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Cover caption: Individuals waiting at a COVID-19 antigen testing center in Warora, Maharashtra, India. © 2020 Ganesh Dhamodkar/Wikimedia Commons.

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Anita Gibson, Lisa Naguchi, Mary V. Kinney, Hannah Blencowe, Lynn Freedman, Tlaleng Mofokeng, Mickey Chopra, Queen Dube, David Ntirushwa, Angela Nguku, Anshu Banerjee, Swaraj Rajbhandari, Hadiza Galadanci, Martina Lukong Baye, Pashtoon Zyaee, Lia Tadesse, Dalya Eltayeb, Aparajita Gogoi, Shams El Arifeen, Samba Sow, Patrick Kuma-Aboagye

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Chelsea B. Polis, Easmon Otupiri, Suzanne O. Bell, Roderick Larsen-Reindorf

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Natalie Tibbels, Abdul Dosso, Aliya Allen-Valley, William Benie, Corinne Fordham, Jeanne Aka Brou, Marjorie Nana, Valère Zounnemeb, Korodénin Fatoumata Silué, Diarra Kamara, Danielle Naugle

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Peter Waiswa, Phillip Wanduru, Monica Okuga, Darius Kajjo, Doris Kwesiga, James Kalungi, Harriet Nambuya, Jude Mulwooza, Abner Tagoola, Stefan Peterson

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Lachmi R. Kodan, Kim J. C. Verschueren, Geertje Boerstra, Inder Gajadien, Robert S. Mohamed, Lily D. Olmtak, Satish R. Mohan, Kitty W. M. Bloemenkamp

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Wenjuan Wang, Shireen Assaf, Thomas Pullum, Sunita Kishor

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Gillian Dougherty, Tihnje Abena, Jean Pierre Abesselo, Jeane Ngala Banda, Tjek Paul Biyaga, Rodrigo Boccanera, Mary Adetunke Boyd, Mesmey Ebogo, Leoda Hamomba, Suzanne Jed, Zeh Florence Kakanou, Prisca Kasonde, Siphwe Chilungu Kasonka, Rachael Lungwebungu, Caitlin Madevu-Matson, Magdalene Mange Mayer, Mukuka Mwamba, Milembe Panya, Paul Sakanda, Fatima Tsiouris, Lauren Walker, Miriam Rabkin

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Emily Teachout, Laura A. Rowe, Helena Pachon, Becky L. Tsang, Lorraine F. Yeung, Jorge Rosenthal, Hilda Razzaghi, Meredith Moore, Dora Panagides, Peiman Milani, Michael J. Cannon

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## LETTERS TO THE EDITOR

### Regarding “A Cluster-Randomized Trial to Test Sharing Histories as a Training Method for Community Health Workers in Peru”

Improving communication between mothers and health systems will grow cost-effective, potentially scalable health impact. By developing an approach of how health systems and mothers can communicate to increase mutual understanding, a "health language" that is grounded in mothers' reproductive life narratives can be developed to help bridge the long-standing gap in how health systems and mothers engage.

Daniel C. Taylor

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# Micronutrient Powders for Infants and Young Children

Stephen Hodgins,<sup>a</sup> Rolf Klemm<sup>b</sup>

➔ See related article by [Dusingizimana et al.](#)

## ■ STRATEGIES TO DELIVER MICRONUTRIENTS TO AT-RISK POPULATIONS

Micronutrient deficiencies, notably of vitamin A, iron, and zinc, have occupied a prominent place on the child health and nutrition agenda over the past 3 decades, and for good reason: there has been robust evidence on the population burden of these deficiencies, particularly in low- and lower-middle-income countries, as well as on their contribution to morbidity, mortality, and compromised developmental outcomes. The situation has been improving, but there is still evidence of widespread deficiencies of these and other micronutrients, especially in sub-Saharan Africa and South Asia.<sup>1</sup> Furthermore, intervention trials have demonstrated unequivocal reductions in risk of under-5 mortality for vitamin A supplementation<sup>2</sup> and reductions in respiratory infection and diarrhea incidence and all-cause mortality for zinc supplementation.<sup>3</sup>

So, we have a significant problem, and we also have specific *technical interventions* for which there is evidence for efficacy. That's a good thing...but it doesn't necessarily mean we have readily available real-world *delivery strategies* that can fix these problems quickly at scale.

The child health and nutrition community has consistently upheld dietary diversity as the ideal. With rising living standards, there have been concomitant improvements not only in protein-energy adequacy but also in micronutrient intake. Nevertheless, the Food and Agriculture Organization has documented that the cost of a nutrient-adequate diet exceeds the international poverty line,<sup>4</sup> with the result that about 3 billion people still cannot afford the minimum cost of a healthy diet. So, appropriately, the child health and nutrition community has sought to accelerate improvements, beyond what improved living standards alone can contribute. This has been achieved, in part, through the development of strategies aiming to deliver key micronutrients

in ways that effectively reach whole populations and especially segments of the population most at risk for severe deficiencies and their consequences.

## ■ FOOD FORTIFICATION AND SUPPLEMENTATION

One of the most momentous public health achievements of the 20<sup>th</sup> century has been the near-elimination of iodine-deficiency-related compromise in cognitive development (with cretinism as its extreme manifestation), achieved largely through salt iodization. Incorporating micronutrients into widely consumed, commercially processed food products—*food fortification*—has proven a highly effective strategy, provided that certain key conditions are met, notably that suitable food products are available as fortification vehicles, and that cost, taste, and appearance are not affected.

In the trials that first demonstrated the contribution of these micronutrients to child morbidity, mortality, and compromised development, the delivery strategy used was *supplementation*. Compared with commercial food fortification, supplementation is inherently a more difficult way to achieve improvements in population health and nutrition outcomes, as it requires (1) logistical arrangements to ensure a reliable supply of a micronutrient commodity to end-users, and (2) a level of user adherence sufficient to produce a health or nutrition benefit. Furthermore, these conditions need to be sustained continuously until the underlying nutrition status of the population is adequate, through dietary intake.

When certain requirements are met, it has proven feasible to meet both of these conditions under real-world programs at scale. Notably, the use of iron-folate supplements by pregnant women has been achieved at relatively high coverage, in some countries, although in most, coverage remains low.<sup>5</sup> In this instance, provision of the commodity to the end-user has been done, taking advantage of an available, generally high-coverage contact with the primary health care system—antenatal visits (ANC). Among 47 countries in sub-Saharan Africa and South and South East Asia for which ANC visit data are available from Demographic and Health Surveys (DHS) conducted over the past 10 years, in 38 of them, more than 85% of women who had given birth over the previous 5 years reported having made at least 1

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ANC visit.<sup>6</sup> Such contacts provide an opportunity for health workers to dispense the product and to counsel their pregnant clients on the rationale for its use and how to minimize side effects. Pregnant women, themselves, are generally highly motivated to adopt practices they believe will help protect and strengthen their unborn babies, and, in this instance, they are asked to adhere to daily supplement use only for a few months. So, the provision of standalone micronutrient products for household use is not an easy strategy, but under the right circumstances, it can work.

Another relatively successful use of such a strategy has been periodic distribution of high-dose vitamin A to infants and children aged 6–59 months, in countries where this deficiency remains common and regular service delivery is challenging. Using a twice-annual, campaign-style delivery strategy (sometimes piggy-backed on Supplemental Immunization Activities), many countries have been able to reach the majority of children in this age group. But this is a demanding and costly strategy that may interfere with routine service delivery.<sup>7</sup> In recent years, some key stakeholders have shown declining support,<sup>8</sup> and, indeed, for some populations it may now be appropriate to review whether this effort should be maintained.<sup>9,10</sup>

## ■ WHAT ABOUT MICRONUTRIENT POWDERS AS A STRATEGY FOR ADDRESSING MICRONUTRIENT DEFICIENCIES IN INFANTS AND YOUNG CHILDREN?

Micronutrient powders (MNPs) have been promoted as a home-based strategy, controlled by the caregiver, to improve dietary quality for infants and young children. In settings where the use of MNPs has been promoted (framed as home or point-of-use “fortification”), clearly, there has been a significant problem of deficiencies of the key micronutrients included in these powders. And, in principle, if these products are reliably consumed several times a week, we would expect benefits (largely, improved iron status) in line with what has been documented in the published trials.<sup>11</sup> It has been demonstrated that where there are committed, adequately funded, and well-managed implementers along the whole supply chain down to the community level, to support MNP logistics, and where context-specific challenges with adherence are adequately addressed,

it is possible to achieve relatively high effective coverage<sup>12</sup> (i.e., a large proportion of those who could, in principle, benefit from such an intervention actually do.)<sup>13</sup> But that is a challenging set of conditions to be met for the intervention to produce its desired population health and nutrition goal.

The article by Dusingizimana et al.<sup>14</sup> in this issue of *Global Health: Science and Practice* documents the performance of an MNP program in Rwanda. As they report, MNPs have been implemented in Rwanda with support from United Nations Children’s Fund (UNICEF) and other partners. First adopted as policy, the program was fully scaled up across the country by 2017. Under the program, sachets of MNP are delivered to the district by UNICEF and the Ministry of Health; they are then distributed to health centers and then to community health volunteers, who have the responsibility to dispense them to households with infants and children aged 6–23 months and counsel mothers on their use.

In this study,<sup>14</sup> program performance was assessed in Rutsiro district, 1 of 19 in the first wave of scale-up. The district was selected for this study primarily because it was found to have a particularly poor baseline nutrition status. The district was typical regarding the degree of outside support received for MNP implementation.

The authors found evidence of relatively good program reach: almost two-thirds of mothers (64%) reported ever having used MNPs. But effective coverage was much lower: 38% reported having used MNPs at least once over the previous week, and use was considerably lower among those aged 6–11 months than among those aged 12–23 months. Furthermore, use was markedly lower among households with high “hunger scores”—those in which MNP use would be likely to produce the greatest benefit. Digging into the causes of the disappointing findings, predictably the authors found problems with commodity logistics and adherence. Supplies were not reliably available, and many mothers either did not see the value in MNP use or found they affected palatability of the thin porridges commonly given to infants aged 6–11 months in this setting.

Rwanda is widely recognized as an exemplar for the performance of its primary health care programs and, arguably, has been the biggest MNP success story in sub-Saharan Africa. It remains the one country on the continent to have fully scaled up this intervention. It is less clear, however, what impact this has made. Among young children aged 12–23 months, comparing findings

**Compared with commercial food fortification, supplementation is inherently a more difficult way to achieve improvements in population health and nutrition outcomes.**

**MNP programs are a comparatively heavy lift, requiring—for their effectiveness—robust commodity logistics and behavior change efforts supporting uptake and adherence.**

from the 2010 Rwanda DHS<sup>15</sup> to those of the 2019–2020 DHS<sup>16</sup> (i.e., from before the introduction of MNPs to after full national scale-up was achieved), there was a modest decline in mild anemia (Hgb 10–10.9), from 31% to 26% but no change in moderate to severe anemia (20% in both surveys). Note that with high-fidelity delivery and adherence, efficacy trials have shown a one-third reduction in anemia.<sup>11</sup>

There were other notable improvements in child nutrition status over this interval, not attributable to MNPs: of children aged 12–23 months, the proportion stunted (<−2SD height for age) dropped from 49% to 36%. So, even the modest decline in mild anemia cannot necessarily be attributed to the MNP program alone.

It needs to be acknowledged: MNP programs are a comparatively heavy lift, requiring—for their effectiveness—robust commodity logistics and behavior change efforts supporting uptake and adherence. Neither of these conditions can be easily achieved and maintained at scale. This is certainly not unique to MNP programs; other efficacious nutrition and health interventions also have onerous supply- and demand-side requirements that undermine the feasibility of achieving sustainable high-coverage delivery at scale.

## ■ ROUTINE DELIVERY AT SCALE: THE DEVIL'S IN THE DETAIL

With management oversight vigilance and dedicated resources, many delivery strategies can give promising results when implemented at relatively small scale. But such results are often poor predictors of program performance at scale, under routine, institutionalized conditions. MNP program efforts have been successful, in the sense that such programs have been introduced in many countries over the past decade. However, it is much less clear what they have contributed to improving mortality, morbidity, and developmental outcomes—at scale. As noted by Pelletier et al.,<sup>17</sup> even with a decade of efforts to introduce and scale up this intervention, most of the programs documented in the peer-reviewed literature have been of modest scale, implemented over relatively short periods, and dependent on significant external support. Review of large-scale program experience<sup>18</sup> has found little evidence on how to effectively reach a large proportion of those targeted and achieve high adherence, when implementing under routine, at-scale conditions.

Evidence from studies such as that reported on by Dusingizimana et al. suggests that, in many

instances, these programs are not achieving the population health impacts hoped for by their promoters. In settings where it will not be feasible to ensure reliable commodity supply or adequate adherence support, population-level impacts will not be attained.

## ■ TIME TO RETHINK?

In the presence of a clear need—in this case, a high burden of serious morbidity, mortality, and compromised development outcomes—and having in hand an intervention proven to be efficacious in addressing that need, it is certainly warranted to make serious efforts to develop and test practical delivery strategies that may have the potential for high coverage under real-world conditions. Such development and testing need to be done on an iterative basis, beginning with smaller-scale proof-of-concept piloting, progressing to tests of delivery effectiveness at a progressively larger scale and more routine conditions. And, as difficult as it may be for those championing a potentially high-impact intervention, we also need to be willing to step back and look critically at our efforts and, when necessary, go back to the drawing board.

Rwanda is a notable high performer with regard to the effective delivery of primary health care interventions. But, even in Rwanda, it is legitimate to ask if the effort expended to date, to introduce, scale up, and sustain MNPs has been worth it, given the modest population impact that can be attributed to this effort.

*Has the juice been worth the squeeze?*

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COMMENTARY

# COVID-19 Pandemic in India: Through the Lens of Modeling

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## Key Messages

India has devised innovative strategies to reduce the spread of COVID-19 within the constraints of a low-resource setting. India has also made some questionable policy decisions. Lessons learned from the Indian experience for public health, health care, and data infrastructure can be globally valuable. In this commentary, as a team of public health data scientists engaged in modeling the pandemic since early 2020, we reflect on India's journey over the past 1 year.

## INTRODUCTION

India, the world's largest democracy, declared its first confirmed case of severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2) infection on January 30, 2020. It currently reports Asia's largest number of coronavirus disease (COVID-19) infections and deaths (27.7 million reported cases and 322,384 reported deaths as of May 28, 2021).<sup>1</sup> The actual numbers for both infections and deaths likely far exceed what are officially reported.

In the past year, India has devised some innovative strategies aiming to reduce COVID-19 spread within the constraints of a low-resource setting. It has also made some questionable policy decisions. Lessons learned from the Indian experience for public health, health care, and data infrastructure can be globally valuable. In this commentary, as a team of public health data scientists engaged in modeling the pandemic since early 2020, we reflect on India's journey over the past year.

## THE LANDSCAPE OF EPIDEMIOLOGICAL MODELS

Epidemiological models help public health planners gauge the future predicted trajectory of epidemics,

providing forecasts or estimates for the daily number of infections, hospitalizations, and deaths. Models operate under various assumptions. They can incorporate hypothetical intervention scenarios and assess their relative impact on disease transmission. Because they may help us calibrate our expectations and resource needs for the future, predictive models have drawn significant attention from the media and the public.<sup>2</sup>

### Types of Commonly Used Models

There have been many models proposed for the spread of COVID-19 in India. These models can be broadly categorized into 2 genres: exponential/Poisson-type regression models and compartmental epidemiological models. For instance, Ranjan<sup>3</sup> and Gupta and Shankar<sup>4</sup> use the classical exponential model on the daily case counts. The compartmental models include variations of the susceptible-infected-removed (SIR) model. Such models are guided by a set of differential equations relating to the number of susceptible people, the number of infected people (cases), and the number of people who have been removed (either recovered or dead) at any given time. One extension of the SIR model is the susceptible-exposed-infected-removed (SEIR) model that incorporates an additional compartment of truly exposed people which is latent or unobserved. Ray et al.<sup>5</sup> provide a summary of these models and their basic assumptions; Sarkar et al.<sup>6</sup> provide an early comprehensive review, and Purkayastha et al.<sup>7</sup> provide a head-to-head comparison of 5 different models for forecasting, with a focus on India. Such models differ in terms of the data they use, ranging from simple case counts to age-sex demography, age-specific contact networks, and mobility data. Some, but not all, models are transparent, explicitly stating assumptions, making their code available, and updating their predictions regularly.<sup>5,8</sup> Such constant recalibration and updating are critical, given that the reality on the ground changes rapidly.

Providing uncertainty estimates for point predictions is also essential since the predictive ability of these models deteriorates rapidly over times longer than a few weeks. Several authors have pointed out that India is heterogeneous. Allowing different state- and district-level model predictions from multiple groups to

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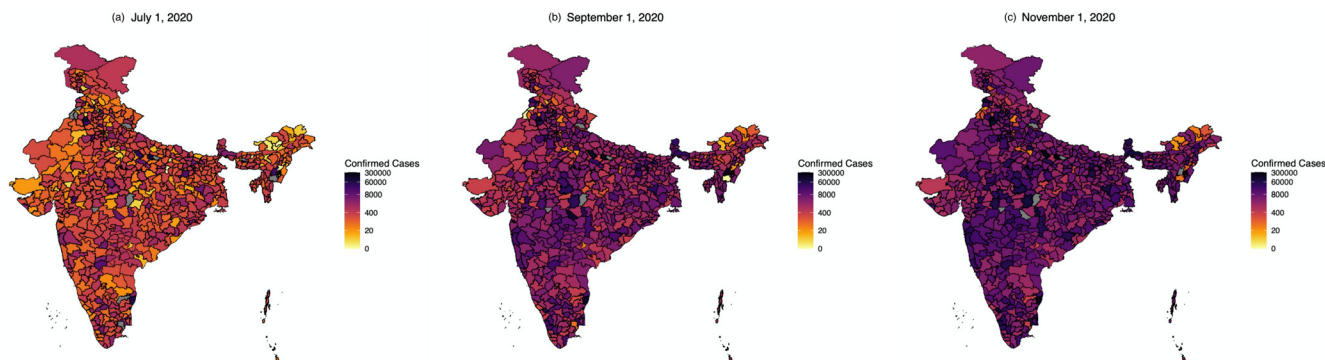
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**FIGURE.** Case Counts in India Using District-Level Data<sup>a</sup> as Reported on (a) July 1, (b) September 1, and (c) November 1, 2020, Shown as a Heat Map in Logarithmic Scale



<sup>a</sup> From covid19india.org.

aggregate toward national-level predictions is a better approach.<sup>9</sup> It would be audacious to claim the superiority of a single model or base public health decisions solely on one.<sup>10</sup> In principle, ensemble methods that average over predictions across multiple models should provide predictions that benefit from aggregated learning.<sup>11</sup> However, for dynamic systems used for modeling the virus transmission, aggregating results from models with diverse assumptions, structure, and inputs may lead to a lack of interpretability.

### Mismeasured Case and Death Counts

While projections based on reported daily case-counts have received the most attention, the differential availability of testing and the high rates of false negatives in the rapid antigen tests (30%–40%) and RT-PCR tests (15%–30%) mandate that investigators either explicitly account for selective and imperfect testing or conduct careful sensitivity analysis.<sup>12,13</sup> Serosurveys and epidemiological models have confirmed a high degree of covert infections for India, and a reasonable estimate would suggest that more than 90% of infections remain unreported.<sup>12</sup> A recent preprint<sup>12</sup> shows that the estimated case underreporting factor for India using data from April 1 to August 31, 2020, is approximately between 10 and 20, with the death underreporting factor estimated at approximately between 2 and 5 as of September 1, 2020. These estimates are obtained from an extension of the SEIR model accounting for the high false-negative rates of diagnostic tests

(misclassification bias) and the symptom-based administration of these tests (selection bias).<sup>12</sup> The infection fatality rate (IFR) for India is estimated to be around 0.1% (using officially reported death counts), whereas the reported case fatality rate (CFR) is 1.4% at the end of the year 2020. There is substantial heterogeneity in the case counts across Indian states. The Figure exhibits heat maps on a logarithmic scale, indicating the number of confirmed cases on July 1, September 1, and November 1, 2020, during the first pandemic wave. These demonstrate the very inhomogeneous spread of COVID-19 in India, which centered largely around the major urban agglomerations in a small number of states over much of the early and intermediate period, expanding only later across the country.

### Expanded Models Using Additional Information on Vaccines and Variants

Newer models leveraging information from serosurveys have appeared (e.g., the well-known Institute for Health Metrics and Evaluation model in the United States).<sup>14</sup> In the Indian context, Mandal et al.<sup>15</sup> use a compartmental model to project the demand for hospitalization, accounting for population immunity estimated by serosurveys. With emerging new variants of SARS-CoV-2 (e.g., B.1.1.7 from the United Kingdom [UK], B.1.351 from South Africa, or P.1 from Brazil), many countries are adopting models that additionally incorporate differential transmissibility and time-varying reproduction numbers of these

**Allowing different state- and district-level model predictions from multiple groups to aggregate toward national-level predictions is a better approach to predicting virus transmission.**

**With emerging new virus variants, many countries are adopting models that incorporate differential transmissibility and time-varying reproduction numbers of these variants.**

variants (Table).<sup>16-22</sup> Now that community-wide vaccination programs are underway in many countries, some of these models also consider different vaccine effectiveness profiles.<sup>16-18</sup> One straightforward approach is to use the traditional SIR or SEIR model, where each compartment is stratified by vaccine status and infecting variant, and to consider time-varying vaccination rates and variant transmission rates.<sup>17</sup> To our knowledge, the impacts of both vaccines and new virus variants have not yet been incorporated in any model from India.

**Conjectural theories explaining causes of India's comparatively low fatality rates include cross-immunity, genetics, prior vaccination, younger population, and a predominantly outdoor lifestyle in rural areas.**

### Resource Allocation Models

When compared to prediction models for case-/death-/hospitalization-counts, less public attention has been given to resource allocation models used to deploy health care resources like estimating oxygen supply or the number of hospital beds<sup>23</sup> or risk stratification using individual-level data.<sup>24</sup> Modeling approaches are critical as India rolls out its nationwide vaccine distribution plan based on hierarchical risk prioritization. Such models based on ecological-level data have been recently proposed.<sup>25</sup>

## ■ MYSTERIES UNEXPLAINED BY MODELS

### Plausible Causes of Lower Case-Fatality Rates in India

The comparatively low numbers for COVID-19 fatalities per million population in India provide some cheer. As of March 30, 2021, India had 119 deaths per million, in comparison to numbers for Brazil (1,507 deaths per million), Germany (926 deaths per million), the UK (1,892 deaths per million), and the United States (1,585 deaths per million).<sup>1</sup> However, India has higher reported fatalities per million compared to neighboring countries: 65 (Afghanistan), 59 (Myanmar), 106 (Nepal), and 66 (Pakistan).<sup>1</sup> Some of this can be attributed to India's relatively young population. India has a median age of 29 years while Bangladesh and Pakistan have median ages of 27 and 23 years, respectively.<sup>26</sup> These numbers should be compared to the median ages of 47 years in Germany and 38 years in the United States. The proportion of the population aged 65 and older who are most susceptible to COVID-19 severity is 6.4% in India, 5.2% in Bangladesh, 4.3% in Pakistan. The corresponding numbers are 21.6% in Germany and 16.5% in the United States.<sup>26</sup>

There have been suggestions that South Asian populations may be protected from more severe forms of the disease for various reasons. These theories include the possibility that infections from other types of coronaviruses in early life, leading to a stronger innate immune response.<sup>27</sup> The South Asian microbiome may differ in qualitative ways from the Western ones,<sup>28</sup> compulsory childhood vaccination programs may play a role,<sup>29</sup> and a genetic component to protect from the disease may exist.<sup>30</sup> The large number of patients detected by contact tracing who are asymptomatic at the time of testing suggests an overall milder impact of the disease.<sup>31</sup> Plausible explanations in support of India's low fatality rates include cross-immunity, genetics, prior vaccination, younger population, a predominantly outdoor lifestyle in rural areas, and plenty of outside air circulating through homes in urban settings. India is nearly 70% rural whereas European countries are overwhelmingly urban, facilitating the spread of the virus. However, all such hypotheses are conjectural at this point, and no causal association has been established.

Set against these hypotheses is the possibility that any innate advantage to the South Asian population is illusory, arising from inadequate counting of COVID-19 deaths.<sup>32</sup> There is certainly evidence that many deaths due to COVID-19 have not been classified as COVID-19 deaths (e.g., attributing patients' underlying conditions or comorbidities as the cause of death).<sup>33</sup> Evidence of deaths with symptoms suggestive of COVID-19 infection comes from on-the-ground reporting from crematoria and burial grounds,<sup>34</sup> detailed citizen-science-driven studies of obituaries,<sup>35</sup> evidence from the patients' families, and death-certificates.<sup>35</sup> Estimates of COVID-19 death undercounting range from a factor of 1.5 to 5.<sup>36</sup> A holistic measure of excess mortality due to the pandemic could have been obtained by estimating the excess over all-cause mortality in non-COVID years if comprehensive historical death data were available.<sup>37</sup> There is every reason to believe that in India, as is the case elsewhere, there have been excess deaths indirectly caused by the pandemic, due, for example, to delays in reaching care or compromised capacity for hospital care. On the other hand, confounders such as the abrupt national lockdown in March 2020 in India induced a decline in road deaths and homicides, a decrease in unwarranted medical interventions, and a reduction in respiratory ailments from a decrease in pollution following the lockdown are difficult to account for.<sup>38</sup>



**TABLE.** COVID-19 Epidemiological Models Incorporating Effects of Different Variants of SARS-CoV-2 and/or Impact of Vaccines

Model Type	Location of Data Used	Research Question	Key Variables/Parameters Considered	Reference
Two-variant compartmental model	USA	Assess the effect of VOC B.1.1.7 on the US pandemic trajectory in Jan-Apr 2021	SARS-CoV-2 immunity from previous infection; time-varying reproduction numbers of current variants and VOC; potential impact of community vaccination	Galloway et al. <sup>16</sup>
SIR model with compartments stratified by age, vaccine status, and infecting strain	Washington, USA	Project the timing and intensity of subsequent waves of infection	Time-varying, age-stratified effects of non-pharmaceutical interventions; different case thresholds for triggering and relaxing partial lockdowns; different vaccination rates and vaccine efficacy profiles; different infectivity rates of current variant and VOC B.1.1.7	Reeves et al. <sup>17</sup>
An extended $\theta$ -SIR model	Italy	Assess the impact of VOC B.1.1.7 and vaccination campaigns on spread of COVID-19	Different numbers of SARS-CoV-2 variants and vaccines; time-varying reproduction numbers; differential immunity depending on dose of vaccine	Ramos et al. <sup>18</sup>
An extended SEIR model (“UVA PatchSim model”)	Virginia, USA	Assess the preliminary effect of vaccines and potential effect of new variants on the trajectory of cases	Seasonal effects, including effect from pandemic fatigue; impact of VOC B.1.1.7; impact of community vaccination	University of Virginia Department of Health <sup>19</sup>
An extended SEIR model (“Behavioral SEIR”)	USA; UK	Forecast the evolution of the epidemic	Seasonal variation in transmission rate; pandemic fatigue; spread of the new variant (same seasonal pattern but different transmissibility)	Atkeson <sup>20</sup>
An extended SEIR model	Brazil	Forecast disease transmission behaviour under 2 SARS-CoV-2 dominant strains	Time-varying reproduction numbers of the original SARS-Cov-2 D614 and its dominant G614 variant; different incubation rates	Celaschi <sup>21</sup>
Renewal equation based semi-mechanistic model	England	Compare reproduction numbers of VOC with non-VOC	Time-varying reproduction numbers of current variants and VOC B.1.1.7; hotspots of infection; true positive rate adjusted SGTF frequencies (proxy for VOC frequencies)	Volz et al. <sup>22</sup>
Age-structured SEIR model	India	Assess optimal vaccine allocation strategies	Different age-stratified vaccination strategies and rates; different efficacies and types of immunity from vaccines	Foy et al. <sup>25</sup>

Abbreviations:  $\theta$ , instantaneous ratio of new detected infectious cases per unit time over the total; COVID-19, coronavirus disease; SARS-CoV-2, severe acute respiratory syndrome coronavirus-2; SEIR, susceptible-exposed-infected-recovered; SGTF, S-gene target failures; SIR, susceptible-infected-recovered; VOC, variant of concern.

## MYTHS UNSUPPORTED BY DATA AND MODELS

### Overstretching Limited Data

Since serosurveys from India indicated that at least 30%–40% of people in large urban areas already have experienced a past infection,<sup>39</sup> there were many discussions in the scientific community whether India is on its way to reaching herd immunity induced by natural infections. Recent articles<sup>40</sup> suggest that herd immunity may be impossible to attain and remain an elusive target even with vaccination efforts.

Several models had predicted the imminent end of the pandemic at the end of 2020. For example,

the government-endorsed supermodel<sup>41</sup> had predicted that there would not be another surge and that the coronavirus crisis would be substantially over by February 2021. However, intermediate outbreaks in some states refuted this naïve optimism, and the second surge made it clear that there are always possibilities of multiple waves of this virus.<sup>42</sup>

### The Second Wave in India

Since the middle of February 2021, the curve of reported COVID-19 cases in India has risen steeply. Some regions, such as the city of Pune, where serosurveys showed that more than 50% of the population had been infected in the first wave, are currently showing many cases in the second

**Recent articles suggest that herd immunity may be impossible to attain and remain an elusive target even with vaccination efforts.**

**The public acceptance of masks and non-pharmaceutical interventions early in the pandemic was impressive, given that close social gatherings are an integral part of the cultural fabric of India.**

wave.<sup>43</sup> This sharp rise could be due to a confluence of factors, such as the potential effect of waning immunity (recent studies show 84% protection at 7 months from past infections),<sup>44</sup> new variants of concern, mass gatherings due to election campaigns, festivities, religious congregations, the reopening of the crowded public transportation system, as well as a sense of false security in the public that has led to a relaxation of preventive measures like face covering and social distancing. While the daily test positivity rate stayed below 2% for much of the period since October 2020, it is currently at 7.2% on March 30, 2021 ([covind19.org](https://covind19.org)<sup>5</sup>). Models can adaptively capture this oscillatory growth, decay, sharp spikes, and falls by dividing the time series into segments. A new class of models is emerging that aims to not just model the virus transmission but also model changes in human behavior over time through predator-prey models like the Lotka-Volterra model.<sup>45</sup> We also need to model reinfection, cross-immunity, and the mutation process of the virus to capture the evolution of the epidemic over time.

## ■ SOME PUBLIC HEALTH SUCCESSSES FOR INDIA SUPPORTED BY DATA

### Scaling Up Health Care Capacity

Low- and middle-income countries are often denied the same credit for innovation, leadership, and implementation of public health policies as developed nations. Before the pandemic, preparedness indices favored more developed countries, with the UK and the United States listed in the top 5 in the Global Health Security Index (<https://www.ghsindex.org>). However, even with a modest rank of 57 in the index, India has substantially exceeded expectations, particularly in the way it scaled up testing and treatment facilities during the period of national lockdown in 2020, and managed to reduce overall COVID-19 case-fatality rates from what was expected in 2020.<sup>46</sup> Partnerships with private laboratories and hospital networks have enabled India to scale up testing from just 3,000 initially to more than 1.8 million tests per day.<sup>47</sup> The country expanded the ICU bed capacity by 3 times (63,758 in September versus 21,806 in April), the number of isolation beds to 1.55 million in September compared to 173,000 in April, and the number of designated COVID-care centers (15,403 in September versus 1,919 in April).<sup>48</sup> It is important to stay prepared and

continue to build this infrastructure because sweeping surges can happen, as we are noticing with the current oxygen crisis in India's second wave during April 2021.

### Community Engagement Strategies

The public acceptance of masks and nonpharmaceutical interventions in the early months of the pandemic was impressive, given that close social gatherings are an integral part of the cultural fabric of India. The success of community health worker involvement and syndromic surveillance, including in the most affected slum areas of Mumbai,<sup>49</sup> shows that India's public health approach can provide a unique example for other countries.

## ■ BACK TO THE FUTURE: WHAT LIES AHEAD?

The year 2020 ended with at least 3 promising vaccine trials<sup>50</sup> globally, with multiple vaccine trials going on in India.<sup>51</sup> Currently, vaccines in development include 45 in Phase I, 33 in Phase II, 23 in Phase III, 6 approved for limited use, and 7 approved for human use. Limited initial supply of vaccines requires countries to adopt model-informed prioritization strategies. Jin et al.<sup>52</sup> provide a mortality risk score calculator based on various sociodemographic characteristics and predisposing health conditions to prioritize high-risk populations for vaccination in the United States. Bubar et al.<sup>53</sup> use a mathematical model accounting for vaccine efficacy and age-related variations in susceptibility, immunity, and fatality rates to prioritize available doses. They also consider individual-level serological tests to redirect available doses. Foy et al.<sup>25</sup> use an age-stratified SEIR-based prediction model to evaluate vaccine allocation strategies in India.

### India's Vaccine Drive

India started one of the largest COVID-19 vaccine drives in the world on January 16, 2021,<sup>54</sup> within a few weeks of finalizing operational guidelines including prioritization of beneficiaries.<sup>55</sup> India has approved the Oxford-AstraZeneca vaccine (locally known as Covishield) and the made-in-India vaccine, Covaxin, for emergency use. As of March 30, 61 million doses have been administered, resulting in 0.65% of the population fully vaccinated while 3.8% had received at least one dose.<sup>1</sup> In March, India administered an average of >2.1 million doses per day ([covind19.org](https://covind19.org)<sup>5</sup>). Being one of the largest vaccine manufacturers,

India has also donated millions of vaccine doses to neighboring countries as a goodwill gesture and has committed to supplying vaccines to many other countries in the world.<sup>56</sup> India is expanding the market with emergency use authorizations to other internationally approved vaccines, and vaccines are to be made available to the adult population starting May 1, 2021.

### A COVID-Adaptive Future for India

Emerging new variants of SARS-CoV-2 are predicted to alter the pandemic trajectory around the world in the coming months. For instance, variant B.1.1.7 can bring about another peak in the COVID-19 case counts in the United States despite community vaccination (assuming 1 million vaccine doses are administered per day beginning January 1, 2021, and that 95% immunity is achieved 14 days after 2 doses).<sup>16</sup> Many other European countries may experience a similar wave of infections from this variant given the expected vaccination rates there.<sup>18</sup> Recently, a variant with double mutations in the spike protein has been discovered in India, and it is not yet clear if this variant is more or less contagious than the dominant one. However, this is an attractive explanation for the current spike.<sup>57</sup> A new peak in the COVID-19 trajectory in India is imminent, given the rapidly rising case counts during March 2021 ([covind19.org](https://covind19.org)<sup>5</sup>). Strategic genomic sequencing to identify known and emerging variants, accelerating vaccinations with more choices for vaccines (including one shot vaccines), and studying vaccine effectiveness against new variants is going to remain crucial in the coming days.

Follow-up studies of those vaccinated to understand the long-term safety and effectiveness of the vaccines will be necessary. Post-marketing studies for COVID-19 vaccines are all the more important owing to limited premarketing data resulting from their expedited development. Dhanda et al.<sup>58</sup> highlight the importance of such studies and the key epidemiological considerations, including active surveillance and careful study design. The Indian Council of Medical Research has set up the National Clinical Registry, a cohort of recovered COVID patients.<sup>59</sup> Monitoring the long-term health of this cohort is crucial as studies have indicated several unexpected post-COVID complications.<sup>60</sup> Vaccination outcomes in this recovered cohort should be of special interest. The economic recovery process for India will require a much longer time horizon and financial strategy.<sup>61,62</sup> Safely reopening educational institutions and

providing transitional support and aid to students and teachers will also be key as we look to the future.

### CONCLUSION

The pandemic has underscored structural barriers as well as deep-rooted problems with India's societal and public health infrastructure. It has displayed the inequities and the lack of poor pandemic preparedness in India. It has helped focus our attention on long-standing questions of the quality of public health systems, the need for better data, the importance of communication, and the need for more interdisciplinary expertise to address the so-called wicked problems that the current pandemic highlights.<sup>63</sup> It is imperative to take this as a teaching example and build strong systems to prepare for future pandemics. This requires substantial resource allocations and leadership to strengthen the agenda of health security, especially in the control of communicable diseases. Addressing alarming levels of air pollution,<sup>64</sup> arresting the high prevalence of noncommunicable diseases, and ensuring adequate support for mental health needs will be pivotal. Investments in public health must increase well above pre-pandemic levels.

Other factors that support a good public health system, including improved health data infrastructure, should be addressed. A planned digital health identity for citizens of India<sup>65</sup> will help identify elderly individuals, individuals with comorbidities, and essential workers nationwide for vaccination programs.<sup>66</sup> National-level health record data, together with actionable systems to access and mine this data while maintaining data privacy, will enable a more targeted approach to public health and health care in India. Even in the post-inoculated world, when the case counts reduce to a few hundred, India should have a robust surveillance system to track and contact trace future outbreaks of SARS-CoV-2 infection and identify any new variants. Sustained adoption and incentivization of COVID-appropriate behaviors are going to help us avoid massive lockdowns with crushing economic and social consequences.

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## COMMENTARY

# Social Distancing in the Era of COVID-19: A Call for Maintaining Social Support for the Maternal Population

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## Key Messages

- Pregnant, laboring, and postpartum women are navigating the challenges inherent to the perinatal period against the backdrop of a global pandemic but without a key protective factor—social support.
- Formal and informal social support systems for mothers need to be prioritized, even during pandemics, and failure to do so will greatly affect mothers, their infants, and their whole households.
- When determining policies to mitigate the spread of coronavirus disease (COVID-19), policy makers should take a harm reduction approach that incorporates feasible and innovative strategies to ensure the continuation of maternal social support.
- Policy makers need to engage and empower mothers as well as the associated professional communities to voice their needs and to inform and participate in the policy formulation process to ensure the creation of policies that are better suited to maternal social support needs during the pandemic.

## INTRODUCTION

Over the past year, the strategies used around the globe to slow the spread of coronavirus disease (COVID-19) have radically changed everyday life for millions of households. Conversing behind masks, avoiding physical proximity with people from outside the household, and viewing one another as potential biohazard carriers have severely disrupted the social and cultural connections that are vital for human communities, especially during crises. The adverse mental health effects of previous infectious disease outbreaks, such as Ebola, severe acute respiratory syndrome (SARS), and H1N1 influenza epidemics, have been documented on a number of populations and subgroups.<sup>1,2</sup>

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However, with the notable exception of HIV/AIDS, the literature on the mental health effects of recent epidemics has left out one particularly vulnerable group—expectant and new mothers.<sup>3,4</sup> The current pandemic was different in this regard. There has been an increased awareness of its maternal mental health ramifications, with more than 2 dozen studies already published within a year on the mental health effects of the pandemic on pregnant and postpartum women.<sup>5,6</sup> The majority of the studies highlighted the impact of containment measures implemented to stem the spread of COVID-19, such as social distancing, as core reasons for the increased maternal mental morbidity. Social distancing measures range from isolation of infected individuals, to closures of schools and nonessential businesses, to national lockdowns.<sup>7</sup> As the world marks 1 year since the World Health Organization declared COVID-19 a global pandemic, nearly every country remains under some form of social distancing.

Since the beginning of 2020, pregnant, laboring, and postpartum women have been navigating the challenges inherent to the perinatal period in the context of sudden, severe, and cumulative stressful events with concurrent reductions of vital social connections and protections. It is therefore critical to mitigate the enormous impact of COVID-19 on maternal mental health. In this article, we argue that formal and informal social support systems for mothers need to be prioritized, even during pandemics, and failure to do so will greatly affect the mothers, their infants, and their whole households. Furthermore, we call for the dissemination of feasible and innovative adaptive strategies that ensure continuation of social support to this population.

## THE PERINATAL PERIOD: A VULNERABLE TIME

The perinatal period, which includes both the gestational and postpartum phases, is characterized by substantial biological changes and major life adjustments that can result in various degrees of emotional distress.<sup>8,9</sup> Globally, a significant portion of perinatal women develop symptoms of depression and anxiety. In high-income countries (HICs), the prevalence of depression ranges

from 7.0% to 20.0% for pregnant women and 9.3% to 13.0% for postpartum women.<sup>10–13</sup> In a review of low- and middle-income countries (LMICs), higher prevalence rates of perinatal depression were generally found, with studies reporting prevalence rates that ranged from 4.8% to 57.0% and 3.8% to 48.5% for antepartum and postpartum depression, respectively.<sup>14</sup> Although perinatal anxiety is not as widely investigated and understood as perinatal depression, research indicates that it is an equally common condition globally. The range of prevalence rates for antepartum anxiety is 5.8% to 35.9% in HICs compared to 6.6% to 61.1% in LMICs, while the prevalence rates of postpartum anxiety range from 4.7% to 36.1% in HICs compared with 2.2% to 38.3% in LMICs.<sup>15–19</sup> Additionally, extensive literature over the past 50 years has shown associations between maternal mental illness and maternal morbidity and mortality, including suicide.<sup>20,21</sup> Moreover, maternal antepartum and postpartum psychopathology has been associated with a range of adverse fetal (e.g., preterm delivery), child (e.g., emotional difficulties, externalizing behavior), and adolescent outcomes (e.g., increased risk for depression).<sup>22</sup> These adverse effects are compounded by socioeconomic disadvantages, and in LMICs, they include worse child physical development outcomes, such as stunting.<sup>23</sup>

Many of the determinants of maternal psychopathology are exacerbated by the realities of life during the COVID-19 pandemic.<sup>24</sup> Perinatal women must now cope with elevated stress in their environments due to heightened fears of infection and contamination, concern for their family's and their own health, and exposure to media coverage of the pandemic.<sup>25,26</sup> Further, daily life has changed drastically due to increased isolation and loneliness as well as disruption of meaningful life experiences such as family gatherings, birth celebrations, and mourning rituals for the death of loved ones. Women and their families are also facing significant economic hardships as unemployment has surged and economies are struggling worldwide. Food shortages have been widely reported during the pandemic, increasing food insecurity, a known risk factor for maternal psychopathology.<sup>27</sup> These experiences exacerbate the psychological toll of pregnancy, labor, and childcare. This circumstance is especially true for women with a history of mental disorders, who are at a heightened risk of developing episodes following exposure to stressful life events.<sup>8</sup>

Furthermore, the preexisting gender disparity in mental disorders will likely worsen as a result

of the differential, deleterious impact of the pandemic on women in general and mothers in particular.<sup>28</sup> Women have historically been significantly more likely than men to be living in poverty, doing considerably more domestic and unpaid work, and providing the majority of care to children, the elderly, and the sick.<sup>29</sup> As COVID-19 swept the globe and lockdowns were instituted, this gender imbalance increased significantly, and women, particularly working mothers, have been taking on even more responsibilities at home to the detriment of their mental health.<sup>29,30</sup> Although staying home protects people from infection, it can become at times an unsafe option for women. Countries have reported increases in domestic violence that range from 25% to 30% as communities went into lockdown.<sup>31–33</sup> Critically, the lack of access to protective familial, community, and governmental networks due to social distancing measures may leave women without the social protections needed to flee a dangerous situation, hold their perpetrators accountable, or access the means for them and their children to survive after leaving their homes.<sup>34</sup> This situation is a human rights and health catastrophe since intimate partner violence, historically higher during the perinatal period, is associated with a range of adverse obstetric, maternal, and child outcomes.<sup>35</sup>

Given the increase in the number and the impact of the determinants of maternal mental health, it is not surprising to see a subsequent rise in the prevalence rates of maternal psychopathology. In a systematic and meta-analytic review of maternal mental health studies during the COVID-19 pandemic, Yan and colleagues<sup>5</sup> reported an upsurge in the prevalence rates of antepartum depression (8%–71%) and anxiety (11%–82%), as well as postpartum depression (15%–29%), surpassing prepandemic prevalence rates. Notably, the rates of psychopathology reported for the maternal population exceeded those of the general population and even the highly overburdened health care workers.<sup>5,36</sup> Given the documented increases in the prevalence rates of maternal mental disorders and the heightened vulnerability of this population, it is vital to harness protections to mitigate the effects of the pandemic on pregnant and postpartum women.

## ■ LIFE DURING A PANDEMIC: THE PERFECT STORM OF HIGH STRESS AND LOW SUPPORT

A well-established protective factor against maternal mental morbidity is social support,<sup>37</sup> defined as

**Many of the determinants of maternal psychopathology are exacerbated by the realities of life during the COVID-19 pandemic.**



the comfort and assistance that persons receive from members of their social network “to help them cope with biological, psychological, and social stressors.”<sup>38</sup> There are various forms of social support that are beneficial to mothers, including emotional, informational, and instrumental support.<sup>37</sup> Social support is associated with lower rates of antepartum and postpartum depression and increased maternal self-efficacy.<sup>39–41</sup> It also mitigates the effects of maternal depression on child outcomes, decreasing behavioral problems and the overall risk of mental disorders in children.<sup>42</sup> Of critical importance, social support has a “buffering” effect on stressors. In fact, the more stressful a situation is, the more impactful social support will be.<sup>37</sup>

However, as people navigate the “new normal” of living with social and movement restrictions, countries and community members are deciding what is considered “essential” and what can be forgone to ensure infection control. Frequently, that has meant restricting physical proximity at the expense of social connection. As a result, community support systems, from maternal support groups to breastfeeding and prenatal classes, and informal in-person support systems, such as visits from friends and relatives, are significantly less available to perinatal women. Even before the pandemic, aspects of motherhood could be lonely and isolating, especially for first-time mothers.<sup>43,44</sup> These social networks were sources of aid, encouragement, and community that served as a lifeline for many women. However, during the pandemic, mothers are finding themselves without support when they most need it.

Moreover, women have to routinely engage with health care facilities before, during, and after childbirth. But, due to infection control measures instituted to reduce the spread of COVID-19 in health care settings, perinatal women are interacting with a medical system that lacks many of the support networks that existed prepandemic. A number of health care facilities globally, including many in HICs, have reduced prenatal visits and prohibited support persons, such as partners, from being present during prenatal appointments.<sup>45,46</sup> During labor and delivery, many hospitals are banning doulas and support persons from attending births. After birth, some hospitals are limiting in-person lactation consultations, forbidding visitations from family and friends, and restricting parents and other helpers from visiting neonatal intensive care units.<sup>47,48</sup> And, in LMICs, where mothers frequently report unsupportive birthing experiences in health facilities, including disrespectful, neglectful, and

abusive treatment from providers, their birth experience may worsen due to the pandemic-related burden on the health care systems.<sup>49</sup>

## ■ CHILDCARE DURING COVID-19: DIMINISHED SUPPORT NETWORKS

Beyond their pregnancy, laboring, and birthing experience, numerous mothers will be spending their postpartum period in a radically restricted society in which they will have to limit their interactions to members of their own households. Globally, there are cultural social support practices that risk disruption, such as the postpartum recovery rituals found in many regions that require at-home support from female relatives and caregivers to ensure rest and recuperation for the new mother.<sup>50</sup> These practices have been consistently shown to provide instrumental, emotional, and informational support for the mother and to reduce the risk of postpartum depression.<sup>51</sup> Moreover, social support can help mothers engage in activities that promote mental well-being, such as exercise and spending time outdoors.<sup>52</sup>

Worldwide, many mothers rely on grandmothers to help with childcare, which has been shown to protect against parenting stress and maternal depression as well as improve child outcomes.<sup>41,53,54</sup> However, many mothers are losing this vital source of support because of restricted visitation between households owing to social distancing mandates, especially those for older adults. In LMICs, where multigenerational households are typical, live-in grandparents are a source of much-needed support and reprieve for the mothers. However, live-in elders face an increased risk of infection when they share their home with family members who leave the house for work or food aid. Also, since they are more vulnerable to the effects of the infection, they disproportionately become sick or perish, leaving the household members bereaved and helpless. Therefore, the tension between benefits and costs associated with social support for mothers has become enormous during this pandemic.

In both high- and low-income regions, partner support is the most predictive of maternal mental and physical health outcomes, surpassing every other type of social support.<sup>8,55–58</sup> In every stage of the perinatal journey, from pregnancy to postpartum, the partner’s involvement is central to maternal well-being and crucial to stress alleviation.<sup>58,59</sup> Intimate partners are a vital source of emotional support, offering affection, reassurance, and encouragement to women as they

**During the pandemic, mothers are finding themselves without support when they most need it.**

**The tension between benefits and costs associated with social support for mothers has become enormous during this pandemic.**

**Pandemic guidelines that do not account for the social support needs of perinatal women will have disproportionate psychological consequences on these women.**

navigate the challenges of motherhood. They also provide instrumental support, including practical, financial, and most importantly, childcare support. With diminished help from outside the household due to COVID-19 restrictions, women need their partner's aid more than ever. Yet, numerous countries reported that despite a substantial increase in fathers' contributions to household duties during the pandemic, mothers were still shouldering most of the increased burden of childcare and housework.<sup>60–62</sup>

Expectant and new working mothers have been experiencing substantial levels of psychological distress and morbidity during the pandemic, with a study revealing that as much as a third of pregnant working women are experiencing significant anxiety.<sup>5</sup> Global studies have revealed that the disruption of childcare support within the home (i.e., domestic caregiver) as well as outside of the home (i.e., childcare centers) during the pandemic has had a disproportionate impact on working mothers.<sup>60,63,64</sup> For instance, compared with working fathers, working mothers are 3 times as likely to be the only household member providing childcare.<sup>64</sup> Moreover, historically, whenever childcare has been unavailable or unaffordable, it is usually mothers who end up choosing to stay home, work part time, or quit their jobs.<sup>65–67</sup> This pattern also seems to be the case during the current pandemic.<sup>68</sup> Furthermore, worldwide, women are 1.8 times as likely to lose their job due to COVID-19 as men, which increases the risk for maternal mental distress and psychopathology.<sup>69</sup> Therefore, the pandemic-induced childcare crisis and its resultant impact on maternal employment is one of the biggest threats to maternal well-being.

Among mothers struggling with lost childcare support, there are particularly vulnerable populations. For example, in LMICs, 64% to 90% of women work in the informal sector and do not have the economic stability to afford to not work to care for their infants.<sup>70</sup> In the past, this frequently meant that children were left home without adult supervision or that the mother brought her children to work with her,<sup>54</sup> both options that are especially dangerous during the coronavirus pandemic. The mental burden of working in unsafe conditions with little formal protections, coupled with the ambivalence of either leaving one's children unattended or exposing them to the pandemic's hazardous conditions, may put these women at an especially high risk for significant distress. For another vulnerable group, single mothers in both HICs and LMICs, who tend to rely on support from their family or community, social distancing rules

may result in enormous isolation and lack of support.<sup>71</sup> Pandemic guidelines that do not account for the social support needs of perinatal women will have disproportionate psychological consequences on these especially vulnerable women.

## ■ CONSIDERATIONS FOR POLICY MAKERS

Many experts believe that COVID-19 and its effects will be around for some time and that even with the approval of multiple safe and effective vaccines, the pandemic will not end abruptly.<sup>72,73</sup> Further, in LMICs, widespread availability of vaccines may not be possible until 2023.<sup>74</sup> At the beginning of this crisis, a core mitigation strategy was for everyone to stay at home and everything that was deemed not essential be closed or banned.<sup>75</sup> However, a public health strategy that may be appropriate for an acute crisis that will resolve in the short term may not be realistic or feasible for a crisis that will continue for some time. Now, a year into this pandemic<sup>76</sup>:

*people are seeking social contact not out of selfishness but because, like going to the grocery store, human connection is an essential activity.*

During the COVID-19 pandemic, nationwide public health guidelines, such as 24-hour lockdowns, that did not consider the needs of the maternal population, led to catastrophic consequences, including maternal deaths and stillbirths.<sup>77,78</sup> These incidents suggest a dangerous parallel to prior epidemics in which maternal and neonatal deaths indirectly caused by the epidemic surpassed the number of deaths directly caused by the infection.<sup>79</sup> Therefore, a need exists to alter COVID-19-related policies and practices of health and social care systems to become more inclusive of the needs of mothers, including their increased need for social support. Policy makers need to engage and empower mothers as well as the associated professional communities to voice their needs, inform, and participate in the policy formulation process. Participatory policy-making practices increase transparency and accountability, and will help ensure the creation of policies that are better informed of maternal needs during the pandemic.<sup>80</sup>

Further, we recommend that policies implement a “harm reduction” approach to social interactions rather than the “abstinence-only” approach that was initially adopted during the pandemic.<sup>81</sup> Rather than perceiving risk as all or nothing, a harm reduction approach to public health policies is based on the understanding that risk is not binary

**A harm reduction approach to public health policies is based on the understanding that risk is not binary and that the risk of an action should be compared against its benefits.**

and that the risk of action should be compared against its benefits as well as the risk of inaction.<sup>81,82</sup> The transmission dynamics of COVID-19 and their multiple impacts on people, while not fully known, are better understood now than at the start of the pandemic.<sup>83</sup> As a result, infection control guidelines, such as recommending that everyone wear masks, have developed to reflect the latest empirical evidence. Similarly, policies and programs that impact the provision of social support for perinatal women need to be continuously informed by and consistently updated to reflect the newest research findings.

The following key considerations may guide policies that aim to be inclusive of maternal social support needs..

### Prioritize Safe Access to Support Services

- Ensure that any social support activity that could be done outdoors (e.g., support groups; and breastfeeding, prenatal, and parenting classes) is not banned given that the risk of COVID-19 transmission outdoors is significantly lower than indoors.<sup>84</sup> These activities should include infection prevention strategies (e.g., social distancing, routine disinfecting, mask-wearing, and respiratory hygiene).
- Ensure perinatal women have access to remote mental health and social support services (e.g., support groups, psychological/psychiatric services, and counseling for gender-based violence), which may be via internet or mobile technology—the latter being much more common in LMICs.<sup>85–87</sup>
- Ensure active outreach is available, because many mothers may be reluctant, unable, or unwilling to reach out for help. For example, midwives, community health workers, and women’s protection officers around the world have stepped in during this pandemic to reach out to mothers and ensure their well-being.<sup>88,89</sup> Outreach may be done via mobile and internet technologies or safe in-person meetings.
- Offer safe options of in-person support for pregnant and postpartum women, including at-home for women who are quarantining at home to reduce their own or their newborn’s risk of contracting COVID-19, especially if they or their infants are in an at-risk category (e.g., chronic lung disease, diabetes, cancer, or cardiovascular disease). For in-person services, the health and safety of the providers (i.e., community health workers; midwives; mental

health counselors; and perinatal health care providers, such as doulas and breastfeeding consultants) must be prioritized as they provide this highly beneficial support to mothers.<sup>90,91</sup> Safety protocols should include access to vaccines (if available), routine COVID-19 testing, and personal protective equipment for the support providers.

### Support the Safe Continuation of Childcare and Schooling

- Prioritize safe ways for childcare services to remain open<sup>92,93</sup> or propose innovative alternatives for specific populations, such as infants and older children of essential workers or expectant and new mothers.<sup>94</sup>
- Provide safe options for children to receive their education in person, especially when community COVID-19 transmission rates are low. Infection prevention strategies that can be implemented to ensure a safe school environment may include ensuring access to COVID-19 testing and vaccines, as well as access to personal protective equipment for school staff; requiring physical distancing between individuals; performing routine disinfection; mandating mask wearing; encouraging respiratory hygiene; reducing school hours; reducing classroom sizes; using outdoor classrooms; and alternating attendance days for groups of students.
- Prioritize governmental investment in supported isolation and quarantine,<sup>95</sup> such as providing alternative living arrangements for infected individuals living in crowded or multigenerational homes. Multigenerational homes are vital sources of support for new mothers, and safeguarding these environments is crucial for the physical and mental health of the whole family.

### Ensure Positive Health Care Interactions and Birth Experience

- Commit to having a safe environment for childbirth to reduce potential harm on mother and infant due to direct and indirect effects of COVID-19, which includes ensuring that laboring women get tested for COVID-19 when they are admitted to the hospital and have personal protective equipment during their hospital stay.
- Safeguard a mother’s right to a “positive birth experience,”<sup>96</sup> which includes being “assisted

**Policies and programs that impact providing social support for perinatal women need to be consistently updated to reflect the newest research findings.**

by a kind and technically competent health care provider.” Support provided by health care providers is very beneficial to laboring women, and this is especially important because of the restrictions on other types of intrapartum support for laboring women due to COVID-19 restrictions.<sup>97</sup>

- Prioritize the safe presence of a support person during health care visits throughout the perinatal period, especially during labor, given its established importance for positive maternal outcomes.<sup>87</sup> This includes ensuring that the support person has access to COVID-19 testing and personal protective equipment during the delivery to safeguard the mother, infant, support person, and health care workers.

## CONCLUSION

The coronavirus pandemic has shed light on the irrefutable mental health repercussions of global crises. Crucially, this pandemic highlighted the detrimental effects of overlooking vulnerable populations when developing crisis mitigation strategies. Therefore, as we continue to navigate the current emergency, it is vital to ensure that mothers and their families are able to receive the highest level of support safely possible as they manage these severe adversities. It is imperative that we prioritize the maternal population in COVID-19 policies, regulations, and recommendations to prevent harmful consequences that may surpass the effects of the crisis itself. Moreover, as we look on to the future after the pandemic, we ought to “build back better,” integrating the lessons we learned and innovations we discovered to ensure that we are better prepared for the next crisis. Given climate change, increased state fragility leading to the highest rates ever of forcibly displaced persons (the majority of whom are women and children), and the documented rise in infectious diseases, the lessons learned during this pandemic are critical for the protection of expectant and new mothers.

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COMMENTARY

# Issue Analysis: A Use-Driven Approach to Data Governance Can Promote the Quality of Routine Health Data in India

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## Key Messages

Key issues in India's health information systems include:

- Myriad data systems collect reams of public health data, often much more than necessary.
- These data systems function in silos and do not lend themselves to a holistic view of the health system's performance.
- India lacks a functional public policy framework to guide health data use and sharing, and the data systems are often not interoperable.

## Key Implications

Key considerations for policymakers:

- Deliberate and agree upon a robust health data sharing and use policy framework that enables user-centric data flows and inter-system data sharing.
- Make actionability the bedrock of data collection efforts by ensuring that systems collect data that either contribute to indicators for measuring health systems performance or support health workers in critical daily tasks.
- Democratize access to aggregate public health data to citizens and researchers. Set up institutional mechanisms for use of data for research to safeguard citizens' privacy rights.
- Embed true interoperability, prioritize decentralization, and consider legacy systems in health information system design.
- Engage with the private sector to collect data to create a more comprehensive picture of health care service delivery and quality in the country.

## MULTIPLE SYSTEMS FOR COLLECTING PUBLIC HEALTH DATA IN INDIA INTRODUCE AVOIDABLE REDUNDANCIES

The health data ecosystem in India consists of several parallel systems for collecting public health data, including the health management information

system (HMIS), the Mother and Child Tracking System/Reproductive and Child Health Portal (MCTS/RCH), and other state-specific health data monitoring systems.<sup>1,2</sup>

The Ministry of Health and Family Welfare (MOHFW) created the HMIS to monitor health programs and provide key inputs for policy formulation and interventions. Currently, around 200,000 health facilities across all districts in India upload facility data every month directly on the HMIS web portal.<sup>3</sup> Launched in 2009,<sup>1</sup> the MCTS captured information on the delivery of the full spectrum of health care and immunization services to pregnant women and children aged up to 5 years. It tracks individual beneficiaries, as opposed to the older HMIS (first rolled out in 2005 with an upgrade in 2008), which captures service delivery information at an aggregate level.<sup>2</sup> The MCTS, which focuses only on maternal and child health, was created due to reported gaps in the HMIS, which records data across health programs including reproductive health.<sup>4</sup> There are several other state-level initiatives on reproductive health data that have either been subsumed under or run parallel to the MCTS.<sup>4</sup>

Since 2015, MCTS is gradually being phased out and replaced by the RCH portal.<sup>5</sup> RCH, an upgraded version of MCTS, was designed for early identification and tracking of the individual beneficiary throughout the reproductive lifecycle.<sup>3,5,6</sup> The RCH portal aims to track eligible couples for their contraceptive needs,<sup>4</sup> in addition to monitoring service delivery for pregnant women and children. This is more comprehensive compared to the MCTS, which restricts data gathering to antenatal and postnatal periods and deliveries.<sup>4</sup> The MOHFW has introduced a tablet-based application, called ANMOL (Auxiliary Nurse Midwife Online) for the RCH portal. It enables auxiliary nurse-midwives (ANMs) to enter data for beneficiaries of their jurisdiction, improving the data quality as the data are entered "at source" by health service providers.<sup>4</sup>

In addition, the Integrated Disease Surveillance Programme (IDSP), Routine Immunization Programme, and vertical disease programs, such as those for malaria and TB, also collect health data.<sup>7</sup>

Because India lacks a functional public policy framework to guide health data use and sharing practices, these data systems often function in silos with little interoperability.<sup>7</sup> Most of these systems, including the HMIS, are expensive, proprietary, and inflexible,<sup>7</sup>

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despite the government's policy on the use of open-source software for public data systems.<sup>8,9</sup>

A key tenet of ensuring data quality and reducing the burden on health workers is that no data should be collected more than once. However, the existing data systems are riddled with redundancies on the one hand and important gaps on the other. For example, childhood TB data are collected under HMIS, IDSP, and Expanded Program for Immunization, with obvious duplication and adverse impacts on data quality and its use. Differing estimates of prevalence and coverage are likely to be a point of confusion for decision makers and program implementers, who may wonder about the reliability of these and therefore avoid using these data for health systems planning or program management. While so much redundant data are collected, there are important gaps, such as the lack of data on antimicrobial resistance, that make it difficult to assess the burden and programs. Also, the MCTS/RCH portal only collects quantitative data, while missing aspects such as community engagement, which is equally important for health services provision. Community engagement, which is a key marker of trust in the health system, can be determined by health service utilization trends and through periodic surveys on service provision quality and patient satisfaction at health facilities.

The mainstream discourse on health information systems has focused on the technology and the potential of standardized health and demographic data for artificial intelligence applications. Although there have been efforts to improve data quality and use for informing policy and programs, the topical concern of using data for health system management and improving quality of care can be addressed more effectively.<sup>10,11</sup> Importantly, high-quality data are a prerequisite for robust data models to develop artificial intelligence applications for health systems.<sup>12</sup>

This highlights several important issues.

## 1. Actionable Health Data Is Still Hard to Come By

The use of data to inform policies and programs to improve health service delivery and health outcomes is not commensurate with the huge public investments in data collection. This is a problem of design for the symbolism of reporting rather than use for driving responsive health system management. Further, a failure to recognize the importance of engaging users of data at all levels to find out what they need also contributes to this poor data use culture. A study assessed that the

overall data collection volume for aggregate data (HMIS data and state-specific data) varies between 3,000 to 8,000 data elements per month.<sup>7</sup> Further, only 10% of these data elements are used to generate indicators, nearly 20% were inactive (returned no values), and about 50% consistently returned blanks or zeroes.<sup>7</sup> This clearly shows that the systems collect far more data than what's reported on and an even smaller proportion is fed into meaningful indicators. The zero/blank value elements may point to gaps in a facility's readiness to deliver certain services (e.g., if "zero" stunted children are reported consistently by a given facility in a poor district, it is more likely that the facility doesn't have weighing scales and height measures rather than that there are no stunted children). Currently, when a "zero/blank" is reported for a given service at a health facility, there's no way to tell if it represents a nonutilized service or a nonexistent service. One way to circumvent this could be to make all data fields required when submitting electronic data (so they cannot be left blank) and to add a pop-up list of options for elaboration. The list could include service not offered, no clients, equipment/medicine shortage, inadequate staffing, other reason, so that appropriate programmatic action may be taken. Additionally, if facility staff are entering data on a paper-based form, provide space for recording a short list of options, to make it easier for staff to complete the form and for whoever is eventually entering the form into an electronic database.

Furthermore, for public health data, denominators are crucial.<sup>7</sup> Although absolute numbers (e.g., number of children immunized) are readily available, it is often difficult to ascertain coverage levels of health services such as the percentage of children immunized fully (immunization coverage) because the denominators remain disparate and vary widely across administrative levels, departments, and health programs. The coverage indicators are vitally important from a health systems performance management perspective, as they reflect the extent to which the people in need receive important health interventions. At times, the absence of standardized denominators creates confusion in setting targets for health facilities due to a lack of a common understanding of how much ground has been covered between different levels or programs.

Additionally, since data quality functions are largely centralized—meaning that there is no standardized approach to checking data at the local levels—the principle of "data quality corrections are best done closest to the source of data collection" is violated.

**Systems collect far more data than what's reported on and an even smaller proportion is fed into meaningful indicators.**

## 2. Private Health Care Sector Generates a Lot of Data but Barely Reports Any

The National Sample Survey 2014 estimated that of all episodes of illness, 72% of rural episodes and 79% of urban, were treated in the private sector. The private sector provides about two-thirds of inpatient care and three-fourths of outpatient care treatments in India. It has been estimated that 60% of the total volume of health data is produced by non-state actors.<sup>13</sup> However, in the absence of regulation and incentives, the reporting is minimal to nonexistent.

## 3. Citizens' Data Access and Privacy Needs to Be Addressed

Communities and researchers have limited access to routine administrative health data. Lack of data sharing can affect the people's trust in the system as they do not know what services are provided or their quality. This, in turn, has implications for citizens' empowerment and mobilization for better population health because they don't have information on the major causes of illness and death and what services are underutilized, apart from stymieing data used for research to improve the quality of care and health outcomes.

Lack of adequate data regulation and privacy standards while collecting case-based data makes households vulnerable to unsolicited phone calls from call centers to verify a pregnancy and potential data mining for market research, apart from graver implications such as stigma or discrimination against people with certain health conditions. Further, data are only as good as the trust that people have in the confidentiality of the data. Reports of misuse or breach of privacy (e.g., through the media) could impact future response rates, make respondents likely to withhold or falsify information, or withdraw their consent to share the data, thereby impacting the quality of the data. Health data systems can therefore benefit from an inclusive, learning, and iterative data governance style, which allows for decisions to be scrutinized and approaches to evolve, based on periodic inputs from the health workers, patients, and researchers.<sup>14-16</sup>

## 4. Reporting Data Into Multiple Systems Imposes Additional Administrative Burden on Health Workers

The MCTS/RCH portal sends all patient-level data to the national portal. However, most patient-level details, especially those pertaining to maternal and child health services, are only needed by

the facility-level staff. The privacy risk and the sheer volume of patient-level data necessitate having a more selective system in which only necessary patient-level data are reported to the national level (e.g., data on outbreaks). Instead of using the current broad-brush approach to collecting data, more careful planning and assessment of what patient-level data are needed at the national level must be done and followed through. Further, parallel data reporting in MCTS/RCH portal and HMIS means that health workers have to enter the data twice.<sup>7</sup>

The government's introduction of and focus on the MCTS/RCH portal undermined the older HMIS by encumbering health workers who needed to focus on reporting into this new system. Furthermore, several other state-specific portals that were created to serve the needs of states and donors exacerbated their workload. While increasing the staff workload, who estimated that 60% of their time was spent on data-related work,<sup>7</sup> the volume of data collected likely had implications for its quality. Such data of questionable quality does not lend itself to effective use while taking valuable health worker time away from their essential caregiving duties.<sup>7</sup> According to a study, ANMs spent an average of 6 hours a week for data collection for MCTS in addition to their routine program activities.<sup>17</sup> This issue has been addressed to some extent in the RCH by introducing ANMOL,<sup>18</sup> designed in collaboration with United Nations Children's Fund. Data are collected at the source by health workers. ANMOL is being rolled out in phases across states and helps reduce the burden of manual data entry and travel for ANMs.

However, in HMIS, there's redundancy in recording data because the ANMs first enter data in physical registers, which are then digitized by the data entry operators at the primary health centers. This step also introduces time lags in data collecting and reporting and increases the risk of data errors, especially if there's discordance between the terms used in the register columns and the software fields of the health data systems. Lack of HMIS data entry training for ANMs and the expectation that health workers enter data in the physical registers alone poses additional concerns about the data quality.<sup>13</sup> Poor translation of medical terms, such as "eclampsia" and "hypothermia" in the local language, results in frequent misinterpretation and poor data quality.<sup>13</sup> This is vastly different from the experience in some other developing countries, which have emphasized the need for greater participatory engagement with health

**In HMIS, the redundancy in recording data introduces time lags in data collection and increases the risk of data errors.**

workers and community members in designing the health information system before implementation to ensure sustainability.<sup>4,19</sup>

## INDIA'S RECENT DIGITAL HEALTH INITIATIVES AND PROPOSED LEGISLATIONS

The National Digital Health Mission (NDHM), launched in August 2020, is the Government of India's marquee program that envisions an integrated digital ecosystem for health care services in the country based on individual patient records. It aims to create a public digital infrastructure that empowers individuals, patients, doctors, health facilities and helps streamline the delivery of health care services and related information. With citizens at the center of the mission, the proposed digital ecosystem comprises diverse actors, including policy makers, health care providers, regulators, health care professionals, private insurers, health-technology companies, and non-profit organizations.<sup>20</sup>

The NDHM represents a stride forward from the National Digital Health Blueprint (NDHB) released in 2019, which recognized the need to establish the NDHM.<sup>20</sup> The NDHB is an extension of the National Health Policy 2017, which espouses the use of digital technologies to provide universal health care. In 2018, a special committee was created to work on the blueprint.<sup>20</sup> The NDHM includes 5 data systems as building blocks: (i) healthID, a unique patient identifier repository; (ii) DigiDoctor, a repository of all doctors enrolled in the country; (iii) Health Facility Registry, a repository of all health facilities in the country; (iv) NDHM Health Records, is an electronic record of a person's health-related information that conforms to nationally recognized interoperability standards and that can be drawn from multiple sources while being managed, shared, and controlled by the individual; and (v) Electronic Medical Records, a digital version of a patient's chart at a particular facility.<sup>20</sup>

It is important to emphasize that NDHM's success depends on its adoption by diverse stakeholders including the states, public and private providers, policy makers, program managers, and citizens. Although these registries have immense potential to provide data for decision making that can be used to inform health system planning and improvements, NDHM's implementation strategy needs to account for the fact that the public health sector is currently based largely on aggregated health information systems rather than patient-

centric systems.<sup>1</sup> Importantly, the guidance on navigating the transition from legacy systems to implementing patient-centric systems is thin.<sup>7</sup> This could create more parallel systems where the new systems would impose additional burden on the providers who may lack the capacity to replace the older systems. Most private providers lack the incentive to register themselves because registration is "voluntary," so they are likely to sidestep this to avoid procedural hassles or patient accountability. Under the central government's new hospital insurance scheme and other publicly funded insurance schemes, most private providers are not included. The private providers that are included, either report data only on a small subset of their patients or no data. NDHM's plans are redolent of challenges that India continues to face in implementing the Clinical Establishments (Registration and Regulation) Act, 2010 (CEA).<sup>21</sup> Like the NDHM, CEA was promulgated by the central government and covers both public and private establishments such as single-doctor clinics, laboratories, and corporate hospitals.<sup>22</sup> The establishments do not see the value of registering themselves under this act and want to sidestep malpractice lawsuits. More than 10 years after CEA was legislated, many states have not been able to implement it due to opposition from the private sector.<sup>21</sup> There have been multiple instances of doctors, supported by the Indian Medical Association, going on strike to protest the implementation of this act.<sup>23-25</sup>

For policy implementation, sequence matters. The Indian government has 2 data protection bills in the works that offer mechanisms to assure data privacy for citizens and establish data governance mechanisms<sup>26</sup>: the Digital Information Security in Healthcare Act (DISHA) and the Personal Data Protection Bill. DISHA's provisions include seeking informed consent and the right to refuse data sharing, protecting against commercial usage of digital health data, and permitting patients to complete their incomplete data or rectify inaccurate information.<sup>27</sup> The data protection bill addresses data governance by laying out the responsibilities of data fiduciaries (data collectors) and the rights of data principals (those about whom data are being collected).<sup>28</sup> It might be prudent to implement the NDHM once these laws are passed so that citizens' privacy rights are legally assured. Waiting would have the added benefit of circumventing the need for post-facto amendments to NDHM per the finally legislated data governance frameworks and would likely help drive better adoption of the NDHM by the citizens and

**National Digital Health Mission is India's marquee program that envisions an integrated digital ecosystem for health care services.**

**NDHM's success depends on its adoption by diverse stakeholders.**

help engender public trust in these new data systems.

## ■ CALL TO ACTION: WHAT MIGHT WE DO TO STRENGTHEN HEALTH DATA GOVERNANCE?

Institutionalizing data governance by establishing a shared, cogent framework in health data systems at all levels of policy and practice, alongside a user-centric design of workflows can promote quality, protect privacy, boost innovative research, and enable service delivery efficiencies. The foundational principle of a robust national health data governance framework is that high-quality data are available to address the information needs of decision makers while protecting citizen's privacy rights and minimizing the burden on health care workers.

### 1. Make Data Collection About Use and Actionability

It is vital that the systems collect data that either contribute to indicators or support health workers in critical daily tasks. The guiding principle should be to reduce the health care workers' burden while strengthening health systems. The decisions about which data elements to capture should begin with what is needed to support the daily activities of the frontline health workers, see what can be repurposed for computing aggregate indicators, and only then, consider additional data elements for collection. The digital tracking and support systems should be user-centered and emphasize the principle of "collect once, use for many purposes"—so that data collected for service delivery can also be used for accountability (i.e., to calculate aggregate indicators required for reporting and monitoring provider, stock, and system performance).

The national health program should specify the information that it needs for public health management and policy and how often and allow state health departments to deliver this information the best way they can. Reducing the volume of data would make it easier for states to validate data and ensure data quality. Further, data may be fragmented across the ministry, state, and agency silos. A lack of data standards for reporting and interoperability between data systems can limit the ability to synthesize information across multiple data sources to fully understand programmatic issues.<sup>29</sup> An open dialogue between producers and consumers of data at both the

national and subnational levels on the various data elements, duplications, and gaps, can help harmonize data sharing and use and improve data quality.

### 2. Enable Health Workers to Enter Accurate Data Directly in HMIS

To eliminate the issues of duplicative work, time lag between collection and reporting, discordance between paper and digital records, and poor translation, the health workers should be supported to enter data directly and accurately at the point of care. Apart from organizing data entry training on HMIS, every effort should be made to include clear translations of medical terms in the local language.

### 3. Make Decentralization a Priority

The main purpose of information technology systems in the states and districts should be for decentralized management at that level. The electronic health records should typically be maintained at the facility level and only aggregate data stored in the cloud. No level should receive routine data for more than 2 levels below (which implies no patient data should go above block or district, other than what's necessary from a high-level policy standpoint, such as data on outbreaks). This will keep the systems decentralized and ensure that the center sees only what it needs for policy or programmatic action. Mature public health systems may provide patient-specific data from each facility with considerable granularity whereas less mature systems can give aggregate numbers from a block or district level. Decentralization addresses multiple challenges at once: helping maintain citizens' data privacy and focusing on what's actionable at each level of the health system while obviating the need for multiple systems.

### 4. Embed True Interoperability

Lack of interoperability precludes a unified view of multiple data sources to comprehensively understand programmatic issues and use this to monitor and improve health systems performance.<sup>29</sup> Despite government policies on the use of open-source software for all public systems, the Application Program Interface (API) access for the national HMIS (which is built on a proprietary platform) is not currently available to the states. For instance, in 2012, the National Data Sharing and Accessibility Policy was announced to strengthen sharing of information across ministries and systems to promote evidence-

**The guiding principle of data collection should be to reduce the health care workers' burden while strengthening health systems.**

based decision making, while discouraging data duplications.<sup>30</sup> In 2015, the government issued its open API policy, which recognizes the need for an interoperable data ecosystem, applications, and processes to make the right information available to the right user at the right times.<sup>31</sup> So, it might be worthwhile for the government to do a stock-taking exercise to assess whether the code is available on public repositories and if open API access is provided.

### 5. Consider Legacy Systems and Transition

While introducing new systems, it's imperative to be deliberate and judicious. A new system may not always fix existing problems and can create new problems because it may not be appropriate for all technical areas nor be interoperable with other systems. So, while new systems are being proposed to replace all others (e.g., the Integrated Health Information Portal [IHIP], which began as a system for IDSP is now looking to include 25 other programs), it may not be feasible to incorporate the needs of different health programs into 1 software. Further, while introducing new systems, the legacy data systems landscape should be considered to enable a smooth transition. For example, the efforts of the National Vector Borne Diseases Control Program to develop a malaria surveillance system were put on hold as the IHIP was supposed to address it, but as the operationalization of IHIP has been delayed,<sup>7</sup> this has resulted in an avoidable data gap.

Finally, the World Health Organization has developed standard modules for TB, malaria, Expanded Program for Immunization, HIV, and mortality reporting on the open-source District Health Information Software-2 (DHIS2) platform and has invited countries to adapt these. So, there's also the question of whether India should seek to work on these globally designed standards as opposed to having new systems developed by information technology vendors who may have a limited understanding of public health. The focus should likely be on data integration and interoperability instead of software integration.

### 6. Seek to Engage Private Health Care Providers to Gather Data

As most providers are not included under the central government's new hospital insurance scheme, they need to be connected to portals to provide the required aggregate information. Further, they may not be willing to provide patient-specific information and may have to be engaged in dialogue

to better understand their concerns and assure them on anonymizing the collected data.

### 7. Define Institutional Mechanisms for Using Data for Research

Separate mechanisms and authorities must be created to use data from central repositories for research to verify the aims of third parties wishing to access data so that data are only used appropriately for research. Research use must not be conflated with the use of personal health identifiers in individual patient care. This is important to prevent data mining for market research as opposed to academic research to keep the sanctity of the purpose for which the individuals trusted providers with the data.

**A new data system may not always fix existing problems and can create new problems.**

### 8. Make Aggregate Data Widely Available

Data collected by routine health information systems, government programs, and large-scale surveys for policy purposes, as well as the data collected by health and biomedical research institutions using public funds, should be made publicly available for researchers and advocates, while ensuring that it is not used for market research. Making data widely available builds the citizens' trust in public data and enables responsive governance through generating high-quality data.

## CONCLUSION

Data quality and data use constitute a virtuous cycle. Data quality can be compromised due to burdensome data collection processes at local service delivery levels, due to complex reporting procedures (e.g., multiple reporting forms), as well as a lack of standardized and harmonized systems for data collection.<sup>32</sup> A considered and shared framework to guide the use and sharing of public health data can help streamline data flows and enable intersystem data sharing. This is likely to promote the use of existing data for policy making and planning by ensuring that data systems generate relevant indicators for measuring health systems performance. A large volume of data of suspect quality does not lend itself to effective use. High-quality data are more likely to be used, and higher use for research and policy making in turn engenders efforts to improve data quality by reviewing the data flows and analyses and sparking conversations on appropriate indicators and denominators. This virtuous cycle of data quality and data use for decision making lends itself to

strengthening health systems performance and improving the quality of service provision while also protecting privacy and building research use.

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COMMENTARY

# How Donors Can Collaborate to Improve Reach, Quality, and Impact in Social and Behavior Change for Health

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## Key Messages

- Since 2018, collaboration among funders of social and behavior change (SBC) in global health has markedly increased. Anecdotal evidence suggests that these efforts are beginning to reduce duplication of effort, improve support to implementers, and increase co-investment.
- As donor collaborations supporting SBC mature, it will be important that they move beyond information sharing to enable more integrated coordination, co-investment, and even cocreation of investments. Global and regional collaborations among donors must also seek to engage country governments and regional coordinating bodies as leaders in the work of SBC.
- To facilitate donor collaboration, our research suggests that participating donors should: (1) define group purpose, goals, and roles clearly and early on; (2) support host country leadership; (3) recognize and leverage the different strengths of private and public donors; (4) demonstrate commitment by investing resources; (5) use honest conversations about failure to inform a joint learning agenda; (6) encourage proactive communication and informal discussion; (7) take the time to understand collaborating organizations' grantmaking, procurement, and compliance processes; (8) consider using a trusted member (or an intermediary) to progress work; and (9) seek early wins that build confidence in the group.

Declaration sought to improve the quality of aid and its impact on development. Donor countries agreed to increase harmonization and coordination, simplify procedures, and avoid duplication by sharing information.<sup>1</sup> By 2011, however, coordination remained a problem. The Working Party on Aid Effectiveness noted that<sup>2</sup>:

*Coordination of donors often remains weak precisely where working towards common goals is needed the most, and weak national leadership and capacity become an excuse for uncoordinated donor-driven approaches.*

The Sustainable Development Goals, set in 2015 by the United Nations General Assembly, include Goal #17, Partnerships for the Goals, and have encouraged better collaboration among stakeholders including donors.

This article uses the term “donor” to refer to both official development assistance (ODA) organizations and philanthropies. The Organisation for Economic Co-operation and Development (OECD) Development Assistance Committee defines ODA<sup>3</sup> as:

*Government aid designed to promote the economic development and welfare of developing countries. . . Aid may be provided bilaterally, from donor to recipient, or channeled through a multilateral development agency such as the United Nations or the World Bank.*

According to the OECD, the total value of philanthropic funding for development is about 5% of the value of ODA, which was \$US23.9 billion between 2013–2015.<sup>4</sup> Private philanthropy invests more in the health sector, by far, than it invests in other development sectors. In 2018–2019, private philanthropy was the third-largest source of health-sector funding, after bilateral aid from the United States and World Bank Global Fund.<sup>5</sup>

## Benefits and Challenges of Donor Collaborations

Donor collaborations can support national governments to improve the scale and efficiency of their activities by reducing duplication of efforts and supporting local priorities more strategically. Research conducted on collaborations among donors in the United States found that

## BACKGROUND

The development sector has long recognized the need for donors to collaborate effectively with host country governments, with each other, and with partners in civil society and the private sector. In 2005, the Paris

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a donor collaboration may increase the visibility of an issue or area of work. Donor collaboration can also facilitate access to nonfinancial, in-kind resources, including technical assistance, networks, consulting help, and convening of influence across donors.<sup>6</sup> Finally, effective collaborations leverage the strengths of different donors, which supports the efficient function of the development ecosystem. A survey of donors in India found that the majority of respondents strongly agreed that working collectively enabled them to make greater progress on social challenges in India than working alone.<sup>7</sup>

Donor collaborations also have challenges. From an interpersonal and interorganizational standpoint, donor staff must be willing to compromise, relinquish a degree of control, and share credit for accomplishments in a collaboration. Collaborations require time and energy and may need to adapt as organizational members and staff change. Not surprisingly, interpersonal tensions can arise, for example, when members with access to greater financial resources and broader geographic scope overlook the unique perspectives of smaller, local members with more limited financial resources.<sup>6</sup> From a logistical perspective, donor collaborations can be challenging to organize due to differing fiscal cycles and a lack of visibility into the fiscal processes of potential partner donor organizations.

## ■ THE CASE FOR IMPROVED DONOR COLLABORATION IN SOCIAL AND BEHAVIOR CHANGE

Global health programming is grounded in mutually reinforcing investments in policy, supply chains, service delivery, and social and behavior change (SBC),\* which uses evidence-based interventions to increase the adoption of healthy behaviors by individuals and influence the social norms that underpin those behaviors. SBC may be used to create demand for health products and services; promote the practice of healthy behaviors within the household and community; improve client-provider interactions; and influence community leaders and other decision makers.<sup>1</sup>

Recent years have seen a growing interest in SBC generally and demand creation specifically among donors, governments, and development

implementing partners. This expanded interest, together with an increased appreciation of both the demand-side barriers to improved health and the limited funding available for SBC programming, research, and evaluation, has prompted donors to consider how best to align their investments.

Several parallel activities in 2017, including internal demand-side landscaping conducted by the Bill & Melinda Gates Foundation (BMGF) and consultations held by the United Nations Children's Fund (UNICEF) to inform the creation of a global mechanism for SBC, highlighted the need for improved donor collaboration and coordination on SBC in global health.<sup>8</sup> In general, these exercises indicated that, while new donors and implementers were investing in SBC, many were operating in isolation and were unlikely to achieve population-level impact due to missed opportunities for learning and duplication of effort. These reflective exercises were followed shortly by the 2018 Global SBCC Summit, which emphasized the need for more coherent direction within the field of SBC. Inspired by these activities, representatives of major donors initiated a concerted effort to better align their respective investments through formal and informal activities.

In December 2018, after discussions among program officers at BMGF, the U.S. Agency for International Development (USAID), and the Children's Investment Fund Foundation (CIFF), BMGF convened a meeting to discuss how demand and SBC could be better coordinated among donors and multilateral organizations. Staff from donor organizations, including the Agence Française de Développement, CIFF, the United Kingdom Foreign, Commonwealth, & Development Office (formerly United Kingdom Department for International Development), the European Commission, the William and Flora Hewlett Foundation, the David and Lucile Packard Foundation, Surgo Foundation, Unilever, USAID, the Wellcome Trust, the World Bank, UNICEF, and the World Health Organization, and FP2020 met to explore the potential for collaboration in their investments on SBC. Before this meeting, there had been few substantive donor collaborations focusing exclusively on SBC; more often, behavior change was addressed as a component of broader thematic or sectoral initiatives.

**Effective donor collaborations leverage the strengths of different donors.**

**New donors and implementers were investing in SBC, but many were operating in isolation and were unlikely to achieve population-level impact due to missed opportunities for learning and duplication of effort.**

\*Many readers will be familiar with the term social and behavior change communication (SBCC), defined as the integrated use of a range of communication approaches—mass media; “new” and social media; community-level activities; and interpersonal communication (IPC)—to influence norms and behaviors pertaining to health. The authors use the broader term, SBC, which is understood to encompass both SBCC and non-communication-based approaches to behavior change. SBC includes any approaches, activities, or interventions that directly affect knowledge, attitudes, behavior, and social norms that influence health or development outcomes. Such interventions may be grounded in several different disciplines, including SBCC, marketing, advocacy, behavioral economics, or human-centered design.

In preparation for this meeting, the meeting organizers—including the authors of this commentary—undertook program research, involving document review and in-depth interviews, to prepare a background paper for the meeting. We identified purposively the documents that we included in the review. As described in the next section, most of the literature we reviewed described models of donor collaboration and lessons learned from them based on collaborations among donors investing in a high-income country, the U.S., and none of them focused explicitly on donor collaboration in SBC.

To complement the perspectives on donor collaborations that we found in the literature, most of the semistructured in-depth interviews we conducted focused on experiences with donor collaborations related to SBC in low- and middle-income countries. Despite substantial differences in context, we found that the factors associated with success of donor collaborations in high-, middle-, and low-income countries were fairly consistent. We conducted semistructured interviews with donor staff, representatives of a host-country government, and researchers. These interviews were conducted with individuals in their professional capacities, either as staff of donor organizations or as staff of other stakeholders in the sector, such as implementing partners and research organizations. Ethics review was not deemed necessary. Between October 2018 and January 2019, we conducted a total of 26 interviews: 14 with donor staff who participated in the meeting, 2 with a host-country government, and 12 with other stakeholders familiar with donor coordination and/or with SBC investments. Interviewees were invited by email and implicitly gave their consent to participate by responding to the invitation email, scheduling the call, and participating in the interview. Interviews focused on participants' perspectives on donor collaboration. We then drafted a working paper to summarize our findings.

This commentary builds upon and expands that research. First, we present several models of donor collaboration, and offer examples of each from SBC investments. Then we identify factors associated with the success and failure of donor collaborations, particularly those focused on de-

mand and behavior change in global health,<sup>†</sup> to help define the way forward for donors and multilateral institutions exploring opportunities for collaboration in SBC.

## ■ DONOR COLLABORATION MODELS

Research on donor collaborations in the US can help elucidate current and potential models for engagement among SBC funders investing in international development. Our research identified several models of donor collaboration that share some common features, including a recognition that collaboration occurs along a spectrum, from informal groups that are loosely structured, to more formal groups that are more structured and closely integrated. Three useful and similar models are described by GrantCraft, Catalyst of San Diego and Imperial Counties (formerly San Diego Grantmakers), and Bridgespan (Table). A fourth model, Collective Impact, developed by FSG, uses a specific and more highly structured approach.

GrantCraft distinguishes 3 types of funder collaborations based on how the participating funders structure their work together. A learning network, the most loosely structured, is a group of funders that come together to share information, learn about developments in a field or issue area, and discuss potential ways to invest more effectively.<sup>6</sup> A strategic alignment network, which is more structured, comprises funders who share a mission, develop strategies together, and work toward joint impact but do their grantmaking separately. By contrast, a pooled fund, which is the most structured, is a “pot” of money to which funders contribute and from which grants or program-related investments are disbursed. Money from the pot is often used without distinguishing its original donor. Similar in many ways to how a foundation functions, a pooled fund has staff to develop strategies, issue calls for proposals, and assess and select potential grantees.

Similar to the GrantCraft model is the “Learn-Plan-Act” model proposed by San Diego Grantmakers, which describes funders' motivations to work with other funders along a continuum of how committed they are to

**We identify factors associated with the success and failure of donor collaborations to help define the way forward for donors exploring opportunities for collaboration in SBC.**

<sup>†</sup>The terms “supply” and “demand” are used in development assistance for strengthening health sector services to describe the availability of health services (supply) and individuals' use of those services (demand). Supply-side interventions may focus on improving the technical quality and/or accessibility of a health service, including geographic, economic, and cultural access. Demand-side interventions may focus on making intended individuals aware of available services and motivating them to seek out and use these services.

**TABLE.** Typologies of Donor Collaborations, With Examples

Model	Less integrated ----- More integrated				
<b>Grantcraft</b>	Learning Network	Strategic Alignment Network	Pooled Fund		
<b>San Diego Grantmakers</b>	Learn	Plan	Act		
<b>Bridgespan</b>	Exchange	Coordinate	Co-invest	Create	Fund the funder
<b>Examples</b>	Global SBC Donor group Scaling Up Nutrition The Curve Community of Practice	Nigeria SBC Donor Coordination Committee, and similar groups in other countries Global Partnership to End Violence Against Children	Social Norms Learning Collaborative Adolescents 360 Generation Unlimited United Nations Trust Fund to End Violence Against Women U-Report	Bernard van Leer Foundation and Conrad N. Hilton Foundation co-funding INSEAD course on behavioral science for early childhood development	United Nations Children’s Fund (UNICEF) Innovation Fund

Abbreviation: SBC, social and behavior change.

learning together, planning together, or acting together.<sup>9</sup>

Bridgespan expands upon the 3 types of collaboration identified by GrantCraft and San Diego Grantmakers, identifying 5 models of donor collaboration.<sup>10</sup> The least integrated collaborations serve the purpose of exchanging ideas and raising awareness. The most integrated collaborations are re-granting organizations, in which more than 1 funder invests in another funder with expertise in a content area.

We reviewed a fourth model of donor collaboration, called Collective Impact (CI). Since 2011, FSG and other organizations have used the CI approach to collaborative problem solving and a structured, cross-sector approach to solving complex social problems with partners, including donors.<sup>11-13</sup> Five essential conditions of a CI initiative are backbone support, a common agenda, mutually reinforcing activities, continuous communication, and shared measurement.<sup>14</sup> An example of the CI approach in SBC is the advocacy work of Alive & Thrive, which improved infant and young child feeding policies in seven countries of Southeast Asia.<sup>15</sup>

**RECOMMENDATIONS FOR SUCCESSFUL DONOR COLLABORATION**

Our research suggested the following practices support a successful donor collaboration: (1) define group purpose, goals, and roles clearly and early on; (2) support host-country leadership; (3) recognize and leverage the different strengths

of private and public donors; (4) demonstrate commitment by investing resources: time, money, networks, and institutional clout; (5) use honest conversations about failure to inform a joint learning agenda; (6) encourage proactive communication and informal discussion; (7) take the time to understand collaborating organizations’ grantmaking, procurement, and compliance processes; (8) consider using a trusted member (or an intermediary) to progress work; and (9) early wins build confidence in the group.

Examples related to SBC are cited in the text and Table, with more information in a Supplement.

**Define Group Purpose, Goals, and Roles Clearly and Early On**

Effective collaboration requires a shared understanding of the problem to be solved, which may pertain to health outcomes, tactical and operational barriers to achieving those outcomes, or some combination thereof. Facilitators must also work to understand the politics, backstories, and relationships among group members that may impact the achievement of shared goals. Agreeing on some shared indicators of progress and success can help donors confirm that their purposes and goals are aligned.

For example, in Nigeria, an SBC committee was established in 2019 under the Donor Partners Group for Health (DPG-H). The SBC committee is guided by terms of reference that define shared objectives, scope, and modalities for effective collaboration among donors funding demand-side activities. The group’s vision is

**Agreeing on some shared indicators of progress and success can help donors confirm that their purposes and goals are aligned.**

a country with effective geographic and technical coordination of SBC investments that are aligned with Government of Nigeria priorities and that maximize opportunities for synergies, co-investment, and program impact.

### Support Host Country Leadership

Sustainable development requires the leadership of host-country governments. This principle is particularly true of SBC, given a historical over-reliance on donor funding in many countries and potential sensitivities around the imposition of sociocultural norms. Alignment among donors can facilitate government leadership, ensure that government priorities are addressed, and support strategic and intentional draw-down of donor investment.

The DPG-H donors in Nigeria established an SBC coordination committee within the DPG-H because the DPG-H drives the agenda of the Health Partners Coordination Committee. Placing the SBC committee within the DPG-H (and by extension under the purview of the Health Partners Coordination Committee, which is convened by Federal Ministry of Health) helps ensure that SBC priorities are both visible and aligned with the Government of Nigeria's health objectives.

### Recognize and Leverage the Differing Strengths of Private and Public Donors

Recognizing the contrasts between public and private donors is necessary to improve collaboration processes, transparency, and efficiency. Private foundations' ability to move money quickly and act nimbly can accelerate the progress of collaborations involving public funders, whose investment processes take longer (T. Wood, personal communication, October 22, 2018; R. Vezina, Harder + Co. personal communication, November 6, 2018). Similarly, private donors often have the flexibility to fund emerging or highly specialized research or programming, and as such can act as disruptors or catalysts within the broader development community. Conversely, public donors typically offer the broad investments, long-standing relationships with host-country governments, and staff on the ground that are critical for achieving sustained impacts at scale.

The Ouagadougou Partnership offers an example of this public-private collaboration. USAID, the William and Flora Hewlett Foundation, BMGF, and other private donors have worked closely together to highlight the need for increased attention to demand-side drivers of family planning use. The private donors have been instrumental in

funding essential research and monitoring through mechanisms such as Track20 and national audience segmentation studies. USAID has supported ongoing advocacy, capacity strengthening, and regional SBC campaigns. Within host countries, it is important to mobilize domestic donors, including from the private sector. Business councils operate in many countries and bring together public- and private-sector donors.

### Demonstrate Commitment by Investing Resources: Time, Money, Networks, and Institutional Clout

Members of collaborations must have a vested interest in the collaborative activity, but they need not commit equal amounts of funding to participate as equals. Committing early and offering non-financial resources and influence are valuable too, but it is important to be transparent about how funding levels relate to decision-making roles (B. Schlachter, FP2020, personal communication, November 20, 2018; L. Dakan, David and Lucile Packard Foundation, personal communication, November 26, 2018). Similarly, it is critical that collaborations include not only technical experts but recognized leaders and those with the authority to make funding decisions. Ouagadougou Partnership's 2019 annual meeting provides an example of shared investment as a reflection of commitment. Although the Hewlett Foundation and BMGF were primary funders of the partnership and supported the annual meeting itself, USAID SBC implementing partners worked closely with the Ouagadougou Partnership's secretariat and major funders to advocate for attention to SBC as a theme of the meeting and organized several SBC-specific events at the meeting. This joint effort on the part of donors, partners, and the secretariat effectively elevated SBC within the meeting without undue burden on a single funder.

### Use Honest Conversations About Failure to Inform a Joint Learning Agenda

Successful collaborations recognize failure as a chance to inform a learning strategy, rather than a reputational threat to a given funder or implementer.<sup>16</sup> Many funders are reluctant to admit that their investments have not achieved intended goals, because they fear it will reflect poorly on their partners or their own management of the investment. However, philanthropic researchers and advisors emphasize that strong organizations use what they learn to improve.<sup>16</sup> In aligning their investments, funders can celebrate

**Members of collaborations must have a vested interest in the collaborative activity, but they need not commit equal amounts of funding to participate as equals.**

what has worked for them individually and collectively but must also be prepared to acknowledge what has not. Having some agreed-upon goals as well as indicators of progress and success can help facilitate these honest conversations. Using an iterative learning approach, such as Responsive Feedback, that guards against both a failure of the theory of change and a failure of implementation may be helpful.<sup>17</sup>

In India, Bangladesh, and Rwanda, BMGF and the World Bank are working with local partners to use behavioral science to improve complementary feeding and dietary diversity for small children, maternal nutrition, and the performance of health care workers. The collaboration is intended to support innovations addressing challenges where ongoing efforts were not seeing sustained results. The grant includes a specific component for capacity building and knowledge sharing of partner programs. This approach allows the project strategy to be continually refined and also enables the World Bank team to identify areas of work and propose solutions focused, in some cases, on adapting and improving the existing strategies being implemented. This effort includes identifying the need to revisit growth tracking but from the point of view of parents' aspirations instead of the traditional focus on monitoring program performance.

### Encourage Proactive Communication and Informal Discussion

Promoting a sense of full collaboration outside of formal, scheduled meetings can encourage team members to communicate as issues arise and build trust with one another. Members of strong collaborations stress the importance of cultivating trust among new and existing members and establishing expectations and habits that facilitate constructive relationships over time. It is important to recognize that each individual in the group represents an organization and may need time to sensitize the organization and navigate the organization's priorities and ways of working (V. Gauri, World Bank, personal communication, November 20, 2018; R. Vezina, Harder + Co., personal communication, November 6, 2018).

At Design for Health, a partnership between BMGF and USAID to promote the application of design practices in global health, development of strong relationships between a core group of staff at the 2 donor organizations allowed the team to course correct as needed, particularly when the

implementing partners' work began to lean toward the strategic priorities of a single funder.

### Take the Time to Understand Collaborating Organizations' Grantmaking, Procurement, and Compliance Processes

Members of a collaboration must recognize each participating organization's administrative requirements, which may vary widely. Underestimating the time and resources needed to navigate procedures for making a grant, including procurement, due diligence, contracting, and reporting, will cause delays. To avoid this, technical experts may wish to engage colleagues focused on management, procurement, and compliance early in the development of a collaborative activity so that timelines and expectations are realistic. Doing this can also allow donors to leverage each other's funding streams effectively and efficiently.

For example, Design for Health was able to use BMGF's flexible funding for priority activities, such as community-building convenings, that USAID could not fund. In turn, USAID funding supported the development of public goods that were created as a follow-on to the community-building convenings. At the outset, USAID and BMGF discussed how they could best leverage their respective funding to achieve the partnership's strategic objectives.

### Consider Using a Trusted Member or an Intermediary to Progress Work

An intermediary can oversee the collaborative effort,<sup>6</sup> providing facilitation and leadership, which allows the donor organization staff to engage as funders rather than as process-facilitators (J. Rangel de Almeida, Wellcome Trust, personal communication, November 9, 2018; L. Sussman, USAID, personal communication, October 17, 2018; T. Wood, BMGF, personal communication, October 22, 2018). Forming a secretariat that can take work forward on behalf of the group can be a useful approach (V. Winder, FP2020, personal communication, November 21, 2018).

In the CI approach to collaboration, this function is called "backbone support." For example, Alive & Thrive (A&T) has provided backbone support for a multilayered SBC CI initiative, funded by BMGF and Irish Aid in Southeast Asia. A&T organized large events with UNICEF to build and maintain momentum around infant and young child feeding policy enhancement in seven countries in southeast Asia. At the country level, A&T strategized with the actors and provided them

with capacity-building opportunities to advance policy work. They were able to mobilize funding to complement the existing resources and ensure ownership from the government and other organizations.

### Early Wins Build Confidence in the Group

Early wins demonstrate the value of working together and are essential to holding a collaborative group together.<sup>18</sup> Writing about the CI approach, consulting group FSG recommends that groups pursue a<sup>14</sup>:

*portfolio of strategies that offer a combination of easy but substantive short-term wins to sustain early momentum for the initiative, as well as more ambitious, long-term systemic strategies that may not show impact for several years.*

One example of an “early win” from the SBC Donor Group convened by BMGF, USAID, and CIFF resulted from participants’ sharing information about their investments. In preparation for the group’s initial meeting in December 2018, participants provided information to BMGF about their organization’s investments in SBC in prioritized countries. BMGF and a consultant collated this information and reformatted it into a database and maps of donors’ SBC investments in selected countries. Participating donors identified overlaps and gaps in their investments. The tangible output was useful in the donors’ individual planning of their investments. The database enables group members to analyze the portfolio of investment across donors, brings visibility to innovative donor initiatives, and encourages donors to explore similar investments for collaboration. Since then, the World Bank eMBED unit has assumed management responsibility for the database.

## CONCLUSIONS

Since 2018, there has been a marked increase in collaboration among funders of SBC in global health. Anecdotal evidence suggests that these efforts are beginning to yield results, including reduced duplication of effort, improved support to implementers, and increased co-investment.

In 2020, the SBC Donor Group met remotely twice and discussed how donors were responding to the coronavirus disease (COVID-19) pandemic in the area of risk communication. The group’s first meeting of 2021 addressed expanding the use of SBC for health systems change rather than limiting its use to individual behavior change. The group intends to support agenda-setting for the next International SBCC Summit

(scheduled for December 2022) and will likely use this forum to assess the group’s results to date, expand membership with more donors based in countries of implementation, and identify specific opportunities for collaboration and cofunding.

Moving forward, funders must be intentional in building communities and collaborative relationships that both leverage these early successes and strive to apply proven practices such as those discussed in this article. It is critically important that funders institutionalize collaborations, moving beyond a small number of participating donors and their staff to engage a broader range of organizations and individuals with a vision and mission that resonates broadly and is supported by decision makers within each participating organization. Achieving this broader participation will require both documentation of the results of donor collaboration and targeted outreach, with attention to smaller funders and organizations that have not historically invested heavily in demand-side programming. As collaborations, such as the SBC donor group initiated by BMGF, USAID, and CIFF, mature, it will be important that they move beyond sharing information to enable more integrated coordination, co-investment, and even cocreation of investments. Global and regional collaborations among donors must also seek to engage host country governments and regional coordinating bodies as leaders in the work of SBC.

### Suggested Next Steps

The OECD conducted research in 2003 and 2018 on private philanthropy and collaboration networks among philanthropists and with ODA. To the authors’ knowledge, this manuscript is the first that considers donor collaboration focused specifically on SBC. The sector would benefit from additional research, including updated research on the barriers and facilitators to donor collaboration in SBC, from the perspective not only of donors, but also from the perspectives of host-country governments, of implementing organizations, and of intended beneficiaries.

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COMMENTARY

# Faith-Based Advocacy for Family Planning Works: Evidence From Kenya and Zambia

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## Key Messages

- Although it is often assumed that religion has a negative influence on family planning (FP), virtually all faith traditions support the concept of healthy timing and spacing of pregnancy.
- Given the growing evidence of the importance of religious leaders and faith-based organizations (FBOs) in shaping policy and reaching communities in support of FP, faith leaders play an important role in advocating for FP and increasing its uptake.
- FBOs are interested in expanding access to FP and increasing service delivery, yet governments, donors, and nongovernmental organizations give low priority to FBOs for financial, training, and commodity support of FP, resulting in a lack of services for underserved populations.
- Faith leaders become effective FP advocates with governments and donors through advocacy training, internal discussions to develop church positions on FP, technical information on FP, and evidence-based rationales for FP.

## EXPANDING THE ROLE OF FAITH-BASED ORGANIZATIONS IN FAMILY PLANNING ADVOCACY

Worldwide, nearly 85% of people are affiliated with a religious faith,<sup>1</sup> including in sub-Saharan Africa. Virtually all faith traditions support the concept of healthy timing and spacing of pregnancy, including access to the means for spacing pregnancies.<sup>2,3</sup>

It is often assumed that religion has a negative influence on family planning (FP), yet virtually all faith traditions support the concept of healthy timing and spacing

of pregnancy.<sup>2</sup> Interfaith support for FP exists, as shown in the Interfaith Declaration to Improve Family Health and Wellbeing, which was signed by a committee of Christian, Muslim, Hindu, and Buddhist leaders, to promote using their networks to promote healthy timing and spacing of pregnancies.<sup>9</sup>

Faith-based health facilities provide between 20% and 50% of health care services in countries in sub-Saharan Africa<sup>7,8</sup> and are especially important for rural, remote, and marginalized populations, sometimes as the sole source of health care. A study of 95 faith-based organizations (FBOs) found that these organizations provide a range of reproductive health interventions, including FP, and link physical health with spiritual well-being.<sup>9</sup> Because FBOs are embedded in the communities they serve, they can reach a range of groups with FP and reproductive health messages that are shaped by local cultures and beliefs and also provide services.<sup>10-12</sup>

Because faith influences health care beliefs and behaviors, religious leaders can influence health-seeking behaviors<sup>4,5</sup> and their support of FP can increase its uptake.<sup>6</sup> An evaluation of the Nigeria Urban Reproductive Health Initiative found that contraceptive uptake was 1.7 times higher for women exposed to FP messages from religious leaders than among women who were not, a statistically significant difference.<sup>6</sup> Through a project involving FBOs and religious leaders in Kenya, religious leaders who implemented the project reported reaching nearly 700,000 people with FP messages and referring more than 87,000 clients to health facilities for FP services.<sup>12</sup>

FBOs are interested in expanding access to FP and increasing service delivery, yet governments, donors, and nongovernmental organizations give low priority to FBOs for financial, training, and commodity support of FP, resulting in a lack of services for underserved populations. When public facilities face stock-outs, commodities are less likely to flow to FBOs.<sup>13</sup>

Advocacy to increase domestic support and financing for FP, an important strategy for achieving the FP2020 goal of reaching an additional 120 million women with contraception, continues to be an important strategy under FP2030. With increasingly decentralized health systems, this work needs to be done at national and subnational levels, led by local organizations. FBOs,

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together with religious leaders, are influential voices with policy makers and with their communities,<sup>14</sup> with growing evidence that religious leaders and FBOs can be strong and effective advocates for FP. An evaluation of the Faith to Action Network in 6 African countries identified several policy successes based on religious leaders' input in those countries.<sup>10</sup> For example, in Ghana, advocacy from network members contributed to the government including FP in the National Health Insurance Act 852 in 2015.

Given people's participation in faith communities, the importance of FBOs in providing health care, and growing evidence of the importance of religious leaders and FBOs in shaping policy and reaching communities in support of FP, is there a wider role for faith leaders in advocating for FP?

Faith leaders may initially lack information and understanding about the role of FP in the health of women, children, and families and the issues facing faith-based health facilities related to contraceptive services, such as stock-outs. While faith leaders are trusted and experienced public speakers, they would benefit from gaining policy advocacy skills to reach policy makers and community members. Does having these skills and tools allow FBOs and faith leaders to play a role in advocating to national and local leaders to strengthen political and financial support for FP and to improve FP-related services?

This article describes an initiative to increase policy and financial commitment for FP and increase community support for FP through advocacy by predominantly Christian religious leaders in Kenya and Zambia in partnership with their health-related FBOs. Over three-quarters of both countries' populations are affiliated with Christian denominations,<sup>15</sup> and Christian FBOs provide approximately 30% of the health services in Kenya and Zambia.<sup>16</sup>

## ■ FAMILY PLANNING ADVOCACY THROUGH RELIGIOUS LEADERS PROJECT OVERVIEW

With funding from the Bill & Melinda Gates Foundation, Christian Connections for International Health (CCIH) partnered with the Christian Health Association of Kenya (CHAK) and the Churches Health Association of Zambia (CHAZ) between 2014 and 2019 to improve the policy and funding environment for FP by increasing the advocacy capacity of FBOs and religious leaders.

CCIH is a global network of Christian organizations and individuals promoting global health and

wholeness from a Christian perspective. CHAK and CHAZ are the health technical arms of their church partners in their respective countries. CHAK has 521 Protestant health facilities and community programs and 67 church programs (registered churches and service delivery organizations affiliated with churches) in Kenya. CHAZ has 157 Catholic and Protestant member facilities, including church health institutions (e.g., mission hospitals, clinics, and rural health centers) and training institutions (nursing and midwifery and biomedical). CHAK and CHAZ are part of the health system and have memoranda of understanding with their governments. They play unique roles in FP advocacy and service delivery through the involvement of the church denominations that own health facilities and the religious leaders who represent them.

The language for FP advocacy requires careful attention to clarity and meaning to avoid misconceptions and misunderstandings.<sup>3</sup> The project started with CCIH's definition of FP<sup>17</sup>:

*Enabling couples to determine the number and timing of pregnancies, including the voluntary use of methods for preventing pregnancy—not including abortion—that are harmonious with their values and beliefs.*

CHAK and CHAZ used similar criteria when recruiting religious leaders to engage in FP advocacy with their governments. Religious leaders needed to be pastors, bishops, or reverends of churches that owned or operated health facilities and were CHAK or CHAZ member institutions.

To empower them to speak up and use evidence-based arguments in support of FP, we trained 14 religious leaders in Kenya and 18 religious leaders in Zambia in advocacy, provided technical information about FP, and had discussions on the biblical support for FP. Most formal religious leaders are male; however, women's organizations in churches and women leaders have substantial influence in matters of reproductive health.

The training was adapted from the Advance Family Planning Project's advocacy portfolio, which focuses on quick wins and helps advocates: (1) understand the policy environment; (2) make effective, evidence-based arguments, and (3) document, validate, and share results to allow for strategy revisions.<sup>18</sup> CHAZ's advocacy plan noted<sup>18</sup>:

*CHAZ will train church leaders in the use of the quick wins strategy to ensure that long-term changes are broken down into incremental changes that combine to produce meaningful and lasting change.*

**FBOs and religious leaders are influential voices with policy makers and communities, with growing evidence that they can be strong advocates for FP.**

**To empower religious leaders to use evidence-based arguments in support of FP, we trained leaders in advocacy, provided technical information about FP, and had discussions on the biblical support for FP.**

**BOX 1.** Selected Message for Christian Communities in Support of Family Planning

“So God created man in his own image; in the image of God he created him; male and female he created them.” Genesis 1:27

To be made in God’s image is to have dignity, value, agency, and the authority to dream and plan, including planning a family and children.

“But if anyone does not provide for his relatives, and especially for members of his household, he has denied the faith and is worse than an unbeliever.” 1 Timothy 5:8

Parents must plan for their children, strive for healthy timing and spacing of pregnancies, and work to have the family they can support, consistent with their beliefs and values.

The FP sensitization used World Health Organization guidelines on contraception, which were also compatible with those of their ministries of health (MOHs). The biblical discussion was key to enabling religious leaders to discuss their theological interpretations of biblical passages with each other and agree on relevant passages from the Bible for use in publicly sharing about FP from a Christian perspective (Box 1).<sup>19</sup>

CHAK and CHAZ, with input from CCIH, developed advocacy plans in 2015, which were adapted over the life of the project to take advantage of new opportunities. In both countries, the advocacy plans called for engaging and training religious leaders, reaching out both internally to the church denominations/bodies and congregations and externally to communities through a range of media, and holding meetings with public officials to advocate for support and funding.

CHAZ is the civil society organization country lead in the health sector, through which CHAZ provides leadership by coordinating civil society organizations and facilitates linkages with the government and donors in the health sector. Through CHAZ’s advocacy role in the country’s health sector, they often present position papers at Zambia’s health policy meetings and the Inter-agency Coordination Committee on reproductive, maternal, newborn, and child health.

Kenya’s advocacy plan focused on 3 counties, following the 2010 Constitution that devolved Kenya’s system of governance to the county level. Overall, advocacy was focused on raising political support and funding for FP in the counties and ensuring that resource allocation, most notably human resources and commodities, also included FBO facilities.

Zambia’s advocacy plan focused on the national level and aimed to increase the national budget for FP to meet FP2020 commitments and adopt and expedite the roll-out of providing injectable contraceptives by community-based distributors.

Additional advocacy tasks added included developing policy on task shifting; developing a post-2020 agenda as the FP2020 commitments ended; developing a post-2020 costed implementation plan; looking at other health financing opportunities (e.g., Global Financing Facility) and ensuring that FP services benefit from such; focusing on youth and teen pregnancies; expanding the FP method mix to include CycleBeads in both public and faith-based facilities for all people to have access; and increasing domestic FP financing to meet gaps in commodities as most of the FP budget was supported by donors.

Data for this article come from a monitoring system and tracking tools developed for the project, with quantitative findings and narrative reports compiled between 2014 and 2019. The monitoring system was based on the theory of change developed for the project (Box 2).

## ■ ADVOCACY TO CREATE A CONDUCTIVE POLICY AND FINANCING ENVIRONMENT TO ENSURE FP GOAL ATTAINMENT

### Building Internal Advocacy

After attending training and before participating in external advocacy with policy makers, religious leaders identified the need for in-depth discussions within their churches to get approval. Internal advocacy included discussions with church leadership about issues such as the church’s definition of FP, which methods it supports, and why it is advocating for increased support for FP important for their communities.

Some internal advocacy within the church involved the CHAK and CHAZ health technical experts. In Zambia, the Baptist Church invited a CHAZ staff member to lead a session on contraceptive methods to ensure the leadership understood

**BOX 2.** Christian Connections for International Health Family Planning Advocacy Project Theory of Change

The project theory of change hypothesized that:

- If faith-based organizations and religious leaders respected by communities and policy makers are trained on family planning and advocacy, underpinned by biblical teaching, and
- If they undertake evidence-informed advocacy based on an analysis of the situation with family planning services in their countries (or at the relevant subnational level), and
- If they speak out about family planning in their communities and interact with policy makers and other relevant stakeholders with terminology on family planning they are comfortable with,

then policy and financial support for family planning by policy makers will increase, along with community support for family planning.

and was supportive of the religious leader who was meeting with the MOH.

The religious leaders also conducted internal advocacy with their church membership to ensure consistent FP messages. To inform their communities on the benefits of FP, religious leaders also incorporated FP into their sermons and other community events. For example, an Orthodox religious leader in Kenya talked about FP during a session at his church for women and men. During a Salvation Army Radio station broadcast in Chikankata, a religious leader in Zambia talked about the need for Christians to embrace FP as a responsible way of practicing stewardship of the gift of procreation.

### Developing Church Positions on FP

CHAZ led the process of clarifying the churches' positions on FP, another important step in preparing for external advocacy. Using the CCIH FP definition as a foundation, CHAK worked with churches at the county level and CHAZ worked with churches at the national level to develop their written positions on FP, including each church's own definition and the FP methods they find acceptable (Table 1).<sup>20,21</sup> These written positions served to dispel the misconceptions that churches and other faiths do not support FP nor many contraceptive methods. Religious leaders used the position statements, along with talking points provided by project partners, in their advocacy discussions with public officials and communities.<sup>22</sup>

### Using Assessment Survey Findings to Shape Advocacy

To inform the advocacy strategy, the project conducted assessment surveys of FBO health facilities in Kenya and Zambia. The assessments reflected the FP, maternal, neonatal, and child health environment (e.g., policies, contraceptive security,

training, and services provided by FBOs) and served to identify gaps to address through advocacy. In Kenya, 33 CHAK facilities were included in the baseline, and in Zambia, 41 CHAZ facilities were included.

Key barriers identified from the assessment surveys in both countries included stock-outs of supplies; lack of staff training; and lack of community knowledge about FP (unpublished reports). More use was made of the health facility-level findings in Kenya because advocacy focused on the subnational level there, whereas the advocacy in Zambia focused on the national level. Still, the assessment survey findings provided context for conversations with the religious leaders and helped direct CHAZ's original advocacy asks and efforts.

### Strengthening Ties With Other FP Partners

To increase in-country advocacy capacity, the project also fostered partnerships between religious groups and other FP actors working in Kenya and Zambia. For example, CHAK and religious leaders collaborated with the Meru County Health Management Team, MOH staff, and national and international nongovernmental organizations to strategize on creating the Meru County Costed Implementation Plan. Through CHAZ's active membership in the Family Planning Technical Working Group (FPTWG), it was asked to co-chair the first FPTWG advocacy subcommittee. Dr. Kennedy Malama, Permanent Secretary, Technical Services, Zambian MOH, stated that the FPTWG was very effective in its advocacy role.<sup>23</sup> CHAZ was also tasked to be the focal point civil society organization for FP2020 in Zambia.

### Increasing Demand for FP

In addition to using their church platforms to inform people about FP and refer them appropriately, the religious leader FP champions used a variety of

**To inform their communities on the benefits of FP religious leaders also incorporated FP into their sermons and other community events.**

**TABLE 1.** Selected Church Positions on Family Planning in Kenya<sup>20</sup> and Zambia<sup>21</sup>

Kenya	Zambia
<p><b>Anglican Church of Kenya Meru Diocese</b></p> <ul style="list-style-type: none"> <li>• Defines FP as having the number of children that one is able to care for in terms of clothing, food, shelter, and other needs.</li> <li>• Gives its members freedom to choose a FP method.</li> <li>• Uses materials on FP produced by the Ministry of Health and the Anglican Development Services Department.</li> <li>• Discusses FP during seminars at the church, pastoral fellowship, and group meetings, such as Mothers Union, Kenya Anglican Men’s Association, Youth Forums, and Conferences.</li> </ul>	<p><b>Beracah Arise Bible Church</b></p> <ul style="list-style-type: none"> <li>• Defines FP as an arrangement between people in marriage agreeing on the number of children to have, when to have them, and how to space them. This is done to enhance good health for the women and children and for the couple to be economically stable to meet the family’s needs.</li> <li>• FP methods are decided by the couple with the help of medical personnel; the church cannot decide for the couple.</li> <li>• Uses materials from the Ministry of Health and guidance of FP from qualified health personnel.</li> <li>• The church team has interpreted the materials and messages with the Bible as a guide.</li> </ul>
<p><b>Orthodox Church</b></p> <ul style="list-style-type: none"> <li>• Defines FP as scientific and natural methods that are used to control the size of a family and spacing between the children.</li> <li>• Supports the use of pills, injectables, implants, intrauterine devices, condoms, CycleBeads, and natural FP.</li> <li>• Has used PowerPoint presentations to educate members on FP at workshops, seminars, and symposiums.</li> </ul>	<p><b>United Church of Zambia</b></p> <ul style="list-style-type: none"> <li>• Defines FP as having a size of children that a family can be able to look after and only having children when a couple is ready for them.</li> <li>• Does not dictate the kind of FP methods that its members use but provides information such as referring couples to health institutions for professional advice.</li> <li>• Uses its gatherings to invite professionals to give health talks on FP and distribute literature.</li> <li>• Hinges on FP being for married couples, hence the promotion of abstinence to those who are not married.</li> </ul>

Abbreviation: FP, family planning.



Major Angela Hachitapika of the Salvation Army Zambia Church speaks at a Ministry of Health breakfast. © 2017 Ngalande Ngalande Jr./Churches Health Association of Zambia

communications tools to reach the public, including television, radio, social media, online media, and periodicals (Supplement). The initiatives to increase demand were coordinated with other partners (e.g., FPTWG in Zambia).

**Advocacy Engagement and Wins**

The advocacy by the religious leaders resulted in public support of FP, political commitments for

FP in both countries, commitments to developing FP costed implementation plans to increase stable financing for FP, and commitments to expand access to contraceptives through task shifting (Table 2).

**Reaching Youth**

In 2019, the religious leaders in Kiambu County expressed concern to the County Executive

**TABLE 2.** Family Planning Advocacy “Wins” Among Religious Leaders

Public Official Support for FP	<p>A member of the county assembly in Murang’a County, Kenya, encouraged women at a rally to have children and offered payment to the pregnant women there. A religious leader FP champion met with the county assembly member and ensured that the county assembly member understood the importance of FP for healthy timing and spacing of children. Since then, the county assembly member was supportive of FP; he stopped offering money and encouraged people to have children they are able to provide for.</p> <p>In Zambia, at a national religious leader meeting on FP, the religious leaders urged the MOH to increase public financing for FP as opposed to being heavily dependent on external donors. The MOH recognizes the church and FBOs as strategic allies in ensuring a healthy population who should be included in a coalition to ensure they provide services that leave no one behind and achieve Universal Health Coverage.<sup>24</sup></p>
Commitment to Increasing Funding and Developing FP Costed Implementation Plans	<p>With the county staff of Murang’a and Kiambu Counties in Kenya, CHAK conducted budget analyses, which highlighted the gaps in FP programming and what the counties could do to respond. CHAK worked with Murang’a County to develop the first-ever 5-year FP CIP in 2020, which was launched in December 2020. CHAK plans to work with the Kiambu County government to develop their FP costed implementation plan in 2021, dependent upon how COVID-19 affects staff availability toward this effort. In Meru County, Kenya, CHAK worked with others to successfully advocate to create an FP costed implementation plan, which was launched in 2018. The religious leaders continued to advocate for FP and implementation of the CIPs and for support to faith-based health facilities. The head of the Meru County, Kenya Executive Committee for Health praised the religious leaders for their work on FP and promised the county’s support of FP, highlighting the importance of religious leader influence and connections.</p> <p>After a FP meeting attended by religious leaders and the MOH, the government of Zambia committed to increasing domestic financing, ensuring that, by 2020, its domestic contribution to FP commodities had increased to a minimum of \$US1.5 million. Previously, there had been a FP line in the budget, but no funding in it. In 2017, there was a release of \$US1.4 million and a release of \$US2.6 million in 2018. As an indication of the need for continued advocacy and accountability, there was no release in 2019. There was also advocacy and agreement to a \$US500,000 allocation for commodities.</p>
Supply Chain Improvements for Health Facilities	<p>Meetings between religious leaders and public officials in the 3 focus counties in Kenya resulted in verbal commitments that the MOH would help FBO facilities with contraceptive stock-outs and supply chain challenges and maintain support supervision for FP in 33 FBO health facilities in the 3 counties. FP commodities and supplies were distributed from the county stores to the FBO health facilities faster and quantities ordered were more accurate.</p> <p>Survey results from the 33 facilities in the 3 focus counties in Kenya in 2014 and 2017 provide an indication of the effects of the advocacy by religious leaders on FBO-run health facilities over the first 3 years of the project. Through the advocacy by religious leaders to the county governments through the CHMT, the FBO facilities have continued to receive FP commodities, with greatly reduced stock-outs in those facilities: in 2014, 40% of the facilities surveyed reported having difficulty getting FP commodities from the government, compared to 0% in 2017. Nearly all (97%) facilities reported stock-outs in 2014, compared to 20% in 2017. Advocacy with the county governments to print new FP guidelines was also successful. In 2017, the lowest level of health facilities surveyed had at least 1 copy of the FP guideline while health centers and hospitals had at least 3 copies (unpublished report).</p>

Abbreviations: CHAK, Christian Health Association of Kenya; CHMT, county health management team; CIP, costed implementation plan; COVID, coronavirus disease; FBOs, faith-based organizations; FP, family planning; MOH, Ministry of Health.

Committee about the high rate of adolescent pregnancy and the high number of girls dropping out of school. The committee asked them to help educate county youth on avoiding pregnancy and HIV. As a result of this outreach and collaboration between the county and the religious leaders, county health officials spoke at church-organized events and informed the hundreds of youth who attended about teenage pregnancy and HIV, and religious leaders encouraged abstinence.<sup>25</sup>

CHAK and the religious leaders created a WhatsApp discussion group with the Kiambu County health staff. Conversation within this WhatsApp group continues and has been particularly useful during the COVID-19 pandemic as teenage pregnancies have increased with school closures. The county is reaching out to youth with information on preventing unintended pregnancy with the result that most girls know where to access FP services, and they are doing so. Those



Religious leaders from Kiambu County in Kenya meet with the County Executive Committee of the Ministry of Health. © 2019 Christian Health Association of Kenya

who became pregnant have had safe deliveries and have been supported to continue in school. The religious leaders have continued to provide messages on reproductive health and FP, and they are working with the county to form support groups for the young mothers to provide support and experience sharing as they go through motherhood and continued schooling.

### ■ DISCUSSION

There have been several calls for faith community involvement in health programming.<sup>26,27</sup> This article adds to the growing evidence base about the importance of FBO and religious leader engagement in FP.<sup>6,10,12</sup> This project, designed to strengthen advocacy for FP by religious leaders with support from faith-based health organizations in Kenya and Zambia resulted in increased public awareness about FP and advocacy wins in both countries, even though the approaches taken in the 2 countries differed somewhat. At the same time, some aspects of implementation unfolded in unanticipated positive ways, highlighting the importance of flexibility and adaptive learning.

Several lessons learned can be drawn from this work about engaging religious leaders as advocates for FP, including: (1) religious leaders and faith-based health organizations can be strong and trusted advocates for FP; (2) internal advocacy through attention to terminology around FP and

developing church positions and getting church leadership support for external advocacy is vital; (3) training in FP advocacy that includes biblical support is important for religious leaders; and (4) faith leaders need support for their modest expenses in conducting advocacy.

### Religious Leaders and FBOs Can Be Strong and Trusted FP Advocates

This article has shown that religious leaders in both countries are committed to advocating to public officials about FP and to talking about FP with communities, provided that their teachings and beliefs on FP are respected. Religious leaders are natural advocates for health issues, given their position of caring for their congregations and their connections within communities. They are respected by public officials and within communities, giving credence to their advocacy. In addition to promoting external advocacy agendas (e.g., stronger policies/more finances), religious leaders are also dedicated to promoting the health and welfare of communities and supporting FBO health facilities in service delivery.

Although attributing advocacy results to a specific initiative is challenging, the project saw shifts in the attitude and policy decisions of the MOHs in both countries that were linked with advocacy by religious leader advocates and the involvement of CHAK and CHAZ in working groups.

**This project resulted in increased public awareness about FP and advocacy wins in both countries.**

By grounding the advocacy in local institutions and through local religious leaders, in addition to quick advocacy wins, the project will have a long-term effect as the religious leaders continue to talk about FP to their congregations and within their communities. Engaging the religious leaders in Kenya in addressing the increase in teen pregnancy during the COVID-19 pandemic is an example of this longer-term effect.

### The Importance of Internal Advocacy Before Attempting External Advocacy

The project revealed that religious leaders need to secure approval from their broader denomination/elders before participating in public advocacy. The project facilitated developing church positions on FP and acceptable contraceptive methods. These church statements demonstrated to policy makers and the public that church bodies and denominations support FP and enabled CHAK and CHAZ, governments, and other organizations to engage more effectively with the Christian community in Kenya and Zambia.

Internal advocacy that includes sensitizing the church leaders and congregations about FP and why advocating for it is important for the church community cannot be rushed, and each church leader's processes need to be supported by technical experts and religious colleagues. It is critical to respect and work within church leaders' and FBOs' existing hierarchy and systems of protocol to achieve long-term sustainability of advocacy.

### Advocacy Training That Includes Biblical Support for FP Is Important for Religious Leaders

The religious leaders benefited from advocacy training that included technical information on FP and Biblical support for FP. The training covered the choice of methods, respected the policies of various communities, and emphasized the importance of complete and correct information, choice of methods, and voluntarism. According to an unpublished internal report, one religious leader described the training:

*If it was not for the training I had, I could not be able to talk on the radio and give information on FP and advocate for these important services, I now know that it is my responsibility to talk about FP and support it. I know I can do much more when I go back to my community.* —Religious leader, Murang'a County, Kenya

CCIH, CHAK, and CHAZ found that while there were training materials available for

advocacy, advocacy on FP with religious leaders required much more relationship building and close attention to terminology. The partners published a manual documenting this integrated training approach to advocacy to help guide other faith organizations in the practical step-by-step activities that were documented from their experiences.<sup>28</sup>

### Religious Leaders Need Support for Advocacy

Religious leaders have many responsibilities and demands for their time, so to ensure consistency and sustainability of religious leaders' involvement, it is reasonable that they should be facilitated to participate in health advocacy activities that are supplemental to the primary role for which the church pays them. These costs would be modest given the potential continued positive advocacy impact. Costs range from transport allowances, boarding and lodging, per diem, and phone airtime, among others. Without some support and facilitation, it is unrealistic to expect religious leaders and unfunded FBOs to implement effective advocacy initiatives that would take away from their other daily responsibilities, given limited time and resources and competing priorities.

### Addressing Negative Feedback

Although the religious leaders were mostly welcomed by the public officials they sought to advocate to, in some cases they received negative feedback. In one of the counties in Kenya, for example, religious leaders received some pushback on their advocacy around county spending on health funds from the national government. Although this information should be available to the public, the county officials indicated that the religious leaders were acting as though they were "private investigators." The religious leaders explained that, as faith leaders, they care about their communities and simply want to make sure money is allocated to support healthy families. Confidence built by the training also helped religious leaders address pushback from public officials.

### CONCLUSION

Most African Christian leaders and groups support modern methods of voluntary FP to achieve healthy timing and spacing of pregnancy and the ultimate goal of ensuring healthier mothers, children, and communities. They may have differences in terms of acceptable FP methods, and

**CCIH, CHAK, and CHAZ found that advocacy on FP with religious leaders required much more relationship building and close attention to terminology.**

these differences must be respected. Religious leaders, with support from FBOs, can be strong and trusted advocates for FP. This project saw transformation among faith leaders in terms of their views on FP and their work to promote it. Policy changes and wider awareness in support of FP resulted from advocacy by religious leaders and FBOs. Collaborations of FBOs with national governments and partners indicate the value of faith actors' voices internally within countries to all partners and externally to global partners. These strong partnerships with governments to enhance outcomes, efficiency, and sustainability provide evidence that advocacy through FBOs makes an important contribution to common goals.

Although this project was modest in size, it demonstrated the vast potential for religious leaders to influence policy and funding for FP and other health interventions, especially ones that involve common values in support of family health and well-being. A larger number of religious leaders, equipped with evidence-based messages consistent with their religious beliefs, who are supported by their denomination leadership and faith-based technical counterparts, and given resources to cover their costs, could have an enormous and sustainable influence on local and national health policy.

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# The COVID-19 Pandemic Exposes Another Commercial Determinant of Health: The Global Firearm Industry

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## Key Messages

- Firearms have a large impact on the health of individuals and societies globally, with a disproportionate burden on low- and middle-income countries (LMICs).
- The firearms industry uses strategies to promote the sale and use of their products that are detrimental to health and therefore should be viewed through a commercial determinants of health lens.
- Coupled with the heightened risks during the COVID-19 pandemic, the threat to health posed by the firearms industry necessitates public health research, intervention, and collaboration.
- Public health practitioners and policy makers should increase efforts to reduce the burden of firearm violence.
- Public health researchers should use a commercial determinants of health lens when investigating health risks caused by firearms.
- When discussing solutions to firearm violence, public health practitioners and policy makers should include perspectives from LMICs and vulnerable groups.

## INTRODUCTION

As a global public health community, we are constantly confronting new attacks on our health and safety. Public health officials have been forced to reassess how to address, research, and fight threats to our health in the face of a changing environment. One of these persisting threats is firearm violence. Firearms contribute to more than 250,000 recorded deaths each year worldwide and 230 per 100,000 years of life lost; these numbers suffer from potentially serious underreporting.<sup>1</sup> Unfortunately, low- and middle-income countries (LMICs) suffer a disproportionate burden of firearm violence. Research has

shown that 83% of all violence-related deaths occur in LMICs.<sup>2</sup> Moreover, in the United States, 90% of the burden of firearm violence falls on civilian populations, as compared to the 10% concentrated in armed conflict situations, and the societal costs of firearm violence have reached more than \$150 billion annually.<sup>1</sup> As a private industry, gun producers and distributors play a major role in the growing availability of guns and, in turn, the severity of firearm violence in the U.S. and globally. We discuss some of these problems here and issue a call to action for the public health, medical, and social communities.

## PRIVATE INDUSTRY'S ROLE IN FIREARM VIOLENCE

Commercial determinants of health are defined as<sup>3</sup>:

*strategies and approaches used by the private sector to promote products and choices that are detrimental to health.*

Private-sector industries, such as alcohol, tobacco, food, beverages, pharmaceuticals, and automobiles, frequently rely on marketing, lobbying, corporate responsibility strategies, and extensive supply chains to direct focus away from the diseases that stem from their industries.<sup>3</sup>

The firearms market is no different. In 2017, more than 1 billion firearms were in circulation globally, 85% of which were in civilian hands.<sup>4</sup> Of those, roughly 46% or 393 million were in 1 country—the United States—where the staggering number of guns now exceeds the population. For decades, the firearm industry has worked to minimize the truth about firearm violence through marketing and lobbying, similar to tactics used by the alcohol and tobacco industries.<sup>5</sup> As a result, public health advocates have worked hard to expose the true impact of firearms on health and society.

The influential role of the private firearm industry on public perspectives holds true in LMICs. Brazil—the sixth leading country in firearm deaths per 100,000 people—is the second-largest producer of weapons in the western hemisphere. Increases in Brazil's domestically produced weapons have correlated with increases in firearm violence.<sup>6,7</sup> Despite these trends, the firearm

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industry in Brazil argues that the increase in violence is due to “imported” small arms to influence policy decisions and continues with their local production.<sup>7</sup> As the United States is also a large importer of weapons from Brazil, their extensive supply chains ensure that production and profits in Brazil remain high. Similarly, in Colombia, ongoing domestic conflicts have supported an increased production in small arms, as well as increased imports from the United States.<sup>8</sup>

Unfortunately, the firearms industry is uniquely protected by governmental policies in some countries. For example, the United States firearm industry uses the Second Amendment, a law that protects the right of people to keep and bear arms, as a rallying cry for weakening federal firearm regulations and attacking state regulations. Policies like the Gun Control Act of 1968 and its subsequent amendments aim to reduce the harmful effects of firearms by regulating interstate commerce, requiring background checks on purchasers, and prohibiting certain categories of individuals from purchasing firearms such as minors, mentally ill individuals, and individuals with a criminal record. However, firearm advocacy groups help pave the way for loopholes to circumvent these restrictions. For instance, advocacy groups, such as the National Rifle Association (NRA), have pushed for the inclusion of the “gun show loophole” which exempts private sellers from requiring background checks for purchasers.<sup>9</sup> The NRA is at the forefront of protecting the firearm industry and one of the most successful advocacy groups. While they claim to promote hunter safety and offer training to members of law enforcement, for the past 30 years a vast majority of their \$250 million budget was reportedly used toward limiting gun legislation regardless of the societal impact.<sup>10</sup> In the past 20 years, of all legislation introduced federally in the United States, only 1 passed into law despite support for gun regulation from the majority of Americans.

Research also suggests that competition within the firearms market has made weapons more lethal over the years.<sup>11</sup> Increases in foreign imports globally have encouraged manufacturers to make higher-performing weapons, and standardization has allowed most models of small arms to fire any type of ammunition. In some cases, the industry has even increased the lethality of weapons for state-employed small arms production.<sup>11</sup> We are now living in a society where more people have access to more deadly technology with little training or societal accountability.

It is for these reasons that using a commercial determinants of health lens benefits public health

efforts to address and control firearms. We propose that it is important to analyze the firearms industry from a commercial determinants of health perspective to help reduce the burden of firearm violence globally.<sup>12</sup>

## ■ COVID-19 PANDEMIC AND FIREARM VIOLENCE

The COVID-19 pandemic has exasperated many societal issues, firearm violence included. At the onset of the pandemic in March 2020, 1.9 million guns were sold in the United States, marking the second-largest month of sales in history; trailing only the month following the Sandy Hook Elementary School shooting and President Obama’s re-election in 2012.<sup>13</sup> According to the U.S. Federal Bureau of Investigation, nationwide background checks for individuals purchasing firearms in March 2020 were up by 41% from the same time last year.<sup>13</sup> Exports of firearms to LMICs have also surged during the pandemic. U.S. manufacturers exported more than US\$90 million worth of firearms to LMICs—most notably India and Thailand—within the first 5 months of the pandemic in 2020, equal to almost 3 times the number from March to July of 2019.<sup>14</sup>

With the subsequent “stay at home” orders in many countries and unprecedented access to such industries online, the COVID-19 pandemic is an increasingly dangerous time for victims of gun injuries including domestic violence. The United States saw a large spike in reports of domestic violence since the onset of the pandemic, and many domestic violence victims are forced to stay in these high-risk domestic situations with little to no support due to lockdown measures.<sup>13</sup> These increases in gun purchases pose a further threat to victims of domestic violence in the United States and globally. For example, in Bangladesh, more than 50% of women who were already experiencing domestic violence reported increases following lockdowns; while in India, lockdowns led to a 131% increase in domestic violence complaints, with higher rates in areas with stricter measures than those with the least strict measures.<sup>15,16</sup>

At the same time, people have been forced to deal with increased stresses from the pandemic. Access to mental health services has decreased due to office closures, and studies have shown that 47% of individuals reported experiencing negative mental health effects due to isolation measures, job loss, and worries regarding themselves or a high-risk loved one contracting COVID-19.<sup>13</sup> The risk of suicide is known to be highest in the first 6 weeks after a person purchases a gun, creating an entirely new

**Exports of firearms to LMICs have surged during the pandemic. U.S. manufacturers exported more than US\$90 million worth of firearms to LMICs.**

**TABLE.** Initial List of Recommendations for Addressing Firearms as a Commercial Determinant of Health

Element of Commercial Determinant of Health	Relevance to Firearm Industry	Recommended Action or Policy
Lobbying	Influencing gun control and gun safety policies	Laws requiring universal background checks and permit-to-purchase laws Global health organizations (e.g., United Nations-World Health Organization) promoting international conventions
Marketing	Targeted marketing to vulnerable groups such as women and the young	Laws restricting marketing and advertising to vulnerable groups Research on optimal pathways for affected groups to impact policy change
Corporate Social Responsibility	Emphasis on safety education, training, responsible firearms ownership programs, shifting focus away from commercial sales <sup>18</sup>	Research assessing the negative effects of corporate social responsibility, policies defining corporate social responsibility strategies and implementing regulations Research exposing how corporate social responsibility is used by industry to its benefit
Extensive Supply Chains	Large export markets to low- and middle-income countries	Regulating trade and enhancing international export control rules around products harmful to health Research on the role of intermediary companies on gun access

burden on people buying firearms and facing stay-at-home orders and stresses related to the pandemic.<sup>13</sup>

### ■ ADDRESSING THE FIREARM VIOLENCE PANDEMIC

During the COVID-19 pandemic, it is important that the field of public health increases efforts to reduce the burden of firearm violence. The commercial determinants of health framework plays a useful role in such an effort by focusing on the industry, flow of arms, and tactics used by distributors, not just users. By further studying this issue, addressing concepts of ownership, industry specifics, concentration, and leverage within the global gun market, we will be able to better understand which aspects of the commercial market have the largest impact on health risks caused by firearms.<sup>17</sup>

To do so, we need a multidisciplinary effort within a commercial determinants of health framework that is inclusive of direct and indirect health outcomes, understanding the political economy of guns and international equity issues (Table). Considerable work has been done over the past 3 decades to document the impact of firearms on health, the economy, marginalized populations, and rates of violence. However, there is a need to further study associated markets, industry tactics globally, and lobbying efforts that increase the potency of firearms as a negative public health issue around the world. The firearm industry and its supporters (industry groups, lobbyists, and paid research groups) especially need to be the focus of global health research, including a study of their transnational practices and marketing

strategies. We recommend that future research on firearms uses the proposed framework to address the commercial determinants of health within firearm violence.

To address this epidemic, it is also critical to bring perspectives from LMICs together with countries like the United States and to include populations most affected by firearms, such as those in poverty, women, youth, and minorities. Finally, it is important to bring the best science to bear on this global perspective to enable evidence-based advocacy for national and international audiences and to change mindsets. Using the commercial determinants of health framework will require such perspectives, and by doing so, the field of public health can play its part in reducing the burden of firearm violence worldwide.

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# Galvanizing Collective Action to Accelerate Reductions in Maternal and Newborn Mortality and Prevention of Stillbirths

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## Key Messages

- Historically, global efforts to accelerate progress toward achieving health and well-being for women and children have appeared separate, despite the inextricable links among maternal, perinatal, and newborn health outcomes.
- Accelerating progress demands that the maternal and newborn health (MNH) community more rapidly and effectively share learning, new evidence, and program experiences.
- A new global initiative, AlignMNH, will establish a country-driven, multidirectional knowledge hub and series of convenings to promote purposeful knowledge sharing and problem solving and align on priorities for action. These efforts are intended to facilitate increased application of evidence and regular review of progress ultimately contributing to improved MNH and prevention of stillbirths.

## ENSURING MATERNAL AND NEWBORN HEALTH REMAINS A PRIORITY

Every day, there are an estimated 810 maternal and 7,000 newborn deaths, and more than 5,000 stillbirths, most of which are preventable.<sup>1-3</sup> While progress has been made in reducing maternal and neonatal morbidity and mortality and preventing stillbirths worldwide, inequities and gaps in quality of care persist<sup>4</sup> and are disproportionately most dire in countries affected by conflict.<sup>5</sup> In 2020, the coronavirus disease (COVID-19) pandemic and response exposed multiple system vulnerabilities, exacerbated inequities to accessing care, and caused widespread disruption in reproductive, maternal, newborn, and child health services.<sup>6,7</sup> Emerging evidence and modeling estimates of the indirect effects of the COVID-19 pandemic on maternal and newborn mortality in low- and middle-income countries (LMICs) reflect a sobering picture of what could lay ahead, with additional deaths estimated to be in the tens of thousands for mothers and hundreds of thousands for stillbirths and children aged under 5 years.<sup>3, 8-10</sup> A dedicated, focused effort must be made to ensure maternal and newborn health (MNH) and prevention of stillbirths remain a priority.

The world is at a critical inflection point, with less than 10 years remaining to achieve the Sustainable Development Goals (SDGs). MNH risks getting lost amidst multiple competing health priorities as countries transition through different stages of the pandemic response. Several additional risks exist in the near term: human resource constraints, inclusive of midwives;<sup>11</sup> increased migration of skilled health workers from rural to urban areas and from low- and middle-income to high-income countries; lack of fiscal space leading to increased financial barriers, such as user fees; and the immiseration of populations leading to increased gender oppression and disadvantage. These are just a few examples of risks that must be mitigated to ensure sustained improvements in MNH.

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Future progress also requires acknowledging and addressing unequal power structures in the field of global health,<sup>12</sup> in large part a legacy of colonialism, which have been identified as substantial barriers to the success of country-level MNH implementation agendas for the fulfillment of human rights and the provision of comprehensive, high-quality care.<sup>13,14</sup> The global MNH community must align on priorities to address inequities fueled by lack of just representation of citizens' voices and country needs and professional hierarchies. Resources must be directed to recover previous gains and to accelerate progress toward equitable, accessible, high-quality care for all women and newborns. Addressing these multiple challenges and sustaining progress will not be achieved within the MNH community alone and will require alliances with other communities both globally and nationally.<sup>15,16</sup>

Historically, global efforts to accelerate progress toward achieving health and well-being for all women and children have appeared separate, despite the inextricable links among maternal, perinatal, and newborn health outcomes. For maternal health, the Safe Motherhood Call to Action in 1987 signaled the need to focus on reducing maternal mortality, highlighting the disproportional burden of mortality in LMICs.<sup>17</sup> In 2000, the establishment of a Millennium Development Goal (MDG) specific to maternal mortality kept a spotlight on the need to invest in the health of women. The MDGs did not explicitly include newborn mortality and stillbirths. To put a focus on these deaths, the World Health Assembly endorsed the

Every Newborn Action Plan (ENAP) in 2014. ENAP set goals for ending preventable newborn mortality and stillbirths with coverage targets, strategic objectives, and milestones to 2020.<sup>18</sup> In 2015, the World Health Organization (WHO) released *Strategies Toward Ending Preventable Maternal Mortality* (EPMM), which outlined global targets and strategies for reducing maternal mortality under the SDGs.<sup>19</sup> The EPMM working group subsequently released a comprehensive monitoring framework to track progress toward achievement of EPMM targets and priorities.<sup>20</sup> This work has outlined a way forward amidst the backdrop of changing trends in population demographics and global disease burden.

## ■ ADDRESSING THE NEED FOR A COLLABORATIVE, INTEGRATED APPROACH

To address the perceived and actual divides between MNH communities,<sup>21</sup> a group of over 50 experts convened in September 2014 to identify specific strategies to improve quality of care and increase collaboration.<sup>22</sup> Recommended actions focused on data and measurement, commodities, advocacy, human resources, standards for care, technical support, and funding to better integrate maternal and newborn care at multiple levels: service delivery, national policy and programs, and among donors and partners. In 2015, as the world was transitioning from the MDGs with separate goals for mothers and children to the SDGs with a focus on universal health coverage, equity, and integration, more than

### Box 1. Roadmap for Maternal and Newborn Health in the Post-2015 Era: 10 Critical Actions (Mexico City)<sup>23</sup>

1. Countries where political leadership acts on strong scientific evidence and the public demands better maternal newborn survival make progress. Governments and societies of countries lagging behind are morally obliged to embrace and implement an active and evidence-based maternal newborn health (MNH) agenda and continuously monitor its progress.
2. Global and national health communities must integrate strategies, services, and funding streams to avoid unnecessary and harmful silos. MNH offers a proven platform to strengthen the entire health system.
3. Weak national health care systems fail too many individuals; reaching the most vulnerable, including adolescents, is an urgent priority.
4. Efforts to improve maternal newborn survival should include attention to maternal morbidities, stillbirths, and child development outcomes; they are essential proxies for inequality and poor quality care.
5. Increasing the investment in better quality MNH services is a fundamental response to health and rights imperatives.
6. Care with dignity does not cost any more. At any resource level, a provider has the opportunity and the obligation to treat clients with compassion and respect.
7. Universal access to integrated sexual and reproductive health care, including contraception, is essential to ensure MNH.
8. It is time to address the gap in measurement, information, and accountability. In order to assess progress in the next 15 years, countries and the global community need to address these complex challenges now.
9. Sharing good news in human development is not a risk but an opportunity to build stronger health programs. This is the time to acknowledge important gains made as strategies are created to implement the SDGs.
10. Supporting all providers, including midwives, to address MNH is imperative to realize the ambitious post-2015 agenda.

**There is still much work to do to support MNH integration within the health system particularly at the community and primary facility levels, where services are often provided by a single nurse or midwife.**

**Accelerating progress demands that the MNH community more rapidly and effectively share learning, new evidence, and program experiences.**

1,000 delegates from over 75 countries came together in Mexico City to reflect on emerging evidence and learning from country experiences to forge a way forward to improve MNH.<sup>23</sup> Ten critical actions were outlined as part of a roadmap in the post-2015 era (Box 1). Five years on, collective action to build on these discussions has been inadequate to drive sufficient progress.

Notable efforts have been made toward integrated approaches, namely, the ENAP and EPMM joint metrics agenda, a joint call to action in 2015,<sup>24</sup> and the release of WHO's *Standards for Improving Quality of Maternal and Newborn Care in Health Facilities*.<sup>25</sup> Despite these efforts, there is still much work to do to support MNH integration within the health system particularly at the community and primary facility levels, where services are often provided by a single nurse or midwife. Also, the path toward universal health coverage requires bringing primary health care closer to people and including people as active decision makers in their own health. These requirements demand that the health system contribute to creating an environment that is safe and supportive for self-care.<sup>26</sup>

Unprecedented opportunities to drive and chart progress now exist. Updated ENAP global, national, and subnational coverage targets and milestones to 2025 were released in September 2020<sup>27</sup> and EPMM is finalizing a complementary process to establish coverage and milestones for maternal health.<sup>28</sup> The burden of stillbirths is also now receiving increased attention having previously been largely absent on the global stage.<sup>29,30</sup> Stillbirth estimates released in October 2020 provide an important reference to maintain visible and urgent attention on the need for accelerated progress.<sup>3</sup> We must be vigilant, however, as

improvements in effective coverage of interventions do not necessarily reflect who is being left behind.<sup>4,31</sup>

Financing must support accelerated progress. Considering the multiple categories of SDG financing, both public and private domestic and international funds, multiple paths must be explored to address the finance gaps.<sup>32</sup> Uncoordinated approaches to funding and limited ability to track resources are potential barriers to more rapid acceleration of achievements in MNH. In recent years, some evidence has suggested that fragmentation, volatility, and transaction costs associated with donor funding have limited the impact of development assistance on health outcomes and sustainability of progress in LMICs,<sup>33</sup> while other research has not shown any clear relationship between donor proliferation or fragmentation in health sector aid and measures of health service delivery or health outcomes.<sup>34</sup> The Global Financing Facility (GFF), launched in 2015, was created in an effort to ensure prioritization and financing of health and nutrition for women, children, and adolescents, and provides an opportunity to align domestic and international investments for reproductive, maternal, newborn, child, and adolescent health in several high-burden countries. Increasing linkages between the GFF and country-led processes to monitor progress toward the SDGs may be one path toward better coordination and increased impact of financing and programs, particularly in the setting of narrowing fiscal space for MNH and the damage brought on by the pandemic.

Accelerating progress demands that the MNH community more rapidly and effectively share learning, new evidence, and program experiences. Progress must be tracked, opportunities and gaps must be identified and addressed, and networks

## Box 2. AlignMNH Initiative

**Goal:** Contribute to accelerated reductions of maternal and newborn mortality and prevention of stillbirths to achieve Sustainable Development Goal era targets and contribute to improved health and well-being in low- and middle-income countries.

**Hypothesis:** Establishing a country-driven, multidirectional platform to convene the maternal and newborn health (MNH) community in a regular and predictable manner will promote purposeful knowledge sharing, problem solving, and debate—grounded in the realities of women's lived experiences—and will facilitate increased application of MNH evidence, data, and metrics, fueling coordinated action, financing, tracking of progress, and mutual accountability, ultimately contributing to increased effective coverage of MNH care.

**Tactics:** Guided by a global steering committee with majority representation of thought leaders based in low- and middle-income countries:

- Convene stakeholders through a regular and predictable conference series focused on country priorities and needs
- Establish a multidirectional, dynamic knowledge hub driven by country priorities and needs
- Engage selected countries to ensure the knowledge hub and conference series are shaped by country priorities and needs and contribute to accelerating progress toward improved maternal, perinatal, and newborn health and well-being



to drive and sustain gains must be nurtured. No country is alone in its challenges. Stakeholders in countries must have access to information in ways that are relevant, timely, and actionable. As highlighted in this journal,<sup>21</sup> focusing on “context-driven, content-focused,” evidence-based solutions is critical to understanding under what conditions something works—and if an approach could be both effective and implementable at scale in another setting. The human rights principles of participation, equality, and nondiscrimination require that priorities are informed by the real, lived experiences of women, and that health systems structures, research methods, and donor funding support this imperative. Within the MNH field, the formal recognition of experience of care as an essential element of quality of care; the burgeoning research, advocacy, and action on respectful care; and the efforts to introduce social accountability mechanisms into health systems are all steps in this direction.<sup>35,36</sup> But true transformation to people-centered systems—for both service delivery and policy making—will require concerted, multivalent action and continuing vigilance.

## ■ FOSTERING MORE COHESIVE EFFORTS TO IMPROVE MNH

To address the need for more cohesion around MNH and prevention of stillbirths, we are committing to a new global initiative, AlignMNH (Box 2). Building on existing assets in the MNH community, AlignMNH will support a predictable cadence of bi-annual international MNH conferences, creating space for stakeholders to review successes, debate the limitations of current strategies, and identify how to address priority issues, questions, and bottlenecks. Complementing the conference series will be a dynamic multidirectional knowledge hub to facilitate a more continuous, virtual dissemination and exchange of evidence and learning to contribute to driving informed action. We openly acknowledge the limitations of online platforms in terms of equitable access to information and advocacy and are committed to better understanding and learning ways to make inclusion in dialogue more equitable and content more reflective of a diversity of experience across countries and stakeholders. AlignMNH will also engage countries to ensure the knowledge hub and conference series are shaped by country priorities and meet their needs to plan, course correct, and drive action powered by data.

AlignMNH provides an opportunity for multi-directional, dynamic sharing, but its successes will

be defined by countries’ access to actionable learning and new evidence, the development of equitable platforms and partnerships, and a focus on priorities relevant to countries. We recognize that we have much to learn to create effective spaces for solution-focused, action-oriented discussion and engaging experts and influencers outside of established, mainstream MNH communities. Sustained progress will only be possible with deliberate consideration and attention to underlying and social determinants of health and navigating complex adaptive systems, which must contribute to realizing the right of everyone to enjoy the highest attainable standard of physical and mental health. Maintaining a sense of urgency and momentum and continuing to be vigilant amidst these considerations will be a challenge, but without collective action, we risk not achieving the SDGs. Whatever strategies are pursued, they will only be possible with the active engagement of multiple stakeholders and concomitant commitments to universal health care access along the way.

We invite you to join us in this movement as we prepare to host a virtual Opening Forum of the AlignMNH Collective on April 20–21, 2021, and a bi-annual International Maternal and Newborn Health Conference in subsequent years with focused convening and discussions along the way. These events, along with the establishment of a related knowledge hub, will help set the stage for a decade of continued learning and collective action to drive progress for maternal, perinatal, and newborn health and well-being. Visit [www.alignmnh.org](http://www.alignmnh.org) to learn more.

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ORIGINAL ARTICLE

# A Mixed-Methods Study of Factors Influencing Access to and Use of Micronutrient Powders in Rwanda

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## Key Findings

- In Rutsiro district, the unavailability of multiple micronutrients powder (MNP) was mentioned as a major barrier to accessing it. Factors that appeared to limit the use of MNP included perceived side effects and the perceptions that MNP is designed for undernourished children, coupled with inappropriate child feeding practices, particularly feeding thin/watery complementary foods.
- Mothers of older children (aged 12–23 months) had about 4 times higher odds of using MNP than mothers of younger children (aged 6–11 months), while mothers whose children participated in the supplementary food program had about 3 times higher odds of using MNP than mothers whose children have never participated in the program. Food insecurity, as indicated by increasing household hunger score, was significantly associated with reduced odds of using MNP.

## Key Implications

MNP program implementers should:

- Ensure uninterrupted MNP supply and make MNP available to mothers while enhancing their understanding of the health benefits of MNP.
- Address gaps in complementary feeding practices by emphasizing timely introduction of diverse complementary foods of adequate consistency and supporting mothers' access to adequate complementary foods.

➔ *Résumé en français à la fin de l'article.*

## ABSTRACT

The World Health Organization recommends point-of-use fortification with multiple micronutrients powder (MNP) for foods consumed by children aged 6–23 months in populations where anemia prevalence among children under 2 years or under 5 years of age is 20% or higher. In Rwanda, anemia affects 37% of children under 5 years. The MNP program was implemented to address anemia, but research on factors affecting the implementation of the MNP program is limited. We conducted a mixed-methods study to examine the factors influencing access to and use of MNP among mothers (N=379) in Rutsiro district, northwest Rwanda. Inductive content analysis was used for qualitative data. Logistic regression analysis was used to determine factors associated with the use of MNP. Qualitative results indicated that the unavailability of MNP supplies and distribution issues were major barriers to accessing MNP. Factors influencing the use of MNP included mothers' perceptions of side effects and health benefits of MNP, as well as inappropriate complementary feeding practices. Mothers of older children (aged 12–23 months) were more likely to use MNP than those of younger children (aged 6–11 months) (adjusted odds ratio [aOR]=3.63,  $P<.001$ ). Mothers whose children participated in the supplementary food program were nearly 3 times more likely to use MNP than those whose children had never participated in the program (aOR=2.84,  $P=.001$ ). Increasing household hunger score was significantly associated with lower odds of using MNP (aOR=0.80,  $P=.038$ ). Mechanisms to monitor MNP supply and program implementation need to be strengthened to ensure mothers have access to the product. MNP program implementers should address gaps in complementary feeding practices and ensure mothers have access to adequate complementary foods.

## INTRODUCTION

Inadequate intake of micronutrients is recognized as one of the most important contributors to the global burden of diseases.<sup>1</sup> An estimated 2 million children worldwide die (19% of total child deaths) each year due to insufficient intake of micronutrients, mainly iron, vitamin A, and zinc.<sup>1</sup> Iron deficiency is the most common micronutrient deficiency worldwide,<sup>2</sup> and it has numerous functional consequences on child health, including impaired physical growth and poor neurocognitive development.<sup>3,4</sup>

In Rwanda, the prevalence of anemia among children under 5 years of age declined significantly from 52% in 2005 to 38% in 2010,<sup>5</sup> but the most recent

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Demographic and Health Survey (DHS) found that 37% of children under 5 years of age had anemia in 2019–2020.<sup>6</sup> The same survey showed that children aged 6–23 months were the most affected. For example, anemia affects 70% of children aged 6–8 months and 64% of those aged 9–11 months.<sup>6</sup> Although other factors, such as parasite infections, may contribute to the high rates of anemia, evidence suggests that iron deficiency, resulting from inadequate dietary iron intake and/or low bioavailability and increased needs for iron during child growth, is a major cause.<sup>7</sup> As in many other low- and middle-income countries, Rwandan children consume predominantly plant-based diets, which contain low bioavailable iron.<sup>8</sup> A recent study conducted in Rwanda found that >60% of children aged 6–23 months do not meet their requirements for iron and other minerals such as calcium and zinc due to low nutrient density for these micronutrients in complementary foods.<sup>9</sup> The consumption of iron-rich foods, such as animal-source foods, and commercial fortified infant foods is low among children aged 6–23 months (20% and 2%, respectively).<sup>5</sup> As a consequence, it's difficult for young children to meet their requirements for iron and other micronutrients during the critical development stages.<sup>10</sup>

The Rwandan food and nutrition policy<sup>11</sup> recognizes the severity of anemia among Rwandan children and has proposed several solutions, including dietary diversity promotion, food fortification, point-of-use fortification with micronutrient powders, use of biofortified crops (e.g., high-iron beans), and deworming.<sup>11</sup> The Rwandan government also implements a supplementary food program that aims to address undernutrition in the child's first 1,000 days of life. The program provides fortified complementary blended porridge flour (locally known as *Shisha Kibondo*) to pregnant and lactating mothers as well as young children aged 6–23 months from the most vulnerable households.<sup>12</sup> Moreover, in 2011, the government of Rwanda, with support from the United Nations Children's Fund (UNICEF), introduced a point-of-use fortification program using multiple micronutrient powder (MNP) as a measure to improve the nutritional quality of complementary foods consumed by children aged 6–23 months and to prevent micronutrient deficiencies among these children.<sup>13</sup>

The point-of-use fortification of complementary foods with iron-containing MNP is recommended when anemia prevalence among young children is 20% or more.<sup>14</sup> Studies conducted in many countries, including Rwanda, with high burden of anemia demonstrated efficacy of MNP in reducing the prevalence of anemia and iron deficiency among children aged 6–24 months.<sup>15,16</sup> While MNP interventions have been shown to be

efficacious in many studies, they are often conducted in controlled trials using resources that are not usually available during a national implementation or scale-up.<sup>17</sup> In some settings, MNP programs have thus been ineffective due, in part, to factors that may affect actual implementation.<sup>18,19</sup> For example, a study in Uganda<sup>19</sup> found that mothers cooked foods with soda ash to reduce cooking time. The authors argued that the ash might have negatively influenced the bioavailability and absorption of micronutrients, making the MNP program ineffective. In addition, contextual factors such as beliefs, resource constraints, and so forth can have an influence on the coverage and utilization of nutrition programs targeting infants and young children.<sup>20</sup> A review<sup>21</sup> of 11 studies on coverage of nutrition programs in 5 countries, including MNP programs, reported significant variability in message coverage (i.e., whether respondents have ever heard of the product), contact coverage (i.e., whether the product has ever been fed to the child), or effective coverage (i.e., whether the product has been utilized as per the pre-established program recommended frequency and quantity) due to different real-world delivery/implementation conditions in which the programs were implemented. The review concluded that achieving impact at scale of such programs requires a better understanding of the factors affecting coverage and utilization.<sup>21</sup> The need for research to understand the factors influencing MNP program implementation in a variety of contexts has been recognized.<sup>22,23</sup>

The purpose of the present study was to examine the factors influencing access to and use of MNP among mothers in Rwanda. In the context of the current study, the MNP program is of interest because the prevalence of anemia has barely changed between 2010 and 2020 in a group of children aged 6–23 months with the highest anemia prevalence,<sup>6,11</sup> despite the MNP program being introduced in Rwanda in 2011, adopted by the 2013 national food and nutrition strategic action plan to address anemia in children aged 6–23 months,<sup>11</sup> and scaled up in all 30 districts of Rwanda in 2017.<sup>13</sup>

## METHODS

This study was conducted in Rutsiro district, northwest Rwanda, approximately 140 km from the capital city, Kigali. The district has the highest prevalence of child stunting (54%) among children under 5 years.<sup>24</sup> The majority (~98%) of the district's population is rural, and agriculture on small plots of land is the main livelihood.<sup>25</sup>

**The purpose of the present study was to examine the factors influencing access to and use of MNP among mothers in Rwanda.**

**The point-of-use fortification of complementary foods with iron-containing MNP is recommended when anemia prevalence among young children is 20% or more.**

**Every caregiver with a child aged 6–23 months is entitled to 30 sachets of MNP per month, which they receive free of charge.**

The main subsistence crops are maize, beans, banana plantain, cassava, and sweet and Irish potatoes. The health system in the district consists of 1 hospital and 17 health centers.<sup>26</sup> Each health center oversees community health workers (CHWs) who provide community-based nutrition and other health services to an average of 23,000 inhabitants living within the health center's catchment area.<sup>27</sup>

The services provided by CHWs include distribution of MNP, locally known as *Ongera*, to caregivers with children aged 6–23 months. In Rwanda, the Ministry of Health or UNICEF deliver MNP to district hospitals, which then distribute MNP supplies to health centers. MNP is then distributed by the health centers to CHWs, who in turn distribute MNP to caregivers during monthly child growth monitoring and promotion activities. Some nongovernmental organizations, mainly World Vision International (Rwanda) and Caritas Rwanda, support the MNP program implementation through training of CHWs and awareness activities related to child feeding. Every caregiver with a child aged 6–23 months is entitled to 30 sachets of MNP per month, which they receive free of charge. Using cooking demonstrations, CHWs also counsel caregivers on optimal complementary feeding practices, such as age-specific dietary diversity, consistency and quantity of complementary foods, and on MNP usage.<sup>8,13</sup>

### Study Design and Participants

This study used a cross-sectional convergent mixed-methods design,<sup>28</sup> combining both quantitative and qualitative data. The data used in this study were collected as part of a survey conducted between September 2018 and January 2019 to investigate the factors associated with nutritional status of children aged 6–23 months. Details on the survey sample size estimation and participants recruitment are described elsewhere.<sup>29</sup> Briefly, the district was first divided into 3 zones based on main roads connecting the district to its neighboring districts. In each zone, 3 health centers were purposely selected to maximize geographic distribution, for a total of 9 health centers. Within each of the selected health center's catchment area, 2 villages were randomly selected. In these villages, monthly growth monitoring lists were obtained from CHWs and used to compile a sampling frame from which participants were randomly selected. Mothers who refused to participate and those who were not found in their homes were replaced (11 mothers in total) by

selecting the next name on the list. Eligibility criteria were (1) having a child aged 6–23 months; (2) child was apparently healthy (i.e., no overt signs of illness); and (3) being in the 2 lowest socioeconomic categories. Of the 400 survey participants, 21 (5%) of the children were excluded from the analysis due to premature birth (i.e., before 37 weeks of gestation) or low birthweight (i.e., less than 2.5 kg). The remaining 379 participants formed the basis of the present study.

### Data Collection

Quantitative and qualitative data were collected concurrently using a survey questionnaire. The questionnaire was developed in English, translated into Kinyarwanda, and programmed into a handheld tablet (Samsung Galaxy Tab 8.0 T295, Korea). It was pretested, and data were collected through face-to-face interviews. Qualitative data were audio-recorded.

### Ethics

This study was approved by the Massey University Human Ethics Committee (reference: SOA 17/67) and the Institutional Review Board of the University of Rwanda's College of Medicine and Health Sciences (reference: 003/CMHS IRB/2017). Permission to collect data was also obtained from the Rutsiro District Public Health Office. Oral informed consent was obtained from all participants.

### Quantitative Data Outcome Variable

"Ever using MNP" was the primary outcome variable. Mothers were asked if they added (yes/no) MNP to the target child's foods in the last 7 days prior to the survey. Mothers who had not used MNP were asked whether they had ever used MNP before (yes/no). A mother was categorized as "ever used MNP" if she had used MNP in the previous 7 days or before, and those who had not used MNP either within 7 days prior to the survey or before were categorized as "never used MNP."

### Other Variables

Information related to participants' demographics, socioeconomic, household food security, and indicators of health system engagement were obtained through mothers' recall. Health cards were used for verification (e.g., child age and health information). Demographic information reported by mothers included the child's age and sex and the maternal age at first birth. Mothers

also reported presence of symptoms of child diarrhea (defined as  $\geq 3$  watery or loose stools per day) and upper respiratory infections (runny nose, coughing, or wheezing) in the previous 4 weeks. Socio-economic variables included maternal education level (coded as none/incomplete primary education, complete primary education, secondary education) and household asset ownership (e.g., radio, land, domestic animals, housing characteristics). Fourteen household assets were used to create a household wealth index using principal component analysis.<sup>30</sup> The first component was taken to represent the household wealth index and divided into terciles (lower, middle, and upper). A household hunger score—a proxy of a household's ability to access food—was measured using a validated cross-cultural household hunger scale (HHS).<sup>31</sup> Adhering to HHS measurement guide, mothers were asked 3 questions intended to capture 3 situations (i.e., lack of food of any kind in the house; going to sleep hungry because there was not enough food; and going a whole day and night without eating) reflecting a household's experience of insufficiency of food supply and intake and physical consequences. Each question was followed by the frequency-of-occurrence question (i.e., how often the reported situation was experienced). The responses were coded and used to generate a household hunger score that ranged from 0 (indicating no hunger) to 6 (indicating severe hunger). Indicators of health system engagement are (1) attendance at growth monitoring site in the previous month (coded as yes/no); (2) the number of antenatal care visits when pregnant with the study child (coded as  $< 4$  visits or  $\geq 4$  visits; a minimum of 4 visits is recommended in Rwanda<sup>5</sup>); and (3) whether the child ever participated in the supplementary food program (coded as yes/no).

### Qualitative Data

The questionnaire included an open-ended question that was used to collect in-depth information on the reasons for not using MNP. Mothers who had not used MNP in the previous 7 days (i.e., those who used MNP but not in the previous 7 days, and those who never used MNP) were asked to provide reasons for not using MNP. Probes (either open-ended or specific to the mothers' comments) were used to obtain additional information.<sup>32</sup>

### Data Analysis

#### Quantitative Data

Median (interquartile range [IQR]) values were determined for continuous data and percentages

for categorical data. Bivariate and multiple logistic regression analyses were performed to examine factors associated with using MNP. The full model adjusted for the presence of diarrhea and respiratory infection in the past 4 weeks. We adjusted for these variables because our previous research in the same population showed that child illness has negative effects on how mothers feed their children, including withholding or restricting some foods from children's diets.<sup>33</sup> Unadjusted and adjusted odds ratios (OR) and 95% confidence intervals (CI) were computed. Variables with a  $P$  value of  $< .05$  were considered significant predictors. We did not perform a Bonferroni correction because, although the correction decreases the probability for type I error, such adjustment is vulnerable to type II error and can obscure important findings.<sup>34,35</sup> All statistical analyses were performed using SPSS version 25.0 (IBM Corp., Armonk, NY).

#### Qualitative Data

Mothers' responses were audio-recorded, transcribed verbatim in Kinyarwanda, and translated into English. Content analysis<sup>36</sup> was used to analyze the data. An inductive content analysis approach, which is recommended when there is no prior research or little is known about the studied phenomenon, was used. The data analysis had 3 phases: preparation, organization, and reporting.<sup>37</sup> The first phase consisted of careful reading of the data several times to become immersed in and familiar with the data. In the organization phase, each transcript was read carefully by the first author, highlighting the text (words or phrases) that appeared to describe the phenomenon under study (i.e., access to and/or use of MNP). The highlighted texts were openly and manually coded by giving each text a descriptive code. The second author read the data to confirm the descriptive codes. These codes were revised, and the codes that emerged from the revision were jointly reviewed before integrating them into the analysis. Final codes were examined, compared, and grouped into categories that represented similar meaning.<sup>38</sup> The first, second, and last authors reviewed, discussed, and agreed on the final code categories. In the final phase of analysis, SPSS (version 25) was used to quantify the frequency of major categories and subcategories.<sup>39</sup> To interpret and report the findings, examples of original textual responses representing specific code or category are presented.

**A household hunger score—a proxy of a household's ability to access food—was measured using a validated cross-cultural household hunger scale.**

## RESULTS

### Quantitative Results

Characteristics of the participants (N=379) are presented in Table 1. The median (IQR) age of children was 15 (11–19) months, whereas the median (IQR) age of mothers at first birth was 22 (20–24) years. More than a half (59%) of the mothers had either no education or did not complete primary education, and only 35% of the mothers had ≥4 antenatal care visits during their last pregnancy. The median (IQR) household size was 4 (3–6) members.

The majority of the mothers (64%) reported ever adding MNP to their children's food, but only 38% added it to their children's food in the previous 7 days (Table 2). The proportion of mothers using MNP to feed their children was significantly lower among mothers with children aged 6–11 months than among those with children aged 12–23 months (39% vs. 76%,  $P<.001$ ) (results not shown).

Table 3 shows that mothers of older children (aged 12–23 months) had about 4 times higher odds of using MNP than those of younger children (aged 6–11 months) (aOR=3.63,  $P<.001$ ). Similarly, mothers whose children ever participated in the supplementary food program had about 3 times higher odds of using MNP than the mothers whose children have never participated in the program (aOR=2.84,  $P<.001$ ). Conversely, as the household hunger score increases by 1 unit, the odds of using MNP decreased significantly by about 20% (aOR=0.80,  $P=.038$ ). Even though attendance to growth monitoring in the last month was a significant predictor of the use of MNP, this variable was not significant in the adjusted model (the multivariable model adjusted for the presence of diarrhea and respiratory infections in the past 4 weeks).

### Qualitative Results

Factors influencing access to and use of MNP are summarized into 9 categories. Below we present results for 6 major categories. A summary of these 6 categories, as well as other 3 minor categories are presented in a Supplement.

#### Limited Availability of MNP Supplies

A frequently reported barrier to accessing MNP was the lack of supplies. Many mothers (n=72) reported getting information from CHWs that there was no MNP stock at their health centers. For example, one mother said:

*I don't have Ongera (MNP) now. We get it from health workers but this month they said they don't have Ongera in the stock at the health center. They told us to come on 13th of November when we take children for growth monitoring.*

#### CHWs–Mother Interactions

Most mothers reported receiving MNP from CHWs through monthly growth monitoring activities while others reported occasionally receiving MNP from health centers (e.g., when mothers took children there for immunization). However, information received from CHWs in the study area indicated that, if mothers ran out of MNP prior to the next distribution date, the mothers were encouraged to contact CHWs and acquire more MNP sachets, if available. However, some mothers (n=33) said that they preferred to wait for routine distribution of MNP, which they felt was the responsibility of CHWs:

*I don't have Ongera [MNP]. We used all the sachets that we had received at the village kitchen. I am waiting for our CHW to distribute Ongera. I don't go to her house to ask for Ongera because they [CHWs] are supposed to distribute. Many times, we were told: wait, wait. So, I prefer to wait, and if I don't have Ongera, it's their fault.*

The narratives also suggested that interactions between mothers and CHWs may be limited, by nonattendance to growth monitoring sites due to competing obligations (n=6), such as the need to work for income to meet family needs. One mother said:

*I received Ongera once; we used them up all. It's been a while without attending growth monitoring session. Most of the days for growth monitoring are days that I am working. Working is most important. It's how we get money to survive.*

#### Limited Information

Some mothers (n=16) explicitly said that they did not know about MNP. A few mothers reported having heard about but not seen MNP (n=4); others mentioned that they were unaware of the distribution schedules or eligibility criteria (n=6). One mother said:

*I have never received Ongera. I think there are some children who are eligible . . . may be those that can feed themselves . . . , and others who are not eligible.*

#### Perceived Side Effects

Some mothers (n=19) reported that they stopped using MNP to feed their children because of side

**The majority of the mothers (64%) reported ever adding MNP to their children's food, but only 38% used it in the previous 7 days.**

**Some mothers reported that they stopped using MNP to feed their children because it caused side effects or made food unpalatable.**

**A frequently reported barrier to accessing MNP was the lack of supplies.**



effects experienced by their children after consumption of MNP. Diarrhea was the most frequently reported side effect experienced, while other side effects included vomiting and fever. While most mothers who reported side effects spoke from their own children’s experiences, a few mothers decided not to use MNP because of the comments by other mothers in their community about the negative side effects of MNP:

*I received Ongera this month when he just turned 9 months. I fed him Ongera, like 3 times, and then he started having diarrhea. So, I stopped adding it to his foods.*

*I received 30 sachets of Ongera last month. I just kept them. I heard from other mothers that Ongera causes diarrhea, so I never fed it to my child.*

Several mothers (n=20) also linked MNP with changes in taste of food, stating that their children disliked foods that were prepared with MNP. One mother said:

*We have used all the sachets [of Ongera] that we received this month. But even when it was still available, he did not really like the foods when it was mixed with Ongera. I used to give him and skipped some days.*

### Incompatibility Between MNP Program Recommendations and Current Child-Feeding Practices

Several mothers (n=33), especially those with younger children (aged 6–8 months), reported never using MNP due to reasons related to feeding practices. For example, many of these mothers (n=27) said that their “child had just started eating” complementary foods or that the “child was still adapting to complementary foods.” Others (n=6) mentioned that they had not yet introduced complementary foods to the child:

*I obtained Ongera a week ago, but I have not yet started giving it to my child. She is not yet ready for all foods. She is only 7 months. We give her things like a spoon of porridge or soft Irish potatoes. I mash them with my fingers. We don’t add Ongera in the porridge. We add sugar, not Ongera.*

### MNP Was Perceived as Intended for Malnourished Children

Some mothers (n=11) perceived that MNP is intended for malnourished children, and children

**TABLE 1.** Sociodemographic and Nutritional Characteristics of Participants (N=379) in a Study on Access to and Use of MNP in Rutsiro District, Rwanda, September 2018–January 2019

Characteristic	
Child age, months, median (IQR)	15 (11–19)
Child age group, No. (%)	
6–11 months	120 (32)
12–23 months	259 (68)
Sex, No. (%)	
Male	184 (49)
Female	195 (51)
Child had diarrhea (past 4 weeks), No. (%)	179 (47)
Child had respiratory infection (past 4 weeks), No. (%)	297 (78)
Child ever participated in the supplementary food program, No. (%)	283 (75)
Mother’s age at first birth, years, median (IQR)	22 (20–24)
Mother’s education level, <sup>a</sup> No. (%)	
Illiterate/incomplete primary	219 (59)
Completed primary	88 (24)
Some secondary	62 (17)
No. of antenatal care visits attended, No. (%)	
1–3	248 (65)
≥4	131 (35)
Mother attended child growth monitoring site (past month), No. (%)	318 (84)
Household hunger score, median, (IQR)	1 (1–2)
Household size, median (IQR)	4 (3–6)
Wealth index terciles, No. (%)	
Lower	126 (33)
Middle	126 (33)
Upper	127 (34)

Abbreviations: IQR, interquartile range; MNP, multiple micronutrients powder.  
<sup>a</sup>Owing to missing data, n=369.

who appeared healthy did not require MNP. When asked to justify their judgment regarding the healthiness of their children, the mothers explained that their child was visually not sick or did not show any signs of malnutrition. Physical appearance, weight loss, and hair discoloration were the most common signs used to describe healthiness of the children:

*I know I can get Ongera from our village health worker. I don’t have them now because I never asked. These [Ongera] are intended for malnourished children. My child has no health issues. He is healthy.*

**Some mothers perceived that MNP is intended for malnourished children, and children who appeared healthy did not require MNP.**

**TABLE 2.** Proportion of Mothers Who Used/Did Not Use MNP to Feed Their Children (N=379), by Age Group, in Rutsiro District, Rwanda, September 2018–January 2019

Age Group, Months	No.	Used MNP in the Past 7 Days, No. (%)	Used MNP but Not in the Past 7 Days, No. (%)	Ever Used MNP, <sup>a</sup> No. (%)	Never Used MNP, No. (%)
6–8	57	10 (17)	2 (4)	12 (21)	45 (79)
9–11	63	22 (35)	13 (21)	35 (56)	28 (44)
12–23	259	113 (44)	83 (32)	196 (76)	63 (24)
Total	379	145 (38)	98 (26)	243 (64)	136 (36)

Abbreviation: MNP, multiple micronutrients powder.

<sup>a</sup> Sum of “used MNP in the past 7 days” and “used MNP but not in the past 7 days.”

*I don't have Ongera [MNP]. I have never fed him Ongera. Ongera are given to children who have bwaki (local term used to denote acute malnutrition). You don't know bwaki? It is when your child has golden hair and swollen tummy.*

## DISCUSSION

Limited information is available on the factors influencing access to and use of MNP in Rwanda. In the present study, we found that the proportion of mothers who added MNP to their children’s foods in the previous 7 days was low (38%), especially those with younger children aged 6–11 months. This proportion increased to 64% when considering all mothers who reported ever having added MNP to their children’s foods. In a small-scale survey of 186 caregivers recruited from 19 of Rwanda’s 30 districts that implemented MNP program (n=10 caregivers in each district), McLean et al.<sup>13</sup> reported 87% coverage (defined as the proportion of caregivers receiving a box of MNP in the previous 3 months). It is worth mentioning that our study found that some mothers who received MNP still did not feed it to their children, so while receiving MNP is sometimes used as an indicator of program coverage, whether the child is consuming MNP according to the program recommended quantity and frequency, and not simply receiving it, may be a better indicator of program success.<sup>21</sup> No consensus exists on a cutoff value for satisfactory MNP program coverage; however, one suggestion is that effective MNP program performance should be appraised as satisfactory when >70% of target children are found (at the time of study) to be consuming MNP.<sup>40</sup> Although estimating actual coverage was beyond the scope of this study, our results suggest that the MNP program coverage in Rutsiro district is generally low. Further research to assess

MNP coverage in Rwanda using appropriate frameworks is recommended. For example, Tanahashi’s framework<sup>41</sup> has been widely used to assess health service or intervention coverage and to identify implementation bottlenecks. This framework defines different stages of coverage, including availability, accessibility, acceptability, contact, and effectiveness. Availability coverage refers to the availability of resources (e.g., drugs, health workers, health facilities) that determine the extent to which an intervention can be made available to the target population. Accessibility coverage is the proportion of the target population for whom an intervention is accessible. Acceptability coverage is the number of people who are willing to use an accessible intervention (they must find it acceptable in terms of, for example, cost, waiting time, beliefs). Contact coverage is the number of people who have been in contact with an intervention and have used it. Effectiveness coverage is the proportion of the target population in need of an intervention that receives an effective intervention.<sup>41</sup>

In this study, a majority of mothers mentioned lack of MNP supplies as the major issue limiting their access to MNP. Limited availability of MNP supplies has been identified in this study, as in others, as a major constraint to access to MNP in many countries.<sup>42,43</sup> In Rwanda, lack of supplies and inadequate distribution of MNP were also reported as key obstacles limiting MNP program coverage.<sup>13</sup> These findings highlight the need to ensure uninterrupted MNP supply to increase coverage of the MNP program. However, even when MNP is available, there are factors related to MNP distribution arrangements that need to be considered. For example, while mothers were encouraged to pick up MNP sachets from their village CHWs, our data indicated that the mothers’ expectation was to obtain MNP through routine

**Limited availability of MNP supplies has been identified in this study, as well as others, as a major constraint to access to MNP.**

**TABLE 3.** Factors Associated With the Use of MNP in Rutsiro District, Rwanda, September 2018–January 2019<sup>a</sup>

Variables	COR (95% CI)	P-Value	aOR (95% CI)	P-Value
Child age group		<.001		<.001
6–11 months	1		1	
12–23 months	4.83 (3.04, 7.68)		3.63 (2.14, 6.16)	
Child sex		.52		.53
Female	1		1	
Male	0.87 (0.57, 1.33)		0.86 (0.53, 1.39)	
Maternal age at first birth	1.03 (0.96, 1.09)	.41	1.01 (0.94, 1.09)	.82
Maternal education level		.32		.44
None/incomplete primary education	1		1	
Complete primary education	1.12 (0.67, 1.88)		1.01 (0.56, 1.83)	
Some secondary education	1.62 (.87–3.01)		1.57 (0.77, 3.19)	
ANC visits		.82		.60
<4 visits	1		1	
≥4 visits	0.95 (0.61, 1.47)		0.87 (0.53, 1.45)	
Mother attended GM (past month)		.01		.43
No	1		1	
Yes	2.10 (1.21, 3.45)		1.31 (0.68, 2.53)	
Child ever participated in the supplementary food program		<.001		.001
No	1		1	
Yes	4.54 (2.78, 7.41)		2.84 (1.57, 5.13)	
Household hunger score	0.89 (0.76, 1.05)	.18	0.80 (0.65, 0.99)	.038
Household wealth index		.77		.26
Lowest tertile	1		1	
Middle tertile	1.20 (0.71, 2.00)		0.83 (0.45, 1.56)	
Upper tertile	1.01 (0.61, 1.69)		0.59 (0.31, 1.13)	

Abbreviations: ANC, antenatal care; aOR, adjusted odds ratio; CI, confidence interval; COR, crude odds ratio; GM, growth monitoring; MNP, multiple micronutrients powder.

<sup>a</sup>The multivariable model was adjusted for the presence of child diarrhea and respiratory infection in the previous 4 weeks.

distribution; however, some narratives suggested there may be opportunity costs associated with attending the distribution sites. This finding implies that the health system must ensure that mothers obtain MNP at no extra time cost. Also, instead of a monthly MNP supply, it may be useful to provide mothers with quantities that are sufficient for several months. If the aim is for mothers to actively seek out MNP, it is essential that they understand its health benefits.

Consistent with other studies,<sup>17,42,44,45</sup> qualitative results from the present study showed that perceived side effects (e.g., diarrhea, vomiting)

and change in taste of foods mixed with MNP were among barriers to using MNP. It has been suggested that possible changes to foods due to addition of MNP and the potential negative side effects of MNP should be acknowledged and clearly communicated to caregivers before children start getting MNP.<sup>23</sup> Moreover, our results revealed that some mothers hold the belief that MNP is mainly for undernourished children. According to these mothers, giving MNP to their (perceived) healthy children was unnecessary. It is important to highlight that micronutrient deficiencies (also known as hidden hunger) such as

**The belief among mothers that children do not need MNP because they lack overt symptoms of ill health or undernutrition requires further attention.**

anemia often have no visible or immediate signs and can coexist with other forms of undernutrition such as stunting, which is also not easily recognized.<sup>46,47</sup> Therefore, the belief among mothers that children do not need MNP because they lack overt symptoms of ill health or undernutrition requires further attention because it presents important challenges for mothers, health professionals, as well as for MNP program implementers. On one hand, such beliefs may undermine the demand for and use of MNP among mothers. On the other hand, the beliefs may make it difficult for the health professionals and MNP program implementers to raise awareness among mothers about MNP. Research shows that belief is a key determinant of maternal health care seeking behavior.<sup>48</sup> For example, a study conducted in Kenya found that parents who considered MNP as a drug were reluctant to use it in the absence of explicit child illness.<sup>49</sup> These findings point to the need for appropriate health messages to ensure mothers understand the health benefits and need for MNP intervention. More specifically, clear and straightforward messages such as “children can still suffer from micronutrient deficiencies even when they are visually healthy” must be used. However, simple words that are adapted to the setting and mothers’ level of education should be used to describe micronutrient deficiencies for a better understanding. It has been suggested that, unless there is some perceived need, individuals may not use an intervention, even if it is free.<sup>50</sup>

**Our findings also showed that access to food is a predictor of using MNP.**

MNP programs are designed such that children should start receiving MNP as soon as they are aged 6 months old. In the current study, we found that mothers of younger children were less likely to use MNP than mothers of older children. Similar findings have been reported in Nepal,<sup>51</sup> where MNP program coverage was lower among younger children (aged 6–11 months) than among older children (aged ≥12 months). In Mongolia, it was also reported that parents delayed feeding MNP to their children until an average age of 13 months.<sup>52</sup> The authors of these 2 studies did not elucidate the factors responsible for the delay in feeding MNP to young children. Qualitative results from the present study suggested that the delay in receiving MNP by younger children was due, in part, to the current complementary feeding practices. For example, our data indicated that half of the mothers with children aged 6–8 months reported that they had never used MNP, either because their child “was still adapting to complementary foods” or because the child “had not been introduced to complementary foods.” Previous studies conducted in

Rwanda showed that children were introduced to complementary foods later than recommended (i.e., aged 8 months),<sup>13</sup> and that dilute cereal porridges were the main food given to young children who were aged 2–8 months.<sup>53</sup> A recent study<sup>33</sup> conducted in the same population also found that thin porridges and stews/soups were the most common foods given to young children, and that the consistency of these foods hindered the use of MNP. In addition, MNP must be mixed with thick solid or semisolid complementary foods because it dissolves in liquids, which may change the taste or color of the foods, leading to less acceptance by children.<sup>54</sup> However, the recommendation to mix MNP with thick/solid or semisolid foods that are introduced to children at a later stage is likely to delay the introduction of MNP to younger children. Therefore, rather than discouraging mothers from using MNP with porridges or other soft foods, an alternative approach is to teach mothers how to improve the consistency of these foods by using local ingredients such as ground nut or bean flours. Once an improved porridge/stew is accepted and feasibility to use it as a vehicle for MNP explored, it could facilitate the mothers feeding MNP to children using a culturally accepted and age-appropriate food vehicle. A similar approach has been found to be successful in Mali.<sup>55</sup>

Our findings also showed that access to food is a predictor of using MNP. We found that the odds of using MNP reduced significantly with increasing household hunger score. Although not necessarily a direct cause, this may be a marker of other factors related to poverty that may play a causal role in access or use of MNP. Another study in Niger found that mothers were unable to give MNP to their children simply because they lacked foods to mix with MNP.<sup>56</sup> Results from the present study also showed that being a beneficiary of the supplementary food program (*Shisha Kibondo*) was associated with higher odds of using MNP. However, it is worth noting that the supplementary food program distributes a fortified cereal-based flour used to prepare porridge, which is not recommended for mixing with MNP. Thus, the influence of the supplementary food program on the use of MNP needs further exploration. Nevertheless, Rutsiro remains the most food insecure district in Rwanda, with 62% of households consuming an inadequate diet in 2018.<sup>24</sup> In the context of such a widespread food insecurity, mothers’ ability to appropriately use MNP may be limited. Therefore, addressing anemia through the MNP program will require, in addition to ensuring availability of and appropriate use of MNP,

improvements in the household access to adequate foods.

## Strengths and Limitations

The strength of the current study is the integration of both quantitative and qualitative approaches. Limitations of this study include a cross-sectional design, which only demonstrates association and not causal relationships. Another important limitation is that the study looked at a program performance in terms of ever-use and use within the past 7 days. In addition, the study focused on 1 district, and the sample was drawn from purposefully selected health centers. Thus, the findings may not be generalizable to the studied district or to other districts. Moreover, our qualitative findings are based on mothers' perspectives, but it would be important to understand the perspectives of other key informants such as CHWs and health center managers on how to improve uptake and use of MNP. This line of investigation could potentially provide additional insights into other context-specific factors that may also inform the MNP program implementation.

## CONCLUSIONS

Findings from the current study point to several issues that need to be addressed to improve the MNP program implementation in Rwanda. The findings suggest the need for more robust supply-chain management to gauge the continuity of MNP supply and availability at the community level. However, even if MNP supply issues are addressed, it remains crucial to address gaps in complementary feeding practices, including inappropriate consistency of complementary foods and maternal perceptions about young children's developmental ability to consume a variety of foods, while enhancing mothers' access to foods. In order to increase the demand and use of MNP, the program implementers must also ensure that mothers have a clear understanding of the health benefits of MNP. Lastly, future research should examine the effect of other factors, including the quality of information and the frequency of interactions between CHWs and mothers on MNP program implementation.

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## En français

### Une étude par méthodes mixtes des facteurs qui influencent l'accès et l'utilisation des poudres de micronutriments au Rwanda.

**MESSAGE CLÉ:** Les lacunes dans les pratiques d'alimentation complémentaire entravent l'utilisation des poudres de micronutriments multiples (PMN) dans le district de Rutsiro au Rwanda. La réussite de la mise en œuvre du programme de PMN nécessite une disponibilité et une accessibilité ininterrompues du produit, ainsi qu'une meilleure compréhension des avantages du PMN pour la santé.

### RÉSUMÉN

L'Organisation Mondiale de la Santé recommande l'enrichissement de l'alimentation à domicile (enrichissement sur le point d'utilisation) à l'aide des poudres de micronutriments multiples (PMN) pour les aliments consommés par les enfants âgés de 6 à 23 mois dans les populations où la prévalence de l'anémie chez les enfants de moins de 2 ans ou 5 ans est de 20% ou plus. Au Rwanda, l'anémie touche 37% des enfants de moins de 5 ans et le programme de PMN a été mis en œuvre pour lutter contre l'anémie. Cependant, la recherche sur les facteurs qui affectent la mise en œuvre du programme de PMN est limitée. Nous avons mené une étude par méthodes mixtes pour examiner les facteurs qui influencent l'accès des mères (n=379) à la PMN et son utilisation dans le district de Rutsiro, au nord-ouest du Rwanda. L'analyse du contenu inductif a été utilisée pour les données qualitatives. Pour déterminer les facteurs associés à l'utilisation des PMN, une régression logistique a été utilisée. Les résultats qualitatifs ont indiqué que l'indisponibilité des approvisionnements en PMN et les problèmes de distribution constituaient des obstacles majeurs à l'accès à la PMN. Les facteurs qui influencent l'utilisation des PMN comprenaient les perceptions, chez les mères, des effets secondaires et des avantages des PMN pour la santé, ainsi que des pratiques d'alimentation complémentaire inappropriées. Les mères d'enfants plus âgés (12 à 23 mois) étaient plus susceptibles d'utiliser la PMN que celles d'enfants plus jeunes (6 à 11 mois) (odds ratio ajusté [ORA]=3,63, P<0,001). Les mères des enfants qui avaient participé au programme d'alimentation complémentaire étaient près de 3 fois plus susceptibles d'utiliser la PMN que celles des enfants qui n'avaient jamais participé au programme (ORA=2,84, P=0,001). L'augmentation du score de faim dans les ménages était significativement associée à des chances plus faibles d'utiliser la PMN (ORA=0,80, P=0,038). Les mécanismes de suivi de l'approvisionnement en PMN et de la mise en œuvre du programme doivent être renforcés pour s'assurer que les mères ont accès au produit. Les responsables de la mise en œuvre du programme de PMN devraient combler les lacunes au niveau des pratiques d'alimentation complémentaire et veiller à ce que les mères aient accès à des aliments complémentaires adéquats.

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ORIGINAL ARTICLE

# STEPS: A Solution for Ensuring Standards of TB Care for Patients Reaching Private Hospitals in India

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## Key Findings

- The STEPS (System for TB Elimination in Private Sector) model demonstrated that a “patient-centric” strategy where private hospitals follow up their patients with TB for clinical actions and public health actions is feasible.
- STEPS successfully addressed the gaps in the quality of care for patients seeking care in the private sector and ensured that services are aligned with the standards of TB care.
- STEPS model helped the state government in establishing a good surveillance system for TB within private hospitals.

## Key Implications

- Policy makers may consider conceiving and implementing locally customized models based on the principles of STEPS for ensuring standards of care to TB patients seeking care from the private sector.
- Donor agencies and intermediaries may consider developing low-cost sustainable solutions for private-sector engagement like STEPS where public program management and the private sector have equal roles and accountability.

## ABSTRACT

**Background:** In India, the private sector diagnoses and treats more patients with TB than the public sector. Gaps in the TB care cascade were observed more among the patients diagnosed in the private sector.

**Concept:** The System for TB Elimination in Private Sector (STEPS) model evolved as a solution to address gaps in the quality of care for patients in the private sector by ensuring standards of TB care. STEPS has 3 components: a consortium of private hospitals, a coalition of all professional medical associations, and a STEPS center in each private hospital. STEPS centers act as a single window for notification, linkage for social welfare measures, contact investigation, chemoprophylaxis, direct benefit transfers, and treatment adherence support.

**Intervention:** STEPS was piloted in 14 districts in the state of Kerala. All 14 districts formed consortiums of private hospital management for policy support and a coalition of professional medical associations for advocacy with doctors. STEPS centers were established in 318 private hospitals.

**Results:** Notification to National TB Elimination Program from the private sector improved by 26% when compared to the previous year. Among the patients notified from the private sector, microbiologically confirmed cases increased by 81%, rifampicin resistance testing at baseline increased by 56%, and the percentage of those informed of their HIV status increased by 95%. The percentage of patients notified from the private sector with their treatment outcome reported improved from 39% (2018) to 99% (2019).

**Conclusion:** The STEPS model demonstrated that a low-cost locally customized private sector engagement model is feasible and is beneficial to society. STEPS could be one of the major solutions for supporting patients reaching the private sector.

## INTRODUCTION

India contributes to 26% of the global TB burden. With 27% of the drug-resistant TB burden, India has the largest number of drug-resistant TB patients in the world.<sup>1</sup> More than half of the TB patients in India seek care from the private sector.<sup>2</sup> Gaps in the TB care cascade include people with active TB not having access to correct and complete diagnosis, including diagnosis of drug resistance; people diagnosed with TB not being started on treatments; and people started on treatment not completing treatment, were observed more among patients who were diagnosed in the private sector compared to the public sector.<sup>3,4</sup> There were concerns about the

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suboptimal quality of care including incorrect diagnosis and treatment, lack of systems for treatment adherence support, and a high loss to follow-up rate that could increase the risk of drug resistance among the patients seeking care from the private sector in India.<sup>3,4</sup>

The *Standards for TB Care in India* (STCI) were developed as a way to engage both the public and private sectors for effective TB prevention and control.<sup>5</sup> STCI, which is a locally customized version of the *International Standards of Tuberculosis Care*, mentions 26 standards that every citizen should receive irrespective of the sector of treatment. Tools like STCI, national policy for mandatory TB notification, and NIKSHAY<sup>6</sup>—the case-based web-based management information system—were built to improve TB care services in the private sector in India. However, quality services as assured in the public sector, such as free diagnostics including rapid molecular tests and drug susceptibility, free drugs, treatment adherence support and monitoring, treatment location transfer, contact investigation, and TB preventive therapy, rarely reach patients who are treated in the private sector.

Conventionally, public health programs elaborate on private sector engagement and public-private partnerships. These partnership models were mostly business-centered like incentive-based and service-purchase models that were similar to a client-vendor relationship rather than an equal partnership between the public and private sectors. Many efforts have been launched to engage the private sector effectively for TB control in India.<sup>7,8</sup> Several models that have successfully increased private case notifications were difficult to expand due to lesser emphasis on creating lasting partnerships and huge short-term financial implications.<sup>9,10</sup>

We conceived a model for ensuring standards of TB care for patients accessing the private sector called STEPS, System for TB Elimination in Private Sector. This article describes the model, its pilot implementation in the state of Kerala, and early outcomes.

## ■ TB ELIMINATION STRATEGIES IN KERALA

With clear evidence of declining transmission of TB and lower rates of drug-resistant TB in Kerala, the Government of Kerala has declared its commitment to achieving the Sustainable Development Goals related to ending TB earlier than the rest of India.<sup>11</sup> The state has notified

72 TB cases per 100,000 in 2019: 57.3 in the public sector and 14.7 in the private sector.<sup>12</sup> The number of TB cases estimated to be outside the current surveillance system, estimated through TB drug sales surveillance, constituted approximately 10% of the existing TB notification.<sup>13</sup>

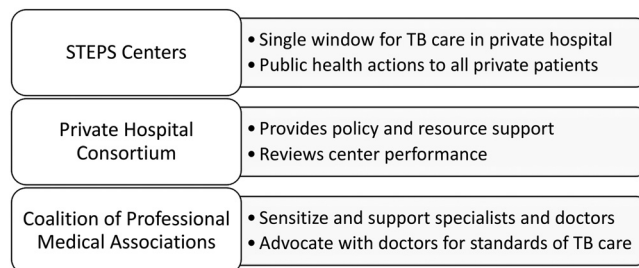
The private health care sector in Kerala accounts for more than 70% of all facilities and 60% of all inpatient beds. Most (90%) of TB notifications from the private sector used to come from the 446 private hospitals and the remaining 10% from general practitioners.

Many public-private strategies for TB control in India started in Kerala during the early years of implementation of the National TB Elimination Program (NTEP)—formerly the Revised National TB Program.<sup>14,15</sup> Through a Global Fund project, since 2005, the Indian Medical Association has conducted large-scale training of private doctors in Kerala using national technical and operational guidelines and later STCI guidelines.<sup>16</sup> Although this training was successful in increasing acceptance of NTEP among private practitioners, it often did not translate into large numbers of TB notification, directly observed treatment short-course (DOTS) regimen, or delivery of public health services to patients in the private sector. NTEP involvement with the private sector continued to be limited to the teaching institutions and hospitals that were managed by Indian Medical Association leaders and senior members. Even after NTEP implemented a daily anti-TB regimen—the absence of which was the major reason the private sector cited not participating—there was not much improvement in the private sector participation.<sup>17</sup> Operations research identified several important barriers to engagement of the private sector in NTEP: absence of mutual trust between the public and private sector, concerns over patient confidentiality and patient choices, apprehension of losing patients, lack of consideration for hospital management, lack of time for doctors to document, inability of the program to keep commitments and timely payments, poor recognition of the private sector, and bureaucratic hurdles.<sup>17</sup>

A recent study from Kerala of the prescribing pattern of practitioners reported that TB management in the private sector follows a reasonable standard of care in terms of treatment prescriptions.<sup>18</sup> A private tertiary care center in Kerala demonstrated that establishing a management system within the hospital ensured 100% TB notification with a 4-fold increase over 6 months.<sup>19</sup> Another study that followed up a cohort of TB

**Several models that have successfully increased private case notifications are difficult to expand due to lesser emphasis on creating lasting public-private partnerships and huge short-term financial implications.**

**FIGURE 1.** STEPS Model for Private Sector Engagement in Kerala, India



Abbreviation: STEPS, System for TB Elimination in Private Sector.

**STEPS centers act as a single “window” in private facilities to ensure that all presumptive TB patients and the diagnosed TB patients receive standards of care.**

patients treated in private facilities in Kerala reported a loss to follow-up of 21%.<sup>20</sup> Limited ability to monitor and promote treatment adherence remained a major challenge in the private sector. Although NTEP documents the treatment outcome of every patient diagnosed/enrolled for treatment, such documentation is rare in the private sector. Lack of a network of staff and providers in the private sector limits the ability to monitor and support adherence to standards of care.

There was a felt need from NTEP for innovative strategies to engage the private sector with limited resource implications and without compromising the efficiency of program management. STEPS evolved as a solution for ensuring standards of TB care in a patient-centric way for all patients accessing the private sector, addressing the concerns of the private sector. The Government of Kerala has included STEPS as 1 of the 10 key strategies in its “Kerala TB Elimination Mission” that aims to achieve Sustainable Development Goals related to TB.

### ■ STEPS INTERVENTION MODEL FOR TB ELIMINATION IN THE PRIVATE SECTOR

STEPS is envisioned as an equal partnership between the public and private sector for the benefit of society with TB elimination as the outcome. The primary objective of STEPS is to address gaps in the quality of care for patients in the private sector by ensuring standards of TB care in both sectors to all Kerala citizens in a patient-centric manner.

The STEPS strategy has 3 components (Figure 1): (1) establish STEPS Centers, (2) form a district consortium of private hospitals, and (3) form a

district coalition of professional medication associations.

#### 1. Establish STEPS Centers

Establishing STEPS centers at all private hospitals was the heart of STEPS. These centers act as a single “window” in private facilities to ensure that all presumptive TB patients and the diagnosed TB patients receive standards of care. The centers provide patient notification, linkage for public health actions including contact investigations, chemoprophylaxis to eligible households, offering HIV testing, domestic airborne infection control kits, direct benefit transfers and nutritional support, and treatment adherence support.

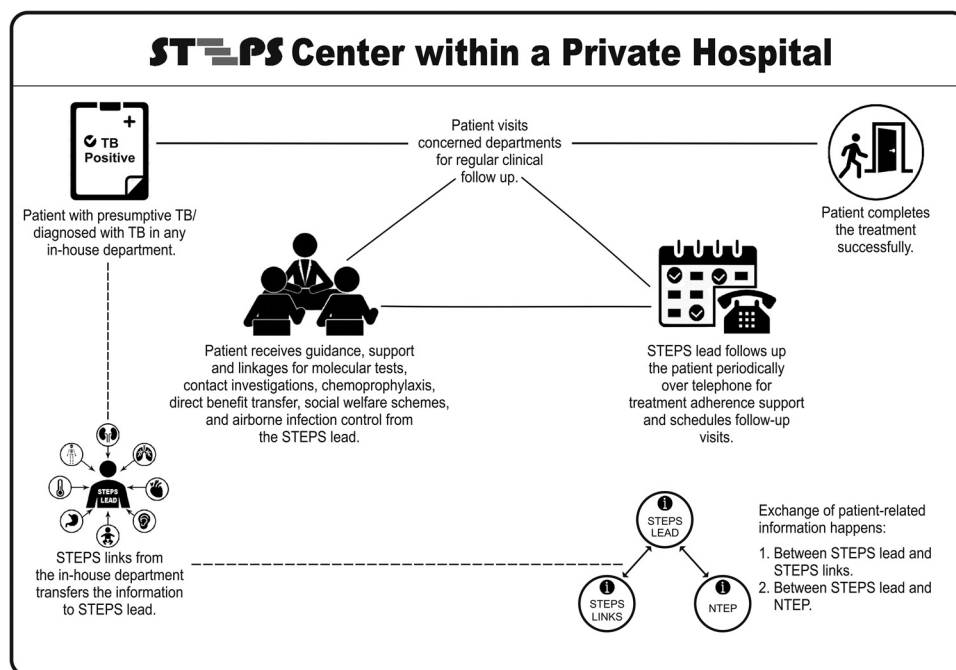
#### 2. Form a Private Hospital Consortium

In every district, a consortium of private hospital owners provides policy and resource support for STEPS centers and reviews the STEPS centers’ performance. Consortium members select one of the hospitals to serve as chair for a fixed term. The district program manager of NTP serves as member secretary. The consortium meets once in 3 months to review the performance of STEPS centers and suggest corrective actions if required.

#### 3. Create a Coalition of Professional Medical Associations

In all districts, a coalition of professional medical associations advocates with medical practitioners and sensitizes them on STCI and STEPS. The coalition is formed under the patronage of the Indian Medical Association. Other members of the coalition included associations of chest physicians, pediatricians, general physicians, geriatrics, family medicine, nephrologists, general surgeons, orthopedic surgeons, and radiologists. Coalition members

**FIGURE 2.** Schematic Representation of STEPS Center Within a Hospital



Abbreviation: STEPS, System for TB Elimination in Private Sector.

select a member from one of the associations to be coalition chair for a fixed term. The member secretary is the NTEP district program manager who provides all logistic and office support to the chair to organize the meetings, execute the decisions, and document. The coalition meets every 3 months to plan and review the activities as per the plan.

The process of establishing each STEPS component entailed the following steps:

- The NTEP district program manager, with the support of the Indian Medical Association, convened the meeting of all professional medical associations in the district to form the district coalition.
- The NTEP district program manager, with the support of the Indian Medical Association, convened the meeting of administrators of all private hospitals to form the district consortium. Every quarter, the consortium reviewed the STEPS centers' performance.
- The hospital administration established STEPS centers in the respective private hospitals and nominated individuals to serve as STEPS leads and STEPS links. The hospital

management reviewed STEPS center activity in the hospital.

- The NTEP district program manager trains the STEPS leads and STEPS links.
- The NTEP district program manager and the Indian Medical Association district coordinator train members of the district coalition who, in turn, trained the member-doctors of the respective professional organizations.

Figure 2 shows a schematic representation of how the STEPS center functioned inside a hospital. A central person (STEPS lead), who was nominated by the hospital management, worked together with contact persons (STEPS link) for each in-house department in a hub-and-spoke model. The STEPS lead and links were typically staff nurses. The entire process fosters customer loyalty (Box 1).

Based on the discussions with the hospital management, NTEP provided services customized to each hospital's demand. Figure 3 illustrates the STEPS centers' role in treating patients and tracking TB cases.

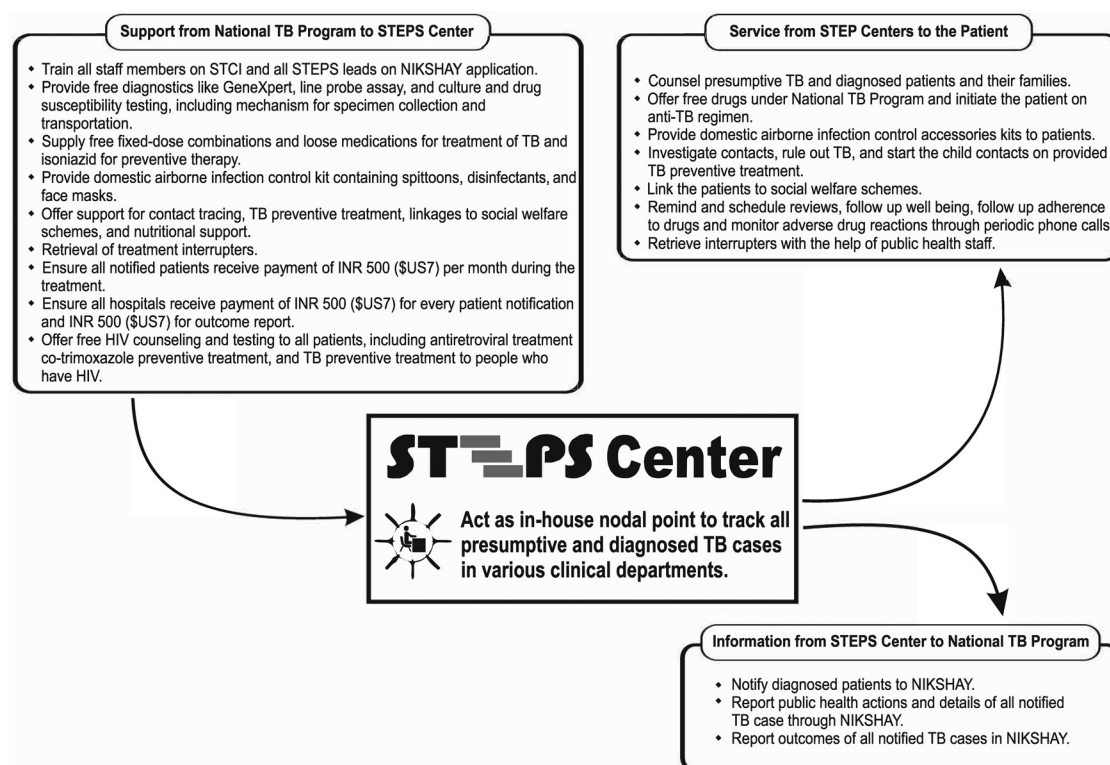
The NTEP field staff of the concerned area coordinated the NTEP services opted by the private

**The process of STEPS centers working within hospitals fostered customer loyalty.**

**BOX 1. Fostering Customer Loyalty with STEPS**

In business, after-sales service is any support provided to a customer after the product or service has already been purchased. Companies use after-sales support as a business strategy because it typically leads to higher customer satisfaction, brand loyalty, and even word-of-mouth marketing. Similarly, a STEPS center can be viewed as an “after-sales service model” based upon a self-initiated business promotion and customer loyalty blended with the social responsibility of the private sector.

**FIGURE 3. Relationship of STEPS Center with the National TB Elimination Program**



Abbreviation: STEPS, System for TB Elimination in Private Sector.

hospitals in their area. In districts where there was a high concentration of private hospitals, additional support in terms of rearrangement of work and redeployment were done by NTEP program managers based on the workload of field staff. From the state level, the nodal officer of Public-Private Mix (PPM) coordinated the supports offered by NTEP to the various STEPS centers.

The Joint Effort for TB Elimination (JEET) project is a patient-provider support agency trying to set up effective and sustainable structures to strengthen existing systems and seamlessly extend quality TB care to patients in the private sector in

India. Kerala State NTEP has customized the project and negotiated with project JEET to render the service of 1 PPM state lead and 5 city officers for 2 years to assist the NTEP district program managers in advocating with private hospital administration to start STEPS centers. They also supported the NTEP district program managers to get in touch with the professional organizations and coordinate training for STEPS leads and STEPS links. JEET staff assisted the state and district NTEP program managers in supportive supervision, reviews, capacity building, and documentation (Box 2).

**BOX 2. How Various Stakeholders Worked With the Private Sector to Establish STEPS**

**National TB Elimination Program (NTEP):** District program managers provided customized support to STEPS centers in private hospital based on their need through NTEP key staff. State program managers monitored, reviewed, and provided supportive supervision.

**Joint Effort for TB Elimination:** Rendered services of one public-private mix lead and 5 city officers for 2 years to assist NTEP program managers in establishing STEPS and act as interphase between NTEP and private sector.

**Indian Medical Association:** Coordinated specimen collection and transportation system from major private hospitals through a partnership scheme with NTEP, facilitated formation of coalition of professional organization in every district, and served as ambassadors for STEPS.

**World Health Organization NTEP Technical Support Network:** Developed the idea of STEPS, coordinated the process, and technically supported all stakeholders in establishing STEPS.

Through a memorandum of understanding, NTEP has partnered with Indian Medical Association and established a specimen collection and transportation system from the major private hospitals in the state to public GeneXpert sites.

**EARLY RESULTS**

STEPS was initiated in January 2019. Each of the 14 districts formed a private hospital consortium and a coalition of professional medical associations. Each coalition and consortium conducted a minimum of 2 meetings during 2019.

Of the 446 hospitals mapped, 318 established STEPS centers during 2019. The hospitals that reported the most TB patients were targeted at the beginning of the pilot for onboarding to STEPS. The remaining 128 hospitals established STEPS in 2020.

Since the STEPS model was piloted, TB patient notification to NTEP from the private sector in Kerala has increased by 26% in 2019 compared to 2018 from 3,981 cases to 5,003; 78% of these notifications were contributed by the STEPS centers.

The [Table](#) compares TB program indicators before (2018) and after (2019) implementing the STEPS model.

STEPS led to a shift from using private anti-TB drugs to NTEP-supplied drugs, leading to 2,000 additional cases being put on NTEP-supplied drugs. Overall, 70% of all cases notified from the private sector in 2019 were treated with NTEP-supplied drugs. Data officially collected by the state drug controller showed that sale of anti-TB drugs decreased from 1.6 million rifampicin units in 2018 to 0.5 million rifampicin units in 2019 after the establishment of the STEPS model.

**KEY CHALLENGES FACED DURING IMPLEMENTATION****Changing Attitudes**

The biggest challenge faced was changing the attitude of the public program managers and staff. Public program managers conventionally preferred to wear a “policing” cap and an “authoritarian” attitude as far as private sector engagement was concerned. Engaging the private sector has never been fully owned by the public sector. Private hospitals that do not follow NTEP were considered to be “enemies” of the program. Change management strategies were devised for changing these attitudes among public program managers. Rather than using technical concepts to change these attitudes, we promoted the idea that engaging the private sector will help the patient, who is ultimately the Government’s responsibility.

Convincing private hospital management to participate in the STEPS model was challenging. To change the private sector providers’ attitudes that their engagement meant pulling them toward the public program, we instead emphasized that the private sector would be enabled to ensure standards of care through sensitization, training, communication, and supportive supervision visits.

**Advocating for the STEPS Strategy**

When the STEPS strategy was clearly communicated to hospital management, they were willing to start STEPS centers at their hospitals. Encouraging social responsibility to fight a disease in a business model by fostering customer loyalty without much interference by external agencies was more than enough reason for the hospital management to join the “movement.” The leaders who started STEPS centers in their hospitals were

**Since the STEPS model was piloted, TB patient notification to NTEP from the private sector in Kerala increased by 26% in 2019.**

**TABLE.** Comparison of National TB Program Indicators Before and After Implementation of STEPS Model in Kerala, India

Indicator	2018	2019	Percentage Change
TB cases notified by the private sector, no.	3,981	5,003	+26%
Private specimens tested by public GeneXpert machines, no.	7,872	14,210	+ 81%
Microbiologically confirmed cases among notified TB, no. (%)	995 (25%)	1,951 (39%)	+ 56%
Patients notified of TB test results, no. (%)			
Patients tested for rifampicin resistance at baseline with GeneXpert	637 (16%)	1,951 (39%)	+143%
TB patients who know their HIV status	1,672 (42%)	4,102 (82%)	+95%
Patients received Direct Benefit Transfer	1,273 (32%)	3,552 (71%)	+122%
Patients whose treatment outcome was reported in Nikshay	1,393 (39%)	4,312 (86%)	+120%
Patients with TB treatment outcome reported, no. (%)			
Patients' treatment was completed successfully	1,253 (90%)	3,797 (88%)	-2%
Patients lost to follow-up	31 (2%)	87 (2%)	0%

made advocates for convincing others. The STEPS model was socially marketed among the private sector as a model owned by private hospitals to help the hospitals to ensure standards of care to their patients. Only the concepts were marketed, and the hospitals were given the flexibility to customize the model within their hospitals to meet the objectives. During the initial year, 2–3 visits by city officers of Joint Effort for TB Elimination and NTEP program staff were required to convince each hospital management to start STEPS centers. However, later many private hospital managements started contacting the NTEP program managers to enroll in STEPS

### Personnel-Related Issues

Gaining the trust of some doctors in the private sector was a challenge in the beginning. Local leaders of the Indian Medical Association and the coalition of professional medical associations have played the role of ambassadors. When the doctors were convinced that STEPS was a system to ensure the standard of care to their patients, which addressed all their prior concerns with NTEP, most of the providers accepted the program.

Public sector staff at the district level felt apprehensive and lacked the confidence to talk to corporate hospital management staff. The professional approach used by the 5 trained city officers of the Joint Effort for TB Elimination project helped in liaising between the public and private partners.

Personal conflicts between staff of both sectors were observed in very few instances. Early

identification of the problems due to open, proactive, and vigilant systems in the program at the district and state level helped troubleshoot those issues promptly.

Conscious efforts were made to sustain the motivation of private sector staff nurses, doctors, and management. WhatsApp groups with all STEPS leads and program staff in every district not only facilitated easy communication and cross learnings but also offered an opportunity to share their success. A letter of appreciation from the highest government officials was sent to all private hospitals' management. Private hospital representatives were involved right from the planning phase to implementation and evaluation. Because the model promoted local customization by private hospitals, the key hospital staff were encouraged to keep working on improving the model within their hospital, which fostered a feeling of ownership.

NIKSHAY, the web-based case surveillance system of NTEP was used to try to document the outcomes and endpoints of various services received by every patient. A uniform web-based system for documenting the process of how a patient received those services has yet to be established.

### DISCUSSION

The National Strategic Plan (NSP) for TB Elimination 2017–2025 emphasizes the government's role as an enabler and not as the sole provider of TB care. NSP envisions ensuring that services are established as per *Standards for TB Care in India* to privately managed patients.<sup>21</sup>

The STEPS strategy, which is aligned with the NSP, helped to improve standards of care for patients reaching the private sector, reduce out-of-pocket expenditure for tests and drugs, and strengthen the health system to ensure universal access to TB care. STEPS extended the full range of program services to the patient in a verifiable way. STEPS demonstrated that low-cost locally customized private sector engagement models with good administrative commitment are feasible and beneficial to society. STEPS also demonstrated how the Joint Effort for TB Elimination project, a private provider support agency, added value in developing sustainable systems for private sector engagement by customizing a collaborative and monitoring framework.

After implementing the STEPS model, improvements in documented quality of care were evident. The model ensured that almost all TB patients who sought care in the private sector had a documented treatment outcome and demonstrated improvements in obtaining microbiological confirmation of TB to correctly diagnose TB and in offering testing for drug-resistant TB at baseline itself. This effort is extremely important for India where the proportion of drug-resistant TB is higher than in other countries. Similarly, the proportion of TB patients in the private sector who knew their HIV status and those who received financial benefits also improved.

STEPS fostered customer loyalty between the patient and the private hospital without any interference from external agencies. Loyal patients will in turn bring back business to the hospital. Return business might have motivated some of the corporate hospitals to appoint a full-time staff person to work with the STEPS centers. The financial incentives provided by NTEP to the hospital (\$US7 per notification and \$US7 per treatment outcome) were used for establishing the systems within the hospital, including some appointing a new staff person. A few hospitals started using the STEPS model for patients receiving treatment for diseases other than TB. In the future, the strategy may inculcate a culture among private hospitals of ensuring public health actions to their patients. STEPS may also lead the way for establishing a system for total engagement of the private sector for all national health programs other than TB.

The STEPS model has no additional financial or human resource implications to the program. It simply tried to optimize the already existing resources and commitments from NTEP. It relied on the social responsibility of the private sector combined with providing profitable customer

care services and realizing the Government's actual role in enabling TB services to the entire population, including those who seek care in the private sector. It is a win-win-win-win situation for the patient, NTEP, private hospitals, and the society, rendering itself easily sustainable and replicable. The model could be locally customized to any setting.

While implementing STEPS, we learned many new lessons. Private hospitals have been very willing to be part of public health initiatives. Developing a public health outlook for private hospitals is possible. This may apply not only to TB but also to many health programs including other communicable diseases and maternal and child health. Involving private hospital management during the whole process was the key to success. When the upper-level management staff are convinced, most of the local problems had easy solutions. To cite an example, many private hospital management groups decided to let their in-house pharmacies provide (private) anti-TB drugs to patients only after notification to NIKSHAY, ensuring 100% real-time notification. Allowing local customizations of the model fosters ownership, which itself sustains their motivation. We left STEPS as an "open system," so that many improvements emerged. One such example is the model of a digitalized STEPS register, which was developed by one of the staff nurses from a private hospital.

The key reason that STEPS was successful was the clear understanding and delineation of the roles, responsibilities, and accountabilities of both public and private sectors based on each stakeholder's skills and expertise. The partnerships were customized for each private hospital. Having strong political and administrative commitment from the state program managers and training succeeded in changing the attitude of the NTEP staff toward the private sector. An important strategic change that contributed to rapid scale-up and acceptance of STEPS was the attempts to gain the trust of hospital management, involvement of nurses for counseling, efforts for quality control through a coalition of professional medical associations, lack of formal memoranda of understanding, and lack of major financial transactions between partners.

A joint monitoring mission held in India in November 2019 led by the World Health Organization and global developmental partners, including 165 multidisciplinary professionals from technical agencies, national institutes, medical colleges, and civil society, recommended supporting

**STEPS demonstrated that low-cost locally customized private sector engagement models with good administrative commitment are feasible and beneficial to society.**

**Gaining trust of hospital management, involving nurses for counseling, and establishing quality control through professional medical organizations helped STEPS be rapidly scaled up and accepted.**

the establishment of STEPS Centers in all private health care facilities along with a formal evaluation to inform its expansion to other states.<sup>22</sup> A formal evaluation including economic evaluation is being conducted now.

The current model has an anticipated minor risk of interruption or delay in supply of NTEP products to private hospitals due to the workload of NTEP staff or due to personal conflicts. Separate systems for supply chain management to private hospitals, online pharmacies, and vouchers for drugs that flow through the private supply chain could be some of the solutions that could mitigate this risk. Also, the public sector may not be able to address the entire diagnostic access demands for patients reaching the private sector in the long run. Schemes like public purchasing of private laboratory services may need to be established. The current experiences with the STEPS model are only with private hospitals and not with individual practitioners.

In summary, STEPS is a low-cost private sector engagement model which helped to ensure standards of care to patients reaching the private sector. The model, which relies on the social responsibility of the private sector and self-realization of the public sector about its actual role to engage the private sector in serving their citizens, was beneficial to society. Locally customized STEPS could be one of the major solutions for supporting TB patients reaching the private sector.

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ORIGINAL ARTICLE

# Differentiated Service Delivery Models for HIV Treatment in Malawi, South Africa, and Zambia: A Landscape Analysis

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## Key Findings

- Differentiated service delivery (DSD) models for HIV treatment in Malawi, South Africa, and Zambia can be grouped into 12 service delivery strategies that vary by population served, medication dispensing duration, location of medication delivery, frequency of health care system interactions, and other characteristics.
- As of 2019, most DSD models in Malawi, South Africa, and Zambia remained limited to clinically stable, adult patients and continue to depend on established facilities for clinical care; individual models relied more on clinical staff, while group models made greater use of lay personnel.
- DSD models required anywhere from 2 to 12 health care system interactions per year, imposing very different burdens on patients and clinics.

## Key Implications

- Policy makers should recognize that each DSD model is designed differently and requires different resources for implementation; the details of how a specific model operates are important to understanding the optimal model mix for future scale-up.
- Existing routine data systems do not capture patients' participation in specific DSD models, making it difficult to assess model coverage or performance. Improving electronic medical record systems so that they reflect actual service delivery is a high priority.

## ABSTRACT

**Introduction:** Many countries in Africa are scaling up differentiated service delivery (DSD) models for HIV treatment, but most existing data systems do not describe the models in use. We surveyed organizations that were supporting DSD models in 2019 in Malawi, South Africa, and Zambia to describe the diversity of DSD models being implemented at that time.

**Methods:** We interviewed DSD model implementing organizations for descriptive information about each of the organization's models of care. We described the key characteristics of each model, including population of patients served, location of service delivery, frequency of interactions with patients, duration of dispensing, and cadre(s) of provider involved. To facilitate analysis, we refer to 1 organization supporting 1 model of care as an "organization-model."

**Results:** The 34 respondents (8 in Malawi, 16 in South Africa, 10 in Zambia) interviewed described a total of 110 organization-models, which included 19 facility-based individual models, 21 out-of-facility-based individual models, 14 health care worker-led groups, and 3 client-led groups; jointly, these encompassed 12 specific service delivery strategies, such as multimonth dispensing, adherence clubs, home delivery, and changes to facility hours. Over two-thirds (n=78) of the organization-models were limited to clinically stable patients. Almost all organization-models (n=96) continued to provide clinical care at established health care facilities; medication pickup took place at facilities, external pickup points, and adherence clubs. Required numbers of provider interactions per year varied widely, from 2 to 12. Dispensing intervals were typically 3 or 6 months in Malawi and Zambia and 2 months in South Africa. Individual models relied more on clinical staff, while group models made greater use of lay personnel.

**Conclusions:** As of 2019, there was a large variety of differentiated service models being offered for HIV treatment in Malawi, South Africa, and Zambia, serving diverse patient populations.

## INTRODUCTION

In 2019, approximately 17.8 million people were receiving antiretroviral therapy (ART) for HIV in sub-Saharan Africa.<sup>1</sup> Achieving global targets for HIV treatment, known as "95-95-95,"<sup>2</sup> would require approximately another 5 million patients to be added to the national HIV treatment programs. Meanwhile, donor spending in low- and middle-income countries is declining, which has led countries, implementers, and funders to seek avenues of greater efficiency in service delivery.<sup>3,4</sup>

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One response to this challenge is the development of “differentiated service delivery models” (DSD models) for HIV treatment.<sup>5</sup> DSD models typically reduce clinic visits and/or move services out of the clinic and may also alter the provider cadre and package of services provided. These models have multiple aims. They seek to make treatment more patient-centric by lessening the burden of frequent clinic visits; reduce costs to both the health care system and to patients; and sustain or improve clinical treatment outcomes.<sup>6</sup> DSD models are intended as an alternative to traditional or conventional care, which has typically been delivered at fixed-site clinics and requires at least 4 patient visits to the clinic per year, if not more. DSD models were originally targeted to adults in the general population who are “stable” on treatment and who comprise the largest population of patients. Models for other populations such as children and those with detectable viral loads have also been developed.

Although scale-up of DSD models is well underway in many sub-Saharan African countries, existing data systems have not yet caught up with the diversity of approaches to HIV treatment delivery. Documentation of care delivered through DSD models is either not captured or is poorly captured in existing electronic medical record systems, and even paper-based patient files and site-level registers may not record, for example, whether a patient received a medication refill at the site, at a community pick-up point, or at home.<sup>7,8</sup> In most countries, moreover, a wider range of different models are being implemented than may be reflected in national HIV treatment guidelines, with both ministries of health and nongovernmental partners designing and piloting approaches that vary from those in the guidelines. Some of these models are described in the published<sup>9–12</sup> or unpublished<sup>13,14</sup> literature or in funder or government databases, but most countries lack a comprehensive inventory of what is being tried. Policy makers thus lack familiarity with the range of DSD experimentation underway, let alone being well-informed about the strengths and weaknesses of different models or their implications for the health care system.

In 2019, we undertook a series of interviews with DSD model implementing organizations in Malawi, South Africa, and Zambia to describe the current landscape of DSD model implementation in 3 high HIV prevalence countries in southern Africa, each representing a different income level (lower, upper-middle, and middle income, respectively). Interviews were conducted with as many nongovernmental and governmental implementing

organizations and agencies as could be identified. Here, we present the information obtained through these interviews on the types and characteristics of DSD models underway. Our goal is to illustrate the diversity of models in use, identifying similarities and differences, in the hope that a knowledge of the breadth of models being tried will help policy makers and program planners to improve decision making for DSD models in the future.

## METHODS

We conducted cross-sectional structured interviews with DSD model implementing organizations in Malawi, South Africa, and Zambia. Each interview elicited the title and implementation start date for each differentiated model of care implemented by the organization and then collected descriptive information about the model, including population eligible, location and frequency of service delivery, provider cadre, and scale. Respondents were also asked for information on data and documentation, existing evaluations, and future plans for DSD projects.

### Identification of Respondents

Our goal was to survey all the organizations that were either implementing or supporting implementation of DSD models in the study countries at the time of the survey (2019), whether for purposes of routine care, demonstration or pilot projects, or research studies. Potential survey respondents included government health agencies, implementing partners of national governments and of the U.S. President’s Emergency Plan for AIDS Relief (PEPFAR) and other donors, and other nongovernmental organizations. We first compiled a comprehensive list of potential respondents. We started with the study team’s own knowledge of each country’s HIV program and then supplemented this with recommendations from government DSD technical working groups and funding organization representatives. We then reviewed each country’s list with relevant national government representatives. Once the inventory of potential respondents was complete, each organization was invited to participate in the survey. Over the course of the survey, we also asked respondents to review and add to the list of potential participants from their own countries.

### Data Collection

Data were collected using a semistructured questionnaire administered by the study team in a face-to-face or electronic meeting with a representative

**DSD models seek to lessen patients’ burden of frequent clinic visits, reduce patient and health care system costs, and sustain or improve clinical treatment outcomes.**

**Policy makers may not be fully familiar with the range of DSD model experimentation underway and may not be well-informed about the strengths and weaknesses of different models or their implications for the health care system.**

of each participating organization. Interviews were audio-recorded and data entered into the project database after each interview was completed. Questions were limited to factual information about the DSD models being implemented. The interview instrument is included in [Supplement 1](#). After all data had been entered, a report of the responses was sent to each respondent for verification, correction of errors, and provision of specific information that was not available at the time of the interview, such as the precise numbers of patients participating in each model.

### Data Analysis

As this was a descriptive analysis, we aimed to group models within each country by their major characteristics, so that an overall profile of the models in use in each country could be developed. We first categorized the models using the taxonomy by Grimsrud et al.,<sup>15</sup> which is widely used within the DSD model literature. This taxonomy sorts models of care into 4 categories: facility-based individual models (FBIM), such as fast-track clinic visits; out-of-facility-based individual models (OFBIM), such as decentralized medication delivery; health care worker-led groups (HCWLG), such as adherence clubs; and client-led groups, such as community adherence groups or CAGs.

Although this 4-category taxonomy is widely used, it also results in combining very diverse models, such as home delivery of ARVs and community-based clinical care, into the same category. We therefore also created a set of “strategies” that further refines the categories, grouping more similar models together. As we defined these strategies empirically, based on the interview

responses, we regard them as results of the survey and present them in the results section.

We then used interview data to describe the key characteristics of each model, adapted from the well-known domains proposed by Duncombe et al.<sup>5</sup>: population of patients served, location of service delivery, frequency of interactions with patients, duration of dispensing, and cadre(s) of provider involved ([Supplement 2](#)). For each characteristic in the results section, we start by describing traditional or conventional care, to provide a comparison with DSD model characteristics. We then report frequencies of each characteristic in each domain.

In reporting aggregate results, it is important to note that each organization-model combination was counted once, regardless of how many clinics offered the model, how many patients were enrolled, or whether other partners described the same model. For example, in this analysis a model being piloted at 2 clinics, with just a few dozen patients enrolled, and a model that had already been scaled up nationally and covered hundreds of thousands of patients were counted equally. Similarly, if 2 respondent organizations each responded that they were implementing the same model, this model was counted twice. We refer to each combination of 1 model described by 1 respondent as an “organization-model.”

Although we did ask survey respondents to report the numbers of sites or facilities implementing each model and of patients participating, in most cases we were unable to obtain complete or accurate data for these. Where such numbers were available, it was generally not possible to confirm that no patients were double-counted in other implementer reports or that no individual



The Central Dispensing Unit warehouse in Ndola, Zambia. ©2019 Bevis Phiri/Clinton Health Access Initiative-Zambia

**TABLE 1.** Number of Organization-Models<sup>a</sup> for Differentiated Service Delivery of HIV Treatment Described by Respondents, by Country, Category, and Strategy

Model Category	Malawi	South Africa	Zambia	Total
Total number of organization-models described	26	43	41	110
<b>Number of organization-models per country and category</b>				
Facility-based individual model	13	6	13	32
Out-of-facility-based individual model	5	22	16	43
Health care worker-led group	7	15	4	26
Client-led group	1	0	8	9
<b>Numbers of organization-models per country and strategy</b>				
Adherence clubs	0	11	3	14
Community adherence groups	1	0	8	7
Community outreach	3	3	4	11
External pickup points	2	17	6	26
Extra clinic hours	1	1	2	4
Family models	2	1	1	4
Fast track services	2	1	5	8
Home delivery	0	1	3	4
Multimonth dispensing	3	1	3	7
Nonstable patient models	6	4	1	11
Key population models	1	1	2	4
Youth models	5	2	3	10

<sup>a</sup>An organization-model is 1 organization supporting 1 model of care.

patients were enrolled in more than 1 model. We therefore do not include information here on the scale of model implementation or coverage.

## RESULTS

### Interviews Conducted and Models Reported by Respondents

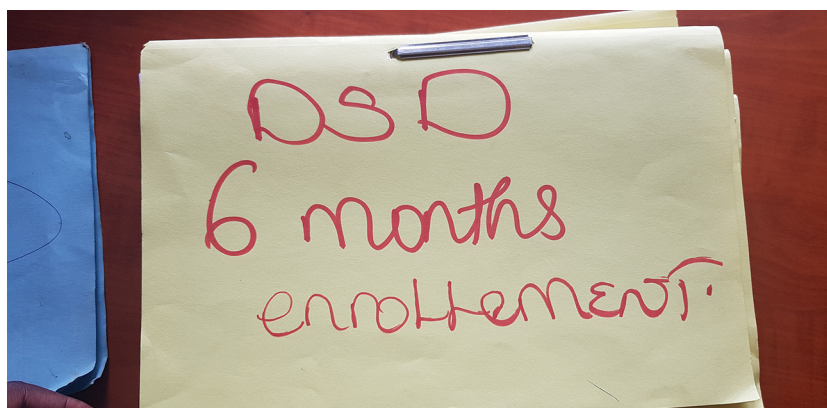
We identified 36 potential respondents in the 3 countries and completed interviews with 34 of them. The remaining 2, both in South Africa, declined to participate in the survey. Interviews were conducted between March 2019 and March 2020, with data verified by respondents between November 2019 and March 2020. We surveyed a total of 8 organizations in Malawi, 16 in South Africa, and 10 in Zambia.

The 34 respondents interviewed reported on a total of 110 organization-models, where an organization-model represents 1 organization supporting 1 model, as shown in the upper half of Table 1. Some models are specified in each country's

HIV treatment guidelines, to be scaled up nationally; others are bespoke models originating from nongovernmental organizations. Countries differed in their most commonly reported category of DSD model: more organizations in Malawi described facility-based individual models and more in Zambia described out-of-facility-based individual models, while no organizations at all in South Africa reported supporting client-led group models.

We also grouped the 110 organization-models into 12 strategies, as described in Table 2 and listed alphabetically in the lower half of Table 1. The 12 strategies do not map directly onto the 4 categories; each taxonomy provides different information.

There are several provisos to the model taxonomies in Table 1. First, while we used both the names given to the models by the implementing organizations and interview respondents' descriptions of the models to allocate each organization-model to a category and approach, in some cases we were uncertain and had to choose what appeared to be the closest fit, given what we



A 6-month dispensing enrollment register at a health facility in Central Province, Zambia. © 2020 Bevis Phiri/ Clinton Health Access Initiative- Zambia

**TABLE 2.** Twelve Strategies for Differentiated Service Delivery Model for HIV Treatment in Malawi, South Africa, and Zambia, as Reported by Interview Respondents

Adherence clubs	Any group model that is led by a health care worker (professional or lay)
Community adherence groups	Any group model in which a patient picks up medications for other group members (typically abbreviated CAG)
Community outreach	A variety of models that bring both clinical care and medications into the community, such as nurse-led outreach
External pickup points	Any model that delivers antiretroviral medications to pickup points outside clinic facilities, such as lockers, community pharmacies, decentralized pickup points, etc.
Extra clinic hours	Any model that adds additional hours to a facility's operations to facilitate access, such as on evenings or weekends
Family models	Any model designed to serve multiple and/or specific members of a family at once (e.g., pediatric clinic or family clinic)
Fast track services	Any model that creates a separate queue, kiosk, or procedure at a facility to speed up service delivery for stable patients
Home delivery	Any model that delivers antiretroviral medications to patients' homes (e.g., by a community health worker or a bicycle courier)
Multimonth dispensing	Any model in which the primary goal is to dispense medications for a longer duration than is done under standard care (usually 6 months)
Nonstable patient models	Models for patients who do not meet definitions of clinical stability, such as high viral load clinics and advanced disease clinics
Key population models	Models for a key population such as men who have sex with men or female sex worker
Youth models	Any model specifically for youth/teens/adolescents (e.g., teen clubs in Malawi and the scholar model in Zambia)

knew. Second, not all of the models listed in Table 1 are mutually exclusive. For example, 6-month dispensing can be implemented within many other models of care. Third, many models also provide some services that are not strictly consistent with their model category or approach. Out-of-facility-based individual models, for

example, may provide some services at facilities, while facility-based models may include home visits for patients who miss appointments; both group model categories likely include some individual services. Similarly, community outreach strategies may incorporate external medication pickup points, along with community-based

**TABLE 3.** Populations Served by Current Differentiated Service Delivery Models for HIV Treatment and Criteria for Defining Stability, by Country

Population or Requirements	Malawi, No.	South Africa, No.	Zambia, No.	Total, No.
<b>Population eligible</b>				
Number of organization-models	26	43	41	110
All patients (no restrictions by disease status or age)	2	1	0	3
<b>Stable and not stable patients</b>				
Adults and adolescents/youth	0	2	0	2
Adolescents/youth (age restrictions vary)	5	2	0	7
Children (age restrictions vary)	0	0	1	1
Total stable and not stable patients	5	4	1	10
<b>Stable patients only</b>				
All ages	0	0	10	10
Adults	10	31	14	55
Adults and adolescents/youth	0	0	9	9
Adolescents/youth (age restrictions vary)	0	0	3	3
Children (age restrictions vary)	0	1	0	1
Total stable patients only	10	32	36	78
<b>Advanced disease/not stable patients only</b>				
All ages	4	2	1	7
Adults	2	2	0	4
Children (age restrictions vary)	1	0	0	1
Total advanced disease/not stable patients	7	4	1	12
Pregnant/postpartum women only (any disease status)	1	1	0	2
MSM/FSW (any disease status)	1	1	3	5
<b>Requirements to be regarded as stable</b>				
Number of organization-models	10	32	36	78
ART ≥ 6 months and 1 suppressed viral load	5	4	9	18
ART ≥ 12 months and 1 suppressed viral load	1	0	23	24
ART ≥ 12 months and 2 suppressed viral loads	0	26	0	26
Not specified	4	2	4	10

Abbreviations: ART, antiretroviral therapy; FSW, female sex worker; MSM, men who have sex with men.

clinical care. Finally, a model that is considered “differentiated” in 1 country—like 3-month dispensing in South Africa—and is thus included in Table 1 may be regarded as standard of care in another, like Malawi, for which it is not mentioned in Table 1.

### Populations Served

As anticipated, most of the models described in the survey served adults in the general population who

were stable on treatment. Definitions of stability varied by country and model, but most included a minimum of 12 months on ART and evidence of viral suppression. A number of other models were designed for people with advanced HIV disease, an unsuppressed viral load, or newly initiated on ART. Models also existed for different age groups (children, adolescents) and vulnerability groups (men who have sex with men (MSM), female sex workers (FSW), pregnant women). We note that the survey

**TABLE 4.** Number of Organization-Models for Differentiated Service Delivery of HIV Treatment by Location of Service Delivery and Country

Location of Service Delivery	Number of Organization-Models			
	Malawi N=26	South Africa N=43	Zambia N=41	Total N=110
Facility for clinical care with medication pickup at				
Facility	19	6	16	41
External pickup point	4	18	15	37
Adherence club	0	13	1	14
Home	0	1	3	4
Total (facility location for clinical care)	23	38	35	96
External location for clinical care				
Clinical care and medications in community	3	3	5	11
Clinical care and medications at adherence club	0	2	0	2
Clinical care and medications at home	0	0	1	1
Total (external location for clinical care)	3	5	6	14

was completed before the adoption of coronavirus disease (COVID-19) related changes to eligibility criteria, which may or may not be permanent. In [Table 3](#), the number of organization-models for each population group is reported by country.

Half (n=55, 50%) of the organization-models were limited to stable adults, and more than two-thirds (n=78, 71%) to stable patients overall. About a quarter (n=25, 23%) either accepted advanced disease or unsuppressed patients along with stable patients or were explicitly designed for those with advanced disease or viral failure. A small handful targeted special populations (n=7, 6%).

As mentioned, where “stability” was a criterion for DSD model enrollment, definitions varied. In [Table 3](#), we also summarize the criteria used for the 78 organization-models limited to stable patients. Of the 70 organization-models for which stability criteria were specified, more than two-thirds (n=50, 71%) required that patients have spent at least a full year on ART before DSD model eligibility, and all required at least 1 suppressed viral load measurement.

### Location

Locations of models reported by survey respondents are shown in [Table 4](#). As mentioned above, one of the main criteria for differentiating HIV treatment delivery from traditional, clinic-based care is the location of service. Before differentiation, nearly all care and medication dispensing took place at fixed-

site clinics, with occasional community outreach efforts to trace defaulters or provide treatment education or adherence support. DSD models offer services in a wide range of locations, from fixed-site clinics to private pharmacies and community meeting spaces to patients’ homes. For models that provide most services off-site, patients typically remain the responsibility of a fixed-site clinic, which supervises the delivery of care through the alternative model and maintains patient records.

Almost all of the organization-models (n=96, 87%) continued to provide clinical care at established health care facilities, though each country had a few organization-models that delivered clinical care outside the facility. Medication pickup locations varied by country. Facility-based pickup was most common among organization-models in Malawi; external pickup points and pickup at adherence clubs, frequently located at the facility rather than in the community, were widely used in South Africa; and medication pickup at facilities and at external pickup points were both common in Zambia.

### Frequency of Interactions With Health Care System

In addition to location of service delivery, the number of times per year that a patient must interact with the health care system—either an established clinic or an off-site location—is a critical differentiator of the alternative models



**TABLE 5.** Frequency of Health Care System Interactions per Year, by Country, Model Category, and Viral Suppression Eligibility Criterion for Differentiated Service Delivery Models for HIV Treatment

Frequency of Interactions Required per Year	Malawi			South Africa			Zambia		
	Organization-models, No.	Full Clinic Visits, <sup>a</sup> Median (Range)	Other Interactions, <sup>b</sup> Median (Range)	Organization-models, No.	Full Clinic Visits, <sup>a</sup> Median (Range)	Other Interactions, <sup>b</sup> Median (Range)	Organization-models, No.	Full Clinic Visits, <sup>a</sup> Median (Range)	Other Interactions, <sup>b</sup> Median (Range)
<b>Models explicitly for stable patients</b>									
<b>Facility-based individual models</b>									
Every 2 months (6/year)				1	4	0			
Every 3 months (4/year)	2	2 (2–2)	2 (2–2)	1	2	4	8	2 (2–4)	2 (0–2)
Every 4 months (3/year)	3	2 (2–2)	1 (1–1)						
Every 6 months (2/year)							3	2 (2–2)	0 (0–0)
<b>Out-of-facility-based individual models</b>									
Every 2 months (6/year)				18	2 (2–2)	4 (4–4)			
Every 3 months (4/year)	3	1 (0–2)	4 (2–4)	1	0	5	13	2 (0–2)	2 (2–4)
<b>Health care worker-led group models</b>									
Every 2 months (6/year)				10	2 (2–2)	4 (4–4)			
Every 3 months (4/year)	1	2	2				4	2 (2–4)	2 (0–2)
Every 6 months (2/year)				1	0	2			
<b>Client-led group models</b>									
Every 1 month (12/year)							1	2	10
Every 3 months (4/year)	1	2	2				6	2 (2–2)	2 (2–2)
Every 6 months (2/year)							1	1	1
<b>Models not requiring stability<sup>c</sup></b>									
<b>Facility-based individual models</b>									
Every 1 month (12/year)	6	0 (0–0)	12 (12–12)	2	0 (0–0)	12 (12–12)	2	0 (0–0)	12 (12–12)
Every 2 months (6/year)				2	0 (0–0)	6 (6–6)			
Every 3 months (4/year)	1	0	4						
Visits aligned to PMTCT schedule	1	5	3						
<b>Out-of-facility-based individual models</b>									
Every 2 months (6/year)				3	0 (0–0)	6 (6–6)			
Every 3 months (4/year)	2	0 (0–0)	4 (4–4)				3	2 (2–2)	2 (2–2)
<b>Health care worker-led group models</b>									
Every 1 month (12/year)	2	0 (0–0)	12 (12–12)	3	0 (0–2)	12 (10–12)			
Every 2 months (6/year)	2	0 (0–0)	6 (6–6)						
Visits aligned to child vaccine schedule				1	0	8			
<b>Not specified</b>	2								

<sup>a</sup> A full clinic visit is a conventional facility visit that provides the services that were typical of a predifferentiation visit, generally including a consultation with a clinician, counseling, laboratory tests if scheduled, and a medication refill.

<sup>b</sup> Other interactions include any interaction with a provider that has been tailored for the population served, including off-site medication pickups, adherence club participation, or a clinical consultation adjusted for the population in question, including specialist consultations for certain types of patients (i.e., all interactions except conventional, undifferentiated full clinic visits).

<sup>c</sup> Includes models for known unsuppressed patients, high viral load clinics, pediatric clinics, and models that accept both stable and nonstable patients.

**TABLE 6.** Months of Antiretrovirals Dispensed in Differentiated Service Delivery Models for HIV Treatment

Average Months of Antiretrovirals Dispensed in Model	Number of Organization-Models			
	Malawi (N=26)	South Africa (N=43)	Zambia (N=21)	Total (N=110)
1 month	7	5	3	15
2 months	2	34	0	36
3 months	7	1	12	20
1 or 3 months (patients typically start with 1 month, then move to 3 months)	2	2	2	6
6 months	3	1	7	11
3 or 6 months (typically previously dispensed 3 months but transitioning to 6 months in line with national policy)	3	0	17	20
Not reported	2	0	0	2

of care that have been developed. During the first decade of large-scale, public-sector ART programs in Africa, patients typically collected their medications once a month, with clinical monitoring conducted 4 to 12 times per year. Dispensing intervals expanded gradually, from a maximum of 1 month at a time to up to 3 months in some countries, but frequent clinic visits remained the norm.

In an effort to reduce the burden of treatment on patients and clinics, where time and space should be freed up by requiring fewer ART visits per year, DSD models generally try to keep stable patients out of the clinic. This may be done by reducing the absolute number of clinic visits per year and/or replacing some or all traditional or “full” clinic visits with brief-er visits for medication pickup only, such as fast-track visits, or off-site interactions, such as adherence club participation or medication access at an external pickup point. [Table 5](#) summarizes the number of clinic and DSD model interactions required per year, with “clinic visit” referring to a full or traditional visit and “DSD interaction” including short clinic visits or medication refill/pick-up visits that were designed for a DSD model. Models that required evidence of viral suppression for eligibility are reported separately from those that did not. While the total number of clinic visits and DSD interactions required per year varied widely by model, most organization-models continued to expect patients to interact with health care providers, either at or outside the facility, at least 4 times per year.

### Dispensing Intervals

Interaction frequency, as presented in [Table 5](#), appears to be determined in part, but not solely, by duration of dispensing; if patients receive a 3-month supply of ARVs at a time, interactions must take place at least quarterly. However, many models are designed to interact with patients more frequently than once per quarter. As previously mentioned, early in national ART programs, patients received a maximum of 1 month of medications at a time, and refills were dispensed only by fixed-site clinics. Because a medication refill visit often takes a full day due to long waiting times—even if a clinical consultation is not required—a promising way to improve treatment delivery is to dispense more months at a time. “Multimonth dispensing” (i.e., at least 3 months of medication dispensed) is now the norm in Zambia and Malawi and under consideration in South Africa, but the number of months allowed in our survey varied from 2 to 6. [Table 6](#) summarizes dispensing intervals expected for DSD models in each country.

Dispensing intervals varied in Malawi, with some organization-models dispensing only 1 month at a time and others offering 6 months per pickup. This variation in dispensing is related to patient population served, with special populations and those with an unsuppressed viral load generally receiving shorter intervals and stable patients generally receiving 3 or 6 months. In South Africa, 2-month dispensing remained the norm, with only 1 6-month dispensing model reported. Dispensing intervals in Zambia reflected the transition underway at the time of the survey between a standard of care of 3 months per pickup to 6 month dispensing, which is now national policy for stable patients.

**TABLE 7.** Different Cadres of Clinical Care Providers and Antiretroviral Therapy Dispensers Employed in Differentiated Service Delivery Models for HIV Treatment in Malawi, South Africa, and Zambia

Provider	Number of Organizational-Models				Total
	Facility-based Individual	Out-of-facility-based Individual	Health Care Worker-led Group	Client-led Group	
<b>Clinical care provider</b>					
Medical doctor/medical officer/clinical officer	9	1	2	2	14
Nurse	7	28	16	0	51
Community health worker	0	1	0	1	2
Non-specified clinician	3	7	3	2	15
Unclear/not reported	13	6	5	4	28
<b>Antiretroviral therapy dispenser</b>					
Pharmacist/pharmacy assistant	12	7	2	0	21
Nurse/clinician	7	7	3	0	17
Community health worker	0	6	5	0	11
Designated patient	0	2	1	9	12
Lay counselor/trained non-clinical personnel	0	14	9	0	23
Medication locker/remote pharmacist	0	3	0	0	3
Unclear/not reported	13	4	6	0	23

### Providers

The final characteristic that helps to describe DSD models is the cadre of staff that provides services. Task-shifting from more to less senior clinical staff, and from clinical staff to lay providers, has been common for many years. Some of the DSD models described by survey respondents developed this practice further, relying more heavily on nonclinical providers located outside facilities, while others continued to make use of different cadres of clinical providers. Table 7 describes the cadres providing clinical care and ARV dispensing in each category of model.

In general, individual models relied more on clinical staff (doctors, nurses, and pharmacists), while group models made greater use of lay personnel (community health workers and counselors). The cadre providing these services, though, was frequently not reported, particularly for facility-based individual models.

### DISCUSSION

This survey of organizations implementing differentiated service delivery models for HIV treatment revealed 110 instances of DSD model provision in Malawi, South Africa, and Zambia in 2019. Three of

the 4 commonly seen categories of DSD models—facility-based individual care, out-of-facility-based individual care, and health care worker-led groups—were well-represented in all 3 countries; client-led groups were common only in Zambia. Most models continued to provide clinical care at facilities and, as anticipated, most models were limited to stable adult patients. The models described in our survey fell fairly naturally into 12 strategies for service delivery which reflect the evolution and divergence of DSD models since they first emerged. As a set, the 12 strategies may offer a more specific and pragmatic way to describe DSD models for HIV treatment going forward.

Although DSD models are often assumed to be “less-intensive” approaches to service delivery, the models being implemented in 2019 still required relatively frequent interaction between patients and providers. Four interactions per year was most common for stable patients; models that allowed or focused on nonstable patients generally required more interactions. Dispensing intervals also varied by model and country. Models in Zambia and Malawi were beginning to reflect these countries’ adoption of 6-month dispensing policies, while dispensing intervals remained relatively short (2–3 months) in South Africa. The advent of

COVID-19 and its accompanying restrictions on travel and service delivery may also influence future decisions about how many interactions patients should have with the health care system. Over the course of 2020, models that minimized contact, such as multi-month dispensing and external medication pickup points, have expanded in many countries, while those that were designed to create contact, such as adherence groups, have diminished.<sup>16,17</sup>

DSD models are also assumed to incorporate task-shifting from more- to less-trained cadres of service providers. In most of the models reported by survey respondents, though, formally trained clinical staff (doctors, nurses, pharmacists) continued to provide the majority of services, even in out-of-facility-based models.

One of the conclusions that can be drawn from our survey is the extent to which the details of each model's design both vary from one another and matter to how well a model achieves the various goals of differentiated service delivery. Within the 4 major categories of DSD models, individual models varied widely, particularly in terms of specific populations targeted and locations and timing of medication pickup or delivery. Home delivery of ARV medications and electronic medication lockers located just outside a clinic facility can both be described as out-of-facility-based individual care, for example, but they differ sharply from one another in terms of resource needs, and they thus potentially have very different roles to play in a national HIV treatment program. There was important variation even within our 12 strategy groups, illustrating the overall difficulty of drawing generalizations about DSD models.

### Limitations

Although we attempted to generate a comprehensive description of DSD models in use in 2019, our survey had many limitations. First, it is possible that our survey missed some implementing organizations in our target countries, and it is unlikely that the inventory of models in Table 1 is truly comprehensive. It includes all the DSD models mentioned by the partners interviewed, but there are almost certainly other approaches being tried by others. We are confident that models that are missing from Table 1, however, are relatively small and/or new initiatives at the time of the survey.

A more important limitation is that the information collected pertains to the situation in 2019, when the survey was conducted. The world of differentiated service delivery is evolving rapidly. Some of the models described to us in 2019 almost

certainly no longer exist 2 years later; new models that had not yet been launched in 2019 may be underway now. Similarly, government guidelines for the models being rolled out nationally in each country may also have been updated since the survey was conducted.

Finally, we were not able to weight the models described to us by their importance within national DSD landscapes. As previously mentioned, we attempted to obtain estimates of numbers of facilities and patients participating in each model, but results were incomplete and difficult to interpret. Thus, we could not reliably distinguish between a bespoke, respondent-specific model serving just a handful of patients and a well-established, national model serving tens of thousands. Our data captured the range of diversity but not its scale. Many countries, including the 3 we focused on, are in the process of revising their paper and electronic medical record systems to better capture patient participation in DSD models, but this process had not been completed at the time of our survey. Capturing patient interactions with nonconventional models of care is essential for understanding the extent and impact of DSD models and for managing individual patients' and facilities' performance. (A good source for further information about monitoring and evaluating DSD models can be found at <https://cquin.icap.columbia.edu/network-focus-areas/monitoring-and-evaluation-of-dsd/>.)

### CONCLUSION

The survey reported here provides what we believe is the most complete description available yet of DSD models for HIV treatment in sub-Saharan Africa. It can both provide examples to other countries of new approaches they have not yet considered and serve as a baseline of model diversity, against which to evaluate the further development of differentiated service delivery in the coming years. For policy makers, understanding the breadth of DSD models being implemented in their own countries is important for learning from local experience. The diversity we observed in such characteristics as the number of health systems interactions required for each model per year, or in the eligibility criteria for different models, is crucial to making decisions about how to optimize the distribution of models across facilities and regions and plan for budget and resource allocation accordingly. Equally important, perhaps, is the recognition of the difficulty of using routinely collected data even to describe DSD models in use, let alone to assess critical

**From our survey, we can observe the extent to which the details of each model's design vary from one to another and how the details matter to how well a model achieves the various goals of DSD.**

outcomes such as coverage and retention in care. Research that overcomes routine data limitations to describe the performance of DSD models—in terms of patient coverage, health outcomes, costs, clinic efficiency, and other consequences—will be of value going forward.

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## ORIGINAL ARTICLE

# Initiation of Breastfeeding in Low- and Middle-Income Countries: A Time-to-Event Analysis

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## Key Findings

- We calculated a continuous measure of time to initiation of breastfeeding in low- and middle-income countries using recent Demographic and Health Surveys Program data and found that although the average time ranged from 1.7 hours in Burundi to 40 hours in Chad, the median time to initiation met the benchmark of within 1 hour in most countries.
- In nearly all countries studied and after controlling for confounding factors, cesarean delivery was associated with a significant delay in median time to initiation of breastfeeding, ranging from 30% to 830% longer time compared with vaginal deliveries in facilities. Conversely, immediate skin-to-skin contact was associated with an earlier time to initiation in almost all countries (10%–80% earlier).

## Key Implications

- Program managers and hospital administrators should consider adopting facility-based programs that encourage early breastfeeding, such as the Baby-Friendly Hospital Initiative, particularly in places where breastfeeding is substantially delayed.
- Government officials should endorse health facility-based policies that promote breastfeeding practices such as skin-to-skin and provide health care worker training opportunities to build awareness of these practices.

## ABSTRACT

**Objective:** Early breastfeeding has numerous benefits for both the mother and her baby. Previous research typically analyzes breastfeeding initiation in binary terms (within the first hour or day). Although delays are associated with cesarean delivery and skin-to-skin contact may facilitate early breastfeeding, a more nuanced understanding of these relationships is needed.

**Methods:** With data from 31 countries that had a Demographic and Health Survey since 2015, we described breastfeeding initiation among babies most recently born in the last 2 years to women aged 15–49 years. In a subset of 21 countries, we conducted survival analysis with multivariable log-logistic accelerated failure time (AFT) regressions to examine factors associated with time to initiation of breastfeeding, specifically the mode of delivery and skin-to-skin contact, controlling for receipt of health care as well as socioeconomic and demographic characteristics of mothers and babies.

**Findings:** Babies in most countries began breastfeeding within a few hours after birth. The mean time to initiation of breastfeeding ranged from 1.7 hours in Burundi to 32 hours in Pakistan and 40 hours in Chad. In most countries (24 of 31), the median time was 0.5 hours. Median time to initiation was greater for births by cesarean delivery compared with vaginal births at health facilities. After controlling for covariates, AFT models showed significant delays in breastfeeding among cesarean deliveries in most countries, with as much as a 9-fold delay in Senegal. Immediate skin-to-skin contact was significantly associated with a shorter time to initiation.

**Conclusion:** Efforts to promote early breastfeeding should encourage skin-to-skin and target cesarean deliveries.

## INTRODUCTION

Breastfeeding has prodigious benefits for both the mother and baby such that it protects infants against infections, supports the growth of the child, and protects mothers from postpartum hemorrhage and some types of cancer.<sup>1,2</sup> Owing to its protective mechanisms, breastfeeding can avert nearly 1 million deaths of mothers and children each year.<sup>1</sup>

Early initiation of breastfeeding (EIBF), defined as the initiation of breastfeeding within the first hour after delivery, is particularly beneficial. The early initiation triggers the release of hormones that help the mother's uterus contract and thus prevent hemorrhage.<sup>3,4</sup> Not only does EIBF provide early milk (colostrum), which has additional protective benefits for the baby, it also

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encourages future milk production.<sup>5</sup> Research has also identified a reduced risk of neonatal mortality with EIBF.<sup>6–8</sup>

Immediate breastfeeding and skin-to-skin contact are intricately related; skin-to-skin may facilitate spontaneous breastfeeding by the newborn and plays an important role in breastfeeding outcomes.<sup>9–13</sup> Early breastfeeding, in addition to skin-to-skin contact, provides thermal care for the newborn.<sup>14,15</sup> The World Health Organization (WHO) recommends that both breastfeeding and skin-to-skin should begin within the first hour after birth.<sup>16</sup> Breastfeeding in the first hour after birth is further considered “essential newborn care.”<sup>17</sup>

Initiation of breastfeeding can be delayed by individual factors, conditions of the birth (e.g., preterm, low birthweight), cultural influences, or barriers at the health facility, including complications during vaginal and cesarean deliveries.<sup>1,18–20</sup> WHO recommends that breastfeeding begin as soon as possible after cesarean delivery given the importance of early breastfeeding.<sup>16</sup> With properly trained, supportive health workers, women can be successful in this endeavor. The Baby-Friendly Hospital Initiative encourages provider training on breastfeeding.<sup>16</sup>

To inform these practices, a nuanced understanding of the delay in breastfeeding following cesarean delivery is warranted, yet most research to date defines and analyzes breastfeeding initiation in binary terms—within the first hour or the first day. A more nuanced description of delays in breastfeeding, especially if substantial differences are seen by mode of delivery, could provide insight for targeted policies or programs. The objectives of this article are first to examine the time to initiation of breastfeeding in a more granular way than existing research and, second, to compare the timing of initiation by factors that may influence early breastfeeding, specifically mode of delivery and skin-to-skin contact.

## ■ DATA

Our analysis used data from 200,054 births across 31 countries where the Demographic and Health Surveys (DHS) Program has conducted surveys since 2015 to describe breastfeeding initiation. We used a subset of these countries (21) with information about skin-to-skin, a potential determinant of early breastfeeding, to further examine the factors associated with time to initiation of breastfeeding among babies most recently born in the last 2 years to women aged 15–49 years. For the

most recent birth, mothers were asked if they ever breastfed and, if so, about the timing of initiation of breastfeeding: “How long after birth did you first put (NAME) to the breast?” Women were prompted to respond in either hours or days after birth. All surveys conducted since January 2015 and released before September 2019 that included this question were included in the descriptive analysis. Table 1 presents the total number of births analyzed in each country, as well as the percentage of babies born via cesarean delivery.

## ■ METHODS

We used several approaches to explore time to initiation of breastfeeding. First, we examined time to initiation of breastfeeding categorically for all babies. Based on a common distribution of time to initiation across countries, we created 7 categories of timing: within the first hour; 1–2 hours; 3–5 hours; 6–23 hours; the day after birth; 2–4 days; and 5 days or more, never breastfed, and don’t know or missing.

We created a continuous variable of time to initiation using a commonly applied demographic method of converting discrete time data to continuous data.<sup>21,22</sup> This continuous variable was used to calculate the mean time to initiation in each country for all births, and by mode and place of delivery. In DHS surveys, interviewers record the time to initiation in intervals of completed hours or days, where a response of “immediately” is recoded as 0; a response of 1 hour assumes no less than 1 hour and is thus outside of the benchmark for “within 1 hour.”<sup>23</sup> If a woman reported beginning breastfeeding 1 hour after birth, this means she began breastfeeding no sooner than 60 minutes after birth and up to 119 minutes after birth. Although it is unlikely that retrospective self-report of time to initiation is so precise,<sup>24</sup> an average for all women beginning within this interval (at least 1 completed hour after birth) would be likely to fall near 90 minutes.

In our analysis, we adjusted for this approximation by assigning the midpoint of the interval reported. For example, if a woman reported she began breastfeeding either immediately or within the first hour, we assigned the value of 0.5 hours, which represents the midpoint of the first hour. If she reported 1 hour, her response is converted to 1.5 hours. We converted responses in days to hours by multiplying by 24 and assuming the midpoint of the day; for example, a response of 1 day was coded as the midpoint between 1 day and 2 days in hours (36 hours). We calculated the

**A more nuanced description of delays in breastfeeding, especially if substantial differences are observed by mode of delivery, could provide insight for targeted policies or programs.**

**TABLE 1.** Sample of Most Recent Live-Born Children in the 2 Years Before Each Demographic Health Survey, 2014–2018

Region	Country	Cesarean Delivery, No. (%)	All Births, No.
North Africa, West and Central Asia, Europe	Albania 2017–2018	328 (31.7)	1,034
	Armenia 2015–2016	143 (21.5)	664
	Egypt 2014	3,602 (57.4)	6,271
	Jordan 2017–2018	955 (27.7)	3,452
	Maldives 2016–2017	460 (42.8)	1,074
	Tajikistan 2017	145 (5.9)	2,465
South and Southeast Asia	Bangladesh 2014	780 (24.6)	3,166
	Cambodia 2014	236 (8.1)	2,906
	India 2015–2016	17,838 (19.3)	92,600
	Indonesia 2017	1,260 (19.2)	6,561
	Myanmar 2015–2016	350 (21.2)	1,652
	Nepal 2016	198 (10.1)	1,965
	Pakistan 2017–2018	998 (25.8)	3,864
	Philippines 2017	572 (15.5)	3,693
	Timor-Leste 2016	97 (3.5)	2,815
Sub-Saharan Africa	Angola 2015–2016	203 (3.8)	5,298
	Benin 2017–2018	265 (4.9)	5,405
	Burundi 2016–2017	282 (5.2)	5,368
	Chad 2014–2015	101 (1.5)	6,656
	Ethiopia 2016	110 (2.6)	4,244
	Ghana 2014	276 (12.4)	2,234
	Kenya 2014	288 (8.2)	3,496
	Lesotho 2014	136 (10.1)	1,348
	Malawi 2015–2016	435 (6.6)	6,579
	Senegal 2016	251 (5.7)	4,410
	South Africa 2016	337 (24.7)	1,364
	Tanzania 2015–2016	268 (6.5)	4,106
	Uganda 2016	414 (7.1)	5,797
	Zimbabwe 2015	147 (6.1)	2,421
Latin America and Caribbean	Guatemala 2014–2015	1,403 (29.5)	4,756
	Haiti 2016–2017	136 (5.7)	2,390

mean and median time to breastfeeding among all births and by mode of delivery among ever-breastfed babies with nonmissing responses. We estimated the lower and upper bounds of the 95% confidence interval (CI) of the mean according to a Poisson distribution.

We conducted multivariable survival analyses to identify the factors associated with time to

initiation of breastfeeding. Because skin-to-skin contact is an important factor in breastfeeding, we analyzed data from 21 of the 31 recent DHS surveys completed that included a question about skin-to-skin contact. The model specification was determined after assessing the proportional hazard assumption based on Schoenfeld residuals, which revealed that survival (time to initiation of



breastfeeding) between covariate groups did not maintain proportionality over time and that relationships between covariates and the outcome were not consistently linear.<sup>25</sup> Therefore, we selected an accelerated failure time (AFT) model, which does not require an assumption of proportional hazards.<sup>26,27</sup> We tested 3 distributions of the AFT model (Weibull, log-normal, and log-logistic) for goodness of fit using Akaike's information criterion (AIC). We selected the log-logistic model because it produced the best fit model in every country but 2, wherein the AIC did not vary substantially between log-normal and log-logistic distributions.

Each model was restricted to babies who ever breastfed, starting as early as immediately after delivery, and did so within 4 days after birth. Data were censored at 4 days because, at that point, most women have reached lactogenesis stage II in which the composition of breastmilk has evolved from colostrum to transitional milk<sup>28</sup> and when nearly all (99% or more in most countries) babies who ever breastfed had initiated breastfeeding. All analyses excluded babies who died within the first 4 days (between 0 and 35 babies per country) because these newborns may have had complications that inhibited their ability to breastfeed.<sup>13,18</sup> We conducted 2 sensitivity analyses in which we removed these restrictions from the models to examine whether these exclusions (neonates who died within 4 days or babies who began breastfeeding after 4 days) altered our findings.

The models included socioeconomic, demographic, and health behavior characteristics of the mother and baby. Socioeconomic and demographic characteristics of the mother included place of residence (urban and rural); region; wealth quintile; education (none, primary, secondary or higher); employment (not employed, employed-professional, and employed-manual, agricultural, or other); exposure to mass media (less than once per week and once per week and more); and parity (1, 2, 3, 4+ live births). We also included marital status (currently married, not currently married). Jordan and Pakistan sampled only ever-married women. In the Republic of Maldives DHS, there was no designation for urban and rural within atolls and regions, so it was only possible to include region (and not place of residence) due to collinearity. Child characteristics included sex and birth size. Birth size was categorized as small, average, or above average, based on the weight of the child if available or recalled, or the mother's perception in the absence of a reported weight. Health behavior and care-related variables included antenatal care visits (<4, 4+); mode and place of delivery

(vaginal delivery at home, vaginal delivery in facility, cesarean delivery in facility); whether the baby was placed on the chest immediately after birth (had immediate skin-to-skin contact, either no or yes); and whether a postnatal check was done within 1 hour for either the mother or baby (no or yes). The postnatal check was based on the mother's report of whether anyone checked her or the baby's health within the first hour after delivery.

We used Stata version 16.0 for the analysis. All statistical tests adjusted for the complex survey design using multistage probability samples drawn from an existing sample frame and applied survey weights to account for nonresponse and disproportionate sampling.<sup>23</sup>

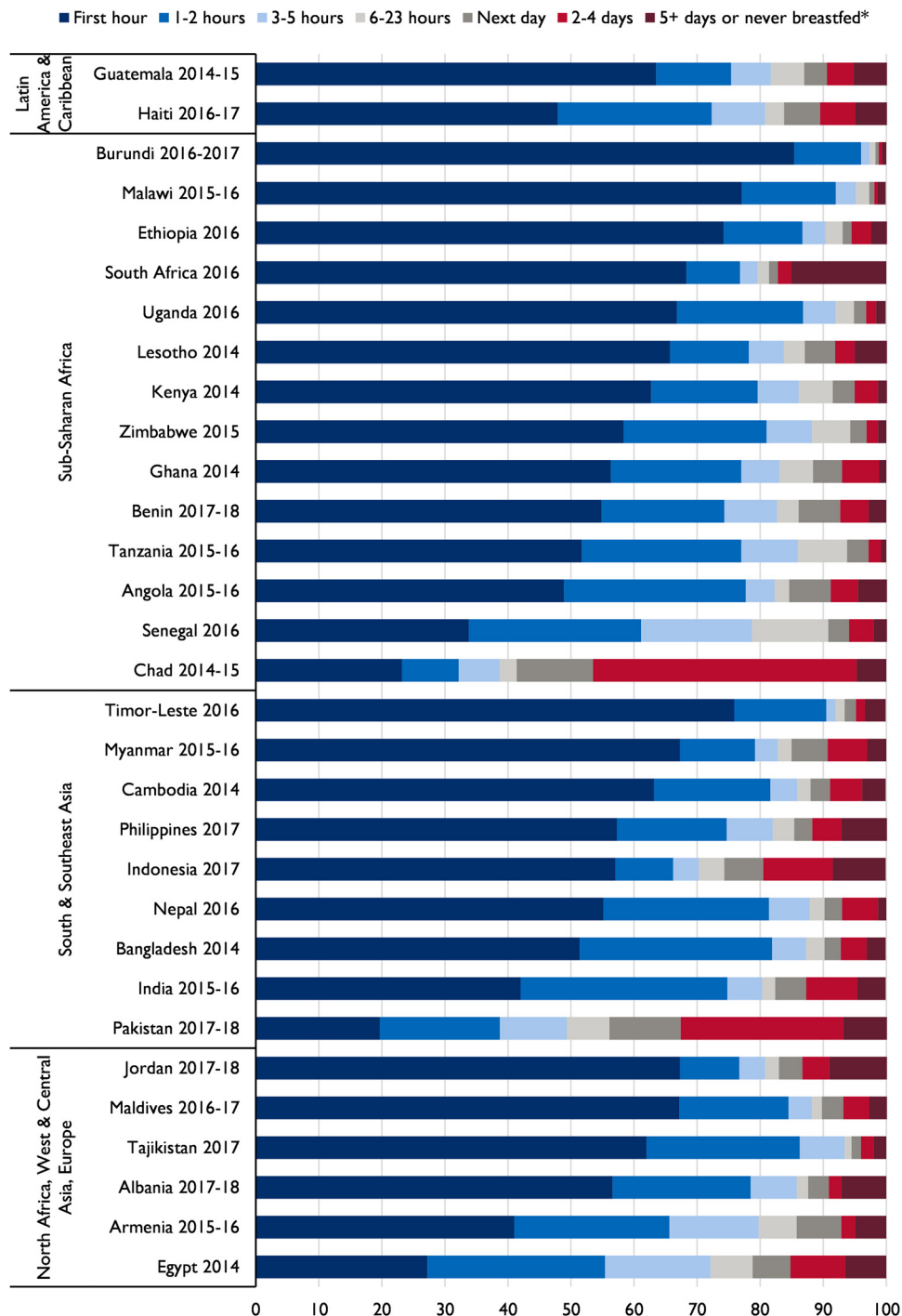
## RESULTS

Figure 1 presents the distribution of time to initiation of breastfeeding in 7 categories with additional information (percentage and 95% CI for each category in each country) provided in Supplement Table 1. In nearly all countries, 80% of babies began breastfeeding within the first day after birth, except Chad and Pakistan, where only 41% and 56% of babies began breastfeeding on the first day, respectively. Fewer than 10% of babies never breastfed or began breastfeeding 5 days after birth or later, the only exception to this being South Africa (15%). Although the majority of babies in most countries began breastfeeding immediately (within the first hour after birth), substantial differences existed across and within regions. For example, in sub-Saharan Africa, 85% of babies in Burundi began breastfeeding immediately versus 23% in Chad. We found inconsistent practice in South and Southeast Asia, where EIBF ranged from 20% in Pakistan to 76% in Timor-Leste, and in North Africa, West and Central Asia, and Europe, from 27% in Egypt to 67% in Jordan.

Table 2 shows the mean and median time to initiation of breastfeeding in hours for all babies and by mode of delivery, highlighting the disparities in time to initiation by mode of delivery. For all babies, the mean time ranged from 1.7 hours in Burundi to 40 hours in Chad. The mean time was less than 7 hours in more than half of the countries among babies born by vaginal delivery at a health facility but typically greater than 20 hours for those born by cesarean delivery. The median time was half an hour after delivery among all births as well as for vaginal deliveries at home and at a health facility. Among cesarean deliveries, the median time to initiation was 2.5 hours or more in most countries. On average, a cesarean delivery appeared to delay breastfeeding

**Although the majority of babies in most countries began breastfeeding within the first hour after birth, substantial differences existed across and within regions.**

**FIGURE 1.** Percentage Distribution of Children by Time to Initiation of Breastfeeding Among Most Recent Live-Born Children in the 2 Years Before the Survey, 2014–2018



\*Category includes “don’t know” or missing responses.

**TABLE 2.** Mean and Median Times (Hours) to Initiation of Breastfeeding, Among All Deliveries, Vaginal at Home, Vaginal at Facility, and Cesarean Delivery, Among Ever-Breastfed Last-Born Children Born in the Past 2 Years

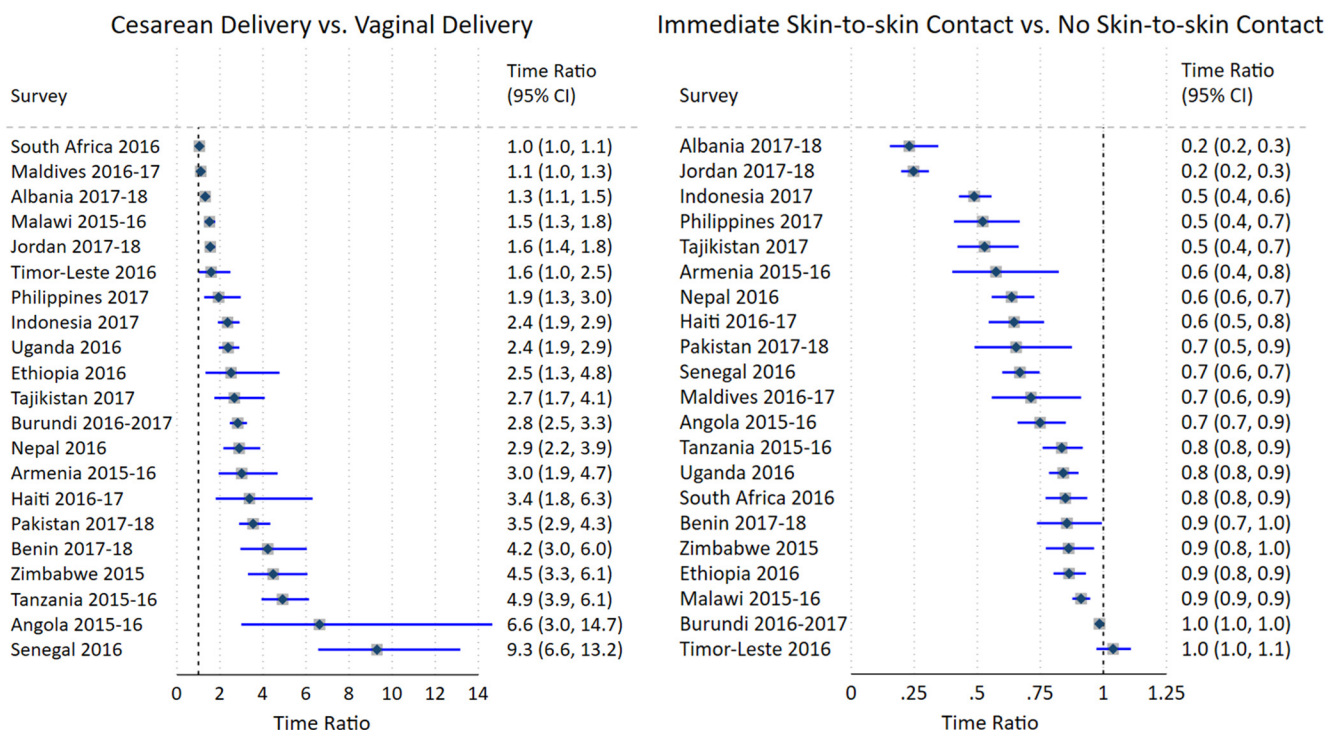
Region	Country	All		Vaginal Delivery-Home		Vaginal Delivery-Facility		Cesarean Delivery	
		Mean (95% CI)	Med.	Mean (95% CI)	Med.	Mean (95% CI)	Med.	Mean (95% CI)	Med.
North Africa, West and Central Asia, Europe	Albania 2017–2018	5.3 (3.8, 7.5)	0.5	1.2 (0.0, 165.3)	0.5	3.5 (1.7, 7.0)	0.5	9.5 (7.0, 12.8)	1.5
	Armenia 2015–2016	8.0 (6.5, 9.9)	1.5	1.9 (0.0, 148.1)	2.5	5.0 (3.9, 6.4)	1.5	19.9 (13.9, 28.6)	5.5
	Egypt 2014	16.5 (15.2, 17.8)	2.5	12.2 (9.8, 15.2)	1.5	10.1 (8.7, 11.7)	1.5	20.9 (19.1, 22.8)	3.5
	Jordan 2017–2018	8.6 (7.2, 10.2)	0.5	2.5 (0.9, 7.0)	0.5	4.7 (3.6, 6.2)	0.5	19.6 (16.0, 24.1)	0.5
	Maldives 2016–2017	10.0 (6.6, 15.1)	0.5	12.8 (5.4, 30.6)	1.5	9.5 (4.4, 20.6)	0.5	10.2 (7.1, 14.6)	0.5
	Tajikistan 2017	3.7 (3.0, 4.6)	0.5	1.5 (1.0, 2.2)	0.5	2.6 (2.1, 3.2)	0.5	23.5 (15.2, 36.2)	3.5
South and Southeast Asia	Bangladesh 2014	7.4 (6.1, 8.8)	0.5	4.7 (3.7, 5.9)	0.5	5.1 (3.5, 7.3)	0.5	15.4 (11.6, 20.5)	1.5
	Cambodia 2014	7.6 (6.6, 8.9)	0.5	11.6 (8.3, 16.3)	0.5	4.9 (4.0, 5.8)	0.5	31.6 (24.3, 41.1)	3.5
	India 2015–2016	12.7 (12.3, 13.1)	1.5	15.9 (15.2, 16.7)	1.5	8.8 (8.4, 9.3)	1.5	22.4 (21.1, 23.7)	1.5
	Indonesia 2017	17.8 (16.6, 19.2)	0.5	18.6 (16.0, 21.6)	0.5	13.3 (12.0, 14.7)	0.5	33.0 (29.5, 36.9)	3.5
	Myanmar 2015–2016	11.7 (9.8, 13.9)	0.5	10.9 (8.6, 13.7)	0.5	11.0 (7.4, 16.3)	0.5	14.6 (10.6, 20.1)	0.5
	Nepal 2016	7.9 (6.5, 9.6)	0.5	9.6 (7.3, 12.6)	1.5	3.9 (2.9, 5.3)	0.5	24.2 (16.6, 35.3)	2.5
	Pakistan 2017–2018	31.7 (28.9, 34.7)	5.5	26.8 (23.3, 30.8)	3.5	24.2 (21.2, 27.6)	3.5	50.8 (43.6, 59.1)	36.0
	Philippines 2017	8.2 (6.8, 9.8)	0.5	6.1 (4.2, 8.9)	0.5	5.6 (4.5, 7.0)	0.5	21.9 (15.9, 30.2)	1.5
	Timor-Leste 2016	2.8 (2.3, 3.4)	0.5	2.4 (1.8, 3.1)	0.5	2.4 (1.8, 3.2)	0.5	14.4 (10.0, 20.9)	0.5
Sub-Saharan Africa	Angola 2015–2016	8.5 (7.4, 9.7)	0.5	8.0 (6.8, 9.3)	1.5	7.4 (5.6, 9.7)	0.5	26.8 (21.0, 34.4)	6.5
	Benin 2017–2018	9.0 (8.1, 9.9)	0.5	8.1 (6.5, 10.0)	0.5	8.0 (7.1, 9.0)	0.5	28.0 (22.5, 34.9)	5.5
	Burundi 2016–2017	1.7 (1.4, 2.3)	0.5	1.4 (0.8, 2.2)	0.5	1.3 (0.9, 1.7)	0.5	10.4 (6.6, 16.6)	1.5
	Chad 2014–2015	40.4 (38.0, 42.9)	36.0	39.9 (37.1, 42.9)	36.0	40.4 (37.5, 43.6)	36.0	66.4 (52.3, 84.3)	60.0
	Ethiopia 2016	5.4 (4.3, 6.7)	0.5	4.6 (3.4, 6.2)	0.5	5.0 (3.6, 7.0)	0.5	28.8 (14.3, 58.1)	1.5
	Ghana 2014	11.5 (8.2, 16.1)	0.5	9.2 (6.9, 12.4)	0.5	8.7 (5.2, 14.5)	0.5	30.9 (15.8, 60.3)	2.5
	Kenya 2014	8.2 (6.0, 11.2)	0.5	12.3 (7.0, 21.8)	0.5	4.5 (3.6, 5.6)	0.5	16.9 (11.3, 25.4)	2.5
	Lesotho 2014	8.7 (6.7, 11.2)	0.5	10.3 (6.8, 15.7)	0.5	6.4 (4.7, 8.7)	0.5	21.7 (10.8, 43.6)	3.5
	Malawi 2015–2016	2.1 (1.8, 2.5)	0.5	2.5 (1.7, 3.6)	0.5	1.7 (1.4, 2.0)	0.5	7.5 (4.4, 12.6)	0.5
	Senegal 2016	9.0 (8.0, 10.1)	2.5	6.7 (5.7, 7.9)	2.5	6.2 (5.4, 7.2)	1.5	53.4 (44.3, 64.2)	36.0
	South Africa 2016	4.5 (3.3, 6.2)	0.5	15.2 (3.9, 59.6)	0.5	3.4 (2.4, 4.8)	0.5	6.2 (3.6, 10.7)	0.5
	Tanzania 2015–2016	5.1 (4.5, 5.8)	0.5	6.8 (5.8, 8.0)	1.5	3.3 (2.6, 4.1)	0.5	11.9 (8.3, 16.8)	4.5
	Uganda 2016	4.2 (3.6, 5.0)	0.5	4.5 (3.3, 6.1)	0.5	3.0 (2.4, 3.8)	0.5	15.2 (10.0, 23.2)	1.5
	Zimbabwe 2015	4.6 (3.8, 5.6)	0.5	7.7 (5.7, 10.4)	1.5	3.0 (2.1, 4.1)	0.5	16.0 (12.4, 20.6)	3.5
Latin America and Caribbean	Guatemala 2014–2015	18.5 (15.4, 22.1)	0.5	7.1 (5.3, 9.5)	0.5	11.1 (8.4, 14.6)	0.5	40.9 (32.0, 52.2)	3.5
	Haiti 2016–2017	11.7 (10.0, 13.7)	1.5	8.9 (7.3, 10.8)	1.5	10.4 (8.0, 13.6)	0.5	52.7 (36.1, 77.0)	6.5

Abbreviations: CI, confidence interval; Med., median.

the least in the Republic of Maldives and South Africa and the most in Senegal. In the region where cesarean delivery was most common (West and Central Asia and Europe), cesarean delivery was the least delayed compared with vaginal births.

Supplement Tables 2a and 2b present the background characteristics and care-seeking behavior of mothers and babies included in the survival analysis. Skin-to-skin contact was a common practice in most countries in Europe and Asia (except for Pakistan, where only 8% of births had immediate skin-to-

**FIGURE 2.** Time Ratios of Time to Initiation of Breastfeeding for Cesarean Delivery and Immediate Skin-to-skin Contact<sup>a</sup>



<sup>a</sup>The reference group for cesarean delivery was vaginal deliveries in a facility and the reference for immediate skin-to-skin contact was no immediate skin-to-skin.

skin contact) but varied substantially across sub-Saharan Africa and Haiti.

Figure 2 shows the time ratios (TRs) of 2 variables included in survival analysis: (1) cesarean delivery compared with vaginal delivery at facilities and (2) immediate skin-to-skin contact compared with no immediate skin-to-skin contact, after controlling for covariates of interest. Complementary Kaplan-Meier survival curves depicting these relationships are presented in Supplement Figures 1a, 1b, 2a, and 2b. With all other covariates held constant, compared with babies born vaginally in a facility, the median time to initiation of breastfeeding was significantly later among babies born via cesarean in all countries except the Maldives and South Africa. Stated differently, babies who were born vaginally had an earlier initiation of breastfeeding compared with babies that were born via cesarean delivery in almost all countries. Notably, the median time to initiation of breastfeeding among babies born through cesarean delivery was over 9 times slower than babies delivered vaginally at facilities in Senegal

(TR: 9.3; 95% CI=6.6, 13.2), 6.6 times as long in Angola (95% CI=3.0, 14.7), and almost 5 times later in Tanzania (TR: 4.9; 95% CI=3.9, 6.1). As seen in Supplement Tables 3a and 3b, which include the TRs and 95% CIs for the full model for each country, in 7 countries (mostly in sub-Saharan Africa), there was a significant but less substantial delay in breastfeeding among babies born vaginally at home versus in a health facility.

Conversely, skin-to-skin contact was significantly associated with a shorter time to initiation in all countries except Burundi and Timor-Leste. In most countries, the median time to initiation was 20% to 90% sooner among babies who received immediate skin-to-skin contact compared with babies whose mothers did not report immediate skin-to-skin contact. In Jordan and Albania, the time ratios were the most extreme (TRs 0.2; 95% CI=0.2, 0.3). The sensitivity analyses found no meaningful changes in the magnitude or strength of the associations after removing restrictions for neonatal survival and breastfeeding within 4 days.

**Babies who were born vaginally had an earlier initiation of breastfeeding than babies born via cesarean delivery in almost all countries.**

## ■ DISCUSSION

The benefits of EIBF have been well documented. One systematic review has also shown a dose-response relationship between the time to breastfeeding initiation and neonatal mortality: later initiation was associated with a greater risk of neonatal death.<sup>8</sup> Given such evidence, using nationally representative samples from low- and middle-income countries, we assessed time to breastfeeding initiation in 31 countries and its determinants in 21 countries.

Levels of EIBF generally appeared higher than estimates by WHO and UNICEF based on data from household surveys conducted in 2016 or earlier.<sup>29</sup> This finding suggested an increasing trend. However, in one-quarter of all countries studied, nearly half or more of all newborns were not breastfed until after the first hour, which is a delay that reduces the life-saving benefits of breastfeeding.<sup>1</sup> Even when optimal early initiation cannot be achieved, breastfeeding within 24 hours of birth still protects newborns from a greater risk of neonatal mortality compared with initiation after 24 hours.<sup>8</sup> Yet in 4 countries in this analysis, over 20% of babies began breastfeeding after 24 hours of delivery. For example, the median time to initiation in Pakistan was 36 hours. Research has identified a wide range of factors associated with late initiation of breastfeeding in Pakistan including the mother's working status and education, perceived benefit of breastfeeding, and traditional feeding practices.<sup>30</sup>

As in other studies,<sup>18,20</sup> our findings demonstrated that cesarean delivery significantly delayed breastfeeding in almost all countries. This finding is concerning because the use of cesarean delivery has increased globally.<sup>31</sup> Although cesarean delivery remains less common in most African countries, it has become more widely experienced by wealthier or more educated women.<sup>24</sup> Despite the challenges faced by women after surgery, studies have shown that with proper support, initiation of breastfeeding within the first hour is possible for babies born by cesarean delivery.<sup>2,29,32</sup> Also consistent with the findings in other studies, including those that used older DHS surveys and studies with an experimental or quasi-experimental design,<sup>10,12,13</sup> skin-to-skin contact between the mother and her baby was associated with a shorter time to breastfeeding initiation in almost all countries. Immediate skin-to-skin contact is believed to be particularly important for newborns born by cesarean delivery for EIBF as well as exclusive breastfeeding.<sup>32,33</sup>

Although EIBF and other breastfeeding practices could still be hampered by social and cultural

beliefs or norms, the sizable increase in the coverage of facility delivery in low- and middle-income countries provides opportunities to promote optimal breastfeeding practices through interventions in health facilities. It is important to have current national guidelines that emphasize the importance of EIBF and essential training for health care staff. Training for health care staff has been associated with improved staff knowledge, attitude, and compliance with the recommended breastfeeding practices and with increased exclusive breastfeeding in some settings.<sup>34</sup> Training for antenatal care providers on breastfeeding counseling has also been shown to relate to EIBF.<sup>35</sup> Further research is needed to identify effective interventions that motivate health providers to promote EIBF.

## Limitations

This analysis has several limitations. First, self-reporting of the outcome variable is subject to recall bias. Previous research suggests that self-reports of the timing of initiation of breastfeeding (specifically, within 1 hour) do not meet acceptable validity criteria.<sup>24</sup> Although women's reporting of EIBF overestimate observed EIBF, self-report still accurately reflects that early breastfeeding is more common among vaginal deliveries than cesarean deliveries.<sup>36</sup> Our study attempted to minimize recall bias to the extent possible by restricting the analysis to the most recent birth in the past 2 years. Our study also assumes the midpoint of the interval reported, which may result in additional bias; however, for the majority of women who reported breastfeeding with 1 hour, shifting coding from 0 hours to 0.5 hours may more accurately reflect the timing of early initiation as babies progress through several initial phases of first relaxing, awakening, and activity before suckling.<sup>9</sup>

Further, our analysis could not account for all the complications that could interfere with breastfeeding. We controlled for birthweight as a proxy for preterm birth, although other complications could hinder early breastfeeding. For newborns, potential complications include congenital deformities, low Apgar scores, and near-miss cases, in which a pregnant woman comes close to maternal death. For mothers, complications can include eclampsia, anesthesia, blood transfusion, other intensive or surgical care such as hysterectomy, or other underlying conditions.<sup>7,18</sup>

## ■ CONCLUSION

Although breastfeeding within the first several hours after birth is common in the 31 countries

**Our finding that cesarean delivery significantly delayed breastfeeding is concerning because this mode of delivery has increased globally.**

analyzed in this study, this analysis demonstrated consistent and often substantial lags among babies born by cesarean delivery but earlier time to breastfeeding initiation among babies with immediate skin-to-skin contact. Interventions that reduce the time to initiation of breastfeeding, such as skin-to-skin contact, should be targeted to health care systems given the increase in health facility delivery and cesarean delivery. Programs and policies should address country-specific practices, including the practice of and the delay in breastfeeding related to cesarean delivery.

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**Author contributions:** LM, WW, and TP conceptualized the study and developed the analysis plan. LM and SF analyzed the data with support from WW and TP. LM prepared graphical and tabular visualizations of the data. LM, WW, and SF co-wrote the article. All authors critically reviewed the article.

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## ORIGINAL ARTICLE

# Use of Fertility Awareness-Based Methods for Pregnancy Prevention Among Ghanaian Women: A Nationally Representative Cross-Sectional Survey

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## Key Findings

- Standard approaches underestimate fertility awareness-based method (FABM) use; we posit that at least 18% of contracepting Ghanaian women likely use an FABM.
- Economically and educationally advantaged women had higher odds of current FABM use (versus intrauterine device/hormonal method), which may suggest deliberateness of method selection (as opposed to limited access to alternatives).
- Most (92%) rhythm users wish to improve the effectiveness of their method, and many are willing to track additional biomarkers, but only 17% ever discussed their method with a health professional.

## Key Implications

- Researchers, programmers, and funders should better understand and address FABM users' needs, in commitment to reproductive autonomy and choice.

## ABSTRACT

Few studies in low- and middle-income countries have examined the use of fertility awareness-based methods (FABMs) for pregnancy prevention. Understanding the prevalence of FABM use among Ghanaian contraceptors and the characteristics and practices of users is essential. Our 2018 nationally representative survey of Ghanaian women included detailed questions on the use of rhythm and Standard Days Method/Cycle Beads (SDM). After considering multimethod use patterns, we estimated likely FABM prevalence among contraceptors, identified characteristics associated with current use of an FABM (vs. current use of a hormonal method/intrauterine device [IUD]), and described how women report using FABMs. At least 18% of contracepting Ghanaian women likely use an FABM, though this may be underreported. Among FABM users, 57% reported current use of an FABM alone; the remainder reported concurrent use of other methods. Women who were older, richer, more educated, and had fewer children had higher odds of current FABM use versus IUD/hormonal method. Although FABM users were more likely than other contraceptors to correctly identify the approximate fertile time, only 50% of FABM users did so correctly. Most (92%) rhythm users were interested in making their method use more effective. While 72% had heard of SDM, less than 25% had heard of various other ways to make the rhythm method more effective. Only 17% of rhythm users had ever discussed the method with a health professional. Rhythm users indicated substantial willingness to track additional biomarkers (e.g., daily temperature or cervical mucus) or to use a phone to enhance the effectiveness of their method, and most indicated no substantial difficulty getting partners to abstain or withdraw on fertile days. A nontrivial proportion of reproductive age Ghanaian women are using an FABM, nearly all of whom are interested in learning how to improve its effectiveness. The family planning field should better address these women's contraceptive needs in commitment to reproductive autonomy and choice.

## INTRODUCTION

Understanding the extent of people's reliance on fertility awareness-based contraceptive methods (FABMs) and the characteristics and practices of such users is essential to comprehensively meeting reproductive needs. A concise introduction to FABMs can be found elsewhere.<sup>1</sup> In brief, FABMs aim to identify the span of days during each menstrual cycle when sexual intercourse is most likely to result in pregnancy (the

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“fertile window”). Depending on the requirements of the specific FABM, users track changes in 1 or more fertility biomarkers (e.g., menstrual start dates, basal body temperatures, cervical mucus or cervical position, and urinary hormone metabolites) in attempts to identify their fertile window during each menstrual cycle. Certain FABMs can be used to either plan or prevent pregnancy. If pregnancy prevention is desired, users can either avoid penile-vaginal intercourse or use other methods (e.g., barrier methods, withdrawal, etc.) on days the method identifies as fertile.

Such FABM users are taking action to avoid conceiving but may be more vulnerable to unintended pregnancy compared with users of certain other contraceptive methods. For example, in low-income countries, an estimated 19% of those who report using the rhythm method (a type of FABM, described in greater detail below) will experience an unintended pregnancy in the first year of use, compared with 0.3% of implant users.<sup>2</sup> Contraceptive effectiveness is a key attribute for many people choosing a method, but other method characteristics influence contraceptive decision making, such as safety, side effects, impact on bleeding patterns, cost, ease of use, protection from sexually transmitted infections, privacy, etc.<sup>3–7</sup> Despite a common assumption that people resort to less effective contraceptive methods due to a lack of access to more effective options, these choices often reflect user preferences.<sup>8–13</sup> For example, side effects and health concerns are the most common reasons for nonuse or discontinuation of hormonal contraception among women in low-income countries who do not desire pregnancy,<sup>14,15</sup> whereas methods perceived as “natural” may appeal to people with these concerns.<sup>12</sup>

FABMs have received relatively limited attention in the contraceptive literature. Rhythm is perhaps the most widely known FABM, although many who report using rhythm are not likely using its formal requirements.<sup>16</sup> Relatively little is known about how those who identify as rhythm users actually use the method and the extent to which they rely on other contraceptive methods during the fertile window versus abstaining from sex during this period (i.e., practice periodic abstinence). Rhythm is typically classified as a traditional method. However, certain other FABMs (e.g., Standard Days Method [SDM], TwoDay Method, etc.) are often classified as modern—although these classifications are not universal (e.g., the United Nations Population Division does not classify these methods as modern)—and the nomenclature is imperfect.<sup>17–21</sup> In addition to

FABMs, some people use menstrual tracking smartphone apps or devices to time sexual intercourse for pregnancy prevention. Although 2 apps have received clearance from the United States Food and Drug Administration for use as a contraceptive method (Natural Cycles in 2018,<sup>22</sup> which also received CE Marking in Europe, and Clue in 2021<sup>23</sup>), most such apps or devices are not tested or indicated for this purpose and may offer predictions of unknown accuracy regarding the timing of fertile days.<sup>24,25</sup>

Research focused specifically on FABM use in low- and middle-income countries (LMICs) has been particularly limited (with exceptions from the United States Agency for International Development and the Institute for Reproductive Health at Georgetown University<sup>18,26–31</sup>). However, there are existing and emerging reasons for greater understanding around FABM use in LMICs. First, our understanding of contraceptive decision making is incomplete without understanding people who select contraceptive options that are not among the most highly effective. Understanding such choices can help to support client-centered approaches to contraceptive counseling, programming, and method development. Second, FABMs use is increasing in some contexts,<sup>32</sup> and multiple researchers have identified substantial underestimation of methods (including rhythm) in nationally representative surveys.<sup>12,13,33–35</sup> This suggests incomplete existing information on the prevalence of FABM use, which impacts our understanding of who chooses FABMs and impacts estimation of other key metrics (e.g., unmet need for contraception). Third, without understanding how people employ these methods, we have little ability to identify approaches that enhance the effectiveness of their contraceptive practices while respecting their contraceptive preferences.

Additional reasons for understanding FABM use in LMICs have emerged more recently. First, the coronavirus disease (COVID-19) pandemic has limited access to contraceptive services, prompting calls by some international organizations for counseling on FABMs,<sup>36</sup> which are less vulnerable than other methods to commodity supply chain disruptions.<sup>37</sup> Furthermore, there is an increasing understanding of the application of principles of self-care to sexual and reproductive health worldwide,<sup>38</sup> as well as emerging literature on whether fertility knowledge (e.g., regarding the timing of ovulation or impacts of age on fertility) impacts reproductive outcomes.<sup>39,40</sup> Although FABMs are not appropriate for all individuals, they can assist certain couples to avoid (or seek)

**Our understanding of contraceptive decision making is incomplete without understanding people who select contraceptive options that are not among the most highly effective.**

**Despite a common assumption that people resort to less effective contraceptive methods due to a lack of access to more effective options, these choices often reflect user preferences.**

**We aimed to estimate the prevalence of FABM use among Ghanaian contraceptive users, understand characteristics associated with choosing an FABM, and collect information on how Ghanaian women use FABMs.**

pregnancy with limited or no clinical support after being trained in and correctly using the method. Finally, the increasing development of new technologies will continue to provide new tools that facilitate use of FABMs and may increase their prevalence. The contraceptive field can play a useful role in helping people who prefer a method they may perceive as “natural” in understanding if new technologies have reliable evidence on contraceptive effectiveness<sup>41</sup> and to optimize the effectiveness of chosen methods.

To expand understanding of FABM use in LMICs, we aimed to examine the use of 2 FABMs (rhythm method and SDM/CycleBeads) in a nationally representative sample of Ghanaian women. Our objectives were to estimate the prevalence of FABM use among Ghanaian contraceptive users (including careful consideration of multimethod use patterns), understand characteristics associated with choosing an FABM (relative to choosing an intrauterine device [IUD] or hormonal method), and collect detailed information on various aspects of how Ghanaian women use FABMs. This article also aims to contribute to improvements in measuring FABM use across diverse contexts by detailing methodological considerations around terminology and definitions used for FABMs in large-scale surveys and how these might be improved.

## ■ METHODS

### Survey Design and Implementation

Our survey design and sampling have been described in detail elsewhere.<sup>42</sup> Briefly, data for this analysis were drawn from a nationally representative, community-based survey of reproductive-aged (15–49 years) women in Ghana (N=4,722), conducted in 2018 as part of a larger study on abortion incidence in Ghana.<sup>43</sup> The survey was a collaborative effort between the Guttmacher Institute, the Kwame Nkrumah University of Science and Technology (KNUST), and the Performance Monitoring and Accountability 2020 team at the Johns Hopkins Bloomberg School of Public Health. We used a multistage stratified cluster sampling design and probability-proportional-to-size sampling to select 100 enumeration areas, each consisting of approximately 200 households. We then listed, mapped, and randomly selected 42 households in each selected enumeration area. In those households, we conducted a short household survey to collect socioeconomic information and to identify eligible female respondents. We invited all eligible women to

give informed consent and participate in the full survey. Trained resident enumerators collected data for both surveys in a private area, using an Android smartphone enabled with Open Data Kit electronic data collection software. Households with one or more participating respondents who completed the full survey received a bar of soap. The Institutional Review Boards of the Guttmacher Institute, the KNUST Committee on Human Research, Publication and Ethics, and the Johns Hopkins Bloomberg School of Public Health provided ethical approval. Prior analyses of these data showed that among all respondents aged 15–49 years in our sample who had ever had sex (n=4,139), 33.7% currently reported using any contraceptive method.<sup>44</sup>

### Identifying Rhythm or SDM Users

Traditional methods and modern FABMs are likely underreported in many surveys, including Demographic and Health Surveys (DHS). Studies suggest that some respondents interpret filtering questions (e.g., “are you or your partner currently doing something or using any method to delay or avoid getting pregnant?”) as pertaining only to modern or non-“natural” methods.<sup>12,13,33,34</sup> Additionally, when asked to spontaneously name methods used, a qualitative study of 48 Ghanaian women found that “fertility awareness methods were rarely spontaneously mentioned as a way to prevent pregnancy...yet counting days was almost universally used at one time or another and participants described it as a taken-for-granted part of a woman’s life.”<sup>34</sup> Other studies suggest that women using multiple methods (e.g., an FABM with condoms during the fertile window) may potentially report only condom use,<sup>12</sup> unless, for example, she is asked about the use of all potential methods.

Our study did not address the first concern as we did use the filtering question, but it did address the second concern by asking about the use of each method among those who affirmed using a method. Specifically, survey respondents were asked, “Have you or a partner ever done something or used any method to delay or avoid getting pregnant?” We asked respondents who said “yes” to spontaneously list methods ever used, and then the interviewer asked about each of the possible methods to capture users who self-identified as using any of these methods (female and male sterilization, implants, IUDs, injectables (3 month and 1 month), pill, emergency contraception (EC), male and female condoms, diaphragm, foam or jelly, SDM/Cycle Beads, lactational amenorrhea

method, N-tablet, rhythm method, withdrawal, washing, or “other traditional method”). The interviewer next followed a similar process for current method use by asking nonpregnant women, “Are you or your partner currently doing something or using any method to delay or avoid getting pregnant?” Again, we only asked respondents who said “yes” to list methods currently used, before being asked about each possible method, to self-identify as current users.

Like DHS and other surveys, our survey may suffer from underreporting of traditional or “natural” methods, if respondents answered “no” to both filtering questions under the assumption that traditional or “natural” methods do not count. Therefore, we interpret our prevalence estimates as a lower bound. However, each respondent who acknowledged ever or currently doing something or using any method to delay or avoid pregnancy was probed on all possible contraceptive methods.

## Data Analysis

Method-specific prevalence is typically calculated based upon the most effective method a person reports currently using. For example, each DHS survey contains a hierarchical list of methods, ordered by typical use contraceptive effectiveness estimates. If a DHS respondent reports currently using both SDM and condoms, she is considered a condom user in prevalence estimation. This approach may underestimate FABM prevalence, as some FABM users use barrier methods or EC during the fertile window<sup>34,45</sup> and would thus be coded as a barrier or EC user, despite having sex with no contraception on days that the method (correctly or incorrectly) identifies as infertile.

To address this underestimation issue, we used an approach previously applied to data from the United States<sup>46</sup> to estimate likely FABM prevalence among Ghanaian contraceptors. First, we calculated a standard prevalence estimate based on “most effective” method (using the ordering represented in Table 1); as already noted, this approach may underestimate FABM use. Next, we recalculated prevalence, incorporating information on multiple method use. That is, a person who reported currently using 2 or more methods would be included in all reported method categories for method-specific prevalence estimation. These are likely overestimates since some women use an FABM with a highly effective method (such as sterilization, an IUD, or hormonal contraception), which likely serves as their primary mode of contraception. Therefore, to identify

the most likely FABM prevalence estimate, it is necessary to examine specific patterns of multiple method use among FABM users. We classified respondents who reported any current use of an FABM into 3 categories:

- Category A: Reported current use of an FABM alone or with current use of a less effective method (i.e., withdrawal, washing, etc.)
- Category B: Reported current use of an FABM in conjunction with current use of barrier methods and/or EC
- Category C: Reported current use of an FABM in conjunction with current use of a highly effective method (i.e., hormonal contraception, an IUD, or sterilization).

As in a prior study,<sup>46</sup> we considered women in Category A as definite FABM users, women in Category B as likely FABM users, and women in Category C as relying primarily on a highly effective (non-FABM) method. Thus, we included women in Categories A or B in our FABM prevalence estimation.

We calculated prevalence estimates among “contraceptors,”\* excluding women who: did not report that they (or their partner) were “currently doing something or using any method to delay or avoid getting pregnant”; women who were currently trying for pregnancy, women who were currently pregnant, and women who reported never having had sexual intercourse. We considered the remaining 1,165 participants “contraceptors.”

Next, we conducted bivariate and multivariable logistic regressions to identify characteristics we hypothesized to be associated with being a current (definite or likely) FABM user versus a current user of hormonal contraceptives or an IUD, and that were available in these data. Characteristics we examined included ecological zone (Northern, Middle, Central), residence (urban vs. rural), age (continuous), marital status (currently married/cohabiting, formerly married or cohabiting, never married or cohabiting), parity (continuous), education (none, primary or middle, secondary), religion (none, any Christian, Muslim, traditional/other), wealth (poorest 60% vs. richest 40%), importance of avoiding a pregnancy now (very important, somewhat important, not at all important), and correct knowledge of approximate fertility time (incorrect vs. correct). We present a multivariable model including all variables hypothesized to be relevant (a sensitivity

**Method-specific prevalence is typically calculated based on the most effective method a person reports currently using, but this approach may underestimate FABM prevalence.**

\*For comparability to other existing estimates, we also calculated contraceptive prevalence among all women, married women, and sexually active unmarried women (Supplement A).

**TABLE 1.** Percent Distribution of Contraceptors<sup>a</sup> Aged 15–49, by Current Contraceptive Method(s) Used at Interview, Ghana, 2018

	Among Contraceptors (Unweighted n=1,165), <sup>a</sup> by Most Effective Method Reported Weighted % and 95% CI	Among Contraceptors (Unweighted n=1,165), <sup>a</sup> By All Methods Reported Weighted % and 95% CI <sup>b</sup>
<b>Female sterilization</b>	3.5 (2.4, 5.0)	3.5 (2.4, 5.0)
<b>Hormonal methods</b>		
Implant	22.9 (19.6, 26.7)	22.9 (19.6, 26.7)
Intrauterine device	2.5 (1.6, 4.0)	2.6 (1.6, 4.1)
3-month injectables	19.2 (16.7, 22.0)	20.4 (17.8, 23.3)
1-month injectables	1.7 (1.1, 2.7)	2.0 (1.3, 3.1)
Pill	12.3 (10.0, 15.0)	13.8 (11.3, 16.8)
Emergency contraception	7.5 (5.7, 9.7)	8.2 (6.3, 10.4)
<b>Condoms</b>		
Male condom	7.8 (6.1, 9.8)	11.8 (9.6, 14.3)
Female condom	0.1 (0.0, 1.1)	0.3 (0.1, 1.0)
<b>Traditional methods and FABMs</b>		
Standard Days Method	4.3 (2.5, 7.1)	6.0 (3.7, 9.4)
Lactational Amenorrhea Method	0.9 (0.5, 1.8)	1.0 (0.5, 1.9)
Rhythm	9.2 (6.9, 12.3)	13.6 (10.5, 17.3)
Withdrawal	3.4 (2.2, 5.1)	12.5 (9.7, 15.9)
N-Tablet <sup>c</sup>	2.1 (1.1, 4.0)	3.6 (2.1, 5.9)
Washing	0.3 (0.0, 0.9)	2.4 (1.3, 4.4)
Other traditional methods (unspecified)	2.3 (1.4, 3.6)	3.0 (2.1, 4.5)

Abbreviations: CI, confidence interval; FABM, fertility awareness-based method.

<sup>a</sup>Denominator includes women who reported currently using contraception, being sexually experienced, not being currently pregnant, and not currently trying for pregnancy.

<sup>b</sup>Indicates percent of all contraceptive users that reported using this method at the time of interview, either individually or as part of multiple method use.

Percentages do not sum to 100% because more than one method may have been used at the time of interview. Respondents could list as many methods as necessary.

<sup>c</sup>N-Tablet refers to Primolut N, a norethisterone pill approved for treating menstrual disorders, which women in Ghana report using as a peri-coital contraceptive method, despite a lack of evidence that it is effective or safe for contraceptive use.

Note: No participants reported that they or their partner was currently using male sterilization, diaphragm, or foam/jelly.

analysis demonstrated similar results when including only those variables significant at  $P \leq .05$ ). Finally, we calculated descriptive statistics on a series of detailed questions asking FABM users about their knowledge of and ways in which they practice FABMs.

We performed analysis in Stata version 16, accounting for the complex survey design using survey weights to adjust for the probability of selection and the Taylor Linearization method to calculate standard errors that correctly account for clustering. We also used the *subpop* option to restrict to appropriate analytic populations.

**Our data revealed a diverse range of FABM method use patterns.**

## RESULTS

### FABM Prevalence Among Contraceptors

Among contraceptors, 9.2% reported rhythm and 4.3% reported SDM as their most effective method (Table 1). As previously noted, these are likely underestimates. Calculating prevalence among contraceptors based on all methods reported increased rhythm prevalence to 13.6% and SDM prevalence to 6% (Table 1). As mentioned, these are likely overestimates, so we examined specific patterns of multimethod use among FABM users.

Our data revealed a diverse range of FABM method use patterns. Among all women who

**TABLE 2.** Use Patterns Among Women Reporting Current Use of Rhythm or SDM, With or Without Current Use of Other Methods

Rhythm	1. Reported Current Use of Rhythm Plus Other Method	Weighted % Among Those Reporting Rhythm (Unweighted n/N)	2. Classification Using “Most Effective Method” Approach	3. Among Women Who Reported Rhythm <sup>a</sup> Weighted % (Unweighted n/N)
A. Relies primarily on rhythm	+ No other method	57.3% (89/156)	A rhythm user	68% (106/156)
	+ Withdrawal	5.6% (9/156)		
	+ Withdrawal + washing	3.4% (5/156)		
	+ N tablet	1.3% (2/156)		
	+ Washing	<1% (1/156)		
B. May rely primarily on rhythm and periodic use of EC and/or condoms <sup>b</sup>	+ EC	5.9% (7/156)	A male condom or EC user	23% (36/156)
	+ Male condoms + withdrawal	5.2% (8/156)		
	+ EC + male condoms + withdrawal	1% (2/156)		
	+ Male condoms	1% (2/156)		
	+ Other unique combinations	9.9% (17/156) <sup>c</sup>		
C. Uses rhythm but relies primarily on a modern method	+ 3 monthly injectables	1.7% (3/156)	A user of a permanent, long-acting reversible, or hormonal method	9% (14/156)
	+ Pill + withdrawal	1.2% (2/156)		
	+ Pill	1.2% (2/156)		
	+ Other unique combinations	4.9% (7/156) <sup>d</sup>		
<b>SDM</b>				
	1. Reported Current Use of SDM Plus Other Method	Weighted % Among Those Reporting SDM (unweighted n/N)	2. Classification Using “Most Effective Method” Approach	3. Among Women Who Reported SDM <sup>a</sup> Weighted % (Unweighted n/N)
A. Relies primarily on SDM	+ No other method	57.3% (39/68)	An SDM user	72% (49/68)
	+ Withdrawal	11.9% (8/68)		
	+ N Tablet	2.9% (2/68)		
B. May rely primarily on SDM and periodic use of EC and/or condoms <sup>b</sup>	+ Male condoms	8.6% (5/68)	A male condom or EC user	28% (19/68)
	+ Male condoms + EC + withdrawal	5.2% (3/68)		
	+ Male condoms + withdrawal	2.9% (2/68)		
	+ EC	2.9% (2/68)		
	+ Other unique combinations	8.4% (7/68) <sup>e</sup>		
C. Uses SDM but relies primarily on a modern method			A user of a permanent, long-acting reversible, or hormonal method	0% (0/68)

Abbreviations: EC, emergency contraception; SDM, Standard Days Method.

<sup>a</sup>Who would be classified as per label in column 2, if using the “most effective method” classification approach.

<sup>b</sup>4 women reported using both rhythm and SDM, so they may rely primarily on either FABM. In DHS they would be classified as an SDM user.

<sup>c</sup>Rhythm plus male condoms and/or EC, and potentially one or more of the following: withdrawal, washing, other traditional method, or SDM.

<sup>d</sup>Rhythm plus 2 or more of the following: implants, 3 monthly injectables, pill, male condoms, LAM, EC, withdrawal, washing.

<sup>e</sup>SDM plus male condoms and/or EC, and potentially one or more of the following: rhythm, withdrawal, N Tablet.

reported currently using rhythm or SDM, over half (57.3%) reported using that FABM without any additional methods (Table 2). The next most common pattern of multimethod use among rhythm users involved either EC or withdrawal (among

5.9% and 5.6% of women who reported rhythm use, respectively), and among SDM users, involved either withdrawal or male condoms (among 11.9% and 8.6% of women who reported SDM, respectively). If classified by

**TABLE 3.** Prevalence of FABMs by Estimation Method and Population Subgroup

	Rhythm % (95% CI)		SDM % (95% CI)		Either <sup>b</sup> % (95% CI)	
	“Most Effective Method” Estimation Approach	Our Estimation Approach <sup>a</sup>	“Most Effective Method” Estimation Approach	Our Estimation Approach <sup>a</sup>	“Most Effective Method” Estimation Approach	Our Estimation Approach <sup>a</sup>
All women	2.4 (1.7, 3.3)	3.0 (2.2, 4.0)	1.1 (0.6, 1.9)	1.4% (0.9, 2.3)	3.5 (2.8, 4.4)	4.3 (3.4, 5.5)
Currently married women	3.2 (2.4, 4.4)	3.6% (2.6, 4.8)	1.7 (1.0, 2.8)	2.0 (1.2, 3.3)	4.9 (3.9, 6.2)	5.6 (4.3, 7.0)
Sexually active (within last 30 days) unmarried women	3.6 (1.7, 7.1)	6.8 (3.9, 11.4)	1.4 (0.5, 4.0)	1.6 (0.6, 4.0)	5.0 (2.8, 8.6)	8.2 (5.2, 12.6)
Contraceptors	9.2 (6.9, 12.3)	12.4 (9.5, 15.9)	4.3 (2.5, 7.1)	6.0 (3.7, 9.4)	13.5 (10.9, 16.7)	18.1 (14.9, 21.8)

Abbreviations: CI, confidence interval; FABM, fertility awareness-based method; SDM, Standard Days Method.

<sup>a</sup>Incorporating information on multiple method use. This approach assumes that women in Categories A and B in Table 2 rely primarily on an FABM and may routinely or occasionally use condoms and/or EC during days they believe to be fertile.

<sup>b</sup>The “either” category does not always equal the sum of the “rhythm” and “SDM” category due to a small number of women who reported both methods.

most effective method, 68% and 72% of women who reported currently using rhythm or SDM, respectively, would be classified as a user of the FABM they reported (Table 2, category A). Approximately 23% and 28% of women who reported using rhythm or SDM, respectively, would be classified as either a user of male condoms or EC using the standard prevalence estimation approach; though these women may rely primarily on an FABM and use condoms and/or EC episodically during their presumed fertile window (Table 2, category B). Finally, 9% of women who reported using rhythm (and 0% of women who reported using SDM), reported also currently using a permanent, long-acting reversible, or hormonal method, and would be classified as a user of that more highly effective method using the standard prevalence estimation approach (Table 2, category C).

We assumed that respondents in categories A and B (Table 2) should be counted as FABM users, suggesting that at least 18.1% of contraceptors in Ghana relied primarily on an FABM, whether modern (SDM: 6%) or traditional (rhythm: 12.4%) (Table 3). In other words, taking multiple method use (i.e., among women using an FABM plus (fe)male condoms and/or EC) into account increased the percentage of women who likely relied on an FABM from 13.5% (95% confidence interval [CI]=10.9, 16.7, and composed of 9.2% rhythm users and 4.3% SDM users) to 18.1% (95% CI=14.9, 21.8).

### Characteristics Associated With FABM Use vs. Hormonal Contraception/IUD Use

In bivariate analyses, factors associated with approximately twice the odds of FABM use relative to hormonal contraception/IUD use included: living in the Middle or Central zone (vs. Northern zone), having never been (vs. currently being) married or cohabitating, feeling that avoiding pregnancy now was not at all (vs. very) important, identifying with any Christian religion (vs. no religion), and correctly identifying the approximate fertile time (vs. not knowing or correctly identifying it) (Table 4). Living in an urban (vs. rural) area and being in the richest 40% (vs. poorest 60%) of the population were associated with approximately 3 times the odds. Having attended secondary school (vs. no school) was associated with over 4 times the odds of FABM use (vs. hormonal contraception/IUD use). Each additional child born was associated with 20% lower odds of FABM use. Age was not significantly associated with FABM use.

In multivariable analysis, factors significantly associated with FABM use (vs. hormonal contraception/IUD use) included: age (each year was associated with an increase in odds of FABM use by 10%), parity (each child was associated with a decrease in odds of FABM use by 30%), and being richer or having attended secondary school or higher, each of which was associated with approximately double the odds of FABM use (Table 4). Feeling that avoiding pregnancy was not at all

**TABLE 4.** Odds Ratio Associated With Use of an FABM Relative to Use of Hormonal Contraception or an IUD

	Use of an FABM (Relative to Use of Hormonal Contraception/IUD)			
	Unadjusted Model <sup>a</sup>		Adjusted Model <sup>±</sup>	
	OR	95% CI	OR	95% CI
Zone (ref :Northern)				
Middle	1.9 <sup>b</sup>	1.0, 3.5	1.5	0.7, 3.4
Central	2.0 <sup>b</sup>	1.1, 3.8	1.1	0.4, 2.8
Residence (ref: rural)				
Urban	2.7 <sup>c</sup>	1.5, 4.7	1.2	0.6, 2.4
Age (continuous)	1.0	0.9, 1.0	1.1 <sup>c</sup>	1.0, 1.1
Union/marital status (ref: currently married/cohabitating)				
Formerly married or cohabitating	0.7	0.3, 1.5	0.6	0.2, 1.3
Never married or cohabitating	2.3 <sup>d</sup>	1.3, 4.0	1.5	0.8, 2.9
Parity (continuous)	0.8 <sup>c</sup>	0.7, 0.9	0.7 <sup>c</sup>	0.6, 0.8
Education (ref: none)				
Attended primary or middle	1.7	1.0, 3.0	1.4	0.8, 2.5
Attended secondary	4.4 <sup>c</sup>	2.3, 8.6	2.1 <sup>b</sup>	1.1, 4.1
Religion (ref: no religion)				
Any Christian	2.0 <sup>b</sup>	1.1, 4.0	1.1	0.6, 2.3
Muslim	1.5	0.7, 3.3	1.2	0.4, 3.3
Traditional religion/other	0.3	0.1, 1.1	0.3	0.1, 1.2
Wealth (ref: poorest 60%)				
Richest 40%	3.0 <sup>c</sup>	2.0, 4.5	1.7 <sup>b</sup>	1.0, 2.7
Importance of avoiding pregnancy now (ref: very important)				
Not at all important	1.8 <sup>b</sup>	1.0, 3.2	1.9	0.9, 3.7
Somewhat important	1.3	0.6, 2.7	1.3	0.6, 3.2
Correct knowledge of approximate fertile time (ref: incorrect knowledge)				
Correct	1.9 <sup>d</sup>	1.2, 3.1	1.5	0.9, 2.6

Abbreviations: CI, confidence interval; FABM, fertility awareness-based method; IUD, intrauterine device; OR, odds ratio.

<sup>a</sup> Model includes only contracepting women who rely or may rely primarily on an FABM (n=206), as well as users of hormonal contraception or an IUD (n=786).

<sup>±</sup> Adjusted for all other variables shown.

<sup>b</sup> P<.05.

<sup>c</sup> P<.001.

<sup>d</sup> P<.01.

important and correct knowledge of the approximate fertile time were associated with an elevated odds ratio in bivariate analysis but did not reach statistical significance at P<.05 in multivariable analysis.

Interestingly, among contraceptors, 34% of those not using an FABM and 50% of FABM users

correctly identified the approximate fertile time (i.e., “halfway between 2 periods”) (P-value for chi<sup>2</sup> = 0.01, Supplement B). It is also worth noting that most (80%) FABM users felt it was “very important” for them to avoid pregnancy now (Supplement B).

## How Women Report Using the Rhythm Method

The vast majority (85%) of rhythm users noted that they identify their fertile and nonfertile days by counting days of a menstrual cycle using a calendar (Supplement C) (participants could report more than 1 response). We did not obtain more detailed information on which rules, specifically, were used to determine fertile days using a calendar. About 1 in 6 rhythm users (17%) used an unspecified approach to determine her fertile window, and 9% did so by observing changes in cervical mucus. Alternative approaches were reported by 5% or less of rhythm users: using a mobile phone app (5%), observing the position or texture of their cervix (3%), recording daily temperature (1%), or using CycleBeads to determine her fertile days (0%).

Among rhythm users, 12% believed there was no chance of getting pregnant over the course of a year while using the method, and 64% reported believing that there was a  $\geq 50\%$  chance.

Nearly three-quarters (72%) of rhythm users had heard of the SDM. Less than one-quarter had heard of ways to make FABMs easier to use, such as CycleBeads (22%) or the CycleBeads mobile app (17%), other mobile FABM apps (23%), or other simple-to-use FABMs like TwoDay method (22%).

Nearly all rhythm users (92%) expressed interest in learning how to make the rhythm method more effective at pregnancy prevention. Among women who wanted to make their rhythm use more effective (and were not already using the given approach mentioned), a majority would be willing to learn about approaches facilitated by a phone (82%) or to record their daily temperature (76%). Slightly over half (53%) expressed a willingness to collect their cervical mucus daily or to observe the texture of their cervix by inserting their fingers into their vagina daily.

Only half of rhythm users knew where to go for advice on using rhythm effectively. Among those who knew, most (53%) would go to a family planning service provider. However, only 17% of rhythm users had ever discussed using the rhythm method with a health professional.

## How Women Report Using FABMs (Rhythm or SDM) Overall

When FABM users were asked how they avoided pregnancy on days identified as fertile (and

permitted to list as many responses as desired), 74% reported avoiding intercourse (Supplement D). The next most common answer (19%) was withdrawal, followed by using condoms or another barrier method (16% among rhythm users, and 13% among SDM users), and EC (12% among rhythm users and 11% among SDM users).

The majority (64%) of FABM users who abstained from sex during the fertile window reported that it was “very easy” to get their partner to abstain on these days, with another 22% reporting that it was somewhat easy. Only 14% reporting that this was somewhat or very hard. Among FABM users who reported using withdrawal during fertile days, 68% said very easy, 10% somewhat easy, and 22% somewhat or very hard. We asked a similar question about condom use, but an ODK programming error precluded calculating estimates for this question.

When FABM users were asked whether menstruation affects sexual activity with their partner, 76% said “yes, we generally avoid sex when I am menstruating,” but 20% stated, “no, because we don’t have sex regularly.” Only 4% responded, “no, we generally have sex when I am menstruating.”

## DISCUSSION

We posit that at least 18% of contracepting women in Ghana likely relied primarily on an FABM for pregnancy prevention. Had we relied on the most effective method reported, as is standard procedure, the estimate would be 13.5% (9.2% rhythm, 4.3% SDM). Our 18% estimate likely represents a lower bound, because, like the 2014 Ghana DHS<sup>47</sup> and 2017 Ghana Maternal Health Survey,<sup>48</sup> we used a filtering question.<sup>†</sup> However, unlike those surveys, among women who acknowledged ever or currently doing something or using a method to prevent pregnancy, our survey asked about all methods. Also, unlike those surveys, we assessed patterns of multiple method use to ascertain likely FABM users.

Our rhythm prevalence estimates (based on most effective method) were slightly lower than those from the 2017 Ghana Maternal Health Survey for all women, currently married women, and sexually active unmarried women (Supplement A). This may be because SDM users may have reported themselves as rhythm users in that survey; combining our rhythm and SDM estimates results in estimates similar to estimates for rhythm. Overall, based

**We posit that at least 18% of contracepting women in Ghana likely relied primarily on an FABM for pregnancy prevention.**

<sup>†</sup>As described in the methods section, the filtering question excluded women who do not perceive themselves as “doing anything or using any method to rhythm in that survey or avoid getting pregnant.”



on our estimate that 18% of contracepting Ghanaian women likely rely primarily on an FABM, we estimate that a minimum of 343,890 Ghanaian women (of an estimated 1,899,943 Ghanaian female contraceptors) currently rely primarily on an FABM<sup>49</sup>; a larger number than those using oral contraceptive pills or using male condoms, and nearly as many as those using 3-monthly injectables.

Among FABM users, more than half (57%) reported currently using only their FABM, while the remainder also reported current use of condoms, withdrawal, EC, and/or other methods. Prior studies in Ghana suggest that such contraceptive “mosaics” of methods that are viewed as natural are common. These methods are believed to help protect the regular flow of menses from bleeding changes induced by other methods<sup>50</sup> as bleeding changes are perceived as linked with infertility.<sup>7,51–53</sup> These contraceptive patterns have implications for how FABM prevalence is calculated in large-scale surveys and merits re-examination of the use of terms like “periodic abstinence” and the definition of “rhythm” currently used in DHS and other survey questions. For example, the Ghana 2017 Maternal Health Survey describes rhythm as “to avoid pregnancy, women do not have sexual intercourse on the days of the month they think they can get pregnant”; this definition inaccurately implies that rhythm is always practiced with abstinence. We elaborate upon this concern in [Supplement E](#), where we advocate that the term “periodic abstinence” be replaced with a less assumption-laden term, such as “fertility awareness-based method.” Similarly, we describe how language used to describe FABMs to respondents should be revised to avoid the assumption of abstinence during the fertile time.

Contraceptors who reported currently using FABMs (versus IUDs or hormonal methods) appeared to have several relatively advantaged characteristics: after controlling for multiple socio-demographic factors, they are more likely to be older, richer, more educated, and to have fewer children. This corroborates other findings from Ghana, in which contraceptors who were older, urban, more educated, and had fewer children were more likely to choose a traditional instead of modern method,<sup>12</sup> though these patterns do not necessarily hold in other countries.<sup>11</sup> Use of FABMs by relatively advantaged women may reflect distinct preferences for these methods, as identified in other Ghanaian studies<sup>10,13</sup> and elsewhere<sup>8,9</sup> or may reflect that aspects of FABMs may

be less accessible to more disadvantaged women (e.g., power differentials negating an ability to negotiate the timing and circumstances of sexual activity with a partner, which women in our sample did not report particular difficulty in doing). Though only borderline statistically significant in our multivariable model, correct knowledge of the approximate fertile time did appear to be higher among likely FABM users, which has been observed previously in Ghana,<sup>48</sup> yet only 50% of FABM users correctly identified the approximate fertile time, indicating substantial room for improvement among individuals relying upon this information to prevent pregnancy.

The majority (85%) of rhythm users reported identifying fertile and nonfertile days using a calendar, though it remains unclear exactly what rules they used to determine fertile and infertile days. Many were likely not using the formal rules of the rhythm method and may have simply avoided unprotected sex on days when they believed—possibly inaccurately—that pregnancy was possible.<sup>16</sup> In [Supplement E](#), we elaborate upon impreciseness in current use of the term “rhythm,” which has come to be used as a generic word for a diverse array of nonformalized practices,<sup>54</sup> perhaps better described as “informal rhythm.” Furthermore, less than a quarter of rhythm users had heard of ways to make FABM use easier, and few reported using tools like CycleBeads or apps indicated for pregnancy prevention. Yet, nearly all rhythm users expressed interest in learning how to make use of their method more effective, and a substantial proportion of rhythm users expressed willingness to collect additional biomarkers (i.e., temperature, cervical mucus, cervical position) or to use tools such as mobile phone apps. Given that only 17% of rhythm users had ever discussed use of the rhythm method with a health professional, there appears to be a substantial missed opportunity to assist rhythm users in identifying ways to improve the effectiveness of their chosen contraceptive method.

This missed opportunity has also been reflected in prior work in Ghana. For example, in a small (n=85) survey in central Ghana conducted in 2010 on contraceptive self-care options, only 36% of respondents indicated interest in self-administered injections, but 75% indicated wanting to learn more about FABMs.<sup>55</sup> In a monitoring study of a free FABM app, 60.8% of Ghanaian women who downloaded the app for the purpose of pregnancy prevention were not using a method of contraception in the prior 3 months, and

**Given that only 17% of rhythm users had ever discussed using the method with a health professional, there appears to be a substantial missed opportunity to assist users in identifying ways to improve the effectiveness of their chosen contraceptive method.**

23% noted that it was the first method they had ever used,<sup>26</sup> suggesting that FABMs may attract new users. Researchers have recommended that family planning programs in Ghana consider the promotion of modern FABMs along with other modern methods,<sup>55,56</sup> which would require health professionals (particularly community health nurses and midwives who commonly offer and provide family planning methods in Ghana) to be trained to offer FABMs. Furthermore, certain FABMs (e.g., CycleBeads) require commodities, but to the best of our knowledge, nationally representative, facility-based, reproductive health commodities and service surveys in Ghana funded by United Nations Population Fund have not included FABM-related commodities when assessing the availability of modern methods at service delivery points.

Strengths of this study include the use of a nationally representative sample of Ghanaian women and the incorporation of probing on the ever or current use of all methods of contraception. This builds upon an approach used by Rossier et al. in Burkina Faso, wherein investigators probed on all traditional methods.<sup>33</sup> Finally, as far as we are aware, this is one of the first studies in a low- or middle-income country to ask detailed questions on FABM use, eliciting information that could be used to inform better outreach to and counseling for rhythm method users, who appear to be interested in understanding how to improve the effectiveness of their chosen contraceptive method.

### Limitations

Our study has multiple limitations, key among them being that our prevalence estimates suffer from some of the same methodological flaws as other nationally representative studies in Ghana, given that we used a filtering question in asking about method use, which may lead to underreporting of FABMs and other methods. We believe this would have been more impactful in soliciting “ever” use (vs. current use). If a participant acknowledged having ever used *any* method, interviewers would eventually ask about all methods, priming the respondent (before answering the current method question), that rhythm and SDM “count” as contraceptive methods. In addition, we did not specifically ask about the use of FABMs other than rhythm or SDM in our survey, which could potentially mean that users of methods such as TwoDay, symptothermal, or others are undercounted; however, we expect this to be highly unlikely, particularly given the responses to questions on knowledge of other FABMs. One

of our questions on rhythm suffered from the same definitional errors as seen in other large-scale survey questions on rhythm. Specifically, one of our questions asked, “You noted that you use the rhythm method, or avoiding sex on days when you are more likely to get pregnant. Can you please state all of the ways in which you identify your fertile and non-fertile days?” The implicit assumption that rhythm users abstain from sexual activity on days they believe they are more likely to get pregnant should be discontinued in survey research on FABMs, as described above and elaborated upon in [Supplement E](#). We do not know whether Ghanaian women who refer to their practice as “counting days” (as identified in other studies<sup>34</sup>) would label themselves as a rhythm user, an SDM user, a nonuser, or something else. [Supplement E](#) also highlights that the way in which users of specific FABMs (such as SDM, symptothermal method, etc.) are classified in DHS may depend upon whether the survey specifically asks about these methods or not; a point which researchers should be cognizant of when analyzing survey data.

Future surveys might more deeply investigate the use of menstrual trackers and how they are perceived, as well as examine whether variables not available in our data (i.e., distance to health facility) may be associated with FABM use. Finally, as noted previously,<sup>46</sup> our approach to FABM prevalence estimation assumes that women reporting multiple contraceptive methods use them in conjunction with one another (rather than that, for example, a user was switching permanently from an FABM to condom use during the month of interview). Another complexity of understanding patterns of multiple method use is that our labeling of individuals being “primarily” FABM users is somewhat subjective; such users may perceive their “primary” method to be condoms or EC, for example, even if the FABM is being “used” throughout the cycle and condoms or EC are being used episodically during periods believed to be infertile.

### CONCLUSION

Our study indicates that a nontrivial proportion of reproductive age Ghanaian contracepting women (18%) are using a traditional or modern FABM (rhythm or SDM); more than those who report using oral contraceptive pills and nearly as many as report using 3-monthly injectables. Findings reiterate that standard approaches to measuring these methods underestimate their use, but additional survey methodological changes are required to further improve the accuracy of FABM use

estimates. Results showed that more advantaged women were more likely to be using an FABM, suggesting that FABM use among this population may be a preference and not simply a lack of access to alternative options. Understanding these choices can help to support client-centered contraceptive counseling and programs for women and couples interested in using these methods. As side effects and health concerns are increasingly the main reasons for contraceptive nonuse in low- and middle-income countries, FABMs may offer an approach to pregnancy prevention to women whose contraceptive needs are not met by other options.<sup>12</sup> Family planning programs should work to respectfully address these needs as part of a commitment to reproductive autonomy and choice.

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**Author contributions:** CBP led the conceptualization of the analysis, programmed the analytical code and conducted the analysis, and verified the overall reproducibility of the results. CBP and SOB managed and cleaned data. EO and RL-R led data collection efforts. CBP, EO, SOB, and RL-R provided resources in terms of study materials, contact with respondents, and computing resources. CBP wrote the original draft of the manuscript. CBP, EO, SOB, and RL-R participated in reviewing and editing the draft.

**Data availability:** De-identified versions of the Community-Based Survey collected by the authors and used in this analysis are available from the Guttmacher Institute upon reasonable request to researchers who wish to use the data for scholarly analysis. To discuss obtaining copies of these datasets, please contact [popcenter@guttmacher.org](mailto:popcenter@guttmacher.org) with the detailed protocol for your proposed study, and information about the funding and resources you have to carry out the study.

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ORIGINAL ARTICLE

# New Mixed Methods Approach for Monitoring Community Perceptions of Ebola and Response Efforts in the Democratic Republic of the Congo

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## Key Findings

- Ebola-affected communities in the eastern Democratic Republic of the Congo had questions about the outbreak, doubts about the reality of Ebola, and concerns about health care and the Ebola vaccination program.
- In peak outbreak areas, beliefs that Ebola response teams were stealing organs and bodies declined after burial teams introduced transparent body bags. Similarly, calls for making vaccination “more fair” declined after Ebola vaccination eligibility was expanded.

## Key Implications

- The model for recording community feedback provided rapid, ongoing comments from neighborhoods and villages where Ebola response activities were underway, allowing people to share perceptions, questions, and concerns in their own words. Local volunteers were central to the model’s success because they were involved in the rapid collection, coding, and interpretation of feedback and applying it to response activities.
- Collecting continuous community feedback throughout an emergency response enables response teams to answer questions, consider suggestions, and adapt interventions to better meet community needs and preferences. Local health departments everywhere could employ this approach to enhance community engagement.

➔ *Résumé en français à la fin de l'article.*

## ABSTRACT

**Background:** Efforts to contain the spread of Ebola in the eastern Democratic Republic of the Congo (DRC) during the 2018–2020 epidemic faced challenges in gaining community trust and participation. This affected implementation of community alerts, early isolation, contact tracing, vaccination, and safe and dignified burials. To quickly understand community perspectives and improve community engagement, collaborators from the DRC Red Cross, the International Federation of the Red Cross, and the U.S. Centers for Disease Control and Prevention explored a new method of collecting, coding, and quickly analyzing community feedback.

**Methods:** Over 800 DRC Red Cross local volunteers recorded unstructured, free-text questions and comments from community members during community Ebola awareness activities. Comments were coded and analyzed using a text-coding system developed by the collaborators. Coded comments were then aggregated and qualitatively grouped into major themes, and time trends were examined.

**Results:** Communities reported a lack of information about the outbreak and the response, as well as concerns about the Ebola vaccination program and health care quality. Some doubted that Ebola was real. The response used the feedback to revise some community engagement approaches. For example, 2 procedural changes that were followed by drops in negative community responses were: using transparent body bags, which allayed fears that bodies or organs were being stolen, and widening the eligibility criteria for Ebola vaccination, which addressed concerns that selectively vaccinating individuals within Ebola-affected communities was unfair.

**Discussion:** This system is unique in that unstructured feedback collected by local volunteers in the course of their work was rapidly coded, analyzed, and given to health authorities for use in making course corrections throughout the response. It provides a platform for local voices to be heard throughout an emergency response and provides a mechanism for assessing the effects of program adjustments on community sentiments.

## INTRODUCTION

By June 21, 2020, the Democratic Republic of Congo (DRC) had reported 3,470 probable or confirmed cases of Ebola virus disease (EVD) since the beginning of the outbreak in 2018. Of these, 2,287 persons died and 1,171 recovered.<sup>1</sup> On July 30, 2018, the DRC

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Ministry of Health led a coalition of international agencies, governments, and nongovernmental organizations in a coordinated Ebola response, despite a uniquely challenging context of political conflict and violence.<sup>2</sup> The response focused on 4 main interventions to stop EVD spread: (1) identifying possible cases and isolating, testing, and treating the patients quickly at EVD treatment centers; (2) finding, quarantining, and monitoring people who had exposure to an EVD case for 21 days (as well as people having had contact with those contacts); (3) offering vaccination to contacts and their contacts; and (4) conducting safe and dignified burials\* in outbreak-affected communities.

As part of this response, local Red Cross volunteers in Ebola-affected communities undertook risk communication and community engagement activities (e.g., community meetings, “phone-in” radio shows, mobile “cinema” presentations) and made home visits in selected communities. During these activities, volunteers recorded any comments from community members about Ebola, such as questions, beliefs, observations, rumors, or suggestions for improving the government-led response to the epidemic.

### Prior Efforts With Community Engagement and Community Feedback in Epidemic Response

Although the concepts are not new in humanitarian settings, community engagement has been slower to be fully incorporated into epidemic response structures,<sup>3,4</sup> despite growing evidence that community engagement strengthens epidemic control.<sup>5-9</sup> The hesitation to embrace community engagement in epidemic emergency response may stem from the fact that authentic engagement requires an investment of time and resources in understanding community needs, as well as a willingness to change epidemic control strategies based on community feedback.

Understanding community needs through some form of community listening (e.g., surveys, focus groups, interviews, rapid ethnography) must be done in a very compressed timeframe and often in extremely challenging field conditions. Even when it is accomplished, engagement only succeeds if social scientists can get actionable information into the hands of decision makers who are willing to be advised in their work. Ideally, community engagement in emergency

response is supported by a regular “feedback loop,” in which community reactions to epidemic control activities are continuously monitored and addressed.<sup>10,11</sup>

### Context of the North Kivu, DRC Ebola Outbreak

The Ebola epidemic that began in North Kivu province of DRC in 2018 was described by the country’s minister of health as “the longest, most complex and deadliest” in the country’s history.<sup>12</sup> The urban location of the early cases contributed to its persistence, as did the social and political turmoil in the region. According to the World Health Organization (WHO), there were 420 attacks on health facilities in eastern DRC during the outbreak period,<sup>13</sup> and security reviews identified 140 armed groups active in the area.<sup>14</sup> Kidnappings and killings of civilians were also frequently reported.<sup>15,16</sup> As a result, for much of the North Kivu Ebola response, WHO-led operations were located hundreds of miles from where cases were occurring.<sup>17</sup> Mistrust of the national government is widespread, as the North Kivu region has long been a stronghold of political opposition. This mistrust intensified in December 2018, when the government excluded several areas in North Kivu from voting in national elections due to the Ebola outbreak.<sup>18</sup>

### The Rapid Community Feedback Collaborators

While gathering community feedback was not a new idea for IFRC as it looked to support the Red Cross of DRC in Ebola control, it needed a way to systematically and rapidly gather feedback to apply qualitative analytic methods to produce reports that could offer specific, actionable recommendations. The CDC Ebola Response Social and Behavioral Science task force had recently created a similar rapid assessment system to support the Zika emergency response in Puerto Rico and the U.S. Virgin Islands in 2016.<sup>11,19</sup> The Red Cross of DRC was a trusted local partner, which had been promoting health and assisting with health emergencies and epidemics for many years. In August 2018, the DRC Red Cross, IFRC, and CDC collaborated to create a method for entering free-text notes into a Microsoft Excel spreadsheet and coding them to allow for rapid aggregation, analysis, and reporting. The current analysis identifies the major themes of community concern during the

**In the context of an epidemic, understanding community needs must be done in a very compressed timeframe and often in extremely challenging field conditions.**

\*Safe and dignified burials are burials performed by specially trained Ebola response teams, in which participants are protected from the still-infectious body, but also can follow traditional practices to the extent possible.

2018–2020 Ebola outbreak in DRC and describes how the information was used by the Red Cross and Ebola response leaders to better address community concerns.

## ■ METHODS

### Recruitment and Training of Red Cross Volunteers

At the outset of the Ebola outbreak in North Kivu, IFRC and local health authorities selected neighborhoods near where individuals with Ebola virus disease had been identified and where community engagement approaches needed to be intensified to prevent and control the spread of the virus. Red Cross volunteers were activated if already present in the targeted communities and/or new ones recruited where activities needed to be urgently scaled up. New volunteer training and refresher trainings included the following topics: Ebola facts, principles of community engagement and accountability, listening skills, and how to accurately and ethically collect and record community feedback.<sup>20</sup> In addition to consulting community and neighborhood leaders before approaching homes or initiating public awareness activities, Red Cross team leads were trained to maintain an awareness of the local situation and to have a low threshold for ending activities on a given day if tensions became apparent.<sup>†</sup>

### Community Feedback Collection During Community Engagement Activities

During the outbreak period, the Red Cross had more than 800 volunteers working across 29 health zones to raise awareness about Ebola. While the number of volunteers participating in Ebola awareness-raising varied widely by health zone and by month (according to the severity of the Ebola outbreak at the time and security conditions), typically volunteers worked in groups of 8 to 10 (in teams of 2), with 1 team lead in a given neighborhood or rural village, supported by a field supervisor, who covered 4 or 5 teams. Three days per week, volunteer teams met with field supervisors to review key Ebola messages and to receive their assigned areas for home visits. Each team visited 15 homes and held an informal conversation about Ebola, sharing basic facts about the disease,

treatment, and prevention and answering any questions. While one volunteer led the conversation, the other took notes, writing down anything anyone said related to Ebola that was a question; a statement of rumor, experience, or belief; a suggestion; or an expression of appreciation. The information noted was recorded without any direct questioning of the community members. In addition, volunteers organized public presentations followed by informal discussions. Feedback from these events was also recorded. Conversations were conducted in local languages (primarily Swahili and Kinandé), and comments were written in the local language or French. Volunteers explained to participants that comments were being written down so that the volunteers and the Ebola response could understand their questions, comments, and suggestions.

### Feedback Collection Form

Red Cross volunteers wrote all community comments on a collection form divided into 5 sections: statements (including rumors, beliefs, and observations), questions, suggestions, expressions of appreciation, and other (Photo 1). To manage the large volume of comments coming at the same time, volunteers were permitted to annotate comments with a multiplier (e.g., 2, 3), when a single comment was repeated 1 or more times by different people. Volunteers gave their completed forms to their field supervisor, who collated them and gave them to data managers for entry and coding in an Excel spreadsheet.

### Coding Scheme and Process

Within the existing categories of comment type (statements, questions, suggestions, expressions of appreciation, and other), text codes were created to distinguish and describe the meaning of comments. The development of the coding scheme was a 3-way effort over several months among Red Cross field volunteers, who had the best insight into the local cultural and political context; IFRC (international and local staff), who had the most experience with using community feedback data for decision making; and CDC staff, who had the technical expertise on qualitative coding system design and analysis. (See Supplement for a complete list of text codes.) Once the scheme was finalized, coding

**During the outbreak period, the Red Cross had more than 800 volunteers working across 29 health zones to raise awareness about Ebola.**

<sup>†</sup>Volunteers were also trained to report any comments that related to threats against Red Cross or others immediately to their team leads, and the leads would report this information to the Red Cross safety and security team. IFRC's community engagement approach, grounded on listening and responding to questions and concerns and co-designing approaches with communities, has resulted in notably high levels of trust (including for performing Safe and Dignified burial interventions) and few instances of refusals or violence against volunteers, and has enabled the Red Cross to enter communities and neighborhoods that have traditionally been closed off to other service organizations.





Red Cross volunteers in the Democratic Republic of the Congo talking to families in Bunia about Ebola and gathering information about their questions and concerns. These types of interactions will help improve how humanitarian actors, including Red Cross, address community concerns. © 2021 Corrie Butler/International Federation of Red Cross

was performed using a bilingual Excel spreadsheet containing preprogrammed drop-down coding menus. CDC scientists coded the feedback in the first months of the collaboration and then trained Red Cross volunteers and IFRC staff to code. From that time forward, the first round of coding was performed by Red Cross volunteers and IFRC staff in DRC in French, and then all codes were reviewed by CDC coders, with 20% being reviewed by senior CDC coders. Discrepant codes and potential adjustments to the coding scheme were discussed and resolved on weekly French-language conference calls.

### Data Analysis During the Response

Initially, CDC generated simple data reports that aggregated codings by comment type (statement, question, suggestion, etc.) and category. Using Excel functions and macros, these reports were generated very quickly; CDC was able to produce more than 80 rapid data reports for use by Red Cross and response leaders. Later on, collaborators identified specific topical areas for more in-depth analysis, resulting in 23 “deep dive” reports and numerous other reports in which CDC applied additional Excel features (such as the Vlookup function and text search macros) for special analyses. IFRC and Red Cross leaders championed the sharing and use of these data for informing, reviewing,

and revising field activities of the response task forces (Photo 2). The coded community feedback was also shared with all response partners through an interactive dashboard created by IFRC. Results from community feedback analyses were frequently triangulated with results from studies by the Ebola response social science team.<sup>5</sup> Since community feedback was collected continuously across the entire outbreak region, it was a good complement to these more structured and geographically limited studies collected at a single point in time.<sup>21</sup>

### Analysis Methods for This Report

Analysts reviewed comments for the period August 2018 through February 2020 in health zones in which there had been an Ebola case in the previous 30 days. Codes were qualitatively grouped into themes according to their meaning, with independent review by 2 other analysts. Themes were then rank-ordered by the total number of coded comments within each theme. In a second, exploratory analysis, frequencies of comments relating to Ebola response activities in 4 health zones (Beni, Mabalako, Katwa, and Butembo) were graphed over time, along with weekly EVD case counts. If marked changes in comment frequencies around Ebola response topics were identified, Ebola intervention program history was reviewed to see if the pattern

**Results from community feedback analyses were frequently triangulated with results from more structured and geographically limited studies and complemented their findings.**



Red Cross volunteers in the Democratic Republic of the Congo provide a sensitization campaign in the biggest market in Bunia. This is a regular activity with communities, providing critical information about Ebola and how to prevent other major diseases. © 2020 Corrie Butler/International Federation of Red Cross

could be explained by changes made in response activities.

### Ethical Considerations

The Red Cross/IFRC community engagement work was considered evaluation, not research by the DRC Ebola response. This determination is consistent with U.S. definitions.<sup>22</sup> All work adhered to the International Federation of the Red Cross and Red Crescent Societies’ code of conduct and ethical treatment of community members policy.<sup>23,24</sup>

### RESULTS

During the review period, there were 292,232 comments collected from communities experiencing Ebola cases within the previous 30 days. Since some comments were coded with more than 1 text code (e.g., if a comment addressed 2 issues), the total set of coded comments was larger (n=315,820). Figure 1 shows the number of comments collected from 16 Ebola-affected health zones over the epidemic period. The majority of comments (78%) came from 4 health zones: Beni, Mabalako, Katwa, and Butembo.

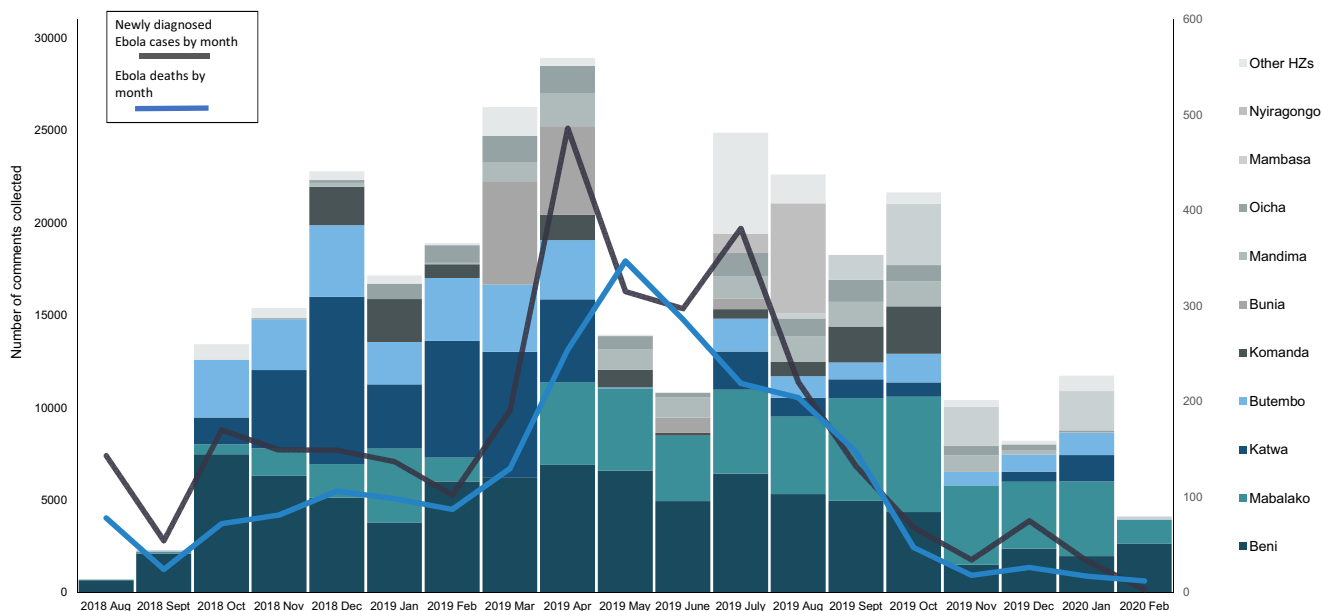
Just over one-third of coded comments were statements (including rumors, beliefs, and observations, 35% of all comments), with slightly fewer questions (29%) and suggestions (27%). The remaining comments (9%) were nearly all

expressions of appreciation. As shown in Table 1, the 5 most common themes were (1) Ebola epidemic and Ebola reality—requests for updates about the progress of the epidemic, and doubts about its reality in one’s community; (2) medical diagnosis and treatment—questions and concerns about Ebola treatment centers and Ebola treatment and health care costs and quality; (3) Ebola vaccine and vaccination—perceived unfairness of the “ring” vaccination strategy (for ring vaccination definition, see WHO’s Ebola Vaccine Frequently Asked Questions<sup>25</sup>), belief in a “good” and a “bad” vaccine, and doubts about vaccine safety; (4) Ebola response feedback—both positive (appreciation) and negative (doubt and mistrust) comments about the response implementation and response staff; and 5) Ebola profit and politics—perceived personal profit and political motives behind the Ebola response.

### Changes in Leading Comment Codes Over Time Within Health Zones

In all 4 zones, the percentages of comments about response strategies fluctuated over time. As shown in Figure 2 (Beni health zone), increases in the frequency of comments about different response strategies occurred during or just after an increase in reported EVD cases. This pattern was generally present in Mabalako, Katwa, and Butembo health zones (not shown) as well, although these 3 health

**FIGURE 1.** Community Feedback Comments in Ebola-Affected Health Zones<sup>a</sup> by Health Zone, Month, and Monthly Ebola Case Counts and Deaths,<sup>b</sup> Eastern Democratic Republic of the Congo, August 2018 to February 2020 (N=292,232)



Abbreviations: HZ, health zone.

<sup>a</sup>Health zones include Goma, Rwampara, Kalunguta, Masereka, Musienene, and Kayna.

<sup>b</sup>Ebola deaths may be cases that were diagnosed in previous months. Thus, in some months the number of deaths may be greater than the number of cases.

zones had notably lower proportions of comments about response efforts overall.

As shown in Figure 2, comments about beliefs in mutilation or theft of organs or cadavers declined over time, and suggestions to expand vaccination to more people had a more subtle drop. These 2 patterns were repeated in the other 3 health zones, except for Mabalako, which experienced a spike in comments suggesting expanded vaccination that coincided with a sudden spike in EVD cases in May 2019. Notable changes did not occur in comment frequencies related to Ebola treatment centers or those related to contact tracing. As this an exploratory scan for patterns that might be associated with changes in Ebola response activities, we are limited in what we can conclude about those activities based on the absence of a pattern.”

### How Collected Data Were Used for Decision Making

Red Cross leaders used weekly data summaries to facilitate discussions and reinforce volunteer Ebola knowledge. In addition, the IFRC presented

regular summaries to local Ebola response commissions, who were particularly interested in understanding leading types of misinformation and concerns about response activities. Reports for the highest levels of the response were frequently combined with other analyses and had particular importance in being one of the few sources to provide verbatim comments.

At each of these levels, community feedback led to relatively rapid changes in practice. Red Cross volunteers began using an “answers to frequently asked questions” document,<sup>26</sup> shared through the Red Cross DRC WhatsApp chat as a field reference. At the health zone level, Ebola response leaders responded to community feedback by improving public communications about the state of the epidemic and including in the updates a section on community feedback and answers to common questions.<sup>21</sup> This information was shared both in print and on the radio. The leaders also made a range of modifications to Ebola response strategies to address community concerns, including hiring more local health care staff, involving Ebola survivors and traditional health care providers in response activities, and

**At multiple levels, community feedback led to relatively rapid changes in practice.**

**TABLE.** Community Feedback Comments in Ebola-Affected Health Zones by Theme and Code, Eastern DRC, August 2018 to February 2020 (N=315,820)

Themes, Codes (Type <sup>a</sup> )	N	%	Representative Quotations
<b>1: Ebola epidemic, EVD reality</b>	<b>56,672</b>	<b>18</b>	
Questions about the Ebola epidemic (Q)	13,110		<ul style="list-style-type: none"> <li>• <i>Since the beginning of the response to EVD how many confirmed cases of Ebola have there been? When will Ebola end?</i></li> <li>• <i>Why does your Ebola pick. . .mothers and children?</i></li> <li>• <i>Does Ebola really exist here in [my community]?</i></li> </ul>
Perceptions, beliefs about Ebola outbreak locally (RBO)	9,485		<ul style="list-style-type: none"> <li>• <i>EBOLA doesn't exist here in [my community].</i></li> <li>• <i>The Ebola you're talking about here is not the Ebola we saw on the television of Equateur because we never saw someone who has blood on his body.</i></li> </ul>
Ebola does not exist (RBO)	6,574		<ul style="list-style-type: none"> <li>• <i>Ebola doesn't exist. Ebola is not real, it's to postpone the elections.</i></li> <li>• <i>It's politics, it's not real.</i></li> </ul>
<b>2: Medical diagnosis, treatment</b>	<b>47,175</b>	<b>15</b>	
Questions about EVD diagnosis, treatment (Q)	11,071		<ul style="list-style-type: none"> <li>• <i>Are there any medicines that can cure the Ebola virus disease?</i></li> <li>• <i>After how many days can a sick person who goes to the ETC be healed?</i></li> <li>• <i>Why would they not want to construct the ETC here among us at [my community]?</i></li> </ul>
Improve health care (S)	10,747		<ul style="list-style-type: none"> <li>• <i>We need to bring in real doctors like the doctors who worked at the beginning of the outbreak, since there were recoveries then.</i></li> <li>• <i>Free care should continue until the end of this epidemic</i></li> </ul>
Mistrust of Ebola treatment center (RBO)	7,694		<ul style="list-style-type: none"> <li>• <i>The health care workers are currently killing people and taking their bodies.</i></li> <li>• <i>A person can arrive at the hospital in good health, but in a few minutes he dies.</i></li> </ul>
<b>3: Ebola vaccine, vaccination</b>	<b>36,093</b>	<b>11</b>	
Expand or modify vaccination program (S)	14,106		<ul style="list-style-type: none"> <li>• <i>Vaccinate the whole population against Ebola disease.</i></li> <li>• <i>We call on the government and the WHO to vaccinate us without discrimination.</i></li> <li>• <i>Set up vaccination centers in all neighborhoods.</i></li> </ul>
Vaccine suspicions (RBO)	7,149		<ul style="list-style-type: none"> <li>• <i>There are two types of vaccine: injection of Ebola virus disease and injection of vaccine for recovery.</i></li> <li>• <i>Your vaccine causes abortion in pregnant women.</i></li> <li>• <i>The Ebola vaccine will kill us in 5 years.</i></li> </ul>
Questions about unfair vaccine distribution (Q)	6,388		<ul style="list-style-type: none"> <li>• <i>Why aren't you vaccinating the entire population?</i></li> <li>• <i>Are there not means to vaccinate all the social categories of the DRC?</i></li> </ul>
<b>4: Ebola response feedback</b>	<b>33,319</b>	<b>11</b>	
Questions about response processes (Q)	11,152		<ul style="list-style-type: none"> <li>• <i>Why make so much money available for vehicle hire, luxury hotels, etc. [rather] than multiplying the machines or laboratories that analyze or test for Ebola?</i></li> <li>• <i>How come others raise awareness and bring us handwashing units, yet you, you come with empty hands?</i></li> <li>• <i>Why are the hospitals being guarded by armed men?</i></li> </ul>
Thank you, not further specified (A)	6,996		<ul style="list-style-type: none"> <li>• <i>We thank the response team for their work in the field.</i></li> <li>• <i>The community thanks the response team for the service provided; thanks to it the community has been saved.</i></li> </ul>
	6,498		<ul style="list-style-type: none"> <li>• <i>We trust the rescuers, they convinced us that the disease exists.</i></li> </ul>

Continued

**TABLE.** Continued

Themes, Codes (Type <sup>a</sup> )	N	%	Representative Quotations
Statements about response staff (RBO)			<ul style="list-style-type: none"> <li>• <i>We doubt the disease today since the agents of response do not want to proclaim the end of the Ebola virus disease. . .</i></li> <li>• <i>People on the outbreak response have their personal interests.</i></li> </ul>
<b>5: Ebola profit and politics</b>	<b>30,606</b>	<b>10</b>	
Ebola is a “business” (or someone is profiting) (RBO)	12,771		<ul style="list-style-type: none"> <li>• <i>Ebola can’t end because the agents’ lives have changed; they earn money from it.</i></li> <li>• <i>We want the responders to be replaced because those who are there now earn a lot and don’t want Ebola to disappear for good.</i></li> </ul>
Ebola is a political tool (RBO)	9,652		<ul style="list-style-type: none"> <li>• <i>Ebola is a conspiracy of whites in collaboration with our politicians.</i></li> <li>• <i>We know that the Ebola disease exists, but it is politicized.</i></li> </ul>
Ebola is used for harming people (by political leaders or through political action) (RBO)	5,131		<ul style="list-style-type: none"> <li>• <i>The response teams are not there to save the lives of the population, but rather for their private interest and to kill the Nande people.</i></li> <li>• <i>Ebola is politics of the Congolese government; our authorities want to exterminate us by spreading Ebola.</i></li> </ul>
<b>Grand total</b>	<b>315,820</b>	<b>100</b>	

Abbreviations: DRC, Democratic Republic of the Congo; ETC, EVD treatment center; EVD, Ebola virus disease; WHO, World Health Organization.

<sup>a</sup>Comment text code type: Q, question; RBO, statement of rumor, belief, or observation; S, suggestion; A, appreciation.

Two individual codes that were not part of the 5 major themes stood out because they accounted for more than 10,000 comments each: “Thank you for Ebola awareness efforts” (n=16,475) and “Provide handwashing station(s)” (n=15,218).

decreasing Ebola response visibility by reducing the number of vehicles used.<sup>21</sup> In addition, vaccine eligibility was expanded in June 2019 to include a wider group of possible contacts,<sup>27</sup> which resulted in a dramatic increase in vaccinations in the Beni health zone during the summer months. A compilation of available field reports documented more than 25 different response actions to which community feedback contributed.<sup>21</sup> By mid-2019, in recognition of the benefits of community feedback in community engagement, the DRC Ministry of Health and WHO had incorporated a continuous community feedback collection objective into its strategic response planning document.<sup>28</sup>

## DISCUSSION

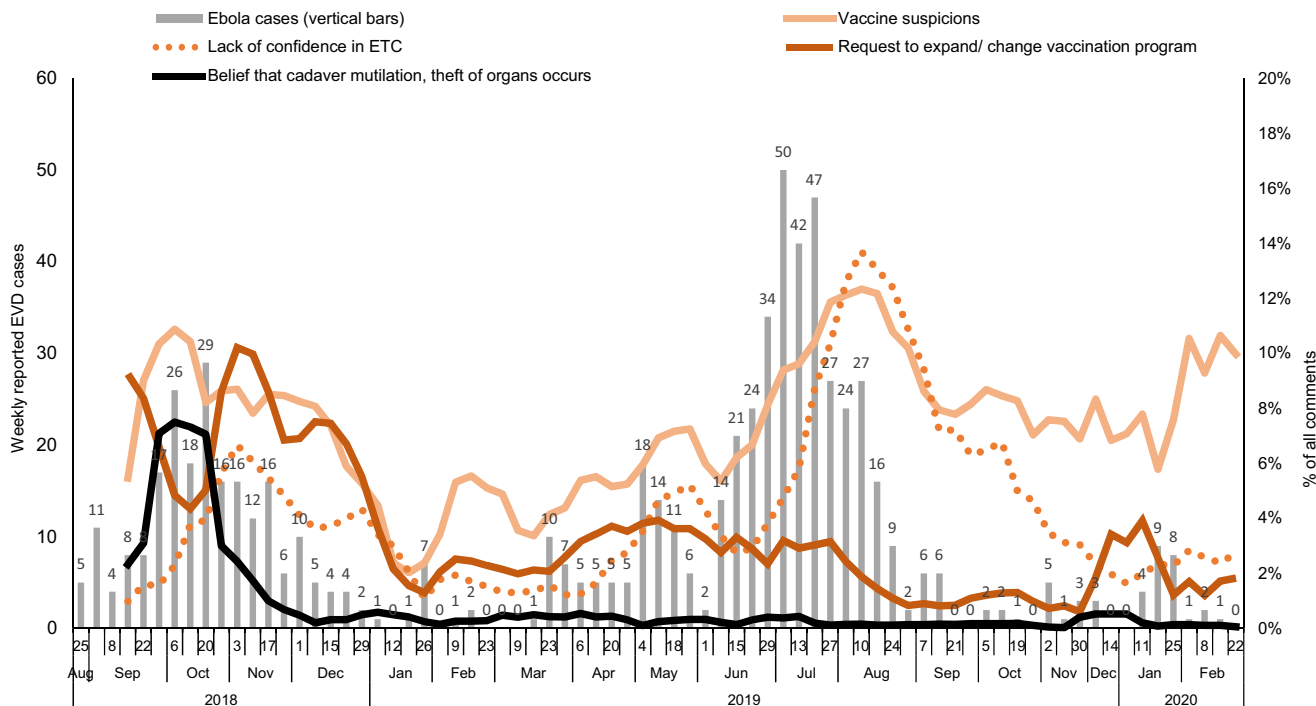
While other social science data collections took place during this Ebola outbreak,<sup>2,21,29–31</sup> the Red Cross community feedback collection was unique in that it empowered local Red Cross volunteers to use the information immediately to address community questions and concerns, it was collected continuously throughout the outbreak, and it provided an opportunity for community members to talk about whatever concerned them in their own words. These attributes all took on additional importance, given the context of violence and insecurity of this outbreak.

Overall, the community feedback pointed to a need for more widespread and frequently updated risk communication and community engagement about cases, deaths, and survivors, as well as EVD symptoms. The lack of understanding that EVD often occurs without hemorrhagic symptoms seems to have contributed to the belief that people were being misdiagnosed with EVD, either unintentionally or intentionally. Similarly, comments about vaccination suggest that the principle of ring vaccination was not understood and that selectively vaccinating Ebola contacts caused suspicions of favoritism. These themes are supported by findings from other social science and news reports during the period.<sup>2,21,29–33</sup>

The exploratory time-based analysis (Figure 2) shows that feedback about response activities (as compared with comments about Ebola itself or other topics indirectly related to response strategies) increased as the epidemic worsened, presumably because response activities in communities increased. Then, as case counts dropped, feedback about response activities also fell. However, statements about the mistreatment of bodies during safe and dignified burial and suggestions to expand ring vaccination to more people did not rise along with increasing cases in Beni. This pattern suggests that offering transparent body bags, widening vaccine

**The community feedback pointed to a need for more widespread and frequently updated risk communication and community engagement.**

**FIGURE 2.** Frequencies<sup>a</sup> of Comments Related to Ebola Response Activities,<sup>b</sup> Beni Health Zone, September 2018 to February 2020<sup>c</sup>



Abbreviations: ETC, Ebola testing center; EVD, Ebola virus disease.

<sup>a</sup>Frequencies are expressed as 4-week rolling averages of the percentage of all weekly comments within each code.

<sup>b</sup>Three additional codes—*recommendation to improve health care*, *comments about responders*, and *questions about burials*—are not shown because they did not show any appreciable change over the period. Another code, *contact tracing*, received too few comments overall to show over time.

<sup>c</sup>There were 2 time segments: November 16–29, 2019, and December 21, 2019 to January 4, 2020, in which no data were collected.

eligibility. and other steps taken by the response alleviated these specific concerns. Comments about mistrust of Ebola treatment centers did not show a clear pattern overall, although it is notable that in Katwa and Butembo health zones in April and May 2019, a sudden increase in reported EVD cases was accompanied by an increase in the frequency of reported comments about distrust of Ebola treatment centers. Violent attacks on responders also occurred within roughly the same period.

The themes of government mistrust affecting willingness to participate in government-recommended outbreak control efforts are being seen in many communities during the COVID-19 pandemic.<sup>34–36</sup> As with Ebola, mistrust of government efforts to control the spread of coronavirus affects people’s willingness to perform behaviors that would protect themselves and reduce its spread.<sup>37</sup> In addition, there are accusations that the response is

politically driven or it is a way to make money, beliefs that coronavirus is not real, and frustrations with coronavirus disease diagnosis and treatment.

Throughout the outbreak, the utility of the Red Cross community feedback and all forms of social science inquiry were increasingly recognized as important to ending the epidemic. Not only was community feedback mentioned by WHO as part of its strategic plan, but several lessons learned documents from response leaders were published that emphasized the central role that community engagement and social science inquiry must play in emergency response, and presented examples of how it can be done.<sup>5,38,39</sup> As a result of this work, IFRC has published a “Feedback starter kit” to guide volunteer groups in developing this capacity.<sup>40</sup> IFRC and CDC also adapted the Ebola text-coding scheme to capture COVID-19-related feedback, and this framework is being used in several countries.<sup>41</sup>

## Limitations

Although a community feedback collection system was useful for hearing and addressing local concerns, important limitations were also present. Because Red Cross volunteers collected comments as they worked, comments were not systematically sampled, nor were they linked to any individual or household. Thus, estimating the prevalence of any given theme within the population was not possible, although it was possible to determine which sentiments were expressed more than others. Text coding is somewhat subjective, and coding text that has been paraphrased and then translated, sometimes twice before review, likely resulted in a loss of precision. When compared side-by-side with survey data from the same areas, community feedback has been found to emphasize negative feedback more than survey data. Therefore, such data are best viewed as qualitative, with only very limited quantification, and are ideally used in combination with data collected through other means.

## CONCLUSION

Despite these limitations, the Red Cross community feedback system filled an important gap during the Ebola outbreak in eastern DRC: the need for highly local, timely, open-ended, and continuous candid feedback from Ebola-affected communities. This information was used by Red Cross to adapt safe and dignified burial strategies to be more responsive to the community and supported changes in vaccine eligibility during the response. In any epidemic situation, as control strategies such as isolation, personal protection, contact tracing, and vaccination are introduced, communities can play a vital role in ensuring that strategies are implemented appropriately to receive maximum participation and effectiveness. Since every community is different, public health professionals need a way to monitor the reactions of communities as they introduce infection control measures. Community feedback can provide a tool for those willing to listen and act based on what they hear. This approach could not only result in more effective epidemic responses but also develop local community ownership of public health action and greater resilience in the face of any health threat.

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**Author contributions:** OB and CP led the collaboration and conceived of the feedback data collection system. GER, EE, VW, and CAC led the bilingual design and implementation of the feedback data collection system. LRD participated in the bilingual design and implementation of the feedback data collection system and describing the community feedback system and its impacts. CAC, LRD and IV led field implementation of the community feedback data collection; VW, CAC, CC, and LRD led data coding and cleaning. GER, MK, and CP participated in data coding and cleaning. VW, CC, EE, CP and OB described the community feedback system and its impacts. IV and GER participated with describing the community feedback system and its impacts. GER led the qualitative analysis and exploratory analysis and led the data interpretation and writing of the manuscript. VW, MK, CC, and CP participated in qualitative analysis and exploratory analysis. DY assisted with data coding and cleaning and assisted with identifying community feedback impacts and literature review. NS supported field implementation of the community feedback data. VW, MK, CAC, CC, LRD, DY, NS, and CP contributed to the data interpretation and writing of the manuscript.

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## En Français

### Nouvelle approche à méthodes mixtes pour le suivi des perceptions communautaires d'Ebola et des efforts de réponse en République démocratique du Congo

**Message clé:** Le système de feedback communautaire de la Croix-Rouge a permis la collecte et l'analyse rapides de plusieurs rapports verbaux pendant une épidémie d'Ebola dans l'est de la RDC. Grâce à ces informations, les responsables de la réponse à Ebola ont adapté des stratégies pour répondre aux préoccupations de la communauté. Lors d'une épidémie, le retour d'information de la communauté est essentiel pour s'assurer que les stratégies de réponse sont acceptées et appropriées.

#### RÉSUMÉ

**Contexte:** Les efforts visant à contenir la propagation d'Ebola dans l'est de la République démocratique du Congo (RDC) pendant l'épidémie 2018–2020 ont été confrontés à des défis pour gagner la confiance et la participation de la communauté. Cela a affecté la mise en œuvre des alertes communautaires, l'isolement précoce, la recherche des contacts, la vaccination ainsi que l'exercice des enterrements dignes et sécurisés. Pour comprendre rapidement les perspectives de la communauté et améliorer son engagement, des collaborateurs de la Croix-Rouge de la RDC, de la Fédération internationale de la Croix-Rouge et des Centres américains de contrôle et de prévention des maladies ont exploré une nouvelle méthode de collecte, de codage et d'analyse rapide des commentaires de la communauté.

**Méthodes:** Plus de 800 volontaires locaux de la Croix-Rouge de la RDC ont enregistré les questions et les commentaires non structurés et en texte libre des membres de la communauté pendant les activités de sensibilisation à Ebola. Les commentaires ont été codés et analysés en utilisant un système de codage de texte développé par les collaborateurs. Les commentaires codés ont ensuite été agrégés et regroupés qualitativement selon des thèmes principaux. Les tendances du moment ont également été examinées.

**Résultats:** Les communautés ont signalé un manque d'informations sur l'épidémie et la réponse, ainsi que des inquiétudes concernant le programme de vaccination contre Ebola et la qualité des soins de santé. Certains doutaient de la réalité d'Ebola. La réponse s'est servie des différentes réponses reçues pour réviser certaines approches d'engagement communautaire. Par exemple, deux changements de procédure ont été suivis d'une diminution des réponses négatives de la communauté: d'une part, l'utilisation de sacs mortuaires transparents (pour apaiser les craintes de vol de corps ou d'organes) et d'autre part, l'élargissement des critères d'éligibilité pour la vaccination contre le virus Ebola (pour répondre aux inquiétudes concernant l'injustice de la vaccination sélective des personnes au sein des communautés touchées par le virus).

**Discussion:** Ce système est unique en ce sens que les commentaires non structurés recueillis par les volontaires locaux dans le cadre de leur travail ont été rapidement codés, analysés et transmis aux autorités sanitaires afin qu'elles puissent les utiliser pour rectifier leur tir tout au long de la réponse. Il offre une plateforme permettant aux voix de la communauté de se faire entendre tout au long d'une intervention d'urgence. Également, ce système fournit un mécanisme pour évaluer les effets des ajustements du programme sur les sentiments de la communauté.

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**FIELD ACTION REPORT**

# Navigating the COVID-19 Crisis to Sustain Community-Based Malaria Interventions in Cambodia

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## Key Findings

- Malaria Consortium-supported mobile malaria workers (MMWs) and mobile malaria posts reported no disruptions in services, based on comparisons between 2020 and the same month-period from the previous year.
- The communities trust the MMWs because they are recruited from within their communities and are often known to them personally, they speak the same language and are engaged in the same forest activities. Likewise, the MMWs trust their supervisors because of the clear duty of care displayed to them and the provision of consistent, relevant, and rapid support.
- A management approach that emphasized trust, relevance, and connection (TRC) made the communities and health service program more resilient to external factors beyond their control and ensured people feel comfortable delivering and using MMW services even during times of uncertainty, such as the COVID-19 pandemic.

## Key Implications

- If malaria elimination goals are to be successfully reached, it is vital to continue delivering essential early diagnostic and treatment services even during a time of potential crisis.
- TRC and flexible programming ensure communities and health services are resilient and less dependent on external factors, making it possible for essential service delivery to continue with minimal disruption.
- Scaling up the TRC approach to the wider MMW program will assist Cambodia, and potentially other settings, in achieving malaria elimination, regardless of the presence of COVID-19 or other potential extraneous disruptive events.

## ABSTRACT

Cambodia has made impressive progress in reducing malaria trends and, in 2018, reported no malaria-related deaths for the first time. However, the coronavirus disease (COVID-19) pandemic presents a potential challenge to the country's goal for malaria elimination by 2025. The path toward malaria elimination depends on sustained interventions to prevent rapid resurgence, which can quickly set back any gains achieved.

Malaria Consortium supported mobile malaria workers (MMWs) to engage with target communities to build acceptance, trust, and resilience. At the start of the pandemic, Malaria Consortium conducted a COVID-19 risk assessment and quickly developed and implemented a mitigation plan to ensure MMWs were able to continue providing malaria services without putting themselves or their patients at risk. Changes in malaria intervention coverage and community uptake have been monitored to gauge the indirect effects of COVID-19. Comparisons have been made between output indicators reported in 2020 and from the same month-period of the previous year.

In general, malaria service intervention coverage and utilization rates did not decline in 2020. Rather, the reported figures show there was a substantial increase in service utilization. Preliminary internal reviews and community meetings show that despite a heightened public risk perception toward COVID-19, malaria testing motivation has been well sustained throughout the pandemic. This may be attributable to proactive program planning and data monitoring and active engagement with the communities and the national authorities to circumvent the indirect effect of COVID-19 on intervention coverage in Cambodia during the pandemic.

## INTRODUCTION

In 2011, Cambodia set an ambitious goal of the complete elimination of all *Plasmodium* malaria by 2025 in its National Strategic Plan,<sup>1</sup> which was amended in 2016 with the Malaria Elimination Action Framework.<sup>2</sup> Since then, the country's malaria elimination database shows impressive progress in reducing malaria trends from January 2018–May 2020. In 2018, no malaria-related deaths were reported for the first time.<sup>3</sup>

However, the coronavirus disease (COVID-19) pandemic presents a potential challenge to this goal. As observed in other countries around the world, COVID-19 can quickly overwhelm health system capacity and divert attention from other pre-existing health priorities. In African countries, the models predicted that the indirect effect of COVID-19 on intervention coverage would lead to additional cases and deaths in 2020 when

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A mobile malaria worker in Cambodia provides health education at a malaria post. © 2020 Malaria Consortium Cambodia

compared to the previous years and possibly lead to further increases in subsequent years as a result of COVID-19 related disruptions to malaria control.<sup>4</sup>

As Peter Sands of The Global Fund said<sup>5</sup>:

*There's a significant risk that the knock-on consequences of COVID-19, in terms of the impact on other diseases, are likely to overshadow the direct impact.*

According to the World Health Organization (WHO), if COVID-19 significantly disrupts the primary health system, it's estimated that malaria deaths could double in sub-Saharan Africa and 80 million children could go unvaccinated for preventable but deadly diseases like measles or polio.<sup>6,7</sup> Fortunately, Cambodia appears to have avoided this situation, and health service delivery was largely able to continue uninterrupted.

Situated relatively close to China, Cambodia was quickly on high alert as international news first reported the outbreak of COVID-19 in Wuhan and the subsequent lockdown of the city. Cambodia's first COVID-19 case was diagnosed on January 27, 2020, (unpublished data from WHO Cambodia Malaria Team and Mekong Malaria Elimination Programme) and the country responded over the next 2 months by setting up a national COVID-19 committee in March, reducing international travel and implementing screening points at border crossings to provide health education and fever screening for returning Cambodian migrant workers. Travel within the country continued except during the holiday period of Khmer New Year (April 2020), which

is normally associated with high levels of social gathering and interaction. The Ministry of Health (MOH), WHO, and other partners ramped up preparations for the health sector to accommodate a potential increase in COVID-19 cases and developed an Emergency Master Plan for COVID-19 Response. The MOH updates the number and location of COVID-19 cases and deaths daily<sup>8</sup> and posts daily surveillance reports.<sup>9</sup> As of April 3, 2021, there have been a total of 1,041 COVID-19 cases and 91 deaths.<sup>8</sup>

In anticipation of the potential disruption on malaria intervention coverage and utilization due to indirect effects of the COVID-19 pandemic, Malaria Consortium set up an internal monitoring mechanism for the mobile malaria workers (MMWs) it supports, using performance output indicators, to detect any deviations from the planned target. Based on the interim findings, Malaria Consortium developed a COVID-19 contingency plan and made subsequent adjustments.

## ■ A COMMUNITY-BASED APPROACH TO INCREASE MALARIA SERVICE ACCESS

In 2009, the Cambodia National Center for Parasitology, Entomology, and Malaria Control (CNM) introduced a new cadre of community health workers (CHWs) known as MMWs to specifically improve the availability and accessibility of malaria services among remote populations (Box).<sup>10</sup>

**Anticipating the potential disruption on malaria intervention coverage and utilization due to the COVID-19 pandemic, Malaria Consortium developed a contingency plan and made subsequent adjustments.**

**BOX. Community Health Program in Cambodia**

CHWs provide a range of services in the communities they serve, such as health education and promotion, and ensuring community participation in health campaigns, etc.

Village malaria workers (VMWs) and mobile malaria workers (MMWs) are part of the broader cadre of community health workers (CHWs) that specifically support malaria activities for hard-to-reach communities. These CHWs are chosen by the community and are supported by either nongovernmental organization (NGOs) or the government but are not recognized as employees by either institution. They are provided with modest monetary incentives as compensation for their services. Using CHWs to deliver health services in their source communities has been shown to be effective in improving coverage of interventions, leading to reductions in mortality (unpublished data). However, in some settings, for example, where CHWs have not been carefully selected, appropriately trained, and adequately supported, having a high number of CHWs per population has not led to expected levels of improvement (unpublished data). Medicine and equipment shortages among CHWs or at facilities and poor quality of care in facilities also limit CHWs' ability to perform their duties and gain community trust.<sup>8</sup>

**Integrating and Institutionalizing CHWs Into the Health System**

One of the major drawbacks of the CHW program in Cambodia is that it was not properly institutionalized and integrated into the formal health system, has a vertical implementation nature, and relies on external financial and technical assistance. Their performance largely depended on the input (funding, commodity supply, and national policies), supportive systems (supervision, training, and incentives), and community support. In one instance, the Global Fund (a major donor for malaria activities in Cambodia) Office of Inspector General Audit noted in 2017 that due to delay in implementing fiduciary safeguards, VMW activities were suspended for a considerable period of time, which resulted in decline of service delivery.<sup>11</sup> Following this instance, additional safeguarding measures were introduced by the Global Fund, including allowing NGOs to support the health centers, provincial health departments, and operational districts to manage the CHWs in a more effective and efficient manner.

In 2016, Cambodia placed a high value on the right to health for all Cambodians in its Health Strategic Plan 2016–2020 and adopted the mission of<sup>12</sup>:

*effectively managing and leading the entire health sector to ensure that quality health services are geographically and financially accessible and socio-culturally acceptable to all people in Cambodia.*

Through health sector reform efforts, the Cambodian government has prioritized the expansion of health service coverage through the public sector (national to health center level) as well as via private-for-profit and private nonprofit organizations. Cambodia's MOH recognizes the important role nongovernmental organizations (NGOs) play in health service delivery, particularly through community-based health networks and coordination with the health institutions at all levels.

Malaria Consortium, along with other local and international NGOs, formed a partnership with CNM in Cambodia and complements CNM in delivering services to the communities as outlined in the goals of both the National Strategic Plan<sup>1</sup> and Malaria Elimination Action Framework.<sup>2</sup> The Global Fund and U.S. President's Malaria Initiative provide funding for the strategic plan. Collaboration between CNM and its implementation partners ensures compliance to national and donor rules and regulations

and upholds accountability to avoid implementation delays encountered earlier.

The performance of village malaria workers (VMWs) and MMWs is closely monitored to ensure data and service quality. VMWs/MMWs are provided a modest monthly incentive based on their performance output, which is supported by internal data quality assurance and financial safeguarding mechanisms. Supervisors ensure data quality by checking and counter-checking data reported by MMWs for consistency, completeness, and accuracy against the daily case register books and also check other program-related data (e.g., stock, long-lasting insecticidal-treated net/long-lasting insecticidal-treated hammock net distribution, time and place of supervision visits, etc.). A community mobilization officer (CMO), which supervises VMWs/MMWs, or health center staff member also conducts routine supervision visits (once every month) to ensure data are of adequate quality.

**Building Trust and Acceptance Within the Community**

In addition to the supportive systems (e.g., supervision and commodities), support from the community is key to maintaining high-quality VMW/MMWs' performance. Because they are recruited from within their communities, they are likely to

have both a personal and a service relationship with the people they visit.<sup>13</sup> Being a member of a community does not guarantee that CHWs will be trusted. Community perceptions of CHWs' motivation and competence shape people's willingness to communicate with and listen to CHWs, which in turn shapes CHWs' ability to fulfill the role of service extender, cultural broker, or social change agent.<sup>14</sup> To be successful, not only do specific efforts have to be made to ensure trust among the communities and CHWs, but between the CHWs, health facility staff, and supervisors.<sup>13</sup> For example, in Thailand, seeing CHWs work alongside public health professionals increased CHW credibility in the eyes of the community.<sup>15</sup>

In the case of the MMWs in Cambodia, those who have strong support and supervision from the CNM, and its partners, have similarly increased credibility within the communities they serve. As noted by Echaubard et al., genuine community engagement creates a sense of ownership<sup>16</sup>:

*Motivated, empowered, and well-informed multistakeholder groups . . . should be better equipped to understand the tools available to them and mitigate cross-scale social and ecological drivers of disease emergence.*

Therefore, CHWs are better placed to identify and sustainably implement adaptive strategies. Early and effective community engagement, non-threatening home visits that enhance friendship, and strong supportive supervision can improve the trust and acceptance of the CHWs within the communities, as well as the confidence of the CHWs themselves, increasing the willingness of community members to use CHW services.<sup>17</sup>

Successful CHW programs require a partnership between communities and health systems (and MOH partners), however, this does not happen automatically. Explicit mutual responsibilities and accountabilities are required, as well as a demonstrated willingness to work in tandem toward a common objective and flexibility.<sup>18</sup> To date, there have been limited examples showing how this collaborative, dynamic approach and trust-building effort can strengthen resilience and help maximize the efficient use of available resources.

## ■ MOBILE MALARIA WORKER'S ROLE IN ELIMINATING MALARIA

To help Cambodia achieve its malaria elimination goal by 2025, Malaria Consortium, as one of CNM's implementing partners, supports the provision of early diagnostic and treatment services for malaria among remote populations through

MMWs and mobile malaria posts (MPs) in 3 provinces in North East Cambodia (Preah Vihear, Stung Treng, and Ratanakiri Provinces). The approach was developed in alignment with the National Strategic Plan for Elimination of Malaria, in close collaboration with CNM, and built on lessons learned from earlier Regional Artemisinin-resistance Initiative (RAI) projects.<sup>19</sup> The MMWs need to have a strong understanding of the local geography, since road access and river crossings change frequently, and work in collaboration with local authorities. Most importantly, MMWs need to build and maintain trust among the people who live in and around the forest, particularly because some may be involved in illegal activities and have cultural and linguistic differences from the majority Khmer population. It is essential that services to these communities are provided by a trusted and culturally acceptable person so that the communities use the services being provided. To achieve this trust, Malaria Consortium uses a peer-to-peer approach, with the majority of MMWs representing at least 2 of the following groups: forest goers, communities that regularly cross borders, loggers, ethnic minority groups, migrant farmers, or construction workers.

The MMWs are trained and incorporated into the national VMW program and meet monthly with health center staff. This process ensures they are included in the general delivery of health services and can share challenges with health center staff. However, unlike traditional VMWs, who provide passive-case detection in their respective villages, MMWs provide active case detection by actively finding possible infections (whether symptomatic or not) that pose risks of infection and can cause onward transmissions. Active case detection targets at-risk populations, hard-to-reach, household members of positive cases, co-exposed, and co-travelers of the positive case who are usually less accessible to village-based testing or health centers. While doing so, MMWs adjust how they deliver their services, depending on changing circumstances and local epidemiology (Figure 1 shows an example of the reach of MMW service delivery).

To maximize the reach of activities and increase the population able to receive services, locations for MP placement and targeted outreach activities are based on the triangulation approach of routinely collected data and local information (Figure 2): (1) local MMW knowledge on social gathering sites, forest entry/exit points which are known as strategic locations to best reach forest goers; (2) epidemiology—distribution of suspected and confirmed malaria cases

**MMWs who have strong support and supervision from the CNM, and its partners, have similarly increased credibility within the communities they serve.**

**MMWs provide active case detection by actively finding possible infections that pose risks of infection and can cause onward transmissions.**

**FIGURE 1.** Map Showing Example of Reach of Malaria Consortium-supported Malaria Mobile Worker Service Delivery, Cambodia



(age-groups and sex); and (3) accessibility of hard-to-reach and remote areas.

To ensure the same level of trust operates between the MMWs and Malaria Consortium, CMOs are employed by Malaria Consortium to support an average of 6 or 7 MMWs or MPs each. This enables each CMO to provide consistent supervision and performance appraisal using a standardized supervision checklist that includes data quality (data entry, consistency, and accuracy), service quality (treatment provided in line with national protocols), stock balance, and level of testing compared to previous months, etc. Any issues that the CMOs identify during supervision are then followed up. If the CMO cannot join outreach activities for any reason, a home visit to the MMW or the MP is always planned, at least once a month. These supportive supervision visits are opportunities for both the CMO (the project staff) and the MMWs to review data and individual

performance, progress, and areas to improve, as well as to develop plans for improvement. This 2-way problem-solving approach adds to the level of trust shared between the project staff and MMWs and subsequently increases the trust between MMWs and the communities. In addition, these processes ensure that MMWs sustain their motivation and job satisfaction, helping to reduce attrition.

## PROGRAM ADJUSTMENTS FOR COVID-19

National guidance documents and operational plans for malaria interventions were quickly adapted by CNM and WHO for the context of COVID-19 (unpublished data). Malaria Consortium's policy during COVID-19 has been to follow national guidelines while continuing to support community-based malaria services via the MMWs/MPs with as

**FIGURE 2.** Triangulation Approach Malaria Consortium Used to Determine Where to Deliver Malaria Mobile Worker/Mobile Post Services in Cambodia



A mobile malaria worker in Cambodia provided with personal protective equipment and COVID-19 guidelines performs malaria testing on a forest-goer in Cambodia. © 2020 Malaria Consortium Cambodia

minimal disruption as possible. Malaria Consortium rapidly conducted a risk assessment and quickly developed and implemented a mitigation plan to ensure MMWs were able to continue providing

services without putting themselves or their patients at risk (Table 1). Developed in consultation with the field-level project staff, community members, and the MMWs, the mitigation plan prioritized: the

**TABLE 1.** Malaria Consortium COVID-19 Risk Assessment and Mitigation Plan for Mobile Malaria Worker Activities, Cambodia

Malaria Risks for Malaria Consortium MMW/Mobile Posts	Mitigation Measures	Implementation Status	Outcome
Risk of decreasing number of tests done by MMWs	Procured additional PPE material Strengthened messaging on importance of use of PPE strengthened	Distributed extra masks and forehead thermometers, March/April 2020	No decrease in number of tests observed In Stung Treng, some decrease in tests for April 2020, but this is yearly recurrent phenomenon due to Khmer New Year Starting up activities in fields near villages resulting in less forest activities by population
Miscommunication/limited understanding of COVID-19 transmission and prevention	Distributed posters related to COVID-19 transmission and prevention (provided by PHD)	Distributed information on COVID-19 to all MMWs, March Gave strong messages to continue screening, implementing/following safety instructions	Low number of COVID-19 cases/no proven local transmission makes it easier for MMWs to continue the task. Malaria Consortium staff continues to support and visit the MMW/MMP in a safe way.
Fear feeling at MMWs/MMP/Malaria Consortium staff level	Provided additional PPE <sup>a</sup> materials and communication about fears	Completed March/April with ongoing sharing information and updating by management team (e.g., repeat safety measures, weekly update mails task force, etc.)	No fear observed among MMWs/MMP and Malaria Consortium staff; no local transmission and no cases in the area gives feeling of safety As MMWs/MMP are locally recruited, no limit in movement when some villages/areas were closed for a few days. No limits in traveling for outreach activities.
Coverage LLIN/LLIHN	Ongoing distribution of LLIN/LLIHN Stock-out observed from March 2020	Requested additional LLIN/LLIHN to continue activity LLIN: out of stock on national level (refill 2021) LLIHN: received June 2020 order	Distribution of LLIHN ongoing by MMW/MMP No more LLIN: increased risk for plantation workers, for new settlements in forested areas, for new remote annex villages
Number of positive malaria cases	System in place: Inform health center of any <i>Plasmodium falciparum</i> positive cases for foci investigation Malaria Consortium team perform active case detection (=screening co-travelers)	Monitoring Malaria Consortium internal database; compare/update national Malaria Information System and exchange data monthly with CNM/WHO intensification plan for Stung Treng and Ratanakiri.	Decrease in the 3 areas of all types of malaria cases (end of dry season, starting rainy season) from January until May 2020

Abbreviations: CNM, National Center for Parasitology, Entomology and Malaria Control; LLIN, long-lasting insecticidal-treated net; LLIHN, long-lasting insecticidal-treated hammock net; MMP, mobile malaria post; MMW, mobile malaria worker; PHD, provincial health department; PPE, personal protective equipment; WHO, World Health Organization.

<sup>a</sup> PPE supplies provided included soap, hand sanitizer, masks, gloves, and thermometer guns.

MMWs’ safety and well-being during the pandemic (e.g., procuring personal protective equipment [PPE] and communicating on how to properly utilize and safely dispose of PPE); communication with the community members to address their risk perceptions around COVID-19 transmission and any fears or concerns they had related to receiving malaria services from the MMWs; program planning (in advance, quantification and distribution planning of

long-lasting insecticidal-treated net requirements to avoid stock-outs); and continuous monitoring of the project data to identify and respond to any transmission outbreaks.

Performance monitoring mechanisms were set up and indicators have been closely monitored throughout the pandemic. MMW performance is monitored through quantitative indicators including average testing per service delivery site (e.g.,



**TABLE 2.** Average Number of People Tested Monthly per Service Delivery Site by Mobile Malaria Workers and Test Positivity Rate, From January to March, 2018–2020, Cambodia

	Average Monthly Active Sites, No.	Monthly Average Tested by Site, No.	Test Positivity Rate <sup>a</sup> (All Plasmodium Species)	Test Positivity Rate <sup>a</sup> (Pf/Mix)
January–March 2018	21	28	24.56%	13.6%
January–March 2019	45	47	7.23%	1.4%
January–March 2020	45	63	2.66%	0.2%

Abbreviation: Pf, *Plasmodium falciparum*.<sup>a</sup> Test positivity rate calculated as the number of positive cases divided by number of tested in a specified period multiplied by 100.**TABLE 3.** Average Number of People Tested Monthly per Service Delivery Site by Mobile Malaria Workers and Test Positivity Rate, From January to June, 2018–2020, Cambodia

	Average Monthly Active Sites, No.	Monthly Average Tested by Site, No.	Test Positivity Rate <sup>a</sup> (All Plasmodium Species)	Test Positivity Rate <sup>a</sup> (Pf/Mix)
January–June 2018	21	29	23.60%	12.2%
January–June 2019	45	51	5.35%	0.9%
January–June 2020	45	63	2.07%	0.1%

Abbreviation: Pf, *Plasmodium falciparum*.<sup>a</sup> Test positivity rate calculated as the number of positive cases divided by number of tested in a specified period multiplied by 100.

outreach activity or MP), and test positivity rate (TPR) (Table 2 and Table 3). TPR was computed as the number of positive cases divided by the number of people tested in a specified period multiplied by 100.

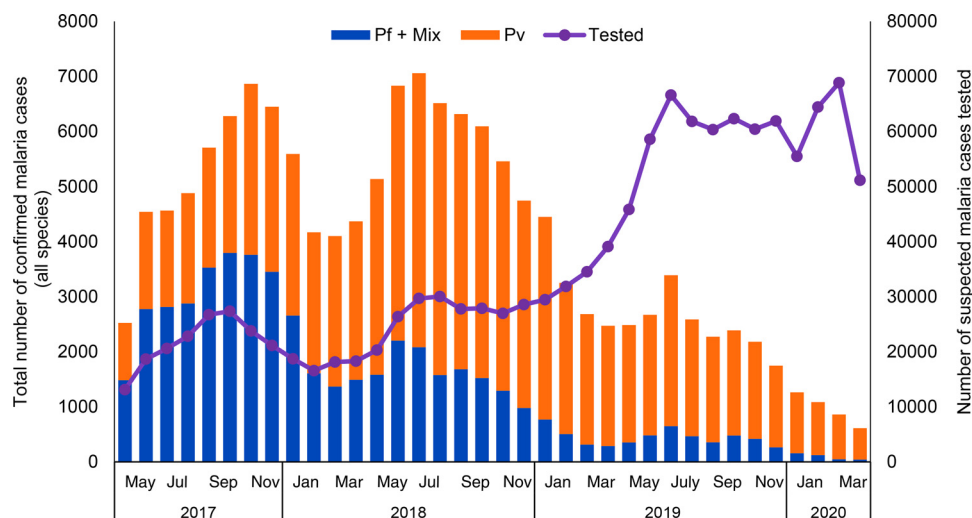
## OUTCOMES

The reported number of confirmed COVID-19 cases has remained low in Cambodia. There have been only minor disruptions to health services. However, the number of malaria tests conducted nationally decreased by 20% in April and May compared to March (unpublished data). To date, there have been confirmed COVID-19 cases in Preah Vihear but not in the other 2 provinces supported by Malaria Consortium. But, as with the rest of the country, there has been an overall decline in malaria testing at the health centers and VMWs among all 3 provinces, according to WHO statistics. Such a decline was not seen in previous years and may be attributed to fear of COVID-19 (Figure 3 shows subregional testing and confirmed *Plasmodium falciparum* and mixed cases). However, based on a review of routine project data, the indicators suggest that there

has been no decline in the utilization of malaria testing/treatment by Malaria Consortium-supported MMWs. During the pandemic period under review (January 2020–June 2020), the monthly average malaria testing rate was higher than in the same period in 2019 and 2018. The overall malaria TPR in Malaria Consortium supported areas continued to decline in 2020, which is consistent with the national disease trend (Figure 3). In fact, contrary to the initially anticipated program disruption and service utilization decline due to COVID-19, there were consistently high malaria testing rates of an average of 63 people per site sustained throughout from January–June 2020 in follow-up RAI2-Elimination project areas (Figure 4). One MMW commented:

*For sure, the activities of the MMWs in this area could still continue because the MMWs are all “recognized” and trusted by the local people. . . . CMOs and MMWs have heard information from people in the communities that some villagers were worried about getting infected by COVID-19. But they still come for malaria testing at the MPs or with the MMWs when they suspect they might have malaria, as they trust our*

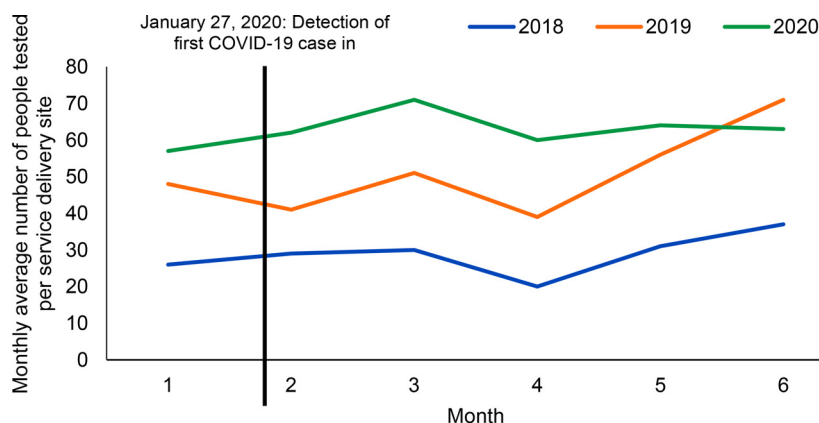
**FIGURE 3.** Malaria Testing and Confirmed Malaria Cases, in Cambodia, 2017–2020



Abbreviations: Pf, Plasmodium falciparum; Pv, Plasmodium vivax.

Source: World Health Organization (WHO). Mekong Malaria Elimination: Epidemiology Summary July-September 2020. Vol. 11, WHO; 2020. Accessed April 5, 2021. <https://www.who.int/publications/i/item/WHO-UCN-GMP-MME-2020.04>

**FIGURE 4.** Malaria Testing Rates Done by Mobile Malaria Workers in Project Areas Between January and June 2018-2020, Cambodia



services and clearly understood that COVID-19 can be prevented by wearing masks and washing their hands with soap or gel. —MMW, Chom Ksant District, Preah Vihear Province

Another MMW reported the same experience:

At the beginning of the outbreak of COVID-19, CMOs and MMWs heard some information from local people saying they were worried about the disease and afraid to go outside or to go to the town. They asked their children to stay at

home. But when they suspect that they might get malaria, they will still go and meet with MMWs in the village, that they have known. —MMW, Cham Village, Siem Pang District, Stung Treng Province

**LESSONS LEARNED**

Malaria Consortium ensured the MMW/MP program is built on trust, relevance to, and connection within the communities being served. Realization of these

philosophies requires sound programmatic processes and measurements of the MMWs' performance and timely proactive mitigation planning. Community systems are fragile and vulnerable to disruption particularly at the time of international health crises. Community access to services was not disrupted because the services continued to be available within their communities and eliminated the need to travel a long distance just to access care, often at their own expense. Accessing the MMWs without diverting to any other providers requires a level of trust.

The communities trust the MMWs because the MMWs are part of the community, are known personally by community members, speak the same language, and are engaged in the same forest activities. Providing quality supportive supervision to MMWs, actively communicating and engaging with the community to address their perceived risks during the pandemic, prioritizing the MMWs' well-being and safety by providing PPE, and regularly communicating with MMWs on their day-to-day issues were all processes that culminated in making the community health systems more resilient to external factors beyond their control. These processes also ensured that, even during times of uncertainty, such as the COVID-19 pandemic, MMWs were comfortable delivering services and communities were comfortable using MMW and MP services.

If malaria elimination goals are to be successfully reached, it is vital to continue delivering essential early diagnostic and treatment services even during a time of potential crisis. Building community resilience through trust, relevance, and connection and using flexible programming ensure communities and health services are less dependent on external factors, making it possible for essential service delivery to continue with minimal disruption. Scaling up this supportive approach to the MMW program could allow Cambodia, and potentially other settings, to ensure they succeed in achieving malaria elimination, regardless of the presence of COVID-19 or other potential extraneous disruptive events.

## ■ KEY STEPS FOR ENSURING TRUST, RELEVANCE, AND CONNECTION

- Recruit MMWs directly from the communities they will serve
- Ensure quality support is provided by the CMOs (e.g., limit network size of MMWs/MPs supported by each CMO)

- Ensure flexibility with locations of MPs and outreach services through triangulation of relevant information
- Respond rapidly to changing circumstances
- Provide clear information and guidelines on changing situation (e.g., COVID-19 transmission and prevention)
- Ensure the safety of staff (both CMOs and MMWs) and those using services (e.g., rapid provision of PPE materials)
- Continue to provide visible support to MMWs despite changing circumstances

## ■ CONCLUSIONS

Malaria Consortium was able to provide care and support for the MMWs and the communities being served by conducting a COVID-19 rapid risk assessment and mitigation plan, providing correct information on the transmission and prevention of COVID-19 and enhanced PPE, and continuing routine support supervision visits. The high level of trust already established by the program ensured a willingness among the MMWs and communities to continue providing and using services as usual.

The project's routine reports and preliminary feedback from the community suggest that Malaria Consortium's trust, relevance, connection strategy, programmatic processes, and proactive mitigation planning has been successful in reducing the indirect effect of the COVID-19 pandemic on the intervention coverage and service utilization by the community across the 3 supported provinces. This clearly demonstrates the important role of building and sustaining genuine trust among the communities served and service providers for the continuation of vital malaria elimination services, regardless of the ongoing external factors, such as COVID-19 or other future pandemics or natural disasters.

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**If malaria elimination goals are to be successfully reached, it is vital to continue delivering essential early diagnostic and treatment services even during a time of potential crisis.**

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FIELD ACTION REPORT

# Real-Time Tracking of COVID-19 Rumors Using Community-Based Methods in Côte d'Ivoire

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## Key Findings

- Rumors and misinformation undermine public health by creating barriers to protective practices and reducing trust in health responders.
- We developed an approach to real-time rumor tracking that leverages existing structures (like national hotlines) and local liaisons (such as community health workers) to submit rumors and misinformation to a central database. The rumors are rapidly coded using a standard form and visualized on custom dashboards.
- During the 6-month pilot of this tool in Côte d'Ivoire, we received and coded 1,757 submissions and used the thematic findings to inform risk communication and community engagement activities.

## Key Implications

- Health leaders should consider using a real-time rumor-tracking approach during public health emergencies and can build on the detailed guide and District Health Information System 2 metadata package provided for a simple, open-source, community-centered technology to make rumor data digestible to responders.

➔ *Resumen en français à la fin de l'article.*

## ABSTRACT

Global misinformation and information overload have characterized the coronavirus disease (COVID-19) pandemic. Rumors are unverified pieces of information spreading online or person-to-person that reduce trust in health authorities and create barriers to protective practices. Risk communication and community engagement can increase transparency, build trust, and stop the spread of rumors. Building on previous work on Ebola and Zika viruses using Global Health Security Agenda systems strengthening support, the U.S. Agency for International Development-funded Breakthrough ACTION project developed a process and technology for systematically collecting, analyzing, and addressing COVID-19 rumors in real-time in Côte d'Ivoire. Rumors were submitted through community-based contributors and collected from callers to the national hotlines and then processed on a cloud-hosted database built on the open-source software District Health Information System 2 (DHIS2). Hotline teleoperators and data managers coded rumors in near-real-time according to behavioral theory frameworks within DHIS2 and visualized the findings on custom dashboards. The analysis and response were done in full collaboration with the Government of Côte d'Ivoire and implementing partners to ensure a timely and coordinated response. The system captured both widespread rumors consistent with misinformation in other settings, such as suspicions about case counts and the belief that masks were deliberately contaminated, as well as very localized beliefs related to specific influencers. The qualitative findings provided rapid insights on circulating beliefs, enabling risk communicators to nuance and tailor messaging around COVID-19.

## INTRODUCTION

Rumors are “collective hypotheses” about reality that are communicated within groups of people, and their defining characteristic is that they are unverified or lack evidence.<sup>1</sup> Rumor content has been classified based on the concerns of the group, such as speculations about causes of illness or safety of treatments. Alternatively, rumors may be based on the motivations of those spreading the rumor, such as to hurt or to help others or to express one’s dread or wishes.<sup>1,2</sup> Specifically, rumors containing inaccurate information can be spread with the intention of helping others or making sense of difficult experiences (misinformation),

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or rumors can be propagated intentionally to cause harm or confusion to others (disinformation).<sup>2,3</sup> While rumors are often seen to be innocuous, those that contain harmful information can cause both morbidity and mortality and extend the life of a public health emergency. For example, in early 2020, a rumor circulating in Iran—that consuming alcohol (including disinfectants) could prevent or treat severe acute respiratory syndrome coronavirus 2 infection—coincided with 800 deaths from methanol poisoning.<sup>4</sup> Influxes in the spread of rumors are often observed during epidemics, such as the current coronavirus disease (COVID-19) crisis, which has more recently been defined as an “infodemic” by the World Health Organization.<sup>5</sup> The term infodemic describes a situation where there is too much information circulating about a given topic and the information contains both accurate and inaccurate statements that make it difficult for people to distinguish one from the other.<sup>6</sup>

During the current COVID-19 pandemic, misinformation has spread widely throughout communities and social networks alike.<sup>6,7</sup> Rumors about this novel pathogen and its associated illness, COVID-19, have flourished, complicating individuals’ ability to determine which information about the virus can and should be trusted. Rumors are notoriously difficult to define, identify, and track.<sup>6</sup> Researchers have characterized the spread of rumors using an epidemiological framework, even estimating the “infectiousness” or pace of sharing particular pieces of information and looking at mediating factors such as linguistic features, message believability, individual personality, or group trust.<sup>8–10</sup> While, on the one hand, researchers have quantified rumor dynamics, public health professionals and policy makers have oversimplified rumors as simply myths or folklore to be corrected.<sup>11</sup> Stories characterized as “rumors” (such as rumors of abuse by humanitarian aid workers or secret testing of medical treatments using coercion or without consent) may later prove true and may have far-reaching impacts.<sup>12</sup> Even regarding rumors that are “false,” characterizing rumors in a factor-falsehood dichotomy runs the risk of bringing an overly biomedical or colonial framing, thereby missing how communities conceptualize their experiences and likewise missing important insights for the design of effective prevention and control efforts.<sup>11</sup>

Nevertheless, developing methods to track, prioritize, and respond to harmful rumors is important to the implementation of social and behavior change interventions during public health

emergencies. As a result of the uptick in social media usage in modern times, researchers are conducting studies on the diffusion of misinformation through social media platforms.<sup>10,13</sup> However, while social media-based analyses provide access to large amounts of information in short amounts of time, they are limited by their inability to include the perspectives of those who do not have access to or do not use social media. Globally, social media penetration has grown to 53%, but in many settings, fewer than a quarter of the population actively access social media.<sup>14</sup> Additionally, rumors may spread rapidly outside social media as individuals share information in common physical spaces or private short message service (SMS) chats that are inaccessible by social media monitoring methods. Systematically identifying and tracking misinformation that flows through “unplugged” homes and communities is necessary to a robust public health response. Surveys may identify these beliefs at certain time points, but household-based and mobile surveys typically occur infrequently and can be resource-intensive, while rumors evolve constantly and require a more agile approach.

The solution to this development challenge may lie in a long-tested method recently given new life through mobile technology: real-time monitoring. In the development and humanitarian aid world, monitoring is the process of simple yet continuous data collection using standard tools to track clearly defined metrics. Mobile devices have allowed monitoring to become more rapid, with data transferred instantly to a central database for processing and analysis and visuals automatically populated to reflect realities hundreds or thousands of miles away. The application to rumor management is clear. Local cadres such as community health workers, hotline teleoperators, or health promoters may be employed as contributors who document and submit rumors they hear during their work and daily lives. Real-time rumor tracking is a relatively novel methodology, versions of which have been implemented by organizations like Internews, International Federation of Red Cross and Red Crescent Societies, United Nations Children’s Fund, and Johns Hopkins Center for Communication Programs (CCP) during outbreaks of Ebola or other humanitarian emergencies.<sup>2,15–17</sup> In some cases, the approach functioned like a general community feedback system, where individuals in a refugee camp, for example, could submit rumors or complaints that would be followed up by staff. In other cases, as with the DeySey system in Liberia during the Ebola outbreak of 2014–2016,

**Developing methods to track, prioritize, and respond to harmful rumors is important to implementing social and behavior change interventions during public health emergencies.**

the system tracked rumors specifically related to Ebola using an SMS system.<sup>16</sup>

CCP, with funding from the U.S. Agency for International Development (USAID) under the flagship social and behavior change program Breakthrough ACTION, piloted a real-time rumor-tracking system in Côte d'Ivoire to identify, rapidly analyze, and respond to rumors that emerged around COVID-19. Initially developed as part of the Global Health Security Agenda portfolio to address rumors related to the country's 5 priority zoonotic disease groups, the launch of the system on March 1, 2020, coincided with the first case of COVID-19 in Côte d'Ivoire on March 11. In the following sections, we summarize the multi-pronged community-based approach to rumor collection, the process of coding and managing rumor submissions, and summarize user feedback and lessons learned for tracking rumors during a public health emergency.

## METHODS

### Training

The 6-month pilot took place between March 1 and August 31, 2020. In February 2020, the team recruited and trained community contributors (CCs), individuals who were in touch with communities and working in fields relevant to human or animal health. A total of 20 CCs were trained: 12 in Abidjan, the capital of Côte d'Ivoire, and 8 in Bouaké, the second-largest city. They received a small amount of mobile airtime credit to allow them to submit rumors through WhatsApp. They were not required to be professional health communicators or health workers, but they were sufficiently able to recognize reportable rumors and submit them via written text or voice message. Teleoperators at 3 national health-related hotlines were also trained, including the 143 line, which led the implementation during the pilot period. The 143 line has national coverage, is free of charge to callers, and offers information and responds to the concerns of the population related to health services. The line is managed by the Government of Côte d'Ivoire and is affiliated with the Department of Communication and Public Relations within the Ministry of Health.

The training was a 2-day workshop explaining the purpose and public health benefits of tracking rumors. Participants watched videos, worked on identifying and classifying rumors, and learned how to submit rumors through WhatsApp or the digital application. CCs and teleoperators practiced recognizing reportable rumors related to

any of the country's priority zoonotic diseases including COVID-19. During the training and through prompts, we characterized a rumor as a piece of information that they were not sure was true. The data management team considered rumors as either unable to be fully verified (for example, theories about where the virus originated) or verified to be false (for example, that COVID-19 cannot affect Africans). However, while the team invested considerable time during and after the training to arrive at a clear definition of a rumor for the CCs and teleoperators, we avoided asking them to be scientific experts and encouraged them to err on the side of inclusion if unsure.

### Rumor Submission

When they heard or saw something they believed to be a rumor, CCs submitted it verbatim, to the extent possible, using a text or voice message to a dedicated WhatsApp line. Message threads were individual as opposed to group chat conversations to avoid amplifying misinformation among key informants. Likewise, teleoperators who heard reportable rumors during their phone calls noted them in a standard log. Rumors identified through the hotline could come from anywhere in the country, while the CCs were located in Abidjan or Bouaké. Both CCs and teleoperators were instructed to deidentify rumors before submitting them. They were also instructed to submit a rumor every time they heard it, even if they had submitted it before.

### Rumor Documentation and Topical Coding

Teleoperators from the national hotline entered rumors received through the WhatsApp line or the hotline into a predeveloped form hosted in a cloud database built on the District Health Information System 2 (DHIS2) platform. The rumor log was an event program in DHIS2, and each rumor was labeled by date, district, and the source from which it was received (either via community contributor or through the hotline). Rumors were then coded in the same form using a standard codebook for a set of defined topics such as "prevention," "modes of transmission," "government response," or "estimates of case counts." Codes were not mutually exclusive, and rumors could have multiple codes applied. For example, the "conspiracy theory" code was defined as "a theory that rejects official accounts of an event or situation in favor of secret organizations or secret plots" and could be co-applied with "treatment" or "vaccination" or other topics. The

majority of codes were defined in advance based on prior research conducted on priority zoonotic diseases or based on behavioral theory such as the Extended Parallel Processing Model.<sup>18</sup> This model posits that in the context of a threat, perceived susceptibility to an illness, anticipated severity of the illness (if contracted), and perceived efficacy of protective behaviors to alleviate the threat can all influence whether people feel motivated to practice protective behaviors. Rumors related to this model—including who is at risk for COVID-19, how serious COVID-19 is, and whether the recommended response measures work—were all of interest to prioritize messaging that would prompt people to take action (danger control) rather than minimize or ignore the threat (fear control). If rumors did not fall into one of the predefined topical codes, the data managers would select “other,” and if they felt that a new code may be warranted, there was an open-ended field to propose new codes. As additional codes were included to reflect new rumors, prior rumors were back coded with the new codes. Teleoperators could also flag a submission for immediate follow-up if they felt a rumor should be referred to a different authority such as the police; this was typically used for submissions about financial scams related to the pandemic or threats of violence. In those cases, the rumors were passed on to project staff who reviewed them immediately and then passed the information on to the appropriate authorities where relevant.

### Real-Time Analysis and Synthesis

CCP data managers reviewed the rumors and verified 100% of the coding. In addition, every 3 days, data managers extracted coded rumors and facilitated a rapid analysis process to identify insights and synthesize submissions into one of, ultimately, 20 belief statements. For example, a topical code might be “modes of transmission,” but the belief statement may be “COVID is spreading through contaminated masks.” The rapid analysis involved reading the coded rumor submissions, identifying the belief statements, and discussing their priority based on a set of 5 questions: (1) Has this rumor been fact-checked and found to be false? (2) If believed, could this rumor cause physical harm to people? (3) If believed, could this rumor create an obstacle to accessing health services? (4) If believed, could this rumor reduce trust in health workers or public health responders? (5) If believed, could this rumor stigmatize people perceived to be at risk or infected?

Through discussion of these questions, belief statements that were deemed to warrant a potential response were added to the rumor log and back coded up to 1 month.

### Data Visualization and Sharing

Custom dashboards within DHIS2 summarized the data by district, topic, belief statement, and week, allowing for rapid analysis across multiple dimensions. Insights, including any geographic or time variation in rumors, were shared with the national Risk Communication Technical Working Group (RCTWG) during weekly coordination meetings. The RCTWG, which existed and met before COVID-19, comprises representatives from government entities in the human health, animal health, and environment sectors. This group remains a permanent mechanism for coordination around risk communication for the Government of Côte d’Ivoire. The RCTWG coordinated various public health and implementing partners to address rumors as needed. At the end of the pilot period, stakeholders provided feedback on the system to assess the usefulness and relevance of the system and to improve implementation.

The real-time rumor-tracking pilot was reviewed and approved by the Johns Hopkins University School of Public Health Institutional Review Board and the Ivoirian Comité National d’Éthique des Sciences de la Vie et de la Santé (National Ethics Committee for Life Sciences and Health in Côte d’Ivoire).

### ■ FINDINGS

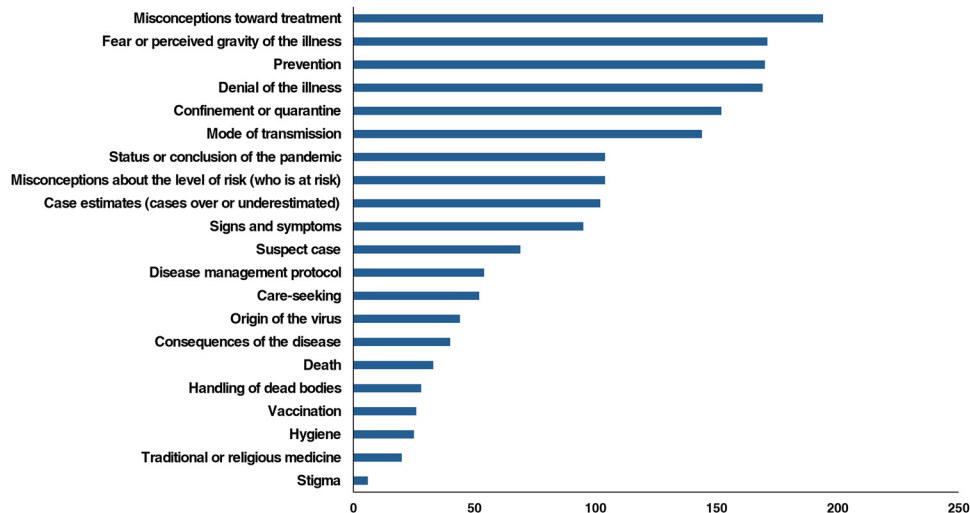
During the 6-month pilot, CCs and hotline teleoperators contributed 1,757 individual submissions to the rumor-tracking system, with CCs contributing 70% of rumors received during this period. Of the rumors where a specific illness was mentioned, 97% related to COVID-19. The Figure shows the number of submissions by topic codes.

The most common topics related to alternative prevention and treatment methods including home and herbal remedies, perceived severity of the illness, perceptions of public health recommendations and government actions, and denial of the existence of the virus. The belief that COVID-19 does not exist or is no longer circulating in Côte d’Ivoire was consistent throughout the pilot period and frequently co-occurred with the “conspiracy theory” code. Many rumors described alternative prevention or treatment methods for COVID-19, such as consuming certain foods or drinks or medications for other illnesses (such as

**The most common rumor topics were alternative prevention and treatment methods, perceived severity of COVID-19, perceptions of public health recommendations and government actions, and denial of the existence of COVID-19.**



**FIGURE.** Rumors on Coronavirus Disease in Côte d’Ivoire Coded by Topic,<sup>a</sup> March to August 2020



<sup>a</sup> Multiple codes could be applied to each rumor. Figure shows a subset of codes. The complete codebook can be found in the Supplement.

antiretrovirals). Communities expressed skepticism or concern about the efficacy or cost of public health recommendations or practices like wearing masks or avoiding travel. Rumors about the status and evolution of the pandemic often featured heavily, and one of the most consistent rumors was that “coronavirus is over.” Rumors related to the development of a vaccine occurred early on, then waned, and then picked up in frequency toward the end of the pilot period in August 2020.

To further synthesize the data, belief statements were collapsed into thematic groups to organize the findings for the RCTWG. The bulk of submitted rumors fell into 1 of the following overarching themes: (1) denial of the reality of the virus or case estimates, (2) status and evolution of the pandemic, (3) recommended public health measures, (4) vaccine development and use, (5) alternative prevention and treatment methods, (6) perceived risk or susceptibility, and (7) perceived severity and symptoms. A definition of each theme is provided in Table 1.

Table 2 provides a summary of the themes, belief statements, and illustrative rumors. Though each belief statement was primarily associated with 1 theme, the themes did intersect. For example, the first 2 overarching themes in Table 2 tended to overlap, with conspiracy theories about the origin and purpose of the virus (created in a lab, created to kill people) co-occurring with

suspicious around the government’s case and death counts being over- or underestimated for nefarious reasons. There were similar intersections between the origin theories and the perceptions of recommended health measures, specifically linking fear of testing or care-seeking to the suspicion that people were being deliberately misdiagnosed for money. Themes that were directly informed by the Extended Parallel Processing Model—such as perceptions around the personal risk of contracting the virus or the severity of COVID-19—provided rich data throughout the pilot as well as theory-informed strategies to respond to rumors through risk communication and community engagement.

In response to the rumors collected via the rumor tracker, during its routine meetings, the RCTWG coordinated the risk communication and community engagement efforts alongside representatives of the Government of Côte d’Ivoire implicated in risk communication and pandemic response, such as the Center for Emergency Public Health, the Crisis Communication Committee, and implementing partners working on social and behavior change activities. The RCTWG prioritized rumors that were timely, reported multiple times, had the potential to cause harm, or put people at risk. Strategic communication messages developed based on rumor data focused on the correct information and avoided restating the rumors. Messages were

**TABLE 1.** Overarching Themes of Rumors About COVID-19 in Côte d’Ivoire, March to August 2020

Theme	Definition
Denial of the reality of the virus and case estimates	Questions or suspicions that the virus is a complete fabrication, or that it exists elsewhere but not in Côte d’Ivoire. Beliefs that the official case counts are false or deliberately misleading (often tied to the belief that the virus is not real) for a political or financial agenda.
Origin and evolution of the pandemic	Beliefs or conspiracy theories about where the virus originated and how and why the pandemic is progressing the way it is, including the belief that the pandemic has ended.
Recommended public health measures	Beliefs about prevention measures such as masks, distancing, reducing travel, quarantining if exposed, testing, and seeking treatment. These beliefs intersect with response efficacy (whether prevention measures work to prevent COVID-19), self-efficacy (whether people feel they can practice the behaviors or what factors stop them from being able to practice the behaviors), and conspiracy theories about secret or nefarious reasons these particular measures are recommended.
Vaccine development and use	Questions or statements about the COVID-19 vaccines, including their development, authorization, testing, and implementation.
Alternative prevention and treatment methods	Suggestions or beliefs about how COVID-19 may be prevented or treated outside of the official recommendations, including home remedies and religious or traditional approaches.
Perceived risk or susceptibility	Beliefs about who is at risk of infection, severe illness, or death - including comparison with other diseases and differentiating the level of risk by various sociodemographic factors (e.g., ethnicity, climate, age, profession, and wealth).
Perceived severity and symptoms of the illness	Beliefs about whether COVID-19 is serious or not, comparisons with the seriousness of other illnesses, and beliefs about specific symptoms.

Abbreviation: COVID-19, coronavirus disease.

**As a result of themes identified in the rumor tracker highlighting the widespread skepticism about the existence of COVID-19 and low-risk perception, specific messages were added to emphasize that COVID-19 exists and is a threat to everyone.**

disseminated through communication products such as radio spots, posters, and through influencers such as religious leaders. Under the guidance of the RCTWG and using the rumor data, the project developed and disseminated radio spots on radio stations that report a reach of 3.6 million people, as well as placing posters and billboards in neighborhoods with populations totaling over 800,000 people. As a result of themes identified in the rumor tracker highlighting the widespread skepticism about the existence of COVID-19 and low-risk perception, specific messages were added to emphasize that COVID-19 exists and is a threat to everyone. Other radio spots modeled a safe visit to a health center in response to rumors that suggested people were afraid to seek routine services. The project used its Facebook page and the public Facebook pages of the Government of Côte d’Ivoire to complement mass media.

The project did not have the resources to conduct a formal evaluation of the social and behavior change activities, which were either designed or adapted because of the rumor-tracking mechanism. However, through a process evaluation, the team collected feedback from 15 stakeholders (10 CCs, 3 RCTWG members, and 2 teleoperators). Feedback was positive, with CCs emphasizing the ease of use and the sense that they were

contributing to an important endeavor. Likewise, teleoperators felt the system was easy to use and relevant to the public health response but felt constrained in their ability to keep up with rumor volume due to competing demands and limited computer access. The RCTWG members appreciated the insights generated by the system and felt they were able to hear from communities rather than employing a 1-way communication response. However, they requested greater involvement in the rumor collection and analysis process. The main suggestion was to expand the system to include more public health issues, beyond COVID-19 and even beyond zoonotic diseases. The RCTWG has asked the project to scale up and continue supporting the rumor tracker. CCs also requested more regular feedback so they could grow in their capacity to contribute rumors and to keep them informed regularly of emerging credible information so they could serve as an information resource to their communities.

## ■ DISCUSSION

Through a 6-month pilot, the real-time rumor-tracking system developed in Côte d’Ivoire identified 7 overarching themes and 20 associated belief statements informed by more than 1,700 rumor

**TABLE 2.** Themes, Belief Statements, and Illustrative Rumors About COVID-19 in Côte d’Ivoire, March to August 2020

Overarching Theme	Associated Belief Statements	Illustrative Rumors
Denial of the reality of the virus and case estimates	<p>COVID-19 does not exist.</p> <p>The government is overestimating case numbers for financial gain.</p> <p>The government is hiding cases for political reasons.</p>	<p><i>The number of people infected by coronavirus is purely a political calculation. —CC, Bouaké, April 9, 2020</i></p> <p><i>They say that the government is increasing the number of confirmed cases of COVID-19 in order to benefit from the money that the WHO is dispersing for the countries that have coronavirus. —CC, Abidjan, April 13, 2020</i></p> <p><i>Coronavirus never existed in Côte d’Ivoire —CC, Bouaké, August 28, 2020</i></p>
Origin and evolution of the pandemic	<p>COVID-19 was created in a laboratory.</p> <p>COVID-19 is being intentionally spread to kill people.</p> <p>COVID-19 is over.</p>	<p><i>Coronavirus is made up of a group of viruses that were created in a laboratory —CC, Bouaké, June 25, 2020</i></p> <p><i>COVID-19 was created intentionally for harm. —CC, Bouaké, July 13, 2020</i></p> <p><i>Currently, the danger is not present anymore, and they continue to instill an irrational fear. —CC, Bouaké, August 28, 2020</i></p>
Recommended public health measures	<p>Recommended measures do not work or are dangerous.</p> <p>It is dangerous or useless to seek testing or treatment for COVID-19.</p>	<p><i>Masks are infected with COVID-19. Use the ones that are created locally. —CC, Abidjan, April 14, 2020</i></p> <p><i>They say that the COVID-19 testing lefts are the places that transmit the illness —Hotline caller, Koumassi Port-Bouet Vridi, May 5, 2020</i></p>
Vaccine development and use	<p>A dangerous COVID-19 vaccine is disguised as a routine vaccine.</p> <p>A COVID-19 vaccine is designed to infect or kill the population.</p> <p>The state will force us to get vaccinated.</p>	<p><i>There’s a vaccine that transmits COVID-19, when you want to kill yourself, they inject you with the virus, you suffer, and after that you die. —CC, Bouaké, July 5, 2020</i></p>
Alternative prevention and treatment methods	<p>Certain food or drinks will prevent or cure COVID-19.</p> <p>Washing in a certain way prevents or cures COVID-19.</p> <p>Certain medications prevent or treat COVID-19.</p> <p>Sex cures COVID-19.</p> <p>There is a new cure that is hidden from the population.</p>	<p><i>Have sex constantly to kill coronavirus. —CC, Bouaké, March 16, 2020</i></p> <p><i>It is said that the government says to eat everything that is hot and wash with hot water because it cures coronavirus. —Hotline caller, Grand-Lahou, April 29, 2020</i></p> <p><i>They say that in Italy, the remedy against coronavirus has finally been found. —CC, Abidjan, May 22, 2020</i></p> <p><i>Drinking cucumber water every morning is very effective for eliminating the COVID-19 virus. —CC, Bouaké, July 7, 2020</i></p> <p><i>The medicine (remdesivir) existed before corona, they created their virus and also the medicine all this for money earned through the death of thousands of people. The world is fucked up. —CC, Bouaké, July 7, 2020</i></p>
Perceived risk or susceptibility	<p>COVID-19 does not kill or affect certain people (e.g., age, blood type, economic status).</p> <p>COVID-19 does not kill or affect Africans or Black people.</p>	<p><i>The coronavirus cannot catch a Black African because of his Black skin. —CC, Abidjan, March 9, 2020</i></p> <p><i>The genetic composition of African blood resists coronavirus. —CC, Bouaké, March 12, 2020</i></p> <p><i>Coronavirus doesn’t kill children, but the virus attacks people who are very old and kills them. —CC, Bouaké, July 7, 2020</i></p>
Perceived severity and symptoms of the illness	<p>Closures and the economic effects of the pandemic are worse than the virus itself.</p> <p>COVID-19 has weakened or is no longer a threat.</p>	<p><i>Coronavirus kills faster than Ebola. —Hotline caller, Yopougon-Ouest-Songon District, May 4, 2020</i></p> <p><i>Malaria is so much worse than COVID-19 in terms of mortality. —CC, Bouaké, July 5, 2020</i></p> <p><i>Patients that survive COVID-19 always suffer from cardiac problems. —CC, Bouaké, July 5, 2020</i></p> <p><i>One patient out of 20 will feel the symptoms of the illness again one month, even nearly 3 months after the first appearance of symptoms. —CC, Bouaké, July 7, 2020</i></p>

Abbreviation: CC, community contributor; COVID-19, coronavirus disease.

**While consistent and clear messaging is the best way to undermine misinformation, tracking emerging rumors can help communication actors to nuance and prioritize messages.**

**By using existing community contributors, institutions, and an open-source, cloud-based platform like DHIS2, the real-time rumor-tracking approach is eminently scalable.**

submissions. These beliefs were consistent with misinformation identified in other settings related to COVID-19, such as perceptions about the efficacy of home or herbal remedies, sun exposure, or alcohol for curing COVID-19.<sup>19</sup> Rumors submitted to the system suggest that communities in Côte d'Ivoire were hesitant to accept the existence of the virus, underestimated their own risk for contracting it, and were suspicious about public health recommendations including masks and testing. While consistent and clear messaging is the best way to undermine misinformation, tracking emerging rumors can help communication actors to nuance and prioritize messages. For example, low uptake of masking can be met with traditional risk communication messaging. But specific insights emerged through the rumor tracker that provided insights about barriers in the community: a widespread conspiracy theory that masks made in China are contaminated with the virus and the perception that lack of public compliance with masking by government officials means that masks do not work. Consistent and clear messaging around masks must consider these fears, not necessarily by “myth busting” and thereby amplifying the rumors but by speaking to the real concerns of the population and modeling the appropriate behaviors. The vaccine roll-out in Côte d'Ivoire provides a new opportunity to hear nuanced feedback in real-time from communities on perceptions and fears around vaccines.

The variety of conspiracy theories tracked during the pilot revealed that at least within certain communities, trust in the government, as well as the international public health response, is lacking. In addition to the cross-cutting beliefs that mirror COVID-19 misinformation in other settings, the rumor-tracking system was able to identify very local beliefs, such as an emergent rumor in a specific district related to early morning washing to prevent infection.

This pilot can serve as a proof of concept that real-time rumor tracking is both feasible and informative to the public health response. The system was built on existing infrastructure: a national hotline, the RCTWG, and locally embedded and trusted community members who, with a limited amount of training, were able to recognize reportable rumors and were motivated to contribute. Both CCs and teleoperators provided positive feedback on the ease of use and relevance of the rumor-tracking approach. While CCs could introduce bias by serving as “gatekeepers” for community feedback, there was a substantial benefit in

engaging people with deep contextual knowledge of their communities, thus allowing the system to filter out the “noise” associated with typical rumor-tracking approaches like social media listening.

In a field with increasingly complex and expensive options for analyzing rumors and misinformation, this pilot prioritized system usability and the feasibility of transferring capacity and ownership to the RCTWG in its approach. Routinizing the data entry and coding process to a rapid, daily task allowed the hotline and CCP staff to efficiently process submitted rumors and accelerated the identification of problematic misinformation. The technology that supported the overall approach is a well-known open-source software platform used by more than 70 countries to track health and social data.<sup>20</sup> The rumor-tracking technology was configured rapidly, and the primary cost was hosting the DHIS2 installation using Amazon Web Services. Affordable, sustainable, and secure, DHIS2 is well in alignment with the Principles for Digital Development.<sup>21</sup> We have made a guidance document and DHIS2 rumor-tracking metadata package available for countries wanting to rapidly install and use this system (Supplement).

Implementers need to identify the best sources of rumors in the local context, taking into consideration national hotlines, existing feedback systems, social media penetration, and the network of trusted community actors or implementing partners. However, by using existing community contributors, institutions, and an open-source, cloud-based platform like DHIS2, the real-time rumor-tracking approach is eminently scalable. The continued interest from the Government of Côte d'Ivoire and the invitation to scale up and continue supporting the rumor-tracking system demonstrates the utility of the system. COVID-19 vaccine-related rumors comprise, at present, the bulk of submissions to the system. The government hopes that the system will contribute insights into vaccine hesitancy and help risk communicators adapt their approaches for the recently initiated vaccine rollout effort.

## Limitations

The real-time rumor-tracking approach has several limitations. First, the motivation of community contributors waned during the pilot, and by the end, most rumors were submitted by a few contributors. Implementers must consider how to maintain motivation through refresher

training, prompts, and airtime credit, to ensure sustained commitment to community listening. Second, while we were aware of the demographic information of the community contributors themselves, we did not ask for demographic information about those from whom they heard the rumors. Thus, we do not have a sociodemographic profile or additional information about the original source of rumor transmission. This limitation is necessary to respect the primary goal of the rumor tracker and the associated ethical constraints; the purpose of the real-time rumor-tracking system is to listen to communities and provide insights into general beliefs, not to create a surveillance system for implementers to follow up on individuals propagating rumors. Third, by organizing rumors into tables and graphs on dashboards, the temptation exists to interpret the information quantitatively. In all materials and dashboards during implementation, we include a caution that data visualized through the system should be considered a snapshot of circulating beliefs and are not representative at the population level. Finally, we were unable to explore the public health impact of tracking rumors within the scope of this pilot. Future studies should endeavor to understand whether risk communication and community engagement activities informed by rumor tracking result in greater behavior change in desired directions.

## CONCLUSION

In partnership with the RCTWG, the team is currently applying findings from this pilot by: (1) expanding the rumor-tracking scope to incorporate social media, (2) training teleoperators at 3 additional health-related hotlines to enter and code rumors, (3) recruiting local radio hosts as CCs, and (4) systematically documenting actions taken that are informed by rumor data. Real-time rumor tracking is feasible and informative and can be integrated into emergency preparedness efforts. As part of a suite of community listening approaches that includes social media listening and surveys, real-time rumor tracking can enable governments to understand their constituents and improve their public health response.

**Acknowledgments:** The methods used in this study were informed by the work of several organizations in addition to Johns Hopkins Center for Communication Programs staff who have offered insights on various rumor management approaches, including the International Federation of the Red Cross, United Nations Children's Fund, and Internews. We are in their debt. We offer our gratitude to the staff of the Côte d'Ivoire National 143 line, the members of the Ivorian Technical Working Group on Risk Communication,

and the local correspondents who leveraged their time and positions to listen to communities and submit rumors, thereby contributing substantially to the COVID-19 response in Côte d'Ivoire.

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**Author contributions:** NT contributed to the concept and design of the rumor-tracking system, configured the database and dashboards, trained teleoperators and coders, and drafted the paper. AAV and AD coded rumors and verified coding, extracted data, led the thematic analysis of the rumor data during the pilot, and drafted sections of the paper. WB, JB, and VZ extracted, interpreted, and shared data; offered continual technical support to the national hotline, the community contributors, and the national technical working group to act on rumor data; and reviewed the paper. KS conducted the stakeholder feedback interviews, analyzed findings, and drafted a section of the paper. CF, MN, and DK developed the concept and design of the rumor-tracking system, tracked the process and provided continual input and support during implementation, and provided substantive review of the paper. DN served as the principal investigator and reviewed the design of the system, ensured ethical compliance, and drafted and provided substantive review of the paper.

**Competing interests:** None declared.

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## En Français

### Suivi des rumeurs sur le COVID-19 en temps réel à l'aide de méthodes communautaires en Côte d'Ivoire

Message clé: Traiter les rumeurs est essentiel pour gérer et mettre fin à une urgence de santé publique. Nous avons piloté un système de gestion des rumeurs en utilisant des méthodes de collecte communautaires, un logiciel source-ouverte et un processus de codage et de visualisation rapide pour comprendre systématiquement et aider les acteurs à répondre aux désinformations du COVID-19 en Côte d'Ivoire.

#### Principaux résultats

- Les rumeurs et la désinformation nuisent à la santé publique en créant des obstacles aux pratiques de protection et en réduisant la confiance dans les intervenants sanitaires.
- Nous avons développé une approche de suivi des rumeurs en temps réel qui s'appuie sur les structures existantes (comme les lignes vertes nationales) et les liaisons locales (comme les agents de santé communautaires) pour soumettre les rumeurs et la désinformation à une base de données centrale. Les rumeurs sont rapidement codées à l'aide d'un formulaire standard et visualisées sur des tableaux de bord personnalisés.
- Pendant le pilote de 6 mois de cet outil en Côte d'Ivoire, nous avons reçu et codé 1 757 soumissions et utilisé les résultats thématiques pour informer les activités de communication des risques et d'engagement communautaire.

#### Implications Clés

- Les responsables de la santé devraient envisager d'utiliser une approche de suivi des rumeurs en temps réel lors des urgences de santé publique et peuvent s'appuyer sur le guide détaillé et le paquet de métadonnées DHIS2 fournis pour une technologie simple, open-source et centrée sur la communauté, afin de rendre les données sur les rumeurs assimilables par les intervenants.

#### ABSTRACT

La désinformation mondiale et la surcharge d'informations ont caractérisé la pandémie de coronavirus (COVID-19). Les rumeurs sont des informations non vérifiées qui se propagent en ligne ou de personne à personne, réduisant la confiance dans les autorités sanitaires et créant des obstacles aux pratiques de protection. La communication sur les risques et l'engagement communautaire peuvent accroître la transparence, renforcer la confiance et mettre fin à la propagation des rumeurs. S'appuyant sur des travaux antérieurs sur les virus Ebola et Zika, avec le soutien du programme de sécurité sanitaire mondiale pour le renforcement des systèmes, le projet Breakthrough ACTION, financé par l'Agence des États-Unis pour le développement international, a mis au point un processus et une technologie permettant de recueillir, d'analyser et de traiter systématiquement les rumeurs relatives au COVID-19 en temps réel en Côte d'Ivoire. Les rumeurs ont été soumises par des contributeurs communautaires et recueillies auprès des personnes appelant les lignes vertes nationales, puis traitées dans une base de données hébergée dans le nuage, construite sur le logiciel libre District Health Information System 2 (DHIS2). Les téléopérateurs des lignes vertes et les gestionnaires de données ont codé les rumeurs en temps quasi réel selon les théories du comportement dans DHIS2 et ont visualisé les résultats sur des tableaux de bord personnalisés. L'analyse et la réponse ont été effectuées en collaboration totale avec le gouvernement de Côte d'Ivoire et les partenaires de mise en œuvre afin de garantir une réponse rapide et coordonnée. Le système a permis de saisir à la fois des rumeurs très répandues qui correspondent à la désinformation dans d'autres contextes, telles que des soupçons sur le nombre de cas et la croyance que les masques ont été délibérément contaminés, ainsi que des croyances très localisées liées à des influenceurs spécifiques. Les résultats qualitatifs ont fourni un aperçu rapide des croyances en circulation, permettant aux communicateurs de nuancer et d'adapter les messages sur le COVID-19.

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FIELD ACTION REPORT

# Institutionalizing a Regional Model for Improving Quality of Newborn Care at Birth Across Hospitals in Eastern Uganda: A 4-Year Story

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## Key Findings

- The interventions implemented led to improvements in maternal and newborn outcomes and the institutionalization and scale-up of the quality improvement process at both hospitals and high-volume health centers.
- Critical factors for success included codesigning and implementing a package of services that fit the context. This package was locally led, integrated but simple, and built on and sustained by mainly local resources to develop local champions.
- Challenges included lack of participation from doctors due to high doctor-patient ratio, scarcity of human and other resources, inadequate infrastructure, unstable electricity, and multiplicity of other initiatives.

## Key Implications

- Successful quality improvement projects must be integrated but feasible, based on the context and building onto the available resources, and implemented over a fairly long time. Creating a network of regional hospitals via a quality improvement collaborative rapidly leads to improved referral care and increased access to high-quality services for mothers and newborns. Once these efforts are operationalized and functional in hospitals, high-volume primary health centers can be brought aboard, which leads to scale-up.
- Having a network of hospitals working to improve quality can be a platform for learning, research, and knowledge generation and for building advanced neonatal care units in places where they hitherto never existed. However, such efforts must be complemented by recruiting more specialized health workers, such as neonatal nurses, pediatricians, and neonatologists, into regional and district hospitals so that nurses and midwives are well supported.

## ABSTRACT

**Introduction:** Despite the rapid increase in facility deliveries in Uganda, the number of adverse birth outcomes (e.g., neonatal and maternal deaths) has remained high. We aimed to codesign and co-implement a locally designed package of interventions to improve the quality of care in hospitals in the Busoga region.

**Design and Implementation:** This project was designed and implemented in 3 phases in the 6 main hospitals in east-central Uganda from 2013 to 2016. First, the inception phase engaged health system managers to codesign the intervention. Second, the implementation phase involved training health providers, strengthening the data information system, and providing catalytic equipment and medicines to establish newborn care units (NCUs) within the existing infrastructure. Third, the hospital collaborative phase focused on clinical mentorship, maternal and perinatal death reviews (MPDRs), and collaborative learning sessions.

**Achievements:** In all 6 participating hospitals, we achieved institutionalization of NCUs in maternity units by establishing kangaroo mother care areas, resuscitation corners, and routine MPDRs. These improvements were associated with reduced maternal and neonatal deaths. Facilitators of success included a simple, low-cost, and integrated package designed with local health managers; the emergence of local neonatal care champions; implementation and support over a reasonably long period; decentralization of newborn care services; and use of mainly existing local resources (e.g., physical space, human resources, and commodities). Barriers to success related to limited hospital resources, unstable electricity, and limited participation from doctors. More advanced NCUs have been established in 3 of the 6 hospitals, and 7 high-volume comprehensive health centers have been established with functional NCUs.

**Conclusion:** The involvement of local health workers and leaders was the foundation for designing, sustaining, and scaling up feasible interventions by harnessing available resources. These findings are relevant for the quality of care improvement efforts in Uganda and other resource-restrained settings.

## BACKGROUND

In 2015, the global policy architecture transitioned from Millennium Development Goals to Sustainable Development Goals, which aim to reduce global maternal mortality by two-thirds, or 70/100,000 live births, by 2030, with no country exceeding a maternal mortality

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**Uganda's maternal and newborn mortality rates remain high, despite nearly three-quarters of births occurring in health facilities.**

**Considering sustainability challenges that have hindered past large-scale maternal and newborn project interventions, we designed and implemented a low-cost, limited-intensity package to improve care at birth.**

rate of 140/100,000 live births.<sup>1</sup> Similarly, the target newborn mortality rate was set at fewer than 12/1,000 live births by 2030.<sup>2</sup> Whereas many high- and middle-income countries have made significant milestones toward these targets, major challenges remain in most low-income countries.

In Uganda, a low-income country, the maternal mortality ratio is estimated at 375/100,000 live births, which is an improvement from 438/100,000 live births in 2011,<sup>3,4</sup> but it is still far from the Sustainable Development Goals target. In addition, the country's newborn mortality has stagnated at 27/1,000 live births for over a decade.<sup>3,4</sup> Despite nearly three-quarters of births occurring in health facilities, Uganda's maternal and newborn mortality rates remain high, which reflects the limited quality of care during pregnancy, labor, and postnatal periods. The consequences of these gaps in care include an estimated 6,000 maternal deaths, 32,300 neonatal deaths, and 34,150 stillbirths per year in the country.<sup>5</sup> Most of these deaths can be prevented through the provision of high-quality care around the time of birth.<sup>6-8</sup>

In response to the need to accelerate reductions in mortality, the World Health Organization (WHO) initiated the Quality of Care Network aimed at reducing maternal, neonatal, and child mortality in institutions by implementing a set of standards.<sup>9</sup> Although Uganda's Ministry of Health (MOH) focuses on improving facility care around the time of birth, as evidenced in its policy documents,<sup>10</sup> there is limited understanding of how this can be achieved in a scalable manner using available resources. A few large-scale maternal and newborn projects have been implemented successfully, such as the Saving Mothers Giving Life project, but sustainability remains a challenge.<sup>11</sup> Key contributing factors to the lack of sustainability include high resource intensity and too many simultaneous interventions overwhelming the local health system.<sup>11,12</sup>

Considering sustainability challenges that have hindered past large-scale maternal and newborn project interventions, we designed and implemented a low-cost, limited-intensity package to improve care at birth. This report describes the implementation experiences and lessons learned to inform maternal and newborn health policy formulation and implementation of similar initiatives in Uganda and elsewhere. The findings presented in this report are based on a synthesis of quarterly project reports and routine health information system data, which was conducted prospectively. This report details activities, challenges, and lessons learned, as well as

changes in select indicators (e.g., mortality, delivery, and admissions).

## Implementation Setting

This package was implemented between 2013 and 2016 in 6 hospitals that collaborated to improve the quality of care at birth in their catchment area, a region of about 4 million people. The hospitals included 1 regional referral hospital and 5 general hospitals (including 2 private not-for-profit missionary hospitals) (Figure 1). All hospitals provide several services (e.g., general preventive and promotional, outpatient and inpatient curative, maternity and obstetric, pediatric, emergency and specialist surgery, blood transfusion, and laboratory services). The regional referral hospital employs consultant pediatricians, surgeons, physicians, and obstetricians and thus provides highly specialized services not available at other facilities. The regional referral hospital also is mandated with supervising and building the capacity of district hospitals within the region. This region has a high fertility rate of 6.1.<sup>3</sup> On average, these 6 hospitals conduct about 1,800 deliveries per month (Table 1).

## THE INTERVENTION

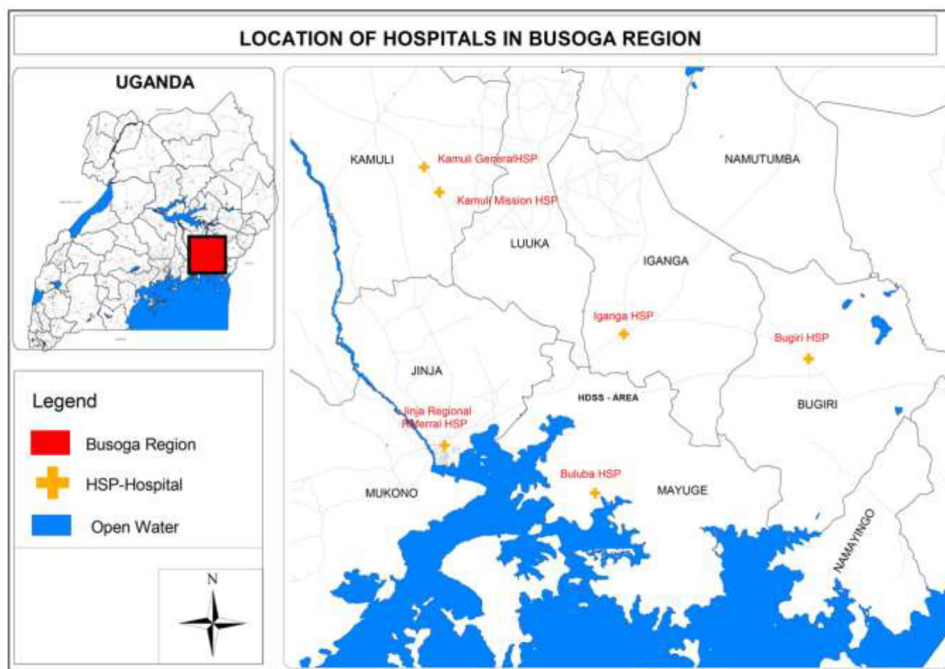
The package was designed and implemented through a collaboration between health managers and project staff. The aim was to improve the quality of care at birth using mostly locally available human resources, commodities, supplies, and infrastructure. The intervention was designed and implemented in 3 major phases: inception, the implementation phase, and hospital collaborative (Figure 2).

### Phase 1: The Inception Phase Engage Health System Managers

Phase 1 took place from November to December 2013. It comprised an initial 1-day health system managers' engagement meeting, followed by a baseline health facility readiness survey and a second engagement meeting. The initial health system managers' meeting was attended by 6 medical superintendents, 6 hospital administrators, and 6 maternity unit nurses in-charge from the 6 hospitals; 5 district health officers; 2 MOH obstetricians; and 2 pediatricians from the 5 districts in which the hospitals are located. This engagement meeting was aimed at discussing the new project, the proposed approach, the manager's anticipated roles, and the forthcoming baseline survey at their facilities. Meeting attendees provided input on the intervention package and



**FIGURE 1.** Location of Hospitals Where a Locally Designed Package of Interventions to Improve Quality of Maternal and Newborn Care Was Implemented, Busoga Region, Uganda



suggestions for how to run the project. In addition, we sought their cooperation in granting research teams access to data and responding openly, especially about their challenges and suggested solutions.

**Conduct Baseline Health Facility Assessment**

The baseline survey included a health facility readiness assessment using WHO’s service availability and readiness assessment tool.<sup>13</sup> Semi-structured interviews were conducted with health providers and facility managers. Key findings from a baseline survey showed a lack of infrastructure for newborn care in the maternity units, limited provider competence in managing newborns, lack of drugs for managing newborn complications, and poor data quality in terms of completeness and accuracy. Opportunities for quick improvement were identified, including the availability of space that could be used to establish newborn care units (NCUs) within maternity units, availability of an existing NCU at the regional hospital from which other hospitals could learn, and willingness of leaders from the regional referral hospital to support the process of improving newborn care at other hospitals.

**Cocreate Intervention**

The second health system managers’ engagement meeting was a cocreation meeting involving dissemination of findings from the baseline survey and discussions with the leaders geared toward identifying priority interventions for implementation to address key findings. This meeting was facilitated by the principal investigator of the study (PW). The general guidelines for the package to be developed were that it had to be simple, low in cost, and built around the available project and hospital resources. Participants of this cocreation meeting agreed on an initial package of interventions targeted at improving capacity for providers to care for mothers and their newborns while concurrently addressing key health system gaps to facilitate newborn care, including functionalizing NCUs and improving the quality of routine data.

**Phase 2: The Implementation Phase**

In this phase, we implemented the interventions agreed upon at the cocreation meeting through 3 main activities: training frontline health workers, establishing functional NCUs; and strengthening

**Baseline survey findings showed a lack of infrastructure for newborn care in the maternity units, limited provider competence in managing newborns, lack of drugs for managing newborn complications, and poor data quality in terms of completeness and accuracy.**

**TABLE 1.** Description of Hospitals and Their Maternal and Newborn Care Capacity Where a Locally Designed Package of Interventions to Improve Quality of Maternal and Newborn Care Was Implemented, Busoga Region, Uganda

	Level, Ownership	Cadres Available, No.	Mean Monthly Deliveries
Jinja Hospital	Regional referral hospital, public	Consultant pediatricians, 1 Obstetricians, 3 Pediatricians, 2 Medical officers, 4–7 Midwives, 13–20 Neonatal nurses, 1 Anesthetic officers, 3–7	500
Iganga Hospital	General hospital, public	Obstetrician, 1 Medical officers, 11 Midwives, 12–15 Anesthetic officers, 1–3	550
Bugiri Hospital	General hospital, public	Medical officers, 2–3 Midwives, 8–12 Anesthetic officers, 1–3	250
Kamuli General Hospital	General hospital, public	Medical officers, 5–7 Midwives, 15–20 Anesthetic officers, 1–3	200
Kamuli Mission Hospital	General hospital, private not-for-profit	Medical officers, 3 Midwives, 7–10 Anesthetic officers, 1–3	200
St. Francis Buluba General Hospital	General hospital, private not-for-profit	Medical officers, 4 Midwives, 7–10 Anesthetic officers, 1–3	100
			1,800 total

the data system. This phase lasted for 1 year (all of 2014).

### **Train Health Workers**

An integrated basic emergency obstetric and newborn care didactic training began in January 2014. We used a 5-day training module, adopted from the MOH training package, to train 90 nurse-midwives in 5 separate training groups. All training sessions took place at the regional referral hospital and were facilitated by national and local trainers, including obstetricians, pediatricians, and midwives.

### **Establish NCU and Procure Drugs and Commodities**

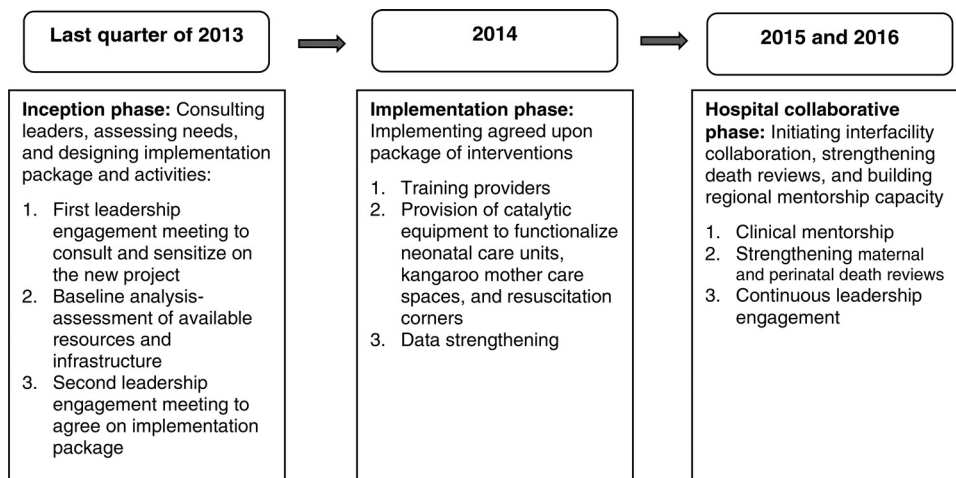
Next, the kangaroo mother care rooms, resuscitation corners, and NCUs were set up in the hospitals by working with hospital managers to identify appropriate spaces within the maternity units. We procured essential catalytic newborn care drugs, supplies, and equipment to ensure the functionalization of these units. The commodities included drugs (e.g., antibiotics, anticonvulsants, analgesics, fluids, and bronchodilators), equipment (e.g., newborn

feeding equipment, resuscitation equipment, incubators, cribs, phototherapy machines, radiant warmers, and oxygen concentrators), and chairs to aid with kangaroo mother care. The trained health care providers gradually started managing sick newborns in these established spaces. Because hospital leaders were part of the initiative, they took over the sustainability of commodities by replenishing drugs and allocating staff to the NCUs.

### **Strengthen Data Systems**

Furthermore, we conducted data systems strengthening to improve record quality. Data strengthening activities included developing and providing previously nonexistent national-level registers of sick newborns for the NCUs. We also provided refresher training sessions on how to enter data into the newborn and maternity registers and how to use data for local improvement activities. These 2 registers are the primary data collection tools and thus directly affect the data quality reported in the DHIS2 system that in turn feeds into the MOH data system. These registers also served as the data source for the project evaluation.

**FIGURE 2.** Schematic Representation of the Project Implementation to Improve Quality of Maternal and Newborn Care in Hospitals, Busoga Region, Uganda



### Phase 3: Hospital Collaborative Phase

Between 2015 and 2016, we started a hospital collaborative to promote peer learning. Across hospitals, we also intensified additional follow-up on activities to include on-the-job mentorships, maternal and perinatal death reviews (MPDRs), and learning sessions, as detailed below.

#### Establish On-the-job Clinical Mentorship

On-the-job clinical mentorships involved practical coaching and consultation between a mentor (a more experienced clinician) and a mentee (a qualified but less experienced health worker). The overall purpose was to promote good clinical practices and subsequently improve the quality of care provided. The selection of 16 mentors was based on their positions, academic qualifications, years of experience, and willingness to be champions of change. We first selected 3 obstetricians, 2 pediatricians, and 3 midwives from within the region who were experienced and already working as local champions. We then added 8 more mentors (3 pediatricians, 3 obstetricians, 1 neonatal nurse, and 1 midwife) from the national level who had been engaged in various mentorship programs. An adequate number of mentors is critical to ensure a minimum number (e.g., 3) is always available for field work.

The mentorship activity was implemented in 2 phases. In the first stage, which lasted 6 months, we paired a local mentor with a national-level mentor at each facility. Pairing local mentors with national-level mentors helped build local mentor capacity and

ensure long-term sustainability. In the second stage, which lasted until the end of 2016, we gradually stopped using the national-level mentors until only 3 remained. During this stage, local mentors acquired the skills to serve as mentors to the health workers in all the hospitals. We also were confident in the capacity of the local mentors, based on observations and feedback from national-level mentors.

The mentorship implementation format involved mentors spending 2 days per month at each hospital, during which they worked with primary providers engaged in a range of activities, including clinical rounds, delivery, and resuscitation of newborns. In the process, mentors taught and demonstrated good clinical management practices to the mentees. In the first 4 months of mentorship, mentors worked with mentees on any case at the facility without being selective.

After 4 rounds of mentorship, the local health providers expressed concerns about mentors spending much of the time coaching them on how to manage cases that they already knew how to handle, and thus not much value was added. In response, we linked MPDRs to the mentorship to identify system failures that led to a maternal or perinatal death. The identified failures were then used to generate change ideas, which were addressed during the clinical mentorship.

Mentorship implementation was guided by the plan-do-study-act approach.<sup>14</sup> Using recommendations from the MPDRs, the mentors worked with health workers to develop and test ideas that they believed would improve the situation. Table 2

**Pairing local mentors with national-level mentors helped build local mentor capacity and ensure long-term sustainability.**

**TABLE 2.** Examples of Successful Change Ideas Generated by Mentors and Mentees for Addressing System Failures That Lead to Maternal or Perinatal Deaths, Busoga Region, Uganda

Category	Idea	Where It Worked Well
Supplies	Keep a buffer stock of essential supplies that typically run out (e.g., blood products, medicines for managing pre-eclampsia and eclampsia, anticonvulsants for newborns, intravenous antibiotics, sterile gloves)	All public facilities
	Work with district health office leadership to access excess supplies, such as drugs, from less busy lower-level facilities	All public facilities
Clinical care	Establish a triage area and triage checklist to ensure all mothers are screened at admission to identify critical cases	All facilities (public and PNFP)
	Use a predischarge checklist in the postnatal unit to ensure all mothers and babies who are discharged are stable	All facilities (public and PNFP)
	Arrange the maternity unit so that unstable mothers requiring constant monitoring are close to nurse workstations	All facilities (public and PNFP)
	Ensure every mother is reviewed by a medical doctor or obstetrician before delivery	1 public and 1 PNFP
	Ensure 80% partograph use for all mothers in labor	All facilities (public and PNFP)
	Assess blood pressure of all mothers at least twice before delivery (within 1 hour of birth and before discharge)	All facilities (public and PNFP)
	Ensure all mothers who enter the NCU wear a gown over their clothes to prevent infection	At facilities with access to washing machine
Administrative	Place hand sanitizer at all NCU entrances to prevent infection	All facilities (public and PNFP)
	Ensure representation of hospital administrator in maternity department meetings, including routine and non-routine (e.g., maternal and perinatal death review) meetings	All facilities (public and PNFP)
Data-related	Ensure all deliveries are entered in the maternity register and all NCU admissions in the newborn register	All facilities (public and PNFP)

Abbreviations: NCU, newborn care unit; PNFP, private not-for-profit.

shows some of the most successful changes. For changes that required capacity building or changes to clinical management procedures, the mentors worked with providers to model the proper practices. These change ideas were implemented and followed up during the next mentorship visit. The lessons from implementing these change ideas were disseminated during learning sessions with other facilities.

**Implement Maternal and Perinatal Death Reviews**

At the beginning of the project, the team intended to implement MPDRs as a stand-alone intervention. However, MPDRs eventually were linked with mentorship, as previously described. In the first 3 months of the hospital collaborative phase, the mentors conducted clinical mentorship and supported facilities in initiating the implementation of regular death reviews.

Before starting this implementation, the project team engaged the hospital and maternity unit

managers to form hospital MPDR committees and to schedule meeting days. The project provided some funding to procure refreshments during these meetings. The mentors supported the capacity building of the providers to conduct proper death reviews, presided over the initial MPDR meetings, and encouraged a blame-free death review environment so that teams could generate specific, measurable, attainable, realistic, and time-bound actionable recommendations. By the third month, teams were able to work independently and had appointed chairpersons (usually the maternity unit nurse in-charge) for the meetings. The mentors then assumed a more passive and supportive role, reminding teams to review the deaths.

**Conduct Collaborative Learning Sessions**

As previously described, the implementation of clinical mentorship and MPDRs using a plan-do-study-act framework resulted in identifying and

testing change ideas. Every quarter, we conducted 7 collaborative learning sessions with health system managers from all 6 hospitals to share lessons learned from implementing change ideas. The team from each facility, led by the maternity nurse in charge, highlighted which solutions worked and why others failed. Colleagues from other facilities asked questions with the intention to learn and possibly transfer best practices to their setting.

Facilities also presented data on selected performance indicators (e.g., partograph use and proportion of babies in NCU who were discharged alive). They then explained any changes in the indicators, highlighting major accomplishments and barriers.

## ■ ACHIEVEMENTS OF THE INTERVENTION

As shown in Table 3, at the beginning of the project in 2013, only 1 facility had a functional NCU in the maternity unit. By the end of 2016, all facilities had functional NCUs, kangaroo mother care rooms, and resuscitation corners in their maternity units. Although initiated with support from the project, hospital management eventually took on the role of sustaining these units. Hospital managers and mentors became champions of newborn care at their facilities, ensuring these services were sustained.

In terms of capacity building, 90 frontline nurses and midwives at 6 hospitals were trained in the management of maternal and newborn health complications. Furthermore, in 2013 and 2014, only 2 facilities conducted death audits, and they were not regular. In response to the MPDR strengthening effort, all facilities started conducting regular MPDRs.

The sick newborn register that was introduced during the data strengthening period was adopted by the MOH and is now used nationwide.

In terms of impact on maternal and newborn outcomes, Figures 3 and 4 show a consistent decline in maternal and newborn deaths during the hospital collaborative phase. The decline occurred with minimal changes in the number of deliveries (Figure 5) and thus indicates improved outcomes. It is important to note that the first 2 quarters of the collaborative phase showed no change, perhaps because the actions had not yet reached saturation. As the phase progressed, deaths steadily declined. All the changes happened with minimal changes in the cesarean section rates (Figure 6), thus this

impact is largely due to changes in basic obstetric care interventions.

We also witnessed a gradual rise in the number of deliveries. In the collaborative meetings, providers attributed the increases to quality improvement efforts as more people became aware of improved services. Uganda has an open referral system with no gatekeeping and with substantial bypassing, thus good quality might have driven demand.<sup>15</sup> However, this hypothesis requires further analysis to confirm.

Lastly, among the achievements as shown in Table 4 after a single provision of catalytic supplies, hospitals were incentivized to sustain the provision of drugs, such as antenatal corticosteroids, phenobarbital for managing newborn convulsions, and magnesium sulfate for managing pre-eclampsia, as well as oxygen delivery systems and other management protocols.

## ■ REFLECTIONS AND IMPLICATIONS FOR PROGRAMS

We implemented a locally designed maternal and newborn quality improvement package in a regional network of hospitals. From this implementation, we achieved institutionalization of NCUs, kangaroo mother care spaces, resuscitation corners, and MPDRs in the maternity units. The package was designed and implemented in collaboration with local and national health system managers. We relied on available resources and deliberately implemented only “fit for context” interventions deemed affordable by the health system managers.

A key achievement of this work was the collaboration with facilities to set up infrastructures for infant care within the maternity units of all 6 hospitals, thus creating a regional network of care for mothers and newborns. In most general hospitals in Uganda, newborns are managed in the pediatric unit, which is typically located some distance away from the maternity unit.<sup>12</sup> This is problematic for several reasons. First, precious time may be lost when transferring a newborn to the pediatric unit, which delays care and could be fatal. Second, the distance separates the mother, who remains in the maternity unit, from her baby, potentially hindering breastfeeding and bonding. Third, these transfers create extra work for already understaffed health providers. Locating the new NCUs within the maternity unit addresses all of these challenges.

**A key achievement of this work was the collaboration with facilities to set up infrastructures for infant care within the maternity units of all 6 hospitals, thus creating a regional network of care for mothers and newborns.**

**TABLE 3.** Achievement of Interventions to Improve Quality of Maternal and Newborn Care Across 6 Hospitals in Busoga Region, Uganda

Indicators Monitored	2013	2014	2015	2016
<b>Inputs, no. (%)</b>				
Hospitals with designated resuscitation corner	2 (33)	6 (100)	6 (100)	6 (100)
Hospitals with working resuscitation corner	2 (33)	6 (100)	6 (100)	6 (100)
Hospitals with designated space for the KMC space	2 (33)	6 (100)	6 (100)	6 (100)
Hospitals with KMC room and mothers practicing KMC	1 (17)	5 (83)	5 (83)	5 (83)
Hospitals with designated NCU space in maternity unit	3 (50)	6 (100)	6 (100)	6 (100)
Hospitals with functioning NCU admitting and managing babies in the maternity unit	1 (17)	6 (100)	6 (100)	6 (100)
<b>Processes</b>				
Staff receiving training, no.	0	90	0	0
Hospitals receiving mentorship, no. (%)	0 (0)	0 (0)	6 (100)	6 (100)
Mentoring visits per facility, no.	0	0	6	6
Hospitals conducting maternal audits, no. (%)	2 (33)	2 (33)	6 (100)	6 (100)
Maternal deaths audited, no.	18	12	45	49
Hospitals conducting weekly perinatal audits, no. (%)	0 (0)	0 (0)	6 (100)	6 (100)
Perinatal deaths audited, no.	0	0	35	36
<b>Outputs, no.</b>				
Deliveries	19,457	20,338	20,905	21,681
NCU admissions	800	1,645	2,661	3,805
Cesarean deliveries	4,807	4,838	5,724	5,595

Abbreviations: KMC, Kangaroo Mother Care; NCU, newborn care unit.

**Another key achievement was linking the MPDR to the plan-do-study-act cycle to help devise feasible solutions to address identified bottlenecks and solve the lack of action on MPDR recommendations.**

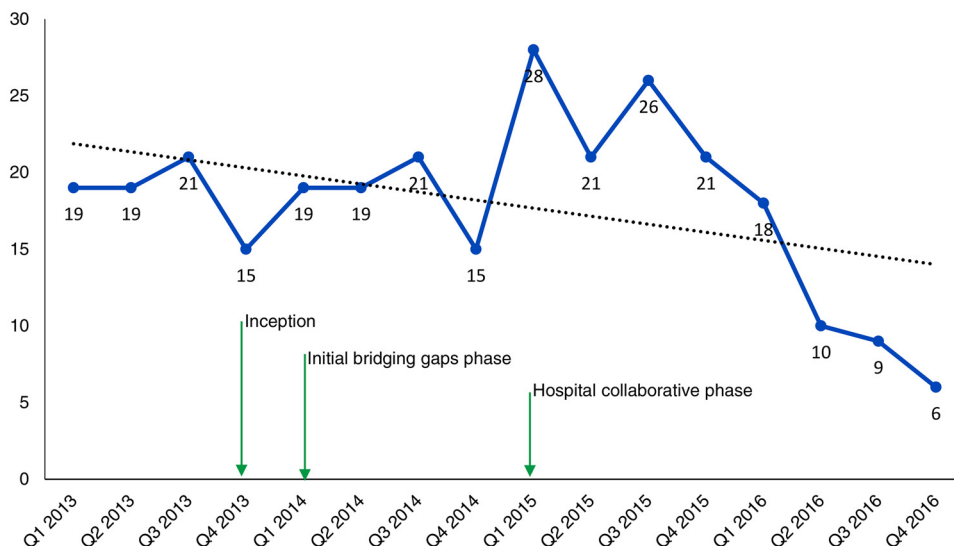
Another important achievement of the project was enabling “action and response” from the MPDRs. Many countries report that the implementation of recommendations is a missing link in the MPDR process.<sup>16,17</sup> Another key achievement was linking the MPDR to the plan-do-study-act cycle to help devise feasible solutions to address identified bottlenecks and solve the lack of action on MPDR recommendations. It is important to note that this time- and energy-consuming activity was challenging to conduct simultaneously with the MPDR meetings, especially at busy facilities. Nevertheless, we believe that this approach could solve the lack of action on MPDR recommendations. Second, through the engagement of leaders, the scope of the MPDR committee was broadened to give them more influence. For example, some facilities were able to access drugs from other facilities that did not use them.

Health system managers participated in the development, implementation, and evaluation of

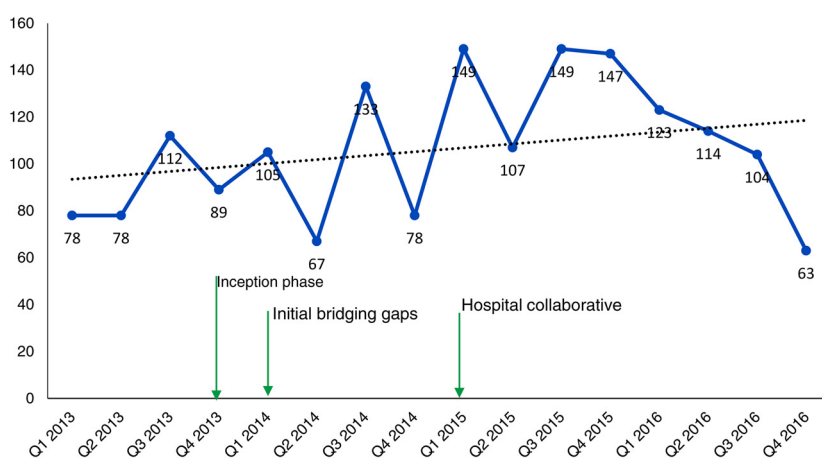
the project interventions, which offered 2 major benefits. First, the designed interventions were feasible within the context because managers generally knew what would or would not work in their context. Second, the managers endorsed the interventions and thus were more willing to cooperate with the implementation and maintenance of those things that were deemed useful. For example, facilities typically have an annual turnover of nurses from one department to another. This turnover was minimized because managers understood that after we built the capacity of staff in the NCUs, any transfers would lead to the loss of this competence.

In terms of resources, we mostly implemented interventions that could be achieved with the resources of the facility, in part because of limited funds for implementation but also because the health system managers tended to propose simple and affordable interventions that leveraged existing resources. This approach avoided the pitfalls of some past projects, which could not be sustained

**FIGURE 3.** Changes in Number of Maternal Deaths in Hospitals Where a Locally Designed Package of Interventions to Improve Quality of Maternal and Newborn Care Was Implemented, Busoga Region, Uganda



**FIGURE 4.** Annotated Chart for Predischarge Neonatal Mortality Rate in Hospitals Where a Locally Designed Package of Interventions to Improve Quality of Maternal and Newborn Care Was Implemented, Busoga Region, Uganda

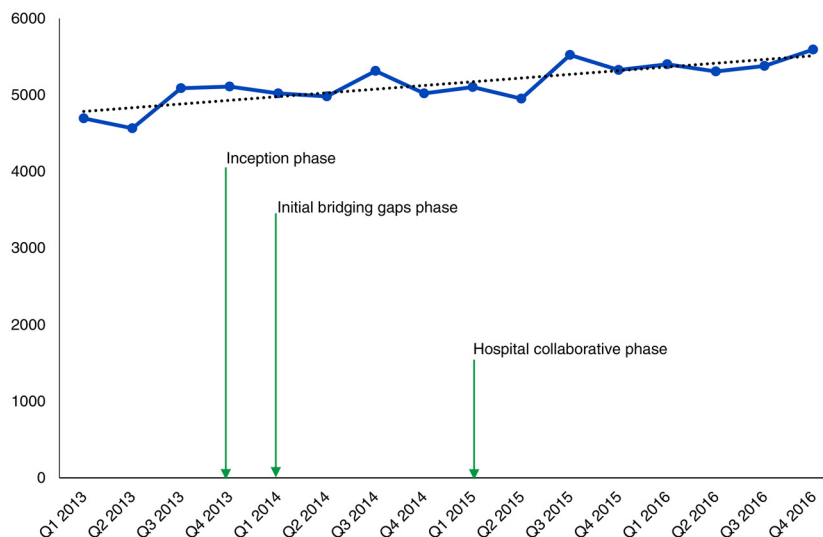


because they were too costly or conducted at a pace that the system could not maintain.<sup>11,12,18</sup>

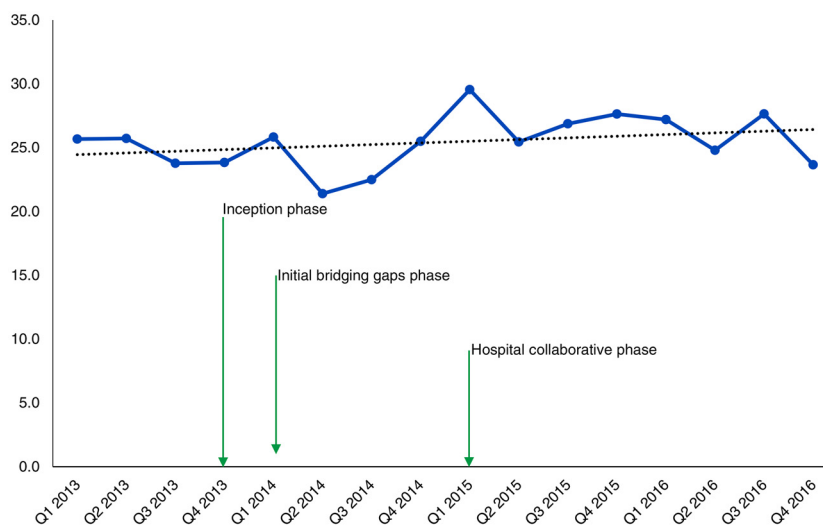
The networking of facilities within the region also improved access to care by vulnerable families, as newborn care services were expanded from 1

health facility to 6. The project also helped free up the NCU at the regional referral hospital. Finally, the collaborative and mentorship program enabled health workers to consult each other easily and make better referrals.

**FIGURE 5.** Trends in Deliveries Over Time With Initiation of Implementation Phases of Project to Improve Quality of Maternal and Newborn Care in Hospitals, Busoga Region, Uganda



**FIGURE 6.** Cesarean Delivery Rate Trend Over Time in Hospitals Where a Locally Designed Package of Interventions to Improve Quality of Maternal and Newborn Care Was Implemented, Busoga Region, Uganda



**IMPLEMENTATION CHALLENGES**

Although we targeted all health workers of maternity units for training and mentorships, most participants were nurses and midwives. Most medical doctors and clinical officers did not attend the training sessions and were rarely available for

mentorships, mainly because they were busy with other work in the hospital or elsewhere, making them highly mobile and difficult to engage. This lack of engagement was a challenge because medical doctors are central in making care decisions for mothers and newborns. Future



**TABLE 4.** Baseline and Endline Assessment Results After Implementing Interventions to Improve Quality of Maternal and Newborn Care in 6 Hospitals, Busoga Region, Uganda

Readiness Assessment Items	December 2013 No. (%)	December 2016 No. (%)
Electricity supply on day of survey	6 (100)	6 (100)
Functional refrigerator	6 (100)	6 (100)
Motorized transport for referrals	5 (83)	6 (100)
Clean running water and soap	6 (100)	6 (100)
Functional newborn weighing scale	5 (83)	6 (100)
Thermometer	6 (100)	6 (100)
Pulse oximeter	4 (67)	6 (100)
Ambu-bag	6 (100)	6 (100)
Newborn suction device <sup>a</sup>	6 (100)	6 (100)
Oxygen (fully working delivery system) <sup>a</sup>	4 (67)	6 (100)
Nasogastric tubes and 20-ml syringes	4 (67)	6 (100)
Phototherapy machine <sup>a</sup>	2 (33)	6 (100)
Kangaroo Mother Care bed or chair <sup>a</sup>	1 (17)	6 (100)
IV cannular sets	6 (100)	6 (100)
IV bags and tubing	6 (100)	6 (100)
Feeding cups <sup>a</sup>	0 (0)	6 (100)
Fetoscope	6 (100)	6 (100)
Stethoscope	6 (100)	6 (100)
Clock <sup>a</sup>	4 (67)	6 (100)
Gloves (clean and sterile)	6 (100)	6 (100)
Adult weighing scale	6 (100)	6 (100)
<b>Drugs</b>		
Dextrose saline and rigors lactate	6 (100)	6 (100)
Vitamin K	6 (100)	6 (100)
Tetracycline eye ointment	6 (100)	6 (100)
Corticosteroids <sup>a</sup>	1 (17)	6 (100)
Oxytocin	6 (100)	6 (100)
Misoprostol	6 (100)	6 (100)
IV antibiotics (ceftriaxone, gentamicin, ampicillin) <sup>a</sup>	6 (100)	6 (100)
Local anesthetics (lidocaine)	6 (100)	6 (100)
Phenobarbital <sup>a</sup>	1 (17)	6 (100)
Nevirapine	6 (100)	6 (100)
Magnesium sulfate <sup>a</sup>	4 (67)	6 (100)
<b>Guidelines and protocols</b>		
Active management of the third stage of labor <sup>a</sup>	1 (17)	6 (100)
Management of postpartum hemorrhage <sup>a</sup>	1 (17)	6 (100)
Management of neonatal sepsis <sup>a</sup>	1 (17)	6 (100)
Newborn feeding <sup>a</sup>	1 (17)	6 (100)
Newborn resuscitation <sup>a</sup>	1 (17)	6 (100)

<sup>a</sup> Catalytic supplies provided by the project.

**Future quality improvement and mentorship programs should be tailored to doctors' schedules to encourage their involvement and engagement.**

quality improvement and mentorship programs should be tailored to doctors' schedules to encourage their involvement and engagement. Where possible, hospital management and MOH staff should consider attaching medical doctors to only 1 or 2 departments where they hope to specialize, which would help build capacity in specialized areas instead of spreading resources across every department.

Some of our change ideas failed. For example, 4 hospital teams proposed that all mothers caring for babies in the NCU should wear gowns to prevent infections. The hospital administration together with the project provided the resources for the gowns. However, this intervention did not work at any of the facilities. The gowns required regular washing and a clean place for changing, but there were no resources or mechanisms for either. Caregivers thus returned to wearing their own clothing. This idea needs further research to make it work in resource-limited hospitals. Another change idea with mixed results was having a medical doctor review all expectant mothers before birth. This idea was not practical in high-volume facilities with few doctors, but it worked well in low-volume facilities, especially the private not-for-profit hospitals.

We added some important medicines to the procurement lists of the hospitals, but occasional stock-outs still occurred, mostly due to an underestimation of supplies at the point of requisition at both the hospital and department levels and due to the general inadequacy of hospital budgets. At the department level, we encouraged the maternity nurse in charge to keep a buffer stock of vital supplies. However, the problem persists at the hospital and national medical stores level.

Another challenge with our approach was that it focused on improving service delivery through the lens of health workers and managers. There was limited engagement of end users or their representatives. As a consequence, we were not aware of the extent to which the package was patient-centered. Future implementations should prioritize and integrate end users' perspectives, as they are fundamental to improving the quality of care.

Other major challenges of this work included implementation in settings where staff were overwhelmed by the number of deliveries conducted and where habitual electricity outages affected operations at various units in the hospital, including the NCU and operating rooms. Moreover, although we were able to find spaces for the NCUs, they were not sufficient to meet demand. As a project, we were unable to address these persistent challenges,

however, we acknowledge their existence and the dire need to address them.

## ■ INTERVENTION INSTITUTIONALIZATION AND SUSTAINABILITY

This project became the basis for further improvement, sustainability, institutionalization, and scale-up. The project work led to an emergence of champions: the nurses and midwives, along with a few doctors, who are now passionate about newborn care and have become advocates and mobilizers for care and further improvement. The improvements we made have become a platform for continued internal and external work and investment. For instance, the platform was used by another quality improvement study, the Preterm Birth Initiative study, to test whether outcomes for preterm babies can be improved.<sup>19,20</sup> Other projects, such as the Omwana Trial, also continue to expand infrastructure, staffing, and skills.<sup>21</sup>

As a team, in the second phase, we were able to move newborn care from hospitals to lower-level facilities by expanding the project to 6 high-volume primary health centers under the Maternal Newborn Scale Up Project (MANeSCALE). All of the health centers now have functional NCUs linked to and supported by the 6 hospitals.<sup>22</sup> A film about the experiences and lessons learned is available at <https://bit.ly/3tO6DYP>.

The leadership engagement meetings led to the Busoga Maternal Newborn and Child health forum, a group of health actors who meet to discuss and promote issues about maternal, newborn, and child health in the region. Achievements of the forum include influencing MOH and Plan International to construct a bigger NCU at one of the hospitals,<sup>23</sup> as well as the formation of a WhatsApp group in 2019 for leaders and health providers to discuss maternal and newborn health and other issues.<sup>24</sup> These efforts indicate a continued expansion of the collaborative.

## ■ CONCLUSION

This regionalized model of a hospital collaborative involving national and local leadership engagement, as well as the use of contextually appropriate interventions and available resources, presents an approach that can be applied by other quality improvement programs for designing feasible, sustainable, and scalable quality improvement interventions in resource-limited settings. A phased, capacity-building approach that empowers local health workers to become skilled and emerge as champions is critical for success. Our findings are important not only for

Uganda's implementation of the Quality of Care Network but also for other countries in similar settings of high maternal and neonatal mortality.

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**Author contributions:** Peter Waiswa, Phillip Wanduru, Monica Okuga, and Stefan Peterson conceptualized the study. Peter Waiswa, Phillip Wanduru, Monica Okuga, Darius Kajjo, Doris Kwesiga, James Kalungi, Harriet Nambuya, and Abner Tagoola contributed to the implementation, data collection, management, and analysis, and they drafted the manuscript. All authors reviewed the manuscript and provided substantial input. All approved the final manuscript.

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FIELD ACTION REPORT

# From Passive Surveillance to Response: Suriname’s Efforts to Implement Maternal Death Surveillance and Response

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## Key Messages

- Crucial elements for a successful maternal death surveillance and response (MDSR) implementation are the 5 Cs: commitment, “no blame, no shame” culture, coordination, collaboration, and communication.
- Essential steps to achieve sustainable MDSR in Suriname are: (1) improving the identification and notification of maternal deaths and (2) introducing and continuing systematic facility-based and national maternal death reviews.
- Lack of action following the recommendations to reduce preventable maternal death is the biggest obstacle for MDSR implementation in Suriname.

## ABSTRACT

Implementation of maternal death surveillance and response (MDSR) is crucial to reduce maternal deaths. In Suriname, MDSR was not implemented until 2015. We describe the process of MDSR implementation in Suriname and share the “lessons learned,” as experienced by the health care providers, national maternal death review committee members, and public health experts. Before 2015, maternal deaths were identified using death certificates and by active surveillance in the hospitals. Based on the recommendations from a 2010–2014 Reproductive Age Mortality Survey in Suriname, a maternal death review committee has improved the identification of maternal deaths and has audited every death since 2015. Although this review committee initiated several actions to implement MDSR together with health care providers, the involvement of the Ministry of Health (MOH) was crucial. Therefore, the Maternal Health Steering Committee was recently installed as a direct working arm of MOH to guide MDSR implementation. One of the main barriers to implementing MDSR in Suriname has been the lack of action following recommendations. Delineating roles and responsibilities for action, establishing accountability mechanisms, and influencing stakeholders in a position to act are critical to ensure a response to the recommendations. To implement MDSR, the 5 Cs—commitment, “no blame, no shame” culture, coordination, collaboration, and communication—are crucial.

## BACKGROUND

The reduction of maternal deaths was the focus of Millennium Development Goal 5 in 2000, and it remained a priority in the Sustainable Development Goals established in 2015.<sup>1–3</sup> In addition to counting maternal deaths, it is essential to identify underlying causes and contributing factors to gain more insight into the gaps in care to prevent avoidable deaths.<sup>4</sup> A maternal death review is a medical audit with an in-depth qualitative investigation of the causes and circumstances of death.<sup>5</sup>

The Maternal Death Surveillance and Response (MDSR) cycle is a continuous action cycle that provides information on maternal mortality surveillance and audit and on the actions needed to improve care and avert avoidable maternal deaths.<sup>5,6</sup> The World Health Organization (WHO) introduced the MDSR approach in 2012 to establish accurate data collection and to translate “lessons learned” to action plans and national

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policies, followed by monitoring to capture the effects.<sup>7</sup> In Latin America and the Caribbean, MDSR was implemented in 2015 in 6 countries: Brazil, El Salvador, Colombia, Jamaica, Mexico, and Peru, which now serve as examples for other countries.<sup>8</sup>

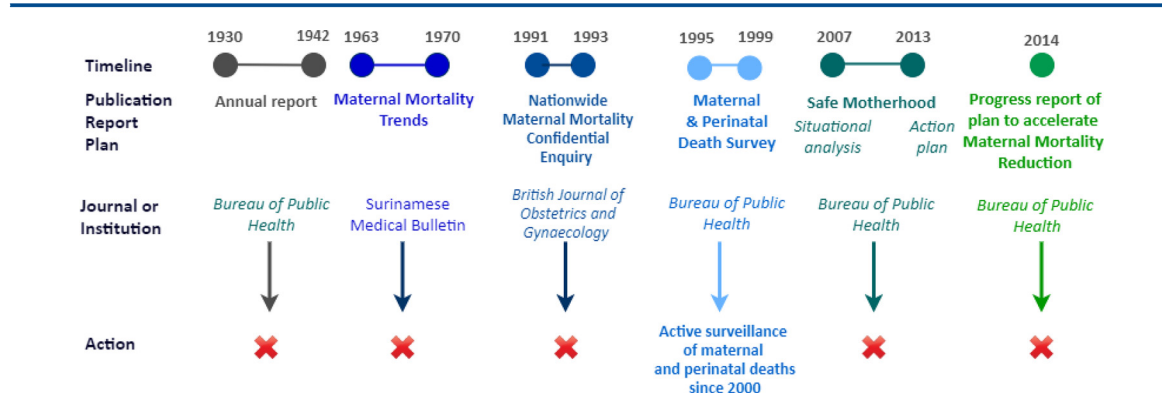
Although the maternal mortality ratio declined with time from 226 per 100,000 live births in 1991–1993 to 154 per 100,000 live births in 2010, Suriname was designated by the Pan American Health Organization (PAHO) in 2010 as one of the 10 priority countries in Latin America and the Caribbean for reduction of maternal mortality.<sup>9–11</sup> Several intentions existed to improve surveillance and classification in Suriname for years, but integrated reviews of maternal deaths were not performed until the installation of a national maternal mortality review committee (the committee Maternal Mortality Suriname [MaMS]) in 2015 (Figure 1). We describe MDSR implementation in Suriname and its facilitators and barriers. We share the lessons learned, as experienced by the health care providers, committee MaMS members, and public health experts involved in MDSR implementation. This MDSR process is described for 3 time periods: (1) pre-2015, a history of MDSR and safe motherhood initiatives before the installation of committee MaMS, for which we conducted a review of key documents; (2) 2015–2019, during the MDSR implementation process, for which we describe the experiences of involved stakeholders (health care providers, committee MaMS members, and public health experts); and (3) 2020 and beyond, the way forward to fulfill the MDSR cycle, for which we describe the strategies of the Ministry of Health (MOH) based on the recommendations and experiences of the previously mentioned stakeholders.

## MATERNAL DEATH SURVEILLANCE AND SAFE MOTHERHOOD INITIATIVES BEFORE 2015 IN SURINAME

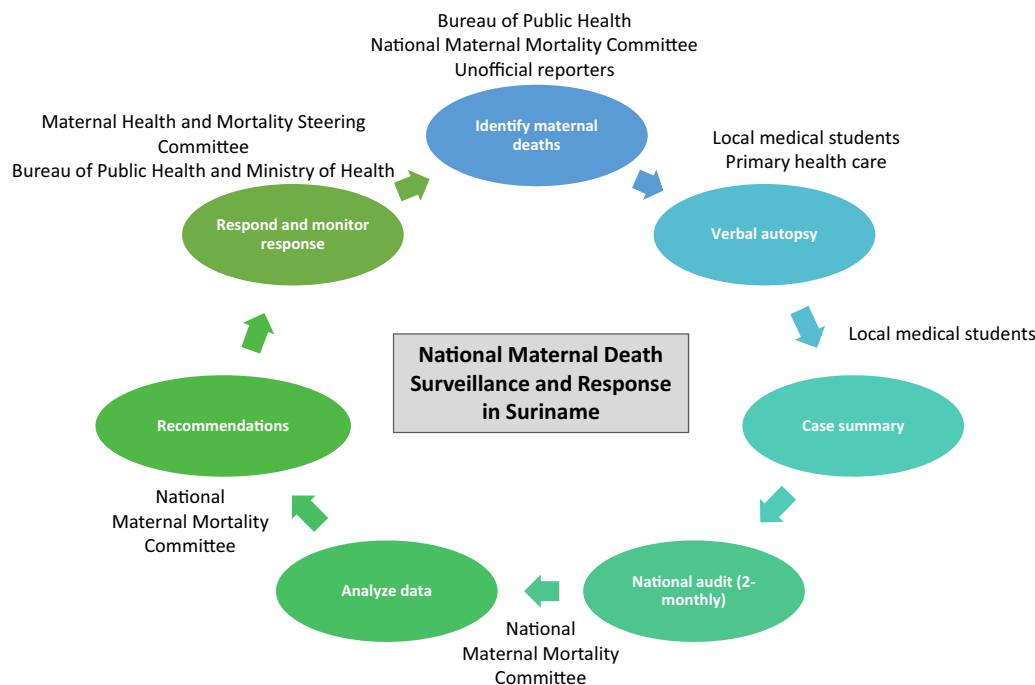
Suriname is a middle-income country in South America with 583,200 inhabitants.<sup>12</sup> The country has an average of 10,000 births in a year, with 86% occurring in the 5 major hospitals, 6% in primary care, 4% at home, and 4% at an unknown location.<sup>13</sup> MOH coordinates the health care systems in Suriname. The Bureau of Public Health (BOG, Dutch acronym) is responsible for public health programs and manages the surveillance and analysis of health data. Although every hospital collects data on maternal health key indicators, no comprehensive national health information system exists.<sup>14</sup>

Figure 1 presents a historical overview of the initiatives conducted to improve maternal health care in Suriname up to 2015. To obtain information on the history of MDSR, we collected and reviewed all documents on maternal health in Suriname available online and those provided by MOH, BOG, and the library of the Anton de Kom University of Suriname. Most of these documents were unpublished. The registration of deaths in Suriname began in the 19th century, but only for inhabitants who were not enslaved.<sup>15</sup> An official civil registration system has been in place in Suriname since 1917, and vital events, including births and deaths of all inhabitants, are registered.<sup>16</sup> The Central Bureau of Civil Affairs is responsible for civil registration. Death notification and registration are done using a death certificate, which is the responsibility of BOG.<sup>17</sup> Underreporting of maternal deaths often resulted from death certificates

**FIGURE 1.** Timeline of Local Plans to Reduce Maternal Mortality in Suriname up to 2015



**FIGURE 2.** Maternal Death Surveillance and Response in Suriname in 2020



Source: Adapted from the World Health Organization.<sup>7</sup>

not being completed or being completed long after an individual’s burial.<sup>10,18,19</sup>

The first reports on maternal mortality did not provide information on the procedure for identifying maternal deaths.<sup>20</sup> A confidential enquiry into maternal deaths, conducted by Mungra et al.<sup>11,18,19</sup> in 1991–1993, highlighted severe underreporting (63%) and made the call to MOH to improve surveillance by undertaking active surveillance, implementing a Reproductive Age Mortality Surveys (RAMoS), and performing maternal death reviews. In 2000, BOG initiated active maternal death surveillance through a monthly enquiry in all obstetric units in hospitals.<sup>21</sup> The cause of death was assigned by the attending physician. Since neither a multidisciplinary review nor a maternal death classification existed, every death in pregnancy (including deaths due to coincidental and accidental causes) was considered a maternal death.<sup>10</sup> However, deaths in the antenatal or postpartum period of women admitted to nonobstetric wards were not captured.<sup>10</sup>

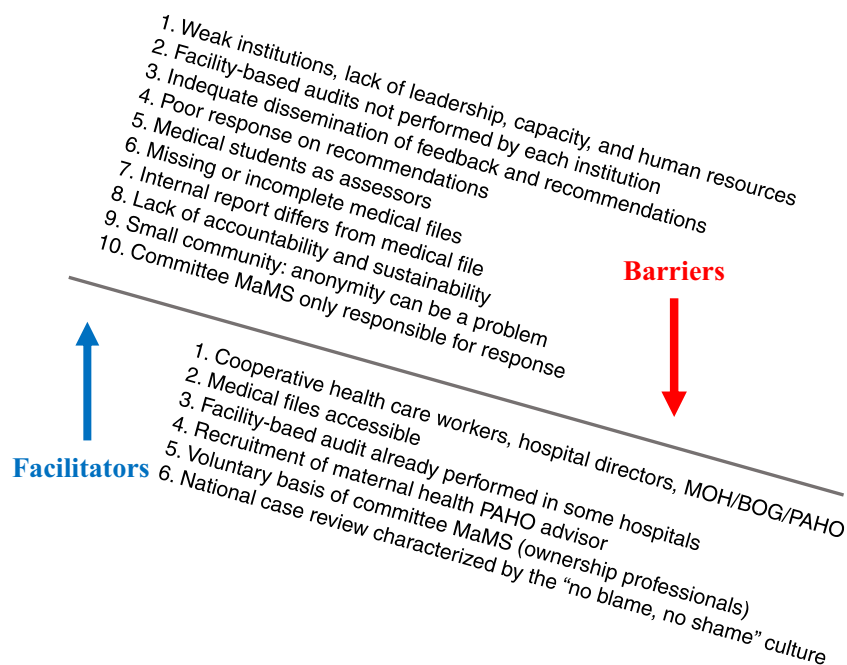
To reduce maternal and perinatal mortality, the MOH performed an analysis in 2007, followed by different action plans and reports, each presenting

similar recommendations, but the plans were not implemented.<sup>22–24</sup> Implementation was less successful than intended due to a lack of human resources, poor communication, and scarce coordination.<sup>23,25</sup> Additionally, these plans and reports were little known among health care providers and other important stakeholders needed for the response.<sup>23,25</sup> Surveillance had barely improved since 2000 and maternal death audits were not conducted until mid-2015.<sup>10,21</sup>

In 2015, a RAMoS was performed by health care providers to retrospectively identify and audit all maternal deaths between 2010 and 2014.<sup>10</sup> An array of methods was used to identify pregnancy-related deaths, as described in previous publications.<sup>10,11,19</sup> Various medical experts determined the causes of maternal deaths and analyzed substandard care. Recommendations centered on (1) improving maternal death surveillance, (2) installing a maternal mortality review committee to audit every pregnancy-related death, (3) implementing national guidelines and early warning scores, and (4) improving postnatal care strategies.<sup>10</sup>

**A RAMoS performed in 2015 retrospectively identified and audited all maternal deaths between 2010 and 2014, and it ultimately led to 4 key recommendations.**

**FIGURE 3.** Facilitators and Barriers in Establishing Maternal Death Surveillance and Response in Suriname as Experienced by Committee Maternal Mortality Suriname Members, Health Care Providers, and Public Health Experts



Abbreviations: BOG, Bureau of Public Health; MDSR, Maternal Death Surveillance and Response; MaMS, Maternal Mortality Suriname, MOH, Ministry of Health; PAHO, Pan American Health Organization.

To ascertain that the recommendations would be pursued, the study investigators of the 2010–2014 RAMoS sought collaboration with MOH, BOG, PAHO, and midwifery and gynecology/obstetric organizations. Through joint efforts of these stakeholders, the responses that could be implemented were the installation of the committee MaMS and the development of national obstetric guidelines.

### ■ MDSR IMPLEMENTATION PROCESS IN SURINAME BETWEEN 2015 AND 2019

In this section, we describe the perspectives and experiences of the members of committee MaMS, the health care providers, and public health experts (BOG/MOH/PAHO) involved in the MDSR implementation.

#### Recommendation Response: Installation of a National Maternal Mortality Review (MaMS) Committee

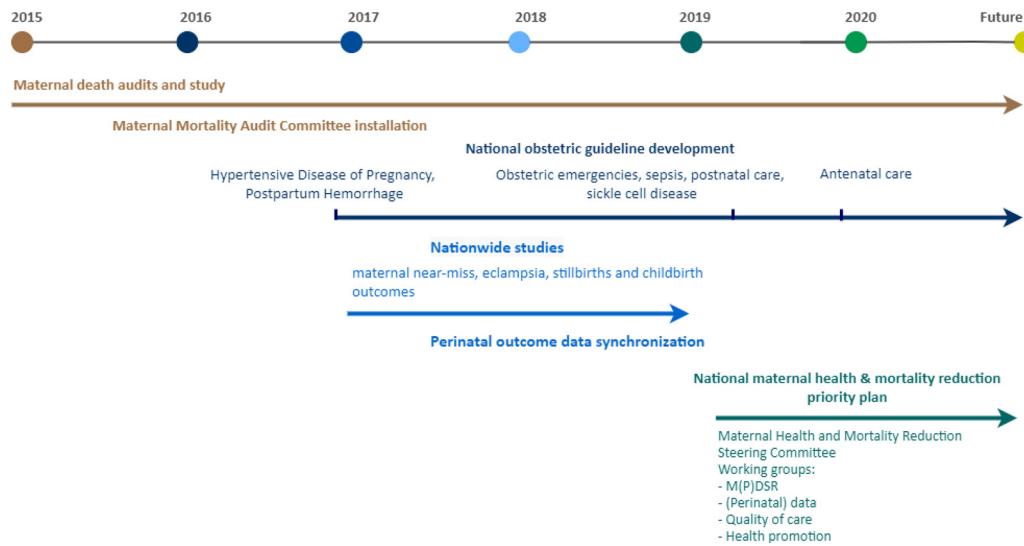
The committee MaMS, established in November 2015, gathers (bi)monthly and audits every

pregnancy-related death in the nation.<sup>26</sup> The committee consists of 4 gynecologists/obstetricians, 1 midwife, 1 internal medicine specialist, 1 BOG representative, 2 medical students, and several external consultants.<sup>26</sup> Most members are consultants from 4 of the 5 major hospitals in Suriname where most births take place; primary health care is not represented. The medical students involved have at least 1 year of experience in obstetrics and discuss every case file with an experienced clinician. Figure 2 depicts the activities currently conducted by the committee MaMS in the MDSR cycle:

1. Active case detection by various sources: (in) formal notification, notification by BOG (C-forms or active surveillance)
2. Sharing of cases (exchange of data) with the BOG and vice versa (not yet performed regularly)
3. Composition of a case summary
4. Collecting additional case information if necessary (e.g., laboratory results, interview with the health care provider)

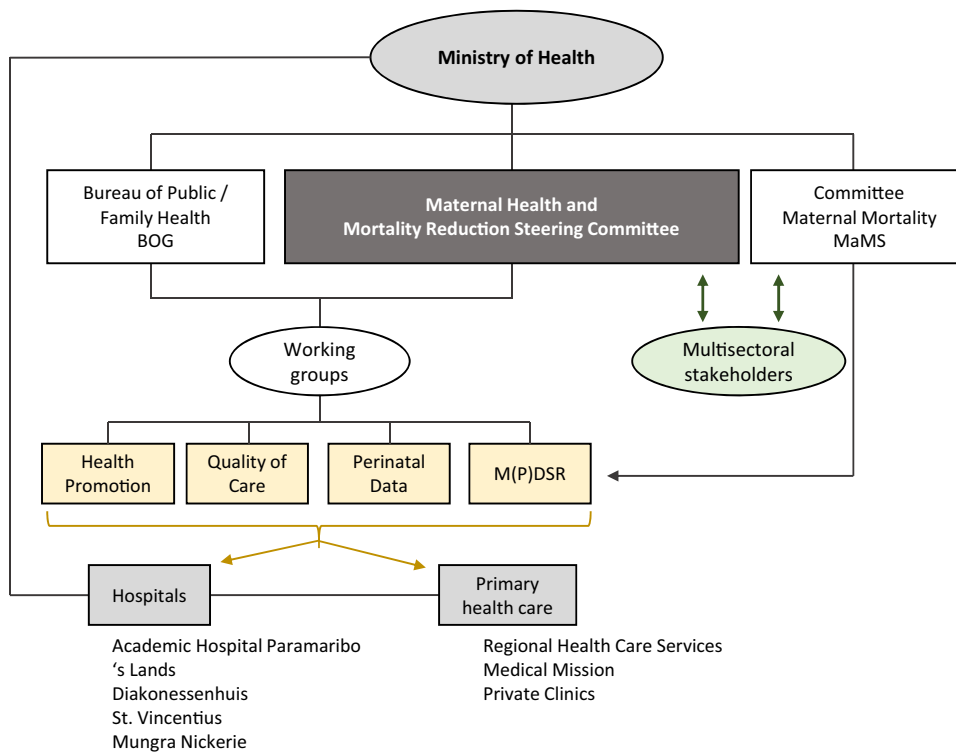


**FIGURE 4.** Timeline of Maternal Health Initiatives in Suriname, 2015 to Present



Abbreviation: M(P)DSR: maternal (& perinatal) death surveillance and response.

**FIGURE 5.** Flowchart of Organization of Maternal Health in Suriname Adapted From the National Maternal Health and Mortality Reduction Priority Plan 2019–2020<sup>36</sup>



5. Verbal autopsy with family members if it could contribute more insight into the circumstances of the death
6. Maternal death review/audit, classification using the International Classification of Diseases for Maternal Mortality,<sup>27</sup> and substandard care analysis according to the 3-delay model<sup>28</sup>
7. Dissemination of recommendations with relevant institutions and the MOH and BOG (not yet consistently done)

Figure 3 summarizes the facilitators and barriers experienced by committee MaMS, health care providers, and public health experts (BOG/MOH/PAHO) in the completion of the MDSR cycle. All audits conducted by committee MaMS guarantee the “no blame, no shame” culture,<sup>5,29</sup> and the committee ensures that no litigation of health care workers is initiated.

Unfortunately, despite the efforts of the committee MaMS and PAHO for 5 years now, maternal deaths are still not structurally identified and identification depends on informal notification by health care workers, family, or news sites. Deceased women of reproductive age are not yet completely incorporated in BOG’s routine surveillance, facility-based reviews are incidentally performed, and there is no established institution responsible for the general MDSR coordination. The members of the committee MaMS are volunteers. Death certificates do not have a pregnancy box, and notification is not required.<sup>10</sup> Owing to a lack of trained professionals, medical

students are responsible for part of the surveillance, data acquisition, and case presentation at the audit and for summarizing the analysis and recommendations. The level of knowledge of these students may affect the quality of information obtained, confidentiality, and sustainability.

### Recommendation Response: Obstetric Guideline Development

The committee MaMS responded to one of the recommendations on quality-of-care improvement from the 2010–2014 RAMoS in 2016 (Figure 4). This response included an adaptation of international obstetric guidelines to the national context and addressed Suriname’s most common maternal health problems, namely postpartum hemorrhage, hypertensive disorders of pregnancy, and obstetric emergency training.<sup>30</sup> Non-pneumatic anti-shock garments (used in hypovolemic shock in case of severe hemorrhage) were provided by PAHO, followed by training, in 2018 and 2019 to reduce and treat postpartum hemorrhage.<sup>9</sup> The evaluation of the previous guidelines and the development of guidelines on postnatal and antenatal care, sepsis, sickle cell anemia, emergency obstetrics, and early warning scores followed in April 2019. Facility-based obstetric emergency training was guided by BOG, PAHO, and the recently installed maternal health quality-of-care working group, to enhance guideline implementation and adherence as advised in earlier studies.<sup>31,32</sup> In addition to the quality-of-care improvement projects, committee MaMS was involved in conducting nationwide studies on

**Unfortunately, despite the efforts of the committee MaMS and PAHO, maternal deaths are still not structurally identified.**

**TABLE 1.** Summary of the Implementation Status of Maternal Death Surveillance and Response in 2020

Already Established	To Be Established
<ul style="list-style-type: none"> <li>• Installation of a national review committee (MaMS) and a maternal health mortality reduction steering committee</li> <li>• Coordination framework and terms of references</li> <li>• Institutional MDSR focal points designated and trained in surveillance and active case detection</li> <li>• Quality-of-care working group operational</li> </ul>	<ul style="list-style-type: none"> <li>• National policy for notification of maternal deaths</li> <li>• Official installation of committee MaMS and the 4 working groups for maternal health, reinforce the health promotion and perinatal data working group<sup>a</sup></li> <li>• Facility-based audits of every case, organized by MDSR focal points</li> <li>• Verbal autopsies by MDSR focal points<sup>b</sup></li> <li>• Specialized assessors for facility audit preparation (nurses, doctors) and external audits (BOG)</li> <li>• Timely dissemination of recommendations</li> <li>• Monitoring and evaluation</li> </ul>

Abbreviations: BOG, Bureau of Public Health; MaMS, Maternal Mortality Suriname; MDSR, Maternal Death Surveillance and Response.

<sup>a</sup>Perinatal data working group was installed, but only sporadically active.

<sup>b</sup>Only incidentally performed until now.

maternal morbidity and near-miss (2017–2019), childbirth outcomes, and stillbirths.<sup>14,33</sup>

## 2020 AND BEYOND: NEXT STEPS TOWARD FULFILLING THE MDSR CYCLE IN SURINAME

In 2020, MOH formulated different strategies to implement MDSR, based on the recommendations and experiences of the members of committee MaMS, health care providers, and public health experts (BOG/PAHO).

Similar to Suriname, other countries in the region have not made great progress in reducing maternal deaths.<sup>3,34</sup> Subsequently, the PAHO and its Latin American Centre of Perinatology, Women and Reproductive Health called for awareness-raising and accountability.<sup>34</sup>

MOH/BOG and PAHO presented an advocacy paper and priority plan in April 2020 to call for a multisectoral effort to reduce maternal deaths.<sup>35,36</sup> They also created a national steering committee for maternal health and mortality reduction to reinforce the coordination of the maternal health program in Suriname.<sup>36</sup> This steering committee was formally installed by MOH in February 2020, and it currently guides, advises, and closely monitors planned interventions of the working groups and reinforces accountability and multisectoral coordination. Although the committee MaMS (responsible for review and recommendations) previously also carried out its own recommendations, MOH and BOG agreed that this steering committee, a direct working arm of MOH, should be responsible for the coordination and monitoring of response. The steering group oversees 4 working groups to ensure more commitment (Figure 5).<sup>36</sup> Through these working groups, responsibilities can be specifically delineated and roles defined. In particular, because of the lack of leadership, it is important to define exactly who is responsible and what the responsibilities are. The 4 working groups include the following:

1. The MDSR working group is responsible for improvements in *surveillance* and maternal death audit, dissemination of *recommendations*, and delineation of roles for *response* by specifying specific tasks and responsibilities.
2. The quality-of-care working group is responsible for the development and monitoring of national standards of care. It also updates and validates national guidelines and supports facility-based and national training.

3. The perinatal (data) working group is responsible for introducing, collecting, synchronizing, and analyzing data on perinatal health in Suriname.
4. The health promotion working group is responsible for the development of a health promotion plan. It implements recommendations following maternal death reviews and supports maternal health education, family planning, and contraception in the communities.

MOH has also identified multisectoral focal points in non-health ministries and institutions and currently prepares the national Maternal and Neonatal Health Strategy (2021–2025) and Operational Plan (2021–2023). Unfortunately, the COVID-19 pandemic has

**In 2020, MOH formulated different strategies to implement MDSR, based on recommendations and experiences from members of committee MaMS, health care providers, and public health experts.**

**TABLE 2.** Summary of Recommendations From Committee Maternal Mortality Suriname Members, Health Care Providers, and Public Health Experts to Strengthen Maternal Death Surveillance and Response in Suriname

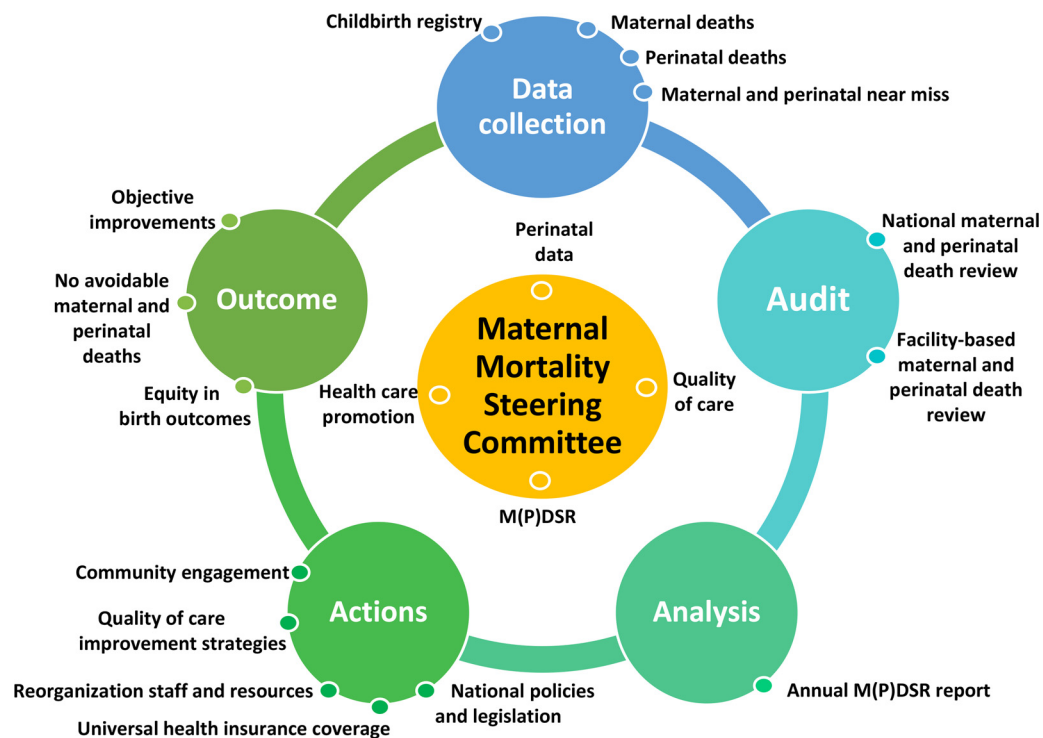
Legislation
<ul style="list-style-type: none"> <li>• Ensure no disciplinary/litigation measures</li> <li>• Notification of maternal death within 24 hours<sup>a</sup></li> <li>• Include pregnancy checkbox on the death certificate<sup>b</sup></li> <li>• Timely completion of death certificate</li> <li>• Autopsy for maternal deaths of unknown cause</li> </ul>
Finances and human resources
<ul style="list-style-type: none"> <li>• Empower BOG by capacity strengthening</li> <li>• Support committee MaMS (administrative personnel, logistics)</li> <li>• Capacity building of the institutional MDSR focal points</li> <li>• Include MDSR in preservice training curricula</li> <li>• Involve health care workers and create awareness (bottom-up approach)</li> <li>• Involve and educate the community</li> <li>• Funding</li> </ul>
Enabling policies
<ul style="list-style-type: none"> <li>• Ensure structural facility-based review</li> <li>• Install special secretariat for MDSR at BOG/MOH</li> <li>• Enable communication and dissemination of findings and recommendations</li> </ul>

Abbreviations: BOG, Bureau of Public Health; MaMS, Maternal Mortality Suriname; MDSR, Maternal Death Surveillance and Response; MOH, Ministry of Public Health.

<sup>a</sup> Institutions and funeral agencies were recently requested to report maternal deaths within 24 hours.

<sup>b</sup> As a temporary solution, a pregnancy checkbox slip is attached to the “C form.”

**FIGURE 6.** The Ideal Paradigm of the Maternal and Perinatal Death Surveillance and Response Cycle for Suriname



Abbreviation: MPDSR, maternal and perinatal death surveillance and response.

caused a delay in action and operation of the working groups.

### Strategies to Institutionalize MDSR in Suriname

To guarantee sustainable surveillance and to improve *identification and notification* of maternal deaths, MDSR focal points (midwives/doctors) are designated in each institution (the 5 hospitals, Medical Mission, and Regional Health Services).<sup>36</sup> The MDSR focal point in a hospital is responsible for active case detection by monthly medical file investigation of deceased women of reproductive age. The primary care MDSR focal point assesses community deaths. MOH issued instructions on the procedure for early reporting and active case detection to health facilities and burial agencies. In addition, PAHO and the Latin American Centre of Perinatology, Women and Reproductive Health organized training in active case detection, verbal autopsy, and review to improve MDSR.

Following the identification of a possible maternal death, BOG must be notified via a hotline

number, and the case must be entered in an anonymized password-protected online database. If no maternal deaths occur, that information must also be reported. The focal point is responsible for the coordination of a more structured facility-based review and reports to BOG and committee MaMS. Although some facilities conduct maternal death reviews within 72 hours, conclusions and lessons learned can differ from the national review. Anonymity and the “no blame, no shame” culture cannot be assured in the facilities. Additional barriers include the lack of leadership to review these deaths and no obligation or request for a report for MOH.

Therefore, it is crucial to perform an external case assessment by specialized trained nurses or medical doctors from BOG with the assistance of committee MaMS. The monthly audits to determine underlying causes and classification on the national level by committee MaMS should continue. Committee MaMS formulates the recommendations and disseminates them to the relevant institutions and MOH/BOG. Although the committee MaMS

instigated the previously mentioned responses, they do not have the authority to act upon recommendations, for example, by adding a pregnancy check box on the death certificates, enacting a national policy to ensure notification of maternal deaths, and mandating postmortem investigation of all unexplained maternal deaths. Therefore, we believe that the response to the recommendations from the review cannot only be the responsibility of committee MaMS. Strong government commitment and leadership of professionals are essential to ensure response on the recommendations, evaluation, and monitoring and to judge the impact on maternal death reduction. [Table 1](#) provides an overview of the implementation status of the abovementioned strategies in 2020.

### Recommendations to Strengthen MDSR in Suriname

In [Table 2](#), we summarize the recommendations from committee MaMS members, health care providers, and public health experts following the lessons learned since the implementation of MDSR in Suriname in 2015. Critical steps in fulfilling the complete MDSR cycle in Suriname (action and response) are delineating roles and responsibilities for action, establishing accountability mechanisms for results, and influencing stakeholders in a position to act. The fulfillment of this cycle is hindered by a lack of financial and human resources, leadership, and legislation and by inadequate government enabling policies.

### MDSR in the Future: Adding Perinatal Deaths to the Cycle

The following step after the institutionalization of MDSR implementation will be the inclusion of perinatal deaths to the cycle, the Maternal and Perinatal Death Surveillance and Response (MPDSR) ([Figure 6](#)). Maternal conditions often influence perinatal outcomes.<sup>37,38</sup> Additionally, gathering perinatal data and performing perinatal mortality audits in the future will extend the MDSR cycle and link maternal and perinatal care. Further, maternal morbidity and near-miss data gathering and audits constitute another essential step. We realize, however, that perinatal deaths are more numerous and the implementation of perinatal death surveillance and review will therefore be more challenging. The plans are to start with a pilot to systematically audit perinatal deaths in 2021–2022.

## CONCLUSIONS

For decades, several attempts by MOH alone were insufficient to institutionalize maternal death

audits. Structural national maternal death review in Suriname was introduced after a timely and complicated process. Stakeholders' involvement, ownership, and leadership were essential to step up in the MDSR cycle from insufficient surveillance to structural audits in 2015. These first steps created a base that the institutions in charge can build on to ensure sustainability. Therefore, a strongly committed government enabling clear policies and laws to improve MDSR is crucial. In summary, the key elements for successful MDSR implementation are commitment, “no blame, no shame” culture, collaboration, coordination, and communication (the 5 Cs).

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**SHORT REPORT**

# The Demographic and Health Surveys Faculty Fellows Program: Successes, Challenges, and Lessons Learned

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## Key Findings

- The Demographic and Health Surveys (DHS) Faculty Fellows Program has trained 152 researchers from 45 universities in 25 countries in Africa, Asia, and the Middle East—demonstrating that it is possible to improve research and analysis skills in low- and middle-income countries through a short-term targeted program.
- The program has not only strengthened individual skills in conducting research with data from large surveys but also substantially increased institutional capacity to use and analyze complex survey data through the fellows' cascading of capacity-strengthening activities at their home universities.

## Key Implications

- Continued investment is needed to strengthen the countries' capacity to use complex survey data for their policy and program purposes.
- The DHS Faculty Fellows Program provides a successful model that other international development programs can use to strengthen capacity in analysis and use of data in low- and middle-income countries.
- Capacity-strengthening programs should engage local institutions to be more effective and sustainable.

## ABSTRACT

Primarily funded by the United States Agency for International Development (USAID), the Demographic and Health Surveys (DHS) Faculty Fellows Program is designed to strengthen the institutional capacity of universities in low- and middle-income countries to use and analyze DHS data. This article provides an overview of the program's evolution and its current form; presents successes and impacts; and discusses challenges, lessons learned, and potential further directions.

Initiated in 2008, the Fellows Program underwent several rounds of improvement. The current model involves a competitive team application process, 2 intensive in-person workshops, completion of a working paper of publishable quality, and the transfer of analysis skills learned during the fellowship to students and colleagues at home universities, all completed over 1 year. Since 2011, the Fellows Program has trained 152 researchers from 45 universities in 25 countries in Africa, Asia, and the Middle East. The program has not only strengthened individual skills in conducting research with data from large surveys but also substantially increased institutional capacity to analyze DHS data through fellows' capacity-building activities at their home universities. These successes have happened despite the many and continuing challenges related to fellows' diverse backgrounds, experience, skills, language barriers, logistical difficulties in organizing in-person workshops in fellows' countries, and sometimes fellows' varying levels of commitment.

With continuous support from USAID, the program hopes to expand to more universities and countries, especially francophone countries. Overall, the DHS Faculty Fellows Program has proven to be highly successful and provides a model for other groups aiming to strengthen capacity for data use and research in low- and middle-income countries.

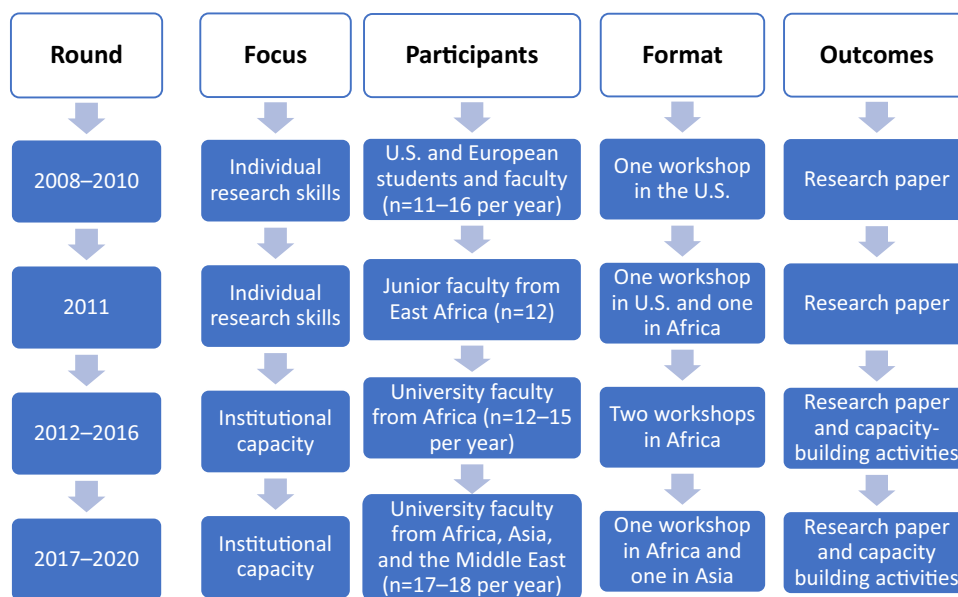
## INTRODUCTION

The Demographic and Health Surveys (DHS) Program is a United States Agency for International Development (USAID)-funded project that assists low- and middle-income countries with the implementation of nationally representative household surveys that collect data on population, health, and nutrition and with the analysis and dissemination of these data. Since 1984, the DHS Program has implemented more than 400 surveys in 90 countries and is a major source of reliable data that inform national and international population and health policies and programs. In addition to technical assistance in data collection, the DHS Program is committed to strengthening the capacity of host-

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**FIGURE 1.** Evolution of the Demographic and Health Surveys Faculty Fellows Program



country partners all along the survey continuum, from survey and sample design to data analysis, dissemination, and use. The DHS Faculty Fellows Program is a major component of the DHS Program’s long-standing commitment to increasing host-country capacity to use DHS data. Its primary objective is to strengthen the institutional capacity of universities in participating countries to understand the DHS microdata and use them to conduct complex analyses to answer policy- and program-relevant questions. The DHS Faculty Fellows Program seeks to create sustainable in-country capacity by training university faculty whose role is to educate students who will be the country’s future policy makers, program managers, and researchers. Although the Fellows Program trains individuals, 2 key elements help to cascade the learning to the fellows’ home universities. First, individual faculty are enrolled in the program as a team with other faculty from the same university, allowing for reinforcement of learning. Second, the terms of the Fellows Program require that on completion, the trained faculty will implement self-designed activities to transfer their learning to others within the university. To ensure institutional commitment to these program requirements, fellows’ applications must include evidence of permission from their university authorities.

This article provides an overview of the program’s evolution; describes its current form; presents successes and impacts; and discusses challenges, lessons learned, and potential further directions. The DHS Faculty Fellows Program provides a valuable model for strengthening capacity for data analysis and research in low- and middle-income countries. Experience and lessons gained from this program could also inform global capacity-strengthening programs in areas beyond research and data analysis.

### ■ EVOLUTION OF THE FELLOWS PROGRAM

The DHS Fellows Program originated in 2008 and went through several major shifts in the course of its development (Figure 1).

#### Initiation Approach: Train Individuals to Produce Academic Papers

The original DHS Fellows Program was designed to focus on building individual skills to prepare academic papers based on DHS data. The first 2 rounds of the Fellows Program, in 2008–2009 and 2009–2010, included a competitive application process, with a journal-quality research paper as the final deliverable, mentoring of each participant by a member of the DHS technical staff, and a US workshop. Although it was open to qualified

candidates from any country, the applicants were primarily graduate students and junior faculty from US and European universities. Fellows received remote guidance and support, mainly from their DHS mentor, on formulating research questions, analyzing data, preparing an analysis plan, and writing the final paper. Toward the end of each round, all fellows came to the DHS headquarters in Maryland, USA, for a 2-week workshop, during which they received intensive one-on-one assistance from their mentors and other DHS staff to finalize their research papers.

The first 2 rounds successfully trained many researchers and provided valuable lessons for future rounds of the program. Participant feedback emphasized the need for an additional workshop at the beginning of the program, which would provide more formal training on the fundamentals and correct use of DHS data before fellows began their own analysis. Two workshops could maximize the learning experience and facilitate the production of high-quality papers. Although these rounds of the program included some participants from low- and middle-income countries, there was no exclusive focus on these countries where there is a great need and a high demand for capacity strengthening in data analysis and use.

**Although the first 2 rounds of the DHS Fellows Program trained many researchers, the program was redesigned in 2011 to focus on university faculty in DHS host-countries.**

**The current model of the program is a result of previous modifications, including improvements to participant selection, training workshops, and postworkshop activities.**

### **Shift Focus to University Faculty in Low- and Middle-Income Countries**

Based on the lessons from the first 2 rounds and the recognition that the format did not fulfill the DHS Program mandate to build capacity in DHS host-countries, the Fellows Program was completely redesigned in 2011 to target universities in low- and middle-income countries. In this iteration, the program focused specifically on junior faculty, who would have many years to train students and contribute to their institutions. In this round, DHS limited the call for applications to several East African countries that had implemented multiple rounds of DHS surveys. Two workshops were provided for the participants: the first was early in the fellowship to provide a solid foundation for DHS data use and instruction, and the second was several months later, allowing sufficient time for fellows to work on their research papers. The first workshop was held in Kenya that year and the second at DHS headquarters. The 2011 program represented 10 universities in 6 East African countries. Most fellows successfully completed a paper that was subsequently published in the DHS Working Paper series.

### **Add Emphasis on Strengthening Institutional Capacity**

Although the 2011 round of the program did consider institutional capacity building—for example, by focusing on junior faculty who may have many years to “give back” to their universities—it was not until the 2012 round that institutional capacity strengthening became a key focus of the program. One modification to this end was to replace applications from individuals with applications from 3-person teams from the same university. The 3-member faculty teams were expected to work together to develop their research proposal, complete a research paper, and develop and implement a capacity-building plan for their home universities. This modified approach was aimed at helping increase institutional capacity in data analysis and research through training more than 1 faculty at a time so that team members could reinforce the learning, and by requiring that the training be cascaded to other faculty and students in each participating university. To ensure successful implementation of the capacity-strengthening plan at the home universities, each team was required to include a senior faculty member who would likely have a greater influence on curriculum development and research activities in the department.

### **Expand the Program From Africa to Asia and the Middle East**

For the first few years, the program primarily focused on countries in sub-Saharan Africa, but in 2017 it was expanded to Asia and the Middle East. The expansion to these regions was motivated by DHS statistics on the number of DHS datasets downloaded by country that indicated limited requests for and use of DHS data in these regions (except for India), despite the availability of multiple surveys in many countries. In addition, analysis of data from DHS’s tracking of journal articles using DHS data also showed that very few papers had been written by authors from South and Southeast Asia (excluding India). These data suggested a need for capacity building in DHS data use and analysis in this region.

### **THE CURRENT MODEL**

The current model of the program is a result of the major modifications discussed above and many other improvements over the years. The current model has more streamlined processes for participant selection, 2 in-person training workshops, and postworkshop activities.

## Selection of Participants

In October or November of every year, DHS issues a call for applications from universities in the targeted countries. These countries are selected based on the availability of recent DHS data and the existence of universities offering academic programs in population and health. Countries targeted can vary every year; priority is given to those that have never participated or have had low participation in previous program rounds. Other important considerations relate to the amount and type of funding available for the program. The program typically selects 5 or 6 teams, each composed of 3 faculty members, on a competitive basis using criteria such as quality of the research proposal, applicants' experience and baseline skills in data analysis, suitability of the proposed capacity-building activities to the applicants' university, country diversity, and gender balance. As the competitive selection process may result in applicants from resourceful universities having a better chance to be selected, the program carefully assesses the diversity of selected universities to reduce repeating participation from the same universities.

## First Training Workshop

The program provides in-person training through 2 workshops led by DHS technical staff. These 2-week workshops are usually held in the fellows' home countries so that it is possible to involve DHS implementing agencies and other stakeholders, including the USAID Mission. Fellows also receive intensive remote guidance and feedback before and after workshops.

Before the first workshop, an online preworkshop assignment prepares the fellows for the training. This includes downloading the required DHS datasets and completing a short course on the objectives and coverage of the DHS Program. The online platform also includes other important learning resources and allows fellows to interact with DHS facilitators. The training curriculum for the first workshop prepares fellows to analyze DHS data from their respective countries. Topics include DHS questionnaires, DHS recode data files and variables, principles of survey sampling and weighting, how to account for complex survey design in the analysis, use of statistical software (usually Stata) for analysis, dataset merging, variable recoding, and multivariate regression analysis. For each topic, the concepts are presented and then enhanced by participatory exercises in Stata. The curriculum also includes discussions

on research conceptualization, preparation of a tabulation plan, scientific writing, research ethics, and citation software. During this workshop, fellows' teams also work with DHS facilitators to refine the design of their research projects and to conduct preliminary data analysis. Research topics are related to reproductive health, family planning, maternal and child health, HIV, nutrition, and gender issues. Pre- and posttests are used to evaluate the effectiveness of the training.

## Second Training Workshop

Between the first and second workshops, while back at their home university, fellows prepare and submit a draft working paper, for which they receive extensive reviews and comments from the DHS staff. The second workshop, which takes place approximately 2 months after the first workshop, concentrates on revising and finalizing the working paper draft, to ensure that the research meets publishable quality standards. By the end of the second workshop, most teams are nearly finished with their revised paper. During this workshop, fellows are also introduced to more advanced topics such as estimation of fertility and child mortality using DHS data and analyzing DHS calendar data, as well as more advanced statistical methods such as multilevel modeling, survival analysis, and decomposition analysis. These topics are selected based on fellows' interests and skills. All the training materials are shared with the fellows for their own teaching and capacity-building activities. DHS is also currently putting these training materials in an online repository to benefit more DHS data users. For each workshop, a final evaluation is conducted to solicit feedback on training quality and usefulness.

## Posttraining Activities

In addition to completing a research paper, fellows are required to design and implement a series of capacity-building activities at their home universities to share their learning with students and faculty colleagues. Activities typically include integrating DHS data into their teaching curriculum, department seminars, and research meetings to increase awareness of DHS data; mentoring graduate students to use DHS data in theses or dissertations; and conducting DHS data analysis workshops for students and faculty. Fellows conduct these activities primarily with support from their home university. The teams are required to submit 2 reports on the implementation and results of these capacity-building activities.

**FIGURE 2.** Countries Included in the Demographic and Health Surveys Fellows Program During 2011–2020



■ **PROGRAM SUCCESSES AND IMPACTS**

**High-Quality Research Published in Peer-Reviewed Journals**

**Since 2011, the Fellows Program has trained 152 researchers from 45 universities in 25 countries in Africa, Asia, and the Middle East.**

Since 2011, the Fellows Program has trained 152 researchers from 45 universities in 25 countries in Africa, Asia, and the Middle East (Figure 2). The program has increased individual skills in conducting research with data from large surveys, as indicated by 57 high-quality research papers published as working papers on the DHS website. Most of these papers, after revisions, have been published in peer-reviewed journals (see Supplement) such as *Studies in Family Planning*, *PLoS One*, *BMC Pregnancy and Childbirth*, *African Population Studies*, *Reproductive Health*, and the *International Journal of Population Research*.

Beyond their fellowship papers, fellows have continued to use DHS data in their own research, and many have published other research based on DHS data after they participated in the program. In 2016 and 2017 alone, 15 papers were published by former fellows. Many fellows have presented their research findings based on DHS data at national and international scientific meetings. These post-fellowship activities have been self-motivated and have not received financial support from the DHS Program.

**Increased Institutional Capacity in Data Analysis and Research**

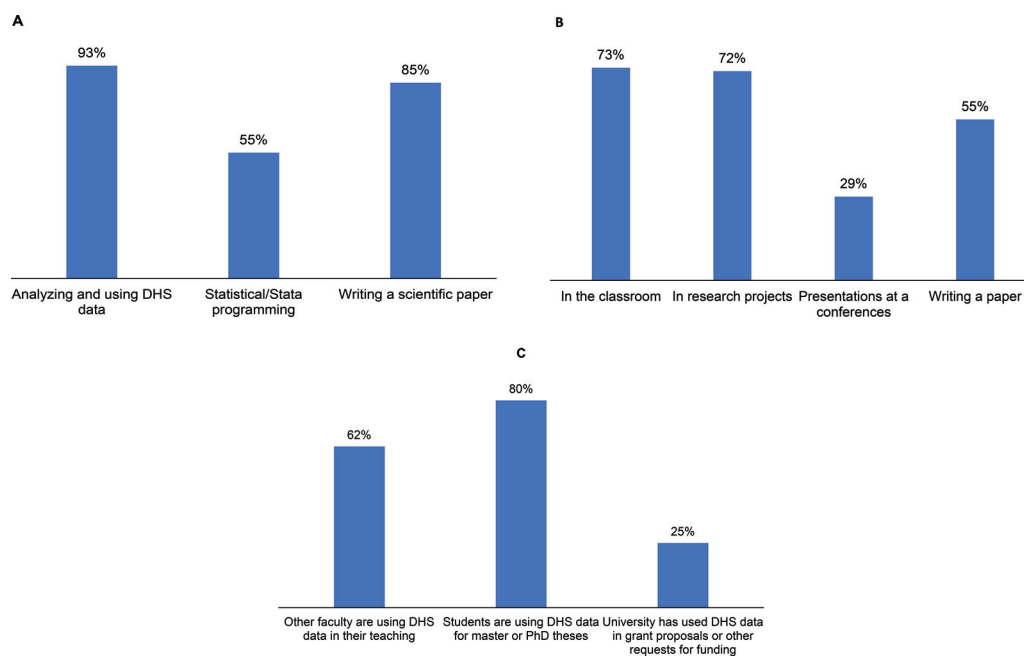
In addition to producing sound research based on DHS data, the Fellows Program has substantially increased institutional capacity to analyze DHS data through the fellows’ capacity-building activities at their home

universities. Many activities continue after the end of the fellowship. Fellows are particularly successful when there are other fellows from previous cohorts working at the same university. For example, teams of Nigerian fellows from Obafemi Awolowo University who participated in different rounds of the Fellows Program (2012, 2014, and 2016) have worked together and conducted annual training on DHS data analysis since 2012. In 2014, they expanded the training beyond students and faculty in their university to other universities and nonacademic research institutions. Between 2012 and 2016, they trained over 100 participants from a variety of universities and organizations in Nigeria to use DHS data. Fellows from several cohorts at Makerere University in Uganda also collaborated to expand capacity-building activities and conduct research based on DHS data. By involving participants from government agencies and local organizations, some fellows have built a network with local stakeholders for future collaboration and data analysis support to these organizations.

Fellows have written blogs on the impact of the Fellows Program on themselves and their university. We present 2 quotes below from the fellows.

*Since 2018, I published 2 journal articles and presented 2 oral presentations at the 10th and 11th International Conference on Public Health among Greater Mekong Sub-Regional Countries. In addition, 3 of my MPH students prepared their proposals using DHS data this year. Myanmar is now realizing the data quality and accuracy of DHS indicators, so, not only academicians and students but also program managers and policymakers are using DHS indicators in relevant situations.* —Fellow from Myanmar 1 year after completing the 2018 program

**FIGURE 3.** Result of the Demographic and Health Surveys Fellows Follow-up Surveys, 2015–2018. (A) Skills learned or strengthened during the Fellows Program that were used since finishing the program, 2015–2018 (n=62); (B) Contexts in which DHS data were used by fellows after finishing the program, 2015–2018 (n=62); (C) Ways that fellows' universities have benefited from their participation in the Fellows Program, 2015–2018 (n=62)



*Thanks to the Fellows Program, we are better equipped to use this data in other work and have shared it with our colleagues during our capacity-building activities. Some colleagues are already hoping to participate in future Fellows Program or other DHS workshops. This program not only allowed us to better understand the DHS surveys, but also make in-depth statistical analyses and to use DHS data to write analysis reports.*  
—Senegal team in the 2019 program

continued to use DHS data in different contexts, including teaching and in research projects. Almost all fellows reported that their universities have benefited from their participation in the Fellows Program through their own capacity-strengthening activities. Their participation in the Fellows Program increased the use of DHS data in their own and colleagues’ teaching curricula and research projects, as well as in their students’ theses or dissertations.

### Continued Impact on Fellows and Their Institutions

The Fellows Program has shown continued impact on fellows and their institutions after the fellowship ends. We analyzed data from a follow-up survey conducted 6 months after the conclusion of the program with the 2015, 2016, 2017, and 2018 cohorts. The response rate was 100% from all cohorts except the 2018 cohort, for which it was 83%. Figure 3 highlights some survey results. Most fellows used their skills in analyzing and using DHS data (93%) and writing a scientific paper (85%) after finishing the program. Fellows have

### Source of South-to-South Consultants for the DHS Program

The Fellows Program has also been an important source of south-to-south consultants for other analysis workshops of the DHS Program. Alumni fellows have a combination of technical skills gained through the program and considerable experience with teaching—their main occupation. Former fellows have often been invited back as co-facilitators in many types of DHS workshops, including subsequent fellows workshops. By 2019, 20 fellows had been invited back to co-facilitate fellows workshops and other DHS data use and analysis workshops, as

**The Fellows Program has shown continued impact on fellows and their institutions after the fellowship ends.**

well as to co-author reports that further analyze their country's DHS data. Former fellows had very positive feedback on the value of facilitation for their careers and further improvement of their analytical and research skills.

## ■ CHALLENGES AND LESSONS LEARNED

**While achieving many successes, the DHS Fellows Program also faces challenges.**

While achieving many successes, the DHS Fellows Program also faces challenges related to fellows' diverse backgrounds, experience, and skills; logistical difficulties in organizing in-person workshops; language barriers; and fellows' varying levels of commitment.

### Diversity of Backgrounds, Experience, and Skills

Teams are selected through an open competitive process that involves rigorous assessments of skills and experience based on applications. However, the baseline capacity of the participants can still vary greatly, particularly in prior knowledge and use of survey data, computer skills, familiarity with statistical software, and research ability. Most fellows have been junior faculty with a master's degree received from their home country and very limited previous experience working with large survey datasets and complex analytical methods. In addition to various skill levels, fellows come from a wide range of research backgrounds, including demography, public health, medicine, social sciences, psychology, and health systems. While this diversity has its advantages in expanding the fellows' exposure to various research areas, it also creates challenges for teaching and mentoring the fellows. The DHS facilitators must engage different interests and accommodate varying skill levels during lectures and hands-on work, while still ensuring that all content is covered within a fixed amount of time. Facilitators must provide one-on-one intensive mentorship to teams with limited skills. At times, major adjustments to fellows' research proposals are required to narrow their original scope or to shift to simpler analytical methods if the team has limited capacity. Teams with more experience are encouraged to apply more advanced methods in their research. Cofacilitators, typically former fellows, provide extra assistance during the limited time available. They also liaise between the DHS facilitators and fellows and are especially helpful in bridging differences in culture and primary language.

Despite the efforts to encourage women's participation in the Fellows Program, for

example, making gender balance an explicit selection consideration, the proportion of female fellows is low, constituting less than 40% in 7 rounds between 2011 and 2020. This proportion is consistent with the sex ratio among all applicants, reflecting the underrepresentation of women in academia in low- and middle-income countries.

### Logistical Challenges

The in-person workshops for fellows are usually held in the home countries of the participating teams, but the selection of the workshop locations must consider accessibility in terms of flights and visas for all the teams. Since the program was expanded to include scholars from both Asia and Africa, the program has aimed to have 1 workshop in Asia and 1 in Africa. Due to the wider geographic dispersion of DHS countries in Asia, it is more difficult to identify an optimal location in Asia than in Africa. There are fewer options for a location with reasonable flight times and no overnight stays during travel. At times, visa accessibility becomes a very critical factor in choosing where to have the workshops, especially when the program includes countries with limited visa access to other countries. Sometimes fellows must travel to a neighboring country because the country for which they need a visa does not have an embassy in their own country. Countries that do not require a visa or that allow for an e-visa are advantageous for workshops, although the travel cost is sometimes higher or the itineraries not as convenient. Therefore, the choice of location is determined by a balance of several factors. For example, 1 workshop was held in Thailand, a non-DHS country, because it offered better visa access, was less expensive, and had more convenient flights than any of the fellows' host countries. This selection, however, did not reflect the goal of having workshops in countries with DHS surveys to better engage local stakeholders.

### Language Barriers

To date, English has been the primary language for the Fellows Program, even though it is not necessarily the primary language in the fellows' countries. For example, although English may be one of the official languages in East African countries, Swahili is more widely spoken than English. The use of English as the program's medium can be a language barrier for some fellows. Recognizing this, DHS uses several measures to overcome language barriers. These include, but are not limited

to, making the teaching materials clear, simple, and concise; always sharing presentations and statistical software programs with fellows; providing exercises for fellows to practice on their own time; and encouraging fellows to ask questions during presentations. The training curriculum has been translated into other languages such as French and Arabic and shared with fellows. The program enlists co-facilitators who play an important role in helping the fellows with language challenges. Co-facilitators are former fellows who have an especially good understanding of the training materials. They have been very helpful in offering supplementary explanations, often in their own language. Fellows are generally active in discussions and ask questions during presentations. Given the preparation and assistance, language has not been a major problem in effectively communicating and has not been a barrier to understanding training materials.

Writing a scientific paper in English is challenging for almost all fellows—as it is for any non-English-speaking researcher. There is no easy way to overcome this hurdle despite the sharing of materials on writing a scientific paper that include a working paper template. All fellows' papers are professionally edited, and fellows review the edits before publication.

### Fellows' Commitment

Fellows' commitment to the requirements and aims of the program is critical to its success. Such commitment includes being responsive to travel arrangements, full participation in the 2 workshops, and timely submission of deliverables. To ensure fellows' participation, especially their travel to the workshops, fellows are required to submit a letter of approval from their universities, assuring permission to participate. DHS also issues a contract with each fellow at the beginning of the fellowship with detailed specifications of activities, deliverables, and timelines, as well as penalties for noncompliance. On a few occasions in both regions, some fellows have been unable to attend the second workshop due to unexpected work commitments. These fellows are usually the senior members of teams. Senior members are helpful in overseeing teamwork and ensuring capacity-building activities at the home university, but they face special challenges in committing the time required to complete the program. They may work remotely with other team members to complete the work, but their absence from workshops has a negative effect on productivity and morale. Thus, DHS is now more cautious about enrolling fellows with high-level administrative positions.

### ■ FUTURE OF THE PROGRAM

With support from USAID, the DHS Program plans to continue the current model of the Fellows Program with further improvements where possible. The program will continue to include a mix of scholars from Asia and Africa, a feature that has received very positive feedback from participants since it increases collaboration between the universities and fellows in the 2 regions. The program is considering expansions in several areas.

#### Expanding to Francophone Countries

We hope to expand the program to more countries and universities, especially, more francophone countries. The use of English has limited our ability to include francophone countries in the past, but it has not prevented it entirely. Our experience with including teams from Burkina Faso and Senegal was successful because the teams had a strong background in public health or demography, had prior experience using DHS data, and had some, albeit limited, English skills. To facilitate their participation, DHS included bilingual facilitators during the workshops and provided all materials in French as well as English. In the 2020 round, more French-speaking countries were targeted in the call for applications and 3 French-speaking teams (from Burkina Faso, Cameroon, and Guinea) were accepted. The inclusion of non-English-speaking teams is an important expansion of the Fellows Program but does imply a need for increased funding to accommodate these changes.

#### Expanding to Research Institutions

Expanding the program to include research institutions was another option that was explored, especially for countries that do not have universities with strong programs and faculty in relevant disciplines. In 2019, the DHS Program experimented with this option but received very few applications, none of which survived the review process. One concern about including research institutions is their limited potential for skill cascading because they do not usually teach students. Skill transfer is certainly possible among research colleagues in the same institution, but higher job turnover compared with universities may reduce the impact. If research institutions are included in future programs, they need to be carefully selected to take into account their potential for capacity-building activities, and their incentives and motivation for continued use of DHS data.

**The DHS Program plans to continue the current model of the Fellows Program with further improvements where possible.**

### Expanding the Use of Virtual Teaching

Almost all training materials have been delivered to fellows through the in-person workshops. Given technological advances, it is now possible to deliver some of the materials through online courses before workshops to reduce the duration of the in-person training. The current program requires fellows to complete an online prework assignment that provides basic preparation for the in-person training. The current prework could be expanded to include some sessions that are usually provided at the beginning of the workshop, such as introductory sessions on Stata, understanding DHS standard recode files, using the DHS recode manual, and finding variables in DHS data files. Virtual learning has its constraints including limited inter-team interactions and requirements for reliable internet connectivity, which is not always possible in many fellows' countries. The second workshop of the 2020 Fellows Program was held online because of the COVID-19 pandemic. While it was found during this workshop that the virtual format was not effective in discussing complex technical topics, such change did not prevent the program from achieving its primary goal. Fellows increased their knowledge of DHS, mastered critical skills for analyzing DHS data, and successfully completed their research projects. Overall, training through a virtual platform can be a useful and economic supplement to in-person training if designed carefully.

Overall, the DHS Faculty Fellows Program has evolved to create and strengthen capacity in low- and middle-income countries in the often neglected but critical areas of data analysis and research. The program has been successful in supporting high-quality research during each round and stimulating subsequent trajectories of research

productivity as evidenced by many peer-reviewed publications by former fellows. The inclusion of several countries in each round has promoted a better awareness of research issues and opportunities in different countries. The program has had a cascading effect by targeting university faculty and requiring them to develop mechanisms such as workshops and course modules within their home universities. The program has also strengthened the links that university faculty have with government agencies and USAID Missions, providing in-country expertise for the analysis of programs and policies. The experience and lessons learned in implementing the DHS Faculty Fellows Program provide a blueprint for other programs aiming to build capacity in analysis and use of data in low- and middle-income countries.

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SHORT REPORT

# Improving Services for HIV-Exposed Infants in Zambia and Cameroon Using a Quality Improvement Collaborative Approach

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## Key Findings

- Although the designs of the QICs varied to fit local contexts in Cameroon and Zambia, they used similar indicators and methods, and each resulted in improvement of testing coverage and timely return of test results for HIV-exposed infants.
- The social dynamics of the QIC approach enhanced the sense of shared purpose and community, fostered teamwork and friendly competition, and built leadership support while creating an internal enabling environment at the facility level. The quarterly learning sessions, monthly data collection, and ongoing mentoring for quality improvement led to significant improvements that were sustained for the life of the intervention.

## Key Implications

- The use of QIC methodology empowered health care workers to design solutions tailored to their specific settings, and each QIC resulted in a “change package” of successful initiatives that were disseminated within each country.
- Health sector policy makers should consider institutionalizing the QIC approach and fostering its targeted implementation to address refractory quality challenges, including the inclusion of QIC methods in national policies, guidelines, training, and monitoring systems.

➔ *Résumé en français à la fin de l'article.*

## ABSTRACT

**Introduction:** Early infant diagnosis (EID) and rapid antiretroviral therapy (ART) initiation are lifesaving interventions for HIV-infected infants. In Cameroon and Zambia, EID coverage for HIV-exposed infants (HEIs) is suboptimal and the time to ART initiation for infants infected with HIV often exceeds national standards despite numerous policy and training initiatives.

**Methods:** ICAP at Columbia University supported the Cameroon and Zambia Ministries of Health (MOHs) and local partners to implement quality improvement collaboratives (QICs) to improve EID coverage and ART initiation at 17 health facilities (HFs) in Cameroon (March 2016 to June 2017) and 15 HFs in Zambia (March 2017 to June 2018). In each country, MOH led project design and site selection. MOH and ICAP provided quality improvement training and monthly supportive supervision, which enabled HF teams to conduct root cause analyses, design and implement contextually appropriate interventions, conduct rapid tests of change, analyze monthly progress, and convene at quarterly learning sessions to compare performance and share best practices.

**Results:** In Cameroon, EID testing coverage improved from 57% (113/197 HEIs tested) during the 5-month baseline period to 80% (165/207) in the 5-month endline period. In Zambia, EID testing coverage improved from 77% (4,773/6,197) during the 12-month baseline period to 89% (2,144/2,420) during the 3-month endline period. In a comparison of the same baseline and endline periods, the return of positive test results to caregivers improved from 18% (36/196 caregivers notified) to 86% (182/211) in Cameroon and from 44% (94/214) to 79% (44/56) in Zambia. ART initiation improved from 44% (94/214 HIV-infected infants) to 80% (45/56) in Zambia; the numbers of HIV-infected infants in Cameroon were too small to detect meaningful differences.

**Conclusions:** QICs improved coverage of timely EID and ART initiation in both countries. In addition to building quality improvement capacity and improving outcomes, the QICs resulted in a “change package” of successful initiatives that were disseminated within each country.

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## ■ INTRODUCTION

Since the release of the Joint United Nations Programme on HIV/AIDS (UNAIDS) Fast Track declaration in 2015, the global community has worked to achieve HIV epidemic control by 2030 by ensuring that at least 95% of people living with HIV are aware of their status, 95% of those aware of their status are linked to antiretroviral therapy (ART), and 95% of those on ART have achieved viral suppression.<sup>1,2</sup> Although many countries have made remarkable progress toward reaching these goals for adults, the same cannot be said for infants and children. In 2018, for example, the global community achieved only 59% of pediatric ART coverage targets.<sup>3</sup>

High-quality national programs are essential to prevent early mortality due to pediatric HIV, which peaks at 3–4 months<sup>4</sup> and approaches 50% by 2 years of age.<sup>5</sup> Unfortunately, the health systems required to deliver HIV testing and treatment services to infants and children are lacking in many settings, and for two-thirds of HIV-infected children in Africa, Asia, and the Americas, HIV is only diagnosed when the children have advanced immunodeficiency, leading to high rates of preventable morbidity and mortality.<sup>6</sup>

The interventions needed to prevent mother-to-child transmission (PMTCT) of HIV and swiftly identify HIV-infected infants and link them to ART can be conceptualized as a cascade of services (Figure 1). Health systems must consistently and correctly identify and engage HIV-infected pregnant women, provide ART for those not already on treatment, and deliver a package of services to their HIV-exposed infants (HEIs). These early infant diagnosis (EID) interventions include maternal counseling, HIV testing before 8 weeks of age, rapid return of results to parents/caretakers and treating clinicians, and prompt ART initiation for HIV-infected infants.

Cameroon and Zambia are both facing generalized HIV epidemics, with adult HIV prevalence of 3.1% and 11.5%, respectively.<sup>7,8</sup> Although Zambia's PMTCT and EID coverage are substantially higher than those in Cameroon (Table 1), neither country has optimized their PMTCT-EID cascade, and substantial gaps remain in HIV services for infants born to HIV-infected women.<sup>9</sup>

Both Cameroon and Zambia have national PMTCT and EID policies, strategies, guidelines, training curricula, and systems for supportive supervision, supply chain management, and program monitoring and evaluation. Despite these national efforts, consistent implementation of EID services is lacking.<sup>10,11</sup> While variation exists

within the quality and/or effectiveness of the implementation of these health system inputs, bridging this ongoing “know-do gap” has become critically important for improving patient outcomes.

The know-do gap between established standards of care (what we know) and the ability of health systems to produce improved outcomes (what we do) has become an area of focus for country HIV programs and international donors.<sup>12</sup> The use of quality improvement (QI) methodologies has been successful in closing challenging know-do gaps such as those seen in Cameroon and Zambia.<sup>13–15</sup> In particular, the QI collaborative (QIC) approach has shown great promise in improving health programs in low-resource settings.<sup>16–21</sup>

To bridge the EID know-do gap in Cameroon and Zambia, ICAP partnered with the Ministry of Health (MOH) in each country, donors, and implementing partners to design and implement the QIC projects to improve 3 key steps in the cascade: EID coverage, timely return of HIV test results, and rapid ART initiation for infants found to be HIV infected.

## ■ METHODS

### QIC Design QIC Methodology

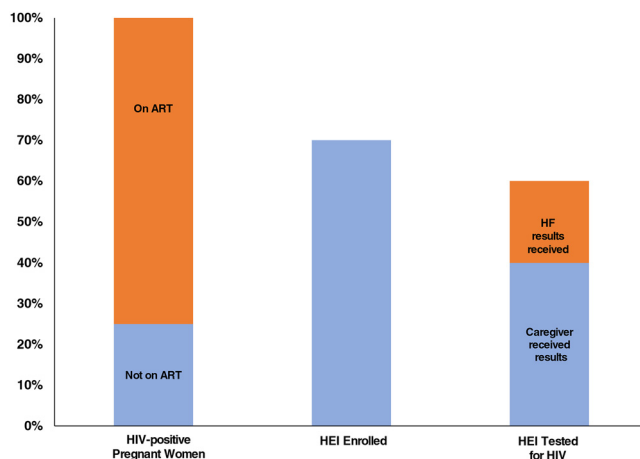
ICAP and its MOH partners used a well-established QIC approach based on the Institute for Healthcare Improvement (IHI) known as the Breakthrough Series, which supports multiple health facilities (HFs) to address the same quality challenge at the same time to achieve rapid, measurable, and sustained improvements.<sup>18,21</sup> The QIC approach begins with convening key MOH stakeholders to identify the specific health care quality challenge and kick-start the design of the QIC (Figure 2). The partners collaborate to select project HF sites and develop shared QIC aims (targets), indicators, and a measurement strategy. Baseline assessments inform the development of appropriate and specific QIC aim statements and provide data with which to monitor and assess QIC progress.<sup>21,22</sup>

Multidisciplinary QI teams are established at each participating HF with various cadres of HF staff; after baseline training and orientation, each QI team is supported to identify contextually appropriate interventions and perform rapid iterative tests of change using the Model for Improvement and its plan-do-study-act (PDSA) cycles.<sup>13</sup> The PDSA approach helps teams test

**The QIC approach has shown great promise in improving health programs in low-resource settings.**

**The PDSA approach helps teams assess changes and possible improvements; the results guide whether to implement, modify, or abandon the proposed intervention.**

**FIGURE 1.** Illustrative Cascade of Interventions Needed to Prevent Mother-to-Child Transmission of HIV, Diagnose Infants With HIV, and Link Infants to Antiretroviral Therapy



Abbreviations: ART, antiretroviral therapy; EID, early infant diagnosis of HIV; HEI, HIV-exposed infants; HF, health facility.

**TABLE 1.** HIV Prevalence, Antiretroviral Therapy Coverage, and Early Infant Diagnosis of HIV Coverage in Cameroon and Zambia, 2018 Data

	Cameroon, %	Zambia, %
Adult HIV prevalence (15–49 years)	3.6	11.3
HIV incidence (all ages)	1.02	2.97
Adults on ART (ages 15–49 years)	55	78
Children on ART (ages 0–14 years)	24	79
Pregnant women accessing ART for PMTCT	80	95
EID coverage (infants tested for HIV at <8 weeks of age)	61	71

Abbreviations: ART, antiretroviral therapy; EID, early infant diagnosis; PMTCT, prevention of mother-to-child transmission of HIV.

changes and see whether they yield improvements; the results are then analyzed to decide whether to implement, modify, or abandon the proposed intervention. If the intervention does not achieve the desired results, it is modified or replaced and the PDSA cycle is repeated.<sup>23</sup>

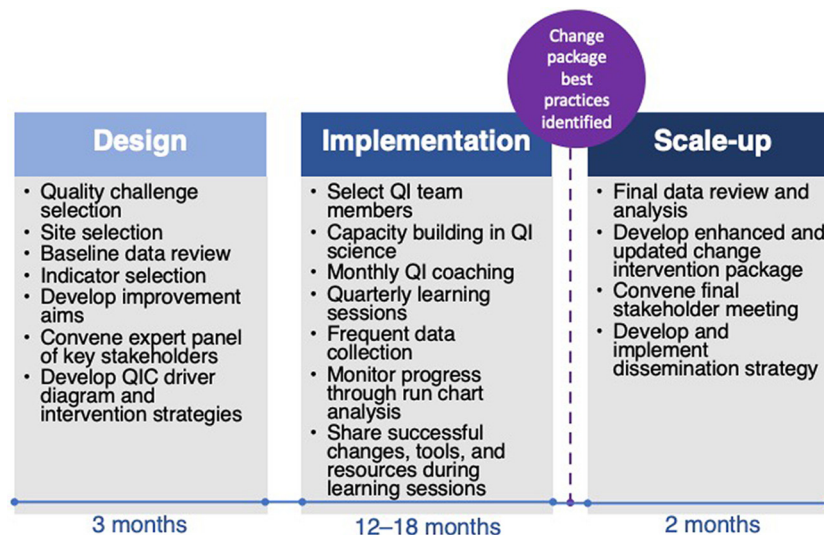
HF’s then come together for quarterly meetings, in which they compare progress and share interventions and innovations.<sup>22</sup> In addition to building QI capacity and improving targeted outcomes, QICs often develop a “change package” of tools, strategies, and best practices that can be shared across teams, scaled up, and widely disseminated. This approach has been shown to produce large-scale improvements in both high- and low-resource settings.<sup>19,24,25</sup>

In both Cameroon and Zambia, ICAP supported the national MOHs to design the QICs in collaboration with a panel of expert stakeholders including MOH leaders, the Health Resources and Services Administration (HRSA), the Centers for Disease Control and Prevention (CDC), and local implementing partners. MOHs had final approval of site selection, indicators, and other key project elements. Because of this collaborative MOH-led design process, the 2 QICs were slightly different in their design and focus (Table 2).

**Cameroon QIC**

Between March 2015 and June 2017, ICAP, HRSA and CDC in Cameroon supported the Cameroon

**FIGURE 2.** Quality Improvement Collaborative Approach Used to Improve Early Infant Diagnosis and Antiretroviral Therapy Initiation and Health Facilities in Cameroon and Zambia<sup>a</sup>



Abbreviations: QI, quality improvement; QIC, quality improvement collaborative.  
<sup>a</sup> Adapted from the Institute for HealthCare Improvement Breakthrough Series.

MOH National AIDS Control Department to design and implement a 15-month QIC to improve EID and ART initiation at 17 ICAP-supported sites in Centre and Littoral Regions. Included in the 17 participating HFs were 3 general hospitals, 9 district hospitals, 3 integrated health centers, and 2 ambulatory care centers. The primary focus of the QIC was to reduce the turnaround time of important steps along the testing cascade, with a focus on the return of EID test results to caregivers. The QIC also measured rates and speed of ART initiation among HEIs found to be HIV infected. Criteria for site selection were developed by MOH and included all HFs directly supported by ICAP Cameroon in Centre and Littoral Regions that had PMTCT and EID services and MOH staff available to participate on a QI team.

**Zambia QIC**

Between March 2017 and June 2018, in collaboration with HRSA, CDC in Zambia, MOH, the Lusaka Province Health Office, and the Centre for Infectious Disease Research in Zambia, ICAP implemented a QIC focused on improving EID and ART initiation (on the same day as the positive HIV test result) among HIV-infected infants at 15 HFs in Lusaka Urban District. The mix of HF types included 5 district hospitals, 9 health centers, and 1 ambulatory care health post. The QIC

also measured EID coverage and turnaround time between critical cascade steps.

The Zambia MOH National HIV/AIDS/STI/TB Council (NAC) supports a well-established performance and QI strategy with successful QI project implementation dating back to 1991.<sup>26,27</sup> QI leaders embedded in NAC facilitated the design and implementation efforts, providing critical leadership of all aspects of the QIC.

**QIC Implementation**  
**Baseline Assessment**

Retrospective aggregate monthly data were abstracted from HF registers by HF staff using a standardized paper-based tool. HF and ICAP staff then entered these baseline data into a standalone District Health Information System (DHIS2)<sup>28</sup> database and conducted descriptive analyses. In Cameroon, the baseline assessment included 5 months of data (October 2015 to February 2016). In Zambia, the baseline assessment included 12 months of data (January to December 2016).

**Staffing, Training, and Project Launch**

Each participating HF assembled a multidisciplinary QIC team, including maternal-child health

**Each HF assembled a multidisciplinary QIC team, including nurses, medical officers, laboratory technicians, lay counselors, and/or HF managers.**

**TABLE 2.** Design of Quality Improvement Collaborative Indicators Used in Cameroon and Zambia to Improve Early Infant Diagnosis of HIV and Antiretroviral Therapy Initiation

	Cameroon	Zambia
EID testing coverage and timing	Percentage of eligible HEIs who received EID testing at <8 weeks of age	Percentage of HEIs tested who received EID testing at <8 weeks of age
	Number of eligible HEIs tested for HIV at >8 weeks of age	Number of HEIs tested for HIV at >8 weeks of age
	Number of eligible HEIs tested each month	Number of HEIs tested each month
Test results return to caregiver	Percentage of HEIs tested who were identified as HIV infected each month	Percentage of HEIs tested who were identified as HIV infected each month
	Percentage of all HEI HIV test results returned to caregiver this month	Percentage of HEIs identified as HIV infected whose caregivers received their results this month
Turnaround time	Mean time from health facility receiving HEI HIV test results from national laboratory and sharing with caregiver	Mean time between positive EID HIV test result and ART initiation
ART initiation	Percentage of HIV-infected infants newly initiated on ART each month	Percentage of HIV-infected infants initiated on ART each month
		Percentage of HIV-infected infants initiated on ART the same day their positive test was received each month
		Percentage of HIV-infected infants initiated on ART within 2 weeks of receiving positive test results each month

Abbreviations: ART, antiretroviral therapy; EID, early infant diagnosis; HEI, HIV-exposed infant.

and ART nurses, medical officers, laboratory technicians, lay counselors, and/or HF managers. Each team attended an initial 1-week workshop, at which ICAP provided training on QI tools and methods and QIC indicators, as well as refresher training on national EID and infant ART guidelines. In Zambia, materials from the national QI curriculum were used throughout the 1-week workshop. In both countries, Cameroonian and Zambian national QI leaders served as expert trainers and facilitators. Using their baseline data, HF teams used process maps, fishbone diagrams, and driver diagrams to identify root causes associated with low EID coverage, loss to follow-up, and low rates of ART initiation for HIV-infected infants. Teams then selected and prioritized interventions (“change ideas”) tailored to their HF and designed to produce rapid improvement.

Institutionalizing QI and building local QI capacity at the central and facility levels are critical to achieving and maintaining epidemic control. Evidence shows that country MOH QI capacity building requires action-based learning and ongoing skill building of QI systematic approaches to produce self-sustaining and scalable change.<sup>29,30</sup> Effective QI training requires experiential learning whereby both staff and leaders within QI teams can directly apply knowledge within the context of ongoing QI projects using the currently

available resources. In both countries, the initial QI workshops were designed to provide QI teams composed of MOH central, district, and facility staff with the opportunity to apply QI theory to everyday work directly at each HF through the use of common practical approaches and tools.<sup>27,28</sup>

### Supportive Supervision and Quarterly Learning Sessions

Each month, in collaboration with local partners and MOH, ICAP provided on-site supportive supervision, QI coaching, and mentoring on data collection and analysis to the QIC teams at each HF. The supportive supervision visits were led through each MOH district health team per their routine HIV program supervision schedule. The visits provided MOH QI mentors with the opportunity to help HF teams identify successful change ideas and link progress to real-time data in DHIS2. The use of PDSA cycle implementation is the heart of QI and is well embedded into the QIC approach.<sup>29</sup> The PDSA framework is grounded in continuous learning and guides thoughtful team-based actions. The tool is intended to help health care workers (HCWs) implement and practically assess if a desired change is leading to improvement in real time.<sup>31</sup> The process typically involves conducting several different “tests of change”

**Although the essential QI methodology appears straightforward and clear, the real-world application is more complex.**

followed by systematically documenting, analyzing, adapting, retesting, and re-evaluating the iterative PDSA cycles using the PDSA worksheets as a tool.<sup>32</sup> Although this essential QI methodology appears straightforward and clear, recent literature suggests that real-world application is more complex, with wide variation in how changes are tested and challenges that cause teams to implement changes with lack of rigor and consistency.<sup>33,34</sup> General parameters and group consensus for the identification of successful change interventions included a demonstration of HCW compliance with implementation, staff satisfaction with the intervention, improvements in monthly data, and predictions about sustainability.

Quarterly follow-up learning session workshops were convened for each project. QIC teams reported their progress using the shared indicators and described their PDSA cycle results. These peer-to-peer meetings provided HF staff with the opportunity to share lessons learned, best practices, failed ideas, and successful tools. These meetings also enabled each QIC team to benchmark their progress against other HFs via friendly competition and to communicate with senior leaders regarding their experiences while advocating for above-site, district level interventions. Each team was also provided with time to plan for the next quarter's activities. During the final learning session, the highest-performing teams were recognized with awards.

### **Data Collection and Analysis**

Each month, HF QI teams collected aggregate anonymized data, shared the data with ICAP using standardized paper forms, and plotted their data on annotated run charts. ICAP staff entered the data into a dedicated DHIS2 database that was systematically reviewed every month for data quality. If errors were identified, HFs were contacted to obtain the correct information. Microsoft Excel 2012 was used to generate monthly descriptive statistics and graphs showing progress toward targets for each HF as well as the performance of the collaborative as a whole. QIC indicator performance was assessed for each HF during the implementation period and the range, mean, and median across HFs was calculated. In addition to descriptive statistics, project baseline performance was compared with performance during the final endline period (3–5 months) of the intervention period using the chi-squared test of independence. Run charts were constructed by the QIC HF teams, who entered the data every month. Run chart

rules of analysis were utilized to monitor processes, measure performance to the aim, and measure the impact of change interventions.<sup>35,36</sup>

### **Dissemination of Successful Change Ideas**

After 15 months of implementation, each project convened a final stakeholders' meeting in which experiences, results, and the package of successful changes and best practices (Table 3) were shared with MOH, regional- and district-level health leaders, implementing partners, and representatives of the U.S. President's Emergency Plan for AIDS Relief (PEPFAR) agencies. During this final meeting, higher-performing HFs were invited to present their project results and change interventions, and MOHs and their partners developed strategies for sustainability, scale-up, and spread of improvements to other parts of their respective country. Funding for each project was completed at the end of the implementation of each QIC. The MOHs in Zambia and Cameroon will lead the scale-up and institutionalization of the QICs in their respective countries.

### **Ethical Review**

Both projects received a nonresearch determination from the Columbia University Institutional Review Board (Cameroon: AAAQ5055 and Zambia: AAAR2850) and the HRSA Office of Planning, Analysis, and Evaluation. The Cameroon Ministry of Public Health Division of Operational Research granted a Letter of Exemption, and the University of Zambia Biomedical Research Ethics Committee granted a waiver of ethics review.

## **RESULTS**

In each country, all HFs participated throughout the QIC and all learning sessions included representatives from each HF. ICAP and MOH partners made 272 supportive supervision visits over 15 months (March 2016 to June 2017) in Cameroon and 235 supportive supervision visits over 15 months (March 2017 to May 2018) in Zambia. Root cause analyses revealed that typical barriers to implementation of the EID cascade included staff knowledge deficits, unclear roles and responsibilities, process breakdowns, and systems bottlenecks. In response, the QIC teams tested interventions related to test result management, improved staff and client education, staffing modifications, workflow process modifications, commodity management, documentation, and data quality improvements (Table 3).

The PDSA method provided HCWs with a simple algorithm for implementing, testing, and

**The PDSA method provided HCWs with a simple algorithm for implementing, testing, and adapting improvement interventions.**

**TABLE 3.** Cameroon and Zambia Change Ideas Shared With Stakeholders After 15 Months of Implementation of a Quality Improvement Collaboration to Improve Early Infant Diagnosis of HIV and Antiretroviral Therapy Initiation

Health care worker capacity building	Provide on-the-job mentorship to optimize PMTCT services
	Demonstrate proper DBS sample collection for HF staff in MCH, labor, and postnatal wards, as needed
	Orient new lay counselors on standard documentation and register completion
	Pair lay counselors based on experience levels to enable peer-to-peer learning
Data quality and documentation	Review registers monthly and provide refresher trainings to fill gaps, as needed
	Reinforce proper documentation practices among all MCH lay counselors
	Enlarge and display national register standard operating procedures
	Assign nurses to supervise lay counselor documentation practices
	Confirm and update caregiver contact information with every visit
	Conduct quarterly reviews for data quality in relevant registers
Client and family education and engagement	Provide targeted, one-on-one health education talks to HIV-infected mothers
	Deliver HF invitations to increase male partner involvement/participation in MCH services
	Recruit and engage mentor mothers to provide health education from the peer perspective
	Provide one-on-one health information and counseling to HIV-infected mothers regarding male involvement in care and the importance of disclosure
	Male partner engagement during ANC visits for all education provided
	Introduce a “care buddy” to increase retention in care where clients attend treatment preparation sessions with a friend, family member, or support person to help with treatment adherence
Workflow process improvements	Develop and use DBS tracking forms between ANC and laboratory departments
	Develop and display a flowchart to illustrate MOH standard of care
	Prioritize immediate action on positive HIV test results received from laboratory
	Develop interfacility communication system to enable confirmed patient transfers
	Assign HIV test (DBS) stock management focal persons
	Active HEI case finding through retrospective ANC chart review and follow up
	Engage the facility-based “linkage officer” to facilitate communication of DBS HIV test results with MCH staff
	Screen postnatal discharge cards upon arrival at postnatal care for HIV testing
	Develop and use a tracking list to follow up on missing DBS results
Designate specific days to prioritize the provision of EID and ANC services	
Community engagement	Engage community-based volunteer peer mothers in active tracking and follow-up
	Introduce geographic HIV-infected pregnant women social networks
	Convene sensitization meetings to engage religious leaders in the community
	Engage safe mother action groups in tracking and follow-up activities

Abbreviations: ANC, antenatal care; ART, antiretroviral therapy; DBS, dried blood sample; EID, early infant diagnosis; HEI, HIV-exposed infant; HF, health facility; MCH, maternal child health; MOH, Ministry of Health; PMTCT, prevention of mother-to-child transmission of HIV.

adapting improvement interventions. The multi-disciplinary HF teams worked together to develop and test contextually specific interventions tailored for their sites and communities. For example, a few QIC teams in Cameroon identified the common practice of pediatric caregivers providing incorrect contact information to nurses, which

hindered necessary follow-up. In response, these teams developed enhanced patient education, including one-on-one counseling and focus groups, to build trust between clients and staff and to explain the importance of HIV testing at recommended intervals, as well as the rationale behind requesting contact information. As observed in

**TABLE 4.** Improvements in Early Infant Diagnosis, Timely Return of Test Results, and Antiretroviral Initiation From Baseline to Endline After Implementing a Quality Improvement Collaborative Approach, Cameroon

Indicators		Baseline Oct. 2015–Feb. 2016	Implementation Mar. 2016–Jun. 2017	Endline Feb. 2017–Jun. 2017	Change Base to End
EID testing	Eligible HEIs who received EID DBS at <8 weeks of age, %	57	71	82	24
	Eligible HEIs who received EID DBS at >8 weeks of age, %	42	29	20	–22
Return of test results	HEIs tested who were identified as HIV infected, %	2	6	4	2
	All HEIs tested whose EID DBS PCR test results were documented and shared with caregiver, %	18	81	86	68
	Mean time from facility receiving results from laboratory to results being reported to caregiver, days	19	8	3	–16
ART initiation	HIV-infected infants newly initiated on ART, %	33	51	89	56

Abbreviations: ART, antiretroviral therapy; DBS, dried blood sample; EID, early infant diagnosis; HEI, HIV-exposed infant; PCR, polymerase chain reaction.

other settings, QIC leadership teams found that while PDSA is simple in theory, application in real life can be somewhat complicated and requires QI teams to thoughtfully dissect their data while drawing shared conclusions about the intervention and its subsequent “success” or “failure” with progress to the QIC aim.

The time required for HF teams to become more independent with PDSA cycle management ranged from 6 to 9 months. During site support visits, MOH leadership and QIC teams initially observed common challenges with QI team PDSA cycle implementation including inadequate planning of the “who, what, where, when, and how” of the change; poor documentation; implementation on too large of a scale; failure to secure site-level leadership buy-in; poor data quality; and poor communication between team members. Over time, HF teams mastered the skills needed to independently identify, implement, and test change ideas.

Table 3 outlines the most successful change interventions identified through group consensus and QI team professional expertise using data and subjective assessment of each intervention.

The QIC approach itself and the facility-level changes led to an improvement in performance in all 3 steps in the EID cascade: (1) early HIV testing for infants under 8 weeks of age, (2) timely

return of EID results to caregivers, and (3) rapid ART initiation for infants found to be HIV infected (Tables 4 and 5, Figure 3).

In Cameroon, EID testing for HEIs under 8 weeks of age improved from an aggregate performance of 57% (113 tested of 197 eligible for testing) during the 5-month baseline period to 80% (165 tested of 207 eligible for testing) during the 5-month endline period ( $P<.01$ ). In Zambia, EID testing improved from an aggregate performance of 77% (4,773 infants under 8 weeks of age tested of 6,197 total infants tested) during the 12-month baseline period to 89% (2,144 infants under 8 weeks tested of 2,420 total infants tested) during the 3-month endline period ( $P<.01$ ). In a comparison of the same baseline and endline periods, the return of positive test results to caregivers improved from 18% (36 test results returned of 196 total tests done) to 86% (182 test results returned of 211 total tests done) in Cameroon ( $P<.01$ ). Return of all test results to caregivers improved from 44% (94 positive test results returned of 214 total positive tests) to 79% (44 positive test results returned of 56 total positive tests) in Zambia ( $P<.01$ ). In Zambia, ART initiation improved from 44% (94 infants initiated on ART of 214 infants with positive HIV test results) to 80% (45 infants initiated on ART of 56 infants with positive HIV test results) ( $P<.01$ ) and ART initiation

**Improvement occurred in early HIV testing for infants under 8 weeks, timely return of EID results to caregivers, and rapid ART initiation for HIV-infected infants.**



**TABLE 5.** Improvements in Early Infant Diagnosis, Timely Return of Test Results, and Antiretroviral Initiation From Baseline to Endline After Implementing a Quality Improvement Collaborative Approach, Zambia

Indicators		Baseline Jan. 2016–Dec. 2016	Implementation Mar. 2017–May 2018	Endline Mar. 2018–May 2018	Change Base to End
EID testing	HEIs who received EID DBS at <8 weeks of age, %	77	84	89	12
	HEIs who received EID DBS at >8 weeks of age, %				
Return of test results	HEIs tested who were identified as infected, %	3	3	2	–1
	HEIs identified as infected who received their results, %	44	86	79	35
	Mean time between positive EID DBS result and initiating ART, days	48	14	9	–39
ART initiation	HIV-infected infants initiated on ART, %	44	83	80	36
	HIV-infected infants initiated on ART the same day positive test were received, %	12	18	11	–1
	HIV-positive infants initiated on ART within 2 weeks of receiving positive test results, %	23	61	71	48

Abbreviations: ART, antiretroviral therapy; DBS, dried blood sample; EID, early infant diagnosis; HEI, HIV-exposed infant; PCR, polymerase chain reaction.

within 2 weeks of diagnosis improved from 23% (50 infants initiated on ART of 214 infants with positive HIV test results) to 71% (40 infants initiated on ART of 56 infants with positive HIV test results) ( $P<.01$ ). In Cameroon, the number of infants with positive HIV test results and infants initiated on ART was 1 infant at baseline to 8 infants at endline; given the small numbers, we used absolute numbers not proportions to analyze performance. Due to the very small sample size, we did not conduct statistical tests of significance because they would not have produced meaningful results.

## DISCUSSION

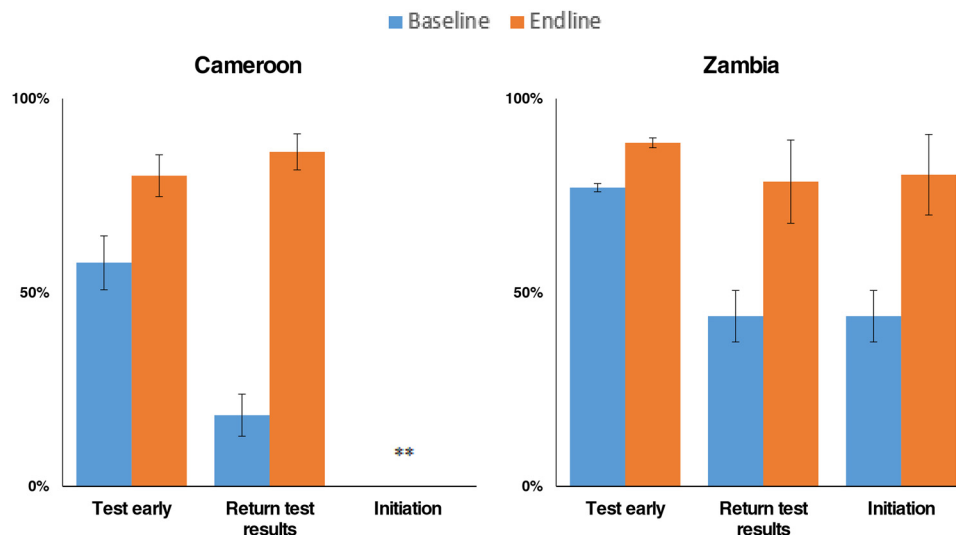
Despite the availability of relevant policies, guidelines, and training initiatives aimed at improving the HEI cascade in Cameroon and Zambia, quality challenges had persisted for years. We found that the use of QIC methodology enabled providers to bridge the know-do gap and was associated with substantial improvements in HEI testing coverage, return of results to caretakers, and swift linkage of HIV-infected infants to treatment in both countries.

The use of clear targets, defined processes, collaborative problem-solving, and ongoing performance evaluation were critical enablers of the successful QI collaboratives. The social dynamics of the QIC approach enhanced the sense of shared purpose and community among HCWs, fostered teamwork and friendly competition, and built leadership support while creating an internal enabling environment at the facility level, characteristics of QI projects that have been noted elsewhere.<sup>16–18</sup> Quarterly learning sessions, monthly data collection, and QI mentoring encouraged the rapid and sustained improvements and facilitated diffusion of innovation. These fundamental activities provided site-level teams with consistent and supervised opportunities to identify and address ongoing challenges to program implementation while continuously measuring progress toward the aim.

Strengths of the project included MOH leadership; the number of HFs; the magnitude and consistency of improvements in these critically important and challenging service delivery domains; the similarity of the findings in 2 countries with different HIV epidemics and EID responses; and the development of resources,

**The use of clear targets, defined processes, collaborative problem-solving, and ongoing performance evaluation were critical enablers of the successful QI collaboratives.**

**FIGURE 3.** Improvements in Early Testing, Timely Return of Test Results, and Antiretroviral Initiation From Baseline to Endline After Implementing a Quality Improvement Collaborative Approach, Cameroon and Zambia



methods, and tools that can be used at additional HFs.

As highlighted by Kruk et al.<sup>37</sup> and the *Lancet* Global Health Commission on High Quality Health Systems, more global deaths are due to poor-quality care than insufficient access to health services, and high-quality health systems could prevent more than 8 million deaths a year in low- and middle-income countries. Investing in quality management—including the development of quality standards, measurement of quality indicators, and implementation of QI methodologies—is increasingly a priority of both MOHs and global health donors. For example, PEPFAR highlights the importance of QI methods in its guidance, funds QICs in multiple partner countries, and supported a multi-year QI capacity-building course for health ministry partners across sub-Saharan Africa.<sup>30</sup> In 2018, the World Health Organization, the World Bank, and the OECD collaborated on a call to action for quality health services, calling for the development of national health care quality policies and strategies inclusive of improvement methods and interventions.<sup>38</sup> Multiple MOHs have incorporated QI methods—including QICs—into national policies and guidelines, ensuring that these activities take place irrespective of donor involvement. In Mozambique, HF teams implement QI projects with support from MOH, and quarterly provincial supervision occurs routinely with or without donor support (Isabel

Pereira, MD, CDC Mozambique, personal communication, 2019). In Tanzania, MOH HIV program leaders routinely perform QI-focused supportive supervision and mentoring activities independent of donor involvement.<sup>39</sup>

Experience shows that quality management, including the use of QI methods and tools, is a high-value and sustainable approach to health systems strengthening. Not all quality challenges require QICs, however, and identifying when a QIC is the optimal intervention is a priority for MOHs and other implementers. As above, important criteria include a high-priority quality challenge shared by multiple sites; a refractory quality challenge that has not improved following simpler interventions, such as training, quality assurance, and/or single-site QI activities; and an enabling environment including available HF staff and strong leadership support.

### Limitations

As with most QIC projects and time-series analyses, inferring causality between the intervention and the results in the current study is limited by the absence of a control or comparison group, and generalizability is limited by the nonrandom selection of HFs.<sup>40</sup> However, expert consensus suggests that randomized studies of QI project effectiveness are likely to be an inappropriate study method and that statistical process control

methods such as the use of run charts are the preferred approach to determining project success.<sup>41,42</sup> Additional limitations of our analysis include the fact that the number of HEIs identified each month was generally quite small, making the use of percentages less informative than it would be with larger samples. It is also possible that some of the changes identified during the intervention were the result of improved data quality rather than improvements in service delivery.

QICs are a relatively resource-intensive intervention, requiring substantial time and effort on the part of HF teams and their district-level mentors. As noted, each project described in this article included stakeholder engagement, training, quarterly in-person learning sessions, and hundreds of supportive supervision visits to HFs over the 12-month project lifespan. This methodology is clearly not appropriate for all quality challenges, but in the context of a high-priority quality shortfall with a substantial know-do gap where other interventions have not succeeded, it is a critically important addition to the health systems toolkit. In the case of EID, for example, the relative cost of a time-limited QIC pales in comparison to the cost of HIV testing, prevention, and treatment services, as well as the cost of low-quality care.

## CONCLUSIONS

Despite robust evidence, supportive policies, national guidelines, and widespread training initiatives, the provision of effective testing and treatment services to HEIs has lagged in countries around the world, with dire consequences for the infants of HIV-infected women. The use of QIC methodology can effectively bridge this know-do gap by empowering HCWs to design solutions tailored to their specific settings. The well-established approach used in these projects is resource-intensive, and additional exploration may be warranted to determine if less intensive approaches can be as effective.

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**Author contributions:** GD wrote the manuscript in collaboration with all authors and led the project, conceptual framework, and overall analysis

of data. All authors discussed and collaboratively agreed upon the design, results, analysis, and planning of the manuscript. TA, MM, and PS significantly contributed to the writing and reviewing of the manuscript. JNB, MP, TPB, RB, MAB, ME, LH, SJ, ZFK, PK, RL, MMM, FT, LW, and MR provided critical revision and final approval of the version to be published. MP designed the concept of the project from Zambia and led project implementation. TA led project concept development in Cameroon, QL activities with the collaborating sites, and final change intervention analysis. JPA led the project data collection in Cameroon and significantly contributed to the analysis with interpretation for writing and reviewing the manuscript. JNB designed the concept of the project from the Zambia Ministry of Health. TPB designed the concept of the project from the Cameroon Ministry of Health. RB designed the concept of the project from the headquarter level. MAB designed the concept of the project from Zambia. ME designed the concept of the project from Cameroon. LH designed the concept of the project from Zambia. SJ designed the concept of the project from the headquarter level. ZFK designed the concept of the project from the Cameroon Ministry of Health. PK designed the concept of the project from Zambia. SCK led the project data collection in Zambia and led the analysis and significantly contributed to the interpretation for writing and reviewing the manuscript. RL designed the concept of the project from the Zambia Ministry of Health. CMM led the design of the monitoring and evaluation strategy from the headquarter level, data collection tools, information system development, data analysis, and interpretation. MMM designed the concept of the project from Cameroon. MM led the design of the monitoring and evaluation strategy from Zambia, data collection tools, information system development, and data analysis. PS led project data analysis and interpretation from the regional level. FT and LW designed the concept of the project from the headquarter level. MR conceived the original project concept and design, overall project leadership, and supervision.

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## En Français

### Améliorer les Services de Prise en Charge pour les Enfants Exposés au VIH en Zambie et au Cameroun à l'aide d'une Approche Collaborative d'Amélioration de la Qualité

#### Résultats Clés

- Bien que les conceptions des CAQ varient pour s'adapter aux contextes locaux au Cameroun et en Zambie, elles ont utilisé des indicateurs et des méthodes similaires, et chaque CAQ a abouti à une amélioration de la couverture des tests et à un temps de retour des résultats prompt des tests pour les enfants exposés au VIH.
- L'initiation du traitement antirétroviral le même jour pour les enfants infectés par le VIH s'est améliorée en Zambie, mais le nombre des enfants infectés par le VIH au Cameroun était trop petit pour être analysé.
- La dynamique sociale de l'approche CAQ a amélioré le sens du but commun/partagé de la communauté, a favorisé le travail d'équipe et la compétition amicale, et a renforcé le soutien du leadership tout en créant un environnement interne favorable au niveau de la formation sanitaire. Les séances d'apprentissage trimestrielles, la collecte de données mensuelle et le mentorat continu pour l'amélioration de la qualité ont conduit à des améliorations importantes qui ont été maintenues pendant toute la durée de l'intervention.

#### Implications clés

- L'utilisation de la méthodologie de CAQ a permis aux agents de santé de concevoir des solutions adaptées à leurs contextes spécifiques, et chaque CAQ a abouti à un « paquet de changement » d'initiatives réussies qui ont été disséminés dans chaque pays.
- Les décideurs des politiques du secteur de la santé devraient envisager d'institutionnaliser l'approche de CAQ et de favoriser sa mise en œuvre ciblée pour relever les défis de qualité réfractaire, y compris l'inclusion des méthodes CAQ dans les politiques nationales, les directives, la formation et les systèmes de suivi.

## RESUME

**Introduction:** Le diagnostic précoce des enfants exposés au VIH (EEVIH) et l'initiation rapide d'un traitement antirétroviral (TARV) sont des interventions vitales pour les nourrissons/enfants infectés par le VIH. Au Cameroun et en Zambie, la couverture de dépistage précoce pour les EEVIH est sous-optimale et le délai de mise en route du TARV pour les enfants infectés par le VIH dépasse souvent les normes nationales malgré de nombreuses initiatives de politiques et formations.

**Méthodes:** ICAP de l'Université de Columbia a soutenu les Ministères de la Santé du Cameroun et de la Zambie (MINSANTE) et des partenaires locaux pour mettre en œuvre des collaboratives d'amélioration de la qualité (CAQ) pour améliorer la couverture du diagnostic précoce des EEVIH et l'initiation du TARV dans 17 formations sanitaires (FOSA) au Cameroun (Mars 2016 à Juin 2017) et 15 FOSA en Zambie (Mars 2017 à Juin 2018). Dans chaque pays, le ministère de la Santé a dirigé la conception du projet et la sélection du site. Le MINSANTE et ICAP ont fourni une formation en amélioration de la qualité et des supervisions mensuelle de coaching, ce qui a permis aux équipes des FOSA de mener des analyses des causes profondes, de concevoir et de mettre en œuvre des interventions adaptées au contexte, de mener des tests rapides de changement, d'analyser les progrès mensuels et de se réunir lors de sessions d'apprentissage trimestrielles pour comparer les performances et partager les meilleures pratiques.

**Résultats:** Au Cameroun, la couverture des tests de diagnostic précoce est passée de 57% (113/197 EEVIH testés) au cours d'une période de 5 mois d'analyse situationnelle et mise en œuvre du projet à 80% (165/207) au cours de la période finale de 5 mois interventions des tests rapides de changement. En Zambie, la couverture de diagnostic précoce a amélioré 77% (4,773/6,197) au cours d'une période de 12 mois d'analyse situationnelle et mise en œuvre du projet à 89% (2,144/2,420) au cours de la période finale de 3 mois interventions des tests rapides de changement. Dans la comparaison des mêmes périodes de mise en œuvre et finales, le retour des résultats de tests positifs aux garde malades/mères est passé de 18% (36/196 garde malades/mères notifiés) à 86% (182/211) au Cameroun et de 44% (94/214) à 79% en Zambie. L'initiation du TARV est passée de 44% (94/214 nourrissons infectés par le VIH) à 80% (45/56) en Zambie; le nombre des enfants infectés par le VIH au Cameroun était trop peu pour détecter des différences significatives.

**Conclusions:** Les CAQ ont amélioré la promptitude dans l'initiation du diagnostic précoce et du TARV dans les deux pays. En plus de renforcer les capacités d'amélioration de la qualité et d'améliorer les résultats, les CAQ ont abouti à un « ensemble de changements » d'initiatives réussies qui ont été disséminés dans chaque pays.

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METHODOLOGY

# Systematic Process Framework for Conducting Implementation Science Research in Food Fortification Programs

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## Key Messages

- There are many countries implementing food fortification programs but not all of them are achieving their public health goals.
- Implementation challenges are best addressed not in an ad hoc way, but rather through a systematic approach known as implementation science.
- The need for implementation science research in public health nutrition programs has been well-recognized.
- Implementation research teams (often composed of scientists, program implementers, and funders) should work together through a systematic process of identifying and addressing gaps in the implementation of a food fortification program.
- This framework provides a systematic way to identify gaps in context-specific programmatic knowledge and action, formulate implementation research questions, prioritize those questions, and supply guidance on how to move forward after the conclusion and analysis of the implementation research studies.

## ABSTRACT

Food fortification has proven to be an effective approach for preventing micronutrient deficiencies in many settings. Factors that lead to successful fortification programs are well established. However, due to the multisectoral nature of fortification and the added complexities present in many settings, the barriers to success are not always evident and the strategies to address them are not always obvious. We developed a systematic process for identifying and addressing gaps in the implementation of a food fortification program. The framework is composed of 4 phases: (1) connect program theory of change to program implementation; (2) develop an implementation research agenda; (3) conduct implementation research; and (4) analyze findings and develop/disseminate recommendations for next steps. We detail steps in each phase to help guide teams through the process. To our knowledge, this is the first attempt to outline a systematic process for applying implementation science research to food fortification. The development of this framework is intended to promote implementation research in the field of food fortification, thus improving access to and effectiveness of this key public health intervention.

## INTRODUCTION

Food fortification has been demonstrated to be an effective and cost-effective approach for reducing micronutrient deficiencies in many settings where governments have created, implemented, monitored, and enforced standards for the fortification of staple foods.<sup>1,2</sup> Factors that lead to successful food fortification programs are well established. Particularly, food fortification programs tend to be more successful when the fortified food vehicle is processed centrally and when a large proportion of the target population consumes this food regularly. Other factors include having appropriate policies and/or standards in place, adequate program coordination across various ministries and agencies, good program monitoring, and proper internal and external quality assurance and quality control.<sup>3-6</sup>

Sometimes, contextual challenges can impede the successful implementation of food fortification programs.<sup>7-10</sup> These challenges can include (but are not limited to) decentralized processing of staple foods, poor regulation and enforcement capacity, or inadequate

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distribution infrastructure.<sup>9,11</sup> Although the best practices for implementing food fortification have been well defined, a process for diagnosing and overcoming obstacles to successful implementation has not. To address this need, we present a systematic process framework that provides a tool for identifying and working through challenges.

Implementation challenges are best addressed not in an ad hoc way, but rather through a systematic approach known as implementation science. The need for implementation science research in public health nutrition programs has been recognized.<sup>11–18</sup> Implementation science is the study of methods for improving the execution of programs across varying contexts, with a focus on understanding implementation outcome variables such as acceptability, adoption, appropriateness, coverage, feasibility, fidelity, implementation cost, and sustainability. Implementation research is the application of scientific methods to describe, explore, and explain contextual barriers to implementation; test implementation improvement strategies (innovative strategies to improve the implementation of the intervention); and identify or predict when an implementation improvement strategy might be appropriate for scale.<sup>19,20</sup> The systematic process framework we present contributes to the existing literature by interpreting the concepts of implementation science and implementation research as they relate to food fortification. It also provides a systematic way to identify gaps in context-specific programmatic knowledge and action, formulate implementation research questions, prioritize those questions, and supply guidance on how to move forward after the conclusion and analysis of the implementation research studies. To our knowledge, this is the first article that outlines a process for the application of implementation science specific to food fortification and the first to provide a process for systematically identifying and prioritizing implementation research questions for this important public health intervention.

## ■ DEVELOPMENT OF THE FRAMEWORK

Global work in food fortification has identified a need for a diagnostic tool to ascertain gaps in knowledge and action related to developing and applying implementation improvement strategies in the process of translating food fortification programs from high-resource to low-resource settings. To inform our process for applying concepts of implementation science to food fortification, we conducted a targeted review of relevant literature.

We included both peer-reviewed and gray literature. We used electronic journal databases such as PubMed and search engines such as Google Scholar. We included English search terms such as “implementation research,” “implementation research framework,” “implementation science,” “implementation science framework,” “implementation research in nutrition,” “implementation research in health programs,” “implementation research in food fortification programs,” and “food fortification.”

We later reviewed literature on commonly used public health programmatic tools such as logic models, theory of change, and the Program Assessment Guide to inform our approaches for developing and prioritizing an implementation research agenda (Phases I and II of the framework).<sup>20,21</sup> Our framework uses modified versions of theory of change methodology, a tool that is commonly used in program planning and evaluation. The methodology uses a process of identifying a long-term health goal and mapping programmatic outcomes backward to identify underlying determinants that must be met to achieve the goal. We also use a modified version of the operational research prioritization table from the program assessment guide. This tool provides a system for prioritizing research questions by factors such as cost, time, and relevance.<sup>20,21</sup> To evaluate the utility of our model, we applied and refined it while working with partners to develop and execute an implementation research agenda for maize flour fortification in Tanzania. While we specifically designed this framework for food fortification programs in low-resource settings, it may also be applicable in middle- and high-resource settings. This model may also be applied to other complex public health interventions.

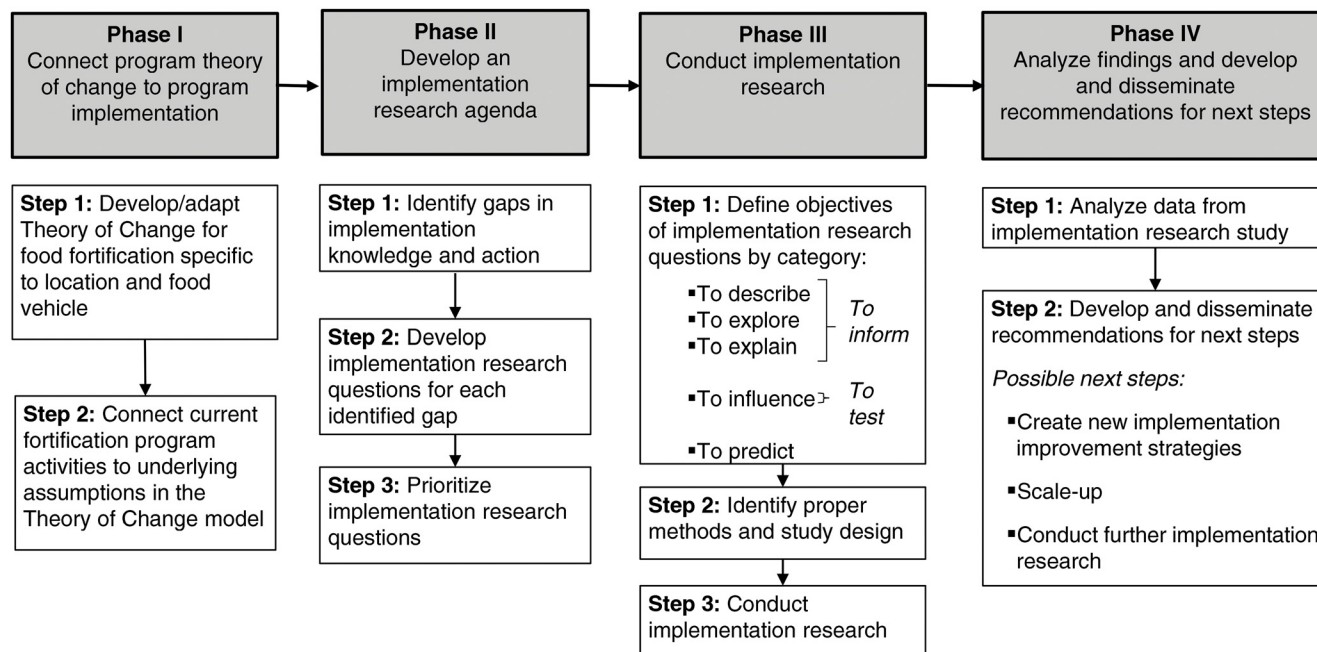
## ■ THE FRAMEWORK

The framework presented here (Figure 1) is designed to guide an implementation research team (often composed of scientists, program implementers, and funders) through a systematic process of identifying and addressing gaps in the implementation of a food fortification program. The framework is composed of 4 phases: (1) connect program theory of change to program implementation; (2) develop an implementation research agenda; (3) conduct implementation research; and (4) analyze findings and develop and disseminate recommendations for next steps. Each phase contains steps to guide teams through the process.

**Best practices for implementing food fortification have been well defined but a process for diagnosing and overcoming obstacles to successful implementation has not.**

**The framework can guide an implementation research team through a systematic process of identifying and addressing gaps in implementing a food fortification program.**

**FIGURE 1.** Systematic Process Framework for Conducting Implementation Science Research in Food Fortification Programs



### Phase I: Connect Program Theory of Change to Program Implementation

Phase I aims to identify underlying determinants not being met by program activities and generate implementation research questions. Phase I addresses 2 questions that help achieve this goal: (1) What are the underlying determinants that need to be met to implement a successful food fortification program? (2) What program activities and implementation improvement strategies are currently in place to address these determinants?

Successful food fortification programs must provide regular access to adequately fortified foods to a target population; however, the degree to which underlying programmatic determinants are met depends on the context in which a program is being implemented. Food fortification programs are inherently complex due to their multisectoral nature; food fortification programs require buy-in and cooperation from food processors, government legislative and regulatory bodies, and civil service organizations. Additionally, programs in low-resource settings often face added complexities that contribute to the difficulties in meeting underlying programmatic determinants. As a result, barriers to program implementation are not always evident, and

strategies to address the barriers are not always obvious.

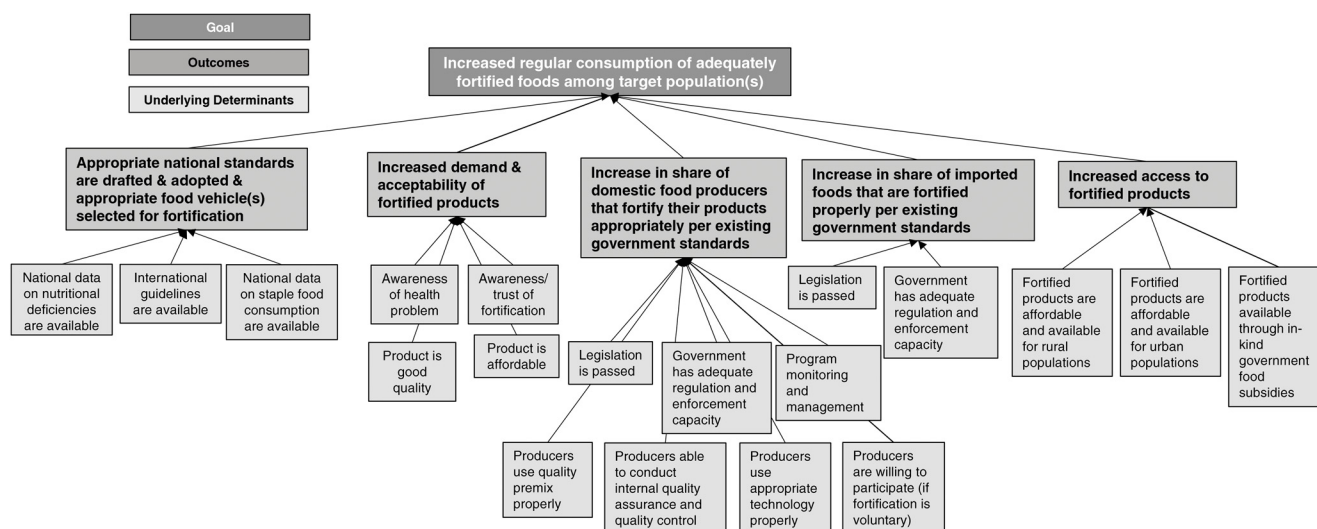
To identify and address the barriers, an implementation research team must first have a clear understanding of the program theory of change. The team also needs to understand what food fortification activities and implementation improvement strategies are currently occurring so that the gaps between theory and practice can be identified. Because program implementation occurs through the efforts of a wide array of actors from the public and private sectors, the implementation research team will need to carefully consider what stakeholders (in addition to the implementation research team) will need to participate in this phase of the framework.<sup>22</sup> The group will need to have a broad knowledge of fortification activities that are being implemented by all food fortification stakeholders.

#### Phase I, Step 1: Develop and Adapt Theory of Change for Food Fortification Specific to Location and Food Vehicle

The first step in Phase I is to outline the theory of how the program will succeed by creating a theory of change model. In Figure 2, we provide an example of a theory of change model for food



**FIGURE 2.** Example of a Theory of Change Model for Food Fortification<sup>a</sup>



<sup>a</sup> Created by members of the Global Fortification Technical Advisory Group.

fortification, which should be adapted to the setting and the food vehicles to which it is applied. It should also be adjusted for the type of food fortification being implemented (voluntary, mandatory, etc.), as this may drastically change the implementation strategy. The model was created by the Global Fortification Technical Advisory Group, which is made up of global food fortification subject matter experts. This model was developed by ensuring that implementation outcome variables (Table 1) informed the immediate outcomes in the model.<sup>20</sup> This model illustrates a pathway that may lead to the increased regular consumption of adequately fortified food in a target population.

**Phase I, Step 2: Connect Current Fortification Program Activities and Implementation Improvement Strategies to Determinants in the Theory of Change Model**

The second step in Phase I is to identify how the current program activities and implementation improvement strategies (dotted boxes in Figure 3) address underlying determinants (light gray boxes in Figure 2). To do this, the implementation research team leads the stakeholders in a brainstorming activity to develop an exhaustive list of current activities and implementation improvement strategies relevant to food fortification. Then, the group connects each activity and

implementation improvement strategy to any determinants that they might address in the theory of change model. This step repeats for each activity in the list. It may be useful to draw lines between activities and theory of change determinants. Figure 3 shows an example of how some implementation improvement strategies can be connected to the theory of change model.

**Phase II: Develop an Implementation Research Agenda**

Phase II is composed of 3 steps: identification of programmatic gaps, research-question generation, and question prioritization. This phase takes an implementation research team through a systematic process of looking at all the possible gaps between the program implementation and the theory of change model for achieving the overall programmatic goal. By identifying all the gaps, the team can identify and prioritize pertinent research questions that affect implementation outcome variables such as acceptability, adoption, appropriateness, coverage, feasibility, fidelity, implementation cost, and sustainability (Table 1).

**Phase II, Step 1: Identify Gaps in Implementation Knowledge and Action**

To identify gaps in the implementation of a food fortification program, the team participating in

**By identifying gaps, the team can identify and prioritize pertinent research questions that affect implementation outcome variables.**

**TABLE 1.** Implementation Outcome Variables Contextualized for Food Fortification<sup>19</sup>

Implementation Outcome Variable	Working Definition in the Context of Food Fortification	Related Terms in Food Fortification (Non-exhaustive)	Examples of Interpretations for Food Fortification Programs (Non-exhaustive)
Acceptability	The degree to which food fortification (or an innovation that addresses a precondition to the increased consumption of adequately fortified foods) is agreeable to stakeholders	Perceived operability; myths, taboos, and beliefs; perceived cost-benefit; perceived affordability; perceived business advantage or disadvantage; organoleptic/sensory properties	Acceptability of food fortification technology by industry; acceptability of the intervention by policy makers; acceptability of the addition of micronutrients to food by consumers; acceptability of a price increase by consumers
Adoption	The uptake, utilization, intention to try or intention to consume any product, activity, or innovation related to food fortification	Uptake; penetration; utilization; intention to try or intention to buy/consume	Adoption of food fortification by producers; adoption of a fortification logo; use or intended use of fortified products by consumers
Appropriateness/ Feasibility	The perceived (or actual) fit, relevance, or compatibility of food fortification for a particular context; the ability of food fortification to reach a particular target group (e.g., women of reproductive age who are below the poverty line)	Practicality; perceived fit; relevance; suitability; operability	Appropriateness of the food selected to fortify; appropriateness of the micronutrient compound being used by food processors; feasibility of fortification in the context of the state of the production industry (e.g., centralized vs decentralized processing); appropriateness of the technology being used by producers; appropriateness of the intervention to address a particular micronutrient deficiency; feasibility to enforce legislation
Coverage	The degree to which the targeted population is consuming fortified products regularly or able to access fortified products	Reach; access; penetration; consumption amongst the population; coverage of the target population	Penetration of fortified products in the market; percentage of the population that can access fortified products
Fidelity	The degree to which activities related to food fortification are occurring according to original program plan, policy, or protocols	Compliance; adherence; quality; delivery as intended	Compliance of the micronutrient compound with national standards; compliance of micronutrient levels found in foods with allowable ranges that are specified by national standards
Implementation Cost	The total cost of implementing all activities related to achieving increased consumption of adequately fortified foods	Program cost	Total cost per beneficiary of reaching 80% coverage of fortified foods
Sustainability	The extent to which fortification is institutionalized within the government and industry and not reliant on continuous external inputs and support	Institutionalization; integration; non-reliance on external inputs; ownership by the government, industry, and society	Degree to which the government can monitor and enforce food fortification; degree to which complying with fortification requirements is a viable business model for producers

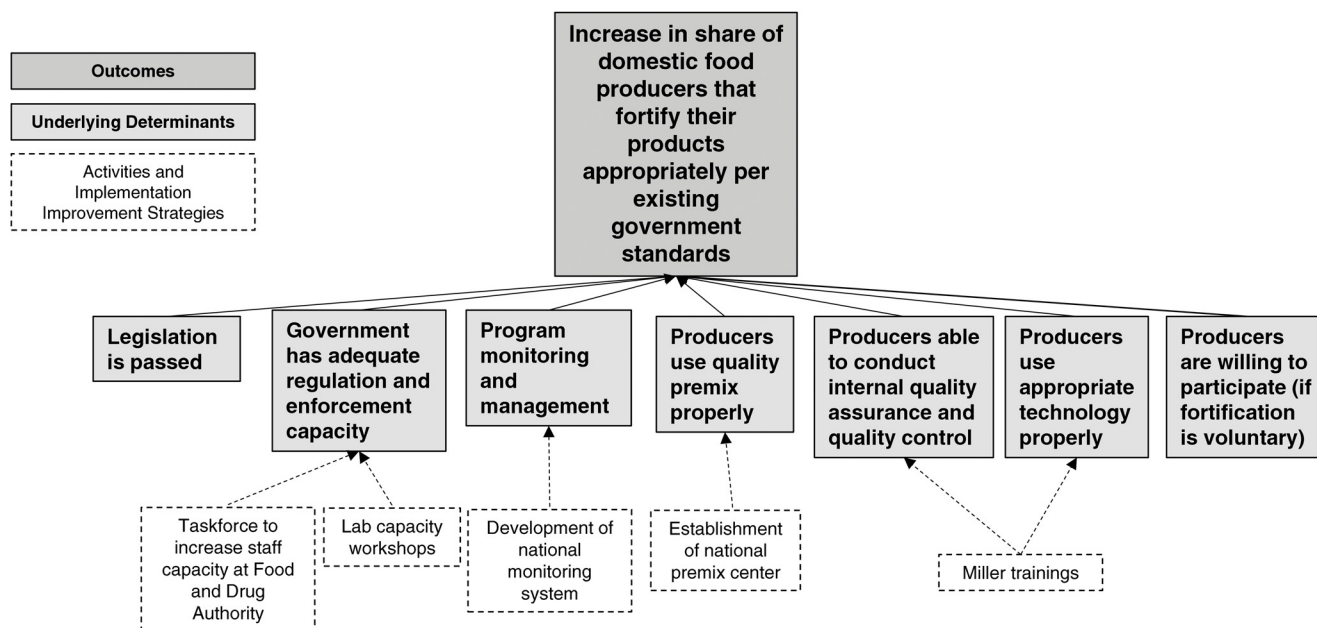
Phase II should examine the ongoing program implementation activities and implementation improvement strategies that have been mapped onto the determinants in the theory of change model. After connecting the exhaustive list of strategies with the particular determinants (in Phase I), it will be evident where some of the gaps are. Perhaps the program does not address some of the determinants that the team had identified as necessary for successful fortification implementation outcomes, or perhaps the program includes some activities or strategies that they were unable

to connect, and thus might not be necessary. To identify gaps that are not immediately evident, the team should go through each determinant and ask the questions that we have developed in the [Box](#).

**Phase II, Step 2: Develop Implementation Research Questions for Each Identified Gap**

The next step is to decide whether each identified gap is a gap in knowledge, action, or both. This will help determine what the research questions should be. For example, if the implementation

**FIGURE 3.** Example of Phase I, Step 2 of Food Fortification Implementation Framework



**BOX.** Questions to Answer for Each Assumption/Determinant in the Theory of Change Model

- Are there any other ongoing activities or implementation improvement strategies that address this assumption/determinant?
- Which ongoing activities and implementation improvement strategies do we know are working well? How do we know?
- Which ongoing activities do we know are not working well? How do we know?
- Which ongoing activities do not have enough monitoring and evaluation data to determine if they are working well?
- Are the ongoing activities or implementation improvement strategies sufficient to address each assumption/determinant?
- What preconditions are not addressed through an ongoing activity or implementation improvement strategy? Do we have enough knowledge to develop an implementation improvement strategy to address that assumption/determinant? If not, what do we need to know before we could develop an implementation improvement strategy? What are the consequences if a particular determinant is not addressed?

research team has identified that there is no activity to address the precondition, “producers use quality premix appropriately,” and the team has determined that there is not enough knowledge regarding whether processors are using quality premix appropriately or how to influence that behavior, then there are gaps in knowledge. The resulting research questions might be: “what proportion of producers in the program region are using quality premix appropriately?” and “what are the factors that influence whether a processor uses quality premix appropriately?” Alternatively, if there is not an activity to address that precondition, and the

team has determined that there is enough knowledge to determine that millers are not using premix appropriately, then there are gaps in action. If the team decides to develop and test an implementation improvement strategy to fill this gap, an example of a research question might be: “what is the impact of a 3-day intensive miller training on using quality premix appropriately?”

**Phase II, Step 3: Prioritize Implementation Research Questions**

This previous step may result in a long list of research questions. Because there may be limited

**TABLE 2.** Template for Prioritizing Implementation Research Questions<sup>21</sup>

	Example
Program outcome and underlying assumption/determinant	Increased access to fortified products. Fortified products are affordable and available for urban populations
Research question(s)	What is the national coverage of fortified products amongst the urban poor?
How will the success of the intervention be affected by the information provided?	The urban poor are a large proportion of our target population. If we are not currently reaching them, we will need to adjust our program with new targeting strategies.
Possible research methods	Secondary analysis of existing data set
Organization/persons responsible for conducting the research	The National Micronutrient Committee
Resources, support, or training required by the organization/persons	Human resources to analyze data and write report
Estimated cost	No additional cost to program
Estimated time to prepare for and conduct the research	6–8 weeks

resources to conduct implementation research and not all questions will be equally important to address immediately, the team should prioritize the questions. To do this, the team should use criteria such as cost of answering the research question, time investment, timeliness, and importance for programmatic success. We have provided a template (Table 2) for the prioritization of implementation research questions, modeled on an approach found in the program assessment guide.<sup>21</sup>

**Phase III: Conduct Implementation Research**

Phase III involves defining the objectives of each implementation research question, identifying methods and study designs, and conducting the research. As with all research, the extent to which the data will provide useful information depends on the level of scientific rigor used when designing, conducting, and analyzing the study.

**Phase III, Step 1: Define Objectives of Implementation Research Questions by Category**

Implementation research questions can be categorized into 1 or more standardized objectives (to describe, to explore, to explain, to influence, to predict) described in the World Health Organization’s (WHO) *Implementation Research in Health: A Practical Guide* (Table 3).<sup>19,23</sup> Understanding the objective of a particular research question can help the team to refine the appropriate methods and inform the next steps after data analysis. If the research objective is to describe, explore, or explain the

underlying determinants, then the research is designed to inform potential implementation improvement strategies. If the objective is to influence determinants, then the research is designed to test an implementation improvement strategy to see if it has the desired effects on the implementation outcome variable. If the objective is to predict, then the research is designed to forecast the likely success of scaling-up implementation improvement strategies.

**Phase III, Step 2: Identify Proper Methods and Study Design**

Implementation research does not require a unique set of methods, which could include surveys, focus group discussions, participatory action research, scenario-building exercises, economic modeling, or a variety of others that are listed in the WHO manual for implementation research.<sup>19</sup> The choice of methods will depend on the research question(s) being asked and the level of confidence desired.

**Phase III, Step 3: Conduct Implementation Research**

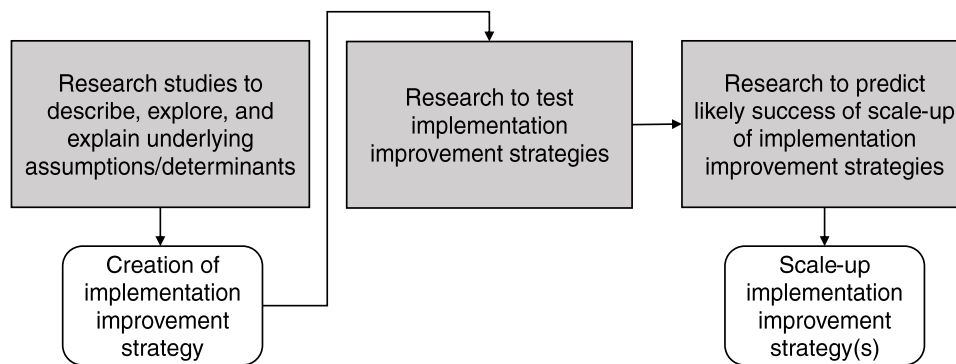
How to conduct research is beyond the scope of this article. However, conducting implementation research does not require unique considerations. For example, the implementation research team may need to ensure that institutional review board approval has been obtained, research tools have been developed and piloted, a field team has been trained properly, and logistics for data collection and analysis have been planned.

**TABLE 3.** Implementation Research Objectives With Examples for Food Fortification Programs<sup>a</sup>

Research Objective	Description	Examples
To describe	Describes the context in which food fortification is occurring and the main components that may affect the success of food fortification	What proportion of the population consumes wheat flour that is produced in industrial mills?
To explore	Explores the possible barriers and facilitators to the implementation of food fortification	What are the barriers and facilitators for implementing adequate external quality assurance/quality control?
To explain	Explains how and why certain aspects of the intervention or the context may influence implementation outcomes	How do market prices affect revenue margins for wheat flour millers?
To influence	Tests desired effects of an implementation improvement strategy	Does additional training and fortification sensitization of millers lead to better fortification of a product?
To predict	Predicts whether the same (or modified version of) aspects of a food fortification program will work under various conditions (useful for scale-up)	Will the radio advocacy materials that increased fortification logo awareness in the southern parts of the country also produce similar results in the northern parts of the country?

<sup>a</sup> Adapted from Peters DH, Tran NT, Taghreed A. *Implementation Research in Health: A Practical Guide*. World Health Organization; 2013.

**FIGURE 4.** Possible Next Steps After the Conclusion of an Implementation Research Study



**Phase IV: Analyze Findings and Develop and Disseminate Recommendations for Next Steps**

The final phase in the framework involves data analysis, interpretation of findings, and the development and dissemination of recommendations. Developing and disseminating recommendations through appropriate channels is paramount for making implementation research useful. Some appropriate channels might include national fortification alliances, working groups, academic journals, government meetings, and conferences. Recommendations are essential for program

implementers and they expand the knowledge base in a way that is valuable for other researchers and potential funders.<sup>13</sup>

**Phase IV, Step 1: Analyze Data From Implementation Research Study**

The choice of data analysis techniques will depend on the research methods employed. Data analysis and dissemination must accommodate the time constraints of the program implementers and funders. These decision makers may have specific deadlines for deciding on program scale-up or programmatic activities for the next funding period; if

**Developing and disseminating recommendations through appropriate channels is paramount for making implementation research useful.**

the data cannot be analyzed in a practical time-frame, the implementation research may not be worth conducting.<sup>15</sup>

#### Phase IV, Step 2: Develop and Disseminate Recommendations for Next Steps

The recommendations for next steps differ depending on whether the purpose of the implementation research question(s) was to describe, explore, explain, test, or predict (Figure 4). If the research intends to inform implementation improvement strategies by addressing a gap in knowledge through a descriptive, exploratory, or explanatory study, the recommendation might be to create and test a new implementation improvement strategy. If the research tested an implementation improvement strategy, the recommendation would depend on whether the strategy was successful or not. If it was successful, the recommendation might be to identify the likelihood of success of the scale-up of the implementation improvement strategy; if it was not successful, the recommendation might be to conduct new research to inform the development of new implementation improvement strategies. If the objective of the research was to predict the likely success of the scale-up of an implementation improvement strategy in various settings, the recommendation would relate to whether or how to scale up an implementation improvement strategy.

#### CONCLUSION

There are many countries implementing food fortification programs but not all of them are achieving their public health goals. In many cases, this is due to underlying contextual determinants that affect the ability of the program to succeed. In this article, we have introduced a systematic process for how to identify key gaps in implementation, develop and prioritize implementation research questions, and carry out an implementation research agenda that will inform implementation improvement strategies. The process framework we present emphasizes the importance of identifying and prioritizing research questions in a systematic way that includes partners from both the public and private sector who are involved in the implementation of various food fortification activities (policy, food production, regulation, and enforcement, etc.). Our framework assumes that food fortification is already occurring; it is a process for identifying and studying gaps in ongoing implementation. Additionally, the process that

we present assumes the need for a facilitating organization or person to bring together fortification partners from the public and private sectors. The development of this framework is intended to promote implementation research in the field of food fortification and thus improve implementation outcomes of this key public health intervention, especially in low-resource settings.

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**Author contributions:** ET facilitated the development of this framework and led manuscript development. LR, HP, BLT, LFY, JR, HR, MM, DP, and PM provided study oversight and contributed to reviewing and revising the manuscript. MC cofacilitated the development of this framework, provided senior-level study oversight, and co-led development of the manuscript.

**Competing interests:** None declared.

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## CORRECTION

## Corrigendum: Donovan et al., Remote Mentorship Using Video Conferencing as an Effective Tool to Strengthen Laboratory Quality Management in Clinical Laboratories: Lessons From Cambodia

➔ See corrected article.

In the article “Remote Mentorship Using Video Conferencing as an Effective Tool to Strengthen Laboratory Quality Management in Clinical Laboratories: Lessons From Cambodia” by Grant Donovan et al., which appeared in the December 2020 issue (Volume 8,

Issue 4), Patricia Sadate-Ngatchou is now listed as an author and Malin Chou is now added to the Acknowledgments for their respective contributions to the article.

The article has been corrected accordingly.

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