer in the fewest steps possible.
An in-country study administrator transferred the images from the ultrasound machine to a secure, centrally located, in-country computer that had access to the Internet (Figure 1). Whenever possible, but at a minimum on a weekly basis, the same in-country study administrator uploaded the ultrasound images to the website in a compressed format (see below for discussion of connectivity and bandwidth challenges). In general, the QA system was not used to triage emergent cases: Although cases could be flagged on the website for emergent review, it was much more common for field sonographers to relay patient-deidentified imaging findings via smartphone to the supervising sonographer or to the referral sonographers at the referral hospital, for real-time consult and triage of potentially emergent cases.

The exams to be reviewed were then made available to the relevant in-country supervising sonographer and to the UW radiologists, who could reference specific cases for further instruction. The email function embedded into the QA website allowed for more rapid communication between reviewers and field sonographers, which proved useful especially in cases where a reviewer’s comments had the potential to change clinical management.

Quality Review Platform

The review section of the website (Figure 2) was designed for rapid evaluation of the image captures and reports for each patient. The prescribed image sets were available in an easy-to-use image slider embedded next to the evaluation form, which asked reviewers to select radio-button options to record quality. With this system, cases could be reviewed in 3–5 minutes. All reviewers used standardized rating criteria and comments. Spanish and French translations of the reviews were provided for sonographers in Guatemala and the DRC, respectively. (English is an official language in Kenya, Pakistan, and Zambia.) Reviews were generally completed within 1–2 weeks of a standard, nonurgent screening ultrasound exam being performed. The UW radiology team reviewed about 75% of the 3,800 exams evaluated during the 12-week pilot training phase, while the in-country supervising sonographers performed approximately 25% of these QA reviews.
Multiple technical criteria were assessed and scored, as well as the final interpretation, and a final evaluation of acceptable, suboptimal but acceptable, or unsatisfactory was assigned based on the scoring of the exam.

After reviews were completed, the exams with ratings and comments were available on the website for the local trainers and trainees to view. Interesting cases (such as classic appearance of rare finding such as placenta previa), cases demonstrating common mistakes, and cases demonstrating superb technique were marked as teaching cases, and these teaching cases were shared across all 5 country sites.

**Feedback to Field Sonographers**

The QA review created a dynamic feedback loop between the reviewers and the field sonographers. The in-country supervising sonographers met with the field sonographers at least once every 2 weeks to discuss the QA reviews that had been completed. The supervising QA reviewers identified teaching cases, which were shared across all 5 country sites.
sonographers could use a computer to display cases from the website or could bring the identifying numbers for specific cases to health centers and pull the cases up on the field sonographer’s ultrasound machine. For errors requiring more immediate attention, the QA reviewers at UW emailed the in-country supervising sonographers through the QA website.

In addition to reviewing exams on the QA website, the trainers observed each trainee scanning at an intervention health center at least once every 2 weeks during the pilot phase. Conference calls between UW radiologists and the in-country supervising sonographers took place periodically during each site’s pilot phase to discuss each trainee’s progress. These conversations incorporated the scan reviews as well as the local trainers’ direct observations. They also allowed the UW radiologists to share best practices from other study sites that might be relevant to QA issues. The data on the website generated from the reviews helped the local trainers target remedial training for specific trainees, as well as demonstrated larger trends from which all the field sonographers could learn. Ultimately, the feedback from the website review was merged with periodic in-person scanning skill tests.

RESULTS OF THE WEB-BASED QA SYSTEM

Benefits
Ultrasound Quality Improvement
The QA website facilitated effective and timely communication between the U.S.-based reviewers at UW, the in-country sonographers who were also QA reviewers, and the field-based sonographers at the study sites. The exams that were reviewed made it possible for reviewers to target where remedial training was needed. The in-country supervising sonographers could also use the website to generate examples of proper and improper technique as well as to find illustrative teaching cases, which were labeled during the reviews.

As described previously, final evaluation of an exam as acceptable, suboptimal but acceptable, or unsatisfactory was determined based on the reviewer-assigned scores. In the first month of the pilot phase, 21.5% of exams at the sites, on average, were rated unsatisfactory. In the third and final month of the pilot phase 10.0% of exams at the sites, on average, were rated unsatisfactory. Identification of errors was strictly adhered to so that, for instance, wrong biparietal diameter level or slightly inaccurate caliper placement on the calvarium both resulted in unsatisfactory ratings. That being said, errors in the third month tended to be minor, such as slightly inaccurate caliper placement rather than wrong anatomic level.

The trend in error rates was consistent with the training design. The initial hands-on training occurred over a short 2-week period. The trainees then returned to their health centers and began the 12-week pilot phase, which was designed to provide the trainees with the necessary additional hands-on experience, as well as on-site training, to improve the quality of their exams. The overall improvement over time speaks to the success of the remote QA system helping to target teaching of specific imaging deficiencies to specific field sonographers.

In addition, we would like to point out that the unsatisfactory rates noted above underestimate the overall quality of the scanning. The QA grading system was designed to deem a study unsatisfactory if any of the single images that demonstrated required scanning components (fetal position, fetal number, placental position, cervical length, biparietal diameter, head circumference, abdominal circumference, femur length, amniotic fluid assessment, and technical factors) was technically deficient. The goal of the tight ratings was to provide teaching opportunities for the field sonographer. However, a better assessment of scanning proficiency is agreement per image and agreement in final ultrasound diagnosis. In agreement per image, the reviewers rated 94.8% of the images obtained by the field sonographers satisfactory, and there was a 99.4% concordance between the field sonographers and the reviewers in the final ultrasound diagnosis.

In-Country Ownership and Capacity
Incorporating the in-country supervising sonographer as a QA reviewer as well as the in-country conduit for distributing feedback from the website reviews to the field sonographers proved successful on multiple fronts. The supervising sonographers translated the QA system and approach into the varied conditions existing in their own country. Each country’s supervising sonographer assisted in the initial 2-week training and had access to their field sonographers’ common mistakes, as highlighted by the U.S.-based reviewers. In the case of attrition of field

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sonographers, the supervising sonographer led the training of replacement sonographers, using existing QA feedback found on the website to tailor such trainings to address common mistakes. In addition, the supervising sonographers did an increasing number of the QA reviews as the pilot phase and trial progressed; this was consistent with the study objective and with the study’s goal of developing an in-country sense of ownership over the process. The QA website thus facilitated the transition of QA review to in-country reviewers, while still allowing central review across the 5 sites to ensure consistency of data. All of these activities increased the likelihood of program sustainability independent of the U.S.-based reviewers.

**Challenges**

**Connectivity Challenges**

Some of the participating health centers had limited, semi-reliable access to the Internet, and with approximately 750 cases being uploaded from each site over the 12-week pilot period, we needed an efficient upload strategy. In the end, this pivoted around 2 variables: image file formats and file management.

- **Image file formats**: The LOGIQ e was able to export exam data in either DICOM-2 or JPEG formats. Although DICOM-2 would have allowed more comprehensive exam information to be shared, it was deemed unnecessary, as all the relevant information could be captured in exam screens and image captures with 7–10 JPEG files per exam. JPEG files were much smaller, which reduced concerns over bandwidth availability for uploads at the data centers.

- **Use of zipped exam files**: Site coordinators were able to zip exam folders into a single file and upload the compressed files in a single upload. This simplified the process, while reducing bandwidth and upload errors. The website automatically unzipped the files on upload and made the individual files available to the reviewers.

**Usability Challenges**

The website was used by individuals with varying computer adroitness and different native languages and roles in the project. To be effective, the website had to interact appropriately with all of these users. One of the most important steps to achieving this goal was partitioning the site functions by study role (i.e., QA by supervising sonographers vs. input by field sonographers). Designing role-based access to the website allowed for simplified menus and options customized for each user. Because each user saw only the options pertinent to their task, site navigation and use went faster, regardless of the user’s role.

**Throughput Challenges**

With nearly 4,000 cases reviewed during the 3-month pilot phase and another 5,000-plus cases reviewed during the trial, the QA reviewer needed an efficient way to access exams and provide consolidated feedback and ratings. We thus created a single interface to evaluate exams, regardless of gestational age. The interface consisted of a review sheet with a series of radio buttons and drop-down menus. Also on the page was an image slider that showed all of the exam images, allowing the reviewer to quickly select each image to evaluate the various attributes of the exam.

Acquiring and sending ultrasound sweeps or cine clips is an alternative method that has been used to review and analyze ultrasounds in the global health setting. Given the sheer number of exams that we needed to review, we posited assigning prescribed representative images as a faster, more efficient method. This method also allowed reviewers to provide each sonographer with clear feedback associated with specific images, diagnoses, and clinical scenarios.

**Feasibility**

To create a QA system that users would find feasible, we had to both develop a centralized QA website and ensure that proper hardware was available and functioning at the in-country sites. There was also the issue of the hours needed to perform the QA. In the First Looks study’s pilot phase, while field sonographers were being trained, approximately 50 working hours were needed to perform the QA review for each of the 5 study sites (4 minutes per case for 750 cases per site). The transferring and uploading of cases accounted for another 24 hours of work per country during this 12-week pilot phase. To limit the burden on local health care providers, the uploading was performed by a member of the study’s in-country administrative staff. As we transitioned into the trial phase, the QA review

The web-based QA system facilitated the transition of QA review from U.S.-based to in-country reviewers.

The QA website was used by individuals with different roles, languages, and levels of computer proficiency.
became less intense because we reviewed only 10% to 20% of the cases performed.

Lessons Learned
The ideal QA website needs to balance information and bandwidth usage. Time requirements and other difficulties in uploading images or in rendering pages with large images have to be balanced against providing enough information for an effective and rapid evaluation.

CONCLUSIONS
The review website and its features made it possible for a team of experts and training staff to provide rapid evaluation and feedback to newly trained sonographers working in several countries simultaneously. This web-based QA system facilitated direct feedback to training sonographers on cases they scanned unobserved, and tracking of sonographers’ progress in skills during the period of the study.

The review process developed for the First Look study was tailored to a specific ultrasound machine, for ease of image transfer. However, the process itself is generic enough that with minor changes in guidance for the data export process, it should be effective with any ultrasound machine capable of exporting exam image files. Modifications to the process for transferring images to a website need to be sensitive to bandwidth availability at the remote sites that are to be evaluated.

We are planning to expand this website to include cloud-based hosting and modifications that will allow more efficient image upload and rendering. These improvements are expected to result in a faster-performing site, which will allow all users of the system to process more exams within a given time frame, even with poor Internet connectivity. We also expect this expansion of the website to allow us to work with field sites that use different ultrasound machines, and the QA process will be further refined to simplify any associated implementation challenges.

In developing a web-based tool to facilitate QA activity for this study, we were challenged by connectivity issues, by country-specific needs for website usability, and by the overall need for a high-throughput system. After systematically addressing these needs, the resulting QA website helped drive ultrasound quality improvement across all 5 countries. It now offers the potential for adoption by future ultrasound- or imaging-based global health initiatives.

Acknowledgments: This study was funded by grants from the Bill & Melinda Gates Foundation and the Eunice Kennedy Shriver National Institute of Child Health and Human Development. QE Healthcare provided funding to the University of Washington and provided equipment for the First Look study. The QA website was based on a concept from the NICHD nuMoM2b study.

Competing Interests: None declared.

REFERENCES


QUALITATIVE ASSESSMENT OF THE APPLICATION OF A DISCRETE CHOICE EXPERIMENT WITH COMMUNITY HEALTH WORKERS IN UGANDA: ALIGNING INCENTIVES WITH PREFERENCES

Aurélie Brunie, a Mario Chen, b Angela Akol c

Conducting a discrete choice experiment (DCE) with CHWs via survey versus interviews gave similar findings: the most appealing attributes for these CHWs were a bicycle, transportation refund, and mobile phone. To promote meaningful and valid results, particularly when applying DCEs to lower-literacy populations such as CHWs, DCEs should (1) use a small number of job attributes to facilitate comprehension, (2) choose attribute levels (e.g., mobile phone vs. no mobile phone) that are realistic yet show sufficient range, and (3) clearly define attributes and their levels.

ABSTRACT

Background: Maximizing the benefits of community health worker (CHW) programs requires strategies for improving motivation, performance, and retention. Discrete choice experiments (DCE) are increasingly used to inform policy response to health workforce shortages in rural areas, and may be of value in the context of CHW programs. Participants are presented with pairs of hypothetical jobs that are described by job attributes with varying levels and are asked what their preferred job is within each pair. Responses are then analyzed quantitatively to obtain information on what attributes are important to participants. We conducted a qualitative assessment to examine the appropriateness and validity of applying a DCE to a new population of CHWs with lower literacy.

Methods: In 2011, we conducted a mixed-method study with CHWs in Uganda, consisting of 183 surveys and 43 in-depth interviews (IDIs). The DCE was administered to both survey and IDI participants. This article reports on the qualitative assessment of the implementation of the DCE. We compare DCE responses between survey and IDI participants to determine whether administering the DCE in a qualitative (IDI) context altered responses. We then present additional information collected on CHWs’ decision-making processes and their experiences with the DCE in the IDIs.

Results: Choices made by IDI participants were consistent with the choices made by survey participants. In-depth exploration of CHWs’ observations in answering the DCE suggest that, overall, CHWs comprehended the DCE exercise and made reasoned choices. However, the data revealed some level of cognitive difficulty and highlighted some design and implementation challenges that are important to consider, particularly when applying a DCE to populations with lower literacy. These include the need to keep the number of attributes small; to choose levels that are realistic yet show sufficient range; and to clearly define attributes and their levels.

Conclusion: DCEs can be an appropriate approach with CHWs but require careful design and implementation.

INTRODUCTION

Community health workers (CHWs) bring health services to the rural poor who often have little or no access to the primary health care system. CHWs typically are lay community members who receive a limited amount of training to carry out one or more basic health functions in their village. The services provided vary across contexts as does compensation, with some CHWs working as volunteers and others receiving payment for their work. Keeping CHWs motivated to perform well and stay on the job is critical to the cost-effectiveness, impact, and sustainability of CHW programs, yet it is challenging, particularly in volunteer programs. An array of non-financial incentives,
such as T-shirts or bags, as well as including programmatic elements such as training or supervision, have been shown to have motivational value and to affect performance and retention outcomes. There is no magic formula, however, to ensure that CHWs stay motivated and productive, and finding the right mix of incentives is a complex issue that depends on the specific context.

In Uganda, both public- and private-sector programs have used CHWs to deliver information and services, including family planning, since the 1980s. In an effort to streamline these efforts and systematically empower and mobilize communities for health, the government rolled out a nationwide Village Health Team strategy beginning in 2004, whereby teams of volunteers provide the platform for all community-based health programming. Although the Ministry of Health defined a set of minimum, non-financial incentives for the Village Health Team model in 2009, identifying incentive packages that appropriately motivate volunteers remains the subject of many discussions among stakeholders, including the ministry and its implementing partners.

In the past 5 years, the use of discrete choice experiments (DCEs) has gained prominence as a tool for identifying strategies to make rural jobs more attractive to health workers in resource-limited settings, including in Uganda. DCE is an analytic technique for eliciting stated preferences that involves presenting respondents with pairs of hypothetical scenarios (e.g., job postings) described in terms of bundles of attributes (e.g., location, salary, or equipment) that vary in their levels (e.g., urban vs. rural posting). Respondents select their preferred scenario within each pair, and response data are analyzed to estimate the influence of each attribute on their choice. The approach mimics real-life decisions because it forces participants to consider trade-offs among wanted attributes when choosing between two scenarios. DCEs can be used in the absence of empirical choice data and permit the inclusion of various incentive options that are not currently being implemented. Although DCE has been applied with low-literacy populations on other health systems topics (such as rural women’s preferences for place of delivery in Tanzania), to our knowledge, completed research involving its use to reveal incentive preferences has been conducted almost exclusively with professional health workers, including doctors, nurses, and medical students. At the time this study was conducted, DCE research had not been extended to lay workers such as CHWs; since then, findings from only one other exploratory DCE with CHWs have been reported.

We implemented a DCE as part of a mixed-method study on the factors affecting the motivation and performance of CHWs in 3 family planning programs in Uganda. Full study findings that include the main quantitative DCE results are reported elsewhere. Here, we present additional results from the concurrent administration of the DCE as part of the qualitative component of the study. Our objective was to obtain data that would unveil CHWs’ reasoning and experiences with the exercise in order to validate the quantitative findings of the DCE in our context. Specifically, we wanted to examine whether CHWs fully considered all attributes when going through choice tasks, as opposed to choosing between two jobs based on a single or subset of attributes, and whether they made reasoned and deliberate decisions. We were also interested in assessing how comprehensible and cognitively demanding the exercise was.

**METHODS**

The design and DCE methods of this study, which received ethical approval from the Uganda National Council for Science and Technology and FHI 360’s Protection of Human Subjects Committee, were fully described in a previous paper. Briefly, we conducted a cross-sectional study in 2011 with CHWs from 3 family planning programs covering 7 of Uganda’s 112 districts: one program was operated in the public sector, one was supported by an NGO, and one had recently transitioned from an NGO to the public sector. We selected CHWs who had at least one year of experience distributing contraceptives (including condoms, pills, and possibly, but not necessarily, injectables) and had attended their last supervisory meeting or had a documented excuse for missing it. These criteria were meant to focus the study on CHWs who were currently active and had volunteered long enough to have experienced all the realities of their work, allowing us to explore the full range of factors affecting motivation. The main study included both a survey and in-depth interviews (IDIs) with CHWs. In the largest district for each of the 3 family planning programs, CHWs were randomly selected to participate in either the survey or an IDI; everywhere else, all CHWs participated in the
survey. A total of 183 CHWs completed the survey and 43 completed an IDI, corresponding to a combined response rate of 91% of all CHWs approached for recruitment into these data collection components.

To inform the selection of job attributes and the levels of these attributes for the DCE, we reviewed the relevant literature and convened a meeting with stakeholders working with CHWs in Uganda. Based on the results of this consultation, we identified a final set of 5 locally relevant and realistic attributes and between 2 and 3 levels for each (Table 1). We used the %ChoiceEff macro in SAS (SAS, Cary, NC) to generate an optimal fractional factorial design through the selection of 24 of the 48 possible combinations of attributes and levels, each corresponding to a job profile; the 24 job profiles were organized in 12 pairs. Each job is thus characterized by the levels specified for each of the 5 attributes and includes the higher level for some attributes and the lower level for others.

The DCE was part of the survey questionnaire. Since we considered that this was a novel application of this approach with CHWs, we also administered the DCE questions to IDI participants, along with additional probing to elicit the rationale behind their decisions and to collect their impressions of the exercise. To keep the task presented to each respondent manageable in the context of the broader survey or IDI, we partitioned the profiles into 4 blocks of 3 pairs of jobs each. Table 2 shows an illustrative pair. CHWs in both the survey and IDI groups were randomly allocated to receive one of the 4 blocks. To facilitate understanding and ensure consistent implementation, trained research assistants read from a script to explain the DCE exercise, then successively presented each CHW with cards describing 3 pairs of jobs in their assigned block and read aloud the job descriptions to the participant. Cards were translated and interviews were conducted in Luganda, Lusoga, or Samia. Research assistants were oriented to the DCE methodology through a training session; supervised role play and a field pretest provided opportunities for testing the clarity of the instructions and of the job descriptions in the local languages.

DCE data obtained from survey and IDI participants were then analyzed separately using different approaches. Choice data from the survey administration of the DCE were analyzed using mixed logit models; corresponding results are presented in the previously published article.19 IDIs were recorded, then transcribed directly from the recording into English. The transcripts were uploaded to NVivo for analysis. First, we compared the distribution of responses to the

### Table 1. Discrete Choice Experiment Attributes and Levels, Uganda, 2011

<table>
<thead>
<tr>
<th>Attributes</th>
<th>Definition</th>
<th>Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supervision</td>
<td>Frequency and location of supervisory meetings</td>
<td>1. Monthly CHW meetings at health center</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Same as (1) + quarterly visit by health center staff in the community</td>
</tr>
<tr>
<td>Training</td>
<td>Frequency and duration of initial and refresher training</td>
<td>1. 5-day initial training and 3-day supervised practicum at health center</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Same as (1) + 3-day refresher training once a year</td>
</tr>
<tr>
<td>Transportation refund</td>
<td>Transportation refund received for each supervisory meeting attended</td>
<td>1. 5,000 UGX per meeting</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. 10,000 UGX per meeting</td>
</tr>
<tr>
<td>Start-up package</td>
<td>Items received upon joining the CHW program (one-time)</td>
<td>1. CHW kit with gumboots, raincoat, job aids, and stationery</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. CHW kit + T-shirt + badge</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3. CHW kit + T-shirt + badge + bicycle</td>
</tr>
<tr>
<td>Communication</td>
<td>One-time provision of a mobile phone to communicate with program staff</td>
<td>1. No mobile phone</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Mobile phone without airtime</td>
</tr>
</tbody>
</table>

Abbreviations: CHW, community health worker; UGX, Ugandan shilling.
DCE choice tasks in the IDI group with that from the survey to assess whether the two approaches, administered to random subsets of the same CHW population, produced similar results in terms of the jobs being selected or whether asking DCE questions in a qualitative interview altered responses. Second, we used a matrix in Excel (Microsoft, Redmond, WA) to produce frequency counts of the references CHWs made to each attribute as part of the rationale for selecting jobs expressed in IDI narratives for comparison with relative importance rankings from the quantitative analysis of DCE results in the survey group. Because not all possible levels of the “start-up package” attribute were featured in each pair, frequency counts were produced at the CHW level, as opposed to the pair level. Third, sections of the IDI transcripts corresponding to the DCE were isolated and coded for observations on DCE content and on the DCE method. The content code was examined separately for the dimensions of each attribute that CHWs highlighted when (1) contrasting levels of a single attribute, and (2) when comparing jobs across attributes (i.e., trade-offs). The method code was examined inductively in a memo, looking for common sub-themes.

RESULTS

Table 3 shows the number of CHWs who participated in an IDI from each family planning program, along with their characteristics. Most participants were women and married. CHWs in the public and former NGO programs had more experience and were more educated than CHWs in the NGO program; the NGO program was the only one in which all IDI participants did not offer injectable contraceptives.

Does Administering the DCE in a Qualitative Interview Alter Responses?

As shown in Table 4, survey and IDI participants who were presented with the same block made similar choices overall. A block refers to a set of 3 pairs of jobs made up of different levels of the 5 attributes shown in Table 1, with CHWs being asked to choose their preferred job within each pair.

The large majority of CHWs (36 of 43) emphasized the bicycle when explaining their selection. The next most frequently highlighted job attributes were an increased transport refund and provision of a mobile phone (29 and 27 CHWs highlighted these attributes, respectively). Overall, this is consistent with the analysis of survey results, in which 4 job attributes had a positive, significant influence on preferences: offering a start-up package with a T-shirt, badge, and bicycle had the largest impact, followed by providing a mobile phone, an increased transport refund, and adding a yearly refresher training.

With IDI data, we found that the bicycle was emphasized by most CHWs within each program; however, the transport refund and mobile phone did not receive equal attention in the job selection process across CHW programs. For example, over three-quarters of CHWs in the former NGO program discussed transportation refund and mobile phone job attributes when

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**TABLE 2. Illustrative Pair of Job Profiles Presented to CHWs During the Discrete Choice Experiment**

<table>
<thead>
<tr>
<th>Attributes</th>
<th>Job A</th>
<th>Job B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supervision</td>
<td>Monthly CHW meetings at health center</td>
<td>Monthly CHW meetings at health center + quarterly visit by health center staff in the community</td>
</tr>
<tr>
<td>Training</td>
<td>5-day initial training and 3-day supervised practicum at health center + 3-day refresher training once a year</td>
<td>5-day initial training and 3-day supervised practicum at health center</td>
</tr>
<tr>
<td>Transport refund</td>
<td>5,000 UGX per meeting</td>
<td>10,000 UGX per meeting</td>
</tr>
<tr>
<td>Start-up package</td>
<td>CHW kit with gumboots, raincoat, job aids, and stationery + T-shirt + badge + bicycle</td>
<td>CHW kit with gumboots, raincoat, job aids, and stationery + T-shirt + badge</td>
</tr>
<tr>
<td>Communication</td>
<td>Mobile phone without airtime</td>
<td>No mobile phone</td>
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Abbreviations: CHW, community health worker; UGX, Ugandan shilling.
explaining their decision, while less than half of CHWs in the NGO program mentioned them. This lends additional support that results from administering the DCE to the IDI and survey groups were similar: in the quantitative analysis, results suggest that preferences for the T-shirt, badge, and package were fairly homogeneous across CHWs, but that preferences for other attributes were more heterogeneous (results are not shown here but are based on the comparison of standard deviation estimates with mean estimates for each attribute).

What Rationale Did CHWs Offer to Support Their Decisions?

The DCE section of IDI narratives exposed CHWs’ rationales in comparing the two jobs within each pair presented to them. This included attribute-specific arguments contrasting different levels of a same attribute across the two jobs or reflecting on the value of this particular attribute, as well as broader perspectives on the respective merits of the two bundles.

Attribute-Specific Arguments

Nineteen of the 43 CHWs explained that bicycles would facilitate their work by making it easier to visit clients, travel far, or go to the health center. Many of the CHWs explained that bicycles would make it easier to visit clients, travel far, or go to the health center.

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Attribute-Specific Arguments

Nineteen of the 43 CHWs explained that bicycles would facilitate their work by making it easier to visit clients, travel far for sensitizations, or go to the health center. Echoing comments from other CHWs, a 65-year-old male CHW in the public-sector program said that the bicycle was a decisive factor:

The Minister for transport [the bicycle], which will help me in my transport especially if I have to see...
my clients for home visits and when I have to go for group talks in some distant places ... the moment I saw the bicycle in job B, then all was well because this is one of the most important requirements for this CHW work.

Half of the CHWs who discussed the provision of a mobile phone said that they valued it as a program tool to exchange information with health center staff, or in the public-sector program, with other CHWs, or to improve efficiency by avoiding unnecessary trips to the health center. A couple of CHWs indicated that the utility of a phone would be limited due to the fact that most clients did not own one. Five CHWs who already owned a phone were nonetheless attracted by the idea of a new, hopefully better, phone, while 3 others felt it would be redundant. Two CHWs commented that not being provided with airtime was an issue, while 7 others indicated that a phone would still be helpful.

When it was discussed, the transportation refund was not systematically invoked as the basis for choosing a job. For instance, some CHWs picked the job with the smallest refund, but then lamented on the smaller refund in the job they had selected. Several CHWs, particularly in the NGO program, argued that 5,000 UGX was insufficient to cover transport (boda boda [a motorcycle taxi] hire) to the health center, or that it was barely sufficient, but would not leave them lunch money. In the other two programs, complaints by slightly less than half of the CHWs seemed to be fueled by the expectation that the refund would enable them to buy something (e.g., soap, food) for their family.

CHWs who were attracted by the addition of refresher trainings saw them as important to not forget what they had been taught, to better understand what they may not have grasped, to receive updates, and to interact with other CHWs and program managers.

Over half of CHWs in the entire sample commented on the importance of items clearly identifying them as CHWs, with a few indicating a preference for ID cards over T-shirts because
they were more durable and credible. These comments were sometimes part of the rationale to choose a job, but sometimes only intended to show appreciation of what was included. The main reasons for wanting to be identified were differentiation from the rest of the community for increased popularity, credibility (in terms of qualifications), and legitimacy (particularly with husbands when visiting female clients).

For supervision, some CHWs underscored the value of community visits; these were seen as a boost to CHWs’ credibility, an opportunity for joint sensitization and direct support, and a way for health center staff to witness firsthand the challenges CHWs faced. However, several CHWs felt that monthly meetings were sufficient, liked going to the health center and assisting the staff, or thought that the health center staff was busy and should not vacate the facility.

A number of CHWs had difficulty choosing between jobs because they felt that several or all attributes were important. Slightly less than one-third of the interview participants commented that the job options presented to them were similar.

Trade-Offs Between Job Attributes
Almost a third of CHWs sometimes had difficulty choosing between jobs because they felt that several or all attributes were important. A 53-year-old woman said:

"You cannot get all you need at the same time ... but why didn't they give a bicycle in job B? ... these people are just trying to play games with us ... something can buy you to choose a certain job, but as you continue, you notice something again enticing in the other job, so you get confused on which job to choose. ... It has really been difficult because these things are all important and, if given the opportunity, I would choose all of them."

The main trade-offs that CHWs discussed revolved around the bicycle vs. transportation refund and the mobile phone vs. bicycle; the CHWs primarily stressed the comparative advantage of the bicycle. Advantages of the bicycle over the refund were discussed by 12 CHWs. The advantages included that a bicycle could make up for a smaller refund and/or allow CHWs to save the refund money, that it was more durable, and that it was more helpful in fulfilling responsibilities. A 35-year-old female CHW said:

"Here you can see that the money is a bit lower than that of job A, but it can still help you at home, but provided I have the bicycle, even if you don't give me money, then I will [be] comfortable because I can use this bicycle to transport my produce to the market from which I can earn some money ... I have been telling you that the major problem I have is that of transport, so when I saw the bicycle I immediately chose that."

Similarly, 6 CHWs highlighted the greater practical value of the bicycle over the mobile phone, such as this 41-year-old man:

"I also like the bicycle and I feel it is much better than a phone ... a phone cannot make it easy for me to reach the health center to get medicine, and yet a bicycle can. I will not just call and ask them to send me the medicine."

What Were CHWs’ Experiences With the DCE?
Comments analyzed under the DCE method code shed light onto CHWs’ experiences with the choice tasks. A little under a third of IDI participants commented on the jobs presented to them in a pair being “similar,” which in several cases they went on to explain meant that the difference between them was "very small." For instance, a 39-year-old female CHW said of the two jobs presented to her:

'[Choosing is] not difficult but [the jobs] are similar; the difference is very minimal.

Several CHWs expressed some difficulties with grasping the content of each job, at least initially, and/or said they needed time to absorb and think before choosing. A number of CHWs commented on features that were in fact present in the two jobs between which they were choosing, particularly with regard to training and supervision. This did not necessarily occur while describing a deciding factor, but rather while commenting on a job scenario and expressing appreciation for some of its features. However, a detailed examination of IDI narratives also highlighted a few inconsistencies between the features CHWs invoked in their rationales and the actual jobs presented to them, again mostly in relation to the training and supervision options (e.g., attributing refresher trainings to the wrong job in the pair). It is not entirely clear whether those inconsistencies stemmed from (1) a failure to simultaneously process all 5 attributes, (2) the nature of training and supervision options, or (3) the fact that supervision is sometimes thought as a form of refresher training, leading to possible translation errors or misinterpretation of some of the comments in the transcripts.

In a few cases, CHWs appeared to have difficulties abstracting their responses from their
actual experiences: for instance, they may consider something not to be feasible. In such situations, they typically, but not systematically, were reminded by the interviewer that the scenarios were hypothetical. In at least a few cases, there was also some indication that CHWs had difficulty letting go of the jobs in the previous pair when presented with a new pair, as some of them, for instance, attempted to link jobs in the new pair to those in the previous pair.

DISCUSSION

Although their use in public health is rapidly spreading, DCEs were originally applied in the marketing sector in high-income countries and remain a fairly novel and unfamiliar approach for such populations as CHWs. In this article, we examined qualitative data on the process of the DCE to assess whether a DCE eliciting CHWs’ incentive preferences could be an appropriate and valid approach for identifying resource allocation priorities for the design of incentive packages in CHW programs. Overall, the findings of this investigation bear out the use of the DCE methodology in our context. IDI narratives highlighted the fact that participants did consider trade-offs when selecting their preferred job alternative. While the complex nature of these decisions may be obvious, this point is noteworthy as a distinctive trait, and advantage, of the DCE approach. At the same time, our experience brings attention to important design and implementation challenges from which some lessons can be derived. While these lessons overlap with guidance on how to design DCEs, we believe that concrete examples from the field, particularly in a context such as ours that extends the application of a DCE for health workforce issues to a different, less-educated population, are important.

Keep the number of attributes small: For results to be valid, participants need to be able to consider all attributes and make trade-offs when choosing between jobs in a choice pair. The number of attributes and their levels also have implications for the number of pairs that will need to be presented to each participant, which can induce fatigue. DCEs on health workforce recruitment and retention in low- and middle-income countries have used between 5 and 8 attributes, and 12 to 18 choice pairs per respondent. With CHWs, we used 5 attributes and 3 choice pairs. These numbers may be conservative because the DCE was implemented as part of either a larger survey questionnaire or a longer IDI; however, our qualitative data showed some signs that the choices may present some level of cognitive difficulty for some and required appropriate pacing and careful instructions to ensure proper understanding. Moreover, while CHWs have lower educational levels relative to formal health workers, it should be noted that all the CHWs in the combined survey and IDI sample had attended primary school, with 74% also having attended secondary school. Issues of comprehension may warrant additional attention for implementation of a DCE with CHW populations with lower education.

Choose attribute levels that are realistic yet show sufficient range: In our DCE, the base level for each attribute represented what CHWs typically received when the study was developed, whereas the improved levels were identified with stakeholders based on what they might realistically be willing and able to implement. While distinct, the different levels sometimes only represented what CHWs considered to be a limited range, which in turn presented some challenges. First, while it may have made it relatively easy for CHWs to envision these hypotheticals, it may also have amplified the potential for confusion with some participants commenting on the jobs being similar. Second, it is possible that the addition of the bicycle to the start-up package may in fact have been too valuable compared with the difference between the lower and higher levels of other options. While our data still show evidence of trade-offs, this may have limited our ability to obtain information on the utility of other attributes. Generally, utility balance should be considered when choosing attributes and their levels.

Third, in light of the available literature and the broader study findings, we were somewhat surprised that the transport refund did not rank higher in the DCE results. Money was an important theme in the broader IDIs, although CHWs’ rationales were complex and combined actual transport and opportunity costs with the desire for compensation. It appears that, while money remains an important factor, the hypothetical increase in the amount of the transportation refund presented in the discrete choice experiment may not have been sufficient to sway CHWs’ overall choices. However, it is important to interpret DCE findings in the context of the specific

While money remains an important factor to CHWs, the hypothetrical increase in the amount of the transportation refund presented in the discrete choice experiment may not have been sufficient to sway the CHWs’ overall choices.
options that are offered and acknowledge that money may remain a point of contention and a potential source of dissatisfaction. Clearly define attributes and their levels: We found there was at times some confusion between training and supervision options. Several factors may explain this. One is that while we (and program stakeholders) considered the two to be different, the line between training and supervision was blurrier for CHWs, particularly when it came to refresher trainings and supervisory meetings. Thus, specific terms should be applied carefully when specifying attributes to avoid ambiguity. Another contributing factor may have been the fact that the levels for these two attributes were stated in increments (e.g., initial training only compared to initial training and refresher training), as opposed to mutually exclusive options (e.g., training compared to no training) that may have been easier to contrast. These issues did not transpire during the pretest we conducted for all data collection instruments, including the DCE, with a small, separate sample of CHWs; however, they may have been avoided with more extensive qualitative pilot work. Due to time and budget constraints, cross-sectional data collection with the DCE design being informed by expert knowledge and the literature was the only feasible option for this study. Preliminary qualitative work should be considered, particularly if the DCE is the only component being carried out.

Limitations
The DCE was one of many components of the IDIs, thereby placing some constraints on the amount of information that could be collected in order to keep the interviews manageable. The limited qualitative data do not allow for more than a cursory examination of CHWs’ decision-making processes throughout the implementation of the DCE and of their experiences with the exercise. However, they provide unique and important insights into the use of this approach with a new, low-literacy population, as compared with the health worker cadres with whom DCEs are increasingly being used to examine health workforce issues. Even though research assistants were instructed to let CHWs select their preferred job prior to probing for additional information, the process of administering the DCE qualitatively may admittedly also have introduced a bias by forcing participants to reflect on the options presented to them and to make their reasoning explicit. Nonetheless, the concordance of quantitative and qualitative results suggests that CHWs made reasoned and deliberate choices even in the absence of probing. The design of the DCE was influenced by a desire to limit the number of choice tasks submitted to participants; however, this may also have affected our ability to detect true underlying preferences. Some DCEs include a fixed choice (i.e., one pair that is the same for all the blocks) to test for internal validity. Because data from the fixed choice question are not included in mixed logit modeling and we were concerned about the total number of choice questions we could present to CHWs, this option was not retained here. However, it should be considered in future research for additional insights. Because CHWs were selected to have at least one year of experience, additional evidence may be needed to elucidate the preferences of early quitters.

CONCLUSION
Incentive selection is a critical aspect of the design of CHW programs that tends to be informed by heuristics or by evidence on the factors associated with CHW performance and retention. Neither approach, however, is well equipped to support the prioritization of incentives, although this is an important consideration in contexts often characterized by limited resources. We found that DCEs could provide an appropriate and valid tool to obtain CHWs’ incentives preferences, but that it requires careful design and implementation. Researchers and managers should consider the value of this approach for their informational needs while also being aware of its complexity. To fully appreciate the usefulness of DCEs, empirical evidence is also needed to establish the predictive value of preferences stated in a hypothetical exercise for similar real-life decisions.

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LETTER TO THE EDITOR

An Implementer’s Perspective on Vouchers for Sexual and Reproductive Health Services

Matthew Wilson,a Caitlin Mazzilli

See related article by Menotti and Farrell.

We found the commentary on vouchers by Menotti and Farrell, published in the September issue of GHSP,1 thought-provoking and comprehensive. At Marie Stopes International (MSI), every year we deliver half a million voluntary contraception and maternal health services via voucher programs in 8 countries. We have directly experienced that "vouchers can be a highly effective tool to increase access to and use of family planning and reproductive health services, especially for special populations including the poor, youth, and postpartum women."1 We are writing to share an implementer’s perspective and a few points of differentiation from Menotti and Farrell.

PREPARING FOR THE COMPLEXITY CRUCIAL TO SUCCESS

The authors touch upon the complexity of voucher programs, but we believe this point needs to be underscored. Voucher programs are simple to describe, intuitively logical and compelling, but they are challenging to design and implement well and at scale. Despite the growing body of evidence on voucher programs by organizations such as Population Council, many aspects of implementation still need to be better understood. A powerful voucher program requires the perfect sequencing of activities from the supply side and demand side to financial management and controls, but this sequencing can be a challenge for field teams to master. Furthermore, there is appetite for ever-more rigorous evidence to coordinate alongside programming, including evidence that these programs can influence national health financing policy. All can be done, but not everywhere. Without strong capacity, many programs will struggle to cope.

Other implementation challenges that are less appreciated by the literature include how to compensate voucher distributors and set reimbursement rates that genuinely promote choice of contraceptive method; how to harness mHealth opportunities when working with populations that have limited access to mobile technologies or where phone communication about reproductive health may pose an ethical risk; how to conduct verification with youth who are reluctant to give consent to be followed up; and how to influence national health financing policy in conducive market contexts. Importantly, we also need to manage expectations. To manage the complexity, achieve economies of scale, realize a return on the systems investment, and deliver value for money, voucher programs need to be resourced well. And to master the complexity, we need to be tolerant of mistakes and alert and responsive to the learning they provide.

REMOVING THE FINANCIAL BARRIERS IS JUST ONE WAY IN WHICH VOUCHERS CHANGE BEHAVIOR

Menotti and Farrell pitch voucher programs as a means of removing financial barriers, and indeed they are. That cost is a barrier for many special populations is indisputable. A recent article in the Bulletin of the World Health Organization,2 for example, outlined a series of financial barriers to health care, including the influence of financing policies on choice and access to sexual and reproductive health services; the negative impact of direct payments on adolescents’ use of health services within health markets at all stages of development; and the influence of direct payments on the type of services used by adolescents.

But just as cost is rarely the only barrier, vouchers increase use of services among special populations not merely because they remove this financial barrier. Our programs have found the “counseling moment” (a phrase we attribute to Anna Gorter) provided by the voucher distributor and the physical possession of a

a Marie Stopes International, London, UK.
Correspondence to Matthew Wilson (matthew.wilson@mariestopes.org).
vouchers build clients’ self-efficacy and sense of entitlement. This illustrates how important it is that those of us implementing voucher programs consider these financing tools within a broader behavior change framework. Agencies working to enroll populations into expanding universal health coverage schemes may also learn from the approaches that voucher programs have used.

DEBUNKING THE PERCEPTION THAT VOUCHERS ARE MORE PRONE TO FRAUD

Menotti and Farrell acknowledge the challenge of fraud prevention and detection within voucher programs. While fraud invariably comes up in discussions about vouchers, we caution against assumptions that output-based financing interventions such as voucher programs are more susceptible to fraud than traditional input-based ones. Some studies have found that output- or results-based interventions may actually be less prone to fraud than input-based interventions, because they are accountable for and oriented toward what can be evidenced and measured. However, a fabricated voucher claim form seems to unsettle us more than a salaried health worker that does not show up for work, leakage of donated and procured commodities, or bid rigging, yet all are fraud and must be controlled as such. Indeed our experience at MSI demonstrates that voucher programs with robust fraud prevention and detection systems can limit fraudulent activity. The strongest voucher programs track every voucher throughout its lifecycle, collect documentation for every service, identify outliers and unusual patterns, and trace clients to verify their existence and eligibility. Inevitably, in many of the contexts where we work, there will always be residual risk but with proper systems in place this risk should not detract from the potential health impact of voucher programs.

REORIENTATING VOUCHER PROGRAMS TO CATALYZE HEALTH FINANCING CHANGES

Menotti and Farrell note that “voucher programs may strengthen capacity and readiness in the health system for implementing universal health coverage.” We concur. This readiness can only come from dialogue that spans far wider than the implementers of the voucher program and its direct donors. The urgency of such engagement is of course dependent on the context, and in most fragile contexts voucher programs will remain a critical means of increasing access to priority services, full stop. In transitioning contexts, we need to continue to test the hypothesis that vouchers can demonstrate a key path toward strategic purchasing. This link might be more obvious to the voucher-acquainted than to the voucher novice. In the political sphere, where many health financing decisions are taken, few voucher program implementers tend to tread. However, unlike complicated reforms, voucher programs are intuitive and might just have political appeal. We need to rethink how to ensure the lessons of bringing coverage to key populations, with quality-assured services and careful payment mechanisms, are not lost as countries grapple with these very questions on the road toward universal health coverage.

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LETTER TO THE EDITOR

Zika Travel Policies May Reduce Women’s Leadership in Global Health

Emma Richardson a

On February 1, 2016, the World Health Organization (WHO) declared Zika a “Public Health Emergency of International Concern,” based on growing evidence that women who have the Zika virus during pregnancy are at increased risk of having their children born with microcephaly. On November 20, 2016, while this letter was in press, WHO declared that Zika was no longer a Public Health Emergency of International Concern because the link between Zika and microcephaly has been found to be robust and in need of a longer-term global strategy. To stem the spread of Zika, travel-related policies have been issued by federal public health agencies and are still in place, advising in particular pregnant women or women trying to become pregnant not to travel to areas with ongoing Zika virus outbreaks. These policies may have the unintended result of decreasing women’s input on the planning, implementation, and evaluation of global health projects. This is important to the field as a whole, because gender-balanced teams are crucial for implementing effective global health programs and projects. As a woman global health scholar and practitioner, I reflect on potential negative impacts of these Zika travel policies and recommend actions.

ZIKA TRAVEL POLICY AND GLOBAL HEALTH

In the United States, the Centers for Disease Control and Prevention (CDC) announced, on January 15, 2016, a travel alert for 14 Zika-affected countries in Latin America, the most economically unequal region in the world with considerable and persistent global health challenges. This region continues to be a high priority for health donors such as the U.S. Agency for International Development. The travel policy recommends special precautions for women who are pregnant or trying to become pregnant, including considering postponing travel to these destinations. The Zika travel policy is unusual in its sex specificity: It recommends that women, and not men, should potentially avoid travel to Latin America. In fact, men can also become infected with Zika, which is sexually transmissible to their partners, but this scenario has not been addressed in the travel policies directly.

GENDER-SPECIFIC IMPACTS OF THE U.S. ZIKA TRAVEL POLICY

1. Women’s leadership and input in global health programs may be reduced. The status of “trying to become pregnant” is complex and may last for years. Many female global health professionals of reproductive age, if they heed the advice of the CDC, would avoid work-related travel to Central and South America. This could mean that for the current cohort of global health projects, women’s input would be significantly reduced. Lack of gender balance is known to hamper effective implementation of global health initiatives.

2. Women may be hesitant to express their concern about Zika. Citing Zika travel policies as a reason to avoid work-related international travel may signal to employers a woman’s intention to have children. Many women worry about revealing their plans to have children to their employers. Women are aware that revealing an intention to become pregnant might be detrimental to their career advancement. For example, employers may prefer to hire and promote those they suspect less likely to have children, to avoid having to cover maternity leaves. While the practice is technically illegal in the United States, women are often discriminated against in hiring, such as by being asked in job interviews if they plan to have children.

RECOMMENDATIONS FOR GLOBAL HEALTH FUNDERS AND IMPLEMENTING ORGANIZATIONS

1. Monitor and report on whether women’s participation in global health programs and
policies is decreasing. Compare measures of participation before and after Zika travel policies were in place.

2. Mitigate the impact. Seek more flexible ways to involve women in global health projects. For example, I acted as gender consultant for a maternal health initiative in Guatemala by combining a shorter in-country trip with later teleconferencing for interviews with maternal health project staff based in Northern Guatemala.

3. Consider increasing the participation of local as opposed to expatriate women. The reality is that most global health projects are funded and managed by international institutions headquartered in the North that employ many expatriates. If instead local professional women were brought to the fore, this could be a silver lining. Involving more local women would improve adaptation of the project to the local context and mitigate the overall loss of women’s perspectives resulting from the Zika travel policies.

RECOMMENDATIONS FOR INDIVIDUAL WOMEN WHO WORK IN GLOBAL HEALTH

1. Know you are not alone. For women of reproductive age who are involved in global health, navigating adherence to Zika travel policies is complex. I hope this letter will stir reflection and push these issues from private dilemmas to public debate.

2. Suggest to global health employers alternative ways for women to be involved. If your intention to become pregnant means you cannot risk travel to Zika-endemic areas, suggest to your employer alternatives such as teleconferencing or partnering with a local counterpart who is a woman.

Zika travel policies may have the unintended consequence of reducing women’s participation in global health programs. Addressing gender equity in global health projects is complex. Recognizing and dealing with gender imbalances in global health leadership is perhaps more subtle, but no less important.

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