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# GLOBAL HEALTH: SCIENCE AND PRACTICE

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Global Health: Science and Practice

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# Open-source collaboration for *Global Health: Science and Practice*

Ariel Pablos-Méndez,<sup>a</sup> Michael Klag,<sup>b</sup> Lynn Goldman<sup>c</sup>

**USAID and the Schools of Public Health at JHU and GWU welcome you to the inaugural issue of GHSP—an open-access, peer-reviewed journal for the global health community, particularly program implementers, to contribute to and benefit from a dialogue based on science and practical programmatic experience.**

It gives us great pleasure to launch this inaugural issue of *Global Health: Science and Practice* (GHSP). Our primary goal is to advance knowledge regarding implementation of global health programs by reaching professionals who design, implement, manage, evaluate, and otherwise support such programs.

This publication represents a collaboration of our institutions—the U.S. Agency for International Development, the Johns Hopkins Bloomberg School of Public Health, and the George Washington University School of Public Health and Health Services. In the spirit of creating a global collaboration, GHSP is completely free and open source—not only for readers but for authors as well. Our Editorial Board reflects the global health community at large. By design, the journal aims to promote easy communication and interactivity. We foresee that public health practitioners, university colleagues, donors, and other development partners will be able to contribute to and benefit from a dialogue based on science and experience of what works for field programs.

GHSP intends to advance implementation science across a wide range of key subject areas with broad remediable impact on health. These will include topics such as maternal and child health, HIV/AIDS, family

planning, nutrition, and water and sanitation. We also will tackle the emerging global epidemics of non-communicable diseases and injury. GHSP will take a multidisciplinary approach to the science and practice of global health, bringing together intervention strategies at multiple levels—environmental, population, clinical, and individual—and approaches ranging from strengthening health systems to promoting healthy behaviors.

In the spirit of open communication and scientific integrity, we have embraced the principle of editorial independence as a fundamental tenet of GHSP. We also follow the Uniform Requirements for Manuscripts published by the International Committee of Medical Journal Editors and the code of conduct and best practice guidelines for journal editors from the Committee on Publication Ethics, including scientific peer review.

Global health is at a tipping point. While proud of its accomplishments, the field has embraced bold goals such as ending preventable child and maternal deaths in a generation—among a number of other formidable challenges. We hope GHSP will be a useful and trusted resource instrumental to advancing global health and achieving this ambitious agenda. We look forward to your engagement and feedback.

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# A journal for global health programming

James D Shelton,<sup>a</sup> Ronald J Waldman<sup>a</sup>

**GHSP aims to improve how programs function at scale, targeting implementers who actually support and carry out programs across all of global health. Thus, we emphasize specific implementation details, using a crisp, accessible, interactive style.**

**W**hat motivated us to initiate *Global Health: Science and Practice* (GHSP)?

## MOMENTOUS GLOBAL HEALTH AGENDA

Infectious diseases such as pneumonia, HIV, malaria, and tuberculosis continue to plague much of the world. Reproductive health issues including unintended pregnancy and maternal mortality are stubbornly persistent. The Child Survival Call to Action, recently announced by the Governments of Ethiopia, India, and the United States with UNICEF, calls for ending preventable child death by 2035. And the Global Burden of Disease Study 2010 highlighted the ever-growing burden of non-communicable disease and injury looming large on the horizon. To rise to the challenges, we must understand the best approaches and implement the best programs.

## PROGRAMMING AT SCALE, REQUIRING BOTH FORMAL RESEARCH AND EXPERIENTIAL KNOWLEDGE

Many journals focus on clinical issues and carefully controlled research. We also will publish such research across a wide range of methodologies—from randomized controlled trials to field-level observational studies. But working at scale is essential to meeting our huge global health challenges. And mounting a successful program to address health issues at large scale entails a level of complexity and requires appropriate adaptation to specific local situations involving a host of implementation details. Formal research definitely helps. But it is not enough. We also need programmatic know-how, including experience-based knowledge and “lessons learned.” We aim to draw on a wide variety of relevant disciplines, such as

evaluation, management science, behavior change, political science, and engineering. The key challenge for applying experiential knowledge is to find principles and lessons learned that are systematic, replicable, and applicable in other settings.

## A JOURNAL FOR PROGRAM IMPLEMENTERS

For programmatic knowledge to have value, it must be used by those actually involved in designing, implementing, and supporting programs on the ground, especially in low- and middle-income countries. Would such a person find useful knowledge and “lessons learned” in an article that they could apply to their own programs? We strive to ensure that program implementers find such practical know-how in GHSP. Accordingly, while we are interested in whether a particular intervention is successful, we encourage authors—many of whom are program implementers on the ground themselves—to **provide a high level of detail on how activities were actually conducted—the kind of implementation detail most other journals tend to shy away from.**

## BETTER INTERACTIVITY AMONG GLOBAL HEALTH COMMUNITY OF PARTNERS

As global health advances, engagement has increased from donors, NGOs, commercial sector partners, and even consortia of such partners. Moreover, governments, civil society, and consumers are assuming greater and greater roles. Improved technology allows for a more accessible, inclusive approach that provides potential to connect with many more colleagues around the world. And our aim is to be as interactive as possible, by allowing readers to submit formal letters to the editor, but also by posting comments on articles and engaging in discussions through social media, including [Facebook](#) and [Twitter](#).

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## OPEN-ACCESS PUBLISHING FOR BOTH READERS AND AUTHORS

We firmly believe that reducing barriers to accessing health information can speed up the pace of scientific discovery, encourage innovation, and, in many low- and middle-income countries, can even mean the difference between life and death. Thus, GHSP supports the open-access movement by making articles freely available to read, use, and distribute (original author and source should be properly cited) and also by not charging authors article-processing fees to submit and publish their work with GHSP.

## CRISP, EFFICIENT COMMUNICATION STYLE THAT TACKLES KEY ISSUES

People implementing programs are busy implementing. And others in the global health community also need efficiently packaged and thought-stimulating literature to meet their

needs. So we will aim for such a crisp style, one that lays out key concepts prominently. Each article will be accompanied by a SOCO—a single overriding communication objective. And we aim to address those global health issues that have the most programmatic importance, global policy relevance, and potential impact, including those that may engender controversy in an engaging and sometimes provocative way. Thus, much of our space will be devoted to commentaries, syntheses, and even debates about key global health developments and issues.

A new communicative, open-source, peer-reviewed journal, from a source considered trusted, is but one of many tools needed to reach the ambitious goals of global health for the next generation. But GHSP's success will depend, in no small measure, on your participation—by authoring, by reviewing, by reading and sharing, and by commenting—but most importantly, by doing.

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## COMMENTARY

# Chlorhexidine for umbilical cord care: game-changer for newborn survival?

Steve Hodgins,<sup>a</sup> YV Pradhan,<sup>b</sup> Leela Khanal,<sup>c</sup> Shyam Upreti,<sup>d</sup> Naresh Pratap KC<sup>d</sup>

A simple technology with potential to prevent 500,000 global neonatal deaths annually.

## NEWBORN MORTALITY: AN INTRACTABLE PROBLEM?

Newborn mortality has been a persistent challenge, with reductions in neonatal deaths lagging behind declines in post-neonatal child mortality in most low-income countries.<sup>1</sup> Indeed, until a decade ago, it was widely assumed that we would see marked improvements only with gains in socioeconomic status and substantially strengthened health systems. However, the landmark work of Abhay Bang in the 1990s in a poor area of India with high newborn mortality demonstrated that simple services, delivered in the home by community health workers, could reduce neonatal mortality substantially.<sup>2</sup> This prompted new interest in applying the kind of simple primary health care strategies that have been so effective in driving down mortality in older infants and children to the problem of newborn mortality.

## SEPSIS THROUGH CORD-STUMP SEEDING: CAN SOMETHING BE DONE?

Sepsis in the first week or two of life is a major cause of newborn deaths.<sup>3</sup> People in many cultures apply substances to the freshly cut cord stump, such as ash, oil, butter, spice pastes, or mud. This and other unhygienic exposures to the fresh wound could well account for a significant proportion of newborn sepsis. Accordingly, cluster-randomized controlled trials have been conducted recently, first in Nepal<sup>4</sup> and then in Bangladesh<sup>5</sup> and Pakistan,<sup>6</sup> to test **application of chlorhexidine—a commonly used antiseptic—to the umbilical cord stumps of newborns**. In the

trials, chlorhexidine was applied daily to the cord stump for approximately a week (up to 14 days in the Pakistan study). In the Bangladesh study, in an additional treatment arm, chlorhexidine was applied only on the day of birth.

## HOW EFFECTIVE IS CHLORHEXIDINE?

At one time, chlorhexidine had been commonly used in newborn intensive care units in the West.<sup>7</sup> But in 1999, the World Health Organization (WHO) stated that such antiseptic use was generally unnecessary (although WHO acknowledged it could still be suitable in settings with high risk of neonatal sepsis due to poor hygiene and called for more research in this area).<sup>8</sup> Use of chlorhexidine for cord-stump care subsequently declined. However, Mullany's 2006 Nepal study showed a very promising result: among infants surviving long enough to enter the study (about 6 to 12 hours after delivery), mortality was about one-quarter lower among infants treated with chlorhexidine than in the comparison group.<sup>4</sup> Moreover, mortality was *one-third* lower among those who received the first application within 24 hours of birth. (Among infants randomized to receive chlorhexidine but who got their first application *after day 1*, mortality was no different than among the comparison group.)

With these positive results, investigators began replication trials in Bangladesh,<sup>5</sup> Pakistan,<sup>6</sup> and later, in Tanzania<sup>9</sup> and Zambia.<sup>10</sup> The 2 recent South Asian trials were reported in the *Lancet* in early 2011.<sup>5,6</sup> (Results from the 2 African trials will not be available for another year.) All 3 South Asian trials showed fairly similar, statistically significant protective effects against mortality (Table 1). In addition to chance, the differences in findings probably reflect some differences in environmental conditions and newborn care practices. The overall pooled effect size across the 3 studies was similar to the original Nepal trial.

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**TABLE 1.** Neonatal Mortality Reduction From Chlorhexidine Cord Care

Country	% Reduction (intervention versus control)
Nepal <sup>4</sup>	24%
Pakistan <sup>6</sup>	38%
Bangladesh <sup>5</sup>	
Single application	20%
Multiple application	6% (NS)
<b>Pooled effect size<sup>11</sup></b>	<b>23%</b>

Abbreviation: NS, not significant.

**An estimated 1 in 6 neonatal deaths could be averted with chlorhexidine cord care.**

## WHAT IS THE POTENTIAL IMPACT ON NEONATAL MORTALITY?

All 3 trials completed to date have shown a protective effect, with a reduction in mortality risk of 23% in a pooled analysis.<sup>11</sup> However, substantial neonatal mortality occurs very soon after birth, before chlorhexidine could be expected to have impact. Intrapartum (or asphyxia) deaths are estimated to account for 20% of global neonatal deaths.<sup>3</sup> Thus, the remaining 80% of neonatal deaths—that is, non-asphyxia deaths, or those surviving beyond the first hours after birth—roughly correspond to the denominator population from which the chlorhexidine study subjects were drawn. So the expected contribution of this intervention in reducing the *overall* neonatal mortality rate could be estimated as  $23\% \times 0.8$ , or about 18% (roughly 1 in 6 neonatal deaths averted).

Is this a credible estimate of its effect? Skeptics have pointed out that in South Asia the *total* proportion of newborn deaths attributable to sepsis as principal cause is *only* 14%.<sup>3</sup> However, chlorhexidine may contribute to reducing deaths otherwise attributed to complications of prematurity or tetanus, which, in South Asia, are estimated to account for 38% and 2% of newborn deaths, respectively.<sup>3</sup> So, the observed effect size across the 3 studies appears reasonable.

## IS IT SUITABLE IN LOW-RESOURCE SETTINGS?

Chlorhexidine for umbilical cord care has many attractive features, notably:

- Addressing a problem with high population health burden
- Efficacy
- Low cost
- Simplicity
- Safety
- Acceptability
- Low regulatory requirements
- Health system compatibility
- Scalability
- Commercial viability

Beyond the issues of efficacy and expected impact on population health, important considerations in decisions to move chlorhexidine into routine use include cost, feasibility, simplicity, and acceptability.<sup>12</sup>

## Chlorhexidine Is Very Inexpensive

The principal costs are formulation, packaging, and transport, not the bulk cost of the raw ingredient. In Nepal, the bulk procurement cost of single-use chlorhexidine tubes is about US\$0.23/newborn (personal communication with Prajwal Jung Pandey, Marketing Director of Lomus Pharm). In other settings, program managers may opt for a multi-day regimen, which would cost somewhat more—but would still be inexpensive in comparison with other routine labor and delivery interventions.

## Variety of Practical Distribution Channels Are Available for Chlorhexidine

When delivery takes place in a health facility, a health worker can apply chlorhexidine just after delivery. When deliveries happen at home, antenatal contacts or community health workers (a major channel in Nepal) can be used to distribute chlorhexidine late in pregnancy, or retail outlets can sell chlorhexidine—either linked to clean delivery kits or as a stand-alone socially marketed product—and the mother, another household member, or birth attendant can apply the product.

Manufacture of the chlorhexidine product is very straightforward and well-suited to local production in many country settings, resulting in lower costs and greater benefits to local economies.



©2011 Chlorhexidine Navi Care Program  
Courtesy of GHSP Journal

A health worker in Nepal applies chlorhexidine to a newborn.

### Simplified One-Time Regimen May Be Enough

It is clear from results of the Bangladesh and Nepal studies that, for effectiveness, chlorhexidine must be applied to the cord stump on the first day of life.<sup>4,5</sup> While the 3 completed trials showed lower rates of visible cord infection in babies having multi-day application, it is unclear whether there is further mortality reduction from additional applications beyond day 1.

In Nepal, where the government is now moving forward with nationwide introduction of chlorhexidine, the Ministry has opted for a day 1-only regimen, based on the argument that this:

1. Minimizes messaging confusion (Advice to families will continue to be, “Keep it clean and dry, and don’t put anything on it other than the chlorhexidine that was put on the first day.”)
2. Keeps costs down
3. Simplifies distribution

### What About Acceptability?

In formative work done in Bangladesh, Nepal, and elsewhere, household caregivers have consistently been very keen to use this product.<sup>13</sup> It responds to a widespread perceived need, at the community level, for something to protect the cord from infection. Indeed, a *collateral benefit* demonstrated in the 3 completed trials was a marked reduction in frank infection of the cord stump.<sup>4-6</sup>

### ROLLOUT IN NEPAL

Nepal has had the benefit of conducting the first trial. Since then, the country has done formative acceptability and product development work,<sup>13</sup>

and then larger-scale piloting.<sup>14</sup> A local manufacturer is producing a good-quality product, using a formulation conforming to household caregiver preferences. The Ministry of Health and Population, late in 2011, made a decision to proceed with nationwide implementation, and chlorhexidine is now being rapidly rolled out. Beyond modest external support for procurement during the first year of the program and for some ongoing monitoring and evaluation costs, the government of Nepal has committed to assuming the full expense of buying the commodity and other program costs from its own resources. As of July 2012, Nepal has scaled up this program to 26 of 75 districts, with distribution mainly through community health workers (as well as for among institutional deliveries), and is continuing rapid expansion. Neighboring Asian countries and several African countries are doing formative work and preparing to pilot. (See [box](#) on scaling up chlorhexidine for cord care, next page.)

### SUPPORTIVE GLOBAL RECOMMENDATIONS MAY BE IMMINENT

Given the new evidence that has recently accrued, in September 2012 the WHO convened an expert consultative meeting, which recommended incorporating chlorhexidine into program use. Having received this expert input, WHO is now completing its own internal review process and is expected to release a statement soon on chlorhexidine use for cord care.

### DOES CHLORHEXIDINE DESERVE THE BILLING OF GAME-CHANGER?

Consider the following:

1. **Huge potential impact.** Our best estimate of efficacy is that its use (at least in a South Asian setting) has the potential to reduce overall newborn mortality risk by up to 18%. Given an estimated 3.1 million newborn deaths per year,<sup>1</sup> an 18% decline would represent over half a million fewer deaths per year globally.
2. **Safe and stable.** For this use, it has effectively no toxicity risks or potential for misuse,<sup>16</sup> and no special storage requirements.<sup>7</sup>
3. **Remarkably inexpensive and cost effective.** The commodity cost per newborn is

**The government of Nepal has assumed most costs to scaling up the chlorhexidine program nationwide.**

**In September 2012, a WHO expert consultative group recommended chlorhexidine for cord care.**

## Box. Key Actions for Scaling up

### Enlist Support from Policy Makers at Country Level

- Engage, inform, and win over key *gatekeepers* and *opinion leaders* (for example, through early, one-on-one informational briefings and exchange of views with leaders in the pediatric community); foster and support *champions* who are well placed to influence opinion and decision-making; engage potential local *pharmaceutical producers*—early.
- Understand and work competently through local *policy and regulatory processes*, both *formal* (for example, registration with drug regulatory body, incorporation on Essential Medicines List) and *informal* (from the beginning, fully inform and elicit concerns from key government counterparts and opinion leaders).
- Ensure registration as an over-the-counter, not prescription, product.

### Sustain Program Momentum

- Form a *technical working group* having Ministry of Health leadership and ongoing meaningful involvement by all key partners in directing the initiative (or incorporate mandate into an existing working group, if one already exists with suitable membership and mandate, for example, a Ministry-led newborn health or safe motherhood working group) and ensure effective functioning—on a sustained basis (with regular meetings, action points, follow-up).

### Appeal to Your Intended End-User

- Conduct *formative research* to understand the potential user's current practices, perspectives, and preferences with respect to appropriate care of the newborn cord stump.
- *Start where the user is now*, “bridging from the known to the new,”<sup>15</sup> for example using formulation and packaging that resemble current products used for cord application.

### Use Simple Approaches and Messages

- For example, day-of-birth-only application, if appropriate.

### Tailor Delivery Strategy to Existing Channels

- Use *antenatal care* (ANC) if current ANC attendance rates are fairly high.
- Use *community health workers* if they are already reaching a large proportion of pregnant women.
- Enlist *private providers and NGOs* as appropriate.
- Add chlorhexidine to clean delivery-kit programs, if they are already reaching large numbers.

### Plan for Ultimate Scale and High Coverage

- Product: Secure long-term arrangements for *procurement* of quality product and ensure adequately robust *supply chain*.
- Providers: Address provider skills, attitudes, and behavior for ultimate large scale.

### Phase Scale Up

- Start with a *learning phase*, implementing at limited scale (for example, within one district) but under conditions closely approximating what you would expect when institutionalized and running as a normal program; *rigorously monitor* during this phase, and then, based on what has been learned, revise and streamline the approach for at-scale implementation.

### Monitor Actively

- Through all phases, from early learning to at-scale implementation, ensure continued sound performance management—at all levels, *monitoring* important aspects of program performance (notably coverage) and actively addressing identified performance issues. This is likely to entail incorporating chlorhexidine coverage into the *routine health information system*, and taking measures to ensure that coverage is being monitored at all levels, as a basis for taking action to ensure good performance.

about US\$0.23 (in Nepal, where a first-day-only regimen is used). With a neonatal mortality rate of 30 per 1,000 live births (typical of South Asia)<sup>17</sup> and a number-needed-to-treat of 185 per averted death, this translates to a commodity procurement cost of about US\$45 per averted death. By piggy-backing on other program efforts, rollout and ongoing program costs should be low.

4. **Highly acceptable and functional.** As a **behavior change** challenge, in many settings we would merely be applying a scratch to a pre-existing itch. To date, consumer acceptability studies have found a near universal desire to use the product.<sup>13</sup> Furthermore, we have not seen problems with correct use in pilot studies.<sup>14</sup>

5. **Multiple possible distribution channels and potential for direct consumer use.** Even in settings where deficiencies in the health care system preclude delivery of most other efficacious newborn interventions at high coverage, distribution and utilization of chlorhexidine does not face the same constraints; a health worker is not required and multiple channels can be used for distribution.

Preventing 1 in 6 neonatal deaths would be huge. “Game-changer” seems, to us, a pretty good fit.

**Competing Interests:** None declared

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COMMENTARY

# Contraceptive implants: providing better choice to meet growing family planning demand

Roy Jacobstein,<sup>a</sup> Harriet Stanley<sup>a</sup>

**Contraceptive implants are extremely effective, long acting, and suitable for nearly all women—to delay, space, or limit pregnancies—and they are increasingly popular. Now, markedly reduced prices and innovative service delivery models using dedicated non-physician service providers offer a historic opportunity to help satisfy women’s growing need for family planning.**

Contraceptive implants offer immense potential to meet the need for family planning. More than 220 million women in developing countries currently have an unmet need for modern contraception, mainly in South Asia and sub-Saharan Africa.<sup>1</sup> Many other women are using less effective “resupply” methods—short-acting methods that require users to continually replenish their supplies of the contraceptive—because highly effective, more convenient methods such as implants are not easily accessible. In all countries, access is lower among poorer, less educated, rural, and younger women.<sup>1–2</sup> From January 1, 2009, to December 31, 2012, more than 9 million implants valued at over US\$190 million have been shipped to developing countries—87% to sub-Saharan Africa.<sup>3</sup> The magnitude of commodity provision is likely to increase markedly, due to major price reductions.

What are implants? Why do they offer so much promise? What challenges must programs address to make them even more widely accessible and used?

## THE PROMISE OF IMPLANTS

### What Women Like About Implants

Implants are a long-acting, reversible form of progestin-only contraception that release an ultra-low amount of progestin continuously into the bloodstream. Currently, 3 implants are available: *Implanon*<sup>®</sup>, *Jadelle*<sup>®</sup>, and *Sino-implant II*<sup>®</sup> (see Table). Women who use implants find them to be very convenient—they are effective immediately and offer up to 3 to 5 years of extremely reliable contraceptive protection upon one client action. Only a brief, very minor surgical procedure under local anesthesia is needed to place 1

or 2 matchstick-sized plastic rods beneath the skin of the inner upper arm.<sup>4–5</sup> Some women also like that pelvic exams and laboratory tests are not required and that implants can be used discreetly. Furthermore, implants do not interfere with sexual intercourse, and return to fertility upon removal is not delayed or negatively affected.

### Unmatched Effectiveness

Effectiveness is a key feature for women and couples using contraception to avoid unwanted pregnancy, but in our experience, even family planning professionals do not always fully realize just how effective implants are: Only 1 unintended pregnancy occurs among every 2,000 implant users in the first year of use.<sup>6</sup> In contrast, failure rates in the first year of typical use of the commonly used resupply methods are considerably higher: 180 unintended pregnancies per 1,000 users of male condoms, 90 unintended pregnancies per 1,000 users of pills, and 60 unintended pregnancies per 1,000 users of the progestin-only injectable *Depo-Provera*<sup>®</sup>.<sup>6</sup> Thus, implants are 120 times more effective than the injectable, 180 times more effective than the pill, and 360 times more effective than the condom.

### Suitable for All Reproductive Intentions and Nearly All Women

Implants are an excellent choice to achieve any reproductive intention—to delay a first pregnancy, space a subsequent birth, or end childbearing. According to the World Health Organization’s (WHO’s) *Medical Eligibility Criteria for Contraceptive Use*<sup>7</sup> and *Family Planning: A Global Handbook for Providers*,<sup>4</sup> implants are safe and suitable for nearly all women, including women who are of any age (including

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**Implants are safe and suitable for nearly all women.**

adolescents), have never been pregnant or have never had children, are living with HIV, have just had an abortion, or are breastfeeding.

**With only one action, women who use implants can be almost certain not to have an unintended pregnancy for up to 3 to 5 years.**

Recommendations among normative bodies differ about the suitability of implants use by breastfeeding women during the first 6 weeks after childbirth, however. WHO guidance states that the risks outweigh benefits during this period.<sup>7</sup> The U.S. Centers for Disease Control and Prevention (CDC) advises that the benefits outweigh risks during the first 4 weeks and places no restrictions on use after 4 weeks.<sup>8</sup> The U.K.'s Royal College of Obstetricians and Gynaecologists (RCOG) places no restrictions on use of implants by breastfeeding women at *any* time.<sup>9</sup> Immediate postpartum provision of implants would offer expanded programmatic opportunity, as women are increasingly receiving safe delivery services and there is almost universal interest among postpartum women in avoiding a subsequent pregnancy for at least 2 years.<sup>10</sup>

**Implants are over 100 times more effective than injectables and pills in typical use, and 360 times more effective than condoms.**

Implants also offer great promise for helping to meet the needs of younger women, who often face many barriers in accessing effective modern contraception. When implants were made available to young Kenyan women ages 18–24 seeking family planning, 24% selected the method.<sup>11</sup> The American College of Obstetricians and Gynecologists recommends that providers encourage adolescents ages 15–19 seeking contraception to consider implants and intrauterine devices (IUDs) as “the best reversible methods for preventing unintended pregnancy, rapid repeat pregnancy, and abortion in young women.”<sup>12</sup>

### Rising Popularity

Although modern contraceptive use lags in sub-Saharan Africa, where only 1 in 6 married women uses it, contraceptive use has recently increased substantially in a number of Eastern and Southern African countries.<sup>13</sup> While this has been mainly due to increased use of injectables, implants use has also increased notably over a short time span in countries such as Ethiopia, Malawi, Rwanda, and Tanzania (see [Box](#) and [Figure](#)). For example, 1 in every 7 women using modern contraception in Rwanda currently relies on an implant, compared with less than 1 in 25 in 2005.<sup>14</sup> These trends suggest that wider availability of implants could lead to much greater use in other African countries and elsewhere where implants currently cannot be accessed widely or easily. High rates of user satisfaction (79%) and continuation (around 84% at 1 year of use) further support this likelihood.<sup>6,17</sup>

### Increasingly Affordable and Available

Prospects for increased availability and use were greatly enhanced when Bayer HealthCare recently announced that it would cut the public-sector price of its contraceptive implant *Jadelle* in half, as a result of volume guarantees from international donor partners.<sup>18</sup> Beginning in January 2013, *Jadelle* will cost US\$8.50 per set. The partnership initiative aims to make 27 million implants available to the public sector and non-commercial private sector in up to 69 low-income countries from 2013 to 2018. This is likely to be a signal milestone on the long road

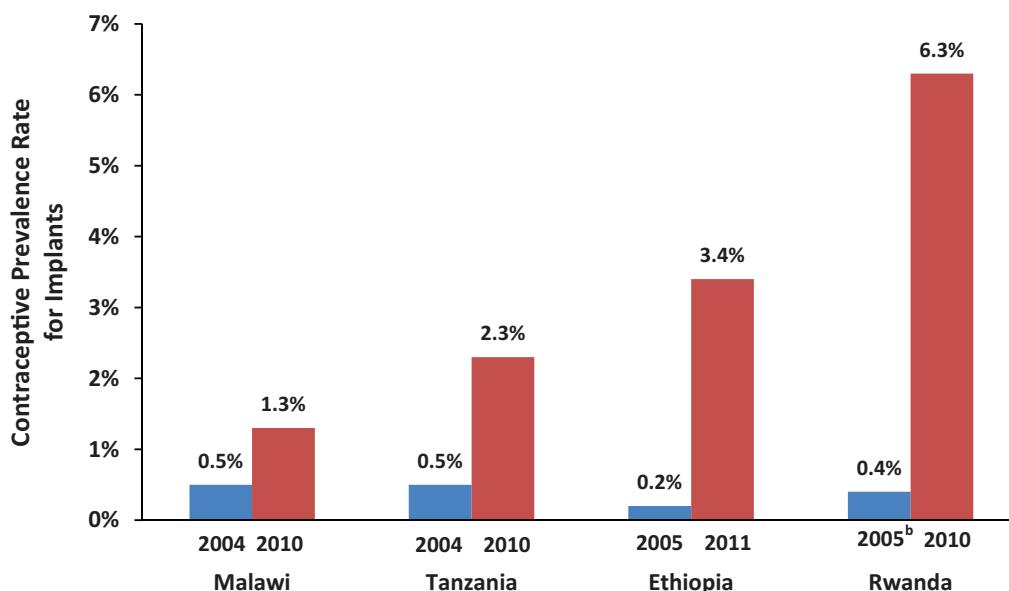
**TABLE.** Key Characteristics of the 3 Available Contraceptive Implants

	Implanon®	Jadelle®	Sino-implant II®
Manufacturer	Merck	Bayer HealthCare	Shanghai Dahua
Active ingredient and amount	68 mg etonogestrel	150 mg levonorgestrel	150 mg levonorgestrel
Labeled duration of effective use	3 years	5 years	4 years
No. of rods	1	2	2
Approximate insertion and removal times	Insertion: 1 min Removal: 2–3 min	Insertion: 2 min Removal: 5 min	Insertion: 2 min Removal: 5 min
Cost of implant (US\$)	\$16.50 <sup>a</sup>	\$8.50	~ \$8.00

<sup>a</sup> The cost of *Implanon* may be lowered in the future to be comparable with that of *Jadelle*.

Source: Modified from a table prepared by FHI 360, the RESPOND Project, and USAID.

**FIGURE.** Increased Use of Implants in Malawi, Tanzania, Ethiopia, and Rwanda, 2004–2011<sup>a</sup>



<sup>a</sup> All data are for currently married women ages 15–49.

<sup>b</sup> The 2005 Rwanda survey grouped use of implants with “other modern methods.”

Data from the Demographic and Health Surveys.<sup>14</sup>

toward wider use of implants. The commodity cost of implants—once as high as US\$23.80 per set—has been a major impediment to their wider availability. (In comparison, the public-sector commodity cost of a Copper-T IUD ranges from US\$0.36 to \$0.48.<sup>1</sup>) Having 3 implants in the market appears to have helped induce these lower commodity prices, and hopefully prices will continue to fall.

## WHAT PROGRAMS CAN DO

### Ensure a Client-Centered Approach

A knowledgeable, empowered client is central to the provision and receipt of quality family planning services.<sup>19</sup> This entails that programs provide and ensure:

- **Informed choice** from among a wide range of contraceptive options. (This has long been the bedrock principle of organized family planning programs.)

- Thoughtful **counseling** to help clients select a method, discuss its characteristics, and dispel myths and misconceptions (for example, that implants might migrate within the body). Counseling should also make clear that clients do not need to use an implant for its full length of labeled use in order to receive it.
- **Anticipatory guidance** regarding common side effects of implants, especially about bleeding disturbances and their acceptability to the client within her sociocultural context. This is particularly important, as changes in menstrual patterns—irregular, infrequent, or no bleeding—while not harmful are expected.<sup>20</sup> The specific pattern in any given woman cannot be predicted with certainty, however.
- Capable and reassuring **management of side effects**, especially of bleeding changes, is thus often the difference between satisfaction and discontinuation. Side effects and

**Counseling about, and management of, bleeding side effects are key to helping women use implants successfully.**

### Box. Implants Use on the Upswing in Eastern and Southern African Countries

Ethiopia, Malawi, Rwanda, and Tanzania have recently achieved notable increases in their modern method contraceptive prevalence rates (CPR), including for implants. As seen in the [Figure](#), in only 5 to 6 years, implants use doubled in Malawi, quadrupled in Tanzania, and rose more than 15-fold in Rwanda and 17-fold in Ethiopia.<sup>14</sup> Implants have become the second most popular method in Ethiopia and the third most popular method in Rwanda. One of every 7 married women using modern contraception in Rwanda and 1 in every 8 in Ethiopia relies on an implant for her contraceptive protection. The CPR for implants in Rwanda is 6.3% among currently married women, 5.9% among sexually active unmarried women, and 6.4% among rural women. These are the highest rates in sub-Saharan Africa and among the highest in the world.

What accounts for this success? Among the most important factors have been:

- An **enabling environment**, with strong policy commitment from the highest levels downward, as manifested most recently by the Prime Ministers of Ethiopia and Rwanda at the London Summit,<sup>15</sup> and supportive service policies that encourage task sharing and task shifting;
- On the **supply side**, training to ensure widespread insertion and removal skills and substantial donor support for purchase of commodities (3.7 million implants valued at US\$72 million were purchased for these 4 African countries between 2009 and 2012)<sup>16</sup>; and
- On the **demand side**, a marked rise in implants knowledge, stimulated by communication activities in programs as well as by diffusion of knowledge among women themselves. In Ethiopia, knowledge of implants among married women ages 15–49 increased to 69% in 2011 from only 20% in 2005, and knowledge was even higher among sexually active, unmarried women (82%).<sup>14</sup> In Rwanda, where only half of married women knew of implants in 2005, such knowledge became universal (97%) by 2010.<sup>14</sup>

**Many cadres of health care providers can provide implants safely and effectively.**

- health concerns are the main reason why women discontinue hormonal methods,<sup>21</sup> and bleeding unpredictability is a chief reason why they discontinue implants.<sup>20</sup>
- Regular and reliable access to prompt **removal** services.
- Adequate **follow-up**, including making it clear that although the client does not *need* to return, she can and should return at any time, whether for advice, reassurance, treatment of side effects, or removal.

### Appreciate and Nurture Providers

In addition to focusing on the client, programs must be attentive to the perspectives, needs, and workloads of providers.<sup>22–23</sup> Without adequate availability and distribution of skilled, motivated, and enabled providers, there can be little provision of implants.<sup>24</sup> In other words, “No provider, no program.” Fortunately for resource-constrained programs, many categories of health care providers—not only doctors but also nurses, midwives, auxiliary nurses, auxiliary nurse-midwives, and clinical officers—are capable, once trained, of safely providing implants.<sup>25</sup> Such “task shifting” or “task sharing” among health cadres is an accepted policy and programmatic reality.<sup>25–26</sup> Ethiopia has even launched a program to train and enable 15,000 rural community health extension workers (CHEWs) to insert *Implanon*,<sup>27</sup> whose one rod can be inserted easily in 1 to 2 minutes. (Removals are handled by referral to higher-level cadres.)

### Ensure Access to Removal Services

Programs also need to ensure **routine, regular, and reliable removal services** for clients, beginning by planning for them at the outset of service expansion efforts. Failure to provide reliable and ready access to removal services could easily tarnish the method’s image and undermine an entire family planning program.

### Consider Use of Dedicated Providers and Mobile Services

A number of countries have successfully followed innovative public-private service delivery models that entail the use of “dedicated providers.” These providers focus primarily on delivering underutilized clinical contraceptive methods, including implants. (A wider range of method choices is generally available at the service site.) The service models have also typically entailed task shifting and provision of free services, either in static public-sector service sites or through mobile outreach.

In Zambia, 18 retired midwives were placed at high-volume, public-sector facilities solely to provide long-acting and reversible contraceptives (LARCs). These dedicated providers inserted more than 22,000 implants and 11,000 IUDs in 14 months and reached younger and lower-parity women.<sup>28</sup> In Tanzania, a policy shift allowed nurses, as well as physicians, to provide implants. Subsequently, insertions more than doubled, from

around 10,000 per quarter in 2007 to more than 20,000 per quarter in 2009,<sup>29</sup> and nurses became the main providers of implants. In Malawi, where use of dedicated, non-physician providers and mobile services contributed substantially to wide use of female sterilization (prevalence of 10% among married women in 2010),<sup>30</sup> implants provision through the same service modalities and providers also rose (see [Box](#)).

### Other Program and Health System Considerations

The following programmatic subsystems must be in place and functional to ensure that quality implant insertion and removal services can be regularly and reliably provided<sup>19,24</sup>:

- Commodity logistics and supplies
- Supervision and management
- Infection prevention and quality control
- Pre-service and in-service training (for all cadres who provide implants)
- Health communication, demand creation, and marketing
- Client follow-up

The environment also must be enabling and supportive, with:

- Strong political commitment
- Adequate and well-deployed financial and human resources
- Service delivery policies, guidelines, and standards that permit task shifting and task sharing to allow other skilled cadres besides doctors to provide implants
- No restrictions on access because of age, parity, marital status, HIV status, or socio-economic status
- Widespread gender equity

Finally, recurrent costs for infrastructure and staff must be met. Despite these costs, the overall cost of implants per couple-year of protection (CYP) is comparable to or less than that of injectables or oral contraceptives, and cost effectiveness rises with longer use.<sup>31–33</sup>

### WHAT IS AT STAKE

A woman in sub-Saharan Africa faces a 1 in 39 lifetime risk of maternal death, and a woman in South Asia has a 1 in 150 lifetime risk.<sup>34</sup> In contrast, the lifetime risk of maternal death in

industrialized countries is 1 in 4,700. Nearly all maternal deaths—99%—occur in low-resource countries,<sup>35</sup> and for every instance of maternal mortality, 20 instances of serious morbidity (such as obstetric fistula) occur.<sup>36</sup> Risk of morbidity and mortality is higher among poorer women, who have less access to modern contraception including implants. Access is also more constrained for young women, among whom 44% of all unintended pregnancies in sub-Saharan Africa occur.<sup>10</sup>

Satisfying unmet need for contraception could reduce maternal mortality by 29%, preventing more than 100,000 maternal deaths each year.<sup>34</sup> If only 1 of 5 sub-Saharan African women now using pills or injectables (that is, other, less effective hormonal contraception) were to switch to an implant, more than 1.8 million unintended pregnancies would be averted in 5 years, resulting in almost 600,000 fewer abortions and 10,000 fewer maternal deaths.<sup>37</sup> If even more women were to switch, or if women not currently using contraception were to access and use implants, even greater individual and public health would accrue. Meeting the need for effective modern contraception, including much wider provision of contraceptive implants to women who would want them, is not only a family planning and health issue—it is a matter of social justice and an equity imperative.

### OUR CHALLENGE

The 2012 London Summit on Family Planning, attended by more than 150 leaders and representatives of governments and civil society, endorsed an ambitious goal of providing family planning to an additional 120 million women.<sup>38</sup> Widespread provision of implants in a quality manner offers a substantial way to help achieve this goal, if the global health community can rise to the challenge. We must do it right, and do it now.

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**Innovative models utilizing dedicated non-physician providers have increased availability and use of implants.**

**The overall cost of implants per CYP is comparable to or less than that of injectables or pills.**

**Meeting unmet need for contraception could prevent more than 100,000 maternal deaths each year.**

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COMMENTARY

# GeneXpert for TB diagnosis: planned and purposeful implementation

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***Xpert MTB/RIF is a major advance for TB diagnostics, especially for multidrug-resistant (MDR) TB and HIV-associated TB. But implementation concerns including cost, technical support requirements, and challenging demands of providing second-line TB drugs for diagnosed MDR-TB cases call for gradual, careful introduction based on country circumstances.***

## INTRODUCTION

**T**uberculosis (TB) continues to be one of the greatest killers in the world due to infectious disease, claiming over 1.4 million deaths in 2011.<sup>1</sup> In recent years, the prevention, diagnosis, and treatment of TB has become more complicated because of 2 factors changing the epidemic: HIV-associated TB and multidrug-resistant (MDR) TB. Many people die from TB because their diagnosis is delayed, and the epidemic continues to endure because we are unable to significantly reduce transmission with current diagnostics. *Xpert MTB/RIF*<sup>®</sup> (or *Xpert*), based on the GeneXpert platform, offers a major breakthrough against these limitations—but only if it is implemented within a context of strong national program and laboratory strategic plans and according to a comprehensive technical approach that includes everything from planning to evaluation.

## BACKGROUND

Sputum smear microscopy remains the most common way to diagnose pulmonary TB. Depending on the report and method used, smear microscopy can accurately detect TB in 20% to 80% (using fluorescence microscopy methods) of TB cases.<sup>2</sup> Sputum smear microscopy has significant limitations because it can

only be used to diagnose TB when sputum has sufficient bacillary load, and it cannot detect drug resistance. Thus, HIV-associated TB often goes undetected because people living with HIV (PLHIV), especially those with severe immunosuppression, generally have very low numbers of bacilli.<sup>3</sup>

A more sensitive approach to diagnosis is to culture sputum samples, which can include testing for drug resistance. However, such techniques require expensive and sophisticated laboratory infrastructure and staff, and it can take weeks or months to obtain results. Realistically, most people who need culture tests to diagnose their TB will not have access to the test results in time to save their lives or to prevent transmission to others.

With the advent of new molecular diagnostics, a rapid and sensitive test to diagnose TB, including HIV-associated TB and MDR-TB, is within reach. The *Xpert MTB/RIF* assay from Cepheid, Inc., is a molecular-based rapid test with potential to revolutionize TB diagnosis. However, a key question looms large: Do resource-constrained countries have the technical and financial resources to appropriately and adequately implement this new test? If so, how should they proceed?

## WHAT IS XPERT MTB/RIF?

The *Xpert MTB/RIF* assay is a fully automated molecular diagnostic test for TB disease developed in partnership among Cepheid, Inc., the Foundation for Innovative New Diagnostics (FIND), the University of Medicine and Dentistry of New Jersey (UMDNJ), and the National Institutes of Health (NIH). It can simultaneously detect *Mycobacterium tuberculosis* (MTB) complex DNA and mutations associated with rifampicin

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**Xpert can detect TB, including MDR-TB, in less than 2 hours, potentially reducing the time to diagnose and treat TB.**

(RIF) resistance (a reliable proxy for MDR-TB) directly from sputum specimens in less than 2 hours, and it minimizes staff manipulation and biosafety risk.<sup>4</sup>

*Xpert* is more sensitive than sputum smear microscopy in detecting TB, and it has similar accuracy as culture.<sup>5-6</sup> Moreover, its ability to detect smear-negative TB provides a significant advantage, especially for PLHIV. Importantly, its ability to detect RIF-resistant TB in less than 2 hours significantly improves the likelihood of timely treatment initiation. (Conventional culture and drug-susceptibility testing [DST] are still required to complete the drug-resistance profile and to monitor treatment.)

*Xpert* does cost more than smear microscopy; it requires a machine that currently costs US\$17,000 and cartridges that cost US\$9.98 for each test, in addition to human resource and other running costs. It also has operational limitations, such as the need for a sustained power supply. However, *Xpert* is intended to be used at facilities close to the patient to reduce the time to diagnosis and TB treatment initiation.

**In December 2010, WHO endorsed Xpert for detecting TB.**

### XPRT AS GLOBAL POLICY

In December 2010, the World Health Organization (WHO) endorsed *Xpert* for the rapid and accurate detection of TB, particularly among PLHIV and people suspected of having MDR-TB.<sup>7</sup> The global TB community responded to quickly roll out and scale up *Xpert* in high TB-burden countries by developing policies, guidelines, and monitoring frameworks to support Ministries of Health (MOHs) in their implementation.

### IMPLEMENTATION REQUIREMENTS

Performing the *Xpert* assay is relatively simple and involves minimal specimen manipulation. However, the numerous operational and programmatic requirements associated with the assay and its results cause implementation to be less easy than expected. Priority requirements include both operational and programmatic considerations.

#### Operational requirements:

- Uninterrupted power supply
- Ambient temperature no higher than 30°C
- Biosafety equivalent to smear microscopy
- Adequate storage for test kits (or cartridges) at temperatures no higher than 28°C

- Waste disposal system for cartridges
- Secure location to protect machine and computer from theft
- Trained laboratory and clinical staff
- Annual calibration of the *Xpert* modules

#### Programmatic requirements:

- Review (and revision) of diagnostic algorithms, policies, forms, and guidance
- Capacity for conventional culture and drug-resistance testing through diagnostic referral networks
- Quality-assured microscopy network to monitor drug-sensitive TB treatment
- Capacity for MDR-TB treatment, including facilities, staff, and drugs
- Computer and software technical support
- Inventory and supply chain management for commodities
- Routine monitoring, evaluation, and supervision of implementation
- Budget to support initial investment of machines and infrastructure and to support running costs for cartridges and calibration

#### Additional technical requirements:

- Coordination mechanisms in country, and epidemiological and SWOT (Strengths, Weaknesses, Opportunities, and Threats) analysis of diagnostic and treatment situation to guide implementation
- Integrating *Xpert* into national laboratory strategies for both the public and private sectors and country plans for initial implementation, including identifying target groups, defining diagnostic algorithms, selecting appropriate sites, forecasting commodities, and developing an annual activity plan and budget
- Ensuring infrastructure and operational needs are met to begin *Xpert* testing at designated sites
- Building capacity for *Xpert* implementation, including training of site staff and clinicians
- Monitoring routine *Xpert* implementation and evaluating the impact of roll out

### COORDINATED COUNTRY SUPPORT

In response to WHO's endorsement and technical assistance needs, the United States Government

(USG) (including the Centers for Disease Control and Prevention [CDC], the Office of the Global AIDS Coordinator [OGAC], and the United States Agency for International Development [USAID]) is supporting implementation and impact-assessment projects to facilitate in-country *Xpert* introduction and scale up in a systematic, phased, and coordinated manner. To maximize the impact, these projects support not only machine and cartridge procurement but also the MOHs, by providing comprehensive technical assistance toward operational and programmatic requirements. Additionally, the USG supports research studying different implementation models and their potential impact on TB care and management programs, including transmission and mortality.

Planning and carrying out activities according to the operational and technical requirements mentioned above is necessary but can be challenging and potentially demanding on countries with limited resources.

## KEY CHALLENGES AND LESSONS LEARNED

Cost and infrastructure requirements are key challenges to *Xpert* implementation. Efforts to date have identified many other challenges and lessons learned.

### Costs and Sustainability

The 4-module *Xpert* machine currently costs approximately US\$17,000. The cost of one test cartridge is US\$9.98, which was recently reduced by 40% (from US\$16.87) through a financial agreement with the manufacturer and the Bill & Melinda Gates Foundation, PEPFAR, UNITAID, and USAID. The actual cost per test will vary by country because of differences in shipping fees, procurement agent and other clearance fees, and the use of required distributors. A reduced pricing scheme for the machine and cartridges for the public sector was negotiated with Cepheid in 145 high TB-burden countries.<sup>8</sup> As seen with other sophisticated test systems (for example, CD4 count tests for HIV), additional cost cuts for automated nucleic acid amplification tests such as *Xpert* may occur as competing technologies enter the market.

In total, first-year initial investment costs, including associated commodities (such as the machine, cartridges [3,000/machine/year at full capacity], uninterrupted power supply, and

printer), calibration, and other human resource needs are estimated at US\$61,000. Annual running costs for cartridges and calibration are estimated at about US\$32,000 per machine.

The price of *Xpert* equipment and cartridges is a barrier for scaling up *Xpert* in many countries. In countries that already have *Xpert* machines, we fear that the machines will sit unused after the initial investment unless due attention is given to identifying sustained resources for commodities and recurrent costs.

Countries also need to factor in the cost of treatment for each MDR-TB case detected by *Xpert*. The cost of drugs for treating an MDR-TB case is 50 to 200 times greater than treating a drug-sensitive TB case, and the overall costs to care for each MDR-TB case are 10 times higher.<sup>9</sup> Many countries do not currently have the financial resources to treat their existing MDR-TB patients, and the detection of additional cases by *Xpert* is likely to further strain such health systems.

### Prioritizing According to Country Circumstances

When, where, and how to use *Xpert* depends on the national commitment to draft policies and implementation strategies; available funds; accessibility, availability, and geographic distribution of adequate diagnostic services; and the epidemiology of TB in the country (especially HIV-associated TB and MDR-TB). Positioning of *Xpert* machines in the country needs to balance available resources, national capacity building, and accessibility to persons suspected of having TB that would most benefit from the diagnostic test.

Because it is a new and expensive technology, many countries are placing their first machines in central- and regional-level labs to gain knowledge, build a cadre of staff who can provide technical assistance on the assay, and most importantly, test as many people suspected of having TB as possible. Given limited resources, *Xpert* should be targeted to at-risk populations, particularly those with suspected HIV-associated TB and/or MDR-TB, to produce a high yield and high impact of early diagnosis. In addition, many countries continue to do parallel diagnostic smear microscopy to preselect persons suspected of having TB and build the local evidence base, but also because their national policies to treat and monitor TB patients rely on smear microscopy status.

**Equipment and supply costs are a barrier to scaling up *Xpert* in many countries.**

## Testing and Treatment Algorithms

*Xpert* should be incorporated into a diagnostic and treatment algorithm that includes all diagnostic tests needed to place a patient on an adequate drug regimen. In some settings, such as among populations with a low frequency of MDR-TB or high frequency of RIF-resistant TB, this may include confirmation of RIF resistance or MDR-TB by conventional culture and DST.

**Countries must be prepared to treat the increased MDR-TB cases that *Xpert* detects, with drugs costing 50 to 200 times more per MDR-TB case than for a drug-sensitive TB case.**

## Diagnosing and Treating MDR-TB

Many countries currently have limited ability to address drug-resistant TB. Lack of TB culture and DST facilities and referral systems continues to delay diagnosis and treatment. Drugs for MDR-TB are available, but they are expensive and often require injections and up to 2 years of treatment. Similarly, weak MDR-TB treatment capacity, including facilities and staff, means that confirmed drug-resistant cases may go untreated until these systems are strengthened. This poses a substantial dilemma for countries who must weigh the benefits of diagnosing MDR-TB against the ethics of not being able to provide sufficient treatment. Increased capacity to detect MDR-TB should dictate that countries and their partners significantly ramp up treatment capacity.

## Training of Both Laboratory and Clinical Staff

Training has focused on laboratory staff members who operate the machine and perform the assay. However, clinical staff members need to be sensitized to *Xpert*, so that they properly use the results to inform treatment. Often, clinicians continue to want smear, culture, and drug-sensitivity test results, even in the presence of an *Xpert* test result. Clinicians and medical associations need to be included in *Xpert* stakeholder meetings and trainings.

## Delayed Turnaround Time of Test Results

Although *Xpert* test results can be ready in 2 hours, many people receive their results days later, often due to laboratory operations issues, including limited staff, practices of batching specimens, and other logistical barriers such as inefficient specimen referral and transport networks. The promise of detection within 2 hours or on the same day is achievable but may be challenging because of these barriers.

## Technical Support Needs

The *Xpert* assay is a computer-based test. Many facilities have limited technical support to help overcome problems encountered with either the hardware or software. These problems can mean that a simple “glitch” can translate into days or weeks of downtime. Language is also another barrier for many countries because the software is currently only in English. Adequate, readily available technical support is needed, in addition to building capacity within the National TB Reference Laboratory system to address potential bottlenecks and technical issues related to implementation.

## Monitoring and Evaluation

A robust monitoring and evaluation system needs to be put in place, including appropriate indicators and support for data collection, reporting, and analysis. It is especially important to monitor the positive effects that *Xpert* can have on treatment initiation rates and reduced time to treatment. Assessment of these effects requires a system that can link diagnostic and clinical information, which is not yet in place in most high-burden countries.

## OPPORTUNITIES

Despite the challenges to implementing *Xpert*, a number of opportunities for strengthening many aspects of TB prevention, diagnostic, and treatment programs are emerging.

### Public-Private Partnerships

The successful public-private partnership among Cepheid, FIND, NIH, and UMDNJ to develop the *Xpert* assay may serve as a model for other collaborations to develop even better diagnostics and new technologies for TB. Similarly, the donor partnership between the Bill & Melinda Gates Foundation, PEPFAR, UNITAID, and USAID immediately increased affordability of *Xpert* cartridges.

### Synergy With HIV Efforts

Since use of the machine in HIV-treatment settings to diagnose co-infected TB patients is highly recommended, *Xpert* scale up in these settings may strengthen the coordination between TB and HIV programs. Although policies to intensify TB case detection among persons with HIV have long been in place, a significant gap remains in on-the-ground collaborative

activities. *Xpert* has the potential to narrow this gap. Additionally, implementation of *Xpert* can be greatly facilitated by leveraging HIV laboratory, care, and treatment infrastructure. TB programs can garner other lessons learned from HIV programs, which have witnessed rapid implementation of new technologies and treatments. In addition, Cepheid and other companies are looking into performing TB testing and HIV viral load testing on a common instrument.

### Stimulating Focus on MDR-TB

Since TB programs finally have a tool to quickly diagnose RIF resistance, they need to ensure that the capacity to treat confirmed MDR-TB patients keeps pace with diagnosis. The early detection of MDR-TB cases through *Xpert* must create new treatment sites and strengthen existing policies and guidance to treat MDR-TB patients. Similarly, increased detection of MDR-TB should increase the market for second-line anti-TB drugs and potentially drive the cost of these drugs down.

### Strengthening Other Laboratory Diagnostics

There is still a need for high-quality microscopy, culture, and DST to monitor treatment and outcomes and to complete the susceptibility profile. Therefore, *Xpert* roll out should motivate countries to continue strengthening laboratory networks and specimen-referral networks throughout the country to keep up with this demand.

### Creating Strong Platforms for New Innovations

Currently, there are no point-of-care TB diagnostic tools at the stage of evaluation or demonstration that are sufficiently sensitive and specific for TB detection in both populations with and without HIV infection. However, a variety of nucleic acid amplification, alternative antigen, and volatile organic compound detection assays are in the pipeline or are proving to have utility in distinct patient populations.<sup>10</sup> The introduction of *Xpert* is expected to strengthen health systems and laboratory networks, which will, in turn, help to create platforms that will make it easier to launch these and other future diagnostics and drug therapies. Coordination of *Xpert* roll out by MOHs and partner and stakeholder working groups will build a high level of capacity to prepare for promising upcoming changes in technology and tools.

## CONCLUSION

*Xpert* is the most exciting innovation in TB diagnostics in over a century. It has the potential to significantly increase TB case detection in 2 priority populations in which traditional diagnostics are woefully inadequate—people with suspected HIV-associated TB and MDR-TB. The possibility to diagnose TB in these important groups in 2 hours will lead to fewer deaths and less transmission of disease.

However, *Xpert* is not a panacea. Its implementation presents major challenges, particularly related to cost and infrastructure, which call for a thoughtfully phased and careful introduction. Strong health systems are required in order to realize the full potential of this new technology. Also, *Xpert* is not a point-of-care test, which remains an important need in TB diagnostics. Fast and accurate detection of TB and MDR-TB needs to happen at the community level with a point-of-care test and a strong laboratory network and referral system to ensure that patients have access to all the diagnostic and follow-up testing they need.

Nevertheless, *Xpert* is more than just a “test”—it is transforming the way we think about diagnosing TB. Countries have to make decisions about where to place the test; clinicians have to learn to trust the test results; program managers must embrace the challenges of implementing a new technology; and policy makers must agree to invest with adequate funding for scale up.

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**Competing Interests:** Amy Piatek is among a group of inventors who earn royalties on licensing fees for molecular beacon usage.

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***Xpert* can improve coordination between HIV and TB programs.**

**Increased detection of MDR-TB through *Xpert* could increase the market for second-line anti-TB drugs and drive costs down.**

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COMMENTARY

# Global health diplomacy: advancing foreign policy and global health interests

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Attention to global health diplomacy has been rising but the future holds challenges, including a difficult budgetary environment. Going forward, both global health and foreign policy practitioners would benefit from working more closely together to achieve greater mutual understanding and to advance respective mutual goals.

Recently, there has been a remarkable surge of interest in the topic of “global health diplomacy” (GHD). Official GHD offices have been established at the World Health Organization (WHO) and at the U.S. Department of State, and offices within governments of many countries now have a broad set of new GHD responsibilities.<sup>1-3</sup> Academics have begun to publish articles on the subject in greater numbers; more than 70% of all peer-reviewed journal articles on GHD since 1970 were published in the last decade, according to a recent analysis.<sup>4</sup> While international engagement on health issues has a history that extends back to at least the 19<sup>th</sup> century, the renewed emphasis is notable. What is driving this interest in—and support for—GHD, and what might it imply for the current and future practice of global health?

## WHAT IS GLOBAL HEALTH DIPLOMACY?

It is worth noting that, even with this growing level of interest, there is little agreement on how to define “global health diplomacy.”<sup>5-6</sup> Generally, GHD refers to international diplomatic activities that (directly or indirectly) address issues of global health importance, and is concerned with how and why global health issues play out in a foreign policy context. GHD can encompass a broad set of activities and actors, such as formal country delegations holding bilateral and multilateral negotiations on health issues, a combination of governmental and nongovernmental actors negotiating on health-related issues, and, although often not considered “diplomacy” in the traditional sense, official or semi-official representatives of one

country acting in a health capacity in another (see [box](#) for specific examples).

## ADVANCING BOTH HEALTH AND FOREIGN POLICY AIMS

Perspectives differ as to whether GHD is driven primarily by global health or foreign policy aims. Global health proponents, for their part, have mostly characterized GHD as a unique opportunity to raise the policy profile of global health. They perceive tying health issues to foreign policy and diplomacy as a recipe for more attention and resources. For example, the current WHO Director-General has characterized the new focus on diplomacy as signaling a “new era” for global health,<sup>7</sup> while the Editor of the *Lancet* expects that such a diplomatic focus can move “foreign policy away from a debate about interests to one of global altruism.”<sup>8</sup> On the other hand, many politicians and foreign policy practitioners emphasize how support for health programs can help achieve foreign policy goals through the application of “soft power” and the practice of “enlightened self-interest.” At times these two different viewpoints may align, but there are many examples when they do not, with foreign policy and national security goals often trumping global health objectives. Some examples include:

- Tightening intellectual property rights on drugs and vaccines instead of promoting ease of access to medicines<sup>9-11</sup>
- Promoting the production, sale, and trade of products detrimental to health (such as tobacco, alcohol, and junk foods)
- Using fake vaccination programs in the context of counter-terrorist operations that can jeopardize community trust in basic public health programs<sup>12</sup>

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**High-profile global health challenges such as HIV/AIDS have been perceived as direct threats to national security and foreign policy interests.**

## WHY NOW?

A number of factors have contributed to the growing attention to the intersection between global health, diplomacy, and foreign policy. Several high-profile global health challenges, including HIV/AIDS and emerging infectious diseases such as SARS (severe acute respiratory syndrome) and pandemic influenza, came to be seen as direct threats to core national security and foreign policy interests, forcing senior policy makers to consider health issues in a new light, which had previously been relegated to a lower policy priority. Partly in response to this, but also in recognition of the need to address ongoing global health disparities and realize the Millennium Development Goals, donors have dedicated more resources to overseas health programs and created new channels of assistance, leading to greater policy attention and scrutiny.<sup>13–14</sup>

Further, global health has grown more interdisciplinary, with links increasingly being made between health and other areas such as international trade and intellectual property rights, agriculture, education, and the environment. In the process, health has moved onto diplomatic and foreign policy agendas.<sup>15</sup> Another factor has been an unprecedented level of personal engagement and commitment shown by many political leaders and high-profile personalities, such as U.S. President George W. Bush, former U.S. Secretary of State Hillary Clinton, UK Prime Minister David Cameron, singer Bono, and Bill and Melinda Gates.<sup>16–18</sup>

## RECENT EXAMPLES

**Non-state actors can play an important role in global health diplomacy.**

Even though much of the focus in GHD may be on carefully planned engagements between actors with explicit, joint interests and objectives, some GHD activities are undertaken in response to crises or to resolve unexpected issues that arise. These may draw in a range of different actors and encompass a variety of diplomatic activities depending on the situation at hand. For example, when politicians and community groups in several states in Northern Nigeria ceased supporting polio vaccination in 2003, international diplomacy efforts were undertaken to restart the polio campaign, bringing together the U.S. (with representatives from the State Department, the Centers for Disease Control and Prevention, and other agencies), the United Nations, WHO, the Organization of the Islamic Conference (currently called the Organisation of Islamic Cooperation),

the African Union, Bill Gates, vaccine manufacturers, and others.<sup>19</sup>

In another example, a broad set of diplomatic actors engaged in a series of formal and informal negotiations with representatives of the Indonesian government when it refused to share H5N1 (avian influenza) virus samples with the Global Influenza Surveillance Network beginning in 2006. The Indonesian government was concerned that the country did not receive benefits from sharing these samples, but its actions threatened efforts to track the potential emergence of an H5N1 pandemic. The parties eventually resolved the immediate issue at hand, but discussions around benefit-sharing and pandemic influenza surveillance and prevention continue even today.<sup>19</sup>

Lastly, there has been growing recognition of the important role of U.S. ambassadors in health diplomacy, largely driven by the creation of PEPFAR in 2003, which brought significant new resources, not to mention a complex new program, to U.S. overseas missions.<sup>21</sup> Indeed, the work of the new Office of Global Health Diplomacy at the State Department is focused squarely on the role of ambassadors, which “will be elevated as they pursue diplomatic strategies and partnerships within countries to foster better health outcomes.”<sup>23</sup>

## NEW WAYS OF WORKING

There are hallmarks to the practice of GHD that are worth noting. As the above examples indicate, non-state actors (including private companies, foundations and charities, NGOs, and civil society groups) can play an important role in GHD, a development which distinguishes this kind of diplomacy from the more traditional, formal negotiations between governmental representatives that characterized diplomacy historically. An additional dimension is the shift from a traditional binary or multipolar set of interactions among discrete government actors in formal settings towards a more dynamic “networked” approach to engagement, aided by instant communication capabilities and newly developed social media platforms and tools. Those engaging in GHD may be served well by taking these characteristics into consideration.<sup>22</sup>

## NEW CHALLENGES

As of today, donor assistance for health has plateaued (and has shrunk in some cases)<sup>23</sup> in

### Box. Types of Global Health Diplomacy Activities

**Formal international bilateral and multilateral negotiations**, such as those that take place at the World Health Assembly and other multilateral forums and traditional negotiations between donor and recipient countries regarding official bilateral health assistance

- Negotiations around the WHO Framework Convention on Tobacco Control
- The U.S. President's Emergency Plan for AIDS Relief (PEPFAR) Partnership Framework agreements on HIV/AIDS between the U.S. government and partner countries

**Multi-stakeholder diplomacy** that often includes countries as well as non-state actors negotiating on health-related issues

- The Global Fund to Fight AIDS, Tuberculosis and Malaria and GAVI (formerly the Global Alliance for Vaccines and Immunization)
- The 2012 London Summit on Family Planning

**Interactions between health actors from one country acting in another country**, which include the activities of official and semi-official representatives from donor countries acting in recipient countries, for example the U.S. Agency for International Development (USAID), PEPFAR, or contracted NGO staff interacting with officials of the host country

- USAID country staff advocating inclusion of family planning services in Ghana's national health insurance program
- U.S. Ambassador calling for greater funding of child survival programs in Malawi's national budget

Source: Adapted from reference 4.

the wake of the global economic crisis, causing countries to reassess their overseas assistance programs and seek ways to collaborate with and leverage other donors, while also seeking greater domestic commitments to health programs from low- and middle-income countries themselves.<sup>24-25</sup> The continuing march of globalization and development has led to rising incomes and greater capacities in many previously poor countries, contributing to their desire to be seen as equal partners and not simply aid recipients. Navigating these trends going forward will require significant engagement from all sides, with attention to negotiation around issues of "country ownership," health systems, and fostering equitable and efficient trilateral and multilateral partnerships. Meanwhile, players must now address a set of newly recognized health issues that face developing countries, such as non-communicable diseases and mental health, alongside the unfinished business of reducing illness and death from preventable infectious diseases and promoting maternal and child health.

### A WAY FORWARD

Will GHD become a defining characteristic of the global health response in the next decade? Given recent trends, we might expect that it will continue to grow in importance. But in order to ensure international engagements on health and foreign policy are truly a win-win, both foreign policy practitioners and global health proponents need to engage more substantially. In an increasingly interdependent world, it is in the long-term interests of every country to have safe, prosperous, and healthy populations in partner countries, and the diplomatic community would do well to recognize that the global health agenda is a strong tool to achieve these goals. Likewise, global health experts could make greater efforts to understand and engage with foreign policy practitioners by keeping diplomatic leadership and embassy staff well informed of their activities and by clearly drawing the link between these activities and the broader policy objectives of foreign policy. Global health proponents also have additional opportunities to

**Global health diplomacy requires attention to issues of country ownership and fostering equitable partnerships.**

seek more visibility and to push for a seat at the table within the context of a broader set of international diplomatic issues with health implications, such as climate change and human trafficking.

Still, in light of the difficult budgetary environment faced by many donor countries and some of the inherent tensions between foreign policy and global health objectives, the extent and impact of GHD going forward remain difficult to predict. But if global health and foreign policy practitioners work together for greater mutual understanding and coordination, we can help to create conditions whereby all parties can benefit from the growing profile of GHD.

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## COMMENTARY

# Can we stop AIDS with antiretroviral-based treatment as prevention?

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**Challenges to scaling up treatment as prevention (TasP) of HIV transmission are considerable in the developing-world context and include accessing at-risk populations, human resource shortages, adherence and retention in care, access to newer treatments, measurement of treatment effects, and long-term sustainable funding. Optimism about ending AIDS needs to be tempered by the realities of the logistic challenges of strengthening health systems in countries most affected and by balancing TasP with overall combination prevention approaches.**

The 2011 results of the HIV Prevention Trials Network 052 randomized clinical trial (RCT)<sup>1</sup> evaluating antiretroviral treatment as prevention (TasP) of HIV transmission heralded a new era of HIV/AIDS control as the debate about prioritizing treatment or prevention comes to an end.<sup>2</sup> For many years, the best hope for ending the HIV epidemic was thought to lie in the development of an effective vaccine. But for now, the most effective preventive interventions will come from tools we already have, including antiretroviral therapy (ART), pre-exposure prophylaxis (PrEP) with ART, male circumcision, and condoms.

There is broad consensus that prevention strategies need to involve a combination of proven prevention interventions.<sup>3</sup> There is also strong advocacy that TasP should be the backbone of population-based prevention.<sup>3-4</sup> With considerable enthusiasm, the international research community has produced mathematical models of TasP to postulate the end of AIDS, an AIDS-free generation, and a cost-effective strategy that saves billions of investments in the future.<sup>5-6</sup> Yet such widespread enthusiasm needs to be tempered with programmatic realities. In the era of global economic uncertainty, we need to overcome a number of specific challenges to realize any population-wide benefits of TasP.

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## EVIDENCE FOR TASP

Mathematical models may be useful for raising policy implications, but they are highly susceptible to the assumptions that inform them. The heterogeneity of estimates of TasP benefits weakens their inferences severely.<sup>6</sup>

As early as 1991, mathematical projections highlighted the potential for TasP using only the antiretroviral drug zidovudine.<sup>7</sup> Since then, incrementally stronger evidence from cohort evaluations have indicated that transmission risks are associated with specific viral load thresholds.<sup>8</sup> It was not until 2011 that results of the HPTN 052 RCT provided randomized evidence of a large preventive benefit associated with early provision of antiretroviral treatment. Early treatment resulted in a 96% reduction in the number of HIV transmissions compared with delayed treatment (95% confidence interval [CI], 73% to 99%).<sup>1</sup>

The trial was conducted among serodiscordant couples (one partner had HIV infection and the other did not) in a well-monitored RCT environment. However, the randomized portion of the trial was stopped early due to treatment benefits,<sup>9</sup> but it was based on comparatively few events<sup>10</sup>—both issues that may bias a trial in favor of inflated treatment effects.<sup>11</sup> In the most recent evaluation of TasP among discordant couples in China, treatment of the index partner conferred only a 26% reduction in transmission to the non-infected partner compared with no treatment (95% CI, 16% to 35%).<sup>12</sup> These findings indicate that the large treatment effects observed in the HPTN 052 RCT are unlikely to be fulfilled in real-world, non-trial environments.

**Early provision of ART reduces transmission of HIV infection—by as much as 96% in randomized trials. But benefits in the real world are probably markedly lower.**

## CHALLENGES

In light of this uncertain evidence, there are a number of important challenges to scaling up TasP, categorized into 6 distinct areas:

1. Prioritization of patient and population groups
2. Human resources and health systems
3. Acceptance, adherence, and retention of patients
4. Improved access to more effective therapies
5. Tools to measure the effect of TasP
6. Financial resources to cover new costs

Many of these issues were put forward a decade ago as challenges to scaling up ART in under-resourced settings.<sup>13</sup>

## Priority Populations

The greatest public health benefits in targeted prevention come from stopping transmissions among those who are most likely to infect others. One approach to maximizing the benefits of TasP should be to address specific groups of individuals with HIV infection, such as sex workers, injecting drug users, men who have sex with men (MSM), and individuals with multiple sex partners. There is an expectation that targeting screening and treatment (test and treat) to specific groups of people who are at high risk of transmitting the virus—and thus reducing their viremia—may result in the greatest reduction in new infections, although this has yet to be evaluated in any research setting.<sup>14</sup> Moreover, these groups are precisely the groups that, in many contexts, have been the hardest to reach for HIV testing and treatment programs because of stigma and discrimination; in many African countries where HIV burden is highest, injecting drug users, sex workers, and MSMs are criminalized.

While there is clearly a need to better engage these key affected populations in TasP programs, the decision to prioritize screening and treatment based on certain risk behaviors rather than on medical need continues to be a subject of debate.<sup>2</sup> An alternative approach would be to increase treatment coverage for people who are clinically eligible by scaling up HIV counseling and testing (HCT) campaigns, linked with rapid eligibility assessment through, for example, point-of-care CD4 testing.<sup>15</sup> This population may not have diverse links within transmission

networks. However, many would argue that this group of people should be prioritized over healthier people with HIV infection because they represent a population that the clinical community has failed to adequately serve and because providing treatment to patients with high viremia and low CD4 counts may still have considerable preventive benefits.<sup>16</sup>

Other strategies to engage infected individuals early besides point-of-care testing include self-testing and home-based testing visits. A recent evaluation of house-to-house testing by health workers in Kenya found high levels of acceptance and that people accepting home testing had a median CD4 count of 323 cells/ $\mu$ L compared with a median CD4 count of 217 among those visiting voluntary testing centers.<sup>17</sup>

## Human Resources

With increasing numbers of individuals screened and treated, health systems will need larger numbers of trained health care workers capable of testing, initiating treatment, monitoring adherence and retention, and engaging patients in long-term social support groups. In countries with HIV burden, health service constraints to expanding ART access are considerable. For example, in settings such as Swaziland (HIV prevalence 25%) and Malawi (prevalence 11%), there are fewer than 0.05 physicians per 1,000 people and fewer than 0.2 nurses per 1,000 people.<sup>18</sup>

The simplification of screening, treatment, and monitoring of patients has allowed for task shifting from doctors to less specialized health staff. Despite numerous observational studies and several randomized trials validating this approach, task shifting for HIV treatment and care is still not universally accepted.<sup>19</sup>

Increasing numbers of patients engaged in treatment will also require that health systems adapt from facility-based care to community-based care and delivery. Several important examples of this model exist in Kenya, Mozambique, and Uganda.<sup>20-22</sup> If more patients begin treatment at higher CD4 counts—before they become sick—then there may be no particular reason for them to routinely visit the central health system if quality care can be delivered to their local communities.

TasP provides an additional compelling argument for improving access to viral load monitoring as CD4 is a weak surrogate marker of viral suppression. Currently, due to costs, viral load monitoring is rarely provided in the lowest-

resource settings. Advocates of viral load monitoring over CD4 monitoring argue that viremia is a better predictor of treatment failure than CD4 monitoring and that a renewed emphasis on decreasing costs of care should focus on making viral monitoring available in resource-limited settings.<sup>23</sup>

### Acceptance, Adherence, and Retention

Linking patients with a positive HIV test to effective and uninterrupted ART represents an important challenge. Major attrition of patients occurs between each stage of the leaky treatment cascade—from diagnosis and assessment of ART readiness to receipt of initial ART and long-term retention in care (Figure).<sup>24</sup>

Just because patients have been prescribed ART does not mean they are willing to begin lifelong treatment. A recent study from Kenya found that almost 40% of serodiscordant couples were unwilling to use early treatment for its preventive effects.<sup>28</sup>

Systematic reviews show that, on average, adherence among people with HIV infection that do start ART is below 80%,<sup>29</sup> and around a quarter of patients interrupt treatment for a median of 150 days.<sup>30</sup> In Uganda, a study found that 11% of patients took unstructured treatment interruptions for over a year and patients with higher CD4 counts were more likely to discontinue care.<sup>31</sup>

Reducing viremia effectively requires adequate and sustained adherence, but approaches to improve adherence remain poorly defined. Community-based organizations have used social groups, involved partners, and sent mobile phone text messages in efforts to retain patients along the cascade of care.<sup>25</sup> Despite dozens of proposed adherence-support interventions, only counseling and mobile phone text messaging have demonstrated their utility in large randomized trials.<sup>32</sup>

Treating greater numbers of asymptomatic patients will require renewed efforts to improve adherence, including identifying adherence-support models for people who have never experienced an illness episode.

### Improved Access to More Effective Therapies

Although there have been recommendations to shift away from using drugs associated with severe adverse events, such as stavudine, toward

better-tolerated tenofovir-based formulations, stavudine is still commonly prescribed in many resource-limited settings.<sup>33</sup> Earlier initiation of ART is a balance of risks. In Western countries, a move toward earlier initiation was contemplated only once less toxic drugs became available. Likewise, a move toward widespread provision of antiretrovirals to asymptomatic patients in other countries will require improving the availability of better-tolerated regimens.<sup>34</sup>

**Viral load monitoring may be a better predictor of ART failure than CD4 monitoring.**

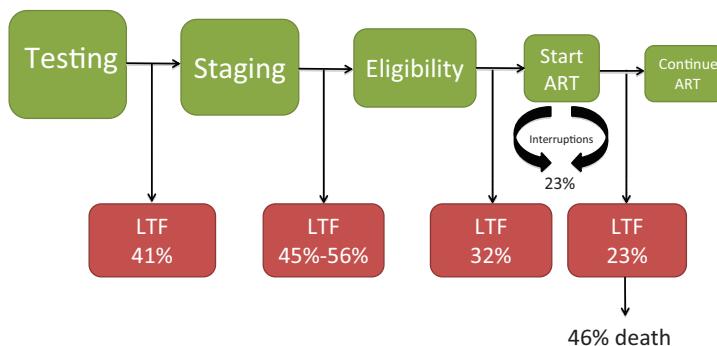
### Tools to Measure the Effect of TasP

Measuring whether TasP has a marked decrease on new infections in communities represents an important challenge to scale up.<sup>35</sup> Only incidence monitoring can determine whether rates of infection have gone up or down. Monitoring HIV prevalence data from cross-sectional surveys may be misleading because other unmeasured interventions, such as prevention messaging, circumcision, death, and the natural course of the disease, may affect prevalence rates. For example, Uganda experienced a marked decrease in HIV prevalence estimates between 1995 and 2000 in the absence of ART, mostly due to the high number of AIDS-related deaths and to successful HIV-prevention media campaigns.

**Early treatment of HIV patients who may not have symptoms yet requires enhanced efforts to improve adherence.**

Incidence monitoring is challenging in many settings in Africa because few incidence cohorts

**FIGURE. The Leaky HIV Treatment Cascade**



The cascade of HIV care proceeds from testing and clinical staging to ART eligibility, receipt of ART, and successful, uninterrupted treatment. Each step opens the possibility to losing patients to follow-up, which has been documented by a number of studies.<sup>25-27</sup>

Abbreviations: ART, antiretroviral therapy; LTF, loss to follow-up.

**While treatment as prevention holds promise, scale-up strategies need to be mindful of programmatic challenges.**

exist. Also, many populations at high risk of infection, such as migrant workers, have high rates of mobility and may not be captured in incidence surveys.

Additionally, determining the specific preventive contribution of treatment will be difficult in an environment where a range of positive prevention interventions, such as condom and clean-needle use, male circumcision, and decreasing the number of partners, are used by different populations to different extents. In 2 pragmatic, controlled cohorts of serodiscordant couples (in China and Uganda) where the index partner in the intervention group received ART, there were no differences in the rates of infection between groups.<sup>36-37</sup> While concerns about study quality afflict the China study,<sup>38</sup> in the Uganda study, the lack of reduced HIV transmission risk occurred despite high levels of viral suppression in the ART group.<sup>37</sup>

### Costs

Implementing treatment as a prevention strategy will have financial costs associated with it in terms of drugs, human resources, laboratory monitoring, and evaluation. In the current global economic climate, where this money will come from is a mystery.

In more developed settings, such as British Columbia, Canada, financial resources for TasP are obtained by moving resources from a previous allocation to the seek-and-treat program.<sup>39</sup> In settings that rely on development assistance initiatives, such as the U.S. President's Emergency Plan for AIDS Relief (PEPFAR) or the Global Fund to Fight AIDS, Tuberculosis and Malaria, new financial resources are unlikely.

Most organizations in Africa have a set allocation of patients who are permitted to begin treatment within defined funding periods, and they are not permitted to initiate ART for patients who do not meet their organization's initiation criteria. Engaging a large number of new patients with higher CD4 status than current eligibility criteria will require permission from funders. Yet neither PEPFAR nor the Global Fund has announced the allocation of significant new funding for TasP.

Whether TasP is a cost-effective strategy compared with other preventive approaches in HIV-endemic settings has been controversial. A model evaluating the cost-effectiveness of TasP compared with medical male circumcision found that a focus on circumcision had greater cost-effectiveness than TasP alone.<sup>40</sup> Clear evidence on

the preventive effects of male circumcision<sup>41</sup> has been available since 2005, but the practice has not been widely implemented, demonstrating that evidence alone does not drive funding or policy.

## CONCLUSIONS

Important programmatic challenges have hindered scale up of ART for the purpose of treatment alone.<sup>13</sup> Enthusiasm about scaling up treatment for preventive effects needs to be tempered by the reality that these programmatic challenges may be difficult to overcome. Overly optimistic public health messages about the preventive benefits of treatment have resulted in misleading communication that effective treatment will reduce the need for other preventive techniques, such as condoms.<sup>42</sup> The extent to which this results in modifications in risky behavior should be of paramount concern to those involved in public health messaging.<sup>43</sup>

TasP has given much-needed impetus to the HIV-prevention and treatment agenda at a time when political support was waning. It has also focused attention on the health system challenges to enrolling and retaining more people with HIV infection, earlier in care.

Other interventions, such as PrEP, prevention of mother-to-child transmission (PMTCT), condom and clean-needle use, and medical male circumcision, are also important strategies to prevent infections. All these interventions face challenges in terms of timely uptake by individuals at risk, health service capacity, and, in the case of PrEP and PMTCT, adherence to treatment.

The appropriate strategic combination of these different biomedical prevention interventions will differ according to the epidemiologic, economic, and cultural realities of different settings.<sup>44</sup> Approaches to defining the best combination prevention mix for particular settings is perhaps one of the most important implementation research questions in HIV prevention today.

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## ORIGINAL ARTICLE

# Reducing child global undernutrition at scale in Sofala Province, Mozambique, using Care Group Volunteers to communicate health messages to mothers

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Care Group peer-to-peer behavior change communication improved child undernutrition at scale in rural Mozambique and has the potential to substantially reduce under-5 mortality in priority countries at very low cost.

## ABSTRACT

**Background:** Undernutrition contributes to one-third of under-5 child mortality globally. Progress in achieving the Millennium Development Goal of reducing under-5 mortality is lagging in many countries, particularly in Africa. This paper shares evidence and insights from a low-cost behavior-change innovation in a rural area of Mozambique.

**Intervention:** About 50,000 households with pregnant women or children under 2 years old were organized into blocks of 12 households. One volunteer peer educator (Care Group Volunteer, or CGV) was selected for each block. Approximately 12 CGVs met together as a group every 2 weeks with a paid project promoter to learn a new child-survival health or nutrition message or skill. Then the CGVs shared the new message with mothers in their assigned blocks.

**Methods of evaluation:** Household surveys were conducted at baseline and endline to measure nutrition-related behaviors and childhood nutritional status.

**Findings:** More than 90% of beneficiary mothers reported that they had been contacted by CGVs during the previous 2 weeks. In the early implementation project area, the percentage of children 0–23 months old with global undernutrition (weight-for-age with z-score of less than 2 standard deviations below the international standard mean) declined by 8.1 percentage points ( $P < 0.001$ ), from 25.9% (95% confidence interval [CI]=22.2%–29.6%) at baseline to 17.8% at endline (95% CI=14.6%–20.9%). In the delayed implementation area, global undernutrition declined by 11.5 percentage points ( $P < 0.001$ ), from 27.1% (95% CI=23.6%–30.6%) to 15.6% (95% CI=12.6%–18.6%). Total project costs were US\$3.0 million, representing an average cost of US\$0.55 per capita per year (among the entire population of 1.1 million people) and US\$2.78 per beneficiary (mothers with young children) per year.

**Conclusion:** Using the Care Group model can improve the level of global undernutrition in children at scale and at low cost. This model shows sufficient promise to merit further rigorous testing and broader application.

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## INTRODUCTION

The United Nations Children's Fund (UNICEF) and the World Health Organization (WHO), together with more than 40 countries around the world, are now calling for a renewed commitment to child survival to eliminate preventable child deaths by the year 2035.<sup>1-2</sup> This will require more than doubling the global annual rate of decline in the under-5 mortality rate, from 2.5% in the previous decade to 5.3%.<sup>3</sup> Health programs will need to place a new emphasis on reaching the most marginalized populations where child mortality rates are currently the highest, with a priority on changing household behaviors, particularly those that are nutrition-related. The most recent progress assessment finds that only 4 of 42 priority countries in sub-Saharan Africa are on track to achieving Millennium Development Goal 4 (MDG 4) for child health (reducing the under-5 mortality rate by two-thirds between 1990 and 2015).<sup>4</sup>

**Poor nutrition contributes to about one-third of child deaths.**

Undernutrition in mothers and children is an important underlying contributor to an estimated 35% of child deaths and responsible for 11% of the global disease burden.<sup>5</sup> Although many developing countries have improved coverage of several key child-survival interventions, there has been less progress in coverage of key interventions for improving levels of childhood nutrition, particularly in Africa.<sup>4</sup> One recent analysis found virtually no improvement in child growth based on anthropometric indicators between 1985 and 2011 in sub-Saharan Africa.<sup>6</sup>

In Mozambique, 44% of children under 5 years old are stunted, and 18% are underweight.<sup>7</sup> Diarrhea is a contributor to malnutrition, and malnutrition aggravates the severity of, and mortality from, diarrhea.<sup>8</sup> In Mozambique, 10% of under-5 deaths are due to diarrhea.<sup>4</sup> The country has one of the highest under-5 mortality rates in the world, at 153 deaths per 1,000 live births, and it is not on track to achieve MDG 4 in the near future.<sup>4</sup> Recent at-scale, community-based programs in Africa have shown disappointing results in improving coverage of child-survival interventions that are based on changes in household practices, such as nutrition- and diarrhea-related indicators.<sup>9</sup>

Determining the best ways to improve practices for preventing and treating diarrhea and for improving childhood nutrition at scale remains a key challenge for Africa. We have identified only 2 sub-Saharan African programs that cover

populations of more than 1 million people and are aimed at improving child-nutrition practices that do not involve food supplementation. The first did not measure changes in childhood nutritional status,<sup>9</sup> and the second did not observe any improvements that could be attributed to the interventions.<sup>10</sup>

We developed and tested a service model that uses only 6.6 paid staff per 100,000 people and that relies on community volunteers. This paper reports on changes in coverage of nutrition- and diarrhea-related interventions and in childhood nutritional status in 7 districts in Sofala Province, Mozambique, compared with changes reported for Mozambique nationally in the national Demographic and Health Surveys (DHS).

## METHODS

### Project Context

The project was carried out by Food for the Hungry/Mozambique (FH/M), in collaboration with the Ministry of Health and with additional technical support from staff at Food for the Hungry's Global Service Center. The project took place from 2005–2010 in 7 districts of Sofala Province, which have a combined population of 1.1 million people. During the first 2.5 years, the project implemented services in 4 districts (Caia, Chemba, Manga, and Marringue) with 42% of the total project population (Area A). During the final 2.5 years, the project expanded to an additional 3 districts (Dondo, Gorongosa, and Nhamatanda) with another 58% of the project population (Area B).

FH/M selected the project area because it had high levels of malnutrition and low coverage of key child-survival interventions. The area is almost entirely rural, and many villages are at considerable distance from a health facility. Residents are primarily subsistence farmers with small plots of land. Motorized transport in the form of motorcycles and vehicles is limited. During the project period, there were no community-level health workers trained by the government and no other nongovernmental organizations (NGOs) working in nutrition in the project areas. There were 46 well-staffed and well-attended health posts and health centers in the 4 start-up districts. Findings from the baseline household survey (described below) showed that 50% of women with a child 0–23 months old had never attended school, 35% had obtained some primary-level schooling, and 15% had obtained 6 or more years of education.

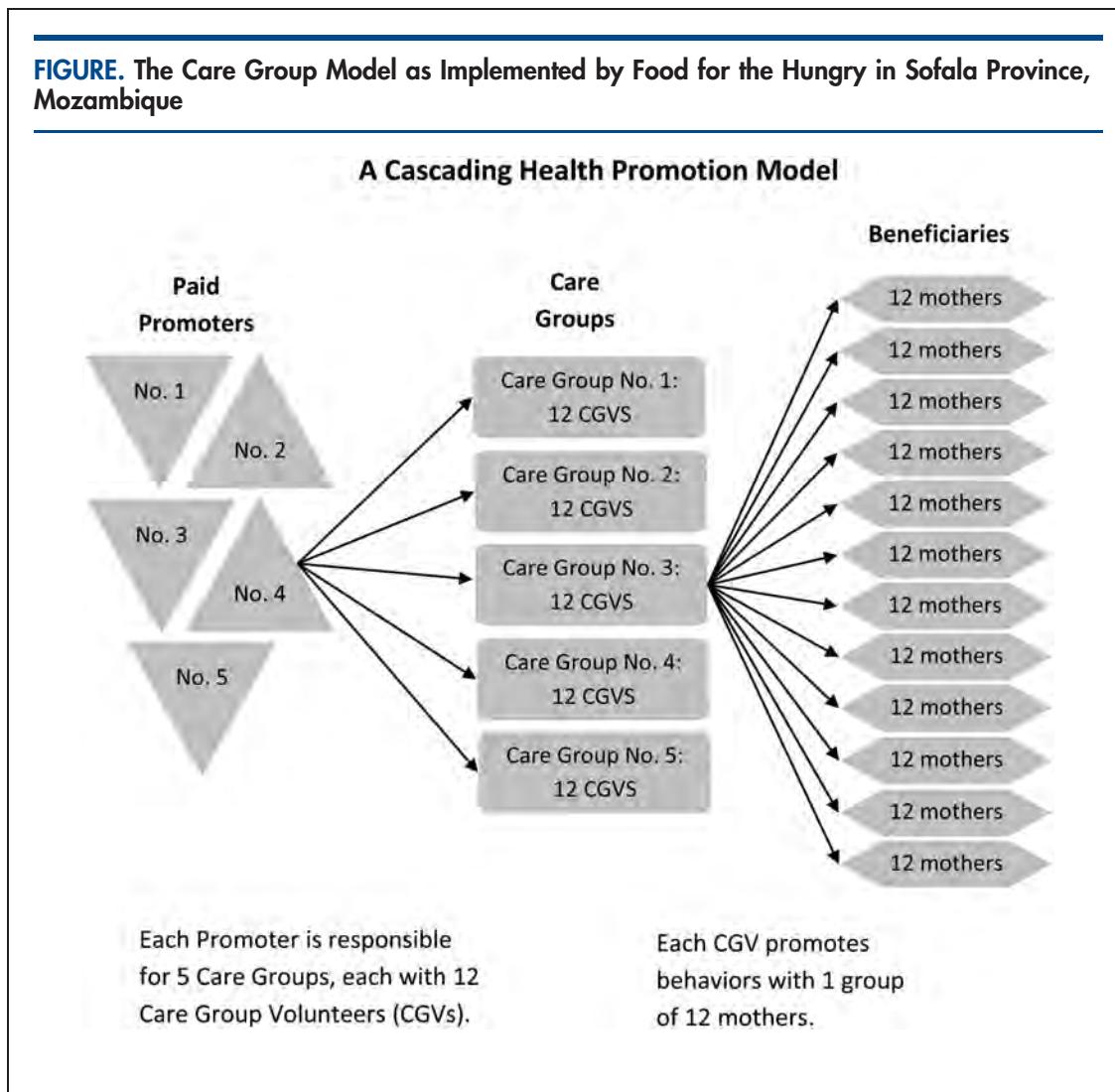
### Intervention

FH/M implemented the Care Group intervention model as described in *The Care Group Difference* manual published by World Relief and the CORE Group.<sup>11</sup>

With the help of community leaders, FH/M first identified all pregnant women and mothers of children under 24 months old in the project area. They then organized these mothers into blocks of 12 households and asked each group to elect a Care Group Volunteer (CGV) who would serve and promote behaviors with mothers throughout the project. Approximately 12 CGVs met together in a Care Group every 2 weeks with a paid project supervisor (called a “promoter”) to learn a child-survival health message or skill (Figure).

Over the following 2 weeks, each CGV then met with the 12 pregnant women/mothers of children under 24 months old for whom she was responsible (from 12 nearby households) to share the messages and skills they had learned, using a flipchart with drawings (see supplemental material for a sample) to assist in conveying the behavior change messages (Box 1). CGVs met with these women either individually during one-on-one home visits or in small groups in their catchment area (with follow-up home visits to those who missed the small-group meetings). They delivered the entire set of messages over approximately a 2-year period. In the early intervention area, the messages were delivered twice.

**FIGURE.** The Care Group Model as Implemented by Food for the Hungry in Sofala Province, Mozambique



### Box 1. Project Structure and Procedures

#### Staff Structure and Functions:

- 1 Project Director, 1 Training Director, 1 Monitoring and Evaluation Coordinator, 5 Supervisors, and 65 Promoters
- Quarterly workshops to train promoters in key health-promotion messages
- Routine supervisory visits to the project communities to support Care Group meetings, for unannounced visits, and for mini-KPC survey data collection
- Technical support from Food for the Hungry/US staff virtually and through periodic field visits

#### Care Group Model Structure and Functions:

- Care Group Volunteers (approximately 1 for each 12 households) are selected by community leaders or beneficiary mothers in consultation with project field staff
- Promoter meets with a Care Group (composed of about 12 Care Group Volunteers) twice a month
- One new set of 2–3 health promotion messages are taught to the Care Group Volunteers at each meeting
- Each Care Group Volunteer promotes positive behaviors during the subsequent 2 weeks to the 12 mothers for which she is responsible, using the newly learned health promotion message

In general, all mothers received the same health promotion or nutrition message in a given 2-week period. However, when making home visits, CGVs also promoted messages related to the child's current problem (for example, promoting oral rehydration solution [ORS] when the child had diarrhea) or age-based needs (such as promoting exclusive breastfeeding in infants up to 6 months of age). Small-group meetings also provided an opportunity for encouraging peer support.

CGVs were trained in community-based integrated management of childhood illness (C-IMCI).<sup>12</sup> Beyond that, the CGVs did not receive any additional training outside the

community-level meetings held every other week, which usually lasted about 2 hours. During these meetings, CGVs also learned and sang songs based on the behaviors that they were promoting; shared their experiences (troubleshooting with the promoter and other volunteers on how to persuade mothers to adopt the behaviors); and reported vital events. Gradually, as the CGVs learned from each other and the promoter, they became more confident and more effective in conveying these messages to their neighbors. CGVs received no cash, services, or in-kind incentives other than the 5 flipcharts used to transmit CG messages and one simple wrap-around skirt decorated with health promotion messages (provided every 2 years).

International and local staff from FH/M developed the series of 24 messages collaboratively that CGVs delivered to promote good nutrition and to prevent and control diarrheal disease (Box 2). The choice of messages and behaviors promoted was influenced in particular by 2 types of rapid formative research studies.

The first was a positive deviance analysis conducted in the project area in September 2004 (before program start-up) to determine the nutritional and child-care practices of mothers of well-nourished children compared with the practices of mothers of children with poor weight-for-age.<sup>13</sup> Findings prompted the project to pay more attention to several key behaviors, such as letting the breastfeeding infant suck on the first breast until satisfied before offering the other breast and point-of-use (POU) water treatment in the home.

The second type of rapid formative research used to inform project planning was a series of Barrier Analysis studies of key health behaviors, including exclusive breastfeeding, handwashing with soap, and use of ORS.<sup>14–15</sup> In these studies, mothers who were practicing a particular behavior (the “doers”) were compared with those who were not (the “non-doers”) to identify behavioral determinants (including barriers and enablers) of the behaviors studied. Results were then used to create or modify project activities and messages.

### Evaluation of the Project

We conducted baseline and endline Knowledge, Practices, and Coverage (KPC) surveys in both project areas, with randomly sampled households that had either pregnant women or mothers of young children (the beneficiaries of the project). The Area A baseline survey took

## Box 2. Basic Content of Health Behavior Messages

### Nutrition

- Breastfeed infants immediately after birth and use colostrum.
- Exclusively breastfeed on demand until infants are 6 months old. Children should not be bottle-fed. Mothers should completely empty one breast before offering the infant the next one.
- Beginning at 6 months of age, children should be provided with appropriate complementary feeding, including iron-, iodine-, and vitamin-A-rich foods; breastfeeding should continue until the child is at least 24 months old.
- Complementary foods given to young children should be diverse, nutritionally dense, and thick enough to give a child the calories needed. Oil should be added to young children's food to ensure that it is energy-dense.
- Women should get voluntary counseling and testing and antenatal care. They should know their HIV status. Women with HIV infection should exclusively breastfeed only until the infant is 6 months old or until such time as exclusive replacement feeding becomes acceptable, feasible, affordable, sustainable, and safe. (We expected, and found, that replacement feeding was appropriate in very few cases in the project area.)
- Pregnant women and young children should consume iodized salt and marine products on a regular basis.
- Beginning at 6 months of age, children should receive vitamin A supplements every 6 months, and they should receive special treatment with vitamin A when they have measles and other severe infections.
- Mothers should receive vitamin A supplements within 6 weeks of delivery, or within 8 weeks if the mother is exclusively breastfeeding. (This was the WHO recommendation during the project period; WHO changed the recommendation in 2011.)
- Promotion of safe water and handwashing is an essential nutrition action. (See diarrhea section.)
- Cooked foods should not be stored without refrigeration for longer than 2 hours, and previously cooked food should be thoroughly reheated before eating.
- Children 0–23 months old should be taken to a health facility for growth monitoring on a monthly basis.
- Sick children should receive extra fluids, including more frequent breastfeeding, and they should be encouraged to eat soft, appetizing, favorite foods. Children should be given food more often during recovery.
- Children who are malnourished should be taken to a health facility for a medical examination.
- When a child will not eat or is losing weight, or when a mother has trouble breastfeeding, the Care Group Volunteer (CGV) or promoter trained in community-based integrated management of childhood illness (C-IMCI) should be contacted as soon as possible.
- Pregnant women should increase their nutritional intake, and they should take iron/folic acid supplements during pregnancy and lactation.

### Diarrhea

- Give oral rehydration salts (ORS) or recommended home fluids to children with diarrhea. (Mothers were taught to make ORS.)
- Use the locally available water treatment product Certeza (or bleach, if Certeza is not available) to purify drinking water and safely store all drinking water used by the family to prevent cholera and other diarrheal diseases.

**Box 2. (continued)**

- Continue to feed and offer more fluids (including breastmilk) to children when they have diarrhea, and increase feeding immediately after illness.
- Children should be dewormed every 6 months.
- Wash hands with soap after defecation, before preparing meals, and before feeding children. Dispose of feces, including children's feces, safely. Use a "tippy-tap" (simple handwashing station made of commonly available materials, such as plastic bottles, that is not dependent on a piped water supply) or other water spreader to economize the amount of water needed for handwashing.
- Properly dispose of feces by constructing and using latrines to prevent diarrhea.
- When a child has diarrhea, the C-IMCI-trained CGV or promoter should be contacted immediately.
- When a child has signs of dehydration or general danger signs—for example, the child looks unwell; is not playing, eating, or drinking; is lethargic or has a change in consciousness; is vomiting everything; has a high fever or fast or difficult breathing—the child should be taken to a trained health worker immediately.
- Cooked foods should not be stored without refrigeration for longer than 2 hours.
- Avoid bottle feeding.
- Caregivers should follow the health care worker's advice about treatment, follow-up, and referral to government facilities for diarrhea.
- When a child has bloody or persistent diarrhea, seek care immediately from trained health care workers. (Dysentery is fairly rare in Sofala, but persistent diarrhea was on the rise at the time the project began.)

place in February 2006, and the Area B baseline survey in February 2009. The endline surveys for both areas were conducted in June 2010.

The community collaborated at the outset of the project to identify all households with project beneficiaries (total of  $T$  households). From this list, we determined which respondents to interview by randomly starting with one household and then selecting every "nth" household (where  $n$  was determined by dividing  $T$  by 96).

In total, we interviewed approximately 100 mothers with children 0–11 months old and 100 mothers with children 12–23 months old for the baseline and endline surveys in each of Areas A and B of the project. We also weighed each "index" child whose mother was interviewed with a Salter spring scale, as well as 2–3 additional children in adjacent households. Thus, the total number of children weighed in the different survey rounds ranged from 569 to 620 (Table 1). The interviews were carried out by project staff members in sites for which they did not have direct program responsibility.

The project also carried out periodic KPC "mini-surveys" (approximately every 6 months) in which we selected a random sample of

households to assess coverage levels for specific indicators related to interventions that had been implemented in the previous 3–6 months. Project promoters conducted these interviews in adjacent supervisory areas other than their own.

Finally, in early 2010 we conducted focus group discussions with beneficiary mothers, CGVs, and promoters to better understand the degree to which the Care Group model was implemented as planned, the benefits perceived by the volunteers and beneficiaries, and other operational issues. Based on this, we developed and conducted 2 quantitative surveys in April 2010 to measure the outreach of CGVs—one with a random sample of 200 beneficiary mothers and 200 CGVs (100 from each project area) and the second with all 60 Care Group promoters in Areas A and B.

**Sample Sizes for Evaluation Surveys**

Sample sizes for the household surveys were calculated to provide estimates of coverage in each of the 2 project areas based on a 95% confidence interval (CI) of  $\pm 10\%$ , 90% power, and an estimated 20 percentage point difference between coverage levels at the time of the

**TABLE 1.** Nutrition-Related Practices and Outcomes Among Care Group Project Beneficiaries, Selected Districts of Sofala Province, Mozambique, 2005–2010

Project Indicators	Area A – Early Implementation				Area B – Late Implementation (delayed by 2.5 years)				
	Baseline (2006)		Endline (2010)		Baseline (2009)		Endline (2010)		Difference
	n/N	% (95% CI)	n/N	% (95% CI)	n/N	% (95% CI)	n/N	% (95% CI)	% Difference, P Value*
<b>Nutritional Outcome</b>									
Children 0–23 m who are underweight (WAZ < -2.0 SD)	139/537	25.9 (22.1–29.7)	101/569	17.8 (14.5–21.0)	168/620	27.1 (23.0–31.2)	89/569	15.6 (12.6–18.7)	11.5, 0.001
<b>Feeding Practices (as reported by mother or caretaker)</b>									
Infants 0–5 m who were fed only breast milk in the last 24 hours	11/46	23.9 (11.1–36.7)	35/47	74.5 (61.5–87.4)	25/45	55.6 (40.5–70.7)	37/46	80.4 (68.6–92.3)	24.9, 0.010
Children 9–23 m who receive food other than liquids at least 3 times/day	34/109	31.2 (22.4–40.0)	87/115	75.7 (67.7–83.6)	54/124	43.5 (34.7–52.4)	82/125	65.6 (57.2–74.0)	22.1, 0.001
Children 6–23 m with oil added to their weaning food	47/130	36.2 (27.7–44.5)	126/145	86.9 (81.3–92.5)	84/143	58.7 (50.6–66.9)	130/149	87.2 (81.8–92.7)	28.5, 0.001
Children 6–23 m who have consumed at least one Vitamin A-rich food in the previous day	40/131	30.5 (22.5–38.5)	88/150	58.7 (50.7–66.6)	80/157	46.5 (38.6–54.3)	102/150	68.0 (60.4–75.6)	21.5, 0.001
Children 0–23 m with diarrhea in the last 2 weeks who were offered the same amount of, or more, food during the illness	22/68	32.4 (20.9–43.8)	35/42	83.3 (71.6–95.1)	26/76	34.2 (23.3–45.1)	29/40	72.5 (58.0–87.0)	38.3, 0.001
<b>Vitamin A Supplementation, Deworming, and Nutritional Monitoring</b>									
Children 12–23 m who have received one Vitamin A capsule in the past 6 months (card-confirmed or mother's report)	74/90	82.2 (74.2–90.3)	88/94	93.6 (88.6–98.7)	80/101	79.2 (71.2–87.3)	94/98	95.9 (91.9–99.9)	16.7, 0.001
Children 12–23 months who received deworming medication in the last 6 months (mother's report)	24/84	28.6 (18.7–38.4)	59/75	78.7 (69.2–88.2)	36/96	37.5 (27.6–47.4)	67/73	91.8 (85.3–98.2)	54.3, 0.001
Children 0–23 m who were weighed in the last 4 months (card-confirmed)	114/156	73.1 (66.0–80.1)	150/170	88.2 (83.3–93.1)	115/172	66.9 (59.8–74.0)	131/158	82.9 (77.0–88.8)	16.1, 0.001

**TABLE 1 (continued).**

Project Indicators	Area A – Early Implementation				Area B – Late Implementation (delayed by 2.5 years)				
	Baseline (2006)		Endline (2010)		Baseline (2009)		Endline (2010)		Difference
	n/N	% (95% CI)	n/N	% (95% CI)	n/N	% (95% CI)	n/N	% (95% CI)	% Difference, P Value*
<b>Diarrheal Disease (as reported by mother or caretaker)</b>									
Children 0–23 m with diarrhea in the last 2 weeks who received ORS and/or RHF	40/69	58.0 (46.0–69.9)	42/45	93.3 (85.8–100.9)	49/79	62.0 (51.1–73.0)	38/43	88.4 (78.4–98.4)	26.3, 0.002
Mothers of children 0–23 m who can correctly prepare ORS	77/177	43.5 (36.1–50.9)	166/196	84.7 (79.6–89.8)	89/200	44.5 (37.6–51.4)	166/196	84.7 (79.6–89.8)	40.2, 0.001
Mothers of children 0–23 m who report that they wash their hands with soap/ash before preparing food, before eating, after defecating, and after attending to a child who has defecated	2/199	1.0 (0.1–334.0)	100/198	50.5 (43.3–57.7)	27/211	12.8 (8.6–18.1)	86/199	43.2 (36.2–50.4)	30.4, 0.001
Mothers of children 0–23 m who report that they purify their water using any effective method (by boiling or using point-of-use water purification)	39/95	41.1 (31.2–50.9)	129/151	85.4 (79.8–91.1)	26/211	12.3 (7.9–16.8)	135/153	88.2 (83.1–93.3)	75.9, 0.001

Abbreviations: WAZ, z-score for weight-for-age; SD, standard deviation; ORS, oral rehydration solution; RHF, recommended home fluids.

\* Statistical significance based on one-tailed Fisher exact test (based on difference in prevalence between endline and baseline results). P values < 0.05 were considered statistically significant. All P values were statistically significant.

baseline and final evaluations. For a simple random sample, this required 103 respondents from each project area. For several indicators, however, the required sample size was considerably larger given that the expected amount of change (in percentage points) was lower. For example, to assess nutritional status, we needed a sample size of at least 586 children ages 0–23 months old to detect a statistically significant change from the projected 25% prevalence of undernutrition at baseline to the projected 18% at endline (with a 95% CI and 90% power).<sup>16</sup>

### Data Quality Assurance

Survey supervisors and investigators reviewed data forms for accuracy, consistency, and completeness. Data were entered in databases, which were reviewed for range and consistency. We used Epi Info<sup>®</sup> (version 6.04d) for data entry, initial data analysis, and initial anthropometric analysis. A second round of independent data analysis was conducted by one of the authors (R.C.) using Stata (version 11.2) statistical software.

To clean the anthropometric data, we calculated the age of the index child. Then, we determined the difference between age stated by the mother and calculated age (per the date of birth). If the difference was more or less than 2 months, we removed the respondent from the anthropometry dataset. We also removed data that were extreme outliers, for example, data for children with a negative calculated age or with biologically unreasonable anthropometric data (as flagged by Epi Info).

Data were collected as part of ongoing project monitoring and evaluation activities. The Johns Hopkins Bloomberg School of Public Health Institutional Review Board reviewed the participation of its staff in the project and determined that their activities did not require human subjects review.

### Data Analysis

We calculated proportions with 95% confidence intervals for the coverage of child-survival interventions and for underweight children, accounting for clustering of anthropometric measures of undernutrition. Mothers were selected independently for interviewing, so there was no need to account for clustering of their responses. We compared baseline and endline indicators to determine the magnitude of the difference and whether the difference, if observed, was statistically

significant. The prevalence of undernutrition in the project areas was determined by comparing anthropometric measurements with WHO child growth standards established in 2006.<sup>17</sup>

### Role of the Funding Source

The project was funded by the Child Survival and Health Grants Program of the United States Agency for International Development (USAID) and by Food for the Hungry. USAID reviewed the project design but played no role in the data collection, analysis, or interpretation, or in the decision to submit this paper for publication.

## RESULTS

### Findings From CGV Surveys

The surveys to measure outreach of CGVs revealed that 44% of CGVs were elected by their mother groups, while 55% were selected by either the community leader or promoter. Mothers may have been more likely to select a “hub” in their social network, which could have facilitated behavior change, since some nutrition and health behaviors are transmitted through social networks,<sup>18–19</sup> and some behaviors “cluster” in social networks.<sup>20</sup>

The surveys also found that CGVs who were elected by their peers were 2.7 times more likely to serve for the entire length of the project (Odds Ratio [OR]=2.7, 95% CI=1.19–5.99;  $P<0.01$ ). The average walking time between CGVs' houses and the most distant house of the women that they served was 15 minutes, and between the CGVs' houses and the community location used for their biweekly training was 17 minutes.

The surveys found that 30% of CGVs worked mainly or exclusively through home visits, while 70% worked mainly with small groups, with follow-up home visits to mothers who missed the small-group meetings. The surveys also found that 68% of CGVs reported that home visits lasted less than one hour, and 82% reported that small-group meetings lasted at least one hour. Newly pregnant women and mothers with young children who moved into the project area were put under the charge of existing CGVs. In order to ensure a continued reasonable workload for volunteers, once a child turned 24 months of age, the CGV was no longer expected to visit the mother in her home. However, the mother was allowed to continue attending neighborhood small-group meetings with the other pregnant women and mothers of young children.

**Mothers in the project areas improved their treatment and prevention of diarrhea over time.**

**Undernutrition among children 0–23 months old declined significantly and rapidly in the project areas, at about 4 times the rate of decline among children 0–59 months old nationwide.**

CGVs achieved a high contact level with mothers in their catchment areas over the life of the project. For example, 3 short KPC household surveys, conducted at 3 separate times during 2007, documented that an average of 91% of mothers with children ages 6–23 months, and 94% of mothers with children ages 0–5 months, had received a visit by the CGV in the previous 2 weeks. In addition, turnover of volunteers was low (5% annually), and less than 1% of CGVs quit due to a stated lack of material incentives.

The CGV surveys found that respect gained from other people in their social network—and seeing the results of the project—were key motivators for volunteers. All surveyed CGVs reported that they were more respected by other women in their community because of their participation as a CGV, and 64% reported being more respected by community leaders. In addition, 61% and 48% reported being more respected by their husbands and parents, respectively, and 25% by health facility staff.

It is interesting to note, as well, that the proportion of CGVs who had accepting attitudes toward domestic abuse was only 3% at the end of the project compared with 24% of the beneficiary mothers whom they served. The CGV surveys also found that 65% of CGVs had communicated with health facility staff about their child-survival activities and topics at least once in the previous year, and 68% had communicated with their community leaders at least once in the previous 3 months.

### Findings From KPC Household Surveys

Baseline and endline KPC household surveys indicate several statistically significant positive improvements ( $P=0.01$  or less) in nutrition-related behaviors (with increases as high as 52 percentage points), including with exclusive breastfeeding, provision of solid foods at least 3 times per day for children 9–23 months, adding oil to weaning foods for children 6–23 months, consumption of at least one vitamin-A rich food during the previous day in children 6–23 months, and provision of the same amount of food or more among children with diarrhea during the previous 2 weeks (Table 1).

Receipt of vitamin A supplementation and deworming medication during the previous 6 months, weighing of children during the previous 4 months (card-confirmed), improvements in mother's knowledge of how to prepare ORS for children with diarrhea, and use of ORS for

children with diarrhea during the previous 2 weeks all demonstrated statistically significant differences ( $P<0.01$ ) between baseline and endline indicators. Baseline levels of receipt of vitamin A supplementation were much higher than for other baseline indicators, but these levels also improved over the course of the intervention in both early intervention (Area A,  $P=0.015$ ) and delayed intervention (Area B,  $P<0.001$ ) areas.

The following household behaviors promoted by the project all showed statistically significant increases in both Areas A and B when comparing endline with baseline measures (Table 1):

- Improved nutrition (exclusive breastfeeding, appropriate complementary feeding, adding oil to weaning foods, and ingestion of vitamin A rich foods)
- Diarrhea treatment (provision of increased fluids for childhood diarrhea, continued feeding with diarrhea, and knowledge of how to prepare ORS correctly)
- Diarrhea prevention (handwashing and point-of-use water purification in the home)

Based on mini-KPC surveys carried out in both intervention areas, a rapid uptake of these behaviors was achieved (data not shown). In Area B, all indicators showed statistically significant improvements by the time of the endline evaluation less than 2 years after project initiation in that area.

### Changes in Childhood Nutritional Status

In the early intervention area (Area A), the percentage of children 0–23 months old with global undernutrition declined significantly by 8.1 percentage points ( $P<0.001$ ) over a 5-year period (Table 1), from 25.9% at baseline (95% CI=22.2%–29.6%) to 17.8% at endline (95% CI=14.6%–20.9%). Global undernutrition was defined as weight-for-age with a z-score of less than 2 standard deviations below the international standard median/mean.

In the delayed intervention area (Area B), over only a 16-month period, the prevalence of global undernutrition declined significantly by 11.5 percentage points ( $P<0.001$ ), from 27.1% (95% CI=23.6%–30.6%) to 15.6% (95% CI=12.6%–18.6%). The average annual decline in Area B was estimated by assuming that the baseline data for this area reflected 2005 values and that the project was conducted over a full

5-year period. Even under these conservative assumptions, the annual rate of decline among children 0–23 months old in Areas A and B was approximately 4 times the rate of decline among children 0–59 months old nationwide in Mozambique (Table 2).

### Project Costs and Other Project Benefits

Total project costs were US\$3.0 million, of which \$2.5 million was provided by the USAID Child Survival and Health Grants Program and \$0.5 million by Food for the Hungry (Table 3). This represents an average cost of \$0.55 per capita per year (when considering the entire project population of 1.1 million people) and \$2.78 per beneficiary per year (when considering the 219,617 mothers with children ages 0–23 months in the project areas as the project beneficiaries).

Findings from the CGV surveys found that the 4,095 CGVs donated a total of 2.4 million volunteer hours serving their neighbors. The project carried out other important maternal and child health interventions, including promotion of birth spacing, antenatal care, and facility-based deliveries and attendance at birth by appropriately trained personnel; provision of appropriate newborn care; use of insecticide-treated bed nets; recognition of serious childhood illness and referral to facility-based care for children with danger signs; and promotion of HIV/AIDS awareness. The project's impact on

these indicators, most of which showed similar statistically significant gains, will be reported in subsequent publications.

## DISCUSSION

This project evaluation demonstrates that an innovative and low-cost behavior change strategy using Care Groups (a volunteer, peer-educator model) achieved major improvements in nutrition-related household behaviors among a population of 1.1 million people in rural Mozambique, an area where diarrhea and malnutrition are major contributors to child mortality. The behaviors on which the project focused are known to be influential in improving child health and reducing under-5 mortality.

The evaluation also demonstrates that the Care Group model achieved a statistically significant decline in the percentage of children ages 0–23 months with global undernutrition. The rate of reduction in both project areas combined was 4 times that in Mozambique nationwide, according to national surveys done during approximately the same time period. The project achieved these results by relying on volunteers to visit households every 2 weeks over a 5-year period at a cost of only \$0.55 per capita; no food supplementation was provided.

To our knowledge, this is the first report in the peer-reviewed literature of a project

**The Care Group project cost, on average, only US\$0.55 per capita per year.**

**TABLE 2.** Average Annual Rate of Decline in Undernutrition in the Care Group Mozambique Project Areas Compared With Mozambique Nationwide

Location	Age group of children <sup>a</sup>	% of children < 2 SD below the standard median/mean of weight-for-age		% Difference	No. of years (endline – baseline)	Avg. annual rate of decline
		Baseline (dates)	Endline (dates)			
Project Areas	0–23 m	26.5% (Feb 2006)	16.7% (Jun 2010)	9.8%	4.4	2.2%
Nationwide <sup>b</sup> (DHS and UNICEF/MICS)	0–59 m	20.0% (2003)	18.0% (2008)	2.0%	5	0.4%
Nationwide <sup>b</sup> (DHS)	0–59 m	20.0% (2003)	14.9% (2011)	5.1%	8	0.6%

Abbreviations: SD, standard deviation; DHS, Demographic and Health Surveys; MICS, Multiple Indicator Cluster Survey.

<sup>a</sup> Comparable national data for children 0–23 months old from the DHS and MICS surveys are not available.

<sup>b</sup> Nationwide data are from the 2003 and 2011 DHS<sup>21–22</sup> and the 2008 UNICEF/MICS.<sup>23</sup> The 2003 DHS reported an undernutrition level of 24.6% using earlier WHO nutritional standards. The 2008 UNICEF/MICS survey recalculated the 2003 DHS numbers, shown here, using the WHO 2006 nutritional standards.

**TABLE 3.** Care Group Project Costs and Number of Beneficiaries, Selected Districts of Sofala Province, Mozambique, 2005–2010

Project Site, Dates	Total Project Costs	Total Population	Total Cost per Capita per Year	No. of Beneficiaries	Total Cost per Beneficiary per Year
Area A, <sup>a</sup> Oct 2005–Sep 2010 (5 years)	\$2,026,191	462,000	\$0.88	92,239	\$4.39
Area B, <sup>b</sup> Mar 2009–Sep 2010 (1.6 years)	\$997,975	638,000	\$0.97	127,238	\$4.90
Total Project	\$3,024,166 <sup>c</sup>	1,100,000	\$0.55	219,617	\$2.78

All dollar amounts expressed in US\$.

<sup>a</sup> Area A included Caia, Chemba, Manga, and Marringue Districts.

<sup>b</sup> Area B included Dondo, Gorongosa, and Nhamatanda Districts.

<sup>c</sup> Includes contributions of \$2,499,901 from USAID to Food for the Hungry and \$524,166 from Food for the Hungry unrestricted funds.

documenting input, process, outcome, and impact measures and providing evidence of improving child nutrition at scale (in a population of more than 1 million people) as a result of a behavior change strategy that did not involve food distribution.\*

A recent review from the Bill & Melinda Gates Foundation pointed to the lack of practical knowledge on how best to change nutrition-related behaviors, such as breastfeeding behaviors, as well as to the lack of tools to measure the impact of existing interventions on a person's nutritional status.<sup>24</sup> The review concluded that scale up of proven and affordable nutrition interventions targeted at pregnant women and children up to 2 years of age is urgently needed to reduce nutrition-associated death and disability.

This paper responds to a critical need and points to a promising approach for implementing and evaluating nutrition programs that merits widespread field application and rigorous evaluation.

While the delayed intervention area (Area B) received the intervention for a considerably shorter period of time (16 months versus 53 months), it showed a greater decrease in undernutrition prevalence than the early intervention area (Area A). There are several possible explanations for this finding. First, project leaders and supervisors had become more effective and efficient in starting up and implementing the

interventions based on their experiences with the early intervention area. Second, intervention effectiveness may peak initially and then decline to some degree over time. In Area A, for instance, there were rapid increases in intervention coverage during the first year of project functioning. The project maintained high levels of coverage over the life of the project, but there was some decline over time. Thus, the impact evaluation in Area B may have been conducted just as coverage of interventions was at its peak. In Area A, there may have been a decline in coverage by the time of the final evaluation. These issues will be explored in further analysis of the data in a forthcoming publication.

The fact that the levels of certain baseline indicators in Areas A and B were significantly different merits exploration. Baseline indicators in Area B were measured 36 months after they were measured in Area A. Differences between Areas A and B were statistically significant for 3 indicators: level of exclusive breastfeeding, addition of oil to weaning foods, and consumption of vitamin-A rich foods. For all 3 indicators, levels were higher at baseline in Area B than in Area A (Table 1). These findings raise the possibility that a secular trend independent of the project may have been present that could account for the changes observed in nutritional status.

We think this is unlikely because baseline levels of undernutrition did not differ in Areas A and B. In addition, Food for the Hungry had operated nutrition programs in several Area B districts between 1997 and 2001, which could have contributed to the more favorable indicator levels.

\* We searched PubMed using the following search terms: malnutrition OR stunting OR wasting with community-based nutrition programs OR community-based program OR community involvement OR community participation OR community programs, and similar terms.

Several design characteristics of the model may be responsible for the model's success. It may be instructive for policy makers, program planners, and practitioners to consider these characteristics when designing and operationalizing nutrition projects in diverse systems settings and at different scale:

1. **Reaching targeted households on an ongoing basis through peer-to-peer education:** Empowering women to convey critical and relevant health and nutrition messages to their neighbors and ensuring that they reach all targeted mothers every 2 weeks provides a powerful platform for behavior change.
2. **Engaging beneficiaries in choosing peer educators:** Beneficiary mothers elected many of the CGVs who served them (44%), making the CGVs—the principle agents of behavior change—more likely to be “hubs” in the beneficiaries’ social networks. Recent studies on behavior change show that some behaviors cluster and spread through social networks and that people who are better connected with others are more likely to influence the behavior of others in their networks.<sup>18–20</sup>
3. **Organizing beneficiaries into small, interactive groups that meet often and have close linkages with community leaders and health facility staff:** Stronger social capital results in the development of new norms about behavior compliance and participation in using health services among network members, provides information and knowledge to individuals in the group, and creates trustworthiness.<sup>25</sup> The Care Group methodology connected pregnant women and mothers, who may have had little or no linkages with community resources, to CGVs on a regular basis. The CGVs, in turn, were linked with community leaders and health facility staff and served as a bridge between the pregnant women and mothers they served and the resources and knowledge held by the community leaders and health facility staff. Despite the fact that mothers, health facility staff, and community leaders may have infrequent contact with one another, important information can flow through the CGVs, who were already key links and hubs in the social network before becoming a CGV and whose work as a CGV further strengthens these linkages.<sup>26</sup>

4. **Keeping workloads of volunteers minimal to avoid overburdening them and ensure they cover beneficiaries well with their assigned tasks:** By using 4,095 volunteer workers, the project was able to cover 90% of almost 50,000 beneficiary households every other week. Keeping workloads and travel times minimal for CGVs almost certainly contributed to a 95% annual retention rate of volunteers. The high level of repeated contact between these peer educators and the small number of mothers each one served may have made it easier for them to work through barriers to behavior change. It also probably helped them develop the relationships necessary for behavior change to happen. Peer-education models that do not reach high levels of coverage in the community sometimes fail to show results.<sup>27</sup> Changes in *community-wide* nutritional practices are often not seen when population coverage of a program is low even if the program affects change at the *individual* level.
5. **Conducting rapid formative research to select key behaviors and their determinants:** Some of the largest changes in behavioral indicators were in the behaviors that were uncovered or explored during rapid formative research. For example, prevalence of exclusive breastfeeding during the first 6 months of life and of handwashing with soap/ash each increased by 50 percentage points (Table 2). Implementers should allocate appropriate levels of resources for these rapid studies<sup>†</sup> and use results to modify activities and messages.
6. **Empowering women by giving them active, volunteer roles in the project:** By using volunteers, the project was able to leverage more than 2.4 million hours of volunteer service. Rather than the volunteer duties being a burden on these women, 96% of the volunteers continued to volunteer each year; most identified several benefits of serving as volunteers, such as increased respect by husbands, peers, family members, community leaders, and health facility staff; and many expressed great enthusiasm during the final evaluation for continuing their health promotion work after the project ended. Other studies have found that the

**Keeping workloads of Care Group Volunteers light contributed to a very low turnover rate.**

<sup>†</sup> Practitioners can view and share their Barrier Analysis and Doer/Non-Doer studies at: [www.fsnnetwork.org/behavior-bank](http://www.fsnnetwork.org/behavior-bank)

benefits to volunteers may remain long after they relinquish their volunteer role, and people who volunteer frequently are more likely to report higher life satisfaction than non-volunteers.<sup>28–29</sup>

Qualitative data from focus group discussions at the end of the project provide further evidence that behaviors did in fact change, that mothers noted improvements in their children's nutritional status, and that the frequency of child death had declined.

Two previous reports have noted the effectiveness of the Care Group approach in improving child health. An evaluation of a child survival project in southern Mozambique (Gaza Province), using a similar Care Group methodology to promote child-survival interventions related to malaria, diarrhea, nutrition, and immunizations, demonstrated marked and statistically significant increases in coverage of the project's interventions.<sup>30</sup> A separate, independent mortality impact assessment carried out for this same project found a 42% decline in under-5 mortality.<sup>27</sup> The baseline project survey did not include a measure of nutritional status, so change in nutritional status was not assessed. A similar Care Group child survival project in Cambodia achieved high coverage of child-survival interventions rapidly, with a decline in the under-5 mortality rate from 129 per 1,000 live births to 35 in 5 years.<sup>31</sup>

Scaling up the Care Group model should be considered in rural areas with elevated under-5 mortality and high levels of child undernutrition. Governments could scale up the approach quickly and at a similar cost per capita either by contracting with NGOs to implement the model or by hiring supervisory staff to provide the necessary leadership and technical support and assigning MOH staff to work directly with Care Groups in the manner that Food for the Hungry did. We favor the former approach because contracts with NGOs could be readily linked with performance—a process that is more difficult to implement when MOH staff provide the services directly. Concern Worldwide (an international NGO) is currently conducting a randomized trial in Burundi to compare the more traditional Care Group model where NGO staff members serve as promoters with an “integrated” model where MOH staff members serve as promoters.<sup>32</sup>

Scaling up the Care Group model would require some intensive training and orientation

of key staff at the outset. It would also require a schedule of phasing in the program in various areas of a country and adjustments to the scaling-up process based on ongoing program evaluations. In the Mozambique context, training protocols, educational messages, and teaching materials (such as flipcharts to use during home visits) have already been developed. Other countries would need to adapt these resources to their particular settings since nutritional messages are context specific. We also recommend a rigorous independent evaluation with any scaling-up activities of the Care Group model because such rigorous evidence is lacking.

### Limitations of the Study

Evaluation of the project had certain limitations. First, we did not have an independent and separate monitoring and evaluation component; survey data were collected by project field staff. However, field staff collected data in project areas where they did not normally provide field supervision, so we believe this should mitigate any potential bias in the data collection process.

Selection of survey samples was based on project implementation data, and they were not selected through an independent method. This could have excluded certain geographic areas or neighborhoods from the sampling frame and potentially biased the results. However, we think this is highly unlikely since we worked closely with the communities at the outset of the project to ensure that all beneficiary households in the community were included in the sampling frame and program implementation.

Conducting the baseline and final anthropometric surveys during different months of the year could potentially lead to declines in nutritional status based mostly on seasonal patterns in nutritional status. However, if anything, actual reductions in malnutrition may have been greater than observed since the baseline was conducted during the first harvest period in Sofala Province (February 2006),<sup>33</sup> and the final was conducted a month after the end of the first harvest (June 2010).<sup>34</sup>

Another limitation is the lack of a comparison area. However, the presence of national DHS survey data provide further evidence that the observed changes are quite likely to have been produced by the project intervention. Still, comparing rates of decline in childhood undernutrition in the project areas with national data from the DHS is less than ideal for several

reasons. First, national data are for children 0–59 months old while data from the project areas are for children 0–23 months old. Second, we do not know the degree to which comparison of these 2 areas is appropriate. Nonetheless, these are the best data available at present for comparison. If the WHO nutritional standards had not changed in 2006 (from being based on data from children in the United States to children around the world raised in optimal circumstances), it would have been possible to assess changes in undernutrition among children 0–59 months of age in Sofala Province, as well as for children 0–23 months of age nationally. This would have provided additional evidence to judge whether the rate of decline in undernutrition in the project areas occurred at a more rapid rate than in other areas.

Finally, measuring height along with weight would have provided important information about the nutritional status of children in the study.

This project was not set up as a research study, and funds were not available to overcome the limitations described above. But even with these limitations, we consider that the entire set of findings provides persuasive and plausible—albeit not definitive—evidence that the Care Group Project as implemented in Sofala Province by Food for the Hungry was effective in improving childhood undernutrition at scale. Given the scarcity of such evidence in the nutrition field, we think the findings presented in this paper justify more rigorous trials of the effectiveness of the Care Group approach.

## SUMMARY AND CONCLUSION

The Care Group child-survival project described in this paper achieved high levels of regular and frequent peer-to-peer contact with pregnant women and mothers of children 0–23 months old in a challenging environment with high levels of under-5 mortality and malnutrition. Coverage of key interventions for preventing and treating childhood diarrhea and promoting good nutrition expanded dramatically in the project areas. The resulting rate of decline in childhood undernutrition was 4 times that for Mozambique nationwide. The project achieved these results at a cost readily affordable to very poor countries—only US\$0.55 per capita. These findings, together with other published results on the effectiveness of the Care Group model,<sup>30-31</sup> provide a growing evidence base that supports the importance of

this model in accelerating progress toward reducing under-5 mortality in Africa and other priority countries where progress has been lagging. The model points to the kinds of strategic shifts that these countries will need to make—both in terms of reorienting service delivery and building partnerships with NGOs for community-based service delivery. Further prospective assessments of the Care Group approach using more rigorous methodologies are needed.

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## ORIGINAL ARTICLE

# Effectiveness of a community-based positive prevention intervention for people living with HIV who are not receiving antiretroviral treatment: a prospective cohort study

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In Mombasa, Kenya, a community-based HIV risk-reduction intervention effectively reached people living with HIV who were not receiving antiretroviral treatment (ART)—a difficult-to-reach population because they often fall outside the ambit of health care services—and succeeded in reducing reported risky sex behavior and increasing ART uptake.

## ABSTRACT

**Background:** We report effectiveness of an HIV-prevention intervention delivered by community health workers (CHWs) in Mombasa, Kenya, to PLHIV who have not initiated or who have discontinued ART—an often difficult-to-reach population because they fall outside the ambit of health care and prevention services.

**Methods:** A 2-arm cohort study assessed a structured risk-reduction intervention involving at least 4 one-to-one counseling sessions and personalized support. The control group received standard prevention services. CHWs recruited treatment-naïve people living with HIV (PLHIV) or those who had previously taken antiretroviral drugs. Data were analyzed using a Propensity Score Matched (PSM)-sample to control for baseline differences between the groups.

**Results:** 634 PLHIV were recruited and followed for 6 months. Median age was 35 years, and 74.3% were female. Participants in the intervention group reported reduced risky sexual behaviors both at endline compared with baseline and compared with the control group. At endline, in the PSM analysis, participants in the intervention arm were less likely than participants in the control group to report unprotected sex with a spouse (Odds Ratio [OR]=0.08, 95% confidence interval [CI]=0.03-0.24), and they reported fewer unprotected sex acts (12.3% versus 46.0%, respectively; OR=0.16, 95% CI=0.09-0.29;  $P<0.001$ ). Further, 92.4% of participants in the intervention group reported zero unsafe sex acts (with partners of negative or unknown HIV status) compared with 70.8% in the control group ( $P<0.001$ ), and more participants in the intervention arm were receiving ART (34.3% versus 12.7%, respectively;  $P<0.001$ ).

**Conclusion:** CHWs effectively reached PLHIV who had never received or who had discontinued ART, and they delivered a risk-reduction intervention that led to declines in reported sexual risk behaviors, as well as to increases in ART uptake. A scaled-up intervention warrants consideration.

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## INTRODUCTION

People living with HIV (PLHIV) comprise those who do and those who do not know their HIV status; both groups constitute important populations for HIV prevention. Among those who know their status, PLHIV who receive antiretroviral therapy (ART) and those who are not yet eligible for treatment but access HIV care for regular follow-up, such as for co-trimoxazole prophylaxis, have frequent contact with health services and are exposed to prevention information and commodities. However, many PLHIV have infrequent or no contact with health services, mostly because they are not yet eligible for treatment, have not had contact with an ART center, or have declined or discontinued ART.

HIV-prevention programs in low- and middle-income countries rarely have direct contact with PLHIV not accessing services, apart from mass media campaigns, for example. There are very few positive prevention studies (prevention aimed at PLHIV) among PLHIV who know their status but are not accessing treatment. Our previous study showed that high-risk sexual behaviors are common in this group, which can place PLHIV at higher risk of superinfection or of acquiring new sexually transmitted infections (STIs) and put their partners without HIV at risk of infection. Unprotected sex occurred in about half of sexual partnerships, notably one-third of them with partners without HIV and slightly more than one-half with partners of unknown HIV status.<sup>1</sup>

To date, most HIV-prevention studies targeting populations with HIV in the United States<sup>2-4</sup> and developing countries<sup>5-9</sup> have been among those accessing health services, such as HIV testing and counseling (HTC) centers, HIV care or treatment services, family planning clinics, maternal and child health clinics, or STI services. Interventions evaluated in these studies varied in frequency, delivery format, and content, and covered a combination of risk assessment, risk reduction, partner testing, HIV-status disclosure, and promotion of condom use. A systematic review and meta-analysis of HIV-prevention interventions suggest that interventions tend to be more successful in reducing risky behaviors if they are based on behavioral theory, specifically designed to change HIV-transmission risk behaviors, and delivered to individuals in an intensive manner and with skills building by health care providers in service settings.<sup>4</sup>

In 2010, in low- and middle-income countries, ART coverage was around 47% among the 14.2 million eligible persons.<sup>10</sup> In Kenya, in 2009, of the estimated 1.4 million PLHIV, 438,000 had advanced disease (defined as CD4 <200 cells/mm<sup>3</sup>) and were eligible for treatment. About 309,000 were receiving ART.<sup>11</sup> These figures show that the majority of PLHIV, many of whom are not yet eligible for ART, fall outside the ambit of regular health care and preventive services. Many PLHIV do not reach or access care services after their HIV tests, with early pre-ART losses of up to 33% among newly diagnosed PLHIV.<sup>12-14</sup>

An estimated 100,000 new adult HIV infections occurred in 2009 in Kenya,<sup>11</sup> highlighting the need for intensive combination prevention efforts, including those focused on the sexual risk behaviors of PLHIV, the large majority of whom do not access HIV care services. In this paper, we present findings from a 2-arm cohort study in Mombasa, Kenya, with pre- and post-measures. This controlled study aimed to assess the effectiveness of a personalized HIV risk-reduction intervention delivered by community health workers (CHWs) to PLHIV who know they have HIV and who are not on treatment. The intervention was aimed primarily at reducing the number of unprotected sex acts and sexual partners and to increase disclosure. Secondly, we assessed the effects of the intervention on stigma and ART uptake. This paper addresses a key population that has not been studied and adds important evidence to current literature on combination Prevention with Positives (PwP).

## METHODS

### Samples and Procedures

The study was conducted in Changamwe and Likoni Divisions of Mombasa, Kenya. The 2 divisions are geographically distinct, approximately 11 km apart, but they have a similar HIV prevalence (about 6% of adults in a 2010 sentinel survey<sup>15</sup>). The divisions also have comparable commercial activity related to the port, tourism industry, and small-scale businesses, and they have similar networks of health centers, HTC centers, and CHWs.

CHWs have a wide reach in the community through various programs (for example, antenatal care, social support, and nutrition services from faith-based organizations) and could theoretically reach PLHIV assigned to both the control and

**Many PLHIV have infrequent or no contact with health services.**

**Positive prevention interventions focus on reducing risky sex behaviors among PLHIV.**

treatment groups. Thus, to retain intervention integrity and avoid contamination, participants recruited from Changamwe Division were assigned to the intervention arm and those recruited from Likoni, to the control arm. Participants in both groups were followed for 6 months. Baseline and endline data were collected in both groups.

Study participants were recruited by CHWs using non-probability targeted sampling, an approach where field-based outreach workers actively recruit participants from identified geographic areas and populations of interest based on a prior ethnographic assessment.<sup>16</sup> CHWs are lay health workers used widely in community-based programs, including social support services, and are familiar with the community and its socio-demographic profile. Local CHWs were asked to undertake a descriptive ethnographic assessment of the population in the selected study areas. Information was sought on socio-economic status, tribes, religious groups, and presence of high-risk groups and PLHIV.

PLHIV in Mombasa are poorly networked and reluctant to reveal their status.<sup>17</sup> As there is no listing of PLHIV in the community, each CHW first identified 2 to 3 unrelated index PLHIV and then asked the index PLHIVs to connect the CHW to other PLHIV they knew. The CHW identified a new index PLHIV if the previous PLHIV did not know any other PLHIV. To limit biases related to recruiter characteristics and consequent oversampling of participants with similar characteristics, each CHW could recruit up to 20 participants. This allowed all CHWs in the study to recruit PLHIV from their communities and networks while avoiding the potential for some CHWs to recruit a large and disproportionate number of PLHIV from a single group that they served (such as female sex workers, men who have sex with men, or injection drug users [IDUs]).

Ethical approval was obtained from the Kenyatta National Hospital's Ethics Committee in Kenya and the Institutional Review Board of the Population Council in the United States. Recruitment followed a detailed protocol on approaching PLHIV, maintaining confidentiality, and verifying the participant's HIV status by checking HIV/CD4 test results or the referral card issued by an HCT center.

CHWs approached PLHIV in the community they served and arranged a time and convenient place to meet. CHWs then confirmed their HIV status, provided information on the study, and assessed willingness to participate and be followed

over 6 months. Following this, the CHW fixed a time to accompany the potential participant to the study site. Trained study staff then assessed participants for eligibility and enrolled participants after completing informed consent procedures. Eligible participants included residents of Changamwe or Likoni who were sexually active (had sex at least once in the past 3 months) adults with HIV and were either ART naïve or had taken antiretroviral drugs at least 6 months previously for any indication, including ART or prevention of mother-to-child transmission of HIV (PMTCT).

### Intervention Description

CHWs in the intervention arm underwent intensive 7-day training on study procedures and the national orientation package for community HIV service providers.<sup>18</sup> These CHWs were trained in counseling methods and motivational techniques to assist clients with HIV to identify barriers to safe sex that they faced, to help clients discuss strategies to overcome these barriers and set goals until the next meeting, and to encourage and support clients in achieving these goals. CHWs from the control site were trained for 3 days on study procedures and PLHIV recruitment. They also received training on the intervention after study completion.

The intervention, provided over a period of 6 months, consisted of a minimum of 4 structured CHW meetings with the participant, each meeting lasting 30–60 minutes. No maximum number of visits was stipulated. In these sessions, CHWs counseled participants on HIV/STI risk reduction and treatment, consistent and correct use of condoms, disclosure of HIV status to partners, HIV testing for partners and children, registering for HIV treatment, family planning, and PMTCT.

The participants and CHWs met at a mutually convenient location, for instance, at a health center, HTC center, post-test club, or the participant's home. CHWs used flipcharts to maintain uniformity of message content and to demonstrate correct usage of condoms. All counseling and contact with participants was conducted in individual one-to-one sessions. The spouse or main sexual partner could participate during pre-arranged couple counseling sessions with the consent of the study participant. See [box](#) for details of the counseling schedule and content.

CHWs contacted participants in the control arm at baseline and endline. These CHWs continued to provide routine support services to

### **Box. Description of Planned Activities During Each Counseling Visit**

#### **Visit 1:**

- Personalized assessment of risk behaviors
- Identification of specific areas of need, for example, condom-related misconceptions, non-disclosure of HIV status to spouse/main partner
- Overview of HIV transmission and prevention strategies using a flipchart

#### **Visit 2:**

- Review of key prevention needs
- Motivation on risk reduction and goal setting
- Assistance with counseling for untested partners and facilitation of HIV testing for partners
- Facilitation of referrals to services for prevention of mother-to-child transmission of HIV (PMTCT), family planning, or treatment of sexually transmitted infections (STIs) per need
- Counseling on need for registration at HIV treatment and care center

#### **Visit 3:**

- Review of progress toward goals set during previous visit
- Follow-up on referrals made to STI or family planning clinics, HIV treatment and care centers, or PMTCT services
- Discussion of and referrals for testing of children and other family members

#### **Visit 4:**

- Review of key prevention message
- Follow up on disclosure, risk-reduction goals, and partner testing

Participants could request additional visits.

PLHIV in the control group but without a specified visit schedule or defined counseling content. Data on the number of CHW encounters with controls were not collected.

CHWs were paid a stipend of KSh2,000 (US\$27) per month based on the national guidelines, plus reimbursement for transportation costs. Study participants received KSh150 (US\$2) as compensation for time spent completing the baseline and endline assessments.

### **Data Collection**

Participants in both groups completed baseline (pre-intervention) and endline (post-intervention) assessments. Data were collected on socio-demographic characteristics, sexual behavior, perceived stigma, and receipt of ART through face-to-face interviews, conducted in Swahili by

trained interviewers. Data were entered using Computer-Assisted Personal Interview (CAPI). However, information on more sensitive behaviors was collected by the participants themselves using Audio Computer-Assisted Self-Interview (ACASI); the interviewer left the room after guiding the participant on the technique.<sup>19</sup> All response options were color-coded and linked to audio directions in Swahili. The interviewer was available outside the door to help the participant in case s/he was unable to understand a particular question or had difficulty with the computer program.

### **Measures**

Sexual behavior data were collected on the number and type of sexual partners, condom use, and disclosure of own status to partners. Participants could report on up to 6 of their most

recent sexual partners in the 3 months prior to the survey. A regular partner was defined as a cohabiting partner, and a casual partner as a partner with whom the participant was not living and had sex with once or rarely. A commercial partner was one in which money or gifts were exchanged for sex. Concurrent sexual relationships were based on overlapping dates for 2 or more partners.

While unprotected sex is considered an important outcome, with unprotected sex between 2 PLHIV carrying risks, the study focused on the outcome of unsafe sex. This outcome, a subset of unprotected sex, was defined as sex without condoms with a partner who is of negative or unknown/untested HIV status.

Condom use fatigue was assessed using a 4-item Likert scale from strongly agree to strongly disagree with the statement: "I am tired of always having to make sure that I use a condom every time I have sex."<sup>1</sup> Condom use self-efficacy was assessed using a 15-item scale (Cronbach's alpha=0.79) derived from the Condom Use Self-Efficacy Scale (CUSES) (Cronbach's alpha=0.91).<sup>20-21</sup> The scale included items assessing the mechanics of using a condom, partner's disapproval of using a condom, assertiveness, and condom use under the influence of intoxicants. Participants responded on a 5-item Likert scale from strongly agree to strongly disagree. Total scores (possible range 15-75) were categorized as low (15-34), moderate (35-54), or high self-efficacy (55-75).

Perceived internalized stigma was assessed using a 16-item scale (Cronbach's alpha of adapted scale=0.81) derived from Berger's HIV stigma scale (Cronbach's alpha=0.96).<sup>22</sup> The scale covered 4 domains with 4 items for each domain: personalized stigma, disclosure concerns, negative self-image, and public attitudes. Participants responded on a 4-item Likert scale from strongly agree to strongly disagree. Total scores (possible range 16-64) were categorized as low (16-40), moderate (41-52), or high stigma (53-64).

A 5-item test with a composite total correct response score was used to assess HIV knowledge. The test included items on transmission of HIV through mosquito bites, transmission through sharing of utensils, transmission from mother to child, reduction of HIV-transmission risk with ART, and re-infection with new viral strains. Concerns about HIV transmission were assessed using 2 statements (4-item Likert scale

from strongly agree to strongly disagree) derived from an HIV treatment optimism-skepticism scale: "New treatments take the worry out of sex" and "I am less concerned about infecting sexual partners."<sup>23</sup>

## Data Analysis

Data were analyzed at 2 levels: within each group to document changes in key sexual and behavioral outcomes over time and between groups at endline. Stata 12.1 was used for data analysis.

Preliminary analyses showed that there were imbalances between some socio-demographic variables in the intervention and control groups, which potentially introduce selection bias. We addressed this by using propensity score matching (PSM), a technique useful for estimating causal effects in non-randomized studies and for removing selection bias.<sup>24,25</sup>

To select variables to include in matching, we used a multivariate logistic regression model to calculate the participants' propensity to being included in the intervention group. The intervention or control group was thus the model outcome, and explanatory variables were the variables that were unbalanced or likely to be associated with exposure to the study intervention.

Post-logistic regression we extracted the propensity scores, which showed different distributions in the 2 arms. Finally, Kernel caliper matching was conducted on 5 variables: age, gender, education, religion, and employment.<sup>26</sup> Matching was effective in balancing all variables. Statistical analyses were conducted on the original and matched data.

Pearson's chi-square test, *t*-test, and Mann-Whitney tests were used to compare groups on categorical and continuous variables at baseline. Wilcoxon signed rank tests, McNemar test, and tests of marginal homogeneity (Stuart-Maxwell and linear trend) for repeated measures on 2 related samples were used to document change within groups over the 2 time periods. Pearson's chi-square test, chi-square test for trend, and Wilcoxon rank sum test were used to compare outcomes between the intervention and control groups 6 months after the intervention. Finally, we computed unadjusted odds ratios and 95% confidence intervals (CI), comparing main study outcomes between intervention and control groups for the PSM samples. For all tests performed, *P* values <0.05 were considered statistically significant.

## RESULTS

### Participant Recruitment and Retention

At recruitment, 147 persons refused to participate in the study, 15.2% in the intervention group and 15.4% in the control site; information on the gender or socio-demographic profile of these persons is not available. A total of 634 participants were enrolled (February–May 2010) and 605 (95.4%) completed 6 months of follow-up, forming the analytic sample for the effectiveness analysis (Figure 1). In the intervention group, 178 (56.5%) of the participants who completed the study received the minimum 4 contact visits from CHWs, a further 136 participants (43.2%) were visited 5 times, and 1 participant was visited 6 times.

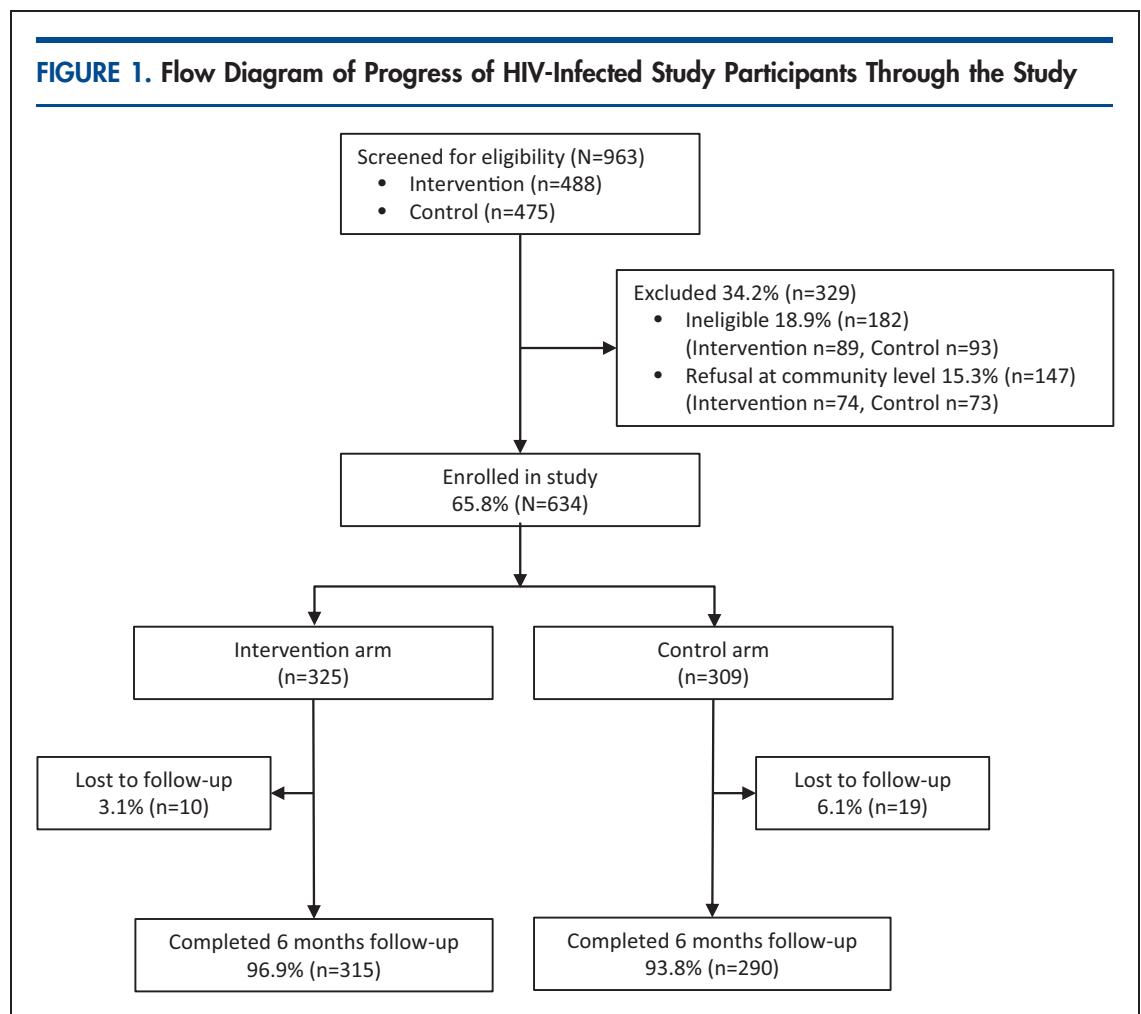
Table 1 provides details of the baseline characteristics of enrolled participants and participants in the PSM sample (N=394). The average age of

study participants in each group was 35 years, and 76.9% of participants in the intervention group and 71.5% in the control group were women ( $P=0.12$ ). Almost two-thirds of the participants had only primary education while 28% had a secondary or higher education ( $P=0.87$  comparing education distribution in the 2 groups).

At baseline, differences were detected between the intervention and control groups on a number of characteristics. Notably, at baseline, participants in the intervention group were more likely than those in the control group to be single or separated, to live alone, to be Catholic/Protestant, and to report multiple HIV tests. They were less likely to disclose their HIV status to partners or others (Table 1).

In both groups, 38.5% of participants had taken antiretroviral drugs previously (either for ART or PMTCT) and a small number attended an HIV clinic. Only a single participant reported

**FIGURE 1. Flow Diagram of Progress of HIV-Infected Study Participants Through the Study**



**TABLE 1.** Baseline Characteristics of HIV-Infected Adults Enrolled in Intervention and Control Sites in Mombasa, Kenya, and of a Propensity Score-Matched Selected Population

Variable	Enrolled Population (N=634)			Propensity Score-Matched Population (N=394) <sup>a</sup>		
	Intervention (n=325)	Control (n=309)	P Value <sup>b</sup>	Intervention (n=204)	Control (n=190)	P Value <sup>b</sup>
<b>Socio-Demographic Characteristics</b>						
Female, n (%)	250 (76.9)	221 (71.5)	0.12	157 (77.0)	150 (79.0)	0.64
Age, mean years (SD)	35.2 (8.4)	35.6 (8.2)	0.51 <sup>c</sup>	35.1 (8.6)	34.6 (7.9)	0.54 <sup>c</sup>
Education, n (%)						
No schooling	30 (9.2)	30 (9.7)		18 (8.8)	21 (11.1)	
Primary education	206 (63.4)	190 (61.5)		130 (63.7)	109 (57.4)	
Secondary or higher education	89 (27.4)	89 (28.8)	0.87	56 (27.4)	60 (31.6)	0.42
Marital status, n (%)						
Married or cohabiting	98 (30.2)	165 (53.4)		67 (32.8)	96 (50.5)	
Single	78 (24.0)	47 (15.2)		48 (23.5)	29 (15.4)	
Separated or divorced	80 (24.6)	51 (16.5)		45 (22.1)	35 (18.4)	
Widowed	69 (21.2)	46 (14.9)	<0.001*	44 (21.6)	30 (15.8)	0.004*
Living arrangements, n (%)						
Stays alone	163 (50.2)	67 (21.7)		94 (46.1)	47 (24.7)	
Nuclear family	103 (31.7)	193 (62.5)		70 (34.3)	116 (61.1)	
Extended family/friends	59 (18.2)	49 (15.9)	<0.001*	40 (19.6)	27 (14.2)	<0.001*
Religion, n (%)						
Catholic	120 (36.9)	35 (11.3)		49 (24.0)	31 (16.3)	
Protestant	135 (41.5)	109 (35.3)		93 (45.9)	101 (53.2)	
Muslim	66 (20.3)	164 (53.1)		62 (30.4)	57 (30.0)	
No religion	4 (1.2)	1 (0.3)	<0.001*	...	1 (0.5)	0.17
Employment, n (%)						
Salaried job or self-employed	56 (17.2)	33 (10.7)		29 (14.2)	27 (14.2)	
Daily wage worker	88 (27.1)	71 (23.0)		61 (29.9)	50 (26.3)	
Vendor or hawker	55 (17.0)	76 (24.5)		50 (24.5)	51 (26.8)	
Green grocer	15 (4.6)	10 (3.2)		7 (3.4)	7 (3.7)	
Unemployed	49 (15.1)	49 (15.9)		36 (17.7)	34 (17.9)	
Other	34 (10.5)	36 (11.7)	<0.001*	21 (10.3)	21 (11.1)	0.98

TABLE 1 (continued).

Variable	Enrolled Population (N=634)		P Value <sup>b</sup>	Propensity Score-Matched Population (N=394) <sup>a</sup>		P Value <sup>b</sup>
	Intervention (n=325)	Control (n=309)		Intervention (n=204)	Control (n=190)	
<b>HIV-Related Characteristics</b>						
Number HIV tests done, n (%) <sup>e</sup>						
1	165 (50.8)	207 (67.2)		104 (51.0)	126 (66.3)	
2-4	139 (42.8)	92 (29.9)		87 (42.7)	58 (30.5)	
5 or more	21 (6.5)	9 (2.9)	<0.001*	13 (6.4)	6 (3.2)	0.007*
Months since HIV-positive diagnosis, n (%) <sup>e</sup>						
0-11	83 (25.9)	102 (34.6)		51 (25.4)	61 (34.1)	
12-23	74 (23.1)	69 (23.4)		46 (22.9)	42 (23.5)	
24 or more	163 (50.9)	124 (42.0)	0.040*	104 (51.7)	76 (42.5)	0.12
Ever taken antiretroviral drugs (including for PMTCT), n (%)	125 (38.5)	119 (38.5)	0.59	75 (36.8)	66 (34.7)	0.68
Currently attends HIV clinic	4 (1.2)	14 (4.5)	0.012*	3 (1.5)	9 (4.7)	0.06
Disclosed HIV status to main partner, n (%) <sup>e</sup>						
Yes	160 (51.3)	203 (70.7)		102 (52.0)	121 (68.8)	
No, but plans to disclose	67 (21.5)	41 (14.3)		39 (19.9)	29 (16.5)	
No, does not intend to disclose	46 (14.7)	27 (9.4)		30 (15.3)	17 (9.7)	
No, cannot say/maybe will disclose	39 (12.5)	16 (5.6)	<0.001*	25 (12.8)	9 (5.1)	0.004*
Disclosed HIV status to anyone besides health workers, n (%)	245 (75.4)	272 (88.0)	<0.001*	157 (77.0)	164 (86.3)	0.02*
<b>Sexual Behavior Characteristics</b>						
Age at first sex, median n (IQR, range)	18 (15-19, 7-42)	18 (15-19, 7-35)	0.91 <sup>d</sup>	18 (9-25, 7-42)	17 (11-26, 7-35)	0.30 <sup>d</sup>
Number lifetime partners, median n (IQR, range)	5 (3-9, 1-53)	4 (3-9, 1-57)	0.49 <sup>d</sup>	5 (1-20, 1-30)	4 (1-35, 1-57)	0.28 <sup>d</sup>
Ever had same sex partners, n (%)	17 (5.2)	15 (4.9)	0.86	8 (3.9)	10 (5.3)	0.52
Has regular sexual partner(s), n (%)	312 (96.0)	287 (92.7)	0.093	79 (42.9)	44 (24.9)	<0.001*

**TABLE 1 (continued).**

Variable	Enrolled Population (N=634)			Propensity Score-Matched Population (N=394) <sup>a</sup>		
	Intervention (n=325)	Control (n=309)	P Value <sup>b</sup>	Intervention (n=204)	Control (n=190)	P Value <sup>b</sup>
Has children, n (%)	281 (86.5)	265 (85.8)	0.80	176 (86.3)	162 (85.3)	0.77
Currently using family planning, n (%)	187 (57.5)	163 (52.8)	0.46	112 (58.0)	96 (53.9)	0.33

Abbreviations: SD, standard deviation; PMTCT, prevention of mother-to-child transmission; IQR, interquartile range.

\* P values < 0.05 were considered statistically significant.

<sup>a</sup> The following variables were used in propensity score matching: age, gender, education, religion, and employment.

<sup>b</sup> Pearson's chi-square test unless otherwise indicated.

<sup>c</sup> t-test.

<sup>d</sup> Mann-Whitney test.

<sup>e</sup> For the enrolled population, sample size of control group for number of HIV tests done is 308; of intervention and control group for months since HIV-positive diagnosis is 320 and 295, respectively; of intervention and control group for disclosed HIV status to main partner is 312 and 287, respectively.

injection drug use in the past 6 months (data not shown). The majority of participants in both groups had regular sexual partners (>92%;  $P=0.093$ ) and biological children (86.5% in intervention and 85.8% in controls;  $P=0.80$ ), and more than half of participants in each group were currently using family planning.

### Behavior Change in Study Sample

Compared with baseline, at endline, the proportion of participants in the intervention

group reporting a number of **risky sexual behaviors** declined considerably, including having multiple partners (2 or more partners in the past 3 months), concurrent relationships in the past 3 months (41.7% at baseline versus 18.2% at endline;  $P=0.015$ ; data not shown), unprotected sex with various partners at last sex, unprotected sex acts in the last month, and unsafe sex in the last month (with partners of negative or unknown HIV status) (Table 2).

**The percentage of study participants who reported risky sex behaviors declined over time.**

**TABLE 2.** Sexual and Behavioral Outcomes Among HIV-Infected Men and Women Before and 6 Months After a Behavioral Intervention in Mombasa, Kenya (N=605)

Variable	Intervention (n=315)			Control (n=290)		
	Before n/N (%)	After n/N (%)	P Value <sup>a</sup>	Before n/N (%)	After n/N (%)	P Value <sup>a</sup>
Number of partners in past 3 months						
0 partners	11/297 (3.7)	58/313 (18.5)		9/283 (3.2)	54/286 (18.9)	
1 partner	158/297 (53.2)	202/313 (64.5)		201/283 (71.0)	174/286 (60.8)	
≥2 partners	128/297 (43.1)	53/313 (16.9)	<0.001 <sup>b</sup>	73/283 (25.8)	58/286 (20.3)	0.06 <sup>b</sup>
Unprotected sex at last sex <sup>c,d</sup>						
Spouse	68/93 (73.1)	9/79 (11.4)	<0.001*	97/144 (67.4)	85/141 (60.3)	0.19
Regular partner	71/115 (61.7)	4/92 (4.4)	<0.001*	56/125 (44.8)	54/105 (51.4)	1.00
Casual partner	89/142 (62.7)	11/101 (10.9)	<0.001*	15/31 (48.4)	20/33 (60.6)	1.00
Commercial partner	36/53 (67.9)	2/33 (6.1)	0.025*	25/43 (58.1)	13/28 (46.4)	0.025*

TABLE 2 (continued).

Variable	Intervention (n=315)			Control (n=290)		
	Before n/N (%)	After n/N (%)	P Value <sup>a</sup>	Before n/N (%)	After n/N (%)	P Value <sup>a</sup>
Unprotected sex in past month <sup>d,e</sup>						
0 acts	115/307 (37.5)	225/258 (87.2)		115/282 (40.8)	126/238 (52.9)	
1-5 acts	87/307 (28.4)	28/258 (10.9)		102/282 (36.1)	69/238 (29.0)	
≥6 or more acts	105/307 (34.2)	5/258 (1.9)	<0.001 <sup>*b</sup>	65/282 (23.1)	43/238 (18.1)	0.002 <sup>*b</sup>
Unsafe sex in past month <sup>d,e</sup>						
0 HIV-negative or unknown status partner	137/307 (44.6)	240/258 (93.0)		172/282 (61.0)	168/238 (70.6)	
1 HIV-negative or unknown status partner	23/307 (7.5)	4/258 (1.6)		26/282 (9.2)	10/238 (4.2)	
2-5 HIV-negative or unknown status partners	59/307 (19.2)	10/258 (3.9)		43/282 (15.3)	33/238 (13.9)	
≥6 HIV-negative or unknown status partners	88/307 (28.7)	4/258 (1.6)	<0.001 <sup>*b</sup>	41/282 (14.5)	27/238 (11.3)	0.003 <sup>*b</sup>
Condom use self-efficacy						
Low self-efficacy (score 15-34)	23/315 (7.3)	2/315 (0.6)		8/290 (2.8)	0/290 (0)	
Moderate self-efficacy (score 35-54)	169/315 (53.7)	31/315 (9.8)		129/290 (44.5)	147/290 (50.7)	
High self-efficacy (score 55-75)	123/315 (39.1)	282/315 (89.5)	<0.001 <sup>*</sup>	153/290 (52.8)	143/290 (49.3)	0.86
HIV status disclosed to partner <sup>c,d</sup>						
Spouse	65/93 (70.0)	74/79 (93.7)	<0.001 <sup>*</sup>	120/144 (83.3)	125/141 (88.7)	0.083
Regular partner(s)	16/115 (13.9)	8/92 (8.7)	0.65	11/125 (8.8)	16/105 (15.2)	0.41
Casual partner(s)	19/142 (13.4)	10/101 (9.9)	1.00	7/31 (22.6)	12/33 (36.4)	1.00
Commercial partner(s)	8/53 (15.1)	7/33 (21.2)	0.16	6/43 (14.0)	7/28 (25.0)	0.56
Currently receiving antiretroviral treatment	1/315 (0.3)	111/315 (35.2)	<0.001 <sup>*</sup>	1/290 (0.3)	36/290 (12.4)	<0.001 <sup>*</sup>
Internalized stigma						
Low (score 16-40)	78/314 (24.8)	133/314 (42.4)		152/290 (52.4)	172/290 (59.3)	
Moderate (score 41-52)	232/314 (73.9)	181/314 (57.6)		134/290 (46.2)	113/290 (39.0)	
High (score 53-64)	4/314 (1.3)	0/31 (0)	<0.001 <sup>*</sup>	4/290 (1.4)	5/290 (1.7)	0.09

\* P values < 0.05 were considered statistically significant.

<sup>a</sup> McNemar test unless otherwise indicated.

<sup>b</sup> Marginal homogeneity (Stuart-Maxwell) test.

<sup>c</sup> Multiple-response question.

<sup>d</sup> Respondents were asked to report on all sexual partners in the past 3 months with a maximum of 6 partners.

<sup>e</sup> Only among sexually active participants.

In the control group, fewer and smaller changes were observed. However, significant reductions were observed in the percentage of control participants reporting unprotected sex at last sex with sex workers ( $P=0.025$ ), unprotected sex in the past month ( $P=0.002$ ), and unsafe sex in the last month ( $P=0.003$ ) (Table 2).

**Condom use** fatigue was reported by around half the participants and did not significantly change over time in either group (data not shown). In the intervention group, an increasing proportion of participants reported high condom use self-efficacy (39.1% at baseline versus 89.5% at endline;  $P<0.001$ ) while there was no increase in the control group.

The percentage of intervention participants reporting **disclosure of HIV status** to their spouse increased significantly from baseline to endline (70.0% versus 93.7%;  $P<0.001$ ) and to some extent in the control group (83.3% versus 88.7%;  $P=0.083$ ). In both groups, however, no statistically significant change was detected in disclosure to other types of partners. Internalized **stigma** scores declined in the intervention arm ( $P<0.001$ ).

**ART uptake**, negligible in both populations at baseline, increased in the intervention (0.3% versus 35.2%;  $P<0.001$ ) and control (0.3% versus 12.4%;  $P<0.001$ ) groups over time, but it was almost three-fold higher in the intervention group than in the control group at endline ( $P<0.001$ ). Overall, ART-experienced participants were more likely to initiate ART compared with ART-naïve participants (56.5% versus 32.6%;  $P<0.001$ ).

### Behavior Change in Propensity Score Matched-Sample

Table 3 presents sexual and behavioral outcomes at endline among men and women with HIV in the intervention and control groups in the PSM sample. At endline, fewer participants in the intervention arm than in the control arm reported **unprotected sex at last sex**: with a spouse (9.1% versus 56.1%; Odds Ratio [OR]=0.08, 95% confidence interval [CI]=0.03-0.24), with a regular partner (5.1% versus 48.5%; OR=0.06, 95% CI=0.01-0.24), with a casual partner (15.4% versus 60.0%; OR=0.12, 95% CI=0.04-0.39), and with a sex worker (8.7% versus 47.4%; OR=0.11, 95% CI=0.02-0.72). Overall, participants in the intervention group reported fewer numbers of **unprotected sex acts in the past month** than participants in the

control group ( $P<0.001$ ). Also, they were less likely to report **unsafe sex** with any partner with negative or unknown HIV status in the last month ( $P<0.001$ ); 92.4% of the intervention participants reported no unsafe sex acts compared with 70.8% of control-group participants.

**Knowledge of HIV transmission** was higher in the intervention group than in the control group (median score=5 [IQR: 2-5] versus 4 [IQR: 1-5], respectively;  $P<0.001$ ; data not shown). At endline, more participants in the intervention arm than in the control arm exhibited high **condom use self-efficacy** scores (88.7% versus 52.6%), and had higher median scores on the knowledge of HIV transmission index (score=5 [IQR=2-5] versus 4 [IQR=1-5];  $P<0.001$ ; data not shown).

More participants in the intervention arm than the control arm were **receiving ART** by endline (34.3% versus 12.7%; OR=1.62, 95% CI=1.07-2.46). Interestingly, a higher proportion of participants in the control group had low internalized **stigma** scores at endline compared with those in the intervention group (44.3% versus 56.3%). At endline, more participants in the intervention group than in the control group reported less **concern about HIV transmission** due to ART availability (84.2% versus 42.1%; OR=7.3, 95% CI=4.3-12.5; data not shown). Finally, analysis of outcomes separately by gender showed that all changes were in the same direction and of similar magnitude in women and men, with no differences detected in effect by gender.

## DISCUSSION

CHWs delivered a personalized HIV risk-reduction intervention that was successful in reducing reported risky behaviors (for example, improved condom use resulting in fewer unprotected sex acts and less unsafe sex) in a cohort of PLHIV who knew their HIV status but were not accessing HIV treatment or care services. The intervention also increased HIV knowledge and ART uptake.

Several studies have evaluated HIV-prevention interventions, but nearly all have been conducted among PLHIV recruited from HIV care or prevention services.<sup>2,4-9</sup> To our knowledge, this is the first study to be conducted among PLHIV who are not accessing HIV services, with more than 40% of the participants testing positive with HIV more than 24 months previously.

**ART uptake increased significantly over time in both intervention and control groups but more so in the intervention group.**

**PLHIV in the intervention group were less likely than those in the control group to report risky sex behaviors.**

**TABLE 3.** Propensity Score-Matched<sup>a</sup> Sexual and Behavioral Outcomes Among HIV-Infected Men and Women After a 6-Month Behavioral Intervention (N=394)

Variable	End of study		P Value <sup>b</sup>
	Intervention n/N (%)	Control n/N (%)	
Number of partners in past 3 months			
0 partners	36/204 (17.7)	34/190 (17.9)	
1 partner	135/204 (66.2)	119/190 (62.6)	
≥2 partners	33/204 (16.2)	37/190 (19.5)	0.61 <sup>c</sup>
Unprotected sex at last sex <sup>d,e</sup>			
Spouse	5/55 (9.1)	55/98 (56.1)	<0.001*
Regular partner	3/59 (5.1)	33/68 (48.5)	<0.001*
Casual partner	10/65 (15.4)	15/25 (60.0)	<0.001*
Commercial partner	2/23 (8.7)	9/19 (47.4)	0.005*
Unprotected sex in past month <sup>e,f</sup>			
0 acts	150/171 (87.7)	87/161 (54.0)	
1 acts	5/171 (2.9)	11/161 (6.8)	
2-5 acts	11/171 (6.4)	36/161 (22.4)	
6 or more acts	5/171 (2.9)	27/161 (16.8)	<0.001* <sup>c</sup>
Unsafe sex in past month <sup>e,f</sup>			
0 HIV-negative or unknown-status partner	158/171 (92.4)	114/161 (70.8)	
1 HIV-negative or unknown-status partner	3/171 (1.8)	6/161 (3.7)	
2-5 HIV-negative or unknown-status partners	5/171 (3.5)	22/161 (13.7)	
≥6 HIV-negative or unknown-status partners	4/171 (2.3)	19/161 (11.8)	<0.001* <sup>c</sup>
Condom use self-efficacy			
Low self-efficacy (score 15-34)	2/204 (1.0)	0/190 (0)	
Moderate self-efficacy (score 35-54)	21/204 (10.3)	90/190 (47.4)	
High self-efficacy (score 55-75)	181/204 (88.7)	100/190 (52.6)	<0.001* <sup>c</sup>
HIV status disclosed to partner <sup>d,e</sup>			
Spouse	52/55 (94.5)	89/98 (90.8)	0.41
Regular partner(s)	5/59 (8.5)	10/68 (14.7)	0.28
Casual partner(s)	6/65 (9.2)	9/25 (36.0)	0.002*
Commercial partner(s)	5/23 (21.7)	6/19 (31.6)	0.47

**TABLE 3 (continued).**

Variable	End of study		P Value <sup>b</sup>
	Intervention n/N (%)	Control n/N (%)	
Currently receiving antiretroviral treatment	70/204 (34.3)	24/189 (12.7)	<0.001*
Internalized stigma			
Low (score 16-40)	90/203 (44.3)	107/190 (56.3)	
Moderate (score 41-52)	113/203 (55.7)	81/190 (42.6)	
High (score 53-64)	0/203 (0.0)	2/190 (1.1)	0.034* <sup>c</sup>

\* P values < 0.05 were considered statistically significant.

<sup>a</sup> The following variables were used in propensity score matching: age, gender, education, religion, and employment.

<sup>b</sup> Pearson's chi-square test unless otherwise indicated.

<sup>c</sup> Chi-square test for trend.

<sup>d</sup> Multiple-response question.

<sup>e</sup> Respondents were asked to report on all their sexual partners in the past 3 months with a maximum of 6 partners.

<sup>f</sup> Only among sexually active participants.

Clients with HIV were recruited from the community, and the intervention was delivered by CHWs. While this is in variance with recommendations for successful HIV-prevention interventions made in a meta-analysis by Crepez et al.,<sup>4</sup> our findings provide evidence that non-formal health care providers can deliver interventions in non-clinical settings. The studies in the Crepez review were conducted in the United States and suggested that provision of interventions by health care providers in service settings were effective in those settings.<sup>4</sup> Shortage of human resources is a recognized limitation of health programs in several African countries and task shifting to other cadres is often considered. In this study, CHWs successfully delivered the intervention without any evidence of breaching confidentiality. Peltzer et al. (2010)<sup>27</sup> also reported successful outcomes (increases in HIV knowledge, behavioral intentions, and risk-reduction efficacy, and declines in number of sex partners and unprotected sex) among persons with HIV receiving a risk-reduction intervention delivered by lay counselors at HTC services in South Africa.

Of note, nearly three-quarters of the participants were women, who constitute 60% of all adults with HIV in Kenya and in sub-Saharan Africa more broadly.<sup>28</sup> There are several possible reasons for higher recruitment of women than men. For example, women might have been easier to reach in their homes by CHWs and more

responsive to being included in a study, while men might have been more mobile. Also, more women might know their HIV status than men, often through contacts with the health system, such as antenatal clinics. Specific efforts are needed to recruit men, as they often make up a much smaller proportion within studies, HIV services, and health programs more generally. Employing more male CHWs might be useful.

Interestingly, in addition to the decline in numbers of reported partners in the intervention group, we observed a marginally significant reduction in the reported number of partners in the control group. It is possible that limited behavior change occurred among participants in the control group through the more limited contact with CHWs and participation in the research study. Nevertheless, future interventions should specifically focus on partner number as a critical concern.

Although reported disclosure of HIV status to spouses increased, disclosure to regular, casual, or commercial sex partners did not change in either group. Several other papers also report high disclosure rates within the marital union<sup>29-31</sup> and lower rates of disclosure among previous or current casual partners.<sup>31</sup> Within these transient or infrequent relationships, people might perceive a lower overall level of responsibility. While future research should explore disclosure and its context with casual and paid partners, the intervention could be

further strengthened by specifically emphasizing disclosure to non-regular partners.

We noted a shift to lower internalized stigma scores in the intervention group compared with the control group in the study sample. However, the proportion of participants with low stigma scores was higher in the control group compared with the intervention group in the PSM sample at endline. The intervention focused on HIV risk reduction and emphasized disclosure to partners and family members. It is possible that frequent contact with CHWs and their guidance to disclose might have contributed to increased self-perceived stigma among intervention participants, at least in the short-term. In the long-term, however, disclosure of HIV status to spouses or main partners is associated with greater acceptance and support from partners, which includes anxiety relief, increased sexual communication, increased care-seeking behavior including ART uptake, and motivation to plan for the future among PLHIV.<sup>31,33-34</sup>

About half the participants in both groups expressed condom use fatigue, or being tired of always using condoms. The proportion of participants expressing condom use fatigue did not change over time and did not translate into an increase in unprotected sex; nevertheless, the impact of this over the long-term warrants concern.

### Study Limitations

The results should be interpreted in light of study limitations. Critically, the study relies on self-reported sexual risk and condom use behaviors, which might be subject to social desirability and recall bias. We used a 3-month recall period and limited the number of partners that each participant could report on to a maximum of 6, with the aim of obtaining more reliable recall and limiting the influence of outliers in the sample. Reviews of validity and reliability of HIV research show that sexual behavior data are fairly consistent and self-reported data on sexual acts are reasonably congruent, especially for short recall periods.<sup>35-36</sup>

Furthermore, a sizeable proportion of participants reported condom use fatigue, which could be considered to support the veracity of self-reported condom use behaviors. However, participants in the intervention group did receive additional counseling and follow-up, which might heighten desirability bias and improve recall

in this group. The study would have benefited from clinical indicators or biological markers for unprotected sex to validate the results.

Further research is needed to demonstrate behavior change, not just reported behaviors. Our study did have one behavioral indicator (ART uptake) that showed a positive result in favor of the intervention.

We recruited PLHIV through non-probability targeted sampling using CHWs to reach potential participants, which might have introduced selection bias. Although our sample was not randomly recruited, we were able to reach PLHIV in the community, who are otherwise not accessible. Individual-level randomization would have controlled for the differences between the 2 groups at baseline. However, to remove the chance of intervention diffusion into the control group, we randomly assigned study sites to the 2 arms. Using PSM analysis, we were able to account for some differences, and findings were supported by results obtained from analysis over time in the entire study sample.

Some limitations of PSM warrant mention. The potential remains for unmeasured confounding and the smaller sample size resulting from this method limits the ability to detect smaller differences between the study groups.

The study tools had some limitations as well. The HIV knowledge index did not include an item on the awareness of HIV risk through sharing of needles/syringes among IDUs or unprotected sex with IDU partners. Recent studies have documented the presence of a sizeable IDU population in Mombasa, and future studies should include this information.<sup>37-38</sup>

Data were also not collected on some important variables such as CD4 cell count and access to health services. These variables could thus not be included in the PSM analysis. It is possible that the differences in ART uptake noted between the intervention and control site might have been due, in some part, to differences in baseline levels of CD4 cell count between participants in these areas.

Finally, given the specificities of the study location and the non-randomized study design, the findings of this research might not be generalizable to other settings. Moreover, our study sample was recruited from among PLHIV who know their HIV status, and our findings might not be applicable to PLHIV who have not been tested.

**Community-based delivery of positive prevention interventions shows promise for large-scale replication in resource-limited settings.**

## CONCLUSION

In conclusion, the community-based positive prevention intervention effectively reduced reported risky sexual behavior and increased ART uptake among PLHIV who knew their HIV status. As the intervention was delivered by non-formal health care providers from the community using a national CHW training package, we consider it suitable for large-scale replication in similar resource-limited settings. Strategies to reach more PLHIV in the community, especially men who are not accessing services, need further research, as do the effects of interventions that target structural and other forms of vulnerability, in addition to the behavioral interventions applied here. Finally, the long-term effects and sustainability of this intervention warrant further assessment, perhaps within a longitudinal study.

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## ORIGINAL ARTICLE

# Successful polio eradication in Uttar Pradesh, India: the pivotal contribution of the Social Mobilization Network, an NGO/UNICEF collaboration

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Innovative approaches to eradicate polio in hard-to-reach areas included: (1) cadres of trusted community mobilizers who track children's immunization status, (2) responsiveness to people's concerns about immunization, (3) outreach to religious and other local leaders, (4) focus on both individual- and community-level behavioral approaches, and (5) continuous data collection and use.

## ABSTRACT

In Uttar Pradesh, India, in response to low routine immunization coverage and ongoing poliovirus circulation, a network of U.S.-based CORE Group member and local nongovernmental organizations partnered with UNICEF, creating the Social Mobilization Network (SMNet). The SMNet's goal was to improve access and reduce family and community resistance to vaccination. The partners trained thousands of mobilizers from high-risk communities to visit households, promote government-run child immunization services, track children's immunization history and encourage vaccination of children missing scheduled vaccinations, and mobilize local opinion leaders. Creative behavior change activities and materials promoted vaccination awareness and safety, household hygiene, sanitation, home diarrheal-disease control, and breastfeeding. Program decision-makers at all levels used household-level data that were aggregated at community and district levels, and senior staff provided rapid feedback and regular capacity-building supervision to field staff. Use of routine project data and targeted research findings offered insights into and informed innovative approaches to overcoming community concerns impacting immunization coverage. While the SMNet worked in the highest-risk, poorly served communities, data suggest that the immunization coverage in SMNet communities was often higher than overall coverage in the district. The partners' organizational and resource differences and complementary technical strengths posed both opportunities and challenges; overcoming them enhanced the partnership's success and contributions.

## THE SETTING FOR POLIO ERADICATION IN INDIA

Polio is a crippling paralytic and potentially fatal disease, spread from person-to-person through poor hygiene and sanitation. Universal immunization

against the 3 types of polio with existing safe and effective oral vaccines has been the major strategy for eradicating the poliovirus globally (Box 1).

When the World Health Assembly launched the Global Polio Eradication Initiative (GPEI) in 1988, it was widely acknowledged that India would be one of the most challenging countries for polio eradication, given its enormous and diverse population. In the mid-1990s, an estimated 150,000 polio cases were reported annually in India.<sup>3</sup> By 2006, Afghanistan, India, Nigeria, and Pakistan were the only remaining polio-endemic countries.<sup>3</sup>

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## Box 1. Four Pillars of the Global Polio Eradication Initiative Strategy

### 1. Routine Immunization

A major cornerstone of the polio eradication strategy is ensuring that at least 80% of children receive all the recommended routine childhood immunizations, including at least 3 doses of oral polio vaccine, before their first birthday. This would reduce the number of children susceptible to poliovirus, which, in turn, reduces the number of cases, the number of hosts available for the survival of the virus, and the potential for outbreaks.

### 2. Supplemental Immunization Activities

Mass polio immunization campaigns that complement routine immunization programs are intended to interrupt transmission by immunizing every child under the age of 5 with oral polio vaccine annually, regardless of the number of times they have been immunized previously. These campaigns help protect children who are not immunized or only partially protected and boost the immunity of those who are immunized, thereby reducing or eliminating the pool of potential hosts.

These campaigns include National Immunization Days, which are conducted countrywide 2 or 3 times per year, 1 month apart, and subnational Supplemental Immunization Activity campaigns. Although these mass campaigns require careful planning and execution, they are possible because members of the community can be trained easily and quickly to administer the oral polio vaccine safely.

### 3. Acute Flaccid Paralysis (AFP) Surveillance

As many as 90% of people infected with the poliovirus experience very mild or no symptoms.<sup>1</sup> A single symptomatic case can therefore represent a significant community-wide outbreak. Robust surveillance to detect and investigate every case of polio-like AFP is essential to polio eradication.

### 4. Targeted Mop-Up Campaigns

Low routine immunization coverage, very dense or mobile populations, inadequate sanitation, and poor access to health services exacerbate communities' vulnerability to polio. In focal areas where polio cases have been confirmed within the previous 3 years and circulating virus is confirmed or suspected, mop-up campaigns in which vaccinators go house-to-house to immunize every child under 5 help to stop transmission.

Source: Reference 2.

In 1995, the Government of India launched its "Pulse Polio" program for polio eradication, with twice-yearly National Immunization Day (NID) campaigns conducted nationwide and subnational Supplementary Immunization Activity (SIA) campaigns conducted more frequently in selected states.<sup>4</sup> The government, working with the World Health Organization (WHO) and the U.S. Centers for Disease Control and Prevention (CDC), established the National Polio Surveillance Project (NPSP) to manage polio case detection and reporting.

The U.S. Agency for International Development (USAID) contributed funds to WHO, the United Nations Children's Fund (UNICEF), and Rotary Foundation for surveillance and awareness-raising activities in India. In 1999, USAID provided grant funding for polio

activities in Africa and Asia to member organizations of the CORE Group—a global network of international health and development organizations that strengthen local capacity to improve the health and well-being of children and women in developing countries. Recognized for their expertise in working with extremely underserved, high-risk, and vulnerable communities, CORE Group member organizations received funding from USAID and the Bill & Melinda Gates Foundation for the "CORE Group Polio Project" (CGPP) in India.

In 1999, type 2 polio was eradicated worldwide,<sup>1</sup> leaving only types 1 and 3 poliovirus. That same year, India added a house-to-house polio vaccination effort: after vaccination teams spent 2 days vaccinating children at designated polio vaccination sites, known as booths (Box 2), new

## Box 2. Vaccination Campaign Booths

Temporary booths were established at or near clinics, markets, schools, and places of worship (temples, mosques, churches). Vaccinator teams brought vaccine, cold chain equipment, records, and supplies, and were loaned tables, chairs, and often an awning or tent decorated with flags and posters encouraging families to bring children under 5 to be vaccinated.

teams of outreach vaccinators travelled from house-to-house to locate and vaccinate any missed children.

Although India reported only 66 polio cases in 2005, it reported 741 in 2009.<sup>5</sup> This number included 602 cases in Uttar Pradesh (UP) and 117 in Bihar, 2 very vulnerable states with poor sanitation, insufficient infrastructure, and millions of children who require more than the usual 4 oral polio vaccine (OPV) doses for immunity against polio. Research conducted under the auspices of the government, WHO, and other scientific organizations, confirmed that the oral polio vaccine widely used over the last 2 decades is less effective among children in UP.<sup>6</sup> Ongoing statewide polio campaigns in UP and Bihar succeeded in vaccinating millions of children every 4 to 6 weeks to contain and eliminate the virus. Meanwhile, new polio vaccines were being developed, leading to the introduction in 2005 of monovalent vaccines<sup>7</sup> (consisting of live, attenuated [weakened] poliovirus strains of either type 1 or type 3 poliovirus) and in 2010 a bivalent vaccine (consisting of live, attenuated poliovirus strains of both type 1 and type 3).<sup>8</sup> These newer vaccines are more effective against the remaining types of polio.

In 2010, there were only 42 cases of polio in India—with only 10 in UP and 9 in Bihar. The last confirmed case in India occurred on January 13, 2011, in West Bengal.<sup>3</sup> On February 25, 2012, India was removed from the polio-endemic country list.<sup>3</sup>

Millions of polio field workers in UP and Bihar were crucial to the successful interruption of polio transmission in India. The Government of India and NPSP hired and trained millions of vaccinators and disease surveillance officers. Rotary International members, along with thousands of

community-based social mobilizers hired and trained by UNICEF and the CGPP, provided advocacy and social mobilization support for campaigns and routine immunization in high-risk communities using interpersonal communication and mass media. In UP these nongovernmental organizations (NGOs) joined forces to establish and maintain the Social Mobilization Network (SMNet), supported by USAID and the Bill & Melinda Gates Foundation. This paper examines the development, performance, and contributions to polio eradication of the SMNet, including the advantage of individual organizations and networks working together in a consortium focused on a common goal.

## THE SMNET PARTNERSHIP

Initially, Rotary in India received funds from the Rotary Foundation and USAID to support polio campaigns with advocacy efforts at the community level, including with banners, posters, parades, and TV events. As the lead agency for polio communication in India, UNICEF was mandated to coordinate Pulse Polio activities and liaise with the government but had limited field implementation capacity at the start. In its role as one of the spearheading partners of the GPEI, UNICEF also contributed to raising campaign awareness, particularly at the national level, while CGPP partners worked at the community and household level.

Working in the same districts, UNICEF and CGPP became convinced that they could not effectively overcome growing resistance to immunization and ensure universal coverage in high-risk areas by operating independently. Realizing that working separately caused duplication of effort, confusion about roles and responsibilities, and difficulties with linking achievements to either organization's activities, UNICEF, CGPP, and Rotary united within a collaborative framework that allowed them to capitalize on their unique capacities, minimize overlap, reduce friction, share lessons learned, and benefit from a common data collection and monitoring and evaluation approach.

In August 2003, CGPP, Rotary, and UNICEF met with the UP government, which was skeptical at the time regarding NGO involvement in polio eradication. Together, they established the Multiagency Social Mobilization Network known as SMNet, focusing on polio-endemic and high-risk areas in UP. These entities felt that

**Of the 3 types of poliovirus, type 2 has been eradicated worldwide and only types 1 and 3 continue to circulate.**

**In the mid-1990s, an estimated 150,000 polio cases were reported annually in India. By 2012, polio had been eradicated in the country.**

presenting a united front and communicating clear and consistent messages with one voice would make communication with government and other stakeholders more effective. Later, UNICEF introduced SMNet activities in Bihar, where there was no CGPP presence. Although Rotary members continued to support campaigns and promote polio eradication among senior policy makers in India, they were less engaged in the grassroots work supported through the SMNet.<sup>9</sup>

UNICEF conducted increasingly localized social mobilization activities and also brought to SMNet its broad health communication experience, capacity to manage large-scale programs, and ability to raise funds at state levels and then redirect funds to fill other partners' resource gaps. While UNICEF's process for approval of budgetary and programmatic changes could be cumbersome, once approval was received, it could redirect both human and financial resources relatively quickly to emerging high-risk areas as the virus circulated to new communities and as resistance to vaccination services waxed and waned.

CGPP partners systematically engaged with existing international and local NGOs and communities to build trust and address local concerns about polio campaigns, especially in those communities where the government and United Nations (UN) agencies had limited access. Ongoing funding from USAID and the Bill & Melinda Gates Foundation allowed CGPP partners to support immunization and surveillance activities and to support families with paralyzed children. CGPP partners participating in the SMNet included the Adventist Development Relief Agency, Catholic Relief Services (joined in 2003), Project Concern International, and World Vision (left in 2008).

In addition, 10 local community-based NGOs and some Catholic diocesan social service organizations participated in the SMNet. All had established credibility because they had governmental approval to receive funding from abroad. CGPP partnered with these local NGOs to expand or improve their grassroots reach in high-risk communities and to enhance community ownership. Grant funds supported field staff salaries, travel, and capacity-building technical and management oversight.

CGPP's compact structure, long-term community presence, and programmatic and technical flexibility fit the emerging needs of the

eradication effort particularly well. The CGPP approach encouraged development of creative, timely interventions and facilitated rapid introduction and assessment of new activities, using community feedback to identify the most effective practices.

Another essential component of the CGPP design was its national secretariats—coordinating units established in each CGPP country to provide leadership, coordinate activities and resource allocation, ensure the quality of CGPP management and technical activities, and serve as a central communication hub connecting field staff, partners, and stakeholders. By design, the secretariats report directly to the independent CGPP headquarters staff in the United States, rather than to a CGPP partner organization. Vested with clear, strong authority, the secretariats are also charged with respecting and maintaining the essentially collaborative nature of the project and the implementing partnership.

The secretariats were required to approve each partner's annual and overall strategic plan and budget and make funding recommendations to the director on behalf of all partners. The partners standardized some aspects of their respective budgets, which was a major contributor to the successful partnership and management of the SMNet. For example, salaries and benefits were consistent across all SMNet field workers, regardless of which CGPP partner paid them. In addition, the partners developed a standardized "cost per census block" to determine activity costs, based on the number of blocks included in each partner's approved catchment area.

The secretariats also represent and speak for the partners at all state, national, and international meetings, voicing their comments, questions, and concerns while allowing them to avoid the costs of participating themselves. The secretariats actively credit the partners and field staff, rather than themselves, with project successes.

SMNet partners use the same vocabulary, messages, and indicators, and they employ similar staffing structures, selection criteria, job descriptions, and benefits. They collaborate with each other and coordinate with local government officials to support routine immunization; campaign planning/microplanning, implementation, and monitoring; and other polio eradication activities.

## THE SMNET FIELD STAFF

Thousands of social mobilization field workers, trained by CGPP and UNICEF, conducted SMNet activities at different levels (Figure 1). Each cadre of field worker performed different yet interrelated functions in support of polio eradication, routine immunization, and health capacity building.

Within the largest cadre, UNICEF managed more than 3,000, and CGPP more than 1,000, **Community Mobilization Coordinators (CMCs)**. Predominantly women selected from the high-risk communities, CMCs received small monthly stipends and were responsible for the immunization status of all children under 5 in their assigned blocks, numbering 400–500 households. They maintained detailed maps of their communities (Figure 2) and visited their assigned households at least once each month to promote polio vaccine campaigns. Using specially designed registers, CMCs tracked pregnancies and the routine and polio immunization status of newborns, children under 5, and pregnant women, sending their register data to their supervisors monthly. CMCs visited each household between and during the campaigns to:

- promote child immunization, hygiene, and sanitation
- raise awareness about the importance of routine immunization and polio eradication
- track missed children and ensure that they got vaccinated

During frequent UP-wide campaigns, CMCs organized children’s rallies and mosque/temple announcements, helped the vaccinators set up booths, accompanied them to houses of missed children, and assisted in convincing resistant families to have their children vaccinated. At the community level, CMCs participated in routine immunization trainings and service delivery, and they organized mothers’ and influencers’ meetings, using educational materials and discussions to promote immunization and other positive health-seeking behaviors. SMNet worked to secure the endorsement and active support of influencers, such as political and religious leaders, doctors, athletes, and artists, who were respected and well-known in the community and were consequently able to influence families’ decisions and actions.

**Block Mobilization Coordinators (BMCs)** trained and supervised the CMCs working within

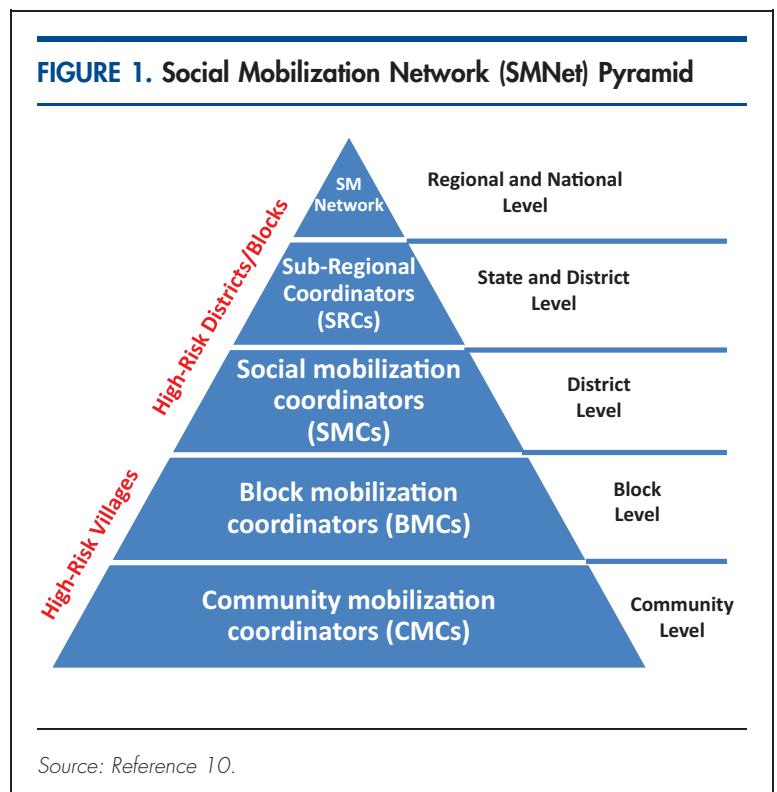


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In Uttar Pradesh, India, a community mobilization coordinator promotes immunization and other positive health-seeking behavior at a local mothers’ meeting.

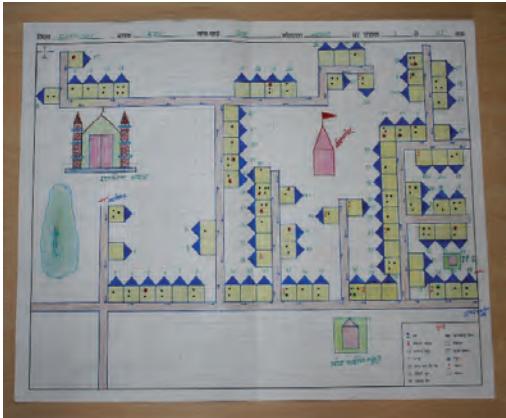
their assigned census blocks and aggregated and analyzed the CMCs’ register data. They also worked with local health officials on vaccination campaign microplans, monitored routine immunization sessions, trained NPSP vaccinators on interpersonal communication techniques, and organized health camps and children’s rallies. They provided monthly reports to their supervisors. During polio campaigns, BMCs monitored vaccination booths and house-to-house activities supported by CMCs and provided feedback.

**FIGURE 1. Social Mobilization Network (SMNet) Pyramid**



Source: Reference 10.

**FIGURE 2. Sample Community Map of Vaccine-Eligible Children**



**Some community leaders actively discouraged—and even prohibited—participation in vaccination campaigns due to misinformation and rumors.**

The SMNet **District Mobilization Coordinators (DMCs)** trained the BMCs, developed communication plans, and monitored routine immunization sessions between campaigns. During campaigns, they monitored the vaccination booths and house-to-house visits, provided feedback, and updated campaign immunization records. They also collected, aggregated, and analyzed the BMCs' monthly data and compiled district-level assessment reports for the Sub-Regional Coordinators (SRCs) who, with the CGPP Secretariat and state-level UNICEF staff, reviewed and analyzed data from the larger SMNet perspective.

### PROGRAMMATIC CHALLENGES AND INNOVATIVE SMNET SOLUTIONS

The government's Universal Immunization Program, launched in 1985, and the Pulse Polio Program called for immunizing *every* child under age 5 with at least 3 doses of OPV.<sup>11-12</sup> Achieving that in UP alone meant that vaccinators had to reach more than 40 million children under the age of 5 in every campaign (**Box 3**). Pockets of children that had not yet been reached within UP's enormous, highly mobile population posed a significant threat to achieving this objective. Nomadic families moved frequently within UP and across the Nepal border. Cultural and language barriers meant children from disenfranchised families, such as bricklayers, slum dwellers, non-Hindi-speaking Muslims, and Scheduled Castes/Tribes (historically

### Box 3. Sheer Numbers

Achieving the near universal coverage needed to interrupt transmission required immunizing massive numbers of children. In a 1998 National Immunization Day campaign, 134 million children in India were immunized in a single day.<sup>13</sup> In 2011, nearly 2.3 million vaccinators immunized roughly 172 million children under 5 during each of 2 National Immunization Days.<sup>3</sup>

disadvantaged families), were often unrecognized, unreachable, and unimmunized.

Furthermore, as mentioned previously, children in UP often needed more than the recommended 4 doses of OPV to be fully protected. Local suspicion and resistance to vaccinations grew when children were paralyzed by polio despite having received more than 4 vaccine doses. Misinformation and rumors also prompted some community and religious leaders to actively discourage, and even prohibit, participation in vaccination campaigns.

In addition, the government's intensive focus on polio vaccination—seemingly to the exclusion of providing much-needed basic health and sanitation services in these designated high-risk communities—provoked frustration and campaign fatigue and provided fertile soil for suspicion. Some communities believed the polio campaigns were a continuation of coercive population control measures from the 1970s when the government forced people with 2 or more children to be sterilized. These factors prompted some families to leave home or send their children away during the well-publicized campaigns while others held the polio program hostage, refusing to vaccinate their children until other health services such as sanitation, clean water, and oral rehydration salts/solutions to prevent diarrheal dehydration were made available. In extreme cases, resistant families verbally threatened the campaign workers or threw garbage or boiling water at them.

In response to these challenges, SMNet partners created linkages between the community and government to address local concerns. The SMNet was designed to address various goals, including: addressing parental concerns; understanding reasons for refusing vaccination; creating trust between polio eradication personnel and local residents; tracking missed children

including newborns; and identifying missed subpopulations. One common thread in the innovative solutions that the SMNet implemented to achieve these goals was the use of data to inform the approaches. In addition, the SMNet implemented a range of creative communication and social mobilization activities to build community trust and promote vaccination.

### Use of Data to Inform Evidence-Based Approaches

The use of data for program planning and implementation was not new—decision makers used data from NPSP’s AFP Surveillance weekly reports to determine the vaccination status of children with AFP, which helped them identify gaps in coverage, prioritize districts and blocks, and direct limited resources strategically. They used coverage and performance data from national and subnational campaigns to assess campaign achievements and plan for the future. As campaign monitoring improved, UP campaign implementers used real-time data in nightly government-led debriefings to support rapid situation analysis and problem-solving.

Despite all this rich data, there were still gaps, particularly at the household level. The SMNet implemented several innovative data collection and use strategies to inform planning, implementation, resource allocation, and message design, including community maps, household registers, a 2-phased vaccination outreach approach, and ongoing community monitoring.

#### Community Maps

The SMNet CMCs began to create community maps (Figure 2) to collect data describing social mobilization activities and child immunization status at the household level. That data were then aggregated monthly at the block, district, regional, and state levels, and then used to identify gaps in implementation.

#### Household Registers

CMCs used CGPP-designed registers to collect and update household-level data during routine monthly household visits and campaigns. These data included pregnancies and vaccination histories (for all antigens in the government’s routine immunization schedule) of all children under 5 years of age, enabling CMCs to track the immunization status of individual children and newborns and identify infants and children with

missing vaccinations, particularly those consistently missed during the campaigns.

To track households with children needing vaccination, CMCs initially marked houses with children under 5 years of age with either a “P,” indicating that all children under 5 in the household were vaccinated, or an “X,” indicating that the house had at least 1 missed vaccine-eligible child. The primary goal was to reduce resistance and convert “X” houses to “P” houses.

In 2005, SMNet partners and the NPSP realized that they needed more detailed data. The “X” code representing unvaccinated children was expanded to indicate, for example, that the child was away from the village and not expected to return before the end of the campaign (XV), the child was away from the house but would return before the end of the campaign (XH), the child was sick (XS), or the family was openly resistant and refused the vaccine (XR).

This additional information facilitated more targeted responses. For example, when families refused to vaccinate their children claiming they were sick, the CMCs could bring local doctors to their homes to help convince the families that the vaccine would help—not harm—their children. At every SMNet level, this led to an evolving and increasingly sophisticated use of data and understanding of subtle types and causes of resistance, which strengthened the polio eradication effort, built capacity, enhanced quality, and promoted local ownership

As described above, CGPP secretariat and UNICEF/UP staff aggregated, analyzed, and used household data from the CMCs for decision-making at each level, and they provided feedback



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A vaccinator in Uttar Pradesh marks a house with the letter “P,” indicating that all children under 5 in the family were vaccinated.

to the field staff. This process instilled valuable skills and a sense of ownership among the SMNet mobilizers at every level.

### *Biphasic House-to-House Vaccination Outreach*

At the start, vaccinators were asked to cover very large numbers of children across wide geographic areas, identify missed children, and convince resistant households. Results showed, however, that it was impossible for the 2- or 3-person vaccinator teams to meet all these demands in the time allotted to them.

To remedy this, the government, with CGPP and other stakeholder encouragement and support, introduced A and B vaccination teams with specific and separate tasks. The A team vaccinators and CMCs visited houses first to find out how many children lived in each household, vaccinate as many of the children missed during the booth days as possible, and document any remaining missed children and households (“X”). They were actively encouraged to be honest about the numbers reached and missed. In the past, pressure to report high coverage had encouraged campaign over-reporting. The B team vaccinators and CMCs then visited all remaining “X” houses to work with the families to overcome resistance and vaccinate the missed children. This approach helped to establish more accurate denominators, used vaccinator time more efficiently, and enhanced mobilizers’ and vaccinators’ interpersonal communications skills. It also improved community mapping and informed training, microplanning, and allocation of teams and vaccine.

The field experience of CMCs and their knowledge of their communities particularly supported the B teams’ efforts. Because the households had come to trust the CMCs, they were more open to receiving and discussing their concerns with the B teams.

### *Ongoing Community Monitoring*

Over time, the partners began to value data and to invest resources into using household surveys and focus group discussions to assess and strengthen immunization knowledge, attitudes, and practices not only of community members but also of the SMNet field workers and local health workers. For example, a qualitative study showed that some CMCs and local health care providers had resisted vaccinating their own children and that local health care providers were counseling parents to avoid vaccinating

children who showed signs of even the most minor illnesses. In response, SMNet partners revised messages and training curricula and adopted more frequent and interactive training approaches to prevent misinformation.

## **Communication and Social Mobilization to Promote Vaccination**

SMNet partners recognized that relying on traditional widespread distribution of informational materials and outreach activities just before and during campaigns offered limited success given the complexity of the situation, particularly among “resistant” communities. Improved data collection and analysis led to expanded, innovative communication strategies.

### *Interpersonal Communication*

Interpersonal communication was at the core of the success of CMCs in building trust and reducing resistance to vaccination. Because vaccinator turnover was high, new vaccinators were often inadequately trained and unsuccessful in addressing families’ concerns and fears during household visits. UNICEF and the CGPP secretariat therefore led interpersonal communication training sessions during government vaccinator training programs in SMNet areas.

CMCs also built and maintained supportive local networks of community, religious, and cultural leaders, doctors, teachers, and other respected individuals. With SMNet training and support, these influential opinion leaders were able to respond effectively to local fears and misconceptions.

For example, some **religious leaders** had previously issued *fatwabs* (legal opinions or decrees issued by Muslim scholars) condemning participation in child vaccination. But after they began meeting with CMCs, they adopted SMNet messages, promoted participation in routine and campaign immunization services, and announced upcoming campaigns during worship services and meetings.

**School teachers** played a critical role in organizing SMNet school activities and mobilizing *bulawwa tolies*—children’s brigades used to encourage children’s participation in polio vaccination campaigns. As trusted sources, **doctors** also helped overcome family resistance to vaccination when their children were sick.

In addition, CMCs earned the trust of **key informants** such as barbers and brick-kiln

**Community mobilization coordinators played a critical role in reducing community resistance to vaccination.**

**Community mobilization coordinators worked with religious leaders and other influential people to promote vaccination campaigns.**

owners who interacted with migrant workers. These informants helped CMCs locate families of migrant workers who were often missed during campaigns and lost to follow up.

Directly and indirectly, **CMCs were the linchpin in building trust at the community level.** In fact, in recent years the government and other stakeholders have involved SMNet CMCs in ensuring community participation in such activities as a 2009 study comparing the immunogenicity of different doses and methods of administration of polio vaccine among children in Moradabad.<sup>14</sup> At the request of the government, the CDC, and WHO, CMCs facilitated enrollment of families and collection of multiple blood samples from children. They are credited with achieving higher-than-expected participation and a drop-out rate of less than 7%.

*Innovative Messages and Materials*

Innovative polio eradication messages and materials have been a hallmark of the SMNet, and particularly of CGPP. Continuous communication work across vulnerable communities demanded constant development of new messages and materials that were technically sound and responsive to local data, as well as sensitive



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Vaccinators conducted special outreach activities, such as at brick-kiln sites, to reach families of migrant workers in Uttar Pradesh.

to the communities' attitudes and concerns and meaningful for local audiences.

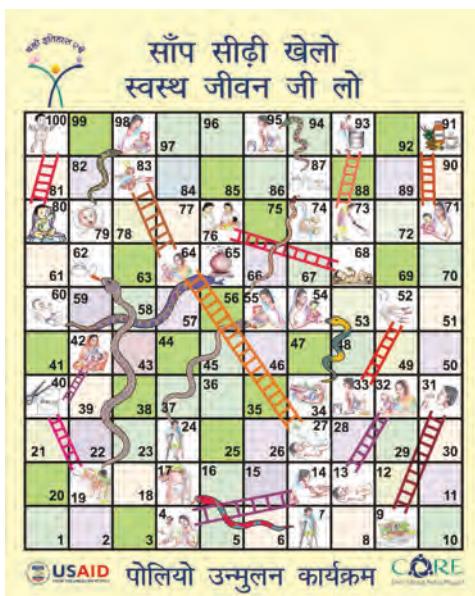
**Creative behavior change messages and materials have been a hallmark of the SMNet.**

Although a broad range of attitudes persist and it is difficult to generalize across communities, in general, local attitudes about OPV shifted from early acceptance, to suspicion and resistance, and then to passive acceptance and signs of growing apathy. Each of these stages required a different communication and social mobilization approach to which the SMNet responded.

Mobilizers from different high-risk, resistant communities met to share challenges and solutions. Insights into complex local attitudes prompted new approaches to overcoming resistance, including messages tailored to specific social and religious groups and their concerns. These were incorporated into creative educational materials, street theater, puppet shows, and other activities promoting immunization and other relevant behaviors, such as handwashing to prevent spreading the poliovirus.

Polio-related materials from the SMNet included:

- Comic books
- Games
- “Science of Polio” video
- PowerPoint presentations
- Picture-based behavior change training modules that CMCs used with mothers during health education sessions
- “Frequently Asked Questions” handout



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The Core Group Polio Project produced a “Snakes and Ladders” board game with a health theme to encourage children and families to choose positive health behaviors, such as polio vaccination.



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On vaccination booth days, children in Uttar Pradesh encouraged people to vaccinate their children.

- Congratulatory cards for new mothers with reminders to protect their babies with the first “zero” polio dose
- Illustrated, scented soap strip packets encouraging handwashing

Eventually CGPP incorporated other health messages addressing issues such as handwashing and sanitation into their behavior change materials. For example, CGPP designed a game based on the traditional Indian “Snakes and Ladders” game but with game board illustrations promoting immunization and other health-seeking behaviors and discouraging unhealthy practices. Squares illustrated with positive health-seeking behaviors are linked with a ladder; landing on these squares literally gives the player a boost up in life. On the other hand, squares illustrated with unhealthy behaviors are linked with snakes that force players back to positions farther away from the winning square.

A mix of sources informed message development. Research conducted among community members and mobilizers, in particular, provided valuable data. For example, families often did not save the immunization and child health cards distributed by the health system. In response, CGPP produced special bags for families to store the cards and introduced new messages encouraging families to keep their children’s cards for 5 years.

The partners also produced specific messages focused on getting children vaccinated *wherever they are* in response to NPSP data showing that 15% of polio cases occurred among migratory populations. CGPP adopted and incorporated key messages from the Global Polio Eradication

Initiative and “Facts for Life” messages developed by UNICEF and other UN agencies.

SMNet behavior change communication experts also integrated and field tested local artistic forms and linguistic expressions into key messages to make them relevant to local culture. UNICEF credits CGPP materials with being particularly well developed.

UNICEF and CGPP frequently provided feedback on prototypes and adopted each other’s final behavior change and training messages and materials. Typically, materials were tested at both district and community levels. The materials were produced locally and incorporated logos of all partners. Training workshops gave CMCs and BMCs opportunities to discuss and learn to use new materials. An Information-Education-Communication working group focusing on routine immunization materials was established to better systematize and harmonize design and production processes, particularly as the SMNet worked to integrate polio communication materials with routine immunization and other health-seeking behaviors.

### Child Mobilizers

As early as 2000, CGPP started involving school children to encourage their families to vaccinate their younger siblings. Later, groups of children marched through their communities before campaigns, creating a celebratory atmosphere and encouraging people to protect their children’s health by getting them vaccinated. Over time this activity was further refined by the SMNet, and the children’s groups became known as *bulawwa tolies* (“calling teams”).

As mentioned above, CMCs worked closely with teachers to engage school children in the polio effort. CGPP recently introduced school programs to educate children about the links between hygiene, sanitation, and health. The program also encourages students to motivate their families to practice good hygiene in their homes, as well as participate in immunization activities.

“Fun Classes” were also recently introduced in more than 500 schools using entertainment formats, coloring books, and class discussions to raise children’s awareness about polio, immunization, handwashing, and sanitation. *Kukru-ku* (referring to the “cock-a-doodle-do” morning wake-up call of a rooster) rallies promote use of latrines and discourage open defecation. Children parade through the streets celebrating

**Children’s groups known as *bulawwa tolies* mobilized families to vaccinate their children.**

the value of toilets and putting coveted CGPP-designed nameplates on each house that has its own indoor toilet.

### *Broader Health Initiatives*

Faced with long-standing and serious health problems, such as diarrheal diseases, malaria, tuberculosis, malnutrition, and lack of sanitation, communities in UP began questioning why the government regularly provided OPV but seemingly remained inattentive to other urgent challenges. These questions and unmet needs contributed to community suspicion and resistance to polio vaccination.

In the first 2 years of the SMNet, CGPP launched health camps and sanitation drives to address community concerns. Before polio campaigns, government health workers and specialized health providers participated in health camps in public areas outside mosques, schools, and other village sites in high-risk areas. The health camps offered services including antenatal care, routine immunization, and distribution of oral rehydration salts (ORS). Soon the government and other stakeholders began conducting health camps in districts that were not covered by the SMNet while continuing to support CGPP and UNICEF health camps.

Sanitation drive activities ranged from collecting garbage to cleaning city drains and building latrines. Funding for these activities was available only in 2003, but they built local confidence in the health system, and the activities did continue in some areas. Subsequently their value was recognized in the government's "107 high-risk block plan" introduced in 2010 to maximize polio vaccination operations in the 107 high-risk blocks of UP and Bihar.<sup>15-16</sup>

## **OPERATIONAL CHALLENGES AND STRENGTHS**

The GPEI mandate to "chase and contain" the highly mobile poliovirus posed new challenges to CGPP partners who were used to long-term integrated community health programs. The partners could add polio activities to the child health services that they were providing in several districts. However, they were not working in all communities and did not have capacity to serve, or monitor progress in, all the high-risk communities. The changing epidemiological situation required levels of flexibility and responsiveness beyond the resources of some of the

partners, particularly as growing resource constraints and donor fatigue affected the partners.

There also was no precedent to inform development of long-term partnerships between NGOs and the government, and there were concerns about effectively managing and coordinating large numbers of staff. CGPP's size, involving more than 1,000 people serving hundreds of thousands of families in very high-risk communities, was unique among NGO programs. Getting started involved understandable growing pains around coordination and interorganizational trust; this delayed initial development of the SMNet.

Furthermore, while the structure of the SMNet contributed to its success, it also posed challenges. Each partner had to follow its internal organizational requirements, which occasionally caused delays. Waiting to get approval from upper-level offices hindered rapid responses to unexpected needs for the partner directly involved, and it also, in some cases, had ramifications throughout the SMNet. This was especially true when decisions related to time-sensitive issues of community coverage or campaign support.

Staff salary issues also affected the partnership and required joint action and decisions. In particular, UNICEF offered better remuneration than CGPP partners. CGPP and UNICEF initially agreed to pay comparable salaries. For some years, the infusion of fresh funds allowed CGPP to keep salaries reasonably on par with UNICEF's, but it became difficult for CGPP to maintain this agreement over the long term due to fluctuations in funding, resources, and priorities.

The SMNet implemented a number of management approaches to resolve these challenges—ranging from transparent communication between all staff levels and stakeholders and defining clear roles of each partner to promoting a unified identity and creating a supportive work environment.

### **Top-Down and Bottom-Up Communication Approaches**

Continuous and transparent communication and ongoing data-sharing among all SMNet levels, from grassroots CMCs to high-level policy-makers, helped to ensure that all partners became aware of any field challenges without delay and responded rapidly with appropriate policies and resources. This contributed to trust

**The SMNet gained the trust of communities by responding to their demands for broader health initiatives.**

and respect both within the SMNet and the communities. Within the SMNet, this fostered ownership and participatory approaches to identifying and solving problems.

A somewhat similar system developed between the CGPP Secretariat and UNICEF's SMNet representative at the state level and the government, NPSP, USAID, and WHO at state, national, and regional levels. The SMNet's data use and transparency gave the SMNet spokespersons credibility and the communities a powerful voice. Invitations for SMNet representatives from CGPP and UNICEF to speak at higher-level immunization program coordination, policy, and technical meetings increased. Conversely, timely information from the government and donors regarding campaigns, new vaccines, innovative best practices, and emerging strategies was communicated rapidly back to field workers and their communities.

### Clear Roles, Responsibilities, and Teamwork

SMNet partners had to trust each other and prioritize and coordinate common actions and goals. Eventually they drafted the document, "Joint Instructions to the Field," which clearly articulated each partner's roles and responsibilities at every level. This document helped capitalize on the partners' different strengths and minimized confusion, overlap, and misunderstandings.

Formal meetings with clear structures, agendas, and minutes also facilitated coordination and ensured common and timely understanding of program developments and needs. During typical meetings, the partners reviewed previous decisions, recent performance, state-level campaigns, immunization and surveillance data, and the current status of polio eradication. They also discussed community- and CMC-related issues and logistics planning.

Although CGPP and UNICEF worked in the same districts, they agreed to divide up the coverage areas. At the UP government's suggestion, the partners evaluated each district's needs and partner presence. If a partner working in a high-risk area was unable to take on polio activities, the other partners were generally willing to shift resources and fill gaps. In certain cases, the partners identified and engaged new partners already working in those areas. An NGO Assessment Tool emerged from this activity to

identify appropriate and credible local NGO partners in new areas.

### Flexibility

There was no blueprint to guide the innovative structure or development of the SMNet or how it should function. CGPP, UNICEF, and the local NGOs working in partnership with them created the SMNet iteratively, experimenting with new ideas to address management and technical challenges, learning from field experiences, and adapting to meet expressed needs. This flexibility and the trust that developed over time allowed the SMNet to operate efficiently and effectively.

In addition to organizational flexibility, the partners had an unusual level of technical program flexibility within the context of GPEI and government polio eradication strategies and immunization coverage goals. When CGPP was first established, everyone expected polio would be eradicated within a few years. Funding was awarded based on annual work plans rather than on a longer-term, detailed implementation plan with clear activities, indicators, and objectives that is typical of USAID child health grants. The resulting flexibility was a golden opportunity for experimentation; the project's emphasis on quality data collection, analysis and monitoring, and constant communication with stakeholders allowed the partners to identify and disseminate successful innovations.

### Unified Identity

Over time, the partners worked in increasingly close coordination and cooperation and publicly presented consistent messages with one SMNet voice. They also promoted all materials with the SMNet brand including all partners' logos, regardless of which partner was the original author—an unusual step for organizations that typically compete for funds and use their own unique branding to highlight any achievements that they can claim.

The decision to work jointly to address common problems, make common presentations, and represent the partnership as a unit came with maturation of the SMNet. As visible, genuine collaboration at the central level grew, it fostered trust, cooperation, and partnership at the SRC, BMC, and CMC levels between both organizations. The collaborative spirit also encouraged the partners to respect each other's unique capacities, share their experiments, successes and failures, and adopt each other's

**The SMNet partners worked together to ensure vaccination coverage in all high-risk areas.**

innovative activities and materials, all under the umbrella of the SMNet brand.

### “War on Polio” Mentality

Ultimately the SMNet partners began to view the polio eradication effort as a “war” against the virus, adopting the attitude that they would do whatever it took to beat the enemy. This approach to confronting the virus—as a constant emergency requiring rapid responses—helped to energize, mobilize, and unite the field workers. As challenges emerged, rather than trying to shift responsibility or assign blame, the partners worked together to overcome each challenge.

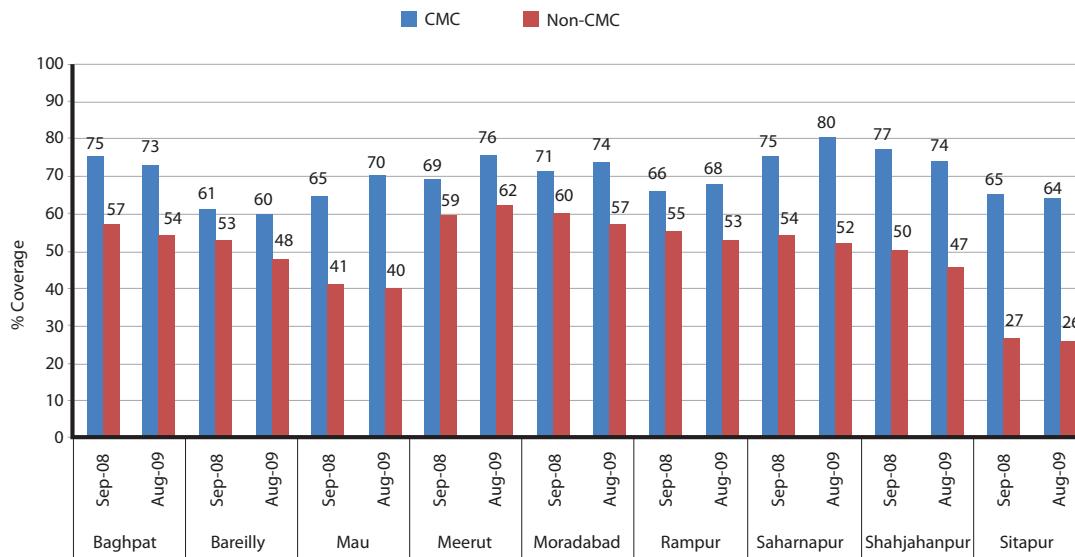
### Supportive Work Environment

When speaking about their experiences with the polio eradication efforts in India, many SMNet staff describe their sense of ownership and pride in their contributions to children’s health and polio eradication. They also refer to a family atmosphere that the SMNet fostered, which

contributed to deep loyalty and a surprising level of retention given work demands. The field staffs’ dedication, commitment, and quality of work far surpassed rational expectations, even for staff in the most impoverished regions of UP.

At the same time, special events held to recognize the contributions of CMCs were important as both frequent campaigns and significant outbreaks continued. In 2006, inspired by similar activities in other immunization and health programs in UP, CGPP and then UNICEF introduced jamborees to boost morale and counter worker fatigue. The day-long events, attended by political and cultural leaders and dignitaries, saluted the field staff’s work and gave them the opportunity to socialize, play games, enjoy a catered meal, and show off their talents with short skits and music and dancing displays. CMCs also received certificates and trophies honoring their hard work and contributions to polio eradication and child health in their communities.

**FIGURE 3. OPV Coverage in Areas With and Without SMNet CMCs, High-Risk Districts of Western Uttar Pradesh,<sup>a</sup> September 2008 and August 2009 Vaccination Booths**



<sup>a</sup> Muzaffarnagar District is not included because it did not have a vaccination booth in August 2009.

Abbreviations: OPV, oral polio vaccine; SMNet, Social Mobilization Network; CMCs, Community Mobilization Coordinators.

### Leadership

SMNet was fortunate in having leaders who fostered and supported these technical and managerial innovations, gave staff ownership and latitude to take risks and experiment, and prioritized transparent communication, feedback, and shared resources. While staff at each level played different roles, the leaders treated and respected all staff equally and encouraged everyone to share their ideas and input.

### SMNET CONTRIBUTIONS TO ERADICATING POLIO IN UP

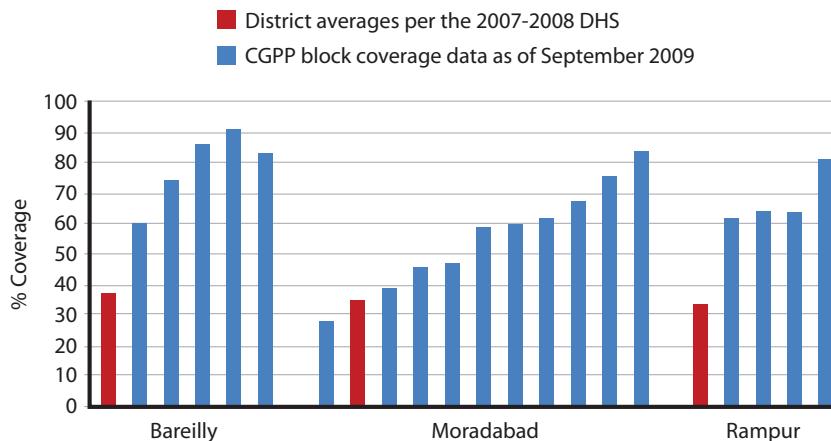
Analysis of immunization coverage data in India indicates that the SMNet has had an impact on OPV coverage in highly resistant communities. UNICEF and CGPP do not cover entire districts (many have populations of well over 1 million). Rather, in coordination with the government at the local and state level, they take responsibility for the most underserved, high-risk blocks in poorer-performing districts. Therefore, the CMC-assigned communities in which SMNet partners work are typically those with the highest levels of resistance and low immunization coverage. Despite this, immunization coverage data from September 2008 and from 1 year later in August 2009 show that the CMC-assigned areas achieved

substantially higher proportions of OPV-vaccinated children at vaccination booths than areas without CMCs (Figure 3).

The polio eradication effort is frequently criticized for possibly emphasizing polio in ways that distract from, and perhaps undermine, overall routine immunization services. However, all SMNet CMCs actively promoted and supported routine immunization and other positive health-seeking behaviors in their assigned households and communities. CMCs tracked all scheduled child vaccinations in their household registers and followed-up on all missed doses.

The third dose of the diphtheria, pertussis, and tetanus vaccine (DPT3) is generally an accepted proxy for full immunization. Figure 4 compares DPT3 coverage rates among children 12 to 23 months of age in SMNet blocks covered by the CGPP in Bareilly, Moradabad, and Rampur districts with the annual district-wide average for DPT3 coverage for the same age cohort in each of these same districts. The government and WHO recognized these 3 UP districts as very high GPEI priorities. Although the CGPP CMCs work in the districts' highest-risk areas and often serve communities with the poorest access to government services, all but 1 CGPP block had higher DPT3 coverage than the district as a whole (Figure 4).

**FIGURE 4. DPT3 Immunization Coverage Among Children Ages 12–23 Months in 3 High-Risk Districts of Western Uttar Pradesh, by District and CGPP blocks**



Abbreviations: DPT3, 3<sup>rd</sup> dose of the diphtheria, pertussis, and tetanus vaccine; CGPP, Core Group Polio Project; DHS, Demographic and Health Survey.

As further evidence of the SMNet's recognized successful approach, when a polio case was identified in West Bengal in 2011, the government and other stakeholders turned to the SMNet, requesting CGPP to support the rapid response, particularly at the household and community level. Following CGPP's engagement, no additional cases were found.

### Plausibility of the SMNet's Contribution to Eradication

It is fair to ask how much of the polio eradication success in India can be attributed to the SMNet, given the contributions of other components, including a new highly effective monovalent vaccine. Historically, epidemiologic data implicates the crucial role that hard-to-reach children in inadequate sanitation environments play in perpetuating epidemics.<sup>17</sup> SMNet activities focused on 3 of the 4 elements of the GPEI strategy to eradicate polio—routine, supplemental, and mop-up immunization. Data reveal that SMNet engagement resulted in better coverage for polio and other childhood vaccines, despite—or perhaps because—they focused on higher-risk, difficult-to-reach communities (Figures 3 and 4).

Moreover, the response to an outbreak in West Bengal using the same approach was largely credited with snuffing out further transmission there. While of course it is not possible to say definitively that the SMNet was crucial for polio eradication in India, it certainly seems quite plausible. Indeed in countries such as Nigeria and Pakistan, where polio eradication remains stubbornly elusive, the major impediment appears to be local attitudes and suspicion toward program efforts by the local population.<sup>18</sup> Local adaptation of some SMNet approaches might be very helpful in ongoing eradication efforts.

### SYSTEM-WIDE CONTRIBUTIONS OF THE SMNET

Although India is officially polio free, SMNet efforts have strengthened a wide variety of NGOs and mobilized community members who continue to support and promote routine immunization coverage and access to primary health services. In addition, the SMNet helped strengthen local capacity among hundreds of CMCs, the majority of whom are women. Many CMCs describe the experience as life-changing.

CMCs have participated in networks with Anganwadi workers (community workers who link families with organized health care services), auxiliary nurse midwives, private practitioners, and local traditional birth attendants to support not only immunization but also other aspects of maternal and child health. They express pride in contributing to winning the “war on polio” and improving child health and say they have gained valuable skills and self confidence. Many returned to school to study information technology, and at least one went to medical school. There is now a critical mass of female mobilizers with health knowledge and communication skills who can support other health efforts.

While campaigns are admittedly costly, and costs of the GPEI have exceeded initial expectations, the return on the investment in terms of lives saved, paralysis averted, and productivity improved will grow every year. Already, an estimated 5 million children worldwide have been saved from crippling, and possibly life-threatening, paralysis due to polio since the global eradication effort began.<sup>19</sup> Other benefits include strengthened NGO and community-based health promotion/disease prevention programs and activities, as well as a model to support effective collaboration between NGOs, government, and multilateral agencies, such as UNICEF.

### LESSONS LEARNED FROM THE SMNET EXPERIENCE

The SMNet experience offers important practical and conceptual lessons for health communication and social mobilization, as well as for partnerships in global health. Namely, the partners implemented community-based activities grounded in:

1. Sensitivity to community concerns and demands, good-faith efforts to respond within constraints of available resources, and ongoing, transparent, 2-way communication with communities
2. Strategic use of data at every level, from planning and message development to results monitoring
3. Use of the CGPP secretariat model for management, coordination, quality assurance, and timely dissemination of information internally and externally

4. A wide variety of innovations, including the mobilization of local CMCs, use of household registers, engagement of community leaders, use of child motivators and children's parades, introduction of health camps and support of related health interventions, such as sanitation, hygiene education, and maternal health

While polio eradication in India presented an unusual situation, which was conducive to a campaign mentality with resources that allowed for more intensity and innovation than most health programming, we believe that some of these lessons may be applicable not only to other campaign contexts but also to broader health programming.

**Competing Interests:** None declared

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## ORIGINAL ARTICLE

# Meeting the community halfway to reduce maternal deaths? Evidence from a community-based maternal death review in Uttar Pradesh, India

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Even in the face of vigorous commitment to improving maternal health services in India, inadequate staffing, supplies, and equipment at health facilities, as well as transportation costs and delays in referral, appear to contribute to a substantial proportion of maternal deaths in a representative district in Uttar Pradesh.

## ABSTRACT

**Background:** Uttar Pradesh (UP) is the most populous state in India with the second highest reported maternal mortality ratio in the country. In an effort to analyze the reasons for maternal deaths and implement appropriate interventions, the Government of India introduced Maternal Death Review guidelines in 2010.

**Methods:** We assessed causes of and factors leading to maternal deaths in Unnao District, UP, through 2 methods. First, we conducted a facility gap assessment in 15 of the 16 block-level and district health facilities to collect information on the performance of the facilities in terms of treating obstetric complications. Second, teams of trained physicians conducted community-based maternal death reviews (verbal autopsies) in a sample of maternal deaths occurring between June 1, 2009, and May 31, 2010.

**Results:** Of the 248 maternal deaths that would be expected in this district in a year, we identified 153 (62%) through community workers and conducted verbal autopsies with families of 57 of them. Verbal autopsies indicated that 23% and 30% of these maternal deaths occurred at home and on the way to a health facility, respectively. Most of the women who died had been taken to at least 2 health facilities. The facility assessment revealed that only the district hospital met the recommended criteria for either basic or comprehensive emergency obstetric and neonatal care.

**Conclusions:** Life-saving treatment of obstetric complications was not offered at the appropriate level of government facilities in a representative district in UP, and an inadequate referral system provided fatal delays. Expensive transportation costs to get pregnant women to a functioning medical facility also contributed to maternal death. The maternal death review, coupled with the facility gap assessment, is a useful tool to address the adequacy of emergency obstetric and neonatal care services to prevent further maternal deaths.

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## INTRODUCTION

Despite progress in recent decades, India has the largest number of maternal deaths of any country in the world.<sup>1</sup> Most maternal deaths in India are concentrated in 7 states (Assam, Jharkhand, Madhya Pradesh, Orissa, Rajasthan, Uttarakhand, and Uttar Pradesh). Uttar Pradesh (UP) has the second highest maternal mortality ratio (MMR) among the 7 states, at 359 maternal deaths per 100,000 live births, compared with the national average of 212 maternal deaths per 100,000 live births.<sup>2</sup>

The Government of India has placed special emphasis on improving maternal, newborn, and child health (MNCH) through policies and program guidelines.<sup>3</sup> One major policy initiative includes increasing institutionalization of deliveries facilitated through the Janani Suraksha Yojana (JSY) program—a national conditional cash transfer scheme started in 2005 that provides eligible women with cash incentives for giving births in an institution.<sup>4–6</sup>

**The maternal death review is a tool to help programs improve maternal services by understanding the underlying factors leading to maternal deaths.**

Recently, the government issued national guidelines for states to carry out maternal death reviews at both community and facility levels.<sup>7</sup> However, implementation on the ground has been extremely slow and challenging.<sup>8</sup> Thus, expected results have not been achieved, and the country is still at a distance from achieving Millennium Development Goal 5 (MDG 5)—reducing India's MMR to 109 by 2015.<sup>2,9</sup>

The maternal death review (MDR) is a tool used in many countries to understand the underlying factors leading to maternal deaths, providing programs with information to improve services and reduce MMR.<sup>10,11</sup> In an effort to analyze the reasons for maternal deaths for appropriate local intervention, the Government of India introduced Maternal Death Review guidelines in 2010,<sup>7</sup> based on the experience of implementing such reviews in Kerala, Tamil Nadu, and West Bengal.<sup>12</sup> However, implementation has not been initiated in most of the districts.<sup>8</sup>

This study was conducted to highlight key operational issues in maternal death identification in Unnao District in UP and to provide an in-depth understanding of the factors and chain of events leading to maternal deaths in the community. This information can be used to advocate policies that would enable the Government of UP to take corrective measures. The relevance of this study extends to other states in India where a similar MDR process is underway.

## METHODS

We conducted a health facility gap assessment in 15 of 16 district and block health facilities in Unnao District in UP using an instrument developed specifically for this study.<sup>13</sup> Facility standards for basic emergency obstetric and neonatal care (BEmONC) and comprehensive emergency obstetric and neonatal care (CEmONC) are specified in the 2012 Indian Public Health Standards<sup>14,15</sup> (see *Box*). We also asked community workers to identify maternal deaths occurring in the district between June 1, 2009, and May 31, 2010, and conducted verbal autopsies with families of a randomly selected subsample of the identified maternal deaths to capture factors and processes leading to the deaths.

### Study Site and Demographic Profile

We chose UP as the study state because it has the second highest MMR in India and it was one of

**TABLE 1.** Demographic Characteristics, Unnao District, Uttar Pradesh, 2010

Characteristic	Data
Total area (km <sup>2</sup> )	4,558
No. of blocks	16
Total population	3,110,595
Birth rate (per 1,000 people)	22.2
Estimated no. of annual births	69,055
No. of institutional deliveries <sup>a</sup>	14,488
Estimated no. of maternal deaths	248
No. of district hospitals	1
No. of Community Health Centres (CHCs)	4
No. of CHCs working as First Referral Units (FRUs)	2
No. of Block Primary Health Centres	9
No. of Anganwadi centres	2,376
No. of Anganwadi workers (AWWs)	2,573

<sup>a</sup> Data from the District Program Management Unit, Unnao, 2011.

Source: References 17,18

### Box. Basic Emergency and Neonatal Care (BEmONC) and Comprehensive Emergency Obstetric and Neonatal Care (CEmONC): Standard Service Requirements in India

According to the revised 2012 Indian Public Health Standards (IPHS), BEmONC services should be provided free of cost by Primary Health Centres and Community Health Centres while CEmONC services should be provided free of cost by District Hospitals and Community Health Centres that are designated as First Referral Units. The 2012 IPHS Standards are available at: <http://mohfw.nic.in/NRHM/iphs.htm>

BEmONC Services	CEmONC Services
<b>Antenatal Care</b>	
<ul style="list-style-type: none"> <li>• Registration (within first trimester)</li> <li>• Physical examination (weight, blood pressure, abdominal examination)</li> <li>• Ensuring consumption of iron-folic acid (IFA) tablets (100 IFA for all pregnant women or 200 IFA for pregnant women with anemia)</li> <li>• Essential lab investigations (Hb%, pregnancy test, urine for albumin/sugar) including blood grouping and pH typing, wet mount</li> <li>• Assured referral linkages for complicated pregnancies and deliveries</li> <li>• Management and provision of all emergency obstetric and newborn care for complications other than those requiring blood transfusion or surgery</li> <li>• Linkages with nearest Integrated Counseling and Testing Centre/Prevention of Parent-to-Child Transmission (ICTC/PPTCT) Centre for voluntary counseling and testing services</li> </ul>	<p>All BEmONC services plus:</p> <ul style="list-style-type: none"> <li>• Blood cross matching</li> <li>• Management of severe anemia</li> <li>• Management of complications in pregnancy referred from BEmONC</li> </ul>
<b>Intranatal Care</b>	
<ul style="list-style-type: none"> <li>• Normal delivery with use of partograph</li> <li>• Active management of third stage of labor</li> <li>• Identification and referral for danger signs</li> <li>• Pre-referral management for obstetric emergencies (eclampsia, postpartum hemorrhage, shock)</li> <li>• Assured referral linkages with higher facilities</li> <li>• Episiotomy and suturing cervical tear</li> <li>• Assisted vaginal deliveries (outlet forceps, vacuum)</li> <li>• Stabilization of patients with obstetric emergencies (eclampsia, postpartum hemorrhage, sepsis, shock)</li> </ul>	<p>All BEmONC services plus:</p> <ul style="list-style-type: none"> <li>• Round-the-clock maternal care services</li> <li>• Management of obstructed labor</li> <li>• Surgical interventions such as cesarean section</li> <li>• Comprehensive management of all obstetric emergencies (pregnancy-induced hypertension/eclampsia, sepsis, postpartum hemorrhage, retained placenta, shock)</li> <li>• In-house blood bank/blood storage center</li> <li>• Referral linkages with higher facilities including medical colleges</li> </ul>
<p><b>Newborn Services</b></p> <ul style="list-style-type: none"> <li>• Neonatal resuscitation</li> <li>• Warmth</li> <li>• Infection prevention</li> <li>• Initiation of breastfeeding within an hour of birth and exclusive breastfeeding thereafter</li> <li>• Screening for congenital anomalies</li> <li>• Weighing of newborns</li> <li>• Antenatal corticosteroids to the mother in case of preterm babies to prevent Respiratory Distress Syndrome (RDS)</li> <li>• Immediate care of low birth weight (LBW) newborns (&gt;1800 g to &lt;2500 g)</li> </ul>	<p><b>Newborn Services</b></p> <p>All BEmONC services plus:</p> <ul style="list-style-type: none"> <li>• Round-the-clock newborn care services</li> <li>• Care of very LBW newborns (&lt;1800 g)</li> </ul>

**Box (continued).**

BEmONC Services	CEmONC Services
<b>Postnatal Care</b>	
<ul style="list-style-type: none"> <li>• Minimum 6 hours' stay post delivery</li> <li>• 48 hours' stay post delivery and all postnatal services for days 0 and 3 for mother and baby</li> <li>• Counseling for feeding, nutrition, family planning, hygiene, immunization, and postnatal check-up</li> <li>• Home visits on days 3, 7, and 42 for mother and baby</li> <li>• Additional visits for the newborn on days 14, 21, and 28</li> <li>• Additional visits may be necessary for LBW and sick newborns</li> <li>• Stabilization of mother with postnatal emergencies (postpartum hemorrhage, sepsis, shock, retained placenta)</li> <li>• Timely referral of women with postnatal complications</li> <li>• Referral linkages with higher facilities</li> <li>• Timely identification of danger signs and complications and referral of mother and baby</li> </ul>	<p>All BEmONC services plus:</p> <ul style="list-style-type: none"> <li>• Clinical management of all maternal emergencies such as postpartum hemorrhage, puerperal sepsis, eclampsia, breast abscess, postsurgical complication, shock, and any other postnatal complications such as RH incompatibility</li> </ul>
<p><b>Newborn Services</b></p> <ul style="list-style-type: none"> <li>• Warmth</li> <li>• Hygiene and cord care</li> <li>• Identification, management, and referral of sick neonates, LBW, and preterm newborns</li> <li>• Care of LBW newborns (&lt;2500 g)</li> <li>• Zero day immunization–OPV (oral polio vaccine), BCG (bacille Calmette-Guerin for tuberculosis), Hepatitis B</li> <li>• Care of LBW newborns (&gt;1800 g to &lt;2500 g)</li> <li>• Referral services for newborns &lt;1800 g and other newborn complications</li> <li>• Management of sepsis</li> </ul>	<p><b>Newborn Services</b></p> <p>All BEmONC services plus:</p> <ul style="list-style-type: none"> <li>• Newborn care in district hospitals through Sick Newborn Care Unit (SNCU)</li> <li>• Management of complications</li> <li>• Care of very LBW newborns (&lt;1800 g)</li> <li>• Establish referral linkages with higher facilities</li> </ul>

Source: Reference 14

the intervention states under the Maternal and Child Health Sustainable Technical Assistance and Research (MCH-STAR) initiative to improve maternal, neonatal, child health, and nutrition policies and programs in India. We selected Unnao as the study district because it ranked in the middle range of socioeconomic status among the districts in UP (48<sup>th</sup> out of the 70 state districts), based on a composite index of 13 socioeconomic and demographic indicators.<sup>16</sup>

In 2010, Unnao District had a total population of about 3 million, with a birth rate of 22.2 per 1,000 people (Table 1).<sup>17–18</sup> An estimated 69,055 births are reported annually and an

estimated 248 maternal deaths occurred based on the MMR of 359 (308–409) in UP.<sup>2,19</sup> Although recent estimates have shown a significant drop in the MMR, by 59% at the national level between 1990 to 2007, the reduction in UP was only 12%, from 407 to 358.<sup>20</sup> Although these estimates are based on the Sample Registration System conducted by the government, they are the most reliable estimates currently available.

Unnao has 1 District Hospital (DH), 4 Community Health Centres (CHCs), of which 2 are designated as First Referral Units (FRUs), and 9 Block Primary Health Centres (BPHCs).

## Data Collection and Analysis

We asked key informants to report on all maternal deaths due to any cause in women ages 15 to 49. Key informants included auxiliary nurse midwives (ANMs) and accredited social health activists (ASHAs), who work under the Ministry of Health and Family Welfare, and Anganwadi Workers (AWWs) who work under the Ministry of Women and Child Development.

Key informants reported a total of 207 maternal deaths from all the blocks in Unnao District, excluding the 2 urban blocks of Shuklaganj and Unnao City. Of these 207 deaths, we confirmed that 153 were maternal deaths that occurred during the study period, representing 62% of the estimated 248 maternal deaths occurring in Unnao District in 2010. The AWWs reported all 153 maternal deaths, but the ANMs and ASHAs did not capture 30% of the deaths. We validated 10% of key informants' maternal death reports with families either through in-person visits or by telephone.

Of the 153 deaths occurring during the study period, we randomly selected a sample of 70 deaths, in proportion to the deaths in each block, to conduct verbal autopsies. We used a modified Maternal and Perinatal Death Inquiry & Response tool—a detailed verbal autopsy questionnaire—to capture missing links in officially recorded data and reconstruct the sequence of events to help pinpoint the exact cause of a maternal death.<sup>21</sup> We administered the questionnaire to husbands of the deceased and to women in the household for 57 of the sampled 70 cases; we subsequently found that 7 deaths were not related to pregnancy or childbirth, 2 were outside the study period, 2 cases had insufficient information, and 2 cases could not be traced (Figure 1). The recall period in all deaths was less than 1 year, as the study was conducted in the last quarter of 2010.

The completed verbal autopsy forms were reviewed by 2 obstetricians who independently assigned probable cause of death, based on available information recorded in the questionnaires related to history, events, and symptoms. If the diagnoses of the 2 obstetricians matched, we considered the diagnosis final. In cases of disagreement, a third obstetrician reviewed the form, and we considered her diagnosis final.

Approval for the study was obtained by the Institutional Ethics Committee of the Public Health Foundation of India. All interviews were conducted after obtaining written consent from

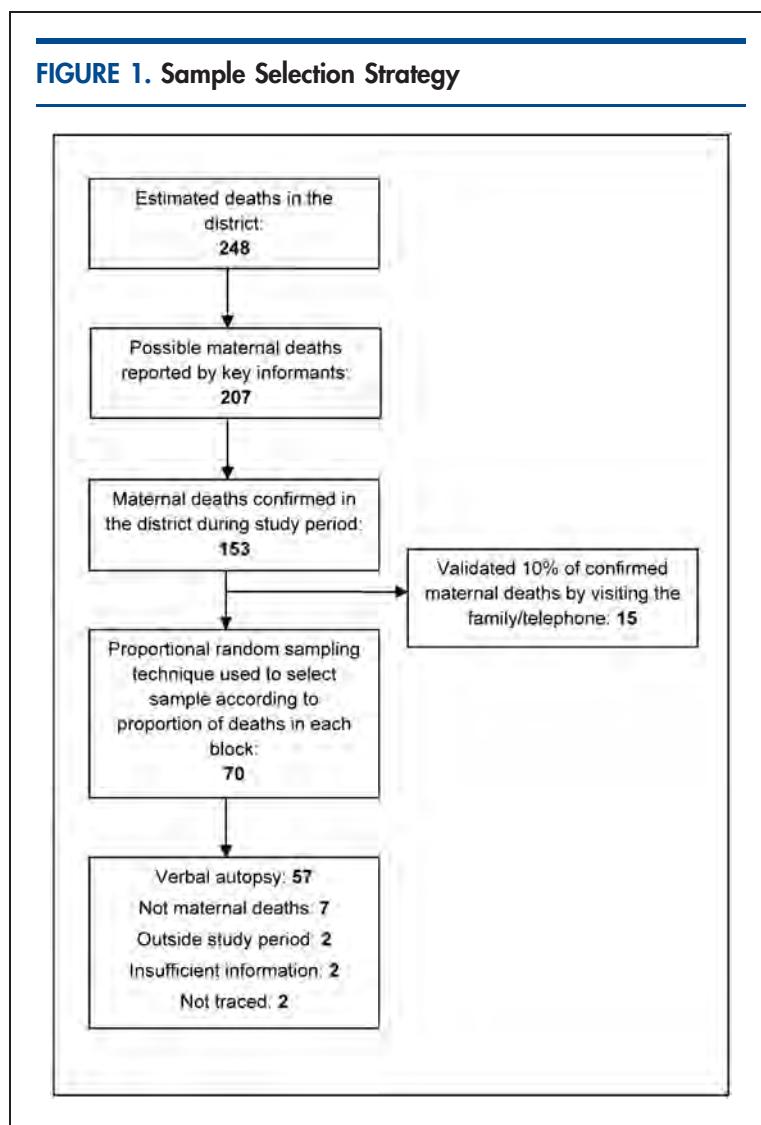
the family. Data collected was coded and analyzed, and emergent themes were documented and studied to understand their implications with respect to reducing maternal mortality. All the data were analyzed anonymously using SPSS 17<sup>®</sup>.

## RESULTS

### Demographic Characteristics of Identified Maternal Deaths

The mean age of the women in the sample of identified maternal deaths was 27.5 years (standard deviation, 4.8) with a minimum of 18 years and maximum of 38 years. Around 54% of women and 45% of their husbands were illiterate. About

**FIGURE 1. Sample Selection Strategy**



**TABLE 2.** Demographic Characteristics of Identified Maternal Deaths, Unnao District, Uttar Pradesh (n=57)

Characteristics	No. (%)
<b>Age at the time of death, mean (standard deviation), years</b>	27.5 (4.8)
<b>Women's education</b>	
Illiterate	31 (54.4)
Literate	13 (22.8)
Do not know	13 (22.8)
<b>Husband's education</b>	
Illiterate	26 (45.6)
Literate	29 (50.9)
Do not know	2 (3.5)
<b>Religion</b>	
Hindu	56 (98.3)
Muslim	1 (1.8)
<b>Caste</b>	
Scheduled Caste <sup>a</sup>	25 (43.9)
Scheduled Tribes <sup>a</sup>	1 (1.8)
Others	31 (54.4)
<b>Type of house</b>	
Kutcha	32 (56.1)
Kutcha-pucca	13 (22.8)
Pucca	12 (21.1)
<b>Toilet in the house</b>	
Yes	17 (29.8)
No	40 (70.2)
<b>Electricity in the house</b>	
Yes	17 (29.8)
No	40 (70.2)
<b>Below Poverty Line card<sup>b</sup></b>	
Yes	27 (47.4)
No	28 (49.1)
Do not know	2 (3.5)

<sup>a</sup> "Scheduled Castes" and "Scheduled Tribes" are historically disadvantaged communities.

<sup>b</sup> Can be used to access all the welfare schemes provided by the Government of India.

56% of the women lived in a Kutch house (mud and straw structures), where 70% did not have a toilet or electricity in their houses. Almost half of the women were below the poverty line, 98% were Hindu, and 44% were from the disadvantaged Scheduled Caste category (Table 2).

### Findings From the Facility Gap Assessment Basic Emergency Obstetric and Neonatal Care Facilities

All 15 of the facilities assessed should have been providing at least BEmONC services, according to government guidelines.<sup>22</sup> Our findings showed that none of the facilities met the recommended standards for BEmONC except the district hospital. Two-thirds of the facilities studied did not report treating any women with maternal complications in the 3 months prior to the study period. One-third of the facilities did not have antibiotic injections available to manage infection in the labor room. None of the 15 facilities had injectable magnesium sulphate available for management of eclampsia (hypertensive disorder), and 40% did not have parenteral oxytocin in the labor room to treat postpartum hemorrhage, while 67% did not have it in store. Misoprostol was also not available in 53% of the facilities.

None of the facilities reported treating any women for abortion-related complications. Although 24/7 normal delivery care is theoretically available in all 15 facilities, 24/7 assisted deliveries (vacuum extraction, forceps) were conducted in only 2 facilities. Nearly all (95%) of the assisted deliveries in the district were conducted in the district hospital.

Regarding neonatal care, 20% of the facilities did not have a designated newborn baby corner. Nearly three-quarters did not have a weighing scale and bulb syringe (to remove mucus), while 80% did not have an overhead radiant warmer. A functioning, self-inflating Ambu bag and face mask (for neonatal resuscitation) were not available in 93% of the facilities. About half of the facilities did not have a functional oxygen supply.

### Comprehensive Emergency Obstetric and Neonatal Care Facilities

Three of the facilities (1 district hospital and the 2 FRUs) assessed should have been providing CEmONC services, according to government guidelines. Nearly all cesarean deliveries were conducted at the district hospital.

Both the designated FRUs had an obstetrician, anesthesiologist, and pediatrician in position, but round-the-clock services were not available except in the district hospital. Two BPHCs with 24/7 delivery services did not have even a female medical officer while 7 of the BPHCs did not have a qualified staff nurse (obstetrical services are mostly provided by female medical officers and staff nurses), falling short of the 2012 revised Indian Public Health Standard (IPHS) Guidelines.<sup>15,23</sup> The facilities lacked essential equipment and instruments and the condition of the labor room, including the walls, flooring, ceiling, lighting, and water supply, was unsatisfactory. Similarly in the FRUs, the overall condition of the operating table (in 7 facilities), infrastructure (in 9 facilities), and cleanliness (in 7 facilities) was found to be unsatisfactory.

Furthermore, 40% of the facilities did not have a functional ambulance available, and among those with a functional ambulance, 47% did not have adequate funds to operate the ambulance. No facilities had referral transport available round-the-clock. Out of 9,355 deliveries reported by the facilities in the 3 months prior to the gap analysis, only 260 cases (less than 3%) were known to have been referred, which is much lower than the general norms of about 15% of women who will need either BEmONC or CEmONC services.<sup>24</sup> Although all the facilities could conduct hemoglobin estimation, 79% of the facilities did not conduct even 2 hemoglobin investigations a day. Finally, 67% of the facilities did not have any staff trained in waste management and 20% did not have a 24-hour running water supply.

### Findings From the Verbal Autopsy

Verbal autopsy revealed that 16% of the maternal deaths reportedly occurred in a private facility, 30% in a government hospital, and 23% at home, while 30% died on the way to a facility (Figure 2). Our study did not identify any abortion-related deaths, which is most likely due to underreporting by the family. Even though abortion is legal in India, many studies have shown that it is still an important cause of maternal death, due to lack of access to safe abortion services.<sup>25</sup> Of the 13 maternal deaths that took place at home, 85% of these women were illiterate, 77% had illiterate husbands, and 54% belonged to the Scheduled Caste and were below the poverty line (Table 3). Of the 17

**None of the health facilities assessed, except the district hospital, met the recommended standards for basic emergency obstetric and neonatal care.**

**TABLE 3.** Reported Place of Maternal Death by Background Characteristics

Characteristics	Place of Maternal Death, No. (%)			P Value <sup>a</sup>
	Home	On the way to a facility	Facility	
<b>Women's education</b>				
Illiterate	11 (84.6)	6 (35.3)	14 (51.9)	0.11
Literate	1 (7.7)	6 (35.3)	6 (22.2)	
Do not know	1 (7.7)	5 (29.4)	7 (25.9)	
<b>Husband's education</b>				
Illiterate	10 (76.9)	6 (35.3)	10 (37.0)	0.07
Literate	3 (23.1)	11 (64.7)	29 (55.6)	
Do not know	0 (0)	0 (0)	2 (7.4)	
<b>Religion</b>				
Hindu	13 (100.0)	16 (94.1)	27 (100.0)	0.30
Muslim	0 (0)	1 (5.9)	0 (0)	
<b>Caste</b>				
Scheduled Caste <sup>b</sup>	7 (53.9)	7 (41.2)	11 (40.7)	0.79
Scheduled Tribe <sup>b</sup>	0 (0)	0 (0)	1 (3.7)	
Others	6 (46.2)	10 (58.8)	15 (55.6)	
<b>Below Poverty Level card<sup>c</sup></b>				
Yes	7 (53.9)	8 (47.1)	12 (44.4)	0.65
No	6 (46.2)	9 (52.9)	13 (48.2)	
Do not know	0 (0.0)	0 (0)	2 (7.4)	
<b>Received Antenatal Care</b>				
Once	1 (25.0)	0 (0)	1 (6.7)	0.56
Twice	1 (25.0)	4 (44.4)	6 (40.0)	
Three times or more	2 (50.0)	4 (44.4)	8 (53.3)	
Do not know	0 (0)	1 (11.1)	0 (0)	
<b>Total</b>	<b>13 (100)</b>	<b>17 (100)</b>	<b>27 (100)</b>	

<sup>a</sup> P values < 0.05 were considered statistically significant.

<sup>b</sup> "Scheduled Castes" and "Scheduled Tribes" are historically disadvantaged communities.

<sup>c</sup> Can be used to access all the welfare schemes provided by the Government of India.

maternal deaths occurring on the way to a facility, 35% of the women and their husbands were illiterate, 41% belonged to the Scheduled Caste, and 47% were below the poverty line. Of the 27 maternal deaths that took place in the

facility, about half of the women were illiterate, 41% belonged to the Scheduled Caste, and 44% were below the poverty line. Only 15 of these 27 women (56%) had sought antenatal care at least once from the facilities.

According to family responses (available for 28 cases), only 1 woman planned to deliver at home, yet 24 of the 57 women (Table 4) delivered at home. In terms of the timing of the deaths, 9 women died before delivery and the remaining 48 women died after delivery (Table 4). Of the 48 women dying after delivery, 25% died (12) at home, 27% (13) on the way to a facility, and 48% (23) in the facility, and all 48 women died within 6 weeks or 42 days of delivery.

Based on the verbal autopsies (and, in 2 cases, medical records available from the relatives), the major direct causes of the reported deaths were: 22 cases of hemorrhage (38%), 15 cases of anemia (26%), 8 cases of sepsis (14%), 6 cases of eclampsia (10%), 4 cases of obstructed labor (7%), and 2 cases that could not be diagnosed with available information (4%). No death certificates were available to validate the cause of death.

Table 5 shows factors contributing to the maternal deaths, which can be grouped into 3 main categories using the “3 Delays Model.”<sup>26</sup>

**Delay 1 (delay in deciding to seek care):** The most common reason that families cited for not seeking care sooner was lack of available transport (28%). Another reason cited was the cost of transport. The median cost of

transport from home to the first facility was Rs. 100 (US\$1.83); from facility 1 to facility 2, Rs. 600 (US\$10.96); and from facility 2 to facility 3, Rs. 550 (US\$10.04). The mean time spent deciding to take the pregnant women to a facility was 4 hours, and average time to make arrangements was 3 hours. It is easy to see how time could be lost while families weighed all these factors.

**Delay 2 (delay in reaching adequate facility):** According to family reports, by far the most common mode of transport to all facilities was taxi/auto rickshaw/tractor. Only during transfers from the second to third facility did the families mention travel by ambulance provided by the health facility. Being sent from one facility to another (and another) adds dangerous delay. More than half the families had to borrow money to take women to the first facility, while all the families borrowed money for treatment. Although public facilities provide free care, families still had out-of-pocket expenses, such as costs for transportation and medicines (from outside pharmacy as advised by the doctor of the visited facility). The median cost of care in the first facility was Rs. 375 (US\$6.85); in facility 2, Rs. 1,500 (US\$27.39); and in facility 3, Rs. 2,500 (US\$45.66).

**Delay 3 (delay in receiving adequate care at facility):** While attention is often focused on delays 1 and 2, information provided by the MDR clearly shows that delays in receiving appropriate care once at the facility played an important role in the maternal deaths in Unnao District. Half of the women had to be taken to at least 2 facilities for management of their complications, thus losing precious time (the mean travel time between facility 1, facility 2, and facility 3 is 1.3 hours).

## DISCUSSION

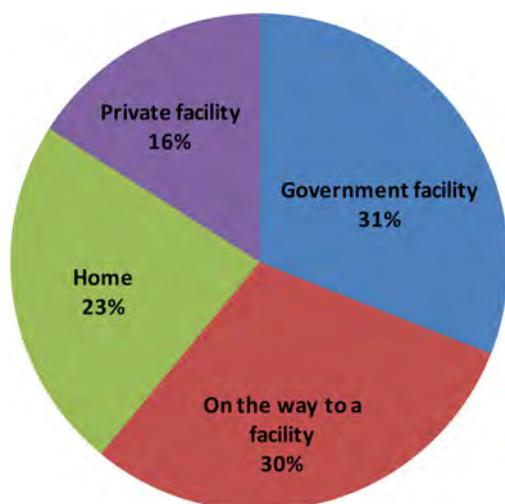
A community-based maternal death review can be a useful tool for program planners, managers, and health advocates, provided that the data are used appropriately and strengths and weaknesses of the tool are kept in mind.<sup>27</sup> Strengths of the MDR lie in the depth of information that can be gathered on the process that the pregnant woman and her family went through and the barriers that they faced. Limitations of the MDR are directly related to its strengths, as it cannot provide maternal mortality levels in the study area.

**Verbal autopsies indicated that almost half of maternal deaths occurred at a health facility.**

**Many families had to borrow money to cover costs of transportation and medical care.**

**Half of the deceased women were taken to at least 2 facilities, causing fatal delays in receiving appropriate care.**

**FIGURE 2. Reported Place of Death in Maternal Death Reviews, Unnao District, Uttar Pradesh, 2010–2011**



**TABLE 4.** Cause of Maternal Death by Reported Place of Death

	Place of Maternal Death, No. (%)			
	Home	On the way to a facility	Facility	Total
Maternal deaths	13 (22.8)	17 (29.8)	27 (47.4)	57 (100.0)
Maternal deaths after delivery <sup>a</sup>	12 (25.0)	13 (27.2)	23 (47.9)	48 (100.0)
<b>Cause of Death</b>				
Hemorrhage	6 (46.2)	7 (41.2)	9 (33.3)	22 (38.6)
Severe anemia	4 (30.8)	5 (29.4)	6 (22.2)	15 (26.3)
Sepsis	2 (15.4)	1 (5.9)	5 (18.5)	8 (14.0)
Pregnancy-induced hypertension and eclampsia	1 (7.7)	3 (17.7)	2 (7.4)	6 (10.5)
Obstructed labor	0 (0)	1 (5.9)	3 (11.1)	4 (7.0)
Unknown	0 (0)	0 (0)	2 (7.4)	2 (3.5)
<b>Total</b>	13 (100)	17 (100)	27 (100)	57 (100)

<sup>a</sup> Of 57 maternal deaths, 48 women died after delivery while 9 died during pregnancy.

**TABLE 5.** Factors Causing Delays in Accessing Appropriate Maternal Health Care (n=57)

Delay Factors	Facility 1	Facility 2	Facility 3
Sought care at and reached a facility (%)	80.7	56.1	24.6
Mean time to make arrangements/travel from the previous location to the next (hrs)	3.1	9.9	3.1
Mean travel time from the previous location to the next (hrs)	1.0	1.4	1.6
Median distance from the previous location to the next (km)	11.0	31.5	25.0
Median cost of transport from the previous location to the next (Rs) <sup>a</sup>	100	600	550
Median duration of stay (hrs)	2.0	3.0	3.0
Median cost of care (Rs) <sup>a</sup>	375	1,500	2,500
Had cash to seek care (%)	43.6	37.0	0
Borrowed money (%)	56.4	55.6	100.0
Sold assets (%)	0	3.7	0

<sup>a</sup> US\$1 ≈ Rs. 55

Although the MDR conducted in Unnao District represents only 1 district in UP, we believe it is representative of the general situation of maternal care in the state. The difficulties of identifying maternal deaths have been

reported in both developed and developing countries for decades. In our study, we took advantage of the extensive network of community health workers in India (ANMs and ASHAs) to report maternal deaths that might have

escaped official notice. An important finding from the death identification process is the high proportion of maternal deaths reported by Anganwadi workers, who are employed by the Ministry of Women and Child Development rather than the Ministry of Health and Family Welfare.

By comparing the expected number of deaths in the study area in a year to the number reported by the community workers, we estimate that we identified about 62% of maternal deaths. This is not an unusual finding. It seems that the only way to identify nearly all maternal deaths in developing countries is to do a repeat household survey and explore the absence of any person. This has been done for many years in Matlab, Bangladesh.<sup>28</sup> Unfortunately, it is too expensive and time consuming to do this for a large area (such as an entire district in UP). Moreover, precise data on the MMR are not needed to identify and address problems in the health system, as our data show.

Clearly the ability of verbal autopsy to identify exact cause of death is limited. An unusually high level (even for India) of maternal deaths was attributed to anemia (26%), which may partly represent deaths related to hemorrhage. Our experience confirmed that of many earlier researchers who found that medical causes of many maternal deaths were not reported, even when a variety of community methods were used.<sup>29</sup> We are aware that the distribution of medical causes of death is inexact in this data set, but it does provide an idea about the major causes of maternal death in the community, for which an appropriate strategy can be formulated. This is consistent with findings in other studies that found that verbal autopsies have limited validity in the attribution of maternal deaths to single specific medical causes and that multiple causes of death should be considered in determining program priorities.<sup>29,30</sup>

This study revealed several important findings in terms of the maternal death reporting process. One is that very few maternal deaths were reported by the government health facilities studied. A common explanation for this might be that women with complications stay at home and either die there or on the way to a facility. Our data, however, show that this is not a valid explanation, as many women are reported to have died in facilities, but the community workers—not the facilities—reported these deaths. A

potential reason that facilities may underreport maternal deaths could be to avoid investigation and punitive action by higher authorities. Under the new MDR guidelines, the Government of India has clearly pronounced a “no punitive action” policy but how much this has eliminated apprehension is yet to be seen. This is clearly an area for further study.

Our study also revealed important areas of the health service delivery system that could be strengthened to reduce maternal mortality, particularly ensuring that facilities provide the appropriate level of emergency obstetric and neonatal care services and that the referral system is efficient and effective. Even First Referral Units with qualified specialists did not manage complications of pregnant women due to such factors as lack of blood or unavailability of staff, and instead transferred the women to the district hospital. In most cases, families tried desperately to obtain medical care for the women, traveling to one, then a second, and often a third, medical facility. Not only did this consume precious time and money (often borrowed), but also many women and their babies died along the way. Our data also highlight the fact that, even after recognition of a complication by health staff, women were referred to the next higher level of facility in the hierarchy—that is, from BPHC to CHC to district hospital—rather than directly to a facility where appropriate resources were available to manage the complication.

Finally, our findings indicate that a woman’s family spends twice the amount in seeking care as that given by the government to pregnant women under the Janani Suraksha Yojana (JSY) scheme that aims to promote institutional deliveries. There are nearly 8.37 million JSY beneficiaries in India—about 37% of whom are in UP. In UP, institutional deliveries constitute 47%, and home deliveries 52%, of all deliveries. About 76% of women in UP were aware about the JSY scheme and 38% of the JSY beneficiaries belong to households that are below the poverty line. Among JSY beneficiaries in UP, 72% of the mothers received money (Rs. 1,400 [US\$ 26.04] or more) after the institutional delivery, but only 8% of them received the amount at the time of discharge.<sup>31</sup> However, our study found that families in Unnao District, UP, spent almost Rs. 500 (US\$9.30) for transportation and care costs at the first facility, Rs. 2,100 (US\$39.06) at the second facility, and about Rs. 3,000 (US\$55.80) at the third facility.

**Anganwadi workers identified more than half of the expected maternal deaths in the district.**

**Lack of the appropriate level of care at health facilities and a poor referral system were key factors contributing to maternal deaths.**

In the case of Tamil Nadu, the government has enhanced the Muthulakshmi Reddy Maternity Benefit Scheme to Rs. 12,000 (US\$223.21).<sup>32</sup> While the top priority should be focused on improving the service delivery system, the Government of India may also consider increasing the JSY incentive while state governments can initiate and implement special schemes focused on maternal and child health to reduce maternal and infant mortality.

### Study Limitations

The MDR can tell us a great deal about the process leading to maternal deaths. However, it cannot tell us much about the level and medical causes of maternal deaths for comparison among sites or over time.<sup>30</sup> A related limitation concerns the distribution of clinical causes of maternal death. Another weakness of the MDR is that information about reasons for delay comes from key informants such as family members, who might be less likely to attribute delays in seeking services to hesitation on the part of the family.

In our study, we know that the reported cases are not representative of all maternal deaths, because no abortion-related deaths were identified. There may also be other, less obvious biases. Furthermore, we obtained information on only one-third of identified maternal deaths. Nevertheless, the cases we followed were selected randomly from the sample of identified maternal deaths, and our findings on reasons for delay were so consistent that we believe they are representative.

### CONCLUSION

Combining data gathered during interviews with families of deceased pregnant women with information gathered during facility gap assessments provides a valuable picture of what families face when a woman develops a serious obstetric complication. Our findings indicate that the expense of transporting a pregnant woman to a functioning medical facility is one of the major contributing factors to maternal death. Life-saving treatment of obstetric complications is also generally not offered at the appropriate level of government facilities and an inadequate referral system contributes to fatal delays in receiving appropriate care. Therefore, the government needs to focus on strengthening facilities that provide emergency obstetric and neonatal

care services and on developing a functional and effective referral system.

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## ORIGINAL ARTICLE

# Women's growing desire to limit births in sub-Saharan Africa: meeting the challenge

Lynn M Van Lith,<sup>a</sup> Melanie Yahner,<sup>b</sup> Lynn Bakamjian<sup>c</sup>

Contrary to conventional wisdom, many sub-Saharan African women—often at young ages—have an unmet need for family planning to limit future births, and many current limiters do not use the most effective contraceptive methods. Family planning programs must improve access to a wide range of modern contraceptive methods and address attitudinal and knowledge barriers if they are to meet women's needs.

## ABSTRACT

Demographic and Health Survey data from 18 countries were analyzed to better understand the characteristics of women wishing to limit childbearing. Demand for limiting (14% of all women) is less than that for spacing (25%) but is still substantial. The mean "demand crossover age" (the average age at which demand to limit births begins to exceed demand to space) is generally around age 33, but in some countries it is as low as 23 or 24. Young women often intend to limit their births, contrary to the assumption that only older women do. Large numbers of women have exceeded their desired fertility but do not use family planning, citing fear of side effects and health concerns as barriers. When analysis is restricted to married women, demand for limiting nearly equals that for spacing. Many women who want no more children and who use contraception, especially poor women and those with less education, use less effective temporary contraceptive methods. A sizable number of women in sub-Saharan Africa—nearly 8 million—have demand for limiting future births. Limiting births has a greater impact on fertility rates than spacing births and is a major factor driving the fertility transition. Family planning programs must prepare to meet this demand by addressing supply- and demand-side barriers to use. Meeting the growing needs of sub-Saharan African women who want to limit births is essential, as they are a unique audience that has long been overlooked and underserved.

## INTRODUCTION

While contraceptive use has risen to relatively high levels in many areas of Asia and Latin America and the Caribbean, it remains low in much of sub-Saharan Africa. Only about 1 in 4 women of reproductive age in Africa use a modern method of family planning,<sup>1</sup> and this proportion is substantially lower in many countries of the region. These numbers, however, do not indicate a lack of interest in family planning among women in the region.

Birth spacing is a commonly used concept in family planning programs in Africa—a concept that is often tied to a health rationale for contraception.<sup>2</sup> However, less of the literature focuses on the group of women in sub-Saharan Africa with the desire to limit (or end) childbearing, even though the proportion of limiters exceeds spacers in several countries in Africa.<sup>2</sup>

Trend data suggest that the proportion of women in sub-Saharan Africa who want to limit rather than postpone childbearing is rising steadily.<sup>3</sup> Increases in the demand for contraception, particularly in eastern and southern Africa, stem primarily from the rising proportion of women who wish to cease rather than postpone childbearing.<sup>3,4</sup> (See box for definitions of demand and unmet need.) Increasing use of contraception among these women will reduce high-risk,

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### Box. Key Definitions

**Demand for family planning** is the desire or motivation of women (or couples) to control their future fertility. Demand for spacing births exists when women would like to wait 2 or more years before their next birth, while demand for limiting exists when women say that they do not want any more children. Demand for family planning consists of both met need (current use of family planning) and unmet need.

#### Unmet Need

Unmet need for family planning\*—the percentage of women who do not want to become pregnant but are not using contraception—is the measure most commonly used to indicate potential demand. Couples with an unmet need for family planning are subdivided into 2 groups:

Women with an **unmet need for spacing** are those who are fecund (able to become pregnant) but are not using family planning and who:

- Want to postpone their next birth for 2 or more years;
- Are pregnant/postpartum amenorrheic and say that their current pregnancy/last birth was mistimed;
- Are unsure whether they want another child; or
- Want another child but are unsure when.

Women with an **unmet need for limiting** are those who are fecund (able to become pregnant) but are not using family planning and who:

- Say they do not want another child;
- Are pregnant/postpartum amenorrheic and say that their current pregnancy/last birth was unwanted, irrespective of whether they say they want another child in the future; or
- Are undecided about whether they want another child in the future.

\*MEASURE DHS recently standardized its definition of unmet need for family planning across all country surveys, including the decision to no longer include contraceptive calendar data. For countries that had previously collected calendar data consistently, revised unmet need figures are higher than under the previous definition. For countries that collected calendar data inconsistently, unmet need trends changed after revision but are now more accurately represented. Among the 18 countries with DHS data analyzed in this study, 11 did not collect calendar data (Benin, Cameroon, Ghana, Lesotho, Madagascar, Namibia, Rwanda, Senegal, Swaziland, Uganda, Zambia); 1 used calendar data consistently (Zimbabwe); and 3 (Kenya, Malawi, and Tanzania) used calendar data in some surveys but not in the most recent ones, and no changes in unmet need were made for the most recent survey. The majority of the countries analyzed were therefore not affected by the definition change. For more information, see reference 12.

**Contraceptive use to limit births has a greater impact on fertility rates than using contraception to space births.**

high-parity births, thereby contributing to the reduction of maternal mortality.<sup>5</sup> Further, meeting the needs of this group is important for 2 reasons:

1. Birth-limiting behavior has a greater impact on fertility rates than does birth spacing.<sup>6,7</sup>
2. Such behavior has been a major factor in driving the fertility transition in Africa.<sup>8</sup>

Fertility intention is an important predictor of subsequent reproductive behavior, and contraceptive use intentions are an even better pre-

dictor, particularly among women who want to limit future births.<sup>9–11</sup> Limiters may have a stronger desire to avoid pregnancy than do spacers. If a spacer has a birth earlier than planned, that birth presumably was still desired, although perhaps mistimed, and would have occurred regardless, whereas an unintended pregnancy for a limiter directly adds to the fertility rate overall.

Meeting women's reproductive intentions in the context of informed choice enables them to have the number of children they desire,

**TABLE 1.** Countries and Survey Years Included in the Analysis

Country	Survey Year
Benin	2006
Cameroon	2004
Democratic Republic of Congo	2007
Ethiopia	2011
Ghana	2009
Kenya	2008/9
Lesotho	2004 and 2009*
Madagascar	2009
Malawi	2010
Namibia	2007
Nigeria	2008
Rwanda	2010
Senegal	2010–11
Swaziland	2007
Tanzania	2010
Uganda	2006
Zambia	2007
Zimbabwe	2010–11

\* The 2004 Lesotho DHS was used for data that were not included in the 2009 DHS.

improves the health and well-being of both women and their families, and ultimately affects macro-level health and development indicators. In this article, we examine Demographic and Health Surveys (DHS) data in a sample of sub-Saharan African countries to better understand the characteristics of women who intend to limit future births and discuss how programs may better serve them to reduce unmet need in sub-Saharan Africa.

## DATA AND METHODS

This analysis focuses on DHS datasets from 18 countries in sub-Saharan Africa that were surveyed between 2004 and 2010 (Table 1). The DHS is a nationally representative household survey that explores, among other indicators,

women's demand for and use of contraception; the surveys are led by ICF Macro/MEASURE DHS, in collaboration with local institutions.<sup>13</sup>

All sub-Saharan African countries with a DHS after the year 2000 were eligible for inclusion in the analysis. We selected countries based on the presence of a sufficient number of users (25 or more) of each of the 4 contraceptive method categories included in the analysis, to allow for sufficient sample sizes. We also included high-population countries (for example, Ethiopia, the Democratic Republic of Congo [DRC]), to ensure that the analyses are representative of much of the region's population. Fourteen countries in sub-Saharan Africa were excluded due to small sample size.

We used STATA Version 9 and SPSS Version 20 to analyze the individual datasets for each country. DHS data for the 18 analysis countries were also explored through StatCompiler, particularly for common indicators such as contraceptive prevalence. The research presented here is part of a larger global analysis of DHS data that explored characteristics of users of various types of family planning methods, as well as of nonusers.

Data were weighted, and women using contraception were categorized as users of short-acting methods, long-acting reversible contraceptives (LARCs), permanent methods, or traditional methods. The LARC and permanent method categories were consistent across countries; **LARCs** comprised intrauterine devices (IUDs) and hormonal implants while **permanent methods** consisted of female and male sterilization. Since use of male sterilization is very low or nonexistent in all of the analysis countries, nearly all permanent method use consists of female sterilization.

**Short-acting methods** consisted of the pill, male and female condoms, the Standard Days Method®, diaphragms, spermicides, and injectables. (Although injectables are effective for up to 3 months, we classified them as a short-acting method, as is the norm.) The mix of short-acting methods varied slightly by country, mostly based on the presence or absence of female condoms and spermicides.

The level of detail provided in the dataset for **traditional methods** also varied by country, but these methods consisted primarily of withdrawal, periodic abstinence, and folk methods. For each country, whichever short-acting methods and traditional methods were present in the

dataset were included in the respective categories. The analysis included all women of reproductive age (ages 15 to 49). When averages across countries are presented, data are weighted by the number of women of reproductive age in the country.

## RESULTS

### Demand for Limiting Is Strong in sub-Saharan Africa, Even Among Younger Women

Although fertility desires are generally high in the region, demand for limiting (met and unmet need) is strong as well:

- Among all women of reproductive age in the analysis countries, more have a demand to space births (25%) than to limit (14%), using an average weighted by population size of women of reproductive age. However, among married women, demand for limiting nearly equals that for spacing in the analysis countries (26% versus 31%, respectively).
- 37% of all demand for family planning is for limiting.
- An average of 9% of women across the 18 countries reported that they had wanted no

more children at the time of their last birth, ranging from 4% in Benin to 37% in Swaziland.

Typically, demand for birth spacing exceeds that for birth limiting among younger women, while older women—having achieved their desired family size—more often have a demand for limiting births. On average, limiters are a decade older than spacers (average age of 37 versus 27, respectively).

The “**demand crossover age**” is the average age at which demand to limit future births begins to exceed demand to space births. This occurs when women reach their desired family size and wish to cease childbearing.

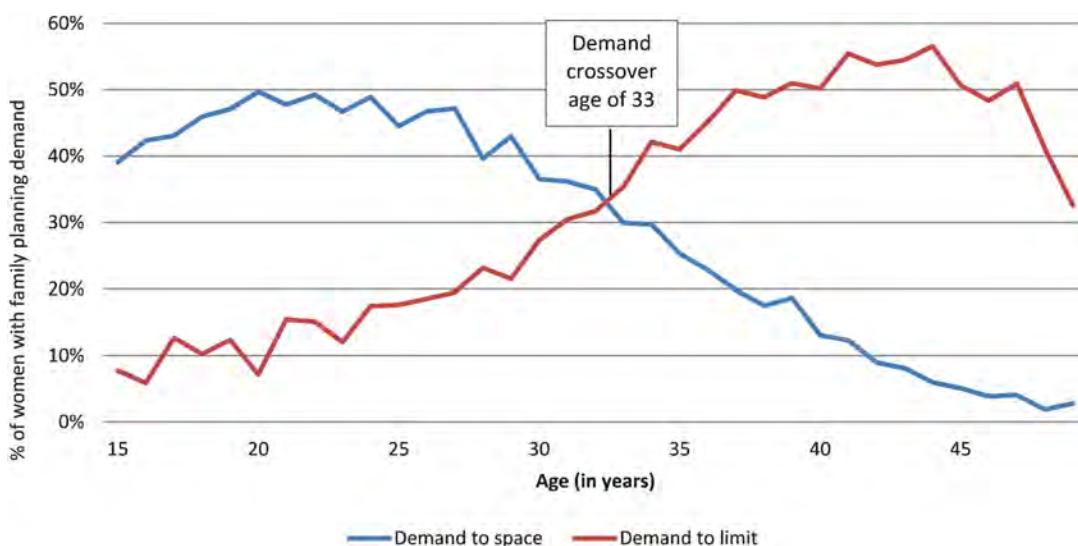
On average, in the analysis countries, demand to limit begins to exceed demand to space at age 33 (Figure 1); however, in some countries, particularly in Southern Africa, the demand crossover age is considerably lower. For example, in Swaziland, the average age at which the demand to limit meets or exceeds that to space is 23; in Lesotho, it is 24 (Table 2).

While demand for limiting is often greatest among older women (35 and older), our analysis shows that young women also have a demand to limit.

**Substantial demand for limiting births exists even among the youngest women in some countries.**

**Demand to limit births begins to exceed demand to space births, on average, at age 33.**

**FIGURE 1. Demand for Spacing and Limiting Births,<sup>a</sup> by Age**



<sup>a</sup> Averages weighted by population of women of reproductive age for all 18 analysis countries

**TABLE 2.** Demand Crossover Age: Mean Age at Which Demand for Limiting Future Births Meets or Exceeds Demand for Spacing Births

Country	Age
Swaziland	23
Lesotho	24
Namibia	28
Malawi	29
Kenya	31
Madagascar	31
Rwanda	31
Ethiopia	32
Zimbabwe	32
Uganda	33
Benin	34
Tanzania	34
Cameroon	35
Zambia	35
Ghana	36
Nigeria	36
Democratic Republic of Congo	38
Senegal	38

included in this analysis have an unmet need for limiting future births.

### Use of Family Planning for Limiting Is Sizable

A sizable proportion of all women in every country reported a demand for limiting births, ranging from 8% in Senegal to 35% in Swaziland (Table 3). In one-third of the countries studied (6 of 18), demand to limit exceeds demand to space. In Swaziland, for example, 35% have a demand to limit, compared with 16% who have a demand to space births.

Although use of family planning for spacing exceeds that for limiting in many analysis countries, limiters comprise a majority of family planning use in more than one-third of the countries analyzed. The percentage of women using contraception to limit births (calculated by dividing the percentage using a method to limit births by the overall percentage using either to space or to limit births in Table 3) is highest in Swaziland (70%), Lesotho (63%), Kenya (59%), Namibia (55%), Malawi and Rwanda (56%), and Madagascar (50%).

The overwhelming majority of family planning users in older age groups are limiters, ranging from 76% of family planning users ages 45–49 in the DRC to 99% in Zambia. However, many women in younger age groups use family planning for limiting as well: 45% of Malawian family planning users, 33% of Ethiopian family planning users, and 20% of Ghanaian users ages 25–29 are limiters.

### Limiters Use Short-Acting Methods More Than LARCs and Permanent Methods

Contraceptives vary widely in their effectiveness, with traditional and short-acting methods having lower rates of effectiveness during typical use than long-acting or permanent methods. Typical-use failure rates (the percentage of women experiencing an unintended pregnancy during the first year of typical use) for short-acting methods range from 6% (Depo-Provera injectables) to 28% (spermicides), while failure rates for traditional methods can be as high as 22% (withdrawal). In contrast, all long-acting and permanent methods have failure rates of less than 1%.<sup>14</sup> In all of the countries included in our analysis, family planning users who would prefer to stop childbearing were more likely to use short-acting or traditional methods than the more effective LARCs and permanent methods (Figure 2):

**An estimated 8 million women in 18 sub-Saharan African countries have an unmet need for limiting births.**

**Contraceptive users who want to limit births are more likely to use short-acting or traditional methods than more effective long-acting or permanent methods.**

- In Swaziland, for example, 44% of women ages 25–29 have a demand for limiting, while 24% have a demand for spacing.
- Similarly, among women ages 25–29, 35% in Lesotho, 30% in Namibia, 26% in Kenya, and 13% in Ethiopia have a demand for limiting.

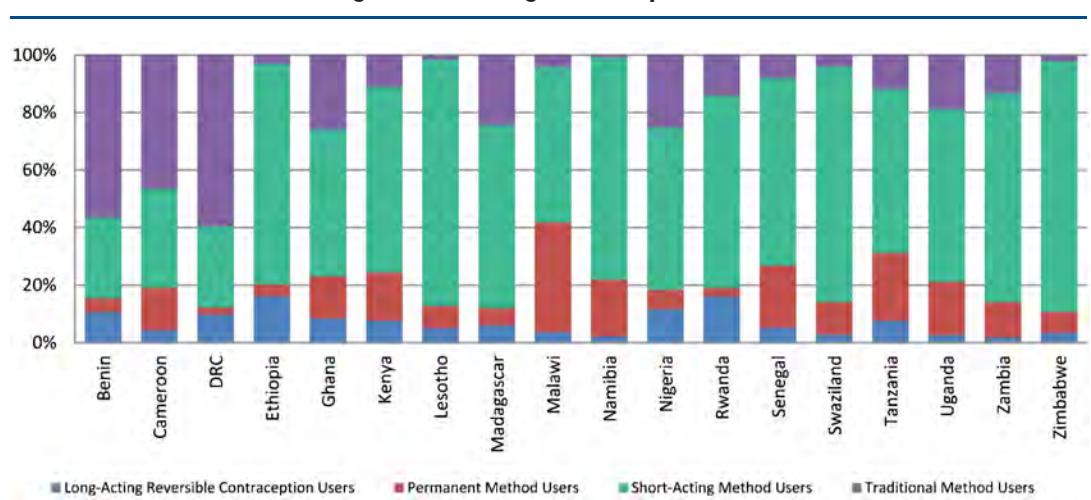
In some countries, substantial demand for limiting births exists even among the youngest women, with 22% of women ages 20–24 in Namibia and 29% in Swaziland having a demand for limiting.

Based on current populations of women of reproductive age and unmet need data from the most recent DHS, we estimate that in 2012, more than 7.8 million women in the 18 countries

**TABLE 3.** Met and Unmet Need and Total Demand for Spacing and Limiting Births, by Country

Country	Demand to limit (%)	Using to limit (%)	Unmet need to limit (%)	Demand to space (%)	Using to space (%)	Unmet need to space (%)
Benin	14.8	5.4	9.4	26.0	11.8	14.2
Cameroon	10.6	6.4	4.2	29.9	19.6	10.3
Democratic Republic of Congo	9.3	5.8	3.5	27.7	14.3	13.4
Ethiopia	14.1	8.5	5.6	21.5	11.1	10.4
Ghana	14.9	7.2	7.7	27.4	12.2	15.2
Kenya	26.8	19.0	7.8	21.4	13.0	8.4
Lesotho	30.3	22.8	7.5	19.6	13.2	6.4
Madagascar	22.0	15.8	6.2	24.3	15.9	8.4
Malawi	28.0	19.8	8.2	25.8	15.6	10.2
Namibia	30.9	25.9	5.0	25.1	20.8	4.3
Nigeria	8.2	4.4	3.8	22.9	11.0	11.9
Rwanda	20.8	16.0	4.8	18.0	12.6	5.4
Senegal	8.0	3.0	5.0	21.4	6.6	14.8
Swaziland	35.0	26.4	8.6	16.0	11.5	4.5
Tanzania	17.5	10.8	6.7	29.6	18.0	11.6
Uganda	19.9	9.6	10.3	26.1	10.0	16.1
Zambia	17.6	11.4	6.2	30.3	18.5	11.8
Zimbabwe	22.3	18.6	3.7	27.6	22.7	4.9

**FIGURE 2.** Method Mix Among Women Using Contraception to Limit Births



- On average, 80% of limiters in the analysis countries use a short-acting or traditional method; 95% of spacers use such a method.
- In 15 of the 18 analysis countries, more than half of women using family planning for limiting rely on short-acting methods.
- Variation between countries does exist. In Malawi, for example, 38% of limiters use permanent methods, as do 23% of limiters in Tanzania.

In 8 of the countries, less than 10% of the method mix was attributable to LARCs and permanent methods. Among family planning users in the selected countries, short-acting methods, particularly injectables, are the most commonly used methods, and LARCs and permanent methods generally constitute a small fraction of the method mix. However, this low number of women that use LARCs and permanent methods may represent only a small proportion of the potential market for these methods. The data show that many more women hope to use a LARC or a permanent method in the future. Furthermore, in 7 of the countries in this review, more women reportedly intend to use a LARC or a permanent method than current users of these methods.

### Many Limiters Have Met or Exceeded Ideal Parity

On average, 28% of women with a demand to limit have met their ideal parity and 30% have

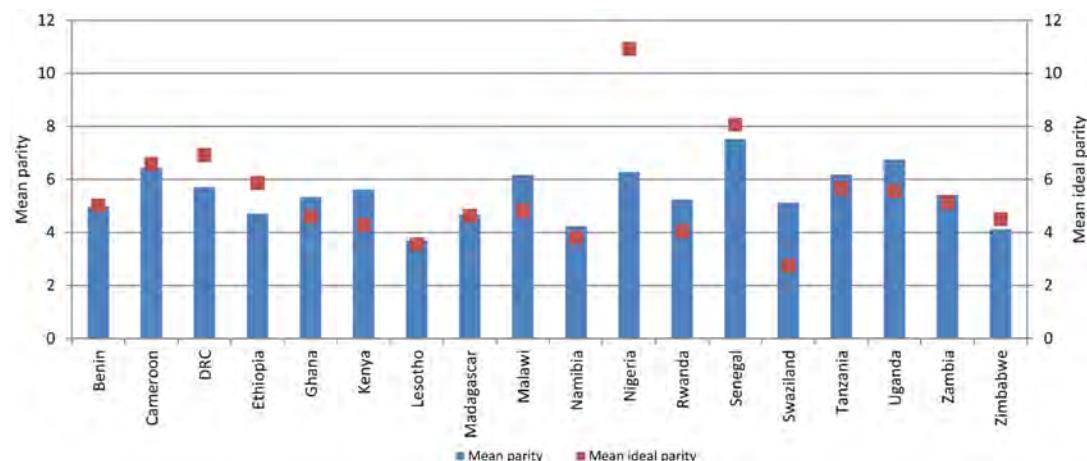
exceeded it. In Rwanda and Swaziland, more than half of limiters have exceeded their ideal parity (54% and 52%, respectively). This contrasts sharply with spacers, of whom 5% have met their ideal parity. In the 18 countries studied, a large proportion of women have reached or exceeded their ideal parity:

- In 15 countries, more than one-quarter of permanent method users have exceeded their ideal parity.
- In 5 of the 15 countries, more than half have exceeded their ideal parity. For example:
  - In Malawi—a country where a large proportion of the modern method mix is attributable to permanent methods (23%)—57% of women using sterilization have had more than their ideal number of children. In Swaziland, 69% of permanent method users have exceeded their ideal parity.
  - In Kenya, Malawi, Rwanda, Swaziland, and Uganda, permanent method users have exceeded their ideal parity by an average of more than one birth (Figure 3).

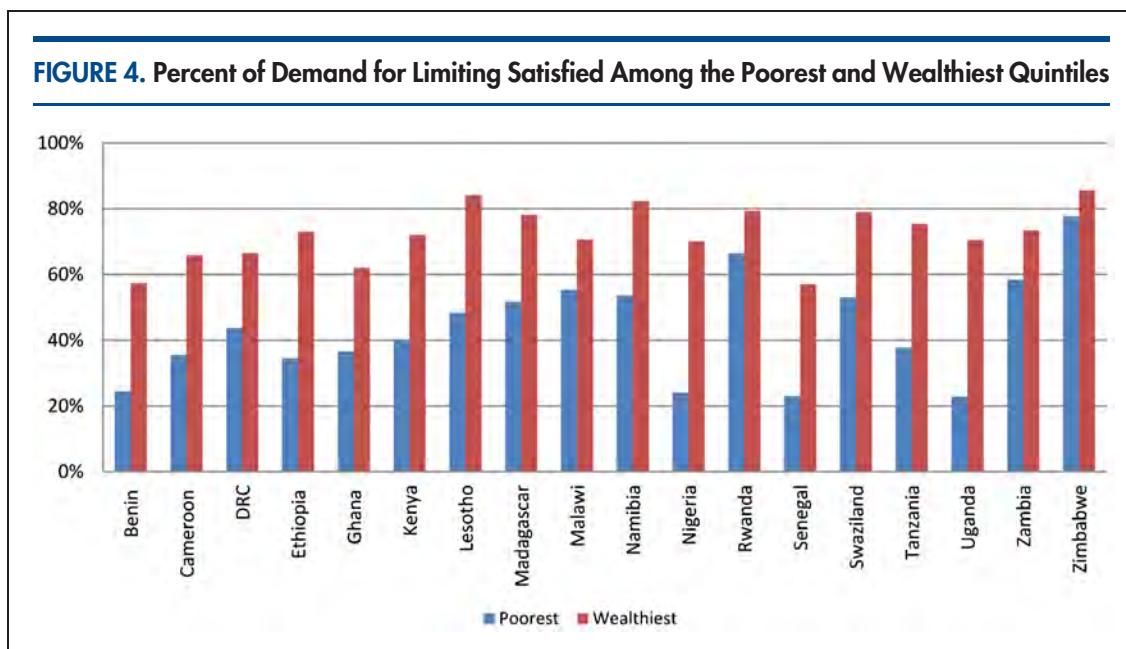
In contrast, in all but 3 countries (Kenya, Rwanda, and Swaziland), the majority of short-acting method users have not yet reached their

**Many permanent method users have had more than their ideal number of children.**

**FIGURE 3. Mean Parity and Mean Ideal Parity Among Users of Permanent Contraceptive Methods**



**FIGURE 4. Percent of Demand for Limiting Satisfied Among the Poorest and Wealthiest Quintiles**



ideal parity. However, many will have done so after their next birth.

### Fewer Poor Women Use Contraception Than Wealthy Women

About 12% of women in the wealthiest quintile used family planning for limiting, compared with only 5% among those in the poorest quintile. Indeed, in some countries, the differences between the wealthiest and poorest quintiles are striking. In Namibia, for example, 30% of the wealthiest women use family planning for limiting, while just 16% of the poorest do so, and 15% of the wealthiest Ugandan women use family planning to limit, compared with just 4% of the poorest. On average, in the 18 analysis countries, 74% of demand for limiting among the wealthiest women is *satisfied*, while only 40% of the poorest women's demand is satisfied. In some countries, these differences are even more considerable (Figure 4).

### Contraceptive Use Varies by Education Despite Nearly Equal Demand

Although women with the highest and lowest levels of education have nearly equal demand for limiting (14.4% versus 14.2%, respectively), disparities in education affect family planning use for limiting. Women who have completed a higher education are nearly twice as likely to use family planning for limiting (12%) than are

women who have received no formal education (7%). Further, the most educated women have less than half the level of unmet need for limiting (6%) as their counterparts who have no formal education (14%). While 80% of demand for limiting is satisfied among women who have completed a higher education, only 40% is satisfied among women who have no education.

### Barriers to Use Include Fear of Side Effects and Health Concerns

In our analysis, women with an unmet need for limiting who did not intend to use family planning in the future most often cited fear of side effects (17%) or health concerns (12%) as their primary reason for not using contraception. (Analysis on this particular indicator excluded Ethiopia, Lesotho, Malawi, Rwanda, Senegal, Tanzania, and Zimbabwe, as this question was not asked in the most recent DHS.) In addition, despite an expressed desire to not become pregnant again, 13% reported that they themselves are opposed to family planning use. Infrequent sex was also cited by many limiters for their lack of intent to use family planning in the future (15%). The primary reasons for not using contraception do not differ vastly between limiters and spacers: fear of side effects (18%) is the reason most often cited for nonuse among spacers. Spacers, however, more often report that they (17%) or

**Fear of side effects and health concerns continue to be major barriers to contraceptive use in sub-Saharan Africa.**

their husband (10%) are opposed to family planning use.

While lack of knowledge about or access to methods is a barrier to use, it was not articulated as a primary barrier among limiters who did not use contraception; an average of 5% said that they did not know of a method, 1% said they knew no source, and 2% cited lack of access or cost barriers.

Even current users can lack information about family planning: 54% of pill users, 47% of female sterilization users, 45% of injectable users, 29% of IUD users, and 25% of implant users reported that they were not informed about potential side effects or other problems associated with their method.

Our results also show that an average of 43% of current pill users and 37% of injectable users in the analysis countries reported that they were not informed about other methods that they could use. This reported lack of information is not limited to users of short-acting methods; on average, 51% of female sterilization users, 34% of implant users, and 24% of IUD users reported that they were not informed, at the specific time the service was provided, about other methods that they could use.

## DISCUSSION

Whether women use a family planning method often depends on the fit between their fertility preferences and the choices available.<sup>11</sup> Making more contraceptive options available in a program's method mix unmistakably raises contraceptive prevalence<sup>15</sup> and helps to ensure informed choice. While women undoubtedly should be able to use their method of choice, it is well known that many women in the countries under review here have limited options, given pervasive knowledge-related, access-related, and societal barriers, as well as resource constraints.

While access was not mentioned as a primary barrier to use in the DHS data used in our analysis, it may still be a significant issue. Given that poorer women are less likely to use contraception than wealthier women, quality information and services may not be as available in poor or hard-to-reach areas. Further, since many women have exceeded their desired parity, we question whether family planning options are readily offered and available to postpartum women when they may need these methods the most. A lack of information about side effects

and method options raises another concern about the quality of counseling and client-provider interaction.

Our analysis suggests that many sub-Saharan African women with an unmet need for limiting future births continue to fear side effects and cite health concerns as primary reasons for their lack of intention to use family planning in the future. These barriers, coupled with societal and familial opposition, are part of the complex nature of influences that drive contraceptive decision making. Family planning programs must address these multiple domains of influence. Evidence demonstrates that exposure to social and behavior change communication messages has a positive effect on family planning ideation (including knowledge of contraceptive methods, spousal communication, and favorable attitudes); on contraceptive use; and on the intention to use a method in the future.<sup>16-19</sup> Exposure to such messages, coupled with proven supply-side approaches, is needed.

A limitation of this study is that the countries included in the analysis represented only a subset of sub-Saharan African countries that had recent DHS surveys, albeit the 18 countries included in the study represent the large majority of the population in the region. Additionally, not all possible questions are included in every DHS; some relevant questions were omitted from some of the surveys analyzed.

Further, some have questioned the ability of DHS survey questions to truly capture intention to limit, particularly given the ambiguity that many women may feel when asked such questions.<sup>8,20</sup> Others argue that because African life is exceedingly uncertain, parents may neither deem the number of children born as important nor conceptualize an end to childbearing with any degree of meaning.<sup>21</sup> Finally, the DHS, as it collects information via household surveys, is a rich source of information about demand for family planning, but it provides little information about access to and availability of methods or about quality of services. While the DHS has its limitations, it still provides the best measures available to compare fertility desires across multiple countries in a meaningful way. However, we recognize the usefulness of having qualitative data to elucidate women's fertility intentions in more depth.

Although differences between countries are large and require context-specific responses, what is clear is that fertility is likely to continue to decline in sub-Saharan Africa.<sup>22</sup> If this trend

**Many contraceptive users report that they were not informed about potential side effects with their method or about other methods that they could use.**

**Expanding the method mix improves contraceptive use.**

holds, more and more sub-Saharan African women will want to limit childbearing, which will require advance preparation from family planning programs, with supply- and demand-side inputs, as well as policy and budgetary commitments.

We have tried to understand the profile and needs of women who want to limit future childbearing in several countries across sub-Saharan Africa; further research is needed to uncover and appreciate the many barriers that women face in meeting their reproductive intentions, so that program managers and policy makers may, in turn, develop more effective and culturally relevant strategies to support women in their contraceptive decision making.

Facilitating the ability of women and couples to make informed choices about the number, timing, and spacing of their births supports a fundamental human right that must always be at the core of family planning programs.<sup>23</sup> While much remains to be learned about fertility desires across sub-Saharan Africa, let us not assume that because fertility decline on the continent has occurred slowly compared with other parts of the globe that desires to limit family size are antithetical in Africa.<sup>24</sup> On the contrary, many sub-Saharan African women are interested not only in spacing births but also in limiting births, and many are already taking action to limit their fertility.

## CONCLUSION

Our findings confirm that women at younger ages have a significant unmet need for limiting, but for a multitude of reasons they are either unable to or choose not to use family planning to avoid pregnancy. Through efforts to expand knowledge of and access to highly effective modern methods, more women may use them to meet their reproductive health needs. We argue for placing as much attention on the growing number of women with the intention to end childbearing as on those who want to space births; the consequences of unintended pregnancies among those who wish to limit are as detrimental as those among women whose pregnancies are spaced too closely together. Women who want to limit future childbearing are a unique audience that has long been overlooked and underserved. Family planning programs must therefore address the needs of both spacers *and* limiters to meet the needs of women in sub-Saharan Africa.

**Competing Interests:** None declared

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## ORIGINAL ARTICLE

# “Man, what took you so long?” Social and individual factors affecting adult attendance at voluntary medical male circumcision services in Tanzania

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In a study in Tanzania, men and women generally supported male circumcision; however, cultural values that the procedure is most appropriate before adolescence, shame associated with being circumcised at an older age, and concerns about the post-surgical abstinence period have led to low uptake among older men.

## ABSTRACT

**Background:** In 2009, the Government of Tanzania embarked on scaling up voluntary medical male circumcision (VMMC) services for HIV prevention in 8 priority regions, with the aim of serving 2.8 million boys and men ages 10–34 years by 2013. By mid-2012, more than 110,000 boys and men in Iringa and Njombe regions had received VMMC. The majority (85%) of these VMMC clients were under 19 years old (average age, 16 years). This study aimed to identify potential barriers and facilitators to VMMC among older men.

**Methods:** We conducted 16 focus group discussions, stratified by sex and age, with 142 purposefully selected participants in 3 districts of Iringa and Njombe regions.

**Results:** Both men and women generally had positive attitudes toward VMMC. Social and personal barriers to obtaining VMMC among adult men included shame associated with seeking services co-located with younger boys and perceived inappropriateness of VMMC after puberty, particularly after marriage and after having children. Additional barriers included concerns about partner infidelity during the post-surgical abstinence period, loss of income, and fear of pain associated with post-surgical erections. Facilitators included awareness of the HIV-prevention benefit and perceptions of cleanliness and enhanced attractiveness to women.

**Conclusions:** While men and women in Iringa and Njombe regions in Tanzania generally view VMMC as a desirable procedure, program implementers need to address barriers to VMMC services among adult men. Selected service delivery sites in the Iringa and Njombe regions will be segregated by age to provide services that are “friendly” to adult men. Services will be complemented with behavior change communication initiatives to address concerns of older men, encourage women’s support for circumcision and adherence to the post-surgical abstinence period, and change social norms that inhibit older men from seeking circumcision.

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## INTRODUCTION

Voluntary medical male circumcision (VMMC) has been shown to be a safe and effective method of reducing female-to-male HIV transmission by about 60% in randomized controlled trials and by up to 73% in post-trial observation.<sup>1-4</sup> Cost and impact modeling have shown that rapid scale up of VMMC among men ages 15–49 years would drastically reduce HIV transmission.<sup>5</sup>

We recognize 3 major contexts in Tanzania where male circumcision (MC) is performed:

1. Traditional MC—generally conducted around or before puberty as part of a traditional rite of passage
2. Religious MC—typically performed during infancy (primarily for Tanzanian Muslims)
3. Voluntary medical MC for HIV prevention—offered since 2009 as a free service through selected government health facilities

In Tanzania, where adult HIV and MC prevalence is 5.7% and 67%, respectively, the national HIV prevention strategy of the Ministry of Health and Social Welfare prioritized VMMC for boys and men ages 10–34 years, particularly in regions with high HIV prevalence and low MC prevalence.<sup>6</sup> The proportion of boys and men ages 15–49 years who reported being circumcised ranged from 21% in Shinyanga to 100% in Lindi.<sup>7</sup>

Iringa Region, with the highest HIV prevalence in the country (15.7%) and one of the lowest circumcision levels (29%), has set a goal to circumcise 264,990 boys and men ages 10–49 years by 2015.<sup>6,7</sup> Since this study's completion in 2011, the Iringa Region has been divided into two administrative regions, Iringa and Njombe. The populations of Iringa and Njombe have been estimated at 1,006,732 and 783,047, respectively.<sup>8</sup> MC and HIV prevalence data in the newly defined regions are not currently available.

By July 2012, more than 110,600 male circumcision procedures had been conducted in Iringa and Njombe regions, with support from the Maternal and Child Health Integrated Program (MCHIP) funded by the U.S. Agency for International Development. This represents 42% of the initial regional goal for Iringa. The majority ( $n=86,972$ ) of VMMCs were conducted through a combination of high-volume outreach campaigns and static services during the cold season when demand is naturally high (cooler

weather is thought to promote wound healing). It is estimated that 26% and 37% of uncircumcised men of all ages in Iringa and Njombe regions, respectively, have been reached through the VMMC program.<sup>9</sup>

In addition to the national age targets, the program has prioritized VMMC for older clients who are more likely to be sexually active and consequently at increased HIV risk. Reaching this subgroup of adult men (ages 20 and above) with VMMC would translate into the greatest HIV-prevention benefit in the near future. In the 2010 Tanzania Demographic and Health Survey, 76% of males ages 15–17 reported having never had sex; by ages 23–24 years, that prevalence declined to 14.3%.<sup>10</sup>

The VMMC program in Iringa and Njombe has extensively used radio coverage, billboards, and experiential media for demand creation and communication efforts. Messages communicate the HIV-prevention benefit of VMMC for all men but primarily focus on adult men. Communication materials and messages explaining benefits to women have also been circulated and aired. Despite the communication focus on older, sexually active men, 85% of VMMC clients in these regions were under 20 years of age (mean age=16 years, standard deviation [SD]=5.1, range=1–76). Merely 6% of VMMC clients were 25 years or older.

The Kenyan VMMC program has reported a similar pattern of young VMMC clients.<sup>11</sup> Research conducted in Kenya and Uganda in circumcision clinical trials and other settings corroborate this cultural preference for circumcision at a younger age.<sup>12,13</sup> A study on acceptability of VMMC among a community in the Mara Region of northern Tanzania that traditionally circumcises showed a strong preference toward pre-pubescent circumcision.<sup>14</sup> Although approximately 67% of Tanzanian boys and men ages 15–49 are circumcised, the major ethnic groups in Iringa—the Hehe- and Bena-speaking people—do not traditionally circumcise males.<sup>7</sup> Ethnic groups that circumcise males in Tanzania typically do so as part of religious or ethnic rites of passage during infancy, adolescence, or pre-adolescence.<sup>15</sup>

Reports from other countries highlighted fear of pain during the procedure, painful erections after surgery, and delays in healing as deterrents to seeking VMMC.<sup>16-18</sup> Other barriers to VMMC included lack of knowledge about the HIV-prevention benefit, concerns about income loss during the post-surgical recovery period, and the

**Communication campaigns in Iringa and Njombe have focused on the benefits of VMMC for older men, but most VMMC clients are under 20 years of age.**

belief that MC is a cultural practice meant for other ethnic groups.<sup>13</sup>

It was unclear whether the deterrents documented in these other contexts also explained lower VMMC uptake in Iringa and Njombe. This study was conducted to explore VMMC perspectives and identify barriers and motivators by age and sex, particularly with implications for older (ages 20 and above) sexually active, married men in Iringa and Njombe.

## METHODS

### Recruitment/Sample

Between February 21–26, 2011, a total of 142 participants (n=68 women, n=34 men ages 18–29, and n=30 men ages 30 and above) were enrolled in focus group discussions (FGDs, N=16) stratified by age and sex. The 16 FGDs were conducted in 3 districts in the 2 regions: Iringa Municipal Council (n=6), Mufindi District (n=5), and Njombe District (n=5). These districts were selected for the relatively high volume of VMMCs provided, and to understand urban, peri-urban, and rural differences. Participants and sampling locations were purposefully selected in close collaboration with local government Council HIV/AIDS Coordinators (CHACs). The CHACs posted announcements and communicated verbally to potential participants about the study and assembled participants prior to the FGD sessions. CHACs were instructed to select people who fit the sex and age strata and who could easily reach the venue for the FGD.

### Design

All FGDs were conducted in Kiswahili in spaces with audio privacy, with an average of 8

participants (range=7–11), a facilitator, and an observer. Sessions were 1.5–2 hours long. Facilitators and observers were gender-matched to the focus group participants, but observers could be female for male FGDs. Sessions were recorded digitally, and extensive notes were taken (in both English and Swahili) to document complementary information. See the [Table](#) for a description of the composition of the FGDs. Participant inclusion criteria were:

1. Ages 18–39 for women, 18–29 for the younger male FGD, and 30 or above for the older male FGD
2. Living within walking distance (approximately 5 km) of the selected location
3. Available to participate during the allocated FGD time

We set different age strata for the male FGDs in order to solicit views that potentially differed by age, on the premise that men would be more comfortable discussing their views with peers. In addition to the FGDs, we also conducted one mixed-gender participatory group exercise in each study district (N=30, 10 participants per district). We asked participants to complete life-cycle exercises whereby they described VMMC appropriateness over the course of a man's life and other cultural factors that could influence a man's decision to get circumcised. Participants diagrammed the lifespan of a male starting from infancy and discussed the appropriateness of VMMC at different stages in his life, including VMMC benefits and drawbacks, barriers, and facilitators for men seeking VMMC services.

FGD participants completed an anonymous questionnaire in Kiswahili on demographic

**TABLE.** Composition of Focus Group Discussions

Age and Sex	No. of FGDs	Average No. of Participants/FGD	Total No. of Participants
Younger men (18–29)	4	8	32
Older men (30 and above)	3	9	28
Women (18–39)	6	9	52
Mixed gender	3	10	30
<b>Total</b>	<b>16</b>	<b>9</b>	<b>142</b>

Abbreviation: FGD, focus group discussion.

information (age, sex, marital/relationship status, parental status, circumcision status, and age of circumcision for males). Female participants were not asked about their partners' circumcision status. Questions were read aloud to the group, and assistance was provided to participants who requested it (about 30% of participants needed assistance).

FGDs were not stratified by circumcision status since MC status was collected anonymously. A man could have self-disclosed his circumcision status during FGDs, but no probes were made to differentiate views of circumcised versus uncircumcised men.

Verbal consent was obtained at the beginning of each FGD, and participants consented not to relay group discussions externally. Regardless of whether they completed the exercise, participants received approximately US\$3 for their time. No participant declined participation or rescinded informed consent throughout the study. Human subjects approval was obtained through the Johns Hopkins Bloomberg School of Public Health Institutional Review Board, with formal written support from the office of the Iringa Regional Medical Officer.

**The growing desirability for male circumcision in Tanzania reflects a shift in social norms, from being a foreign procedure to one that promotes cleanliness, prevents infections, and attracts women.**

### Analysis

After checking for missing fields, quantitative data from the survey were entered into PASW<sup>®</sup> Version 16 statistical software and analyzed. Immediately following each FGD, the moderator/facilitator teams discussed and revised their notes and highlighted key points to explore further in the digital recordings. FGDs were transcribed in Kiswahili. All coding and thematic analyses were conducted manually in Kiswahili by 3 analysts, and key themes and passages were translated into English.

## RESULTS

About half of the participants in the 16 FGDs were men (74 of 142 total participants, or 52%). Men were slightly older than women (mean age of men=32.6 years, range=18–68 versus mean age of women=29.2 years, range=18–47). The majority of men and women were married (66% and 57%, respectively) and were parents (77% and 82%, respectively). Most men (72%) were circumcised by age 13.5 years (range=2–25 years).

The following themes emerged during analysis:

- Knowledge and attitudes toward MC

- Norms around MC/VMMC, particularly in relation to age and sexuality (specifically, sexual function and ability to fulfill sexual obligations during abstinence/healing period, and, for older men, shame)
- Other barriers to VMMC, including penile injury
- Ideal VMMC service delivery modalities to attract older men

### Knowledge and Attitudes Toward VMMC

Almost all of the participants correctly described VMMC as removal of the foreskin. Many participants also spontaneously mentioned prevention of HIV transmission and good hygiene as benefits of VMMC. Participants' attitudes were generally positive toward VMMC, and male participants mentioned peer pressure, women's preferences, disease prevention, and cleanliness as key motivating factors in seeking VMMC. Women mentioned greater sexual pleasure as a VMMC benefit. Sexual and aesthetic appeal of VMMC resonated more among younger men and women in the FGDs.

### MC/VMMC Norms

In Iringa, perceptions of MC seem to be shifting, from the view that the procedure is foreign and undesirable to one that promotes cleanliness, prevents infection, and increases attractiveness to women. This shift in norms was most striking among younger male participants, one of whom stated:

*When I started high school ... many of the other students were circumcised, and I wanted to get circumcised as well. ... My parents didn't understand me at all. They said, "In our society, we don't do that." They forbade me.*

Eventually, this young man was circumcised. Another young male participant stated:

*We were born in the 80s ... it is unusual to find [uncircumcised] men ... I really haven't come across them.*

An older male participant identified greater social status with circumcision:

*A circumcised man has a higher status ... For us boys of higher [older] age [jokingly], you might hit on a woman, and if you are not circumcised and she finds out, she won't agree to go with you. And I think that shows the status of circumcision.*

There was a prevailing notion of "modern" Tanzanian culture in which the majority of men

are circumcised. Two younger male participants emphasized:

*There is no traditional culture for MC, but in town it is accepted as normal practice now.*

*Many of us have been to town, and if people see that you are uncircumcised in town, they laugh at you.*

### Age and Circumcision

Male and female participants almost unanimously articulated that it was best to perform VMMC before puberty. Most participants believed that VMMC clients in their 20s or 30s would be ridiculed or thought to be unusual and shameful. A participant in the Mufindi young men's group stated:

*If you see an old man getting circumcised, you will have to laugh at him a little bit like, "Man, what took you so long?"*

Another participant explained:

*There is fear and shame if you reach over 19 and you go to get circumcised. You will have to wear a kanga [cloth wrap worn by Tanzanian boys following traditional circumcision] during the healing period and everyone will know.*

Participants identified men ages 25 and older as being "too old" to be circumcised. However, the notion of an "older" VMMC client extended beyond age to include marital/relationship status and parental status. For example, an unmarried, childless man in his 20s seeking VMMC would be considered normal but not if he were married with children. Participants also described it as shameful for a man's children to hear that their father had been circumcised:

*... My child hearing that I've gotten circumcised?! A shame!*

The theme of social hierarchy, in which older adult men occupy a distinguished status that they reinforce with appropriate behavior, emerged. Perceived age-inappropriate behavior by older men (such as seeking VMMC) can be viewed as a threat to their status within the family and society and would bring shame—the most frequently mentioned barrier to VMMC for older men. See the [box](#) for detailed descriptions of shame related to older men seeking VMMC.

Male FGD participants noted that they would like to support their sons in getting circumcised and would be in a better position to do so if they

themselves had been circumcised. Participants also recognized that men seeking circumcision can serve as a positive example to the household.

### Sexuality and Circumcision

Participants consistently described MC as more sexually desirable to women because of increased virility and a more attractive penis. A female participant stated:

*A man who has been circumcised is better because he is cleaner, and making love is more pleasurable.*

A man's circumcision status was largely viewed as public information. This response by a younger female participant illustrated how

**Cultural values in Tanzania encourage male circumcision to be performed before puberty—well before marriage and parenthood.**

### Box. Themes of Shame Related to Older Men Seeking VMMC

#### Perspectives of Older Men

- It is an inappropriate activity for the age, and it causes status loss and embarrassment; need to hide the procedure.
- An elder should respect himself, control his sexual desires, and prevent diseases even without male circumcision (MC).

#### Perspectives of Younger Men

- It is not appropriate for older men to undergo MC; a man who does it will be laughed at.
- Status restricts older men from sharing intimate issues in front of society, neighbors, younger people, and their children.
- It is an age-inappropriate activity (scornful description of how pitiful it would be to see an older man wearing the wrap—*kanga* or *kitenge*—that boys often wear after traditional circumcision).

#### Perspectives of Women

- Undergoing MC is not status-appropriate for older men.

#### Perspectives of Both Men and Women

- If a man has passed the appropriate age for MC, it is considered shameful to admit his "incomplete" status.

circumcision status might become public information:

*I heard an argument between two women over a man. One of them said: "... I don't need him, now I've got one who is circumcised—he is better for me; he really satisfies me."*

Given the cultural preponderance of multiple concurrent partnerships (MCP), participants viewed VMMC within marriage as a favorable option for reducing risk of HIV acquisition. A female participant stated:

*Our husbands are not trustworthy; it is better they are circumcised. At least we will get some protection.*

**Both men and women expressed doubts about being able to adhere to abstinence guidelines in the post-surgical healing period.**

Men shared concerns about women in MCP as well. Participants brought up the custom of *mafiga matatu*, a Kiswahili expression used throughout Tanzania translated as "three cooking stones." The expression implies that just as one needs three stones to hold a pot over the fire, a woman needs multiple partners to be fulfilled. Female participants also noted that when a woman's partner is circumcised, she can simply shift to another *mafiga* while she waits for him to heal.

According to younger men, not fulfilling sexual obligations to a girlfriend could lead her to leave him since premarital relationships are considered transient and largely about sex. Some women shared this concern about younger women. Concerns about a wife seeking another partner during the abstinence period were less of an issue among older/married men but were widely noted among participants:

*For a married man, you have to agree with your wife about the 6 weeks following circumcision. It is necessary that the wife is aware of the rules and agrees for her husband to get circumcised. Many women will not be able to wait and this makes married men afraid to seek circumcision.*

Women also expressed concerns about abstinence but thought that their men would not be able to abstain. One young woman laughingly stated:

*That type of man is out there! He knows that the food is steaming hot, and on top of that there are hot peppers in it, but he keeps eating it even when the tears are running down his face. (Group laughs and agrees.)*

**Focus group participants unanimously preferred having separate VMMC services for adult men and boys.**

## Sexual Function and Penile Injury

Fears of penile injury from erections in the immediate post-operative period also emerged as a potential barrier. In particular, participants described a fear of erections causing stitches to rupture, resulting in pain and delayed wound healing. A mixed-gender group stated:

*At 14 years, he [VMMC client] will have a better understanding about cleanliness ... and if he dreams [of] his girlfriend, he could get an erection which could cause the stitches to get stretched out and cause damage to the penis.*

## Loss of Income

Concern about loss of income from absence on critical, income-generating days was frequently raised in FGDs and viewed as a major deterrent to seeking VMMC. A young male participant stated:

*Even for those who see the importance of circumcision, the process of circumcision takes time. During that time you better stay home to take care of yourself and not work.*

## VMMC Service Delivery for Adult Men

Four VMMC service delivery approaches were discussed in the FGDs:

- Extending hours to weekends and evenings
- Couples-oriented services
- Separate services for boys and men
- Services with only male health care providers

Participants unanimously preferred the model of separate services for adult men and boys. Participants repeatedly stated that mixing services for boys/adolescents and adult men was culturally inappropriate. In all FGDs, participants acknowledged that an older man would lose face if he met a younger man or boy in this setting. While some participants presented other modifications to service delivery models, no other model had uniform support. More education for female partners was raised as a good idea, but neither male nor female participants indicated a preference for couples-oriented services. Female participants indicated satisfaction in participating in the decision-making to seek circumcision but not to be present during the surgery. Some men raised concerns about the presence of female health care providers, especially younger male participants who tend to be shyer.

## DISCUSSION

VMMC is currently being scaled up in Iringa and Njombe, and thus knowledge about and acceptance of the procedure appears to be high in the communities. While people generally view the procedure as a desirable one, the positive attitudes have not yet translated into service uptake across all subgroups of men. Cultural and financial barriers, as well as perceptions about pain and injury, were major barriers for certain segments of the male population, particularly with regard to age and stage of life. Concerns about income loss during the post-surgical period were also pervasive. The most prominent barrier for adult men with children was shame associated with what they perceived as an age-inappropriate procedure.

The preference for pre-adolescent/pre-adult VMMC has been described in other studies.<sup>12,14,19</sup> In Iringa and Njombe, FGD participants explained that adult men enjoy a privileged place in society; revealing the fact that they are uncircumcised would compromise their status.

The 6-week abstinence period was an important concern, particularly for men with younger female partners who were thought to have multiple partnerships. Many women felt that VMMC offered some protection against HIV if their male partners had multiple sex partners. Conversely, men were concerned that their female partners may be unfaithful during the post-circumcision abstinence period.

Findings from a study in Kenya showed that marital or cohabiting status strongly predicted early resumption of sex among VMMC clients.<sup>12</sup> This study did not explore the reasons for early resumption of sex (for example, an individual's sexual desire versus a wish to fulfill sexual obligations to his partner), but based on our findings it might be important to investigate this issue further. Epidemiologic modeling studies have shown that the benefits of VMMC at the population level can be conferred to women, but the role of concurrency in mitigating the benefit as suggested by these participants has not been explored and warrants further study.<sup>20</sup>

Relevant counseling and informational materials that address issues related to age of VMMC clients, seasonal timing of the procedure, and effects on sexuality—particularly factors influencing post-circumcision abstinence—will be developed.<sup>21</sup>

Demand creation, education, and service delivery models to promote VMMC uptake

among adult males in Iringa will be adapted based on these study findings. As a result of this investigation, selected service delivery sites will segregate clients by age to decongest service delivery sites and hopefully attract older, married men and men who are parents—the type of clients who might be inhibited to undergo VMMC due to a lack of privacy. Static sites devoted to serving older men will be provided rather than using campaigns that tend to attract younger men and adolescents.

In Roger's diffusion of innovation theory—a framework explaining how new ideas are adopted—the pace of adoption of a new idea or process is informed by how people perceive a new behavior, whether people believe the new behavior has advantages over their current practice, how easy it is to practice the new behavior, whether the new behavior can be tried without risk, and people's perceptions of how others who have adopted the behavior have fared.<sup>22</sup> The theory defines 5 categories of adopters of innovations, depending on how early they are willing to adopt a new idea. Applying this theory to the 110,000 VMMC clients in Iringa and Njombe (representing an estimated 30% of uncircumcised 10–39-year-old males in the regions), VMMC has passed the “early adopters” stage (the second category of innovators) and is well into the third “early majority” stage. Early adopters in Iringa and Njombe appear to be younger men and boys. To reach the last 2 adopter categories of “late majority” and “laggards,” messages and approaches used in the community and among the client base need to reflect concerns of older men, as well as strive to change ingrained social norms among secondary audiences, such as partners and community leaders.

## Study Limitations

The self-reported prevalence of MC (72%) in the study sample was higher than the regional average (29%), suggesting that this study might not be representative of regional barriers and facilitators of VMMC. This difference in MC prevalence is not well understood, but we hypothesize that it could have resulted from selection bias, representative sampling from areas with higher MC prevalence than regional MC prevalence reported several years ago, or chance. This study sample was drawn from areas where the VMMC program is more mature and as a result might have higher MC levels than those measured in the 2007–08 Tanzania HIV/

**Behavior change communication messages should reflect concerns about the appropriateness of the procedure later in life and the post-surgical abstinence period.**

**Future research should explore how concerns about partner faithfulness during the post-surgical abstinence period or other factors can influence early resumption of sexual activity.**

AIDS and Malaria Indicator Survey. Selection bias also could have resulted from the purposive selection and the inclusion criteria that participants must reside close to the study site.

Alternatively, social desirability could have played a role in the reported circumcision status. Even a small number of participants erroneously reporting being circumcised when they were not could dramatically skew the observed MC prevalence due to the small sample size. One participant did reveal during the FGD that he had marked that he was circumcised on the form when he actually was not. We tried to create an environment to enhance truthfulness by posing questions in third person to minimize bias. In addition, the questionnaire did not ask whether the male participants' circumcision procedures were performed medically or traditionally. Participants were not asked about their ethnicity; we assumed most were Hehe, the predominant ethnic group in Iringa and Njombe. However, in urban areas with high mobility, ethnic homogeneity cannot be assumed.

## CONCLUSION

To effect change in the community and interpersonal environment, community approaches should involve community leaders, champions, positive social deviants, peer educators, and social media. In addition, service delivery approaches should be appropriate to social norms. Women's support for circumcision, described by participants as key for both a man's decision to seek VMMC and his ability to adhere to post-circumcision abstinence guidelines, must be solicited through education and communication aimed at women. We recommend that VMMC scale up includes formative qualitative assessment of attitudes, care-seeking practices, and social norms related to VMMC, particularly the appropriate age and life stage to get VMMC, to help guide this process. The findings also highlighted the need to address concerns and misconceptions around erections during the post-circumcision healing period.

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## ORIGINAL ARTICLE

# Lessons learned from scaling up a community-based health program in the Upper East Region of northern Ghana

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The original CHPS model deployed nurses to the community and engaged local leaders, reducing child mortality and fertility substantially. Key scaling-up lessons: (1) place nurses in home districts but not home villages, (2) adapt uniquely to each district, (3) mobilize local resources, (4) develop a shared project vision, and (5) conduct “exchanges” so that staff who are initiating operations can observe the model working in another setting, pilot the approach locally, and expand based on lessons learned.

## ABSTRACT

Ghana’s Community-Based Health Planning and Service (CHPS) initiative is envisioned to be a national program to relocate primary health care services from subdistrict health centers to convenient community locations. The initiative was launched in 4 phases. First, it was piloted in 3 villages to develop appropriate strategies. Second, the approach was tested in a factorial trial, which showed that community-based care could reduce childhood mortality by half in only 3 years. Then, a replication experiment was launched to clarify appropriate activities for implementing the fourth and final phase—national scale up. This paper discusses CHPS progress in the Upper East Region (UER) of Ghana, where the pace of scale up has been much more rapid than in the other 9 regions of the country despite exceedingly challenging economic, ecological, and social circumstances. The UER employed 5 strategies that facilitated scale up: (1) nurse recruitment from their home districts to improve worker morale and cultural grounding, balanced with some social distance from the village community to ensure client confidentiality, particularly regarding family planning use; (2) prioritization of CHPS planning and continuous review in management meetings to make necessary modifications to the initiative’s approach; (3) community engagement and advocacy to local politicians to mobilize resources for financing start-up costs; (4) a shared and consistent vision about CHPS among health administration leaders to ensure appropriate resources and commitment to the initiative; and (5) knowledge exchange visits between new and advanced CHPS implementers to facilitate learning and scale up within and between districts.

## INTRODUCTION

Community-based health services programs are being launched and expanded throughout sub-Saharan Africa. Yet clinic-focused services remain the mainstay of most of these programs despite several

convincing demonstrations that community-based operations can be more effective if static services are augmented with active provision of doorstep care.<sup>1-4</sup> Even the most successful of these small-scale projects often fail to be mainstreamed into large-scale operations, because experimental trials generally use many resources that are challenging to replicate in large-scale operations.<sup>5</sup> Moreover, when doorstep service innovations are expanded beyond original target areas, a complex process of instituting system-wide adjustments to new supervisory structures, leadership dynamics, policies, resource allocation strategies, and

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**Leadership to develop small-scale innovations is often different than the type of managerial and political leadership required to change systems at scale.**

plans are needed at each organizational level.<sup>6</sup> Such systemic changes are more complex to undertake than donors, researchers, and planners typically anticipate,<sup>7</sup> largely because leadership required to develop and test small-scale innovations sometimes contrasts with the type of managerial and political leadership required to change a large-scale system.

As early as the 1978 Alma Ata Conference, policies for achieving community-based primary health care became a pillar of Ghana's health policies. By the 1990s, however, mounting evidence that health development was not achieving national goals stimulated deliberations on feasible means of achieving health-sector reform.<sup>8-13</sup> Moreover, the specific means of improving program performance remained unclear.<sup>14-15</sup> Research identifying gaps in health outcomes called for national solutions, yet there was little concrete guidance to evidence-based policymaking and program development.

This paper describes the history of how an experimental study set the stage for a national program for promoting community-based primary health care—the Community-Based Health Planning and Services (CHPS) initiative. The paper also discusses factors of the initiative in the Upper East Region (UER) where CHPS was originally tested and scale up was most successful, despite being Ghana's poorest and most remote region. After a decade of implementation, the population of CHPS communities served by the CHPS program as a proportion of total district populations in the UER was 5 times the coverage achieved in the other 9 regions. To clarify factors that could explain the relative success of scale up, we consulted current and former Regional and District Directors of Health Services in the UER and compared their insights with those of leaders from an adjacent region where CHPS has been relatively slow to scale up.

## WHAT IS CHPS?

CHPS is a national health policy to reorient primary health care services from subdistrict health centers to convenient community locations. Its goal is to transform the dynamics of rural health care service delivery from community health care providers who passively wait for patients into outreach workers who actively seek patients in communities and their homes, also known as doorstep services. The vision

of CHPS is to accelerate progress toward Millennium Development Goals 4 and 5 (MDG 4 and 5) on child health and maternal health, respectively. The core strategy entails deploying trained and salaried nurses, known as community health officers (CHOs), to village locations where they provide basic preventive, curative, and promotional health services in homes or community clinics. The CHOs are supported by the health care program's community organizational activities, including the recruitment, training, and deployment of volunteer workers. Critically important to CHPS is the effective provision of family planning information and services, to include doorstep provision of oral, injectable, and barrier contraception, referral for IUDs and other long-acting methods, and promotional services that are targeted to the needs of men and organized mainly by male volunteers.<sup>16-17</sup>

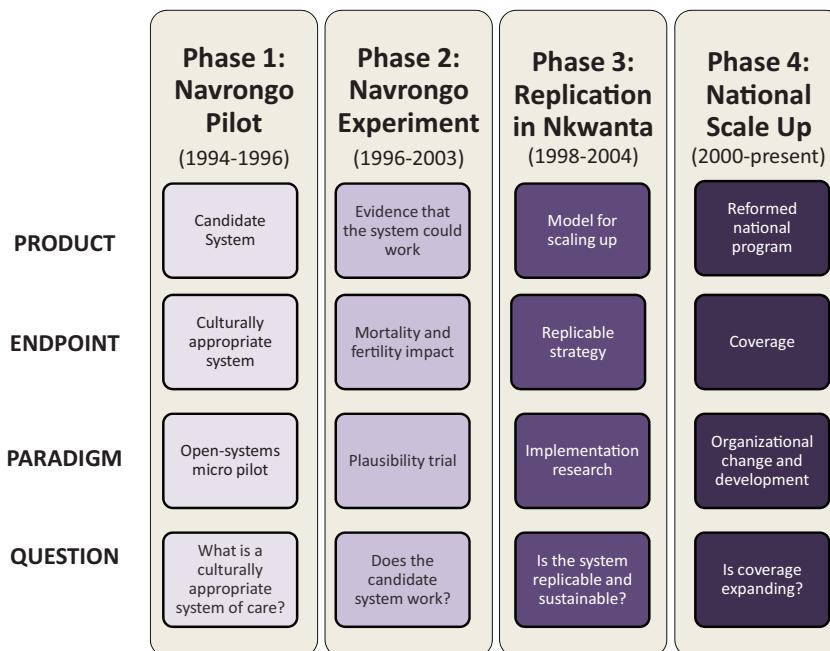
## PHASED PROGRAM DEVELOPMENT OF CHPS

Beginning in the early 1990s, Ghana instituted a partnership between applied health researchers and administrators to develop an action-oriented research agenda to guide health sector reform by resolving policy debates.<sup>18</sup> CHPS was informed significantly by national program development experience in Asia.<sup>19</sup> It was initially developed as a pilot project of the Navrongo Health Research Centre and progressed into a national policy over 4 overlapping phases (Figure 1).

### Phase 1: Navrongo Pilot to Develop Social Grounding for Service Strategies

In Navrongo, Kassena-Nankana District, UER, an 18-month pilot was initiated in 1994 by a team of social researchers, health scientists, and program implementers. The team consulted chiefs and elders, married women and men, and health care providers about appropriate strategies for implementing, managing, and sustaining community-engaged primary health care<sup>14</sup> in order to subordinate operation of the program to social institutions that shape reproductive preferences and health-seeking behavior.<sup>20-21</sup> Research scientists conducted qualitative research to determine the form of social interaction necessary for simplifying health communication and program mobilization processes and for facilitating volunteerism, consensus building, and ideational change. Qualitative research also identified

**FIGURE 1.** Phases in the Ghana Program Development Process



Source: Reference 14.

gender issues and possible strategies for addressing them,<sup>22</sup> including how to offset gate-keeping constraints in seeking health care,<sup>23</sup> how to engage the support and participation of men in reproductive health promotional activities that they might otherwise resist,<sup>24</sup> and how to sustain worker accountability for responsible service delivery.<sup>17</sup> Focus group discussions were conducted quarterly to understand health worker and community reactions and to revise and tailor program operations. Following 18 months of this participatory research and planning, an appropriate model was finalized.<sup>25</sup>

Two sets of activities emerged from the Phase 1 model:

- Existing clinical nurses were reoriented to community health care and assigned to village locations with the new designation of “community health officers” (CHOs). Nurses completed 18 months of training focused on basic curative health services, public health, immunization, and family planning.

- Male volunteers from the communities were recruited and trained for 6 weeks to provide a limited set of services, such as oral rehydration and provision of condoms (Box 1). These *zurugelu* (“togetherness”) activities were based on existing traditional forms of governance, consensus building, and volunteerism, and they were designed to build male leadership and participation into reproductive health services, in addition to expanding women’s participation in seeking reproductive and child health services. The project equipped volunteers with bicycles and start-up kits of essential drugs, conducted training on service management, and set up revolving accounts so that the community financed and sustained the flow of supplies.<sup>26</sup>

During Phase 1, the project clarified, documented, and translated operational details of mobilizing *zurugelu* and community health officer activities into practical and culturally appropriate implementation plans.<sup>17</sup> See Box 2

### Box 1. Community Health Services Piloted in Phase 1

**Role of nurses**, known as community health officers (CHOs), who received 18 months of technical training and provided both health post-based and doorstep services:

- Integrated management of childhood illness (treatment of malaria and febrile acute respiratory infection with antibiotics), management of diarrheal disease, and referral of complicated cases
- Outreach organizational support for comprehensive childhood immunization
- Provision of micronutrient supplementation
- Antenatal care, including the provision of iron folate
- Support for uncomplicated deliveries and referral for emergencies
- First aid for minor injuries and skin conditions
- Health promotion and education, including supervisory support for volunteers
- Family planning counseling and services (oral contraception, condom distribution, and injectable contraception) and referral for long-acting methods
- Management of contraceptive side effects and referral, as needed

**Role of male volunteers**, who were selected by community stakeholders and trained for 6 weeks:

- Antipyretics for the care of children
- Oral rehydration
- Condoms
- Vitamin supplementation
- Health and family planning promotion directed mainly to male social networks
- Organizational backstopping of CHO activities, such as immunization and antenatal care

### Box 2. Key Lessons from the Phase 1 Navrongo Pilot

- Community-based consultation is an effective means of adapting strategies to the social environment. Traditional social structures can be successfully engaged as a programmatic governing body—in this case, the chieftaincy and lineage system.
- Collaboration between community leaders, implementers, and social scientists permitted “learning by doing”—adjustments of strategy according to new evidence, community advice, and worker comments. Operational aspects involving selection and training of workers and volunteers, as well as gender and communication strategies, work routines, location of health posts, and other operational details, can be optimized with “learning by doing” community input.
- Appropriate worker recruitment strategies need to be developed to address Ghana’s cultural and language diversity. (Ghana has 82 languages.) National centralized recruitment and training of frontline workers lead to the deployment of staff who lack basic linguistic skills and cultural knowledge. District-level decentralized manpower development reduces turnover and improves performance.
- Workers should be posted to their home district but not to their home village. Villages seek nurses who have an element of social distance and an ability to maintain family planning confidentiality. For this reason, the project constructed “community health posts” to provide a balance between integrating services into the local context and maintaining social distance between the service and social system.

for key lessons learned during the first phase.

### Phase 2: Navrongo Experimental Trial to Test the Pilot Approach

Following the pilot, 37 communities of Kassena-Nankana District were grouped into experimental areas where *zurugelu* and CHO activities were deployed. Subdistricts were assigned to 1 of 4 experimental groups to evaluate the relative efficacy of the approaches (Figure 2):<sup>16</sup>

1. *Zurugelu* activities
2. CHO activities
3. Both *zurugelu* and CHO activities
4. No intervention

Relative efficacy was evaluated with data on child mortality and fertility trends collected by the Navrongo Demographic Surveillance System (NDSS).<sup>16,27,28</sup>

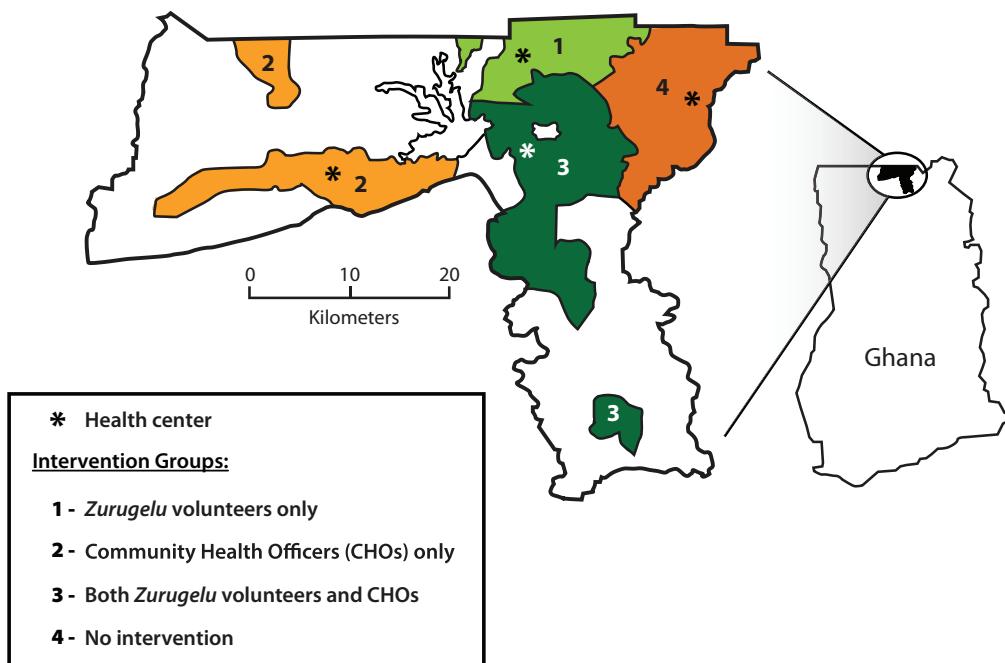
Results indicated that comprehensive community-based health care provided by the CHOs

with support from *zurugelu* volunteers was associated with statistically significant reductions in fertility rates and substantial improvements in child survival compared with other experimental groups.<sup>29-30</sup> In the first 3 years of the project, the total fertility rate declined by 1 birth in the combined CHO and *zurugelu* communities while it remained unchanged at nearly 5.5 in the comparison areas. In the communities where CHOs were deployed—whether with or without *zurugelu* volunteers—child mortality declined by one-half in only 3 years. Within 7 years, child mortality declined by two-thirds.

Communities in which CHOs were deployed but without support from community volunteers showed no changes in fertility rates. In addition, there was no fertility or mortality impact in the subdistricts where only *zurugelu* activities were implemented. In fact, volunteers posted without resident CHOs were less effective than providing no community care at all.<sup>22,31</sup> The non-intervention group was also ineffective, experiencing

**Deploying nurses, with support from community volunteers, substantially reduced both fertility and child mortality rates.**

**FIGURE 2.** Navrongo Experimental Trial Intervention Groups, Kassena-Nankana District, Ghana



Source: Reference 32.

### Box 3. Key Lessons from the Phase 2 Navrongo Experimental Trial

- The combination of traditional social institutions and volunteers with community health nurses, relocated from subdistrict health center clinics to communities, maximizes social acceptability of health and family planning care.
- The combined CHO and *zurugelu* volunteers approach produced substantial improvements in both fertility and child mortality rates.
- Piecemeal approaches do not work: Volunteer-based outreach without a resident CHO had no impact on fertility or child mortality; CHO-based services without the support of volunteers had no family planning and fertility impact.

modest demographic changes unrelated to community-based care.

Because the CHO plus *zurugelu* approach produced improvement in both reproductive and child health, the combined approach was deemed to be the optimal strategy for national scale up.<sup>29-30,32-33</sup> See Box 3 for lessons learned during the second phase.

### Phase 3. Replication Experiment in Other Districts to Validate Approaches

Although results of the Navrongo trial were impressive, district and regional health managers questioned relevance of the model to a national program. They debated whether replication of this model could be achieved in other parts of Ghana and whether it would improve demographic and health outcomes in areas outside the UER. Critics asserted that non-replicable institutional resources of the Navrongo Health Research Centre were responsible for the project's success, compromising relevance of the approach in other settings. Others argued that the Navrongo model was relevant only to the sociocultural circumstances of the UER.

To gain the necessary credibility for launching a national scale up of the model, the Navrongo experience was validated in another cultural and ecological zone of Ghana—the rural Nkwanta District of the Volta Region—whereby only routinely available resources of the Ghana Health Service (GHS) were used.<sup>14-15</sup> To facilitate this process, the Volta Regional Health Administration sponsored a “knowledge exchange,” in which health workers from Nkwanta District visited the Navrongo project team in Kassena-Nankana to observe the Navrongo model of care and engage in candid discussions with counterparts about the feasibility of transferring the Navrongo model to Nkwanta. Although participants viewed the

transfer of the model as requiring a daunting expansion of logistics capabilities, manpower, and supervisory workloads, direct dialogue with the Navrongo project team dispelled mystery about the CHPS development process and nurtured teamwork for developing pilot CHPS areas in Nkwanta.<sup>34</sup>

To facilitate implementation, the Nkwanta management team adopted Navrongo's participatory planning process for adapting strategies to local and contextual circumstances as several distinct differences existed between the Nkwanta and Kassena-Nankana Districts, including their social organizational structures. Moreover, Navrongo had extensive research resources that the Nkwanta team lacked. Thus, the Nkwanta team developed training, logistics, and management information procedures that could be implemented at minimal cost.<sup>34-35</sup>

The exchange program achieved operational success and contributed to increased health access and use.<sup>35-36</sup> In response, the GHS sponsored additional replication projects so that each region of Ghana would have learning localities where CHPS could be implemented using the Nkwanta scaling-up strategy. In each replication district, the community-based care model increased contraceptive prevalence, participation in antenatal and postnatal care, and childhood immunization coverage.<sup>34,36</sup>

The success of the multidistrict replication process suggested that the Navrongo model could be implemented in similarly impoverished and health-deprived localities even with contrasting administrative, social, and cultural systems (Box 4). The exchange program also demonstrated that inter-district peer-exchange programs could be used to scale up CHPS.<sup>40-41,14</sup> Most importantly, monitoring evidence suggested that participatory team exchanges were a more successful strategy for fostering scale up

**Exchange visits between newly implementing and advanced teams were more successful at scaling up the CHPS model than traditional workshops.**

#### Box 4. Key Lessons from the Phase 3 Replication Trial

- Knowledge exchange visits between new and experienced CHPS districts can catalyze the transfer of CHPS implementation capabilities.
- While CHO doorstep service delivery is the core component of CHPS, optimizing implementation requires adjustment to social and ecological conditions of each district. CHPS operational details should be locally planned and decentralized.
- Cultural heterogeneity requires strategic decentralization. Sustaining and spreading the Phase 1 pilot learning process informs and catalyzes scaling up.
- Redesigning training manuals to address technical inadequacy and improving documentation so that manuals are system implementation-focused rather than focused solely on health interventions was necessary.
- Decentralizing human resource development to the regional level ensured linguistic and cultural diversity were not constraints to scale up.

than workshops. Indeed, even today, most CHPS coverage is concentrated in districts that participated in exchanges with the Navrongo or Nkwanta teams. Much of the success with CHPS scale up in the UER is related to the fact that all workers in the region have had experience with the process of developing and implementing CHPS, even before they started the process in their home localities.<sup>15</sup>

#### Phase 4. National Expansion of the CHPS Initiative

In 1999, the GHS reconvened district and regional health managers to assess the Nkwanta validation experience, and consensus emerged for promoting lessons from the Kassena-Nankana and Nkwanta Districts into a national program (Box 5). According to monitoring data from the GHS,<sup>42</sup> nearly all districts in Ghana had some degree of coverage of the CHPS program by 2008 (Figure 3). Further observation and monitoring indicated that CHPS spread most

rapidly in districts where pilots had been launched, suggesting that scale up followed patterns of change characteristic of diffusion processes.<sup>15,43</sup>

#### CHPS SCALE-UP CHALLENGES AND UPPER EAST REGION SOLUTIONS

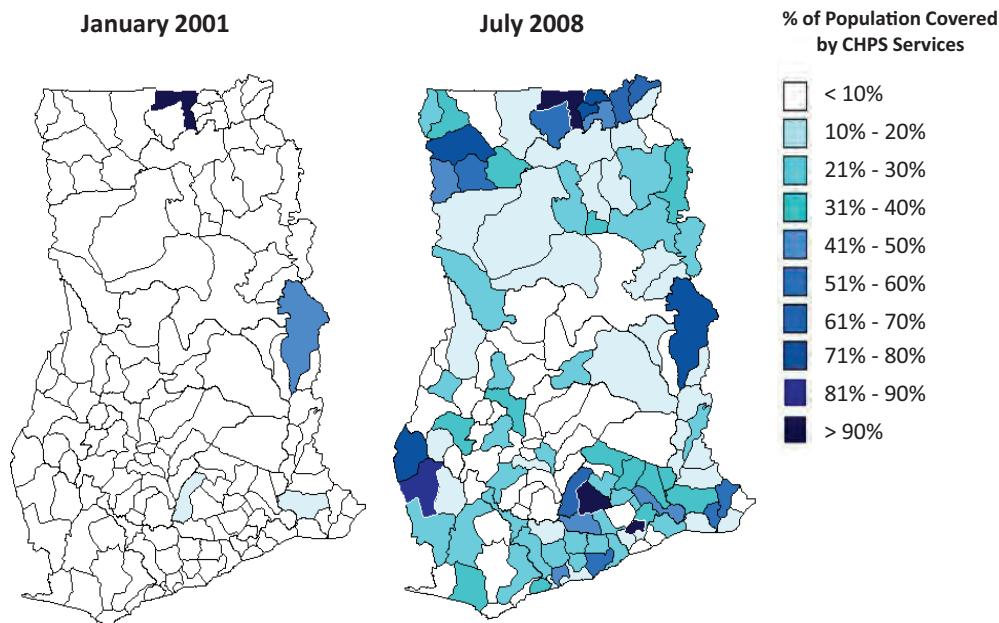
Monitoring data from September 2000 to June 2008 indicate that the proportion of the population covered by functioning CHPS zones across Ghana's 10 regions is low, with the most populous regions in southern Ghana performing the most poorly (Figure 4). The national trend of CHPS scale up in Ghana during this time period is also low (indicated by the black line in Figure 4). In contrast, the prevalence of CHPS coverage in the UER was 5 times that of the national average as of mid-2008. Further progress since 2008 has sustained the region as the leader among all 10 regions and the only region on target to attain full coverage by 2015.

#### Box 5. Key Lessons from Phase 4 National Scale Up

Because core financing for CHPS is lacking, relying on other strategies helped to mobilize the necessary resources and accelerate scale up. These included:

- Funding "pilot CHPS" zones within districts that give managers experience while politicians can observe operations and witness community enthusiasm for CHPS. Let the political gains of CHPS expansion become a political gain for local assemblymen and assemblywomen.
- Seeking local government and community support to fund start-up costs while health sector managers seek financing from the development sector for expansion costs
- Prioritizing CHPS in regional staff meetings, budget discussions, and data review to catalyze organizational change. Follow through with regional technical staff visits to districts and CHPS zones, making CHPS expansion a key factor in performance reviews.

**FIGURE 3.** Geographic Density of CHPS Coverage by District, Ghana, January 2001 and July 2008



Abbreviations: CHPS, Community-Based Health Planning and Services.

Source: Reference 15.

### Methodology for Assessing Views of District Directors

To clarify stakeholders’ perceptions of factors that either constrained or accelerated the scale up of CHPS in the UER, we interviewed all former and current District Directors of Health Services, 3 former and current Regional Directors of Health Services, and key staff and scientists of the Navrongo Community Health and Family Planning Project. For comparison, we interviewed the current Regional Director of the Northern Region and District Directors of Health Services in 4 northern regional health administrations. We also conducted a desk review of archival reports and documents of the GHS.

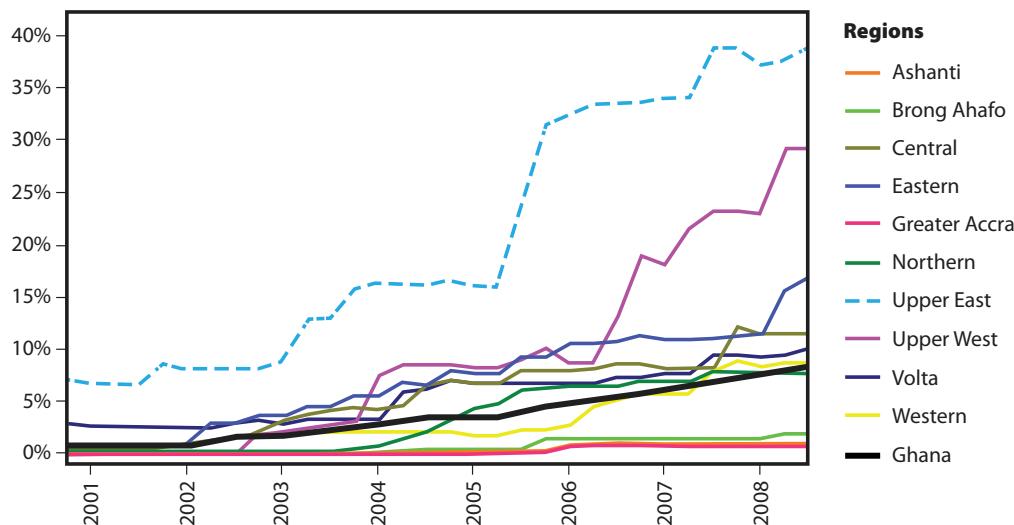
We identified 2 sets of challenges to scaling up the CHPS program.

In general, issues related to **manpower numbers, training, service capacity, and deployment** summarized in Table 1 apply to

the early CHPS implementation era. For example, CHOs in the early phases were unprepared to deliver essential health services, such as addressing maternal and neonatal complications. In addition, the initial training program for CHOs did not provide them with the necessary skills in how to engage with the community. Since 2009, a project of the GHS known as the Ghana Essential Health Intervention Programme (GEHIP) has focused on diagnosing barriers to CHPS expansion and developing interventions to address these problems. For example, the project trained CHOs in strategies for saving newborn lives and implemented a referral system to manage complicated cases.

Table 2 summarizes constraints related to **support systems for expanding CHPS, maintaining operations, and leading the program development process**. For instance, stakeholders pointed to the complicated health management information system that overburdened

**FIGURE 4.** Percentage of the Population Served by Workers of the CHPS Program, by Region and Nationwide, September 2000 to June 2008



Abbreviations: CHPS, Community-Based Health Planning and Services.

Source: Reference 15.

staff to the detriment of service delivery. Furthermore, lack of feedback on the collected data resulted in little use of the information to improve service delivery. In many districts, lack of leadership and political engagement, coupled with the absence of a budget line item for CHPS, resulted in inadequate resources and a lack of focus on and clarity about the program.

### 5 Strategies for Sustaining and Accelerating Scale Up in the UER

Interviews with the district and regional directors revealed 5 common strategies in the UER to cope with these challenges, which facilitated better scale up in the region compared with other regions.

#### Appropriate Manpower Recruitment, Training, and Deployment Strategies

Due to the close proximity of the the Navrongo Centre to the Regional Health Administration in the UER, which deploys CHOs, the operational details of launching, sustaining, and scaling up a large cadre of community nurses, including

developing appropriate strategies for selecting trainees, has always been well understood by regional health leaders. Before 2002, the UER lacked a community health nursing school, and most nurses came from outside the region. They often did not speak local languages, and it was challenging to find nurses for community relocation who had the cultural understanding that community work required. As one district director noted:

*It is all about commitment. When meet[ing with] them we plead with them because we know [it] is not easy traveling every day in and out ... [and it] is risky. It's very difficult for us to draw [nurses] from [subdistrict] health centers. Some are pregnant, some are going to school, [and] some are joining their new husbands.*

In response, the UER opened a regional training school in Navrongo and pioneered a policy of recruiting nurse trainees from the districts to which they would be posted. The communities themselves nominate and financially support most nurse candidates to ensure

**TABLE 1.** CHPS Scaling-Up Constraints and Responses in the Upper East Region (UER) Related to Recruitment, Training, and Deployment of Community Health Officers

Constraint Type	Barriers to Scaling Up	Actions Implemented in the UER	Global Implications
Limited range of services	<ul style="list-style-type: none"> <li>• <b>Deficient range of services.</b> Community health officers (CHOs) were unprepared for essential services (midwifery, emergency management, immediate post-delivery care).</li> <li>• <b>Over-extension of job descriptions</b></li> </ul>	<ul style="list-style-type: none"> <li>• Piloted and scaled up community-engaged referral system</li> <li>• Trained CHOs in strategies for saving newborn lives</li> <li>• Focus roles on the burden of disease and family planning</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Risk transition.</b> Community-based primary health care reduces the burden of disease. Emergency-related causes comprise an increased proportion of the remaining unaddressed burden.</li> <li>• <b>Community-based planning.</b> Developing effective referral systems requires adapting operations to community road conditions and communication needs.</li> </ul>
Inappropriate CHO recruitment	<ul style="list-style-type: none"> <li>• Insufficient nurse manpower</li> <li>• Centralized recruitment results in deployment of workers to localities where they are not conversant with local languages or customs.</li> </ul>	<ul style="list-style-type: none"> <li>• Expanded nurse training school volume</li> <li>• Recruited trainees from districts where they are to be assigned and involved health committees in selection process</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Bottom-up planning.</b> Community health systems development requires “bottom up” strategic planning so that scale up builds capacity that effectively links services to local cultural conditions, languages, and health needs.</li> <li>• <b>Plan for ethnic diversity.</b> Community-engaged recruitment reduces turnover and improves performance, morale, and community ownership.</li> </ul>
Inappropriate CHO training	<ul style="list-style-type: none"> <li>• <b>Pre-service training.</b> Existing 18-month training program does not address community engagement, service outreach, and community health care planning. Overreliance on didactic training and shortage of locations and equipment for mentoring arrangements hinder CHO preparedness.</li> <li>• <b>In-service training.</b> Relocating nurses from clinics to villages requires training them to be community organizers with liaison and diplomatic skills.</li> </ul>	<ul style="list-style-type: none"> <li>• Implemented 6-month regional CHO internships focused on community engagement</li> <li>• Organized peer mentoring coordinated with the training school curriculum</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Systems approach to manpower development.</b> Equipment and budgetary planning should integrate the process of pre-service, internship, and in-service training and plan for peer-mentoring arrangements.</li> <li>• <b>Community-engaged peer leadership.</b> Didactic health technology training is insufficient.</li> </ul>

**Community involvement in nurse selection catalyzed scale up of the CHPS program in the Upper East Region.**

language competency. This early attention to “community-engaged” manpower development has catalyzed scale up. Unlike in other regions, where nurses are often unfamiliar with their place of assignment, CHOs graduating from the UER training school in Navrongo return home to work among their own community. In 2004, the year the first group of nurses graduated from the Navrongo training school, all districts in the region witnessed an increase in the number of functional CHPS.

*Evidence-Based Review and Modification of CHPS Strategies*

Results of the Navrongo research project were shared with the District Health Management Teams (DHMTs) from the onset of the experiment, which provided district managers with the evidence needed to convince them to make the necessary changes in operations. Furthermore, a continuous review of research in management meetings and a general climate of openness to the role of research in guiding action prompted

**TABLE 1 (continued).**

Constraint Type	Barriers to Scaling Up	Actions Implemented in the UER	Global Implications
Inappropriate CHO deployment	<ul style="list-style-type: none"> <li>Insufficient programmatic focus on household services; health posts are the main service point.</li> <li>The National Health Insurance Scheme (NHIS) incentivized static services at the expense of doorstep care, reducing access.</li> <li>NHIS reimbursement for the provision of clinical services de-emphasizes supervisory outreach.</li> </ul>	<ul style="list-style-type: none"> <li>Developed supervisory work routines that are independent of NHIS reimbursement rules</li> </ul>	<ul style="list-style-type: none"> <li><b>Systems approach to CHO deployment, monitoring, and supervision.</b> Programs that focus narrowly on a single community health worker cadre, health problem, or function are risky. "Learning localities" are needed where systems functioning is comprehensively monitored and where lessons learned are communicated to senior officials.</li> <li><b>Compatibility of reimbursement schemes with doorstep care.</b> National Health Insurance schemes require careful trial of their impact on non-clinic based community-based service operations.</li> </ul>
Inappropriate volunteer deployment	<ul style="list-style-type: none"> <li>Volunteers providing anti-pyretics can inadvertently delay parental health-seeking behavior, elevating risk. With careful training and supervision, however, volunteers can provide integrated management of childhood illness (IMCI).</li> </ul>	<ul style="list-style-type: none"> <li>Training volunteers in social engagement methods is essential.</li> <li>Female health volunteers are more committed to service activities than male volunteers, but male volunteers are critical to family planning promotion.</li> </ul>	<ul style="list-style-type: none"> <li><b>Risk mitigation with field research:</b> Reliance on untested imported initiatives is risky.</li> <li><b>Partial IMCI does not work:</b> Volunteer services can cause more harm than good unless volunteer deployment is coordinated with deployment of trained nurses and governed by rigorous supervision.</li> </ul>

additional modifications to improve the CHPS program. For example, long-term observation of the Navrongo project showed that neonatal mortality remained unacceptably high while health among other under-five children had improved dramatically.<sup>29,44</sup> The CHPS approach, as it was originally developed, lacked sufficient focus on ways to prevent maternal and neonatal death and disability.<sup>45</sup> To address this, UER regional and district health managers have invested in a program of in-service training designed to expand the range of services CHOs provide, with particular focus on improving and saving newborn lives, referral services, and other priority programs inadequately addressed by the initial Navrongo model.

*Community Engagement and Grassroots Political Action to Mobilize Resources*

The Navrongo project uncovered the need to develop health posts in which nurses could live and provide care to the community, which

would establish a balance between community engagement and social distance. While the communities preferred nurses who were familiar with local languages and customs, they wanted the nurses to be socially removed from their own networks and extended families—someone the project termed as a "trusted outsider," or a person who would keep secrets about family planning and avoid favoritism that might arise if the nurse was too closely linked to kindred groups.

To bypass GHS restrictions on spending resources for construction of new facilities, the UER Regional Health Administration encouraged communities to develop interim facilities with local labor, donated materials, and traditional construction methods. Then managers approached district assemblymen and development officers to replace functioning interim facilities with more permanent structures. A decade of systematic problem solving with community engagement has been the single

**Community engagement has been the single most important factor in scaling up the CHPS program in the Upper East Region.**

**TABLE 2.** CHPS Scaling-Up Constraints and Responses in the Upper East Region (UER) Related to Support of District Health Systems

Constraint Type	Barriers to Scaling Up	Actions Implemented in the UER	Global Implications
<b>Information Systems</b>			
Cumbersome information systems	<ul style="list-style-type: none"> <li>Unwieldy Health Management Information Systems (HMIS) require more staff time for data management than is available for service delivery.</li> </ul>	<ul style="list-style-type: none"> <li>Simplified registers from 27 to 5</li> <li>Developed monitoring tools for outreach and supervisory support</li> </ul>	<ul style="list-style-type: none"> <li>Inappropriate information systems can impede worker commitment to scaling up.</li> </ul>
Lack of information utilization	<ul style="list-style-type: none"> <li>Lack of feedback or systems for information utilization</li> </ul>	<ul style="list-style-type: none"> <li>Developed simple-to-implement data visualization tools</li> </ul>	<ul style="list-style-type: none"> <li>Implementation and supervisory support information is neglected in HMIS design.</li> </ul>
Lack of essential information	<ul style="list-style-type: none"> <li>Absence of actionable information about perinatal risks and causes of death</li> </ul>	<ul style="list-style-type: none"> <li>Developed maternal and neonatal mortality audit scheme with weekly medical review of results</li> </ul>	<ul style="list-style-type: none"> <li>Training and staff development require tools for evidence-based planning.</li> </ul>
<b>Essential Equipment, Supplies, and Facilities</b>			
Shortage of community-based health facilities	<ul style="list-style-type: none"> <li>High cost and slow pace of health post construction</li> <li>Official restrictions on the use of Ghana Health Service revenue for construction</li> </ul>	<ul style="list-style-type: none"> <li>Constructed interim facilities through community engagement and by volunteers</li> <li>Leveraged financing of construction through outreach to district political and development-sector leadership</li> </ul>	<ul style="list-style-type: none"> <li>Community investment in construction can facilitate engagement in health systems development.</li> </ul>
Lack of essential equipment	<ul style="list-style-type: none"> <li>Shortage of motorbikes and ambulances</li> <li>Lack of electrification, wells, and amenities</li> </ul>	<ul style="list-style-type: none"> <li>Obtained support from UNICEF and other donors for essential equipment, solar panels, and batteries</li> </ul>	<ul style="list-style-type: none"> <li>Low-cost equipment can be expensive to maintain.</li> <li>Investment in electrification and amenities reduces worker turnover and supports scale up.</li> </ul>
Lack of essential commodities	<ul style="list-style-type: none"> <li>Stockouts of essential drugs</li> <li>Expansion of services without expansion of access to supplies</li> </ul>	<ul style="list-style-type: none"> <li>Implemented simple stock monitoring and logistics reporting tool</li> </ul>	<ul style="list-style-type: none"> <li>Total systems planning is essential to effective community-based service development.</li> </ul>
<b>Planning and Resources</b>			
Lack of financial planning and budgets	<ul style="list-style-type: none"> <li>Absence of a budget line for CHPS</li> </ul>	<ul style="list-style-type: none"> <li>Implemented District Health Planning and Reporting Toolkit (2010)</li> </ul>	<ul style="list-style-type: none"> <li>Slow scale up can be addressed by clarifying resource management requirements and the health rationale for community-based services to grassroots politicians and leaders.</li> </ul>
Lack of flexible resources	<ul style="list-style-type: none"> <li>Extreme constraints on resources for the Common Fund</li> <li>Cash flow delays</li> </ul>	<ul style="list-style-type: none"> <li>Leveraged financing of the Common Fund (3 districts only)</li> </ul>	<ul style="list-style-type: none"> <li>CHPS lacks earmarked support from international donors. Instead, external resources are focused on technical assistance. Requiring a resource-constrained system to invest in incremental resources is unrealistic.</li> </ul>

**TABLE 2 (continued).**

Constraint Type	Barriers to Scaling Up	Actions Implemented in the UER	Global Implications
<b>Leadership and Governance</b>			
Lack of leadership for CHPS	<ul style="list-style-type: none"> <li>• Absence of district and regional leadership for CHPS implementation</li> <li>• Lack of facilitative supervision</li> </ul>	<ul style="list-style-type: none"> <li>• Implemented peer leadership exchanges between Navrongo and district teams and between leading district teams and counterparts</li> <li>• Implemented supervisory peer leadership exchanges</li> </ul>	<ul style="list-style-type: none"> <li>• Leadership is developed through transfer of knowledge via onsite demonstration and participatory exchanges. Workshops are an ineffective tool for leadership development.</li> </ul>
Failure to replicate Navrongo community engagement	<ul style="list-style-type: none"> <li>• Lack of community entry and engagement</li> <li>• Limited focus on establishing community health committees</li> <li>• Absence of mechanisms for durbars and community exchanges</li> </ul>	<ul style="list-style-type: none"> <li>• Employed social engagement strategies, including outreach to chiefs and elders, engagement with social networks and opinion leaders, community durbars for building consensus and collective action</li> </ul>	<ul style="list-style-type: none"> <li>• Social engagement, gender strategies, and traditional governance strategies can be diluted with scale up. Resources for exchanges, demonstration, and discussion of social organizational issues can be crucial to effective scale up of community health service strategies.</li> </ul>
Absence of political support	<ul style="list-style-type: none"> <li>• Absence of political engagement strategies</li> <li>• Limited district development investment in health</li> </ul>	<ul style="list-style-type: none"> <li>• Mobilized resources for health post construction through grassroots political support</li> </ul>	<ul style="list-style-type: none"> <li>• Siloing community health development in the health sector can detract from scale up. Grassroots political engagement can contribute to off-setting resource limitations.</li> </ul>

most important factor explaining the rapid scale up of CHPS in the UER.

**Shared and Consistent Vision and Commitment Among Leaders**

Regional and district leaders in the UER have had a priority focus on and commitment to CHPS. From the onset, the UER Health Administration carried out strategies to mobilize resources, even cutting budgets of other activities and temporarily curtailing services to create budgetary space for CHPS. As UER district health managers noted when they were asked about scaling-up problems:

*Resources are not always as you need. There are always other things that you can put in there. If there is not that commitment to implement CHPS, you don't go that extra mile to put resources in place.*

*The response [to shortage of funding] is we just keep going and going. Because you cannot ignore them. You keep trying; sometimes you get lucky, in another time you are not.*

*If we get to the [district] assembly and explain things to them, [they] understand.*

*We discuss [CHPS] with the NGOs. We would draw our budget and discuss our [funding] challenge with them [and clarify] that this is what we want to do. But this is our challenge—to throw more light on the program so that they would help us.*

Although launching CHPS is not expensive, its incremental costs are difficult to sustain. The estimated total expenditure for 1 fully functional CHPS zone covering a population of about 3,500 is US\$33,345 (about US\$9.50/capita) (including a solar panel but excluding CHO salaries, fuel for vehicles for monitoring activities, and training costs). The most costly components are facility construction (\$20,240) and motorbike procurement (\$5,300). However, if village volunteers conduct construction, using traditional material for building walls, the cost is reduced substantially (to about \$3/capita). These modest costs are nonetheless a major challenge for district managers, who often lack adequate resources for implementing even the most basic health service agenda. The incremental costs of initiating the Navrongo model was the most dominant constraint to CHPS implementation identified

during the course of our interviews. Every district director interviewed noted some aspect of this problem. For example:

*There is no funding for CHPS. The strategy was mainly to cut back on other things. It's tough.*

*For me, funding is a big issue. Even when you got District Assemblies to build a compound [health post], really getting it functional, getting people trained, and getting all the logistics is the problem.*

*Where you want a new system to work well, you put money for it. CHPS doesn't have [money].*

*When I want to [send nurses] to school I have to look for my own funding. No one funds training. The CHOs were first supported by the district assemblies but they say they are constrained, so they are now funding themselves.*

*Everything they [District Assemblies] do depends on their Common Fund. If the Common Fund doesn't come, whatever they tell you, it is always difficult because the internally generated revenue is not adequate to even meet their overhead courses.*

**CHPS expansion was most successful in areas where local politicians contributed funds to the program's budget.**

CHPS expansion has been most successful in areas where GHS regional and district officials have persuaded local governments to add CHPS into their annual budgets. Simple-to-implement communication strategies have facilitated exchanges between local government authorities, politicians, and health leadership about CHPS. For example, GHS leaders have involved local officials in CHPS-sponsored community celebrations of implementation progress, linking popular support for CHPS to the political aspirations of elected officials.

But not all district health directors—the local focal points of health administration—consider CHPS as the most effective means to achieving health objectives, partly because most managers are unfamiliar with the Navrongo experiment but also because many are unconvinced that CHPS is cost-effective. To address these issues, the UER is testing a toolkit that will help managers compare different budgetary options and their implications on offsetting health and mortality risks. This tool has provided district managers with practical means of demonstrating the potential impact of investing in CHPS on health outcomes and may have contributed to accelerating the expansion of investment in CHPS between 2010 and 2012.<sup>42</sup>

In addition to their commitment to CHPS, UER leaders also shared a coherent and

consistent vision about CHPS, which contributed to the scaling-up process. According to GHS policy documents, CHPS is defined as “the mobilization of community leadership, decision-making systems and resources in a defined catchment area (termed a ‘zone’), the placement of reoriented frontline health staff, known as Community Health Officers, with logistics support and community volunteer systems to provide services according to the principles of primary health care (PHC-Plus).” Regional and district leaders in the UER had a similar interpretation of this policy. For example, most UER directors considered CHPS to be functional even without a compound as long as CHOs provided services. In contrast, directors based elsewhere tended to disagree with this perspective. One such manager noted:

*You need a person to be there. You need a compound [health post] to make it functional. Those are the two key ingredients you need ... CHPS without a compound compromises [the program]. At any time, people should be able to call on you ... People have been trying to define that it's functional without a compound. But a compound must be there. In a community, when services are not done holistically 24 hours, how can you say it's functional?*

*Some issues are not clear[ly] defined. What is operational CHPS? What is functional CHPS? [We] Need to make sure that [the] document is still relevant; [we] need to redefine to clarify parameters. CHPS is progressing at various stages. It needs revision. People have different understandings. People have expressed different views. Based on that, the policy should be revised.*

Similarly, officers interviewed in the UER were consistently clear about responsibilities of the CHOs, but CHO responsibilities were less clearly defined elsewhere. For example, one manager outside the UER argued that CHPS workers should be health promoters but not service providers:

*[We] Shouldn't overload them [the CHOs]. CHOs should not be doing antenatal [care] and immunization. They should only do education ... [and] should only be going out. [They] Should not be sitting there.*

The shared vision and commitment to the CHPS program among UER leaders facilitated the process of political and community

engagement, which in turn facilitated resource mobilization. When health sector leadership catalyzes the process of community engagement and resource mobilization, CHPS scale up proceeds even if no health sector revenue exists for the program.

### Peer Exchange Visits

Exchange visits between new and advanced districts helped to facilitate scale up by giving new CHPS program leaders an opportunity to directly observe how the model was working successfully. Dialogue between program leaders dispelled mystery about the CHPS development process and nurtured teamwork among the implementers. Peer exchanges were designed to achieve this by equipping visiting teams with the capability to implement the program in 1 or 2 zones.

To focus exchanges on implementation, visiting teams were encouraged to include participants who could represent the contrasting implementation responsibilities of each level of the system: the District Health Management Team, at least 1 subdistrict supervisory team, and 2 or more CHOs from the participating subdistrict. These individuals were then teamed with counterparts from an advanced implementation team to plan together how to implement a functioning CHPS zone in the participating team's home district.

The teams discussed the practical task of zone implementation, community engagement, replicating exchanges between communities, and building local political commitment to CHPS expansion. Each participating team also received seed funds to cover the cost of implementing a pilot zone, with training on how to cost and budget the program. Taken as a set of activities, exchanges equipped and financed pilot implementation of CHPS in ways that catalyzed scale up of operations once participants returned to their home districts.

Participants were also oriented to focus group methods that would enable managers to respond to community and worker opinion, adapt strategies to local conditions, decentralize planning, and take ownership of the program as a district-directed, scaling-up initiative.

Although 38 districts throughout Ghana participated in exchanges, this process was far more intense in the UER than elsewhere. By 2004, all districts, subdistricts, and CHOs in the region had participated in 1 or more exchanges

with the Navrongo team. National monitoring data have since revealed that peer-exchange visits have been more successful than workshops. In fact, by 2008 CHPS coverage was concentrated in the 38 districts that participated in exchange visits with the Navrongo or Nkwanta advanced CHPS districts.<sup>15</sup>

## CONCLUSION

Despite the challenges that have been identified, the CHPS initiative has begun to introduce health care reform in every region and district of Ghana. In the UER, where scale-up problems have been the focus of strategic review, trial, and dissemination, CHPS has established a sustainable service model, which ensures that progress is adapted to local realities and guided by evidence. Coverage of community-based care in the UER was 5 times the national average after a decade of scaling up, even though the region is the poorest in Ghana.

Nonetheless, problems with district health system leadership persist and merit further research, demonstration, and policy development. The new Ghana Essential Health Intervention Programme (GEHIP) has been launched to address the evidence gap on how to improve district leadership for continued CHPS expansion,<sup>39</sup> including the development of district planning tools, resource management systems, and intersectoral coordination strategies.<sup>46</sup> In addition, the new project is testing a simplified management information system to meet the information needs of CHOs and district leaders while minimizing the time and effort required for CHOs to capture, manage, and report information.<sup>47</sup>

Although much remains to be accomplished, the CHPS experience in the UER attests to the practicality of scaling up CHPS throughout Ghana. Its core strategy is based on the principle of putting evidence into action through research, experimentation, multiple validations, and adaptation efforts—learning by doing.

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## STORY FROM THE FIELD

## From housewife to health worker: touching other lives and changing my own

Interview conducted by Tahir Tarar,<sup>a</sup> Translated by Duaa Khalid<sup>b</sup>

*Shaheen Hussain, the 6th of 7 children raised in an unprivileged home in a village of Punjab, Pakistan, married when she was 18 and played the traditional role of housewife and caregiver to her children, but she felt unfulfilled on a personal level. Two years ago, she became a field-based health educator with the “Suraj” (sun) social franchise of private reproductive health care providers, established by Marie Stopes Society in 3 provinces of Pakistan. Her story below, transcribed and translated from an interview, is a testimony of how this program not only touches the lives of the women who receive the reproductive health services but also of the health educators themselves.*

“I have lived in Adda Chakrala, Punjab, my whole life. I went to school till class 10, but could not continue as my parents could not afford the school fee. Instead I was married when I turned 18. As expected of me, I gave birth to my first child soon after my marriage. In a span of 10 years, I had 3 children. I was fortunate that my husband understood the importance of a small family, given our limited resources. Both of us had grown up in families that had more mouths than our parents could feed, and we had vowed not to let that happen to our own children. I took care of the house and brought up my children to the best of my ability but felt unfulfilled. I knew I could and should do more.

Two years ago my husband came home from work with news of a vacancy for the position of a ‘health educator.’ He had heard of the position from the locally elected representative/counselor. It was the first time I heard of an organization called Marie Stopes Society. I learnt they required a woman who belonged to the community, was at least matriculate so that she was able to read and write Urdu, and willing to move freely within the community on a daily basis.

Having always felt like something was missing in my life and wanting to be useful to my community, I applied for the job. I can never forget that day I was

told I had been selected—that day became a turning point in my life.

I was trained with a group of other women like myself from adjoining communities. After training, I embarked on visiting homes and meeting with married women of reproductive age. I made use of my training to broach the subject of pregnancies and contraceptives. At the beginning, I often had women closing their doors on me before I had finished speaking. These women felt awkward talking to me, and talking to their husbands, regarding spacing of pregnancies and family planning.

Eventually, employing the skills taught to me during my training, my perseverance, and show of empathy, women began to let me into the home to talk. Most often, mother-in-laws of young married women sat in the room. This allowed me to not only speak to the young women but also to their mothers-in-law—the decision-makers in most cases!

Today, I am invited by women to discuss personal matters and give advice. I take great satisfaction in what I do because now I can support women of my community in making informed decisions regarding spacing of their pregnancies and contraceptive choices. Those unable to pay for services have access to quality services using vouchers we offer through Suraj.

Most importantly I have managed to address the myths and misconceptions surrounding modern contraceptives. I have also been able to provide support and counseling for method continuation or method switching. Increasingly, I have sensed a difference in spousal communication through the women I interact with.

My work is my passion. It gives me inner satisfaction to be able to support women and couples in deciding on a method to help prevent unintended pregnancies. I can see the change in the lives of so many women with safe pregnancies and healthier babies, happier families.

What I did not mention so far is the monetary benefit of my work! I am proud to be contributing to my household’s income and being able to give my children better opportunities.”

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## AFTERWORD

As a field-based health educator with the Suraj social franchise, Shaheen Hussain makes door-to-door visits to households in her community, raising awareness among married women of reproductive age about the benefits of healthy timing and spacing of pregnancies for the mother, child, and entire family. She also provides information on the entire range of available modern contraceptives and promotes the Suraj facilities for their quality services. Using a poverty assessment tool, Shaheen identifies women who are unable to pay for health services and provides them with vouchers that they can redeem for free quality services at the Suraj facility.

In Pakistan, women bear, on average, 4.1 children, and only 30% use contraception.<sup>1</sup> However, the total demand for family planning is far higher at 55%, with 1 in every 3 pregnancies unplanned.<sup>1</sup> Failure to meet the unmet need for family planning has had adverse implications on development indicators, particularly for maternal and child health. Postpartum hemorrhage, other pregnancy complications, and the consequences of unsafe abortion are major causes of maternal deaths.<sup>2</sup> At 276 maternal deaths per 100,000 live births,<sup>1</sup> the maternal mortality ratio needs to be reduced by three-quarters by 2015 to realize Millennium Development Goal 5 to improve maternal health. More than 80 women die each day in Pakistan, and more than 30,000 women each year, due to preventable complications during pregnancy.<sup>1,3</sup>

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Shaheen counsels a community member about the benefits of healthy timing and spacing of pregnancies.

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