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# Building Health System Capacity Through Implementation Research: Experience of INSPIRE—A Multi-country PMTCT Implementation Research Project

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**Background:** The INSPIRE—Integrating and Scaling Up PMTCT through Implementation REsearch—initiative was established as a model partnership of national prevention of mother-to-child transmission of HIV (PMTCT) implementation research in 3 high HIV burden countries—Malawi, Nigeria, and Zimbabwe. INSPIRE aimed to link local research groups with Ministries of Health (MOH), build local research capacity, and demonstrate that implementation research may contribute to improving health care delivery and respond to program challenges.

**Methodology:** We used a mixed methods approach to review capacity building activities, as experienced by health care workers, researchers, and trainers conducted in the 6 INSPIRE projects before and during study implementation.

**Results:** Between 2011 and 2016, over 3400 health care workers, research team members, and community members participated in

INSPIRE activities. This included research prioritization exercises, proposal development, good clinical practice and research ethics training, data management and analysis workshops, and manuscript development. Health care workers in clinics and district health offices acknowledged the value of hosting implementation research projects and how the quality of services improved. Research teams acknowledged the opportunities that projects provided for personal development and the value of participating in a multicountry research network.

**Discussion:** INSPIRE provided an opportunity for African-led research in which researchers worked closely with national MOH to identify priority research questions and implement studies. Close partnerships between research teams and local implementers facilitated project responsiveness to local program issues. Consequently, processes and training needed for study implementation also improved local program management and service delivery. Additional benefits included improved data management, publications, and career development.

**Key Words:** PMTCT, capacity building, implementation research, partnerships, health systems

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## INTRODUCTION

In 2009, 21 of the 22 countries with the highest estimated numbers of women living with HIV were in Africa, and accounted for more than 90% of pregnant women living with HIV in need of services for the prevention of mother-to-child transmission of HIV (PMTCT). In 2011, the UNAIDS “Global Plan”<sup>1</sup> set the goal of reducing new HIV infections among children by 90% and AIDS-related maternal deaths by 50% by 2015. Since then, the “Super-Fast-Track Framework”<sup>2</sup> has fixed an even lower target, ie, reducing the number of children newly infected to less than 20,000 by 2020. Furthermore, the 90-90-90 targets challenge health systems to reach and initiate 95% of pregnant women living with HIV on lifelong HIV treatment by 2018, and to retain them and their infants in care.<sup>3</sup> Each of these ambitious and much-needed strategies requires a well-trained health workforce if the targets are to be met.

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Implementation research (IR) provides a means of addressing challenges faced in delivering health care by broadening and deepening understanding of real-life factors and their impact on programs.<sup>4</sup> Currently, only 1.3% of global health research publications, including IR, have led authors from research institution located in the WHO Africa region.<sup>5</sup> This is grossly disproportionate to its population—37% of the world's population—the burden of disease its population suffers and the magnitude of the HIV epidemic in the region. In recognition of the importance of research for improving health in its populations, the African Science Technology and Innovation Ministers summit held in Morocco (2014) appealed for more Africa-led research.<sup>6</sup>

INSPIRE—Integrating and Scaling Up PMTCT through Implementation Research—represented a collaboration between the World Health Organization (WHO) and Global Affairs Canada (GAC). It aimed to improve access, quality, and uptake of PMTCT services, by enhancing service delivery in health facilities and strengthening national programs and health systems through support of IR projects in high HIV burden countries. INSPIRE sought to establish research partnerships that actively linked local research groups with Ministries of Health (MOH) and thereby build capacity to conduct IR and use experiences and routine data to improve health services.

In partnership with MOH in Malawi, Nigeria, and Zimbabwe, 2 projects were implemented in each country to test approaches for enhancing access to and delivery of services and improve retention in care of women living with HIV. All projects had national researchers as principal investigators (PIs) and, in addition to the study-specific activities, incorporated capacity building activities and training to strengthen research skills. Study preparations and training commenced in 2011, participant enrollment was completed by October 2015, and scheduled follow-up in all studies will be concluded by the end of May 2017.

Elsewhere, investments in human resources and systems that specifically increase capacity of health care workers (HCWs), researchers, and stakeholders have not only developed the skills of individuals, but equally important, have benefited the health system and wider community.<sup>7</sup> Here, we describe how individually and collectively, the INSPIRE projects contributed to building capacity in IR and strengthened program management and service delivery in the 3 countries.

## METHODOLOGY

We used a mixed methods approach to document and evaluate capacity building activities before study and during study implementation from 2011 to 2016 conducted by, or in conjunction with, INSPIRE projects. Activities at all levels of the health system, including training of research teams, HCWs, and peer support staff (Expert Mothers/Mother Mentors/Mother Support Groups) were reviewed in relation to their contributions to strengthening health program management, service delivery, or IR skills.

For the purposes of this article, capacity building is defined as any training, mentoring, technical support, or other activities for change toward strengthening research capacity and improving health care.<sup>8</sup> Data were compiled from multiple

sources, including monthly, quarterly, and annual project reports submitted by project teams to WHO and GAC, and reports after WHO site visits to each project. Training data included training content and methods, participant numbers, cadres, and level of health system where they were conducted. We grouped capacity building efforts under 4 thematic areas, namely enhancing or improving: (1) IR capacity, (2) program management, (3) service delivery, and (4) additional outcomes.

A single focus group discussion (FGD) was conducted with the 6 PIs and 2 project coordinators at completion of the projects. Structured questionnaires were distributed through the WHO country offices and completed by relevant MOH partners in the 3 countries, to assess their views on the activities they participated in or observed.

The FGD was organized by subject area, namely (1) characteristics of capacity building; (2) challenges experienced with either capacity building or service delivery during study implementation and how these were addressed; (3) outcomes, benefits, and improvements in program implementation as an outcome of activities; (4) indirect benefits and outcomes of the IR projects; and (5) sustainability for supporting research capacity. The discussions were conducted in English and digitally audio recorded; the content was reviewed post-FGD to verify findings and comments. Two facilitators led the discussions and observers independently documented the discussion. FGD discussion notes and questionnaire responses complemented information previously captured through project and other reports.

## RESULTS

From 2011 to 2016, INSPIRE study teams and WHO conducted capacity-building activities that included over 3400 HCWs, MOH staff, and project team members (Table 1). Activities at national or state level focused on improving program management skills and forging/strengthening partnerships between MOH and key stakeholders who conduct research. At district and facility levels, activities were mainly organized around HCW training to improve programmatic and service delivery including the quality of routine health systems' data. Table 2 summarizes the research interventions tested in each study and describes activities that were intended to strengthen health systems, peer support services, and research skills. WHO-led activities to strengthen the leadership skills of MOH staff are also included.

Here, we describe activities conducted either with all project teams or as part of specific projects that may have served to build capacity in IR or program management and service delivery.

### Strengthening IR Capacity

At the onset of INSPIRE, country stakeholders participated in a research prioritization exercises in each country using the Child Health and Nutrition Research Initiative (CHNRI) process.<sup>9</sup> The objective of each was to identify the most important IR questions for that country, which would contribute to reducing new HIV infections in children and improving survival of mothers living with HIV. Participants

**TABLE 1.** Capacity Building Activities and Cadres of Health Workers or Project Staff Included in the Activity

Type of Activity	Country, Cadre, Health System Level and Target Groups (No. of Trained/Retrained)	Outcomes
<b>Implementation Research</b>		
Country research prioritization exercise using CHNRI process*	Malawi, Nigeria, and Zimbabwe: national; WHO, MOH policy makers, academics, researchers, district health workers, implementing partners, people living with HIV, and study teams (150)	Strengthened leadership capacity of national level MOH staff to direct research prioritization in each country
Proposal development workshop	Malawi, Nigeria, and Zimbabwe: national; project teams, WHO, MOH (50)	Strengthened research capacity of local researchers and national level MOH staff in research and program planning
Community research ethics and methodology	Nigeria and Zimbabwe: community members; mentor mothers, HCWs (Nigeria 34 and Zimbabwe 59)	Increased knowledge and importance of ethics in research of HCWs and mentor mothers
Regional exchange visits	Nigeria and Zimbabwe: MoMent, Evidence for Elimination, MOH, and WHO; project managers, nurses, data managers, clinicians (6)	Strengthened implementation of Option B+ strengthened quality improvement component in Nigeria research project
Data verification including use of routine data quality assessment (RDQA) approach	Zimbabwe; provincial, district, facility; research team, nurses, data clerks (129)	Improved data quality at local health level and HCWs' skills in RDQA, record keeping, data management and reporting, and program management
Data analysis planning and publication workshops	Malawi, Nigeria, and Zimbabwe: project; PIs, statisticians, data managers, WHO Headquarters expert consultants (epidemiologists, statisticians) (44)	Improved data analysis skills of local researchers, data managers, statisticians on study teams
<b>Service delivery</b>		
Good clinical practice	Malawi, Nigeria, and Zimbabwe: national, provincial, district, facility; research team, nurses (611)	Strengthened research capacity of local researchers and MOH in standards for design, conduct, performance, monitoring, auditing, recording, analysis and reporting of studies
Training on continuous quality improvement (QI)—break through series	Nigeria: project; health facility QI teams (72)	Improvement of QI for service delivery
Skill building for point-of-care CD4 count and viral load training—Antiretroviral Therapy distribution training and training on SMS system	Malawi, Nigeria, and Zimbabwe: nurses, counselors; health services assistants, Community Health Management Information System officers (542)	Strengthened DBS sample collection and transport, supply management improvement in service delivery, and program management of HIV diagnostics and logistics
Training of mentor mothers and mother support group coordinators	Malawi, Nigeria, and Zimbabwe: facility, community; volunteers, expert clients (129)	Improve HIV and ART counseling skills of community support groups. Increase retention in care of HIV mothers and their infants.
Training for piloting of Option B+ Integrated Management of Adult Illnesses (IMAI)/ Integrated Management of Pregnancy and Childbirth (IMPAC)	Nigeria, Zimbabwe: facility; nurses, counselors (398)	Strengthened implementation of Option B+ at study sites.
PMTCT and early infant diagnosis; basic principles of PMTCT and service delivery. National PMTCT Guideline updates (mentoring, in-service training)	Malawi, Nigeria, and Zimbabwe: MD, medical assistants (MA), clinical officers (CO), nurses, ART/Antenatal Care data clerks, HTC counselors, laboratory assistants (132)	Strengthen skills of HCWs to implement national PMTCT program at district and local clinics
Refresher on study SOP (facility-based mentorship) mentoring and in-service training	Malawi, Nigeria, and Zimbabwe: MA, CO, nurses, ART/ANC clerks, HTC counselors, laboratory assistants (264)	Improve HCWs' implementation of study protocols at sites. Strengthen service delivery
PMTCT indicators and rate estimate capacity building training	Malawi, Nigeria, and Zimbabwe: INSPIRE PIs, data managers, M&E officers, WHO PMTCT focal points (31)	Strengthened monitoring and evaluation of PMTCT global indicators and use of SPECTRUM modeling tool, for program and policy staff
<b>Program management</b>		
Site visit project midterm review dissemination workshops, study updates, peer review and stakeholder collaboration, coordination meetings	Malawi, Nigeria, and Zimbabwe: national; MOH, WHO, study teams (180)	Strengthened links between local researchers and national programs. Disseminated early lessons learned from studies and promoted early adoption of policies and processes that improved PMTCT program rapidly.
INSPIRE project joint field supervisory and monitoring visits	Malawi, Nigeria, and Zimbabwe: national, district and project team, MOH staff, WHO, project staff (180)	Improved HCWs' skills in program management. Provided written reports and on-site feedback on study implementation after visits.

**TABLE 1. (Continued)** Capacity Building Activities and Cadres of Health Workers or Project Staff Included in the Activity

Type of Activity	Country, Cadre, Health System Level and Target Groups (No. of Trained/Retrained)	Outcomes
Data quality management training and mentoring and supervision for HCWs on best practices for stock management	Nigeria and Zimbabwe: nurses, doctors, District Health Environmentalists (452)	Improved practical skills, application of national program monitoring and study tools, overview of Maternal, Neonatal and Child Health; Integrated Care Package for Pregnant Women, care package for newborn and essential HIV-exposed infants services. Strengthened HCW knowledge for stock management best practices.
Project facility–level mentoring	Malawi, Nigeria, and Zimbabwe: facility, research team, community; health care managers, nurses, data clerks, project team, community volunteers (80)	Strengthened skills in collection of quality data and facility management of records for national and local staff. Staff able to make improvements in management of sites based on feedback from mentoring visits.
Total HCWs trained/retrained	3422	

\**Child Health and Nutrition Research Initiative*. Rollins N, et al. Prioritizing the PMTCT implementation research agenda in 3 African countries: Integrating and Scaling Up PMTCT Through Implementation Research (INSPIRE). *J Acquir Immune Defic Syndr*. 2014;67:S108–S113. Adaptations are themselves works protected by copyright. So in order to publish this adaptation, authorization must be obtained both from the owner of the copyright in the original work and from the owner of copyright in the translation or adaptation. DHE, District Health Executives.

included MOH, research institutions, academia, PMTCT implementing partner organizations, civil society, and WHO country offices. The process provided an opportunity to strengthen the research involvement of the MOH by directing the development of research questions and facilitating collaboration with research partners.

Nine project teams, 3 from each country, subsequently participated in the proposal development workshop. Over the course of a week, experts in HIV/PMTCT, research methods, statistics, qualitative research, and behavioral interventions met with project teams to facilitate the development of research proposals. Six of the 9 submitted proposals were approved for funding.

Technical and monitoring site visits were regularly conducted to ensure the quality of study implementation and to develop research capacity: independent researchers who were experts in research methods and study implementation visited sites at least twice per year and led joint reviews of progress and study challenges; exchange visits were organized between teams in the same country and between countries; meetings were arranged between project teams, MOH, and other research or implementing partner groups in country to share research experiences and lessons learned.

Project teams introduced new project staff and local HCWs to IR methods and approaches for maintaining the quality of IR implementation including ethical standards. This included good clinical practices’ training, staff mentoring, and data quality assessments (Table 1). These study activities, while directed at improving data quality and completeness for study purposes and protecting patient confidentiality, were also intended to embed research as a valued process among district and facility staff. Good clinical practices’ training was facilitated by INSPIRE research teams and, in some countries, was supported by the relevant Medical Research Council; a total of 611 HCWs or research team staff were trained on research methodology and ethics. Repeat training was conducted regularly.

Data management and analysis workshops were organized at which 4–6 members from each project team attended.

Workshops lasted up to 1 week and provided opportunity for teams to meet with external statisticians and epidemiologists and review how the quality and integrity of data was regularly checked and errors corrected. A 1-week manuscript writing workshop was organized in October 2016 to facilitate project teams to draft 2 manuscripts per project. Teams were again supported by external epidemiologists, statisticians, and HIV/PMTCT experts.

### Contributions to Improved HIV/PMTCT Program Management

In all countries, project teams were involved in piloting approaches for launching, establishing, and scaling up Option B+ in the relevant health districts or states. Teams assisted with training, design of materials including site registers and monitoring tools. In Zimbabwe, INSPIRE teams also helped coordinate national stakeholder meetings, and sharing of early lessons with other implementing partners.

In addition to site visits by experts in research methods and implementation, MOH and WHO country staff jointly visited project teams every 4–6 months. District health managers also participated in these reviews and provided opportunity for feedback from a programmatic perspective. When gaps in routine services were identified by the studies, the visits allowed for constructive discussions to identify solutions and actions, or determined that the problem needed to be escalated to a higher level within the system. MOH staff from the national office were also able to hear about early learnings and ideas not directly related to the study interventions and primary outcome measures, and to consider disseminating them to other districts or states. For example, appointment registers were not being implemented effectively in some districts; simple systems developed by study teams for maintaining and reviewing attendance registers were therefore taken and used in these other settings.

INSPIRE also supported “south-south” exchanges and coordinated visits and follow-up activities with other regional institutions. For example, the Institute for Healthcare

**TABLE 2.** Interventions Tested as Part of INSPIRE Projects and How They Contributed to Program Delivery

Implementer	Interventions	Capacity Building Contributions to Strengthen Health System, Peer Support Services, and Research and Leadership Skills
Malawi	<ol style="list-style-type: none"> <li>1. Incorporating Mother–Infant Pair (MIP) Clinics into standing health sites</li> <li>2. MIP Clinics using SMS Frontline Technology among community health workers (CHWs) to contact and trace missed client appointments</li> </ol>	<p>Strengthening health systems through clinic integration and employment of SMS technology</p> <p>On-site mentoring of project and MOH district staff to maintain MIP Clinic including maintenance of patient records, data quality, and tracking of patient appointments. Built capacity in program management to improve service delivery and IR capacity. SMS Frontline Technology training for district level Information Technology staff to maintain and support IT equipment for more efficient CHWs' notification of missing patients.</p>
PURE: PMTCT Uptake and REtention study	<ol style="list-style-type: none"> <li>1. Control (standard of care)—MOH HIV care clinic (HCC) model</li> <li>2. Standard of care plus Mothers-to-Mothers (M2M) and Back to Care retention interventions</li> <li>3. Decentralized community-based services where expert mothers with HIV and on ART provide support services to mothers and their families at the community level</li> </ol>	<p>Strengthening peer support within retention interventions by using facility- and community-based mother-to-mother support models</p> <p>Capacity building of “expert” mothers as part of M2M program at the facility level and at community level, to execute peer support services to mothers as well as their families to keep clients retained in care. Trained mothers have been absorbed into local organizations and continue to provide peer support for mothers with HIV and assist HCWs in the collection of routine patient data.</p>
Nigeria	Break through collaborative learning series (quality improvement health systems' intervention)	<p>Health systems strengthening through continuous systematic quality improvement intervention</p> <p>Capacity building of district and local level health staff QI intervention. HCWs identified health issues/barriers to improve health services, conceptualized interventions, monitored and evaluated pilot interventions to take action (adopt/not adopt). Incorporation of higher level staff and cooperation with HCWs throughout the intervention has supported an environment of empowerment and action; skills have been acquired, which they can continue to use to improve other health services.</p>
MoMent: Mother Mentor Study	<ol style="list-style-type: none"> <li>1. Control (standard of care), informal peer supporter program</li> <li>2. Mother Mentor program in clinic setting</li> </ol>	<p>Strengthening peer support in clinic settings using structured community-based mother mentor support intervention</p> <p>Capacity building of new mentor mother community cadre for M2M program provided support to pregnant women with HIV to stay in care and ensure Early Infant Diagnosis testing for their infants. Trained mentor mothers provided additional human resources support to HCW staff. This cadre will continue to provide peer support to pregnant women in other programs and support HCWs in the collection of routine patient information.</p>
Zimbabwe	Mother support groups plus standard of care	<p>Strengthening peer support in clinic settings by establishment of formal mother support groups</p> <p>Capacity building for new formalized mother support groups and mother coordinators (“expert mothers”) to implement peer support services in coordination with facility ARV and Maternal Child Health Programme. MSG provided informational lessons on PMTCT (adherence, disclosure, well-baby visits etc.) to mothers with technical guidance of HCW staff. Collaboration between expert mothers and HCW strengthen client health services by providing accurate, up-to-date information to clients by their peers.</p>

**TABLE 2. (Continued)** Interventions Tested as Part of INSPIRE Projects and How They Contributed to Program Delivery

Implementer	Interventions	Capacity Building Contributions to Strengthen Health System, Peer Support Services, and Research and Leadership Skills
E4E: Evidence for Elimination	Provision of point-of-care (POC) CD4 devices with targeted HIV counseling	Strengthening health care services through the provision of POC CD4 technology and linked HIV counseling within primary health clinics  Capacity building of HCWs to provide quality counseling to clients and use of new technology. E4E developed targeted new more robust HIV counseling procedure coupled with informing clients of immediate results of CD4 counts.
WHO	INSPIRE projects	Strengthening research skills of African region local researchers and leadership of MOH to conduct large scale IR and disseminate findings to national and international audiences  Guidance on data analysis and development of peer-reviewed publications for primary outcomes for dissemination  On-site and off-site technical support to research teams; improving study implementation, data quality and analyses  Direct feedback and recommendations for local PIs and MOH district team members at MTRs  In-depth reviews of protocols, implementation, and analyses challenges with study PIs and formal recommendations for improvements
National stakeholders	<ol style="list-style-type: none"> <li>1. Country IR prioritization exercise</li> <li>2. National stakeholder meetings with local research teams to discuss research project progress and challenges</li> <li>3. Biquarterly site visits to each project from WHO and expert consultants with research teams and national research partners</li> </ol>	<p>Strengthening of leadership capacity of National MOH staff through directing country prioritization exercise and the selection of research questions focused on national and local issues</p> <p>Established a sustainable collaborative link between MOH and local researchers through CHNRI process and national stakeholder meetings</p> <p>National research partners made rapid policy changes or service delivery decisions affecting sites based on joint biquarterly project site visits</p>

Improvement (IHI) in Ghana visited the Lafiyan Jikin Mata (LJM) project team in Nigeria to strengthen their knowledge and skills regarding continuous quality improvement methodologies. Training included staff from district health offices and clinics. IHI staff also communicated regularly through phone and email to provide ongoing mentoring to the research team and district health teams during the study period.

To strengthen the monitoring and evaluation of PMTCT global indicators by program and policy staff, INSPIRE conducted a PMTCT indicator and rate estimation workshop that was facilitated by WHO staff. Thirty-one participants including project staff, WHO PMTCT focal points, and national and regional monitoring and evaluation officers from all countries attended the workshop. Training focused on mechanisms for improving data quality, use of the SPECTRUM modeling tool, and how outputs could be used to inform policy and program decisions at national and state levels.

### Contributions to Improved Service Delivery

Numerous simple innovations developed by individual projects were incorporated in local services as a result of the studies being nested in routine services. For example, in Malawi, project teams developed postnatal care registers and appointment diaries as monitoring and tracking tools. District

and national health staff observed that these tools helped to more efficiently schedule client return dates and track missed appointments, thereby contributing to improved client services. The modified registers and diaries have recently been incorporated for routine use by the national program.

In Nigeria, the Federal MOH identified the potential of expert trained mentor mothers as a strategy to help task shifting and sharing. They are investigating the requirements for formalizing mentor mothers as a health cadre and have used the project training curriculum to inform standardization of community volunteer training.

In Zimbabwe, mentoring of facility staff to improve data quality included use of a checklist and data quality assurance tool to evaluate completeness and accuracy of patient medical records; after the end of the study, the same tool was adopted and implemented by nonstudy clinics. Similar supervision and mentoring tools developed by a team in Malawi have also been adopted by the district health team.

### Additional Outcomes of INSPIRE Activities

Several other positive “capacity” outcomes were reported by projects. These included INSPIRE-related scientific publications, conference abstracts, invitations to delivery plenary presentations, and staff professional development.

All projects published study protocols, participated in satellite sessions at both the International AIDS Society Conference (2014) and the International Conference on AIDS and STIs in Africa (2015). PIs described how the research skills of their core project teams improved from working on INSPIRE projects, and several were enabled to pursue higher education certificates and degrees; others were offered competitive job opportunities. At this time, there have been 12 INSPIRE peer-reviewed publications, 41 conference abstracts or presentations based on INSPIRE data, 39 additional certificates and higher degrees (Masters/PhD) pursued, and 53 movements to better jobs due to work experience gained from INSPIRE. PIs remarked that their experience working on INSPIRE, including collaborating with the other projects, strengthened their ability to manage research studies. Study PIs have participated in WHO guideline development meetings and shared preliminary findings from their projects at these meetings that have informed global programmatic recommendations.

## DISCUSSION

INSPIRE contributed to building capacity at all levels of the health system. Although we were able to quantify some of the specific outcomes such as the number of people trained or articles published, other dimensions of “capacity building” and their impact on national PMTCT programs are only anecdotally described. Measuring the value of the financial investment and technical support provided by INSPIRE for human capacity and skill development has proven difficult.

INSPIRE successfully fostered close collaborations between research teams, MOH, local implementer, and other stakeholders. All teams considered the close working relationships between the research teams and these groups to be beneficial and facilitated trust and influence<sup>10</sup>; MOH representatives reported that the strengthened relationships would encourage prompt use of research findings. MOH representatives and district health managers also acknowledged the benefits of hosting the research projects in mitigating a number of routine implementation challenges and how projects contributed to improving service delivery at district level.

District health teams and staff at local facilities seemed to benefit from hosting the respective IR projects. In addition to learning specific skills such as continuous quality improvement approaches or methods for improving the quality of local data, activities designed to train HCWs to perform specific tasks important for individual studies increased staff morale and a sense of self-worth. As one clinical officer in Malawi commented, “Now I know what it takes to do such research, this gives me drive to get involved. I understand the importance of getting consent from a research participant, keeping records and follow up adverse events on study participants. I am delighted to have passed the exams and obtain a certificate that adds value to my CV.” In settings where there are limited opportunities for professional development, participation in IR studies that are embedded in the local services may be one way of increasing motivation of health professionals.<sup>11</sup>

However, challenges to conducting IR and building research capacity in settings, where human and other resources are constrained, need to be acknowledged. Some health workers perceived research as additional work rather than an opportunity to learn or develop professionally. In some projects, this resulted in an unwillingness to engage and use new knowledge or adopt proposed approaches. Project budgets for capacity building activities were limited, and additional nonstudy capacity building activities were not possible. In all 3 countries, financial incentives have been offered as part of national training exercises and by other research teams to improve health worker motivation and attendance.<sup>12</sup> In INSPIRE, when these were not offered, some HCWs declined to take an active role in the study; when per diems were provided for workshops, some higher level staff attended, although they were not subsequently involved in the study.

Our review of the INSPIRE capacity building activities was not planned at the beginning of the initiative but was designed and conducted retrospectively. For this reason, we lack data over the course of the study related to the number of staff working at clinics and staff movement. We were also not able to include the views or observations of all members of the research teams and HCWs involved in the studies. A major omission was the collection of views and opinions of community members. We are therefore not able to fully reflect the ways by which INSPIRE may have affected on the skills and confidence of HCWs, either positively or negatively, and the community. We did not perform independent assessments of the skills of HCWs or evaluations of district health systems to know if activities directly changed performance. However, the feedback from MOH, district, and facility managers was consistently favorable toward the research studies. We interpreted this to mean that the studies contributed positively to the capacity and performance of district health teams. In retrospect, it would have been helpful to have prospectively planned a systematic approach for evaluating capacity building activities to inform the cost effectiveness and long-term value of such research activities.

INSPIRE demonstrates one model for building research and program management capacity. It is our hope, and belief, that the experience gained by researchers and HCWs through the INSPIRE initiative will meaningfully contribute to PMTCT programs in Malawi, Nigeria, and Zimbabwe, will benefit women living with HIV and their infants and children, and enhance the depth and capacity of the research leadership and community in Africa.

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