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Committee on the Evaluation of Strengthening Human Resources for Health Capacity in the Republic of Rwanda Under the President's Emergency Plan for AIDS Relief (PEPFAR)

Board on Global Health

Health and Medicine Division

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COMMITTEE ON THE EVALUATION OF STRENGTHENING HUMAN RESOURCES FOR HEALTH CAPACITY IN THE REPUBLIC OF RWANDA UNDER THE PRESIDENT'S EMERGENCY PLAN FOR AIDS RELIEF (PEPFAR)

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This Consensus Study Report was reviewed in draft form by individuals chosen for their diverse perspectives and technical expertise. The purpose of this independent review is to provide candid and critical comments that will assist the National Academies of Sciences, Engineering, and Medicine in making each published report as sound as possible and to ensure that it meets the institutional standards for quality, objectivity, evidence, and responsiveness to the study charge. The review comments and draft manuscript remain confidential to protect the integrity of the deliberative process.

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Although the reviewers listed above provided many constructive comments and suggestions, they were not asked to endorse the conclusions or recommendations of this report nor did they see the final draft before its release. The review of this report was overseen by **Kristine M. Gebbie,** Flinders University School of Nursing and Midwifery, and **Ann M. Arvin,** Stanford University School of Medicine. They were responsible for making certain that an independent examination of this report was carried out in accordance with the standards of the National Academies and that all review comments were carefully considered. Responsibility for the final content rests entirely with the authoring committee and the National Academies.

Preface

The world needs more health workers. The need is acute in low-income country settings with the highest burden of HIV disease, including in sub-Saharan Africa. With 11 percent of world population, 24 percent of global disease burden, and more than 70 percent of HIV disease,[1] yet only 3 percent of the world's health workforce, this region is ripe for innovation and investment to improve human resources for health (HRH).[2] Given this context, the Rwanda HRH Program was an important experiment, one that arose from a unique set of circumstances—a postgenocide need to rebuild, impressive advancement in addressing baseline HIV metrics, and a government dedicated to improving Rwandan health via creation of a stronger and more self-sustaining health system.

The President's Emergency Plan for AIDS Relief (PEPFAR) and its leadership in the Office of the U.S. Global AIDS Coordinator are mandated to address HIV, and the Government of Rwanda has a commitment to improve the health of all its people. These goals may seem to be in conflict—a vertical focus on a single disease and a horizontal approach to building a health system able to address all citizens' basic health needs. The debate over vertical versus horizontal programming has been an ongoing one; however, given the growing burden of noncommunicable diseases (accounting for 71 percent of global mortality)[3] and the evolution of managing HIV disease as a chronic care model with multiple comorbidities, there may be increasing congruence. In this context, we must admire the creativity of PEPFAR and the Government of Rwanda in partnering to launch this distinctive program.

The Rwanda HRH Program experiment is one from which we believe salient lessons can be drawn for the design and implementation of workforce capacity building that advances both HIV prevention and care and country attainment of universal health access and coverage. Many countries and collaborations can learn from the way the HRH Program was conceived, executed, and evaluated. These lessons are especially timely given the commitment made at the United Nation's first high-level meeting on universal health coverage (UHC) on September 23, 2019, which recognized the substantial shortfall of workers in low- and middle-income countries and "the need to train, build, and retain a skilled health workforce," noting in particular "nurses, midwives, and community health workers."[4]

Perhaps a primary lesson of the Rwanda HRH paradigm is the limited time line of the Program, foreshortened as it was by a 2-year reduction in PEPFAR funding. Even the original

[1] Kharsany, A. B. M., and Q. A. Karim. 2016. HIV infection and AIDS in sub-Saharan Africa: Current status, challenges and opportunities. *Open AIDS* 10.
[2] IFC (International Finance Corporation). 2019. *Sub-Saharan Africa: Health and education.* https://www.ifc.org/wps/wcm/connect/REGION__EXT_Content/IFC_External_Corporate_Site/Sub-Saharan+Africa/Priorities/Health+and+Education (accessed November 6, 2019).
[3] WHO (World Health Organization). 2018. *Noncommunicable diseases*. https://www.who.int/news-room/fact-sheets/detail/noncommunicable-diseases (accessed November 6, 2019).
[4] United Nations. 2019. *Political declaration of the high-level meeting on universal health coverage: "Universal health coverage: Moving together to build a healthier world."* New York: United Nations. https://undocs.org/en/A/RES/74/2 (accessed January 28, 2020).

conception of a program designed for less than a decade was arguably too brief to create cohorts of expert clinicians who could be educated, practice and have an effect on care, and educate the next generation of clinicians in turn. Another key lesson is that the degree of structural change needed for sustained gains in institutional capacity for health professional education was underestimated. Likewise, faculty development to take on this work at the University of Rwanda was not as grounded in partnership engagement as it could have been.

Given the vertical mission of PEPFAR, the goal to understand whether the HRH Program funding improved outcomes for people living with HIV (PLHIV) is logical. As a committee, we thought deeply about how one might attempt to answer this as an overarching evaluation question, given the lack of baseline and time-series data, the too brief period of funded work, and the challenges of navigating between a vertical focus on HIV outcomes and a more horizontal nation-building program of health workforce advancement. The committee's final conclusion was that it would not be possible to determine attribution. But given the continued HIV epidemic in sub-Saharan Africa, as well as the issue of how best to achieve UHC worldwide, this evaluation was an opportunity to highlight the importance of HRH and how it can affect not only PLHIV, but ultimately everyone's health.

The study was completed in a relatively accelerated time frame, but with thoughtfulness and methodologic depth. Following from our commitment to learn as much possible, despite the limitations caused by the circumstances of this Program and this evaluation, the committee offers not only findings about this Program, but also suggestions for how future endeavors such as this could be designed to more explicitly enable learning to follow from innovation.

We are deeply grateful for the work of the dedicated staff, consultants, and committee members, and most of all to the Rwandan government representatives and university employees, faculty who participated through U.S. partner institutions, and others throughout the country who participated in this evaluation. We invite the reader to consider ways to apply the lessons to their own work to improve the health of people and populations.

Ann E. Kurth, *Chair*
Committee on the Evaluation of Strengthening
Human Resources for Health Capacity in the Republic of Rwanda
Under the President's Emergency Plan for AIDS Relief (PEPFAR)

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We also wish to express our sincere thanks to the speakers, listed in Appendix B, and other participants at the committee's public sessions in Washington, DC, and Kigali, Rwanda, for their time and their willingness to share with us their various perspectives.

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Acronyms and Abbreviations

APEFE	Association pour la Promotion de l'Éducation et de la Formation à l'Etranger
ART	antiretroviral therapy
ARV	antiretroviral (drug)
BSN	Bachelor of Science in Nursing
CDC	U.S. Centers for Disease Control and Prevention
CD4	cluster of differentiation 4
CHAI	Clinton Health Access Initiative
CHUB	Centre Hospitalier Universitaire de Butare/University Teaching Hospital, Butare
CHUK	Centre Hospitalier Universitaire de Kigali/University Teaching Hospital, Kigali
CHW	community health worker
CMHS	College of Medicine and Health Sciences
COP	country operational plan
COSECSA	College of Surgeons of East, Central, and Southern Africa
CPD	continuing professional development
ESTHER	Ensemble pour une solidarité thérapeutique hospitalière en réseau/Network for Therapeutic Solidarity in Hospitals against AIDS
FCS(ECSA)	Fellowship of the College of Surgeons of East, Central, and Southern Africa
FY	fiscal year
GDP	gross domestic product
GHWA	Global Health Workforce Alliance
GP	general practitioner
HRH	human resources for health
HSS	health systems strengthening
HSSP IV	Health Sector Strategic Plan 4
LMIC	low- and middle-income country
M&E	monitoring and evaluation
MDG	Millennium Development Goal
MHA	Master of Hospital and Healthcare Administration
MIFOTRA	Ministry of Public Service and Labour
MINECOFIN	Ministry of Finance and Economic Planning
M.Med.	Master of Medicine
MOE	Ministry of Education

MOH	Ministry of Health
MOU	memorandum of understanding
MSN	Master of Science in Nursing
NGO	nongovernmental organization
NISR	National Institute of Statistics of Rwanda
PEPFAR	President's Emergency Plan for AIDS Relief
PLHIV	people living with HIV
PMTCT	prevention of mother-to-child transmission
PrEP	preexposure prophylaxis
RBC	Rwanda Biomedical Center
RPHIA	Rwanda Population-Based HIV Impact Assessment
RWF	Rwandan Francs
SIDA	Swedish International Development Cooperation Agency
SMART	specific, measurable, achievable, relevant, and time-based
SPH	School of Public Health
SPIU	Single Project Implementation Unit
TAGGS	Tracking Accountability in Government Grants
TDF	tenofovir disoproxil fumarate
UGHE	University of Global Health Equity
UHC	universal health coverage
UNAIDS	Joint United Nations Programme on HIV/AIDS
USAID	United States Agency for International Development
USD	U.S. dollar
USI	U.S. institution
WHO	World Health Organization

Summary

Since 2004, the U.S. government has supported the global response to HIV/AIDS through the President's Emergency Plan for AIDS Relief (PEPFAR). Working through many partners, including country governments, PEPFAR supports a range of activities, such as direct service provision, programmatic support, technical assistance, health systems strengthening, and policy facilitation.

The Republic of Rwanda, a PEPFAR partner country since the initiative began, has made gains in its HIV response, including increased access to and coverage of antiretroviral therapy (ART) and decreased HIV prevalence. However, a persistent shortage in human resources for health (HRH) affects the health of people living with HIV (PLHIV) and the entire Rwandan population. This challenge is consistent with a balancing act commonly faced in the global response to HIV, which requires policy, funding, and programmatic decision making around how to improve health care to meet HIV-specific needs—the core of PEPFAR's mission—within a health system that lacks sufficient capacity to meet either HIV-specific health needs or those of the broader population.

Recognizing HRH capabilities as a foundational challenge for the health system and the response to HIV, the Government of Rwanda worked with PEPFAR and other partners to develop a program to strengthen institutional capacity in health professional education and thereby increase the production of high-quality health workers. The HRH Program was originally designed to address four barriers to the provision of adequate care: a shortage of skilled health workers, poor quality of health worker education, inadequate infrastructure and equipment for health worker training, and inadequate management across different health facilities. The Ministry of Health (MOH), which implemented the Program, partnered with U.S. medical, nursing, dental, and public health training institutions to build capacity at the University of Rwanda College of Medicine and Health Sciences. Activities centered around a twinning program that paired Rwandan and U.S. faculty and health professionals, new specialty training programs and curricula, and investments in teaching hospitals and learning environments.

Funding came primarily from PEPFAR through the U.S. Centers for Disease Control and Prevention (CDC). Other funders included the Global Fund to Fight AIDS, Tuberculosis and Malaria; the MOH; and to a lesser extent, other entities. The Program was fully managed by the Government of Rwanda and was designed to run from 2011 through 2019. PEPFAR initiated funding in 2012. In 2015, PEPFAR adopted a new strategy focused on high-burden geographic areas and key populations, resulting in a reconfiguration of its HIV portfolio in Rwanda and a decision to cease funding the Program, which was determined no longer core to its programming strategy. The last disbursement for the Program from PEPFAR was in 2017.

CHARGE TO THE COMMITTEE

The Health and Medicine Division of the National Academies of Sciences, Engineering, and Medicine (the National Academies) was asked, through a single-source request for application from CDC, to evaluate the HRH Program. The overarching purpose of the request

was to understand how PEPFAR's investment affected morbidity and mortality outcomes for PLHIV. The National Academies was asked, to the extent feasible, to address four objectives:

1. Describe PEPFAR investments in HRH in Rwanda over time, including its support for MOH efforts to address HRH needs as well as the broader context in which these investments were made.
2. Describe PEPFAR-supported HRH activities in Rwanda in relation to programmatic priorities, outputs, and outcomes.
3. Examine the impact of PEPFAR funding for the HRH Program on HRH outcomes and on patient- or population-level HIV-related outcomes.
4. Provide recommendations to inform future HRH investments that support PLHIV and to advance PEPFAR's mission.

EVALUATION APPROACH

To meet this charge, the expert committee convened by the National Academies sought to develop an approach that would integrate the evaluation objectives to examine the Program in relation to its priorities, to strengthen institutional capacity to produce high-quality health workers, and to examine its impact on outcomes for PLHIV. The evaluation applied a retrospective mixed-methods design, drawing on document review, qualitative interviews, and secondary analysis of quantitative data. Eighty-seven interviews were conducted with program administrators; U.S. institution faculty; professional associations and councils; University of Rwanda faculty, students, and administrators; health care workers; and other stakeholders. CDC and PEPFAR determined that participation in interviews would present a conflict of interest; therefore, the perspectives of current staff from the donor are not represented in this analysis, a notable gap. Secondary quantitative data collection and analysis used publicly available HRH and HIV data and data provided by the University of Rwanda and the MOH. Some of the requested data were not available, which limited the analysis that could be performed.

The committee approached the request to assess the impact of PEPFAR's investments from the perspective of the Program's plausible contribution to HRH and HIV-related outcomes. This contribution was conceptualized through a theoretical causal pathway for how programmatic activities and resulting changes in HRH outputs could reasonably be expected to contribute to intermediate HRH and health outcomes for PLHIV. The well-documented relationship between HRH outcomes and patient-level outcomes was used to bridge the gap between the Program's original stated intentions and this evaluation's objectives. The posited pathway to impact is that a stronger health workforce that is able to meet the health needs of the population can be expected, along with other factors, to generate improved public health and health care delivery systems. The combination of a functioning health system with an effective workforce results in better-quality services. This contributes to improved health outcomes in general, including for PLHIV, and to improved HIV-related outcomes, such as decreased incidence, mortality, and morbidity.

The approach of assessing plausible contribution to impact is an accepted standard as an effective methodology to retrospectively assess a health systems strengthening program such as the Program. Directly attributing impact to the Program was not feasible for a number of reasons. First, the retrospective nature of the evaluation limited the options for designing an examination

of impact. Second, the lack of an appropriate comparator made determining attribution unrealistic. Rwanda's unique context relative to other East African countries, the role of the University of Rwanda as the singular public institution for health professional education, and the widespread placement of HRH Program trainees meant there was no intervention-free setting, in Rwanda or in a comparable country, that could enable a comparison design to facilitate attribution analysis.

Third, it was not possible to disentangle the effects of Program activities from the multitude of other factors, both within and external to the health system, that contributed to HRH and HIV-related outcomes. Fourth, Rwanda had made notable HIV-related achievements before the Program began. With a relatively high baseline for key HIV indicators, any effects would be of a relatively small magnitude, making it challenging to conduct a before-and-after comparison that could isolate the impact of this program, which focused on one aspect of an integrated health system in which multiple factors play a role in people's access to high-quality HIV care.

Finally, the proximal timing of this evaluation relative to the end of PEPFAR's funding limited the ability to detect potential impact on population-level HIV indicators such as incidence, prevalence, morbidity, and mortality. Any effects on these outcomes would be expected to manifest much later; investments in health professional education can take years to have an effect on patient- and population-level outcomes, given the time required for training and for trainees to enter the health system in the necessary volume and duration.

The committee has crafted a report to be useful to PEPFAR as it reflects on its investments in the Program. The report also contains valuable information for the Government of Rwanda as it continues strengthening its health workforce and health system to address the evolving needs of its population, including with respect to HIV. In addition, the report can inform other stakeholders in Rwanda engaged in that work, such as other funders, health professional educational institutions, professional societies, patient advocacy groups, and other civil society organizations. Further, there are lessons for stakeholders in other countries aiming to strengthen health systems and the health workforce through professional education.

FINDINGS AND CONCLUSIONS

The evaluation's overarching findings are visualized in Figure S-1, organized according to the report chapters where they are presented in detail. Based on findings about both the successes achieved and the challenges experienced in the Program, the committee was able to draw conclusions about its implementation and its effects.

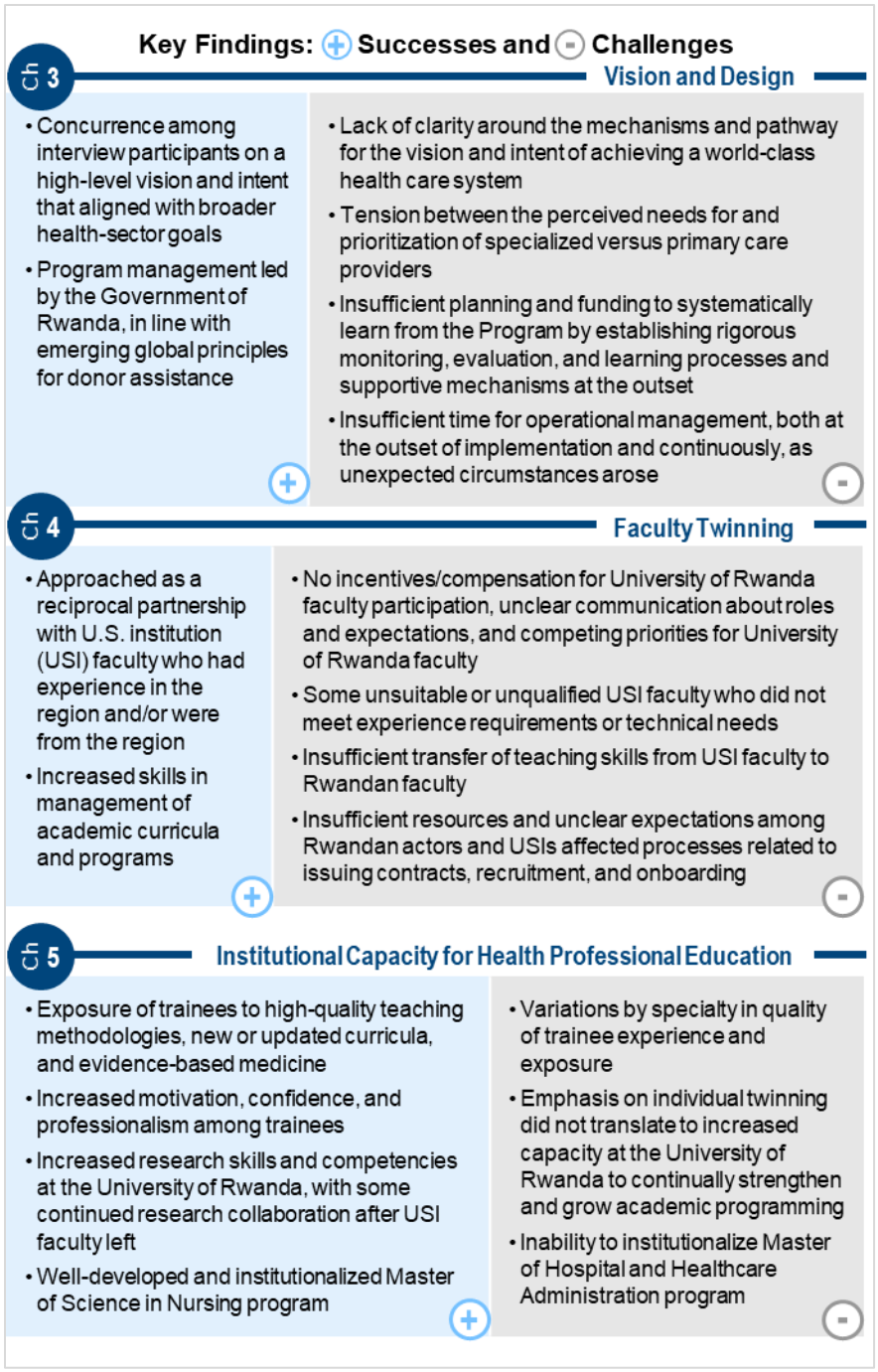

FIGURE S-1 Key findings: successes and challenges.

FIGURE S-1 Continued.

For the reasons described above, it would not be reasonable to expect investments in the broad, foundational capacity building represented by the HRH Program to result in large changes in HIV-specific, population-level outcomes within the time frame of this evaluation. Such investments are not designed to achieve relatively short-term, large-scale shifts in population disease outcomes and therefore may not be the appropriate choice if that is the singular intention of an investment.

Concurrent with the HRH Program, Rwanda experienced decreasing prevalence, increasing access to and coverage of ART, and increasing percentages of adults who know their status, are on ART, and have reached viral suppression. It would be reasonable to expect, in combination with a multitude of other factors, that some initial improvements in quality and availability of care resulting from the Program could contribute to such population-level outcomes. It would not be possible to isolate, quantify, and attribute such effects to this Program without a prospective evaluation design and available data matched to that purpose.

Nonetheless, this evaluation was able to draw some conclusions with respect to the Program's effects on PLHIV. Analysis of the available data suggests that improved quality of care links Program activities to programmatic impact—namely, improved overall health outcomes and HIV-related outcomes. Respondents with roles in both health professional education and health service delivery perceived the Program as contributing to improved quality of care for all Rwandans, including PLHIV, through direct and indirect pathways, such as greater availability of providers, improved skills for basic and HIV-specific care, and improved skills to address HIV-related complications. The Program was described as having a positive effect on the safety, effectiveness, timeliness, and accessibility of services for PLHIV. The potential for health professional education and increased production of providers to improve quality of care is limited by systems factors, such as infrastructure, equipment, diagnostics, and geographic distribution of referral services.

With respect to the goal to expand the quantity and quality of the health workforce in Rwanda, the Program achieved many successes. Exposure to high-quality teaching from faculty recruited through partnerships with U.S. institutions laid the groundwork for trainees to provide high-quality care, take on leadership roles, and train the next generation of health professionals. The Program improved the overall quality of professional preparation as a result of institutional capacity outcomes, such as new programs and new or upgraded curricula, and increased the quantity and quality of different cadres of health professionals, especially in nursing, midwifery, and selected medical specialties. It also increased trainees' research capacity, motivation as they entered the health workforce, and professional development opportunities. An improved relationship between the MOH and the Ministry of Education, as well as the strengthening of professional associations and professional councils, are results that could provide momentum to sustain and continue building institutional capacity. This evaluation could not speak to sustainability achieved through these gains because of how little time has elapsed since the end of PEPFAR investments.

The complexity of the HRH Program and the system it aimed to strengthen meant these successes were accompanied by challenges, which together offer lessons for future programming. Challenges with respect to the ambitious goals of increasing institutional capacity for health professional education included operational issues, variable implementation of the twinning approach that paired University of Rwanda and external faculty, insufficient design around the mechanisms intended to achieve the Program's full vision, and inadequate planning for the complexity of structural changes necessary to achieve and sustain improvements in health professional education. There was also a tension between the perceived need for specialized care and the perceived need for greater primary care. Unmet HRH needs remain, in terms of both sheer numbers of professionals and their geographic distribution.

When it was funded, the Program represented an uncommon, although not unique, donor approach to strengthening HRH capacity through a large investment in building capacity in health professional education institutions. This was a departure from PEPFAR's usual operational model between funder and government. Although it was not a requirement of the first phase of PEPFAR funding, without a clearly defined monitoring and evaluation plan at the initiation of the Program, there was a missed opportunity to systematically learn both how to strengthen HRH capacity, and how governments, other stakeholders, and external donors could together balance disease-specific priorities and broader health system needs.

IMPLICATIONS FOR HIV AND HUMAN RESOURCES FOR HEALTH PROGRAMMING

As Rwanda and other countries make laudable progress toward controlling the epidemic and improving treatment coverage, more PLHIV are living longer, with health needs that lie at the intersections of managing HIV and its complications over time, managing comorbid conditions, and attending to quality of life. Comprehensive support for the needs of PLHIV is increasingly dependent on the strength of the entire health system. Therefore, to advance their mission, it is in PEPFAR'S's interest to support comprehensive health system strengthening through long-term strategies that are well coordinated with other donor and government investments. To be most effective, these would not be designed around a specific disease, but it is also reasonable for disease-specific funders to expect their investments in broader efforts to have effects that contribute, albeit not exclusively, to disease-focused outcomes. Investments can contribute to programs designed to optimize and monitor disease-specific effects without interfering with broader systems effects. Such investments have the greatest potential to yield sustainable results.

RECOMMENDATIONS

The committee navigated this balancing act between disease specificity and systems strengthening in response to its task to make recommendations to "inform future HRH investments that support PLHIV and to advance PEPFAR's mission." The recommendations reflect a suggestion that when PEPFAR and other funders with a disease-specific mandate invest in HRH strengthening, they take a "diagonal" approach, seeking the intersection between vertical (disease-specific) needs and outcomes and horizontal (systemwide) efforts that can help meet those needs. The recommendations seek to make that intersection more balanced, achievable, and measurable for future investments in HRH. The recommendations offer a framework for designing and implementing future efforts to strengthen the health workforce and the provision of services for PLHIV.

Building on the successes from this Program, reflecting on the lessons learned, and recognizing the inherent complexity of HRH, these recommendations are organized around five key areas:

1. The need to codesign programming with diverse relevant stakeholders;
2. The importance of taking a complex systems approach;
3. The value of planning and adaptive management;
4. The importance of selecting an appropriate model (or components) for improving health professional education; and
5. The centrality of a proactive and multifaceted approach to monitoring, evaluation, and learning.

Program Codesign

Across respondents and program documents, there was concurrence on the Program's high-level vision, which aligned with broader health-sector goals, but there was lack of clarity among stakeholders around the mechanisms and pathways for achieving this vision. This had

implications for design, implementation, and sustainability planning and was compounded by participating institutions' differing administrative practices.

Recommendation 1: Funders investing in strengthening human resources for health should support a codesign model through a process that engages representatives from diverse stakeholders as the designers,[1] including funders, program administrators, implementers, regulatory bodies, and those who will use or benefit from the programmatic activities.

To ensure a feasible program that reflects reality and responds to the need, a collaborative, bottom-up design process that includes funders, government representatives across relevant sectors, implementers, and beneficiaries (in this case, faculty, students, and patients) can be an effective approach. The 2008 Accra Agenda and 2011 Busan Partnership highlight the importance of South-to-South partnerships and the multistakeholder model for development.[2] This model encourages national and subnational governments to play a greater role in oversight and accountability, civil society organizations to contribute to policy and implementation oversight, and the private sector to explore how to advance mutually reinforcing development outcomes.

Funding agencies' emerging use of cocreation models also provides a way to further include diverse stakeholders (such as implementing partners, host-country governments, private-sector representatives, and local organizations and experts) to lead activity design and structuring, enhancing local ownership and increasing the likelihood of achieving the results.

Design with a Complex Systems Thinking Lens

Health systems are complex and nonlinear, requiring cooperation across sectors and organizational units. The HRH Program underestimated this complexity. This was illustrated by the missed opportunity to actively engage the MOE and the University of Rwanda in the design and early implementation phases. This engagement subsequently improved in the course of operationalizing the Program. Another underestimation of complexity relates to time frame. Building a health workforce and being able to observe the resulting impact on HIV-related morbidity and mortality takes decades, a reality that was not reflected in the relatively short duration of PEPFAR's investments.

Recommendation 2: Designers of programs to strengthen human resources for health should employ a complex systems thinking lens, including multisectoral approaches that mix top-down and bottom-up models with long-term flexible funding that can support both the immediate needs of a health system and longer-term issues, such as the retention of health workers.

[1] Later recommendations that actions be taken by HRH program designers refer to this group of diverse stakeholders.

[2] This term describes collaboration among two or more low- and middle-income countries involving knowledge exchange and support that enable them to work toward their development goals.

Applying complex systems thinking can change how program designers conceive of health system challenges, the questions they ask about how to improve the system, and their understanding of the factors that support or hinder improvement. A systems approach also recognizes that the health system is nested within a larger government, and the health workforce is nested within regional labor markets, necessitating collaboration and coordination across sectors and among governmental and nongovernmental institutions.

For the health workforce, a systematic approach needs to be adopted in the context of the labor market, taking into account health worker supply and demand and how those interact dynamically with the need for health services, the health needs of the whole population, and national goals for access and coverage. Program design should not only create new health workers but also redress factors that undermine the capacity of the existing workforce. A labor market lens that considers both supply and demand can leverage existing investments in health professional education and correct imbalances in supply, which are often caused by the dominance of demand-side forces. Government health workforce production policies should be coordinated with policies in the education and labor sectors, as well as policies about absorbing newly educated health workers into the health sector. Governments should also regulate the private sector to ensure quality of care and appropriate, equitable health worker distribution. The private sector should drive innovation, such as public–private models for strengthening the workforce in response to market opportunities and other settings in which governments cannot effectively respond.

To align with the time frame needed to build an HRH pipeline, funding strategies should be long term and integrated with a recipient country's larger strategy. Funding needs to outlast donor countries' political terms and agendas and typical donor funding cycles, with a built-in transition to sustained country-led financing. Donors should accommodate this, to the extent feasible, with greater flexibility in shaping and adapting program budgets and processes. Donors should enable longer-term coordinated funding and incorporate practices such as an inception period in procurement processes; increased flexibility in revising objectives, targets, and outputs; and allowing a proportion of the program's budget for adapting strategies and development programming based on changing conditions. At the same time, donor expectations for revising programming should be clearly outlined for recipients, with transparency infused throughout the process. As partners, governments should focus on assembling diversified funding sources and convening public- and private-sector actors with vested interests in national HRH goals to coordinate financing initiatives and reduce reliance on donor funding, which can be volatile.

Planning and Adaptive Management

Overall management of the HRH Program was challenged by a lack of clarity around the mechanisms and pathways for achieving its vision and by the lack of time and capacity allocated for operational management, both at its outset and throughout implementation.

Recommendation 3: To maximize the effectiveness of investments in human resources for health, which inherently require change within a complex system, designers of programs to strengthen human resources for health should spend time before implementation to establish a shared vision, proposed mechanisms to achieve that vision, and an operational plan that takes an adaptive management approach.

Donors increasingly recognize the need for adaptability to make effective investments. Those funding HRH programs need to embrace this approach, including clarity of rationale and specificity of design at the outset, and learning-based adjustments as implementation proceeds. Program assessment and accountability should be responsive to realities encountered during implementation, rather than being narrowly based on adherence to the original design.

Adaptive management is an intentional approach to making decisions and adjusting programmatic activities in response to emerging information, unintended consequences, and unexpected challenges. Key principles include reframing program design and implementation from a linear to a more iterative process, building in flexible management structures, identifying periodic windows to assess and reconsider implementation decisions, and creating feedback loops between decision making and real-time information on the program's progress and struggles. Adaptive management is underpinned by robust, continuous, and usable data that are rapidly analyzed and debated to facilitate informed decision making within a culture of improvement. A critical aspect is coordinated consultation across departments and functions, balanced against defined roles and responsibilities for decision making and effective action. As discussed in Recommendation 6, HRH programs should include a comprehensive approach to monitoring, evaluation, and learning as an integrated responsibility not only for designated staff, but also for other technical and operational staff.

Models for Improving Health Professional Education

Building capacity in the HRH Program occurred predominantly through an academic consortium comprising U.S. institutions that contracted faculty to be paired in "twinning" relationships with University of Rwanda faculty. These faculty also provided direct teaching and clinical service provision. The Program had mixed results with twinning, predominantly caused by varied experiences in design, management, and implementation across specialties and nursing. Strengths included bringing external experts to the University of Rwanda, which improved the ability of Rwandan faculty to manage programs, enabled an increase in the number of trainees, and built lasting U.S. and Rwandan partnerships for research and faculty professional development. That the twinning program did not fully meet its objective of widespread, institutionalized teaching and clinical skills transfer was attributable to a lack of clarity in its design and operational challenges in its implementation.

Recommendation 4: Designers of programs to strengthen human resources for health should, on the basis of the vision and goals of the program, evaluate different models for improving health professional education that best fits the workforce needs to be met and the local structural and contextual considerations for human resource capacity building.

The HRH Program used an individual twinning model to build faculty and institutional capacity for health professional education. Other models are available and should be evaluated before selection, based on the programmatic goals and vision and the needs of the health workforce. Efforts to institutionalize improvement require the following:

- Structures to support faculty in the longer term;
- Availability of faculty to commit additional health professional education development;
- Adequate time and funding for accreditation processes, research skills building, and other aspects of health professional education beyond teaching skills;
- Long-term institutional partnerships; and
- Less time-intensive teaching models.

Program designers should consider the application of technology for education and skills building and the potential for blended learning (combining technology with traditional face-to-face approaches).

For programs that select twinning models to improve health professional education, this evaluation offers several lessons for potential improvements, depending on the time frame, goals, and desired type of skills to be transferred.

Recommendation 5: Designers of programs to strengthen human resources for health who want to employ paired partnerships, or "twinning," should identify clear objectives and consider an integrated design, with twinning partnerships at both the institutional and individual levels that are based, to the extent available, on best practice guidelines.

Institutional twinning comprises partnerships between institutions, which may include aspects that are operationalized through individual relationships between participating faculty or practitioners. The World Health Organization (WHO), the European Union's ESTHER[3] Alliance for Global Health Partnerships, and the United Kingdom's Tropical Health Education Trust have all employed institutional twinning partnerships and have well-developed definitions, practices, processes, and tools for designing, implementing, and assessing the effectiveness of institutional twinning models.

Individual twinning comprises partnerships based on pairing individuals in peer-to-peer, mentoring, or trainer–trainee relationships. Their effectiveness can be enhanced when carried out under the umbrella of an effective institutional partnership. Operationalizing peer-to-peer twinning support should consider methods such as blending in-person and distance learning or bidirectional international placements of shorter durations. Using ratios greater than one-to-one for partnering between external and local twins could be another effective approach.

There are two key themes that should be considered when strengthening health professional education institutions via any twinning model. First, the approach should be adapted to the funding context and the country needs. It is imperative to consider the cultural, linguistic, and historical dynamics involved in twinning relationships, by preparing and coaching twins and prioritizing regional twinning when possible. Second, twinning should be considered a partnership. Partners should formally agree to predefined roles that are shared transparently with the individuals involved before initiating the relationship. Roles could include exchanging knowledge while sharing teaching or clinical responsibilities, mentorship, training or a mix of these.

[3] The organization's original name was Ensemble pour une solidarité thérapeutique hospitalière en réseau (ESTHER) or Network for Therapeutic Solidarity in Hospitals against AIDS, as it was known in English.

Programs that develop robust plans for learning, as discussed in Recommendation 6, will make a much-needed contribution to the knowledge base on twinning methodologies and their effectiveness.

Monitoring, Evaluation, and Learning

While there was recognition that the HRH Program presented an unprecedented opportunity at the intersection between health systems strengthening and HIV, there was insufficient planning and investment to learn systematically from the endeavor through monitoring and evaluation support established at the outset.

> **Recommendation 6**: **Designers of programs to strengthen human resources for health should craft and resource a robust and rigorous framework for monitoring, evaluation, and learning that fits the complex, interconnected, and often changing nature of health systems, and that balances costs and feasibility with transparency, accountability, and learning.**

Rigorous monitoring, evaluation, and learning should begin in the design phase by drawing on a wide base of evidence to increase relevance and effectiveness in the country's current context. Elements include background research on relevant models in the region, social or organizational network analysis of existing actors working to improve HRH, or the use of available tools and guidelines, such as those compiled by WHO, to identify gaps and estimate specific needs within the health workforce, including HIV-specific workforce needs.

A baseline needs assessment should inform how to balance competing priorities, such as emphasis on specialized or primary care. With respect to HIV/AIDS, a long-term design for HRH investments needs to reflect the anticipated future of the epidemic—strengthening a health system to be able to care for an aging PLHIV population. The design of HRH programs should consider the anticipated evolution of workforce needs as the burden of disease shifts over time. In Rwanda, for example, many of the documented emerging clinical needs fall outside the realm of HIV/AIDS. Comprehensive, coordinated assessment will enable future HRH investments to identify common barriers and opportunities, as well as those specific to diseases and specialties.

Program design should also include ongoing mixed-methods monitoring with built-in pause points for actionable learning. Key components include a priori selection or development of indicators to evaluate the program's effectiveness, efficiency, and outcomes and a funded plan for dissemination and use of findings. Ongoing monitoring should draw on or improve existing government data systems to minimize burden and ensure data systems also benefit from the investments. Periodic evaluations or special studies that look at particular aspects of the program could provide a useful complement to routine, ongoing data collection and use.

Systematically designed plans for monitoring, evaluation, and learning with sufficient funding and staffing would enrich understanding of what it takes to build, implement, and sustain an effective HRH program, as well as the program's potential impact. Early process indicators can support course corrections. Measures selected and timed appropriately can document longer-term effects of systems change. If an HRH-strengthening program uses a twinning model, monitoring of the twinning process and interactions and adapting recruitment and onboarding accordingly could improve implementation and achievement of results. Mapping and tracking trainee placements and roles following the program would facilitate analysis of the program's

effect on patient outcomes. If there is an expectation that a program should demonstrate a contribution to both systemwide and disease-specific effects, each of these areas of monitoring, evaluation, and learning needs to be designed from the outset to document and assess that dual intent.

CONCLUSION

The HRH Program, funded by PEPFAR from 2012 to 2017, represented an opportunity for a vertical, HIV-focused external donor to invest in horizontal systems change by strengthening Rwandan health professional education institutions to produce a workforce of sufficient quantity and quality to meet the needs of the Rwandan population, including PLHIV. During PEPFAR's investments in the Program, notable inroads were made in producing more high-quality health workers, and participants in this evaluation were overwhelmingly in support of the Program. The full realization of this opportunity in the form of improved capacity at the institutional level to continually produce health workers was hampered by insufficient planning, muddled communications, and weak monitoring, evaluation, and learning for adaptive management. While important lessons can be drawn from the Program's successes and its challenges, there was a missed opportunity for systematic learning from the approach taken, owing to the lack of a prospective design to document and evaluate the systemwide effects and the specific effects on HIV care.

The future of strengthening HRH in resource-limited settings, in ways that also yield improvements in health care outcomes for PLHIV, requires a reimagining of how partnerships are formed, how investments are made, and how the effects of those investments are documented. The effect of such investments is likely to be greater and more lasting if program investments are longer, multisectoral, and designed with more explicit attention to understanding and meeting health workforce needs in light of the evolving needs of PLHIV.

1

Introduction: Evaluation of Scope and Approach

BACKGROUND

Since 2004, the U.S. government has provided support for global HIV programs through an initiative known as the President's Emergency Plan for AIDS Relief (PEPFAR). As the largest bilateral donor to the global response to HIV, PEPFAR is a multifaceted and complex initiative. Working through many partners, including country governments and nongovernmental organizations, PEPFAR supports a range of activities, such as direct service provision, programmatic support, technical assistance, health systems strengthening, and policy facilitation. These activities are implemented in the cultural, social, economic, and political landscape of each partner country, and in the presence of HIV and health programs supported by other domestic and donor funding sources. These efforts have contributed to saving and improving the lives of millions of people around the world (IOM, 2013).

As the focus of global and national responses to the epidemic transitioned from an urgent need to scale up HIV services to sustainability and country ownership of HIV programs, strengthening components of the broader health system, such as human resources for health (HRH), remained crucial for delivering services and achieving better health outcomes (Palen et al., 2012). The Joint Learning Initiative, the *World Health Report 2006,* and the Global Health Workforce Alliance all highlighted the increasing HRH shortage, most acute in countries heavily affected by HIV, and called for greater investments in health workers (Palen et al., 2012). This included scaling up education and training to boost the number of qualified health workers, as well as addressing skills mix imbalance, retention, migration, and maldistribution (Chen et al., 2004; WHO, 2006; WHO and GHWA, 2008). The PEPFAR 2.0 HRH strategy, based on these development frameworks, was also aimed at innovative health service delivery models, such as task shifting, quality improvement, and regulation of providers (PEPFAR, 2015). Among HRH initiatives that emerged as a result, three PEPFAR-funded efforts—the Medical Education Partnership Initiative, the Nursing Education Partnership Initiative, and the General Nursing Project—played important roles in expanding the workforce of physicians, nurses, and midwives and the capacity of health professional education institutions in Africa.

The Republic of Rwanda has been a PEPFAR partner country since the beginning of the initiative.[1] Rwanda has made steady improvements in its response to HIV, with increasing access to and coverage of antiretroviral therapy (ART) and a steady decrease in HIV prevalence (Nsanzimana et al., 2015; UNAIDS, 2018a). Government leaders in Rwanda have long advocated for equity, integrated service delivery, and systems strengthening in the health sector (Binagwaho et al., 2014; Nsanzimana et al., 2015). However, despite gains in the response to HIV and in other key population health indicators since the 1994 genocide against the Tutsi, Rwanda has a health worker density of just 1.1 per 1,000 population for physicians (0.1 per

[1] United States Leadership Against HIV/AIDS, Tuberculosis, and Malaria Act of 2003, P.L. 108-25, 108th Cong., 1st sess. (May 27, 2003).

1,000), nurses and midwives (0.7 per 1,000), and other health workers (0.3 per 1,000) combined (Open Data for Africa, 2018)—far below the World Health Organization (WHO) recommended minimum of 4.45 skilled health workers per 1,000 population (WHO, 2016).

RWANDA HUMAN RESOURCES FOR HEALTH PROGRAM

Reflecting a prioritization of HRH in Rwanda, the HRH Program was originally designed as an 8-year program (2011–2019) to respond to four key barriers the Rwandan government had identified as preventing the provision of high-quality health care: (1) a shortage of skilled health workers; (2) poor quality of health worker education; (3) inadequate infrastructure and equipment for health worker training; and (4) inadequate management across different health facilities (MOH, 2011). The HRH Program, which was designed, managed, and implemented by the Rwanda Ministry of Health (MOH), sought to remedy these issues by partnering with U.S. medical, nursing, dental, and public health training institutions to build institutional capacity at the University of Rwanda College of Medicine and Health Sciences and to augment and increase the capacity of the country's health care workforce (Binagwaho et al., 2013; Cancedda et al., 2017; Uwizeye et al., 2018).

In addition to PEPFAR funding, primarily through the U.S. Centers for Disease Control and Prevention (CDC), the Program was supported by other major funders, including the Global Fund to Fight AIDS, Tuberculosis and Malaria; the Rwandan MOH; and, to a lesser extent, other entities (Cancedda et al., 2018). In 2015, PEPFAR adopted a new strategy that required country programs to focus resources in high-burden geographic areas and on key populations (PEPFAR, 2014). The strategy resulted in a reconfiguration of PEPFAR's HIV portfolio in Rwanda and a decision not to continue funding the Program (PEPFAR Rwanda, 2015).

HRH Program Framework

The Program framework (see Figure 1-1),[2] describes the ultimate goal of the HRH Program, which was to "upgrade Rwanda's health professional workforce to be of sufficient quantity and quality to meet the national need" (MOH, 2014). the Program proposed a number of ambitious workforce expansion targets by cadre:

- Nearly double the number of physicians (from 633 to approximately 1,182) in 8 years (MOH, 2011).
- More than triple the number of specialty physicians (from 150 to 551).
- Increase the overall size of the nursing and midwifery workforce by 25 percent (Binagwaho et al., 2013).
- Increase the proportion of nurses with advanced certificate training by more than 600 percent.
- Increase the number of trained professional health care managers from 7 to 157, so each district, provincial, and referral hospital could be professionally managed (Binagwaho et al., 2013; MOH, 2011).

[2] The HRH Program Framework is taken from the Program's 2014 monitoring and evaluation plan (MOH, 2014). It is presented here unaltered. It reflects the whole of the Program, which includes PEPFAR, the Global Fund, and other financial investments.

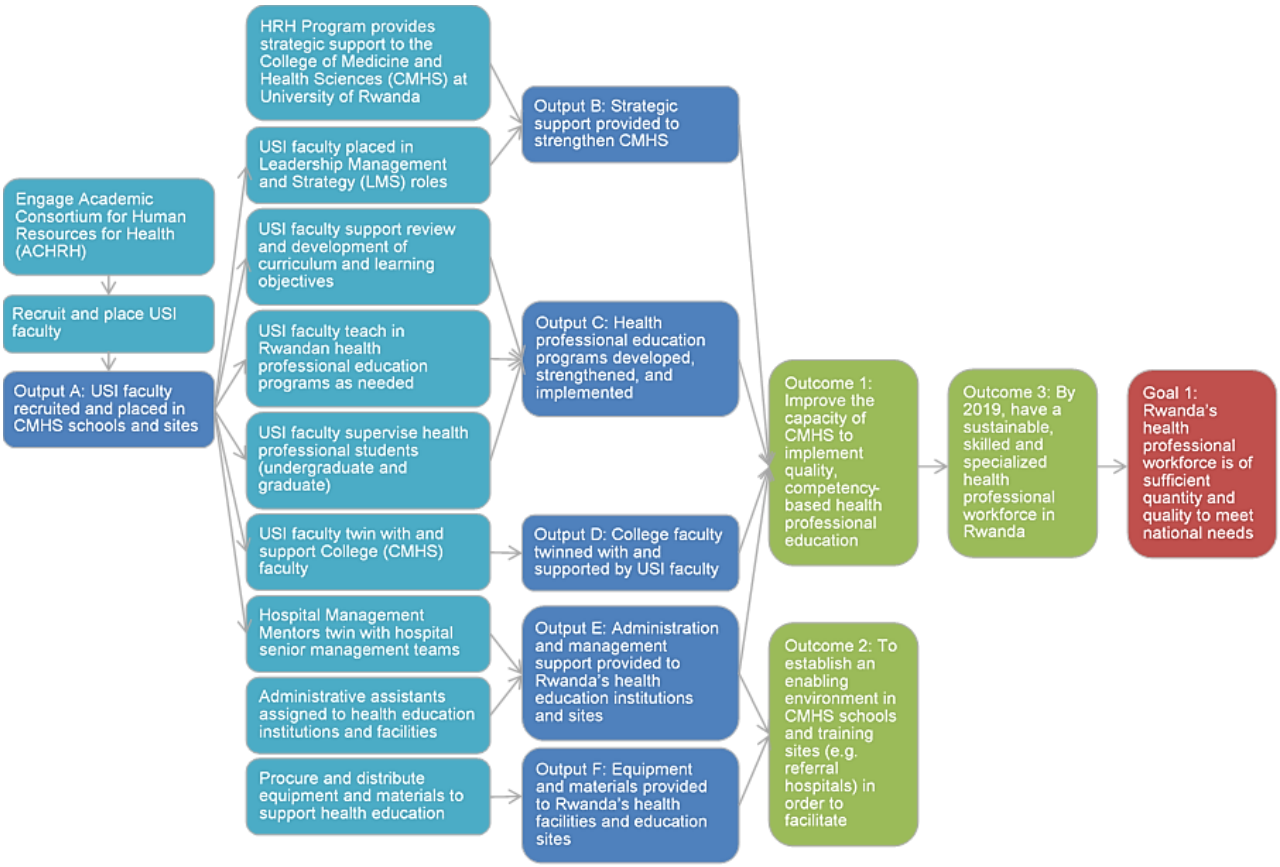

FIGURE 1-1 HRH Program framework.
NOTE: CMHS = College of Medicine and Health Sciences; USI = U.S. institute.
SOURCE: MOH, 2014.

To accomplish its goal, the HRH Program was designed to include numerous activities. U.S. medical and health professional universities provided instructors for Rwanda's new health educational and training programs, filled gaps in teaching rosters for existing programs, and supported Rwandan educators in the development of new curricula and professional training programs (Cancedda et al., 2017, 2018; Uwizeye et al., 2018). A twinning program, pairing Rwandan and U.S. institution (USI) faculty and professionals, sought to build knowledge, promote the transfer of clinical and teaching skills, and facilitate research collaboration (Binagwaho et al., 2013; Cancedda et al., 2018; Ndenga et al., 2016). In addition, the HRH Program's hospital quality improvement projects assigned faculty from USIs to hospitals to build leadership capacity (MOH, 2016). Other important efforts to build the institutional capacity of Rwanda's medical and health professional institutions under the HRH Program included upgrading equipment and infrastructure at teaching facilities and training professional health managers (Cancedda et al., 2018). To make teaching a more attractive career option, the Program proposed a variety of structural and policy changes, including a new career laddering system within health cadres (MOH, 2011).

The HRH Program was fully managed and operationalized by the Government of Rwanda. The MOH set up a new management and advisory infrastructure to run the Program. It received direct U.S. and other donor funding and expended these funds, in part, through contracts with U.S. medical and health professional institutions that, as part of an academic consortium of

22 USIs, had been selected to provide faculty and health professionals to implement capacity-building and workforce-strengthening activities (Binagwaho et al., 2013; Cancedda et al., 2017, 2018).

CHARGE TO THE COMMITTEE

At the direction of the U.S. Global AIDS Coordinator, the Health and Medicine Division of the National Academies of Sciences, Engineering, and Medicine (the National Academies) was asked to undertake an evaluation of the HRH Program, through a single-source request for application from CDC (CDC-RFA-GH18-1850). The National Academies had been called on previously to evaluate the implementation and impact of PEPFAR programs (IOM, 2007, 2013). Box 1-1 presents the full Statement of Task, as provided by CDC and the Department of State's Office of the U.S. Global AIDS Coordinator and approved by the Governing Board of the National Academies.

In response to this request, the National Academies appointed a committee of experts to carry out the evaluation as a consensus study. The committee is a multidisciplinary group of experts, selected based on their relevant knowledge and experience, expressly for the purpose of conducting this evaluation. Members have expertise in health workforce and health professional education, HIV clinical care and service delivery, health care quality, health services research, mixed-methods research, epidemiology, biostatistics, and health economics. See Appendix A for more information about the committee.

BOX 1-1
Statement of Task

An ad hoc committee will evaluate and document PEPFAR's investments in human resources for health (HRH) in Rwanda. The purpose of the evaluation is to understand how the CDC PEPFAR-funded Ministry of Health HRH Program (funded 2012–2017) affected morbidity and mortality outcomes for people living with HIV (PLHIV).

To achieve this aim, using a participatory approach which seeks the views and assessments of relevant stakeholders, the evaluation will, to the extent feasible, specifically address the following:

1. Describe PEPFAR investments in HRH in Rwanda over time, including its support for the Ministry of Health's (MOH's) efforts to address HRH needs as well as the broader context in which these investments were made.
2. Describe PEPFAR-supported HRH activities in Rwanda in relation to programmatic priorities, outputs, and outcomes.
3. Examine the impact of PEPFAR funding for the HRH Program on HRH outcomes and on patient- or population-level HIV-related outcomes. This will include comparing national and subnational HIV incidence and prevalence and HIV-related morbidity and mortality before PEPFAR-HRH Program implementation to during and after PEPFAR-HRH Program implementation, using data from baseline and repeat HIV surveys as well as other available data sources.
4. Provide recommendations to inform future HRH investments that support PLHIV and to advance PEPFAR's mission.

The design and operationalization of this evaluation was conducted in accordance with specific National Academies' policies and procedures that are in place to assure neutrality and objectivity for its consensus studies. Therefore, the study committee, staff, and evaluation team explicitly do not include any individuals who are affiliated with the sponsor of the evaluation, the funders of the program being evaluated, the implementers of the program, or parties with any other conflict or perceived conflict of interest. Given the wide reach of the HRH Program in Rwanda, overlapping with most individuals in fields of expertise and professional roles related to both health professional education and health service delivery, the committee does not have any members who are from Rwanda. Members of the committee do have experience in clinical care, HRH, and health professional education in Rwanda and throughout the region.

An advantage to the use of an external evaluator is that it optimizes objectivity and neutrality in the evaluation design, data collection, analysis, and interpretation, and it provides assurance that the resulting conclusions and recommendations have not been vetted or controlled by those closely affiliated with or affected by the subject of the evaluation. A disadvantage of an external evaluation can be that the evaluators do not inherently have the depth of context or the first-hand knowledge and insight of those who were directly involved. To enable appropriate interpretation of the available evidence and to foster the generation of meaningful conclusions and useful recommendations, it is important to incorporate this perspective and experience.

This evaluation incorporates several elements designed to accomplish this. First, a range of data sources were used to gather information about the context in which the HRH Program operated, as called for in the Statement of Task. The evaluation design also included the

participation, through qualitative methodologies, of stakeholders with direct knowledge of the context and first-hand experience of the Program. Furthermore, in addition to study committee members with experience working in Rwanda, the evaluation team who carried out data collection and analysis included members who are Rwandan and contributed their contextual understanding. More broadly, stakeholders close to the Program in Rwanda had the opportunity to participate in public meetings, held in Kigali in December 2018 and May 2019, and provide additional context on HRH and HIV in Rwanda. Several points during the operational planning phase of the evaluation also provided opportunities for cooperation with key parties involved in the implementation of the Program, primarily the MOH and PEPFAR Rwanda.

Before its public release, the report underwent a thorough review by another independent panel of experts with expertise in HRH, HIV, and other subjects and methods relevant to the evaluation. Among these reviewers were individuals from Rwanda. However, consistent with National Academies' policies protecting the independence of the committee's work, the sponsor and key parties involved in the HRH Program neither reviewed preliminary findings, conclusions, and recommendations nor changed the draft report before its public release as a final document.

COMMITTEE'S APPROACH TO THE CHARGE

Overview

In response to the Statement of Task, the evaluation applied a retrospective, concurrent mixed-methods design, drawing on literature and document review, qualitative interviews, and secondary analysis of quantitative data. Chapter 2 describes the design and methodology in more detail. By drawing on multiple complementary data sources, the design provided flexibility to capture what results had occurred, while gaining a deeper understanding of how the gains were achieved and why change did or did not happen. This design also enabled insight into how different stakeholders, implementers, participants, and beneficiaries experienced the HRH Program and its effects.

The committee used a contribution analysis approach that focused on the potential contributions to observed outcomes by understanding how the Program and its components were implemented and what effects they produced, and by examining the contextual factors that may have enhanced, moderated, or otherwise influenced outcomes (Moore et al., 2014). The analysis of the effects of the Program was informed by a theory-based causal pathway, described under the section "Theoretical Framing," that reflects how programmatic activities and resulting changes in HRH outputs could be reasonably expected to contribute to intermediate HRH and health outcomes for people living with HIV (PLHIV).

The evaluation also employed appreciative and utilization-focused principles and a socioecological framework. Appreciative approaches in evaluation are effective in identifying often unrecognized programmatic results from the perspectives of diverse stakeholders, and in determining strengths on which to build for future efforts (Preskill and Catsambas, 2006). A utilization-focused approach ensures insights are grounded in the realities of those closest to a program and is more likely to provide useful and realistic recommendations to inform future activities and investments in HRH for HIV in Rwanda and elsewhere (Patton, 2008). Applying a socioecological framework provides a lens through which to view how different levels

(individual, interpersonal, community, organizational, and policy) interact and influence outcomes separately and as part of a larger system (McLaren and Hawe, 2005).

Evaluation Scope and Time Frame

The charge to the committee was to focus on PEPFAR investments in the HRH Program. The use of PEPFAR funding is difficult to isolate in this Program, which was implemented through an integrated financing stream that drew from multiple combined funding sources (described further in Chapter 3). Therefore, the evaluation focused on activities within the Program that were supported, although not exclusively, by PEPFAR. These included building health professionals' capacity to train HRH in nine clinical and management specialties (anesthesia, emergency medicine, internal medicine, nursing and midwifery, obstetrics and gynecology, pathology, pediatrics, surgery, and hospital administration) and investments in equipment.

The evaluation focused on the activities carried out during the years when the HRH Program received PEPFAR-supported funding (2012–2017), also taking into account ongoing and lasting effects of those activities and the effects of the 2015 decision not to continue PEPFAR funding through 2019.

Theoretical Framing

Theoretical causal pathways facilitate understanding of how complex interventions plausibly contribute to more distal outcomes and show the processes undertaken to achieve those outcomes. Investments to expand health professional education and training capacity ultimately aim to contribute to improved health outcomes, although different capacity-building strategies vary in their timeliness of effect, in terms of both outcomes for health professionals and population health outcomes (WHO and GHWA, 2008). There are several pathways by which investments in HRH capacity could yield improved health outcomes. Although the HRH Program was designed to "build the health education infrastructure and health workforce necessary to create a high-quality, sustainable health care system in Rwanda" (MOH, 2011), the Statement of Task necessitates linking the Program's aims to HIV-related outcomes at the population and patient levels. These outcomes reach further downstream than the stated goals and outcomes of the HRH Program.

Developed through a combination of existing evidence, theory, and the expertise and knowledge of the study committee, the theoretical causal pathway (see Figure 1-2) strives to bridge the gap between the Program's intentions and the evaluation's objectives; it also guided the evaluation's lines of inquiry and assessment of the contribution of PEPFAR-supported Program activities. The pathway is holistic, in that it includes elements that, although not funded under the HRH Program with PEPFAR support, are essential for building a health workforce that can effectively respond to the health needs of PLHIV. Taking this holistic view of HRH and associated needs to produce improved health outcomes for PLHIV facilitates examination of the context in which the Program was implemented.

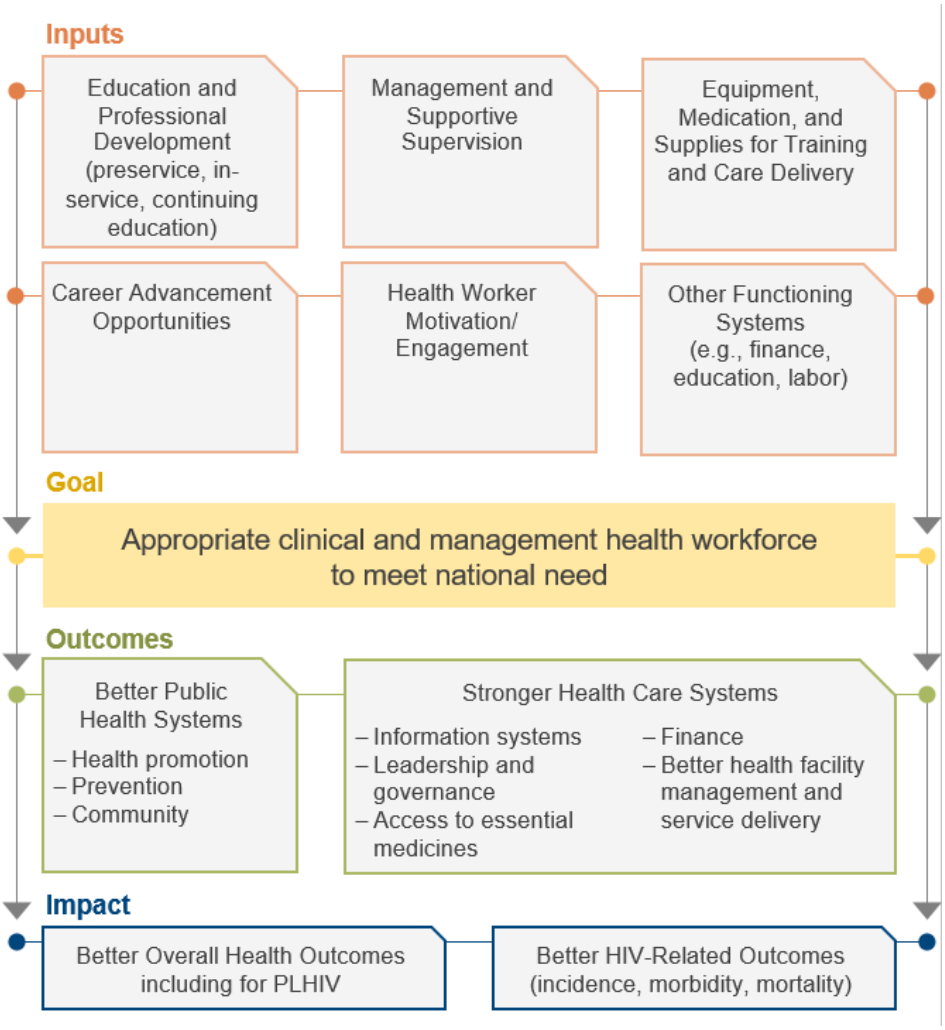

FIGURE 1-2 Theoretical causal pathway for the evaluation.

As the causal pathway illustrates, a stronger health workforce that is able to meet the health needs of the population is understood, along with other factors, to generate improved public health and health care delivery systems. The combination of a functioning health system with an effective workforce results in better-quality services. This, in turn, contributes to improved health outcomes in general, including for PLHIV, and improved HIV-related outcomes, such as decreased incidence, mortality, and morbidity.

Key HRH outcomes, such as the number and density of health care workers, have been linked to important health services and population health outcomes. For example, lower physician density has been associated with higher maternal, infant, and under-5 mortality rates, and higher aggregate health care provider densities have been associated with higher immunization coverage and better health status (Anand and Bärnighausen, 2004; Robinson and Wharrad, 2001; Speybroeck et al., 2006). Other studies have found a negative relationship between physician density and morbidity more broadly, as measured by disability-adjusted life years (Castillo-Laborde, 2011). The WHO Task Force for Scaling Up Education and Training for Health Workers suggests that intermediate health outcome indicators related to direct contact

with health care providers could be a useful way to measure health workforce scale-up (WHO and GHWA, 2008).

Although crucial for producing an effective health workforce, pre-service and in-service health professional education alone are not sufficient. Health worker performance is also influenced by management and supportive supervision practices, professional development and promotion opportunities, salaries and other incentives, and functioning systems in the health sector, such as referrals and supply chains (Bello et al., 2013; Henderson and Tulloch, 2008). Health workers' engagement with their jobs is also associated with facility performance (Alhassan et al., 2013). For example, a recent study in Tanzania found that every 10 percent increase in health workers' job satisfaction was associated with a 1 percentage point decline (95 percent confidence interval [CI]: 0.3–1.6) in HIV patients lost to follow-up (Lunsford et al., 2018).

It is widely recognized that a comprehensive health system is required to implement the interventions needed to decrease HIV-related mortality. However, it is also widely accepted that access to skilled HRH contributes to improved health outcomes and that insufficient HRH can exacerbate the impact of the HIV epidemic (McCoy et al., 2008). There can also be a bidirectional effect, in which investments in the response to HIV affect HRH, as evidenced by the effect, over time, of HIV funding from PEPFAR and the Global Fund on countries' HRH strategies and policies (Cailhol et al., 2013).

Much of the literature addressing HRH and HIV focuses on task shifting and scale-up of antiretroviral therapy (ART) services. Jaskiewicz and colleagues (2016) note a positive association between filled health care worker positions and greater provision of preventive services, such as testing and co-trimoxazole preventive therapy, which is commonly to reduce HIV-related infections. Other studies have noted an association between staffing shortages and greater attrition for PLHIV (Govindasamy et al., 2012) and an association between greater staff burden for pharmacy staff—but not other facility staff—and greater risk of attrition for HIV patients (Lambdin et al., 2011).

Finally, although not illustrated in this theoretical causal pathway, it is important to note that many elements beyond the health sector influence the efficiency and effectiveness of the health system, both as a whole and in part. For example, without a functioning education sector that supports general education and professional educational institutions, students may not be prepared with the knowledge, skills, and competencies they need to be trained as health workers capable of providing high-quality care.

Assessment of Causality and Contribution to Impact

The third objective under the Statement of Task is to examine, "to the extent feasible, … the impact of PEPFAR funding for the HRH Program on HRH outcomes and patient- or population-level HIV-related outcomes." The committee used the analytical approach of contribution to impact, the accepted standard, as an effective methodology for evaluating complex development assistance programs where an experimental design is not appropriate or feasible (IOM, 2014; Leeuw and Vaessen, 2009). Several factors complicated the feasibility and compromised the appropriateness of measuring a counterfactual and observing attributable impact: the retrospective nature of the evaluation, the timing of the evaluation with respect to the HRH Program's plausible mechanisms of impact the interacting effect of other factors and concurrent programs on the outcomes of interest, and the lack of an appropriate comparator.

The committee was charged to design, plan, and carry out this evaluation after the HRH Program had been implemented and after the end of the investment period being evaluated. This retrospective nature of the charge to the committee limited investigation into the causal impact of the Program on health outcomes for PLHIV, and especially on the population-level HIV incidence, prevalence, morbidity, and mortality outcomes of interest named in the Statement of Task. When an understanding of causal impact is desired, the ideal design is prospective, with data collected from the beginning for either intervention and comparison groups or for a before-and-after comparison of the intervention group. This evaluation, by necessity, relied retrospectively on secondary indicator data that were not created or collected for evaluative purposes. As Chapter 2 details, a challenge for this evaluation was the availability of relevant, available measures to respond directly to requested aspects of the evaluation.

In addition, PEPFAR's investments in the HRH Program and the subsequent request for this evaluation took place relatively recently, compared to the time frame required to develop and deploy highly qualified nurses and physicians. Effecting population-level change through investments in health professional education should be expected to take many years, if not decades, given the time required for training and for trainees to make their way as fully qualified health professionals into the service delivery system and as faculty to produce ongoing cohorts of providers. At the time of this evaluation, not enough time had elapsed to reasonably expect a sufficient volume of newly trained health providers to have been in the health system for long enough to observe changes in the population-level outcomes specified in the Statement of Task that could be attributed to the HRH Program.

Further complicating the ability to assess attributable impact was the difficulty of distinguishing the effects of HRH Program activities on the outcomes of interest from the effects of the multitude of other factors that contribute to HRH and HIV outcomes. The theoretical pathway presented above illustrates the range of these other factors. Programs that support and strengthen these other factors have an interactive effect. Concurrent with the HRH Program, there were investments from PEPFAR and other sources to support direct service delivery, quality improvement, capacity building, strengthening of other building blocks of the health system, and other interventions, all with the ultimate aim of affecting the same HIV-related outcomes. Population-level changes in health outcomes that could be used to reflect program impact cannot be separated by specific programs or investments. This makes it difficult to isolate and attribute improvements to PEPFAR's investments in the HRH Program. Even impact on individual-level health measures is difficult to attribute, as the availability and quality of services an individual receives could be influenced by different programs, funded through different sources.

Another factor that ruled out an analysis of attributable impact was the lack of a comparator. Although it can be possible, in some cases, to employ a comparison design retrospectively, this was not an appropriate design in this case. Rwanda's health and higher education systems—and the political, sociocultural, and historical context in which they operate—are key factors in the implementation of the HRH Program, just as with any other program. Rwanda's unique context relative to other countries in Eastern and Southern Africa, the singularity of the University of Rwanda as the public-sector institution for health professional education in Rwanda, and the widespread deployment of the HRH Program's trainees meant there was no appropriate comparison setting where the Program was not implemented that would allow attribution of outcomes.

This is made more complex by the HIV-related accomplishments in Rwanda before the start of the HRH Program. In 2012, when the Program was launched, HIV prevalence was 3.2 percent, with 52 percent ART coverage (UNAIDS, 2018b). In comparison to other countries in the region, these rates put Rwanda with the highest ART coverage and some of the lowest prevalence (see Table 1-1).

TABLE 1-1 HIV Prevalence and ART Coverage in the Eastern and Southern African Regions, 2012

Country	HIV Prevalence	ART Coverage
Uganda	6.6%	30%
Kenya	5.6%	41%
Tanzania	4.9%	33%
Rwanda	3.2%	52%
Burundi	1.4%	32%
Democratic Republic of the Congo	1.0%	14%

SOURCE: UNAIDS, 2018a.

In 2016, Rwanda was the first country in the Eastern and Southern Africa region to reach the "first 90" in the 90-90-90 target (90 percent of all PLHIV knowing their status by 2020). It reached the "second 90" goal of placing 90 percent of people who know their (HIV-positive) status on treatment in 2017 (UNAIDS, 2018c). The relatively high baseline for key HIV indicators in Rwanda meant any effects caused by the Program would be relatively small in magnitude. This made it particularly difficult to conduct a before-and-after comparison that could discern and isolate observable effects for a single program, focused on just one aspect of a health system in which multiple, interacting factors all play a role in access to high-quality care for PLHIV and have contributed to achievements in HIV-related outcomes both before and during PEPFAR's investments in the HRH Program.

In light of these considerations, the committee used the lens of assessing contribution to impact in the context of the design and intent of the HRH Program and the landscape of other funding sources, other HIV programs, and other factors that affect health. Contribution analysis is an effective methodology in complex circumstances, where an experimental design or generating quantifiable measures of impact is not feasible or appropriate. In this approach, whether and how the elements of a theory of change led to the achievement of results are understood through concepts such as plausibility and reasonable agreement (Biggs et al., 2014; Mayne, 2011; Nakrošis, 2014).

Contribution analysis of this kind is accepted as an appropriate standard for large-scale development assistance programs because of their complexity (IOM, 2014; Leeuw and Vaessen, 2009), including specifically for PEPFAR. A 2008 Institute of Medicine workshop on design considerations for evaluating PEPFAR's impact highlighted the need to "shift to a broader definition of impact evaluation and to a more nonlinear concept of causation" (IOM, 2008). As Patton (2012) notes, contribution analysis is particularly useful "where there are multiple projects and partners working toward the same outcomes, and where the ultimate impacts occur over long time periods influenced by several cumulative outputs and outcomes over time," as is the case with HRH and HIV-related outcomes in Rwanda.

Contribution analysis approaches often begin with a theory of change, which is tested against evidence gathered throughout the evaluation (Mayne, 2012). The HRH Program had a

framework that informed its design, but it did not have a theory of change that reflected external factors or that linked program activities with the outcomes of interest in the Statement of Task—HRH and individual- or population-level HIV outcomes. For this evaluation, the contribution analysis of the effects of the HRH Program was informed by the theory-based causal pathway, described above. This approach enabled the committee to reasonably examine, to the extent feasible, the effects of PEPFAR's investment in the Program on HRH outcomes and on HIV-specific and other HIV-related health outcomes, including (1) the HRH Program's potential to have made plausible contributions to improving mortality and morbidity outcomes for PLHIV in Rwanda during the time frame considered in this evaluation, and (2) its potential to improve future outcomes, as HRH outputs resulting from the Program are deployed over time in the health system.

USE OF THE EVALUATION

This evaluation provides a valuable opportunity to describe and understand how PEPFAR's recent investment in building capacity for heath professional education in Rwanda, as part of efforts to address health workforce needs, contributed to HRH outcomes and to the health of PLHIV. Through a mixed-methods approach, guided by the theoretical causal pathway, the National Academies endeavored to respond to the request for this evaluation by conducting a rigorous assessment that took into account the complexities of the HRH Program and the Rwandan health system, the multitude of factors that contribute to health outcomes, and the challenges and limitations inherent in the timing and nature of the evaluation request.

By assessing convergence and consistency among findings from different yet complementary data sources and methods, and by exploring the data to understand areas of divergence, the committee was able to develop conclusions about the HRH Program's performance and effects, and make recommendations to inform future HRH investments that support PLHIV and advance PEPFAR's mission. The committee's hope is that the findings, conclusions, and recommendations generated from this evaluation and described in this report will be used by Rwandan, U.S., regional, and global stakeholders to inform future efforts to strengthen the health workforce in Rwanda and elsewhere.

ORGANIZATION OF THE REPORT

This report is organized in eight chapters. Following this introduction and description of the evaluation's scope and approach, Chapter 2 describes the evaluation design and methodology in more detail, followed by the findings and conclusions in Chapters 3 through 7. This includes content, corresponding to the committee's Statement of Task, that describes PEPFAR's investments in HRH over time; describes PEPFAR-supported HRH activities in Rwanda in relation to programmatic priorities, outputs, and outcomes; and examines the contribution of PEPFAR funding for the HRH Program to HRH outcomes and health outcomes, including HIV-related outcomes, in Rwanda. Chapter 3 examines the HRH Program's vision and its design, which had implications for the activities and outcomes described in later chapters. Chapter 4 explores the individual twinning model the HRH Program used to build individual capacity of University of Rwanda faculty in teaching and clinical practice.

Chapter 5 examines efforts to build institutional capacity at the University of Rwanda to continue producing high-quality health care workers. Chapter 6 presents data on the increased

production of medical specialists, nurses, midwives, and administrators, as well as data on procurement of equipment and supplies for medical education and training. In Chapter 7, the HRH Program's contribution to health care service delivery and quality of care is discussed, along with a more detailed discussion of how impact could be assessed under circumstances different from those encountered in this evaluation. Chapter 8 captures the overall messages of the evaluation and conveys the recommendations the committee has made in response to its charge.

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2

Evaluation Design, Methods, and Limitations

This chapter details the evaluation's operational design and methodology, building on the discussion of the theoretical framework in Chapter 1 and followed by a discussion of the limitations encountered.[1]

DESIGN

To address the Statement of Task, the evaluation applied a retrospective, concurrent mixed-methods design with embedded in-depth examinations and contribution analysis. The committee approach focused on the Human Resources for Health (HRH) Program's potential contributions to observed outcomes by understanding how the Program and its components were implemented and by examining the contextual factors that may have enhanced, moderated, or otherwise influenced outcomes (Moore et al., 2014).

Mixed-methods designs provide the flexibility to capture trends regarding what results have occurred, while enabling a deeper understanding of how gains were achieved and why change has (or has not) happened (Creswell and Plano Clark, 2007). Such designs also provide insight into how different populations might have experienced the intervention. Drawing on multiple data sources and approaches, this evaluation yields an understanding of both breadth (via quantitative data) and depth (via qualitative data). Using mixed methods and drawing on data across diverse data sources is of critical importance when evaluating complex interventions for which the pathway between activities and outcomes is nonlinear (Creswell and Plano Clark, 2007; Patton, 1987).

This evaluation draws from the following types of data:

- Literature and document review
- In-depth examinations of the University of Rwanda and a facility microsystem
- Qualitative interview data
- Quantitative secondary data

Figure 2-1 illustrates the link between the evaluation objectives and the design elements (e.g., document review, in-depth examination, qualitative interviews, and secondary quantitative data) used to address the objectives. The lower part of the figure shows that although the design was concurrent, some elements occurred sequentially. The document review preceded the concurrent qualitative interviews, in-depth examinations, and secondary quantitative data.

[1] The protocol for this evaluation underwent a scientific and technical review by the U.S. Centers for Disease Control and Prevention, Office of the Associate Director of Science, and was approved on April 25, 2019. Ethical approvals for this evaluation were also provided by the Rwanda National Ethics Committee (April 3, 2019) and the U.S. National Academies' Committee to Review Studies on Human Subjects (April 23, 2019).

Integrated interpretation was the final phase. Integrated analysis and interpretation occurred during July, August, and September 2019.

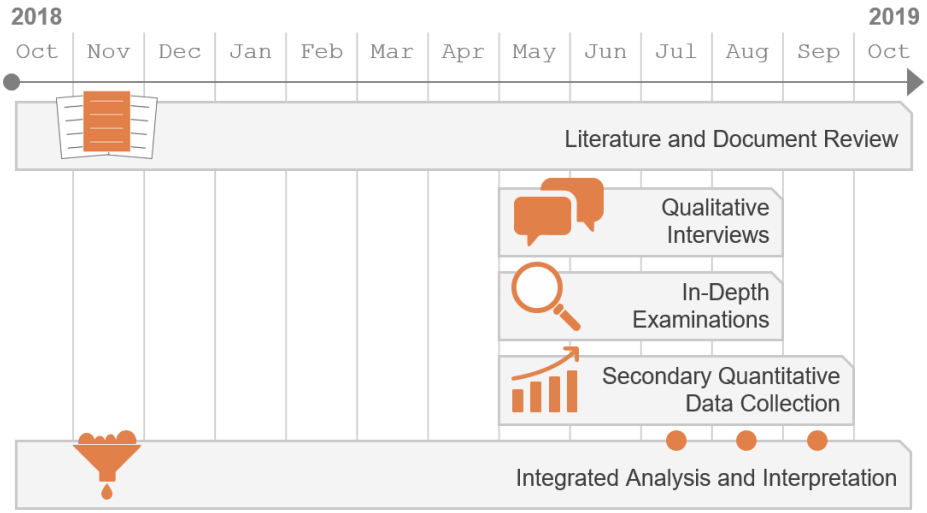

FIGURE 2-1 Evaluation process.

The data sources had complementary uses for the evaluation. The document review drew on policy and program documents, reports, and published literature. It situated the HRH Program within the broader HRH and HIV context in Rwanda and across the globe to understand the context and landscape in which the Program was designed and implemented and to inform an understanding of the extent to which the Program implemented activities and produced results as planned. Data from interviews with key respondents with specialized knowledge of the HRH Program—its inception, implementation, management, and transition after the close of funds from the President's Emergency Plan for AIDS Relief (PEPFAR)—were used to further address the evaluation objectives. These data provided insight into the Program's implementation and achievements, and into its perceived effect on HRH capacity and HIV service delivery. These data also facilitated the interpretation of findings from the document review and from secondary quantitative data for HRH and HIV outcome indicators, which were analyzed for trends over time.

The two in-depth examinations were conducted at the University of Rwanda and a "facility microsystem," a facility that receives referral patients from a lower-level facility. These deeper examinations provided a more holistic understanding of the effects of the HRH Program on the capacity to produce a workforce of sufficient quantity and quality to meet the needs of the Rwandan population, and of the HRH Program's role in affecting health care management and the provision of HIV and other health services. In an effort to assess the potential causal impact on HIV outcomes, the intention was to treat HRH Program graduates as an intervention, characterizing each district's dose based on quantity and type of graduate. The committee could then estimate the Program's pooled effect on the HIV outcomes of interest. However, unavailability of data at the required level of detail hindered the committee's ability to perform this type of analysis.

Evaluation Team

A team of expert evaluators from EnCompass collaborated with the committee and study staff in the design phase, carried out the primary qualitative and secondary quantitative data collection and initial analysis, and provided synthesized findings and initial interpretations to the committee. See Appendix A for more information about the EnCompass evaluators.

Sample

A mixed-methods design involves collecting data from diverse populations using an appropriate sampling methodology.

Literature and Document Review

The evaluation team conducted a thorough search to identify the documents for review, including HRH Program reports; relevant global and Rwandan policies, guidelines, plans, and strategies; and peer-reviewed and gray literature on topics related to HRH and HIV service delivery in Rwanda, the region, and worldwide. Key respondents shared additional documents during the qualitative data collection.

In-Depth Examination—University of Rwanda

The University of Rwanda, as the primary institution responsible for educating health professionals, was purposively selected to understand the institutional capacity for health professional education. The evaluation team identified and invited key respondents to participate in interviews. Key respondents were individuals with knowledge of the HRH Program design and implementation and with experience with the Program in the university, including administration, leadership, faculty, and students across relevant schools (medicine, nursing and midwifery, and public health).

In-Depth Examination—Facility Microsystem

The intention of the facility microsystem analysis, including at least a district hospital and a teaching/referral hospital, was to construct a bridge between the outputs of the HRH Program (a larger and well-trained health workforce, including greater availability of specialists for referral services) and patient-level outcomes for HIV. The evaluation aimed to designate facilities by degrees of exposure to the Program, as determined by having or not having HRH trainees on staff. However, as the evaluation team learned more about the Program, it became evident that all facilities had HRH trainees on staff, including hospital administrators, physician specialists, nurses, and midwives.

It was also important to gather experiences and perceptions from HRH trainees and frontline health workers working outside of Kigali, prompting the selection of the Centre Hospitalier Universitaire de Butare (CHUB), which is a university teaching hospital in Butare, Huye district (Southern Region), and Bushenge Hospital, Nyamasheke district (Western Region). These districts were chosen because they had similar HIV prevalence to the 2014 to 2015 Rwandan national average of 3 percent (NISR et al., 2016), making them typical cases with

respect to HIV-related indicators. Nyamasheke district had higher antiretroviral therapy (ART) coverage (85 percent) than the 2015 national average (74 percent) (PEPFAR Rwanda, 2016),[2] while Huye district was comparable to the national average in both categories (see Table 2-1).

TABLE 2-1 HIV Prevalence and ART Coverage in Facility Microsystem Districts

	Huye District	Nyamasheke District
HIV Prevalence Among People Aged 15–49*	2.9%	2.2%
ART Coverage**	73%	85%

NOTE: ART = antiretroviral therapy.
SOURCE: *NISR et al., 2015; **PEPFAR Rwanda, 2016.

Qualitative Interviews

Interviews (qualitative, and in both of the in-depth examinations) involved a predominantly purposive sampling approach, mixed with snowball sampling, in which information-rich respondents were selected during the first round. These respondents were then invited to suggest other potential respondents. Respondents were selected from the following categories:

- HRH Program administration, both within and outside the Government of Rwanda
- Faculty from U.S. institutions that were members of the HRH Program's academic consortium
- Professional associations and people living with HIV (PLHIV) groups
- Other key stakeholders, such as representatives and staff of other donors and international organizations working in HRH and HIV in Rwanda

Current employees of the U.S. Centers for Disease Control and Prevention (CDC) and PEPFAR at both the Rwanda country team and headquarters levels declined to participate as interview respondents, owing to a determination, made by CDC's Associate Director for Science, that there could be an actual or perceived conflict of interest.

The final sample of interview respondents across the three evaluation components (facility microsystem in-depth examination, University of Rwanda in-depth examination, and qualitative interviews) included 87 interviews (see Table 2-2).

[2] We recognize that more recent national-level estimates of ART coverage are available and indicate greater coverage; however, for selection purposes, it was necessary to use coverage estimates from the same year.

TABLE 2-2 Interview Respondent Sample

	Stakeholder Type	Sample
Qualitative Interviews	Government of Rwanda program administration	12
	Nongovernment (of Rwanda) program administration	4
	U.S. institution faculty	12
	Professional associations and professional councils	2
	Others (donors, international NGOs, experts, PLHIV groups)	5
University of Rwanda In-Depth Examination	Faculty	5
	Students	20
	Administration	7
Facility Microsystem In-Depth Examination	CHUB	12
	Bushenge Hospital	8

NOTE: CHUB = Centre Hospitalier Universitaire de Butare/University Teaching Hospital, Butare; NGO = nongovernmental organization; PLHIV = people living with HIV.

Several respondents fell into multiple stakeholder types (e.g., a student who had graduated and gone on to serve as a university faculty member, or a university faculty member who also held a leadership position in a professional association).

Data Collection

The evaluation team conducted a literature and document review and collected publicly available quantitative data between October 2018 and October 2019. Primary qualitative and requested secondary quantitative data were collected between May and September 2019.

Literature and Document Review

The evaluation team conducted a thorough literature and document review of materials on the HRH Program and related topics, as well as documents from other projects and programs related to HRH in Rwanda. The evaluators gathered publicly available documents from relevant websites dating from 1996 through 2019, beyond the end of PEPFAR's investment in the HRH Program. This time frame includes health system rebuilding following the genocide against the Tutsi, decentralization of the health system, and initiation of the HRH Program in 2012, and it extends beyond the implementation and closeout of PEPFAR's support of the HRH Program in 2017. The review comprised 4,267 documents:

- Program documentation: Request for proposals, proposals, designs, regular reporting to CDC, financial information provided by the Ministry of Health (MOH), and closeout documents
- Peer-reviewed, gray, and unpublished literature on the HRH Program, health workforce, health professional education, and the HIV epidemic in Rwanda more broadly, as well as HRH labor market analyses
- Government of Rwanda documents, including policies, strategies, plans, and guidelines on HRH and HIV service delivery at the national and subnational levels;

labor market reports and other documentation on labor market dynamics, as well as insurance scheme documentation
- Performance-based and results-based financing documents
- Global documents, including policies, priorities, strategies, plans, and guidelines on HRH and HIV service delivery from sources such as PEPFAR; the Global Fund to Fight AIDS, Tuberculosis and Malaria; the World Health Organization; and the Joint United Nations Programme on HIV/AIDS (UNAIDS)
- Program documents and publications from other HRH-related programs in Rwanda, including those from donors and implementing partners

Qualitative Data Collection

All qualitative data collection conducted as part of the two in-depth examinations and other qualitative interviews used Appreciative Inquiry, an asset-based approach that captures current strengths and the most significant changes identified by respondents, as well as desired realities and steps needed to reach those realities. Appreciative Inquiry actively engages respondents and increases the likelihood of obtaining rich information about sensitive topics (Preskill and Catsambas, 2006). Data were gathered via semistructured individual interviews and group discussions.

In keeping with the evaluation's appreciative and utilization-focused principles, interview guides emphasized collecting participants' views of what worked well in the HRH Program,[3] factors that facilitated or inhibited success, and opportunities for continued success in HRH in Rwanda. The guides also focused on areas where respondents saw potential for improvement in future HRH and health systems strengthening activities, programs, and initiatives. These approaches enabled the evaluation team to gather a variety of perspectives on HRH Program successes and challenges and to ensure relevant, realistic findings and recommendations.

A central tenet of qualitative methods is flexibility; in this case, the evaluators adapted and adjusted lines of inquiry and interview guides as new information and insights emerged. Data collection and analysis was iterative; data were coded and initial analyses were performed during the data collection phase to inform subsequent data collection. During regularly scheduled meetings, the evaluation team collectively determined new insights to examine more thoroughly and how to gather this information. This process involved minor modification to the interview guides to better understand the nuances of the HRH Program and context, but these changes were not substantive, in that they did not involve new topics or respondent groups.

Initial analysis of the transcripts was another means of evaluating and enhancing the quality of the data. Transcripts were evaluated for fidelity to the data collection instruments, appropriateness and depth of probing, detail of descriptive notes from the data collectors, and quality of the rapport between data collectors and key respondents. When issues arose, data collectors were retrained, focusing on improving areas of weakness. Data quality assessment took place throughout the data collection phase.

[3] Rwanda-based staff reviewed the interview guides for translation errors in Kinyarwanda and English and to ensure a clear understanding by all those interviewed. The semistructured interview guides were adjusted for relevance to respondent type. For trainee respondents, probes were adjusted as relevant. However, as is the standard when using semistructured interview approaches, the key questions were kept consistent to reveal trends across respondent groups.

Preference was for individual interviews to provide the space and confidentiality to examine individual experiences and potentially sensitive knowledge. All but one interview was individual. Respondents in Rwanda were invited to participate in person in Kigali and other locations; if scheduling did not allow, the data collection team offered a virtual interview option. Data were gathered in English, French, or Kinyarwanda, according to the respondent's preference. Respondents based in the United States or a third country were invited to participate in virtual interviews. Virtual data collection was conducted in English by U.S.-based evaluation team members using Zoom or Skype, depending on the quality of the connection and the respondent's preference.

All interviews and group discussions (in-person and virtual) were audio recorded, transcribed verbatim, and, when necessary, translated to English for analysis. Virtual interviews were recorded using an external device, not through the virtual platform's recording option, to avoid a third party's retaining a copy of the conversation.

In-Depth Examination—University of Rwanda

Interview guides for the in-depth examination with the University of Rwanda were tailored to those in administrative roles, those in faculty roles, and current and former students. Interviews explored the following topics:

- Experience with the administration of the HRH Program
- Process of, and experience with, building faculty capacity to train health care workers and managers, including via the twinning program and curriculum development
- Perception of systemwide effects of the HRH Program on health care service delivery in Rwanda: production, distribution, and management of HRH, including HIV service; planning and management at health facilities; and referrals between facilities
- Perception of the HRH Program's effect on the health education system infrastructure at the university

In-Depth Examination—Facility Microsystem

One Rwandan data collector made three site visits to collect data from the two facilities in the facility microsystem. Interviews were conducted with health care workers and health managers, those who had undergone training under the HRH Program, and those who had not. Interviews explored the following topics:

- Experience with health professional education training (preservice and in-service)
- Professional career path
- Job satisfaction and belief in their own capacity, morale, and motivation
- Perception of their job as an important, viable career
- (When applicable) Perception of systemwide effects of the HRH Program on health care service delivery in Rwanda: production, distribution, and management of HRH, with a focus on HIV service; planning and management at health facilities; and referrals between facilities
- (When applicable) Perception of the HRH Program's effect on the quality of HIV and other health services

Qualitative Interviews

Qualitative interview guides were developed according to initially identified relevant topics and then adapted iteratively, based on respondent type and what had been learned in previous data collection activities, following the approach described above. Table 2-3 lists the detailed interview topics by respondent type.

TABLE 2-3 Interview Topics by Respondent Type

	Respondent Type			
Interview Topic	Program Administrators (Rwandan Government Officials; PEPFAR Staff)	Twinned Faculty and HRH Program Leads from the United States	Rwandan Professional Association and National-Level PLHIV Group Leadership	Staff from Other Donors and Partners Working in HRH in Rwanda
PEPFAR investments in HRH broadly since 2011	x			
Plan and design of the HRH Program	x			
Experiences with health professional education in the HRH Program		x		
Management of the HRH Program	x	x		
Implementation of the HRH Program, including any changes that occurred	x	x		
Coordination across other investments in the HRH Program and other HRH activities in Rwanda	x	x	x	x
Perceived influence of Rwandan contextual factors on the HRH Program	x	x	x	x
Perceived influence of PEPFAR and global health contextual factors on the HRH Program	x	x	x	x

	Respondent Type			
Interview Topic	Program Administrators (Rwandan Government Officials; PEPFAR Staff)	Twinned Faculty and HRH Program Leads from the United States	Rwandan Professional Association and National-Level PLHIV Group Leadership	Staff from Other Donors and Partners Working in HRH in Rwanda
Perceived influence of the HRH Program on infrastructure for professional health education, production, management, and distribution of HRH; quality of services; and service delivery	x	x	x	x
Perceived effect of the early termination of the HRH Program	x	x	x	x
Perceptions of institutionalization of HRH Program achievements	x	x	x	x
Learning for future HRH investments in Rwanda	x	x	x	x

NOTES: HRH = human resources for health; PEPFAR = President's Emergency Plan for AIDS Relief; PLHIV = people living with HIV.

Quantitative Data

The evaluation team sent an informal request for quantitative data to the MOH and Rwanda Biomedical Center (RBC) on May 7, 2019, followed by a formal request, sent on May 17, 2019. The RBC issued an approval letter on May 20, 2019, but with the stipulation that study findings be shared with the RBC before publication or any dissemination. To meet this condition, the National Academies of Sciences, Engineering, and Medicine (the National Academies) proposed that the MOH conduct a technical review of the analysis of MOH-provided data and that a predissemination briefing be held with the MOH. The Ministry's agreement to this proposal was received on August 20, 2019, at which point the evaluation team began working directly with key individuals in the MOH to obtain these data. The following data were requested:

- HIV-related indicators at the facility level
- HRH Program trainee data: who was trained under the Program, in what specialty, graduation dates, and current place of employment
- Equipment procured under the HRH Program

- HRH Program budget and expenditures

The evaluation team did not receive facility-level HIV data from the MOH, leaving the committee to rely on publicly available data, predominantly from UNAIDS. Per communication with the MOH, there was not a readily available database of HRH Program trainees and their current places of employment; thus, it was not possible to understand which facilities had been exposed to the HRH Program. The MOH and the University of Rwanda did provide elements of the data on trainees alongside data from professional councils responsible for licensures and other publicly available data from Government of Rwanda sources, such as the Master Facility List. However, these data varied in some instances, confounding interpretation. Because of the timing of receipt of the data, the committee was not able to reconcile these variations across sources.

Data Analysis

Literature and Document Review

The evaluation team conducted text analysis of literature and documents using a Microsoft Excel spreadsheet set up to capture and organize data according to topics represented in the evaluation objectives and questions and reflecting the theoretical causal pathway discussed in Chapter 1. The team generated a timeline to more readily observe the events that preceded and were concurrent to HRH Program implementation, including after the end of PEPFAR funding for the Program. Comparison matrices were generated to explore convergence and divergence between what was planned as described in the design documents and what was executed, as described in HRH Program reports through 2017. Text and policy analyses were performed to examine key elements of the context and the Program,[4] in keeping with the theoretical causal pathway.

In-Depth Examinations and Qualitative Data

The evaluation team employed a utilization-focused and iterative data collection and analysis process, with initial data analysis occurring as data were still being gathered to ensure quality, refine questions, and identify new lines of inquiry. Any additional data added to the dataset were coded appropriately, with new findings integrated into existing findings and tested to confirm or disconfirm cases.

A combination of deductive (theory-driven) and inductive (data-driven) coding approaches were applied to the qualitative data. The evaluation team developed an initial coding scheme, based on the evaluation objectives, and included the topics in the data collection instruments. Complementary to the deductive approach, transcripts were read to enable open coding and identification of topics outside the content of the guides. Four members of the evaluation team led the coding, using an iterative process, reapplying additions or changes to the coding scheme to the entire dataset. Frequent meetings with the evaluation team members

[4] "Policy analysis" describes a type of analysis that examines economic, social, or other public issues through the formulation, adoption, and implementation of a principle or approach to address a problem. As this examination was of existing policies, it is primarily descriptive.

participating in coding facilitated a shared understanding of the coding scheme. Intercoder reliability testing was conducted to ensure at least 90 percent agreement across coders. Qualitative transcripts were coded in Dedoose, an online qualitative data analysis platform the team selected to allow multiple team members to code in the same platform and check and correct any discrepancies in real time. Dedoose enables encryption, so only those participating in data collection or analysis had access to these data. Coded data were synthesized into categories and themes, informed by the evaluation objectives. The team produced interpretive data summaries, reflecting the initial insights generated in each category or theme and, where appropriate, links with other categories or themes.

The evaluation team performed comparative analysis to identify points of convergence and divergence across key respondent groups. Comparative matrices were prepared by theme to generate visual representations of the points of convergence and divergence. Findings generated from these data sources were combined with insights generated through the comparative matrices to enrich understanding of the HRH Program's planned activities and what had been implemented.

The evaluation team conducted two main phases of data analysis, with the first round in preparation for the fourth committee meeting in July 2019. Insight and guidance from the committee was integrated into subsequent data collection, coding, and analysis. The second phase of data collection was completed in August 2019. Following data collection, the evaluation team conducted an internal, integrated 2-day data analysis, triangulation, and interpretation session.

Quoted material throughout this report is redacted to protect respondents' confidentiality and anonymity, in alignment with the ethical guidance approved in the evaluation protocol. Direct quotations from respondents included in this report have been edited for clarity.

Quantitative Data

The evaluation team used a time series approach to examine publicly available HRH and population-level data for trends over time. Data were plotted in run charts and annotated with events and other descriptions to help interpret what was observed. Where appropriate, maximum likelihood event count time series analysis was performed. A maximum likelihood event count time series model assesses the probability of a maximum parameter value in an ordered sequence of observations through time. It is generally a stochastic method, and when analyzing the variability of HRH program data, this approach was useful to assess whether the intervention had an effect significantly greater than the underlying trends in HRH and population-level data. Wherever possible, this analysis was performed at national and subnational levels. First, data was collated and cleaned in Microsoft Excel and subsequently analyzed in Stata 14 using the estimation function.

Analysis of financial data was descriptive, exploring changes in the level of funding for the HRH Program across sources. Other CDC and donor funds in HRH and health systems strengthening in Rwanda were also examined for change over time, as a means of understanding the financial landscape.

Analysis and Interpretation with the National Academies Committee

To ground findings and conclusions in utilization-focused approaches, following initial independent analysis of data by type, the evaluation team used a participatory process for integrating and synthesizing the data. This was conducted at three key points in the data collection and analysis period. First, during the fourth meeting of the National Academies committee (July 9 and 10, 2019), the EnCompass team presented initial insights into the data that had been collected by that time. The committee worked through an affinity analysis process, in which they organized insights into categories and then queried the data for what was missing, what needed further data collection, and what needed additional data analysis.

The evaluation team also held a 2-day internal data analysis, triangulation, and interpretation workshop on August 20 and 21, 2019. This workshop included only those on the evaluation team who had collected or analyzed data. Participants examined evidence across data sources, shared emerging themes, and developed initial findings and interpretations. The result of the workshop was an evidence-based narrative addressing the first three evaluation objectives, as well as thematic matrices that presented qualitative and quantitative data side by side, facilitating observation of convergence and divergence and explanation of evidence that supported each finding and conclusion.

The evaluation team then supported a process of further analysis and interpretation by the committee in September 2019. After providing committee members with draft findings and interpretations, backed by the thematic matrices, the evaluation team facilitated a participatory, appreciative session with the committee to further examine, interpret, and validate findings and to arrive at consensus on conclusions and recommendations.

Ethical Considerations

Approvals for this evaluation were provided by the Rwanda National Ethics Committee (April 3, 2019), the U.S. National Academies' Committee to Review Studies on Human Subjects (April 23, 2019), and the CDC Office of the Associate Director for Science (April 25, 2019). Permissions were obtained from the necessary national, subnational, and institutional authorities to carry out the in-depth examinations at the University of Rwanda and the facility microsystem.

All potential respondents for in-depth examinations and interviews received a written information sheet and a certificate of consent in English or Kinyarwanda, as appropriate. The information sheet described the purpose of the evaluation; how the respondent(s) had been selected; the data collection method, procedure (individual interview or group discussion), and duration; risks and benefits; reimbursements; confidentiality; planned sharing of findings; and voluntariness (right to refuse or withdraw). Respondents also received contact information for the Rwanda National Ethics Committee. Signed consent was the preferred method of documentation. Virtual interview respondents received the consent information during the recruitment and scheduling process, and their electronic signatures were obtained.

LIMITATIONS

In an effort to address the first two objectives, which focused on describing the HRH Program and the context in which it was implemented, the evaluation team conducted qualitative interviews with individuals who were involved in the administration of the Program. These

included respondents from the Government of Rwanda and other organizations involved in the design and early implementation. However, CDC's Associate Director for Science determined that the participation of current staff would present a conflict of interest, and staff from CDC-PEPFAR and the Office of the U.S. Global AIDS Coordinator declined invitations for interviews. The absence of PEPFAR's perspective, as the funder of the portion of the Program under evaluation, presents a significant gap in the data and has likely resulted in skewed findings. The donor's perspective would have provided balance and nuance to findings, conclusions, and recommendations around program design, management, and sustainability. The absence of clear conclusions regarding the donor is the result of these missing data and should not be interpreted as an indication of donor performance.

Not all specialties under the HRH Program are represented equally in the qualitative interviews. The sample is skewed toward pediatrics, obstetrics and gynecology, and nursing, facilitating deeper examination of these specialties relative to others, such as surgery, internal medicine, and midwifery.

With respect to the third objective of the evaluation, described in more depth in Chapter 1, it was not possible to design an evaluation that assessed the attributable impact of the Program on HRH outcomes or HIV-related morbidity and mortality. The lack of facility-level HIV indicator data decreased the committee's ability to assess meaningful differences in HIV care and outcomes between facilities with and without HRH trainees. However, even if the committee had these data, identifying an appropriate comparator—which would be the most appropriate approach for determining attribution—was not possible. Instead, this evaluation uses the lens of contribution analysis and presents regional data alongside Rwandan indicator data to situate Rwanda's progress in context, without making analytical comparisons.

Drawing conclusions about plausible contribution is also challenging, because of the multitude of interacting factors and concurrent programs that could reasonably be expected to contribute to the same outcomes of interest specified in the Statement of Task. Further, the timing of this evaluation, just 2 years following the end of PEPFAR funding, also presents an obstacle to determining changes in HIV-related mortality and morbidity, as well as other HRH outcomes. Producing a specialized health workforce that has entered the health system and is providing high-quality services for PLHIV takes years, and observing any patient-level effects would require even more time. This challenge is similarly important for evaluating the Program's sustainability and degree of institutionalization.

In addition, the integration of financial investments from diverse sources in the Rwandan government's administration and management of the HRH Program meant it was difficult to disentangle PEPFAR's investments and related activities from other sources (Government of Rwanda and the Global Fund). It was also challenging to assess the plausible contribution of the activities that were predominantly funded by PEPFAR without more detailed disaggregation of Program expenditures, which would have enabled a more thorough description and analysis of the relative contribution of different programmatic activities.

Finally, the request for data on where HRH trainees were placed following graduation had to be extracted from multiple sources, as Rwanda's Human Resources Information System did not include information on health worker training. This placed a significant burden on the MOH for extracting and generating the information. Much of the data used in this analysis was therefore extracted from publicly available data, which was generally aggregated data that did not allow for effective subnational analysis. Other data were not up to date; for example, the most recent *Annual Health Statistics Booklet* published by the MOH includes data up to 2016.

Finally, the data that were received from the MOH raised questions when triangulating and interpreting them alongside data received from other sources.

A technical review was conducted in October 2019, in which the MOH was provided with tables and figures, as well as descriptive text (methods applied and description of data sources), but excluding findings, interpretations, or any information that could be interpreted as committee deliberations. The purpose of this review was to seek guidance from the MOH and prevent misinterpretations that were technical in nature. In accordance with the National Academies' policy, comments and written feedback provided by the MOH as part of this technical review are included in the study's Public Access File. Documents and other information provided for the committee's consideration are available upon request from the National Academies' Public Access Records Office (paro@nas.edu).

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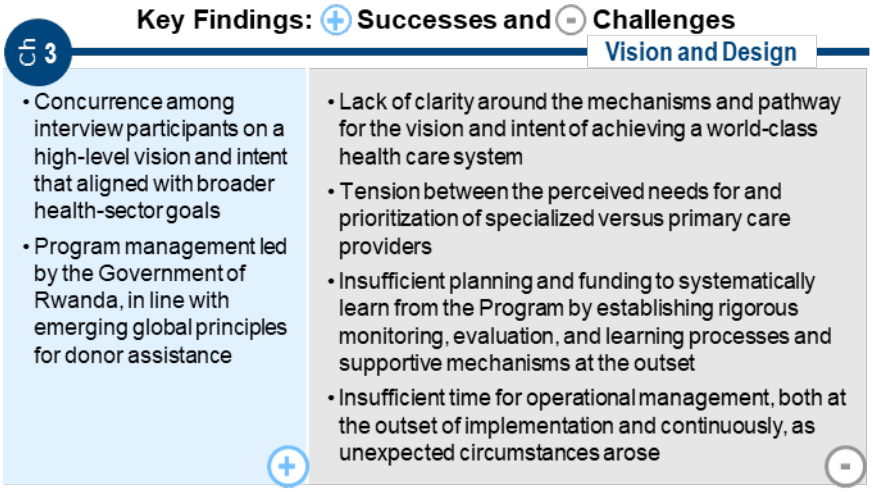
3

Human Resources for Health Program Context, Vision, and Design



CONTEXT IN RWANDA LEADING UP TO THE PROGRAM

The Costs of Conflict

Rwanda's recent history of conflict is essential context for the HRH Program's origin and implementation progress. The 1994 genocide against the Tutsi in Rwanda resulted in an estimated 1 million deaths and 2 million displaced people. All social services were devastated, bringing to a halt all foreign assistance programs related to health, education, agriculture, and other economic development efforts. The toll on the health system included physical destruction of hospitals, laboratories, and equipment, not to mention the death or displacement of more than 80 percent of the country's health professionals (USAID, 1996). By 1995, fewer than 10 pediatricians were reported to have been practicing, and there were no trained medical personnel, such as psychiatrists or trauma surgeons, to address issues emerging from the conflict (Binagwaho et al., 2014; Nsanzimana et al., 2015). The time and other investments required to counter the long-term public health effects of damaged social institutions were evident in the fact that it took 6 years for the first class of medical students to graduate (Willis and Levy, 2000).

During and immediately following the genocide against the Tutsi, international organizations prioritized restoring primary health care services and water and sanitation systems (USAID, 1996). The International Committee of the Red Cross, United Nations Children's Fund, and nongovernmental organizations (NGOs) such as Médecins Sans Frontières focused on repairing and operationalizing clinics with emergency health kits, medicines, supplies, and staff

to provide on-the-job training to auxiliary health workers (USAID, 1996). Immunization service delivery was disrupted, but the Ministry of Health (MOH) received international support to restore vaccine stocks and function to its immunization supply chain and logistics system (USAID, 1996). However, other capacities to detect and control infectious diseases, particularly the spread of HIV and cholera from migration and refugee camps at Rwanda's border, would remain a challenge for years (Binagwaho et al., 2014; Nsanzimana et al., 2015).

Although donors and NGOs were essential for providing necessary emergency relief, these agencies did not fully coordinate with the Rwandan government in the transition from emergency operations to rehabilitation of the health system. Consequently, health care services were fragmented and the MOH was slower to build institutional capacity to manage the country's health priorities and sustain a health care delivery system (USAID, 1996).

Major Developments in Rwanda's Health-Sector Planning

During the recovery period following the genocide against the Tutsi, the Government of Rwanda has consistently planned for how the health sector could better the health status of the population and support national poverty reduction goals. The release of the Health Sector Policy in 2005 outlined an overhaul of the sector, in light of decentralization efforts underway and in pursuit of more significant health gains (MOH, 2005a). Seven intervention priorities were established in seven areas:

1. Availability of human resources;
2. Availability of high-quality drugs, vaccines, and consumables;
3. Geographical access to health service;
4. Financial access to health services;
5. Quality of and demand for services in disease control;
6. Strengthening national referral hospitals and treatment centers; and
7. Strengthening the health sector's institutional capacity.

In particular, the Government of Rwanda would support financial access to health services by increasing public funding of health services (MOH, 2005a).

The government strategy around this policy has evolved over time. The first Health Sector Strategic Plan (2005–2009) laid out plans for achieving the health-related Millennium Development Goals (MDGs), with attention to getting maternal and child mortality on track (MOH, 2005b). The following iteration of the Health Sector Strategic Plan (2009–2012) highlighted health systems strengthening in each of the seven intervention areas and continued to emphasize increased financial access to health services, noting the scale-up of community-based health insurance, as well as increased quality of care promoted by performance-based financing (MOH, 2009a). The World Health Organization (WHO) framework of health systems building blocks served as a foundation for the third Health Sector Strategic Plan (2012–2018), in which the MOH started to orient toward objectives in the post-MDG era and increasingly considered health resource management and governance mechanisms (MOH, 2012d). The resulting Health Sector Policy of 2015 touted key health achievements, including improved maternal and child health, increased community health worker coverage, and antiretroviral therapy (ART) and malaria program successes since 2004 (MOH, 2015a). However, it also outlined policies to address challenges in support for vulnerable and marginalized populations, sustainable health

system financing, and noncommunicable disease prevention and control, taking into account Rwanda's epidemiologic transition and socioeconomic progress (MOH, 2015a). The current Health Sector Strategic Plan (2018–2024) centers on the Sustainable Development Goals and fully acknowledges these challenges and the need to reorganize the health system and involve other sectors of development to ensure universal health coverage for all needed services at all stages of life (MOH, 2018a).

HIV in Rwanda

The first case of HIV in Rwanda was documented in 1983; the Government of Rwanda initiated its response in 1985 with a blood donor screening program and has since sustained efforts to address the HIV epidemic (Kayirangwa et al., 2006). In 2009, Rwanda published its first National Strategic Plan on HIV/AIDS (MOH, 2009b). The development of national strategic plans on HIV/AIDS, the decentralization of the Rwandan health system, and movement toward community-based health insurance and performance-based financing facilitated its key achievements and remarkable progress toward achieving HIV epidemic control (MOH, 2009a,b, 2018c). Rwanda has also made steady improvements in increasing access to and coverage of ART over the past decade. The government's commitment to confronting its HIV epidemic has accelerated progress toward the UNAIDS 90-90-90 targets prior to the Human Resources for Health (HRH) Program, as discussed in more detail in Chapter 7.

HRH in Rwanda

Despite improvements since the genocide against the Tutsi nearly destroyed the health infrastructure and resulted in acute health workforce shortages, which hindered health service delivery and served as a major barrier to HIV care and treatment, Rwanda continues to fall far below WHO's recommended critical minimum threshold of 4.45 doctors, nurses, and midwives per 1,000 people (WHO, 2016). This shortfall comes from an insufficient number of trained health professionals relative to the need. Addressing HRH capacity had been featured in prior health-sector planning, but specific direction to develop a "competent, dedicated, productive, and accessible workforce" in support of the MOH's mission of "providing quality preventive, curative, rehabilitative, and promotional services" was not articulated until the National Human Resources for Health Policy in 2014 (MOH, 2014c).

These guidelines were developed for the planning, management, use, and monitoring of health-sector resources to operationalize the National HRH Strategic Plan (2011–2016) (MOH, 2011a), building on Rwanda's Health Systems Strengthening Framework and Consolidated Plan 2009–2012 (MOH, 2009a). Notably, the National HRH Strategic Plan called for the development of a clear health service delivery plan, delineating specific competencies for each cadre providing services at each level of care, more emphasis on the quality of trained professionals and their distribution, and demand for reliable data to inform health resource management and evaluation of health system effectiveness (MOH, 2011a).

Economic and Financial Context for Health in Rwanda

As Rwanda recovered and rebuilt from the genocide against the Tutsi, its economy eventually also started to experience considerable growth. Figure 3-1 shows the trajectory of

growth from the early 2000s, as illustrated by gross domestic product (GDP), the total national expenditure, and the portion of that national expenditure that is government spending. The HRH Program was situated in this period of economic growth.

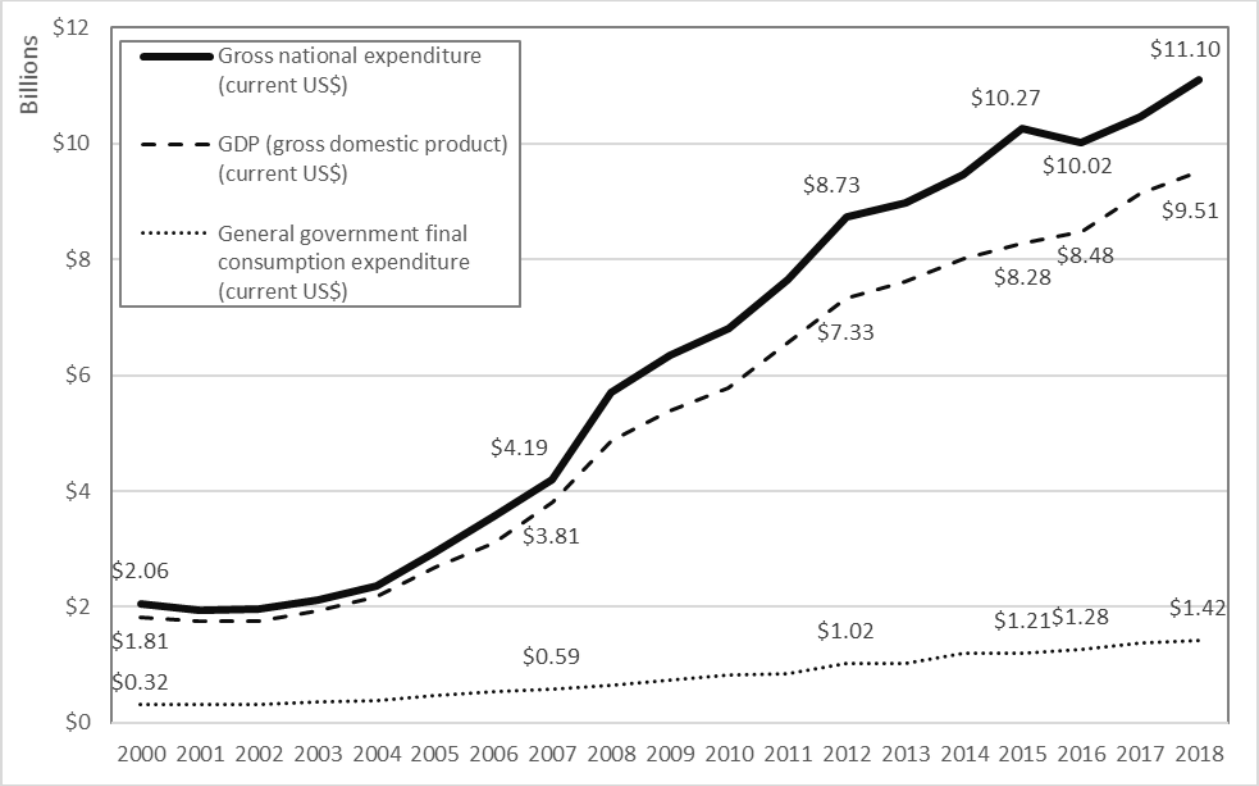


FIGURE 3-1 The size of the Rwandan economy from 2000 to 2018 in current U.S. dollars.
NOTES: Gross national expenditure is the sum of household final consumption expenditure, general government final consumption expenditure, and gross capital formation. General government final consumption expenditure includes all government current expenditures for purchases of goods and services (including compensation of employees). On average, inflation was about 6.5 percent in the 2000 to 2018 period (World Bank, 2019f), and the average growth of the official exchange rate in the same period was approximately 4.6 percent.
SOURCES: World Bank World Development Indicators; World Bank, 2019c,e,g.

Concurrently, there was growth in spending on health in Rwanda. Figure 3-2 shows the trajectories of growth in both per capita total health expenditures and per capita government spending on health, alongside the growth in per capita GDP.

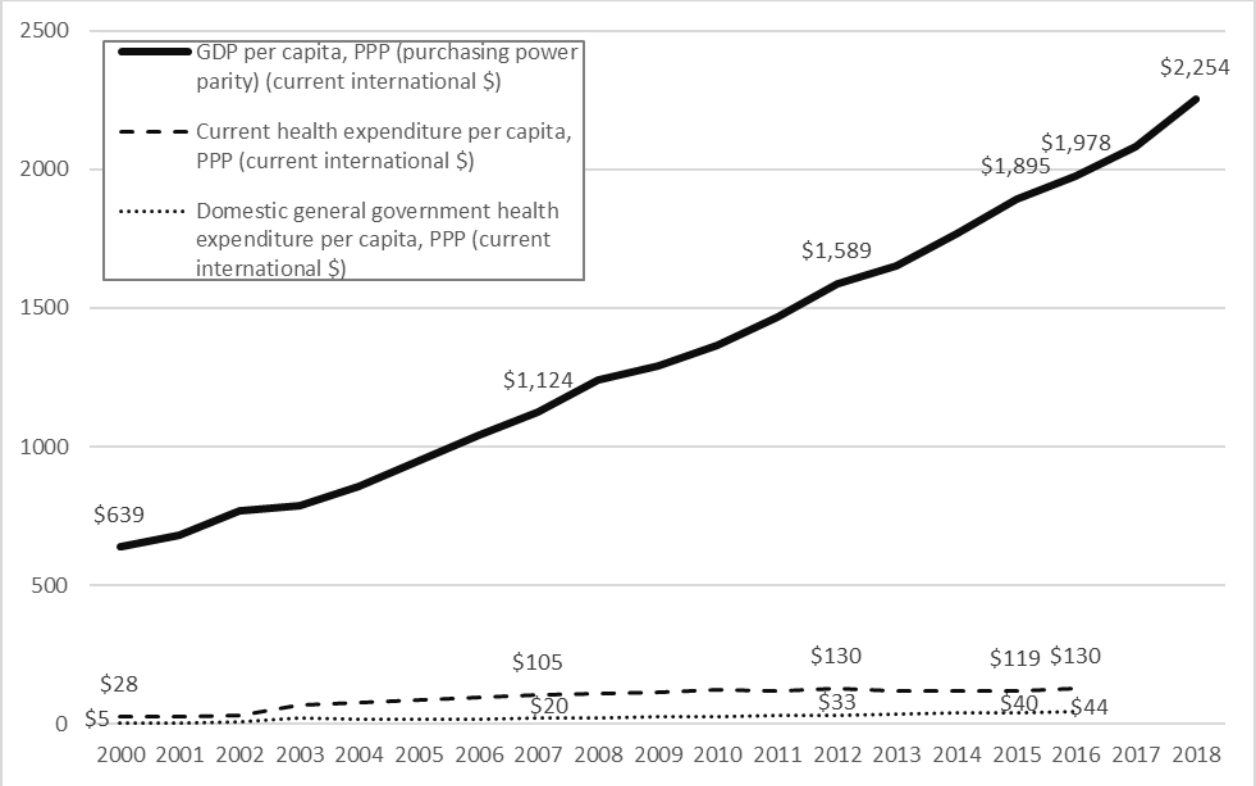


FIGURE 3-2 Health expenditures in Rwanda from 2000 to 2016 (in purchasing power parity per capita).
NOTES: Current health expenditure is the estimate of all health care goods and services consumed each year. Domestic general government health expenditure is public expenditure on health from domestic sources. On average, inflation was about 6.5 percent in the 2000–2018 period (World Bank, 2019f). The purchasing power parity conversion factor, for the 2000 to 2018 period, presented an average growth of about 4.4 percent (World Bank, 2019h).
SOURCES: World Bank World Development Indicators; World Bank, 2019a,b,d.

In this same time period, as Figure 3-3 shows, close to half of the health expenditure in Rwanda has consistently come from external aid, ranging from 41 percent to 54 percent between 2000 and 2016. Spending specifically for Rwanda's response to HIV increased drastically during this period, and as of 2014 it has been consistently estimated at about $200 million annually. Of this, 80 percent comes from external funders, a larger proportion than for health overall (Nsanzimana et al., 2015).

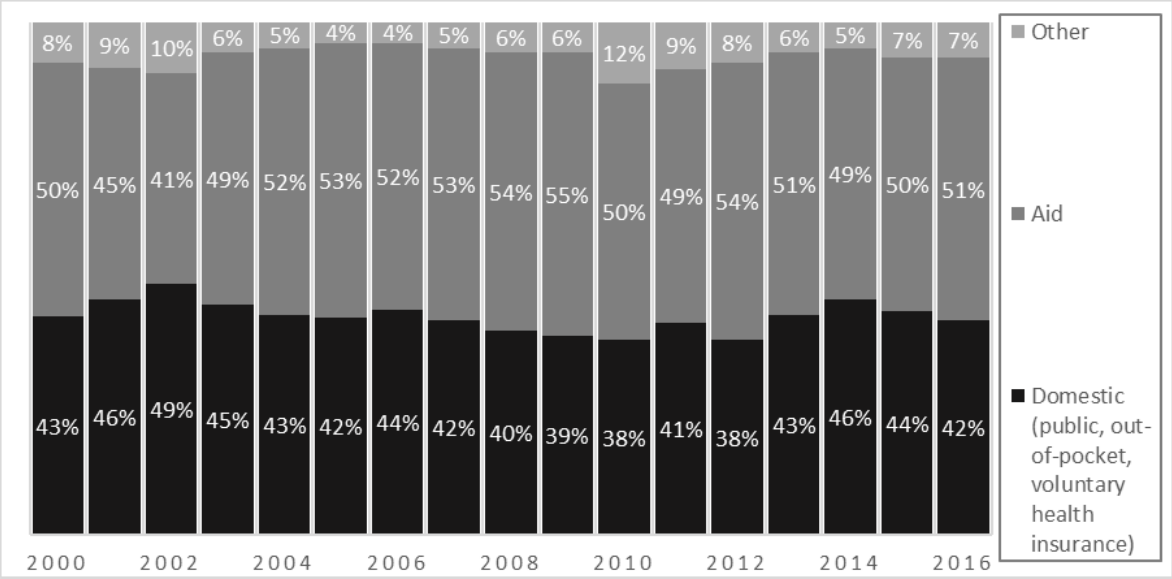


FIGURE 3-3 Proportion of health expenditure in Rwanda by revenue source.
NOTE: Domestic "all sources" comprises of out-of-pocket voluntary health insurance and domestic public expenditures.
SOURCES: WHO Global Health Expenditure Database; WHO, 2019a.

PEPFAR Funding Context

Before the HRH Program was launched in 2012, the President's Emergency Plan for AIDS Relief (PEPFAR) had an established funding history in Rwanda going back to 2003 (Binagwaho et al., 2016). Figure 3-4 shows PEPFAR total annual planned funding for programs in Rwanda from fiscal year (FY) 2009 to FY 2019, including the years surrounding the HRH Program.[1] Amounts shown in the bar graph were PEPFAR allocations to treatment, testing, prevention, health systems strengthening (HSS), government and systems, care, and applied pipeline. Percentages indicate proportion of annual funding allocated for HSS over time (PEPFAR, 2019c).

PEPFAR's total planned funding for its Rwanda program portfolio declined overall from 2009 to 2019. The proportion of funding allocated to HSS increased during the period between FY 2013 and FY 2016 relative to surrounding years, with a peak in FY 2013. This period is concurrent with the timing of financial support for the HRH Program. Before FY 2013, PEPFAR planned funding in Rwanda for HSS had not exceeded $9 million and had remained under 10 percent of total planned funding. Between FY 2013 and FY 2016, PEPFAR funding for HSS activities ranged from $24.7 million in FY 2013 (27 percent of its total portfolio) to $11.8 million (17 percent of its portfolio) in FY 2016. Since FY 2016, funding for HSS activities in the portfolio has not exceeded $1.9 million, or 2 percent of total planned funding. In the same period between FY 2013 and FY 2016, there was a decrease in the proportion of funding allocated to other program areas. In contrast, the proportion of PEPFAR planned funding devoted to HSS

[1] This graph was generated from publicly available PEPFAR planned funding data, downloaded June 16, 2019, from PEPFAR's Panorama Spotlight website. Planned funding information was used because publicly available expenditure information was less granular and was not available from the start of the HRH Program.

activities between FY 2009 and FY 2019 in other East African Community countries has been less variable and has not exceeded 13 percent of the total portfolio.[2]

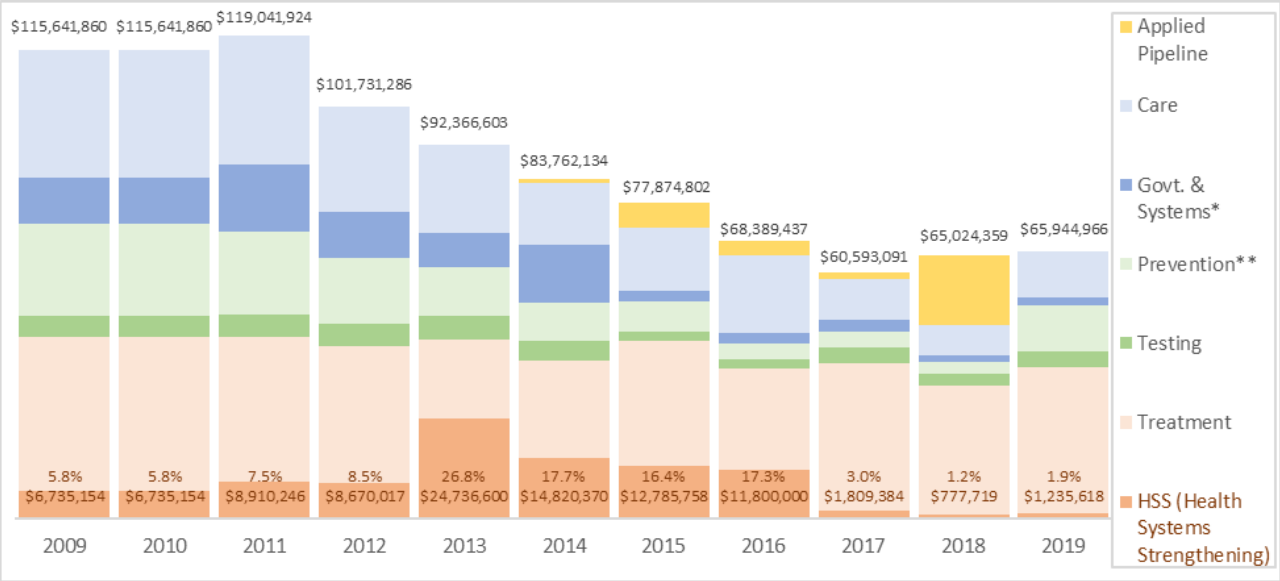


FIGURE 3-4 PEPFAR Rwanda planned funding by program area and percent allocation for HSS.
NOTES: The bar graph shows amounts allocated to each program area indicated and the percentage of funding dedicated to health systems strengthening (HSS). These activities are classified under the OHSS code by PEPFAR and defined as "contribut[ing] to improvements in national-, regional- or district-level health systems," and notes that these "[a]ctivities may be focused on health systems building blocks themselves as well as on institutions and processes that strengthen the building blocks and their interactions." The Treatment category includes funding for programs classified under Adult Treatment, Antiretroviral Drugs, and Pediatric Treatment. Testing includes funding for programs under HIV Testing and Counseling. Prevention includes funding for programs classified under Blood Safety, Injection Safety, Injecting and Non-Injecting Drug Use, Prevention of Mother-to-Child Transmission, Sexual Prevention: Abstinence/Be Faithful, Sexual Prevention: Other Sexual Prevention, and Voluntary Medical Male Circumcision. Government & Systems includes funding for programs classified under Laboratory and Strategic Information. Care includes funding for programs classified under Adult Care and Support, Pediatric Care and Support, Tuberculosis/HIV, and Orphans and Vulnerable Children. Applied Pipeline includes appropriated but unspent funds carried over from prior years. The U.S. government FY runs from October 1 through September 30.
SOURCES: PEPFAR, 2019c,d.

PEPFAR Investments in the HRH Program

At the inception and during the first 3 years of its funding, PEPFAR considered the HRH Program to be a strategic or key priority within its overall portfolio (PEPFAR Rwanda, 2012, 2013, 2014). Initially, PEPFAR shifted resources from other activities to "transfer significant

[2] The other East African Community countries include Kenya, Tanzania, and Uganda. In Kenya, PEPFAR planned funding for HSS activities has ranged from 1 percent to 3 percent of total planned funding between FY 2009 and FY 2019. In Uganda, funding for these activities has constituted between 2 percent and 5 percent of the PEPFAR portfolio, and in Tanzania, between 3 percent and 13 percent of the PEPFAR portfolio, during this time. South Sudan and Burundi have smaller total PEPFAR portfolios, averaging less than $16 million per year.

support to the area of HRH" (PEPFAR Rwanda, 2012) and thus fund the Program (PEPFAR Rwanda, 2012, 2013). Subsequently, the Program's placement relative to other PEPFAR programmatic priorities decreased over time (PEPFAR Rwanda, 2013, 2014, 2015). The HRH Program was being funded during the window of peak PEPFAR funding for HSS in Rwanda, shown in Figure 3-4.

Between FY 2011 and FY 2013, the Program was funded as a component of an existing U.S. Centers for Disease Control and Prevention (CDC) cooperative agreement with the MOH called "Strengthening the Capacity of the Ministry of Health to Respond to the HIV/AIDS Epidemic in the Republic of Rwanda under PEPFAR" (also known as the Clinical Services Cooperative Agreement) (Mtiro, 2018). Preceding the HRH Program, CDC had already been providing direct support to the MOH for its HIV/AIDS-related programs (CDC, 2009c, 2012):

- The integration of HIV services and programs into the health system at all levels;
- Capacity building for infection control;
- Injection safety;
- Medical waste management;
- Epidemiological investigation, lab management, pharmaceutical management, health communication, electronic medical record use, and data collection and analysis;
- Use of terminology standards and registries; and
- Training for physicians, community health workers, and service providers in clinical handling and management of sexual and gender-based violence.

This funding also provided salary support and benefits for physicians, technicians, and data managers, as well as supporting quality improvement initiatives, performance-based financing evaluations, technical meetings with stakeholders, and management and audits of MOH/PEPFAR-supported facilities and sites (MOH, 2014a).

The United States Agency for International Development (USAID) also provided some funds for the Program, although the amounts could not be confirmed (CDC, 2012; PEPFAR Rwanda, 2013). In addition to PEPFAR funding, the Program had a diversified funding base, evidenced by the engagement of the Global Fund to Fight AIDS, Tuberculosis and Malaria.[3]

Starting in FY 2014, CDC used a separate cooperative agreement with the MOH, "Strengthening Human Resources for Health Capacity in the Republic of Rwanda under PEPFAR," to fund the HRH Program (Mtiro, 2018). In 2015, PEPFAR's priorities shifted, and the HRH Program was classified as a "noncore" investment as part of an analysis in alignment with PEPFAR's new 3.0 strategy. The decision was made to end funding for the Program on March 30, 2017, instead of continuing PEPFAR support through June 30, 2019, the Program's official closing date (Mtiro, 2018; PEPFAR Rwanda, 2015).

Public reporting systems provided limited information about the actual amount invested by PEPFAR in the HRH Program. Table 3-1 shows available information regarding the mechanisms PEPFAR used to provide funding for the Program.

[3] The Global Fund specifically sponsored the launch of Rwanda's first dental school and development of dental curricula and partnerships (Seymour et al., 2013), as PEPFAR did not include dentistry in the list of specialties it would support. Examination of the dentistry school and program was not included in this evaluation.

TABLE 3-1 PEPFAR Funding Sources That Contributed to the HRH Program

	FY 2012 (Oct 2011–Sep 2012)	FY 2013 (Oct 2012–Sep 2013)	FY 2014 (Oct 2013–Sep 2014)	FY 2015 (Oct 2014–Sep 2015)	FY 2016 (Oct 2015–Sep 2016)	FY 2017 (Oct 2016–Sep 2017)	FY 2018 (Oct 2017–Sep 2018)
U.S. Centers for Disease Control and Prevention (CDC)*							
Strengthening the Capacity of the Ministry of Health to Respond to the HIV/AIDS Epidemic in the Republic of Rwanda Under PEPFAR (Award No. U2GPS002091; Mechanism No. 10825)	$17,556,432 (total cooperative agreement)	$22,168,552 (total cooperative agreement)	$23,507,981 (total cooperative agreement)	$0	$0	N/A	N/A
Strengthening Human Resources for Health Capacity in the Republic of Rwanda Under PEPFAR (Award No. U2GGH001614; Mechanism No. 17621)	N/A	N/A	N/A	$11,000,000	$10,500,000	Unknown**	Unknown**
United States Agency for International Development (USAID)* **							
Unknown Award(s)/Mechanism(s)	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown

NOTES: N/A = not applicable (funding mechanism not used to contribute to the HRH Program that year). All amounts are in U.S. dollars.
* Annual total disbursed funding by award/mechanism as reported through the U.S. HHS Tracking Accountability in Government Grants System (TAGGS) (accessed July 7, 2019). TAGGS reports the total amount disbursed through such agreements, but does not provide any further breakdown by program or activity. Therefore, the proportion of the amount that was specific to the HRH Program is not known in FY 2012 to FY 2014, when the HRH Program was funded as a component of the cooperative agreement, "Strengthening Capacity to Respond to the HIV/AIDS Epidemic," that started in FY 2009. Starting in FY 2015, the HRH Program was funded through its own cooperative agreement, "Strengthening Human Resources for Health Capacity in the Republic of Rwanda under PEPFAR," and the amounts reported in TAGGS are reflective of the amounts disbursed for the HRH Program: $11 million in FY 2015 and $10.5 million in FY 2016. Any amounts disbursed through CDC after FY 2016 are also not known.
** Information is not publicly available on whether amounts were disbursed through this or any other CDC award or mechanism after FY 2016.
*** Although there is documentation that some PEPFAR investments in the HRH Program came from other implementing agencies, those amounts and sources are not reported publicly. Approval of USAID maternal and child health funds to be used for implementing the HRH Program is referenced in a 2012 CDC memo requesting a multiyear expansion supplement for the "Strengthening the Ministry of Health's Capacity to Respond to the HIV/AIDS Epidemic in the Republic of Rwanda under PEPFAR" cooperative agreement. However, amounts were redacted and data on the portion of the award/mechanism allocated to the HRH Program were not publicly available (correspondence provided by CDC Rwanda in August 2018). In addition, Rwanda's Country Operational Plan FY 2013 referenced a planned shift of $2 million from USAID's Family Health Project to the HRH Program, but the actual amount disbursed and allocated for the HRH Program is not publicly available.
SOURCES: CDC, 2012; PEPFAR Rwanda, 2014; TAGGS, 2019.

HRH Program Budget and Ministry of Health Expenditures on Health

The HRH Program budget proposed in 2011 was $151.8 million over 8 years (MOH, 2011b). The Program received external funding from the U.S. government, through PEPFAR, and from the Global Fund. The total funding amount from these external sources, as provided by the MOH, was just under $100 million, with approximately 60 percent coming from the U.S. government (see Table 3-2). This comprised 12 percent to 16 percent of the total annual PEPFAR investment in Rwanda.

TABLE 3-2 HRH Program Budget by Year (U.S. Dollars)

Fiscal Year	U.S. Government	Global Fund	Total Annual Budget
2012–2013	12,300,163	6,775,325	19,075,488
2013–2014	14,971,013	6,775,325	21,746,338
2014–2015	12,976,798	6,775,325	19,752,123
2015–2016	11,000,000	5,729,026	16,729,026
2016–2017	10,500,000	5,847,111	16,347,111
2017–2018	0	5,519,856	5,519,856
2018–2019	0	362,246	362,246
Total HRH Program Budget	61,747,974	37,784,214	99,532,188

NOTES: Amounts and totals are reported as provided by the MOH in current U.S. dollars. On average, inflation was about 5.2 percent in the same period, and the average growth of the exchange rate was about 5.8 percent between 2012 and 2018 (World Bank, 2019f,g). U.S. government and Rwandan FYs are not the same: U.S. FY runs October 1 through September 30; Rwandan FY runs July 1 through June 30.
SOURCE: Financial data provided by the MOH.

The amounts disbursed from CDC to the MOH, however, were slightly lower than the budgeted amounts (see Table 3-3). Where there was a balance, CDC approved carrying it over to the next year, with the exception of 2015 to 2016, after PEPFAR had deemed the Program noncore.

The total amount budgeted for the HRH Program comprised about four percent of the total annual health budget for the MOH as reported in the Ministry's Health Resource Output Tracking Report for available concurrent years (see Table 3-4). Given that government expenditure comprises less than half of the total expenditure on health in Rwanda (as described in Figure 3-3), the HRH Program likely represented less than 3 percent of total health spending in Rwanda at the time it was implemented.

TABLE 3-3 CDC Disbursements for the HRH Program by Year (U.S. Dollars)

Year	Disbursement from CDC	Approved Carryover	Expenses	Balance
2012–2013	12,300,163		6,630,040	5,670,123
2013–2014	12,577,279	5,670,123	4,898,183	13,349,219
2014–2015	12,769,798	13,349,219	26,119,017	—
2015–2016	11,000,000		10,558,378	441,622
2016–2017	10,058,378		10,500,000	
Total	58,705,618			

SOURCE: Financial data provided by the MOH.

TABLE 3-4 Ministry of Health Budget and Expenditures Reported Preceding and During the HRH Program (U.S. Dollars, Rounded to Millions)

	FY 2010/2011	FY 2011/2012	FY 2012/2013	FY 2013/2014	FY 2014/2015
Total Budget	514 million[a]	539 million[b]	533 million[c]	*	499 million[d]
Total Expenditure	420 million[a]	514 million[c]	*	481 million[d]	480 million[d]

NOTES: Amounts shown are the current amounts reported at the time each source report was published. Amounts were provided in Rwandan francs (RWF) after FY 2011/2012 and therefore converted to U.S. dollars (USD) using the following World Bank historical exchange rates, rounded to the nearest dollar: in 2013, 1 USD = 647 RWF; in 2014, 1 USD = 682 RWF; in 2015, 1 USD = 721 RWF (World Bank, 2019g).
*Expenditure data for FY 2012/13 and budget data for FY 2013/14 were not reported.
SOURCES: [a] MOH, 2012c; [b] MOH, 2012c, 2013b; [c] MOH, 2013b; [d] MOH, 2018b.

Figure 3-5 provides the context of the MOH's broader concurrent workforce-related expenditures before and during the HRH Program. From FY 2010/2011 to FY 2014/2015, as the amount of MOH expenditure going toward health workforce increased there was a small decline in workforce expenditure as a proportion of the total MOH expenditure, from 42 percent to 39 percent. Concurrently, there was an increase in the proportion of investments for drugs and other consumables, and materials and equipment. However, trends in these data are difficult to interpret because of changes from year to year in how expenditures were reported by the MOH. It is also not possible to clearly interpret how the overall expenditures of the MOH intersected with the HRH Program expenditures because these reports do not indicate whether these expenditures include or exclude the funds expended as part of the HRH Program. In addition, there may be other sources of expenditures on HRH in Rwanda.

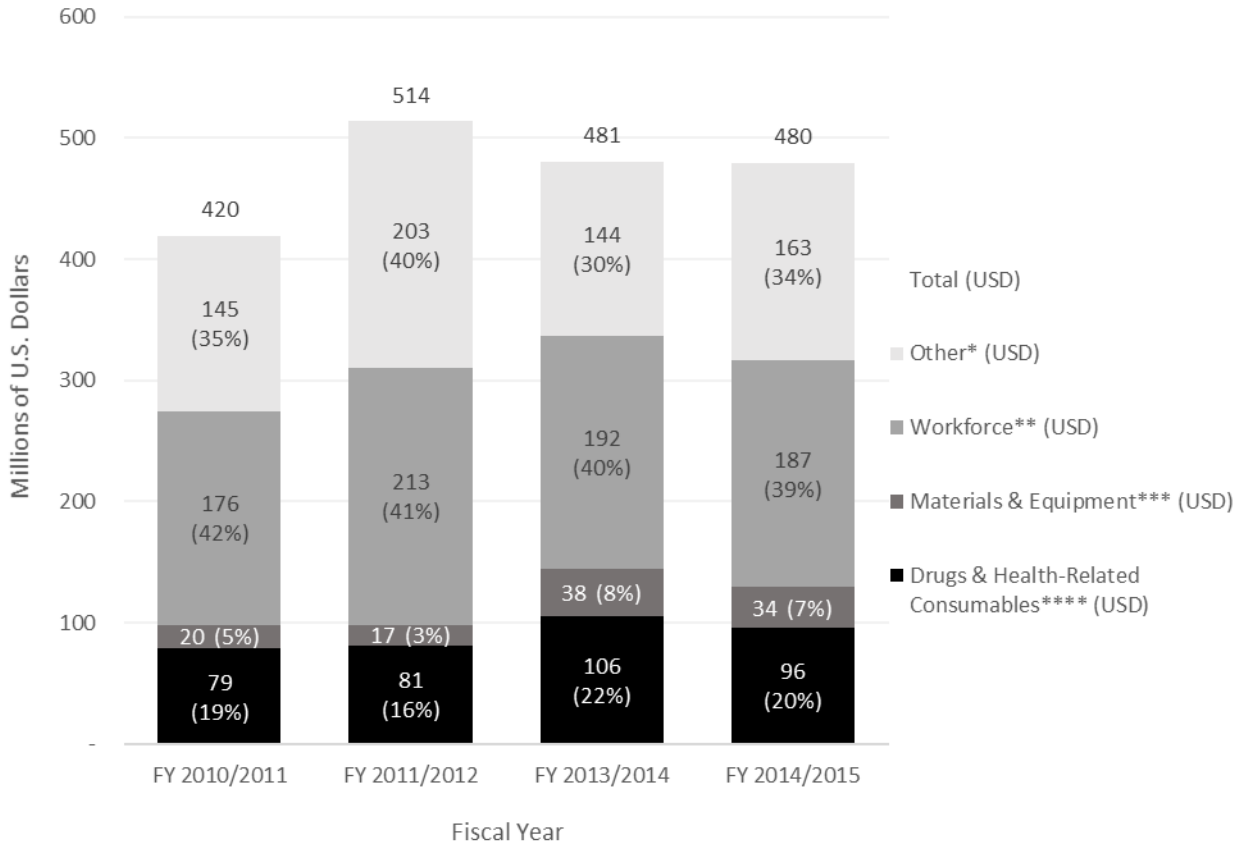


FIGURE 3-5 MOH expenditures FY 2010/2011 to FY 2014/2015 (U.S. dollars).
NOTES: USD = U.S. dollars. Amounts shown are the current amounts reported at the time each source report was published. Different input categories were used each year and aggregated according to the four major categories shown in the figure. Expenditures after FY 2011/2013 were provided in Rwandan francs (RWF) and converted to USD using the World Bank conversion for each year and rounded to the nearest whole number: in 2011, 1 USD = 600 RWF; in 2012, 1 USD = 614 RWF; in 2014, 1 USD = 682 RWF; in 2015, 1 USD = 721 RWF (World Bank, 2019g).
* Other comprises public relations and awareness such as advertising, campaigns, and communications for health; domestic and international travel and transport costs; indirect costs; infrastructure; overhead and general administrations costs; and vehicles and maintenance.
** Workforce comprises in-service training and workshops, incentives for community health workers, preservice training and workshops, salaries for contracted government personnel, salaries for government personnel, salaries for nongovernmental personnel, salaries for short-term consultants, service provision, technical assistance, and performance-based financing.
*** Materials & Equipment comprises medical and nonmedical equipment.
**** Drugs & Health-Related Consumables comprises commodities, consumables, and drugs.
SOURCES: MOH, 2012c, 2013b, 2016a, 2018b.

The categories of expenditures aggregated into the broad category of "Workforce," and how they were reported, varied from year to year (see Table 3-5).

TABLE 3-5 MOH Health Workforce Expenditures with Category Breakdowns by Year (U.S. Dollars)

	FY 2010/2011	FY 2011/2012	FY 2013/2014	FY 2014/2015
Total Expenditures	419,636,014	514,014,611	480,938,416	479,889,043
Workforce (percent of Expenditures)			40%	39%
Workforce Expenditure Amount	176,132,460	212,751,636		
Workforce Category Breakdowns (as Reported)				
Direct Salaries/Labor Costs/Remuneration	109,328,045		28% (of total expenditures)	30% (of total expenditures)
Capacity Building	42,369,081		7% (of total expenditures)	5% (of total expenditures)
Incentives	24,435,334			
In-Service Training and Workshops		40,200,881		
Incentives for Community Health Workers		29,381,321		
Preservice Training and Workshops		8,064,948		
Salaries (Contracted Government Personnel)		35,049,224		
Salaries (Government Personnel)		27,784,464		
Salaries (Nongovernment Personnel)		1,475,639		
Salaries (Short-Term Consultants)		3,998,622		
Service Provision		18,688,571		
Technical Assistance		21,554,278		
Performance-Based Financing		26,553,688		
Social Benefits			5% (of total expenditures)	4% (of total expenditures)

NOTES: Amounts shown are the current amounts reported at the time each source report was published. In FY 2013/2014 and FY 2014/2015 expenditure categories were reported as percentages of the total expenditure. Amounts reported in Rwandan francs (RWF) were converted to U.S. dollars (USD) using the World Bank's historical exchange rates, rounded to the nearest dollar: in 2014, 1 USD = 682 RWF; in 2015, 1 USD = 721 RWF (World Bank, 2019g).
SOURCES: MOH, 2012c, 2013b, 2016a, 2018b.

A consistent pattern was that salaries and labor costs represented the largest proportion of expenditures. When reported, categories such as capacity building, preservice training, and workshops represent a very small amount of the total investment.

HUMAN RESOURCES FOR HEALTH PROGRAM VISION AND DESIGN

Political, Economic, and Social Context During the Design of the HRH Program

By 2012, when the HRH Program was launched, Rwanda was viewed as an ideal environment, not least because it was perceived as being a "peaceful and stable country," which was seen as an important factor for successful program implementation. Health-sector achievements in the intervening years (see Chapter 7) made the landscape especially attractive for international donors:

> *Everyone wants to work with a winning team. Even before HRH, there [was] evidence on the ground the Rwandan health system was performing. We, in the last 15 years, have reduced maternal mortality tremendously, neonatal mortality, achieved the [Millennium Development Goals], and we are on the track with the Abuja Declaration for Health, which is the amount allocated for health in general…one of the highest in Africa. So, all these health indicators were improving, [and] I think it becomes much easier working with someone who is already busy working for himself and help them achieve results, than trying to invest where you don't see results anyway. (09, University of Rwanda Administrator in Obstetrics and Gynecology)*

These achievements built on years of previous engagements by and with the United States and other partners in Rwanda, which created energy and interest in continuing to develop the health sector:

> *From the beginning, USAID and CDC were on board…. Other partners were interested, WHO and UN agencies, other bilaterals … also I think a lot of U.S. institutions had an interest here … family medicine and Tulane University, but also Yale University was present. They already had an MOU [Memorandum of Understanding] with the Ministry of Health, which was then integrated into the HRH [Program]. So there was definitely a strong presence to create a core group of people, to create a momentum on that. (22, Non-Government of Rwanda HRH Program Administrator from an International NGO)*

The perceived political will, on the part of the United States at the time and the Government of Rwanda, also created enabling conditions to develop and fund a holistic HSS program such as the HRH Program:

> *[T]he government of Rwanda and even the side of the U.S. government—of CDC, even the Global Fund … [were] very committed and convinced that this was the right program to face the situation, and so there were a lot of high-level advocacy*

> *and enthusiasm on both sides. (20, Government of Rwanda HRH Program Administrator)*

Across all respondent groups, the perception was that the Rwandan government's leadership in the context of a strong health system were keys to successful programming:

> *The first factor is political will. The Ministry of Health put so much effort in HRH programming for it to succeed … the environment was good enough for the HRH Program to operate without any challenge as the system was already well established. (30, Former Government of Rwanda Program Administrator and PLHIV Representative)*

> *There is a huge leadership commitment in Rwanda. The government…wants to be a partner in everything that is happening, working hand in hand with partners and being in the driver's seat…. That's a huge success factor. (11, International NGO Representative)*

> *If you brought a program in a country where the leadership is not very strong in delivering results, we wouldn't be where we are. (09, University of Rwanda Administrator in Obstetrics and Gynecology)*

The facilitating environment in Rwanda, from the perspective of U.S. institution (USI) faculty participating in the HRH Program, had three parts. First, Rwanda was viewed as having a "flexible" health system that could change with an evolving health workforce. Second, the government was confident in its successes in fighting HIV. Finally, existing infrastructure, such as roads and Internet access, was seen as facilitating successful implementation.

HRH Program Vision

At the time of the HRH Program's design and funding, Rwanda was implementing the Health Sector Strategic Plan 2009–2012 and the HIV/AIDS National Strategic Plan 2009–2012, both of which had goals around the availability, quality, and rational use of HRH in service of improved health outcomes, in alignment with *Vision 2020* goals of health equity, universal health coverage, increased access to and delivery of quality health care (CDC, 2014; MOH, 2011b; Uwizeye et al., 2018). However, there were several critical obstacles within the Rwandan health care system, including the shortage of skilled health workers, poor quality of health worker education, and inadequate infrastructure, equipment, and management in health facilities (MOH, 2011b, 2014b, 2016b).

According to program documents, the HRH Program was designed to address those challenges as a large, systems-based, health sectorwide initiative to scale up institutional and training capacity and create a high-quality, sustainable health system in Rwanda capable of providing "world-class care" (CDC, 2012; MOH, 2011b, 2012b, 2014b, 2016b). Upgrading the health professional workforce to be of "sufficient quantity and quality to meet the national need," would "contribute to the distal goal of improved availability and quality of care in Rwanda" (MOH, 2014b). Strategies would focus on increasing skill levels and specialization of health professionals and educators, establishing high-quality training sites, accelerating recruitment and

retention of students, creating a culture and career ladder for health professional teaching, and expanding research partnerships and academic exchange (MOH, 2011b).

According to the Government of Rwanda, sustainable effect of the HRH Program would be the country's ability to produce a supply of new skilled, specialized health workers and Rwandan health educators and to ensure adequate infrastructure, equipment, and supplies without external financial support (MOH, 2014b). This country vision aligned with PEPFAR 2.0's strategic vision and focus on developing a sustainable HIV response that supported HSS activities with partner governments (PEPFAR, 2019a,b).

With the inception of PEPFAR 3.0, PEPFAR's strategic vision pivoted away from this horizontal approach and toward targeted epidemic control (PEPFAR, 2014). This shift in priorities does not fully align with Rwanda's strategic goals, as the Government of Rwanda has consistently planned for developing the capacity of its health system. Iterations of Rwanda's Health Sector Strategic Plans for 2009 to 2024 have emphasized HSS in key intervention areas, community-based health insurance, and quality of care through performance-based financing, while outlining policies to address challenges for vulnerable and marginalized populations, sustainable health system financing, and prevention and control of noncommunicable diseases (MOH, 2009a, 2012d, 2018a). Against this backdrop, the HRH Program was conceived with the goal of ultimately increasing the quality of health care delivery and the overall health care system in Rwanda, contributing to the government's "mandate in terms of developing capacity of the health staff" (45, Government of Rwanda HRH Program Administrator).

Interview respondents for this evaluation shared the same understanding of the HRH Program's rationale, which they saw as being borne out of a need to rebuild the health system following the genocide against the Tutsi and in the face of an HIV epidemic and an aging population of people living with HIV (PLHIV):

> *[O]ur discussion in 2010 to 2012 was how can we develop this capacity, rebuild this health system by working on the areas which are highly affected, which is medical personnel, nurses, specialists, doctors. The demand was also high not only for a single disease, but for everything. For HIV/AIDS is not seen as a single disease as such; sometimes it starts as a small virus and it ends by being a whole medicine. (01, Government of Rwanda HRH Program Administrator)*

Thus, the HRH Program "was fully integrated into the health system" with potential effects beyond "just one disease" such as HIV (87, Government of Rwanda Program Administrator). This is in keeping with the evolution of Rwanda's health sector strategic planning at the time, which focused on health-related MDGs, and specifically maternal and child mortality in the first phase (2005–2009), and transitioning to a focus on HSS and financial access to health services in the second phase (2009–2012). The third phase (2012–2018) emphasized health resource management and governance mechanisms (MOH, 2012d).

HIV Achievements in Rwanda

By 2011, when the HRH Program was being designed, Rwanda had made notable achievements in addressing the HIV epidemic relative to other countries in the region, as discussed in Chapter 1. Concurrent to the evolution in the health-sector strategic planning was a process of decentralization that facilitated increased access to HIV services. The first phase

(2000–2005) facilitated the expansion of HIV services to lower-level facilities (Binagwaho et al., 2016). This effort helped to distribute and expand HIV care by integrating community health workers who were providing services at the village level to the more advanced care offered at health centers, and district and referral hospitals (Binagwaho et al., 2016).

In 2008, during the second phase of decentralization (2006–2010), the Rwandan health system moved authority to the district level to launch new HIV treatment sites. However, coordination of services between HIV and other care remained poor. While districts received funding for health, they received funding for essential HIV/AIDS services much more slowly as PEPFAR and the Global Fund followed different paths to decentralization (Nsanzimana et al., 2015).

The second Health Sector Strategic Plan in 2009 called for the need to better integrate HIV/AIDS care into routine health services. To support this effort, the Government of Rwanda entered into a cooperative agreement with CDC to increase staffing (CDC, 2009b). It also started transferring management of HIV patients from international partners to government-run programs (PEPFAR, 2010; PEPFAR Rwanda, 2011). This transition resulted in a sustainable and successful HIV program that now has the internal expertise to manage HIV care at all levels (Binagwaho et al., 2016).

During the third phase of decentralization, starting in 2011, the Rwanda Biomedical Center restructured HIV coordinating mechanisms to facilitate better integration with other disease-specific programs (Nsanzimana et al., 2015). The previous HIV programs were dissolved, including the National AIDS Control Commission, so other disease-focused programs could be leveraged to create operational efficiencies, especially given dwindling resources. The third Health Sector Strategic Plan (2012–2018) called for the integration of HIV services at a decentralized level, the need to improve quality, and the need to maintain trained and adequate numbers of staff at all facilities (MOH, 2012d). The result of this decentralization has been a rapid increase in the number of facilities offering ART services, from four in 2002 to 552 in 2016, as reported in the Rwanda Integrated Health Management Information System.

Respondents related the success of Rwanda's health sector to the window of opportunity provided to the HRH Program. Respondents perceived Rwanda as having "achieved all the expressed outcomes that we entered with the intent of achieving," providing an opportunity to explore what could be done

> *With a vertically funded program that has achieved outcomes that were desired but now is turning to look at the larger needs of those already infected HIV-positive individuals for their broader health care needs as we move forward in their care. (25, Non-Government of Rwanda HRH Program Administrator and U.S. Government Donor)*

Rwanda was seen as an interesting test case for a different model of development that leveraged the gains achieved through a vertical program to strengthen an entire health system. To the extent that HIV outcomes were considered in the design of the HRH Program, the MOH viewed building a specialized health workforce as a priority in addressing long-term care for PLHIV and infectious disease control, which was considered a moral, epidemiologic, and economic necessity—a "triple imperative" (Binagwaho et al., 2013).

Respondents working with NGOs in the HRH and HIV space in Rwanda felt that an HRH Program with the goals of strengthening the health system could improve HIV outcomes:

> *[T]he program was not designed specifically to improve the lives of people with HIV/AIDS. It is a health system strengthening intervention, and it will help the system; obviously, it will support the people who have HIV/AIDS because of their frequent contact with the health system. (05, Other International NGO Representative)*

HRH Program Goals, Objectives, and Strategy

While there was general agreement on the overarching vision of the HRH Program, there was less congruence between program documentation and interview respondents on the intended mechanisms for achieving this vision. Program documents illustrated that developing the Rwandan health education system remained a principal component of the HRH Program. Throughout the Program, the MOH noted that focusing on health education was a mechanism for filling the gap between the supply and demand of highly qualified health professionals in Rwanda (MOH, 2011b, 2015b, 2016b). By the midterm review, however, key HRH Program activities such as twinning through participating USIs that formed the Academic Consortium were deemed necessary to "gap-fill" and "simultaneously build the long-term capacity of their counterparts and host institutions" (MOH, 2016b).

This evolved from the initial premise that the Program was designed to simply fund the mechanism for dramatically increasing production of health workers in a short time frame (MOH, 2011b). As highlighted in the 2011 HRH Program proposal, the original objectives were to increase the number of physicians and physician specialists, continue advancing the skill levels of nurses and midwives, introduce the role of health manager into the Rwandan health system, launch the Rwanda School of Dentistry (the first class began in the fall of 2013 at the University of Rwanda), and build the institutional capacity of their health professional schools and clinical teaching hospitals to sustain high-quality health education (MOH, 2011b).

Most of these objectives continued to be referenced as core program expectations informing the development of core indicators in their eventual monitoring and evaluation (M&E) plan and as objectives in a results framework for the midterm review (see Table 3-6). Many outlined areas of work, such as expanding research partnerships and academic exchange, were also generally consistent through the years though with varying specificity. For example, the 2015 programmatic/technical work plan emphasized "internationally benchmarked curricula" in one of the areas of work, whereas other program documents stated that the HRH Program would "implement quality, competency-based instruction" (MOH, 2011b, 2015b, 2016b).

Notably, it was not until the MOH's performance and measurement plan development process, which began after program implementation, that three overarching strategic outcomes emerged. Two of these outcomes highlighted the role of the University of Rwanda's College of Medicine and Health Sciences (CMHS) in providing high-quality health professional education programs and accompanying training environments, alongside the third outcome of establishing a sustainable, skilled, and specialized health professional workforce (MOH, 2014b, 2015b). In addition, M&E had not been designated as a specific area of work until this point; the 2014 M&E plan acknowledged the challenge of establishing a baseline for all program areas, because M&E efforts were being articulated after implementation (MOH, 2014b). This was reflected in inconsistencies in baseline and target goals for the number of health professionals in several

cadres, particularly in the number of nurses and midwives to be produced by the HRH Program once it began to deemphasize the upgrading of A2 to A1 nurses (MOH, 2011b, 2014b).[4]

TABLE 3-6 Evolution of the HRH Program's Goals and Approaches

	2011 Rwanda HRH Program, 2011–2019, Funding Proposal	2014 HRH Monitoring & Evaluation Plan, March 2014	2015 Project Narrative and Programmatic/Technical Work Plan	2016 Rwanda HRH Program Midterm Review Report (October 2015–June 2016)
Aim	Build the health education infrastructure and health workforce necessary to create a high-quality, sustainable health care system in Rwanda			
Identified Challenges to Achieving Aim	Critical shortage of skilled health workers Poor quality of health worker education Inadequate infrastructure and equipment in health facilities Inadequate management of health facilities	Reduce the critical shortage of skilled health professionals Improve the quality of health professional education Increase and diversify health care worker specialties Enhance infrastructure and equipment in health facilities and educational sites Improve health facilities and educational site management		Critical shortage of skilled health workers Poor quality of health worker education Sustainability of health education system
Goals (2011) Core Program Expectations (2014) Complete Results Framework	Increase the number of physicians from 633 to 1,182, and the number of physician specialists in areas such as internal medicine, family and community medicine, obstetrics and	Increase the number of general practitioners practicing in Rwanda from 625 to 1,182 (disaggregate by cadre) Increase the number of physician specialists (subspecialists) from 128 to 551		Increase the total number of physicians Increase the number of physician specialists in priority clinical areas

[4]A2 nurses have completed secondary school education; A1 nurses receive a diploma after 3 years of training at a higher education institute; A0 nurses are graduates of a 4-year Bachelor's program and may go on to enroll in a Master's program (Uwizeye et al., 2018).

	2011 Rwanda HRH Program, 2011–2019, Funding Proposal	2014 HRH Monitoring & Evaluation Plan, March 2014	2015 Project Narrative and Programmatic/Technical Work Plan	2016 Rwanda HRH Program Midterm Review Report (October 2015–June 2016)
Objectives (2016)	gynecology, pediatrics, surgery, and anesthesiology from 150 to 551			
	Dramatically advance the skill level of nurses/midwives by increasing the number of nurses/midwives with A0 credentials from 104 to 1,011 and the number of nurses/midwives with A1 credentials from 797 to 5,095. These actions will increase the overall number of nurses/midwives from 6,970 to 9,178	Increase the number of nurses and midwives from 9,670 to 10,200		Increase the total number of nurses and midwives Increase the skill level of nurses and midwives
	Introduce the role of health manager into the Rwandan health system and increase the number of trained health managers from 7 to 157	Introduce the role of health manager and increase their number from 7 to 157 (introduce trained health manager position in district hospital and develop their job description)		Introduce the role of health manager at district hospital level
	Launch the Rwanda School of Dentistry, and increase the number of oral health professionals from 122 to 424	Launch the school of dentistry and increase the number of health professionals from 122 to 424		Increase the number of oral health professionals

	2011 Rwanda HRH Program, 2011–2019, Funding Proposal	2014 HRH Monitoring & Evaluation Plan, March 2014	2015 Project Narrative and Programmatic/Technical Work Plan	2016 Rwanda HRH Program Midterm Review Report (October 2015–June 2016)
	Build the institutional capacity of the medical, nursing, oral health, health management schools, and clinical teaching hospitals to sustain high-quality health education	Create teaching hospitals and medical schools that have the infrastructure, equipment, and institutional capacity to sustain high-quality education		
Strategic Outcomes		To improve the capacity of the University of Rwanda's College of Medicine and Health Sciences (CMHS) to implement quality, competency-based health professional education programs	Improved capacity of the University of Rwanda's CMHS to implement quality, competency-based health professional education programs	
		To establish an enabling environment in CMHS schools and training sites (e.g., referral hospitals) to facilitate improved health professional education	Established environment in CMHS schools and training sites (e.g., referral hospitals) conducive to facilitating improved health professional education	
		By 2019, have a sustainable, skilled, and specialized health professional workforce in Rwanda	Established a sustainable, skilled and specialized health professional workforce in Rwanda	
Areas of Work	Increase skill levels and specialization of health care professionals and educators		Increase skills levels and specialization of health care professionals and educators	Increase skill levels and specialization of health care professionals and educators

	2011 Rwanda HRH Program, 2011–2019, Funding Proposal	2014 HRH Monitoring & Evaluation Plan, March 2014	2015 Project Narrative and Programmatic/Technical Work Plan	2016 Rwanda HRH Program Midterm Review Report (October 2015–June 2016)
	Establish high-quality clinical training sites and schools		Establish high-quality clinical training sites and schools	Establish high-quality clinical training sites and schools through procurement of infrastructure and equipment and improvement of health management capacity
	Accelerate recruitment and support student retention		Support recruitment and retention of trainees and students in nursing and midwifery, biomedical laboratory sciences, medicine and surgery, and health management programs	Accelerate recruitment and support student retention
	Implement integrated, competency-based curricula		Develop and deliver internationally benchmarked curricula	Implement integrated, competency-based curricula
	Increase the importance of teaching and careers in health professions		Increase the engagement of health professionals in learning, teaching, and scholarships	Increase the importance of teaching and careers in health professions
	Build institutional capacity for health education		Recruit to and retain faculty in Rwanda by working with USIs Increase collaboration between health professional education stakeholders Enhance the recruitment and retention of graduates in the health care and health education sectors	Build institutional capacity for health education

	2011 Rwanda HRH Program, 2011–2019, Funding Proposal	2014 HRH Monitoring & Evaluation Plan, March 2014	2015 Project Narrative and Programmatic/Technical Work Plan	2016 Rwanda HRH Program Midterm Review Report (October 2015–June 2016)
			Development of faculty for health professional education	
	Expand research partnerships and academic exchange		Expand scientific partnerships and academic exchange	Expand research partnerships and academic exchange
			Monitoring and evaluation	

NOTE: CMHS = College of Medicine and Health Sciences; HRH = human resources for health; USI = U.S. institution.
SOURCES: MOH, 2011b, 2014b, 2015b, 2016b.

Qualitative data reveal a lack of congruence in the pathways to reach the Program vision; respondents reported a range of strategies including improving quality of care, producing high-quality health workers, building primary care, building specialty care, strengthening the medical education system (including faculty), and improving the availability of equipment and infrastructure. Among Government of Rwanda respondents, the Program's main objective was unequivocally to build a larger cadre of health care workers across specialties:

> *"The vision of the MOH was to improve the shortage of HRH, improve their quality in terms of skills and knowledge, and how to deal with some of the major issues that we had here in Rwanda. (48, Government of Rwanda HRH Program Administrator)*

To do this, as one HRH Program trainee articulated, it was necessary to build postgraduate training programs (32, University of Rwanda Non-Twinned Faculty and Former University of Rwanda Student in Obstetrics and Gynecology).

In contrast, the perceived objectives of the HRH Program among most University of Rwanda and USI respondents was to upgrade the number and skills of Rwandan health educators. When probed, one Government of Rwanda respondent who had been involved in the Program's design vehemently disagreed with the assertion that building capacity within the University of Rwanda was a programmatic objective:

> *Creating people who want to teach—it's something else. Don't forget that we [the HRH Program] create people to give care. That was the objective. And this has to be well understood. We needed people to provide care. It's good that we*

> *reinforced the University, but our program was not to reinforce the University. (18, Former Government of Rwanda HRH Program Administrator)*

Some USI faculty reported that the objectives and design of specific specialties changed significantly over the course of the Program. For example, the initial objective of the nursing and midwifery activity was to contribute to the skills upgrading of A2 nurses, but this shifted to focusing on building an A0 nursing cadre through the development of the Master of Science in Nursing (MSN) program:

> *The HRH Program started with increasing the level of A2 nurses to A1, to advanced diploma. Because the majority of health care providers in Rwanda were A1.... Then they started upgrading the A2 to advanced diploma. (31, University of Rwanda Administrator in Nursing and Midwifery)*

Similarly, the objectives around the Master of Hospital and Healthcare Administration (MHA) program evolved as its developers gained an understanding of the context and needs in hospital administration:

> *Initially, the program is for the [USI] faculty to come to Rwanda and work in a hospital and pair with the hospital administrator. So, instead of doing a formal education program ... we pair with them and help them side* by *side to do the day-to-day operations…. Later on, they discovered they don't have an official curriculum for hospital management so they started the development of a hospital management program that was based in the University of Rwanda School of Public Health. (06, USI Faculty in Pediatrics)*

The emphasis on specialized care over primary care evolved throughout the Program and was not clearly understood among different stakeholder groups. The Program comprised both pre- and in-service training activities, but the former were prioritized, in accordance with national HRH policy because preservice education "is less costly and gives immediate hand[s] on skills to the health professional" (MOH, 2014c). The strategy to focus on immediate hands-on skills was a central tenet of train-the-trainer models and the twinning program, which planned for Rwandan faculty and new graduates to phase out Academic Consortium faculty or to train colleagues in district hospitals, building capacity for local ownership and sustainability.

Efforts to strengthen the medical and nursing programs and the medical education system were underway before the HRH Program. In FY 2008 and FY 2009, USAID funded the University of Colorado to second "a family medicine faculty member … to provide extensive practical teaching, postgraduate supervision, and assistance with [the] development of the Family Medicine program" and to assist in integrating HIV/AIDS into postgraduate medical program curricula (PEPFAR Rwanda, 2008, 2009). By FY 2010, the University of Colorado's efforts had been subsumed under a large CDC-funded capacity-building program with Tulane University and had expanded to include support for a 4-year postgraduate medical program aimed at preparing "physicians to function with a broad clinical scope … to better address the burden of disease existing in Rwanda's rural communities." Twenty-three physicians, "including seven in Family and Community Medicine," were enrolled (PEPFAR Rwanda, 2010).

The in-country postgraduate medical program was initiated under the former Minister of Health, Jean Damascene Ntawukuriryayo, and continued by his successor, Richard Sezibera (Flinkenflögel et al., 2015). Although some of the work performed under Tulane's cooperative agreement with CDC was transitioned to the University of Rwanda, the agreement was not renewed at the close of its 5-year term under Agnes Binagwaho's tenure as Minister of Health (PEPFAR Rwanda, 2012).

One respondent who was involved in the design and early implementation phases noted that primary care was central to the HRH Program at the start, but was excluded from the list of clinical areas during implementation:

> *The emphasis on the primary care thing was one of the cornerstones of the HRH Program. The U.S. government came back to us when we submitted the proposal with lots of questions and concerns. They wanted to make sure that we really had an emphasis on primary care. So, we brought memos and answers to … certify that primary care was going to continue to be a key emphasis of the program. But then, as soon as the program was approved and funded, shortly [thereafter] the family medicine residency was discontinued and there was a shift from primary care to specialty care. (22, Non-Government of Rwanda HRH Program Administrator)*

According to one respondent representing an international NGO, the reasoning behind supporting specialized care over primary care was not well understood, because it

> *Flew in the face of the primary health care focus that people were having, particularly USAID, at the time [and there was] fear of donors that are putting a lot of resources in the specialized services is going to be done at the detriment of primary health care. (05, International NGO Representative)*

In contrast, a senior MOH official commented that there was no need to build primary care in Rwanda when the HRH Program started, because there were—and continue to be—other investments and efforts to strengthen primary care, but no efforts focused on specialized care.

Notably, few respondents spoke about the objectives of the HRH Program in relation to HIV. Two University of Rwanda administrators reported that the Program's goal should have been positioned in the context of "transition from acute burdens of HIV as a signature illness to much more chronic disease management" (02, University of Rwanda Administrator). A former HRH Program administrator expanded on this idea:

> *[T]he main problem was, we have a huge HIV population who have been on treatment for a very long period of time, and they started to develop other kinds of diseases—internal disease, where they might need surgery. They were in need of more specialized type of care that [could] be provided by very few specialists. (45, Government of Rwanda HRH Program Administrator)*

The literature echoes the HRH Program–HIV connection, in which it was imperative for the MOH to build a specialized health workforce to address long-term care for PLHIV and infectious disease control (Binagwaho et al., 2013).

DESIGN PROCESS

Figure 3-6 depicts the overall timeline of the HRH Program. In 2011, the Government of Rwanda submitted an unsolicited proposal, which was funded in 2012 under the expanded Clinical Services Cooperative Agreement (CDC, 2012). Prior to funding, 18 USIs submitted letters of intent to join the Academic Consortium, although one withdrew before the Program was launched (MOH, 2011c). USI participation in the Program increased until 2015, when institutions began withdrawing. An MOU was established between the MOH and a new USI in 2018, after PEPFAR's investment had ended. Membership in the Academic Consortium provided USIs with a mechanism through which to establish annual MOUs with the MOH. The Consortium was also a mechanism for determining the clinical purview of each USI. For example, Yale University was an obstetrics and gynecology partner, and New York University and Emory University provided support to the nursing programs, both upgrading nurses and the establishment of the MSN program.

USIs under the Academic Consortium contracted with individuals to work at the University of Rwanda to "twin" with and mentor existing Rwandan faculty, aid in strengthening existing residency programs and establish new programs, provide direct teaching services to Rwandan students, and, in some cases, provide direct care to patients. With few exceptions, the USIs contracted with U.S. citizens and did not engage regional faculty who could lend practical experience and knowledge from a more locally relevant context to the Program (see Chapter 4 for a more detailed discussion).

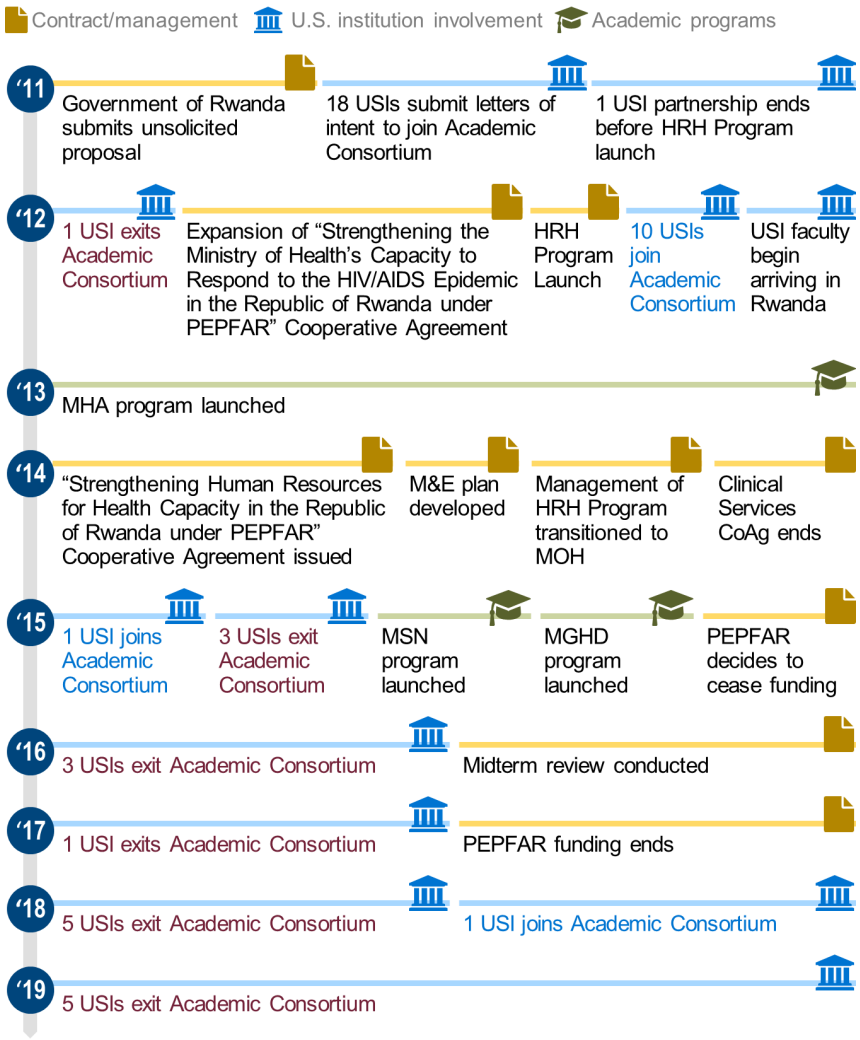


FIGURE 3-6 HRH Program time line.
NOTE: HRH = human resources for health; MSN = Master of Science in Nursing; PEPFAR = President's Emergency Plan for AIDS Relief; USI = U.S. institution.

Data-Informed Design

It was clear from interview respondents, including those who were engaged in the design of the HRH Program, that no specific baseline assessment was done prior to launching the Program. Six Government of Rwanda current program administrators referenced supporting documents, such as reports or an assessment, that informed the Program; three of these respondents specifically cited the Third Health Sector Strategic Plan and the Human Resources for Health Strategic Plan 2011–2016:

> *[F]rom the HRH Strategic Plan, that's why they had all the information: How many specialists do we have? What are the problems? What are the number of physicians per population? And then from the strategy that was developed in 2010, if my memory is serving well, that's what informed that we need the*

program. We need trainees to provide care to the population. (45, Government of Rwanda HRH Program Administrator)

The Third Health Sector Strategic Plan makes reference to an extensive situation analysis and comprehensive midterm review conducted in 2011, which informed the plan's priority to "improve quantity and quality of human resources for health (planning, quantity, quality, management)" (MOH, 2012d). Other HRH Strategic Plan objectives include increasing the number of trained and equitably distributed staff and improving health worker productivity and performance in part by improving the quality of preservice training (MOH, 2011a). Similarly, PEPFAR's Rwanda Country Operational Plans reference Tulane University's collaboration with other donors and the "National Technical Working Group for Human Resources in an in-depth needs assessment … designed to determine the health workforce needs in Rwanda, taking into account the disease burden, existing cadres and ongoing trainings (pre- and in-service)" (PEPFAR Rwanda, 2010, 2011). However, respondents from the Clinton Health Access Initiative (CHAI), who collaborated with the MOH in the design of the HRH Program, felt the MOH was not in a position to examine or plan for their HRH needs:

I think at the time, the reason the Ministry asked for our help was that they didn't have, you know, a very strong or well-established vision for where they should go in HRH…. So, even though there were some documents put together, people didn't really take it seriously. I don't think there was any kind of plan for longer term.... I haven't seen needs assessments that were done in an objective way [or] any kind of transparent process. (22, Non-Government of Rwanda HRH Program Administrator)

Collaboration During Design

The HRH Program design process appeared to have involved members of the MOH and CHAI, without involving other key partners, such as the Ministry of Education (MOE), Ministry of Finance and Economic Planning (MINECOFIN), or implementing partners working in HIV and HRH. CHAI's role, with financial support from the ELMA Foundation, was one facilitator. At the request of then-Minister of Health Richard Sezibera, CHAI convened an HRH working group to prepare a road map and strategy. These documents formed the basis of the HRH Program proposal, which CHAI "unilaterally wrote … and submitted to the U.S. Embassy" (20, Government of Rwanda HRH Program Administrator). As part of this process, CHAI worked with the MOH to determine programs within the PEPFAR portfolio whose funding could be reduced or terminated to cover the costs of the Program:

[CHAI] helped to figure out where the money was going to come from … basically, it's a budget and expenditure reporting from partners. We analyzed that, compared that to the Country Operating Plan of the U.S. government. And then we sat down with the Ministry of Health, discussed the programs they wanted to keep, what they wanted to cut. We went through the list, suggested some cuts to find them funding. And then the Ministry went back to the U.S. government and said, "cut this, cut that" and that's how they found the funding. (20, Government of Rwanda HRH Program Administrator)

This was corroborated by PEPFAR during one of the committee's open sessions. Once the Program was funded, CHAI was asked to stay on, and managed the HRH Program through the first year of implementation while the MOH set up internal management structures and onboarded staff.

Although the MOH–MOE relationship faced challenges at the beginning of the HRH Program, it strengthened over time. Not involving the MOE during Program design and early implementation was perceived as a mistake:

> *We actually started the HRH Program without the Ministry of Education involvement. Only after we launched it and it was a reality, I think, that's when we realized that we had made a mistake by not involving education. To be fair, I think things were also in flux; even in the government, it was not totally clear where postgraduate training was supposed to be, whether in the School of Medicine, it was under Ministry of Health, or Education and where the respective roles started and stopped. But at some point, they [MOH officials] had to go to see the Minister of Education, Dr. Vincent Biruta, and basically apologize and explain what happened … from then on, things started to work well with the Ministry of Education. (22, Non-Government of Rwanda HRH Program Administrator)*

One MOH respondent involved in the early stages of the Program described the MOE as "a contractor" (18, Former Government of Rwanda HRH Program Administrator). A non-Government of Rwanda HRH Program Administration respondent expressed his view that there was no relationship between the MOH and MOE before the Program, and that a relationship had been built through MOH–MOE steering committees formed to set standards for health care professional education:

> *We used to sit together—Minister of Health, Minister of Education, University [of Rwanda]—to try to understand the challenges and provide solutions together. I think from the HRH Program we strengthened this collaboration between the Ministry of Health and Education. (48, Government of Rwanda HRH Program Administrator)*

FINANCIAL MANAGEMENT

The 2011 HRH Program proposal indicated that a Single Project Implementation Unit would be established "to centralize programmatic, financial, and administrative management functions" (MOH, 2011b). PEPFAR investments in the HRH Program flowed directly to the MOH, although according to one respondent, a "parastatal" had been set up to manage the money, where funds were disbursed by MINECOFIN. One respondent involved in the early phases of the Program noted that this design was intended "to try and eliminate the high cost of an international NGO go-between … and having a government that had demonstrated their ability to manage and oversee, monitor, and evaluate programs" (25, Non-Government of Rwanda HRH Program Administrator).

The Permanent Secretary of the MOH had oversight over the HRH Program budget. The Government of Rwanda employed a Public Financial Management system, in which funds were held in an account separate from the National Treasury. The system facilitated budget oversight, because the University of Rwanda used the same system.

According to MOH data, the bulk of the expenditures from PEPFAR investments in the HRH Program went to USIs, followed by equipment procured for health professional education and clinical training (see Table 3-7).

TABLE 3-7 HRH Program Expenditures of PEPFAR Investments (U.S. Dollars)

Recipient	Budgeted Amount	Disbursed Amount
USIs	31,180,833	29,804,744
University of Rwanda	5,830,730	5,830,730
Equipment Procurement	16,083,568	17,901,279
Travel	429,600	429,600
Supplies	3,092,778	3,092,778
Program Management	2,529,771	1,646,487
Total HRH Program Expenditures	59,147,280	58,705,618

NOTES: The fluctuating exchange rate was set by the Rwandan National Bank. The original Program proposal had a specific line item for equipment maintenance, amounting to $1.5 million. A similar line item is not reflected in these expenditure data.
SOURCE: Financial data provided by the MOH.

Table 3-7 includes only funds provided by CDC and does not reflect other investments from sources such as the Global Fund and the MOH. According to the MOH, the $441,661 difference between the budgeted amount and the disbursed amount was not funded by CDC.

The MOH articulated the importance of unmeasurable inputs that were critical for the running of the HRH Program, including overhead costs expended by the University of Rwanda for managing its facilities, unallowable expenses incurred by USIs in recruiting and managing USI faculty, and other essential financial inputs by the MOH, such as annual travel allowances for all residents to move across sites for their rotations and visit their families when they were rotating at a site away from their primary residence.

Financial audits of the Global Fund's investments during periods concurrent with the HRH Program (2014, 2016 to 2018), and therefore presumably inclusive of funds applied toward the HRH Program, yielded no major concerns. Systems of internal control were typically found to be "generally" or "partially" effective. The 2014 audit identified three areas for improvement: data quality assurance, supporting documentation, and low absorption of funds (Global Fund, 2014). The 2016–2018 Global Fund audit found, however, that grant oversight and assurance mechanisms needed significant improvement (Global Fund, 2019). Audits of other investments in the MOH had similar findings. An audit of the MOH's management of Gavi funds rated the MOH as partially satisfactory (Gavi, 2018), and an assessment of a Swedish International Development Cooperation Agency–supported program that centered on building research and

higher education capacity identified three key issues in the MOH's financial management: lack of consolidated financial reporting; delays in disbursements to Swedish partner universities; and slow budget execution that affected implementation (Tvedten et al., 2018). Additionally, a thorough search for a CDC audit of the HRH Program was conducted, and none was located.

Beyond the financial management processes, program administrators expressed some frustration about PEPFAR's processes and restrictions on how funding could be used, especially in the light of the HRH Program's holistic and integrated design:

> *The second [challenge] was how surprisingly hard this was using PEPFAR money … it was a pain in the ass, I'm sorry for my language..... For anything, any comment, any point, you need to ask for authorization…. People from Atlanta will have to sign something and Rwandans as well and … you need to write 200 pages of document. The equipment that was supposed to come in year 1 came in year 3 or 4. It was really not easy to use the funds. (45, Government of Rwanda HRH Program Administrator)*

> *There are too many specialties that these fund were not really able to support and for us, I can see how [HIV] is related to that. A radiologist doesn't just treat a non-HIV patient, it treats both and the most complicated cases come from the people who have HIV. Same with dentistry. (03, Government of Rwanda HRH Program Administrator)*

Institutional Financial Arrangements

The 2011 HRH Program proposal outlined several key principles guiding the relationship between the MOH and USIs. The MOH would receive funds directly from the U.S. government and issue contracts to USIs. MOUs were established between USIs, the MOH, and MINECOFIN. Each USI had separate coordinators for the academic aspects of the MOU and for finances. The mismatch of FYs between USIs, the Government of Rwanda, and CDC, compounded by yet another difference in the University of Rwanda's academic year, presented an additional contractual challenge that affected payment scheduling:

> *CDC came with a specific CDC fiscal year for some reason which was March-April [and] that was even more difficult because it pushes the quarter to another one, so from October you will see that it comes to the other year and all this payment to universities was done quarterly. (20, Government of Rwanda HRH Program Administrator)*

The 2016 midterm review also noted this challenge. Upfront stipulations around financial management included that USIs' overhead to the programmatic and administrative functions could not exceed 7 percent of total direct costs for recruiting faculty, predicated on the assumption that the Government of Rwanda would be responsible for some of these administrative activities (MOH, 2011b,c). The HRH Program proposal also stipulated that USI faculty were expected to commit to residing in Rwanda for at least 11 months and would receive:

> *Salary and benefits … lower than they could obtain at their universities in the U.S. This reflects the fact that the HRH Program is a development project meant to serve poor people in a resource-poor country and also reflecting the fact that this is an educational opportunity for the U.S. faculty (MOH, 2011b).*

USI faculty were mostly contract hires, not existing faculty receiving time to dedicate to the HRH Program.

PROGRAMMATIC MANAGEMENT APPROACHES AND CHALLENGES

The HRH Program experienced challenges in its design, launch, and execution that were both internal to Rwanda (between the MOH and MOE and stakeholders outside the Government of Rwanda) and external to Rwanda (between the MOH and USIs).

Interinstitutional Relations

MOH–MOE Relations

As indicated above, the design phase did not actively engage the MOE, a gap that had implications in the early implementation period. Some faculty at the University of Rwanda were aware of the HRH Program before it was launched, and reported being excited that former U.S. President Bill Clinton and Rwandan President Paul Kagame had participated (37, University of Rwanda Administrator), although respondents knew of other faculty members who were not aware of the Program:

> *I was a little bit ahead of my colleagues who had those challenges of not being informed ahead, but for me, I knew that the program was there. (80, USI Faculty in Nursing)*

This absence of communication about the Program included incoming students who were anticipating joining training programs abroad, but were told they would be enrolled in programs in Rwanda:

> *Because we were not informed of the Program … yeah it was a surprise! We did exams, competing for scholarships [in other East African countries]. We were responsible for getting a mission letter from in-country ourselves…. When we presented them…. They said, "No, no, we are not going" and they didn't inform [us] that we have a program locally. We kept asking, "What happened?… What is next?" Then it was 6 months later they say, "All those who have scholarship are going to have your program locally." (47, University of Rwanda Faculty and Former Student in Nursing)*

The MOH received and managed external HRH Program funding and was responsible for signing MOUs with USIs. The MOE had little input into the allocation of funds. The roles and the responsibilities of the MOH and MOE, which required a collaborative relationship between the two ministries, was articulated by a respondent representing a professional association:

> *The Ministry of Health had nothing to do with the assessment of the students or their teaching, not very much, except that the Ministry of Health was the one that was creating the environment in which people were trained because, in the Ministry of Health they were responsible for the good running of the hospital, and without a hospital that is capable of providing good care you cannot talk about good teaching of postgraduates…. The academic head of medicine [at the University of Rwanda] was the one who was looking at the planning of the rotations, he would be the one who decides who comes to King Faisal, who goes to CHUK [Centre Hospitalier Universitaire de Kigali/University Teaching Hospital, Kigali], who goes to Kanombe … how long that person will stay and will also come for a visit to see if people are there to get reports of what is happening. (35, University of Rwanda Non-Twinned Faculty in Internal Medicine and Professional Association Representative)*

During implementation, University of Rwanda administrators reported that the communication between the MOE and the MOH was clear and managed through a steering committee chaired by the principal of CMHS. They reported that he had oversight over all of the operational and programmatic issues with HRH trainees, while the MOH dealt with contractual issues and accreditations:

> *We have a steering committee … chaired by the principal of the [College of Medicine and Health Sciences] and is composed [of] all deans of the college where we have the HRH Program,… and the team of HRH from the Ministry of Health. We sometimes invite also HoDs [heads of department] and if it's necessary, we invite the HRH faculty. (37, University of Rwanda Administrator)*

MOH respondents also mentioned the value of the steering committee as the entity "in charge of giving the guidance and making the policies" (20, Government of Rwanda HRH Program Administrator), which strengthened the ministries' relationship. MOH respondents also articulated the roles and responsibilities, while reinforcing the idea that "it is one government" and neither ministry could unilaterally determine the priorities of both sectors (03, Government of Rwanda HRH Program Administrator). The steering committee was also responsible for ensuring no duplication of efforts between the HRH Program and other investments in strengthening health workers, such as the Capacity Development Pooled Fund.

USI faculty described the relationship between the MOH and the MOE as "painful" (23, USI Twinned Faculty in Nursing), affecting their ability to support the review and approval of new or updated curricula and accreditation of new programs:

> *I would just think that the Ministry of Health would want the best teachers but that's not what they have been doing. (16, USI Faculty in Obstetrics and Gynecology)*

MOH–International NGO Relations

As with the design, respondents from international NGOs felt the MOH was not inclusive of other organizations in the program's management and implementation:

> *My view is that at least the Ministry of Health doesn't try to involve other partners…. My feeling is that the Government of Rwanda, the Ministry of Health, has taken an attitude of saying: "You know, this is our business and we are not…." (05, International NGO Representative)*

> *Coordination [between the HRH Program and other programs] wasn't great … activities tended to occur in silos. (26, International NGO Representative)*

MOH–USI Relations

The 2016 midterm review highlighted challenges in contracting processes: lack of clarity around leave and other policies, timeline and processes for obtaining work permits and licenses for USI faculty, and funding and reporting requirements that resulted in delays in drafting MOUs; delays in annual revising and reissuing MOUs; late award notification, which delayed program funding and USI reimbursements; and a need to accommodate USI and HRH Program processes delaying submission of invoices and payment (MOH, 2016b).

Interview respondents for this evaluation echoed many of these challenges. From the USI perspective, challenges with contracting included contracts being limited to 1 year, requiring annual renewal, differences in malpractice standards, and the exclusion of overhead from contracts (described in the previous section), which was viewed as an "extra horror" that was "not realistic for a long-term project with a U.S. institution" (15, USI Faculty in Hospital and Health Administration). MOH delays in issuing contracts, raised in the midterm review and in interviews, had notable implications on the presence of USI faculty at the University of Rwanda and their personal and professional futures:

> *We did not start immediately in year 1…. We had no contract. There were people from here who were told that there would be contracts in July. We got our contract in November…They don't get it. People stay here without contracts for periods of time…. [The MOH coordinator] was like, "Oh, we'll get the money," but when? My faculty is the sole provider of her family. She can't work for free. (17, USI Faculty in Obstetrics and Gynecology)*

> *We would stay on a few months to finish up or to make a transition. But it's very unsettling for the people [Rwandan faculty and residents] that you are working with when you say, "I hope I'll be back." (16, USI Faculty in Obstetrics and Gynecology)*

Program administrators who worked outside of the Government of Rwanda shared that some USI faculty "pulled out" of the HRH Program because the financial gap (due to these contract conditions) "was putting enormous pressure … so it was too much risk" (22, Non-

Government of Rwanda HRH Program Administrator). There was also fluctuation in the number of USIs participating in the Program. In 2011, 18 programs had submitted letters of intent to join the Academic Consortium (11 in medicine, 6 in nursing and midwifery, and 1 in health management and global health delivery). In 2012, one of those institutions withdrew prior to program launch, though an additional 10 joined the program (9 in medicine, 1 in nursing and midwifery). USIs began exiting the Academic Consortium in 2015 with 3 exiting in 2015 (2 in medicine, 1 in nursing and midwifery); 3 in 2016 (2 in medicine, 1 in nursing and midwifery); 1 in 2017 (from nursing and midwifery); 5 in 2018 (4 in medicine and 1 in health management and global health delivery); and 5 in 2019 (2 in medicine and 3 in nursing and midwifery). Two USIs did join during that period: 1 in 2015 (in health management and global health delivery) and 1 in 2018 (in medicine).

That USIs were expected to spend no more than 7 percent on administrative activities related to recruitment reinforced a feeling that these institutions were nothing but a "recruitment firm, rather than true partners" (06, USI Twinned Faculty in Pediatrics) in building the institutional capacity to provide high-quality health professional education. This feeling was exacerbated in situations when the MOH told USIs its needs, sometimes with little warning, and with USIs conducting the screening and proposing individuals and the MOH making final decisions. Additionally, differing benefits between the two countries created obstacles, especially around maternity leave, which was part of the contracts USIs issued but was not a Government of Rwanda benefit. A similar obstacle was perceived with sick leave:

> *In Rwanda, we know that sick leave is something that you take when you are sick. In the U.S., sick leave are accrued and you have day per month as a right and when you do not take them you will add those accrued sick leave into your annual leave to sometimes we could have faculty doing 60 days or 40 days of leave and you know for an academic year where you have to work 1 year, it is not easy … it had implications on the budget, meaning you are paying someone who did not work for 60 days, did not deliver. (20, Government of Rwanda HRH Program Administrator)*

The 2011 proposal indicated that "basic benefits [would] be provided" to USI faculty, naming only health insurance, emergency evacuation insurance, adequate housing, and roundtrip airfare (MOH, 2011b).

Government of Rwanda staff who managed the HRH Program also sometimes felt disappointed by USIs, which was seen as affecting programmatic success:

> *There are also some institutions that disappointed us in the middle just by withdrawing from the program or not sending the required qualified staff. All those already are jeopardizing the good implementation of the program. (03, Government of Rwanda HRH Program Administrator)*

Communication from USIs to the MOH about the physician specialists, nurses, and midwives selected to travel to Rwanda, specifically their experience and seniority, also affected the relationship, although this was seen as having improved "over time as we went on mentioning this challenge the profiles changed and I think they would send even better people" (48, Government of Rwanda HRH Program Administrator).

MONITORING AND EVALUATION

Reporting requirements for the HRH Program evolved over the years, in part because of the changing funding mechanisms as well as the broader shift in standards for M&E. In April 2012, before the Program was integrated into the MOH's periodic program reports for the Clinical Services Cooperative Agreement, the MOH submitted to CDC a detailed work plan and budget for the Program. The work plan was similar to a logical framework and included goals, objectives, activities, a quarterly timeline, and program indicators that were consistent, if not more detailed, than CDC reporting requirements at the time (CDC, 2009a; MOH, 2010, 2012a). Program indicators for the HRH Program and other components of the Clinical Services Cooperative Agreement, however, remained largely output measures (CDC, 2009a; MOH, 2010, 2012e).

In 2013, the work plan for the Clinical Services Cooperative Agreement Continuing Application called for the development of an "M&E framework and indicators" as one of the HRH Program's "major programmatic/technical activities" (MOH, 2013a). An open invitation for Program participants to volunteer to join one of two stakeholder groups—an in-country M&E Working Group (comprising HRH Program members and Rwandan faculty) and a USI M&E advisory group—was also sent in 2013 to support the M&E plan development. As a result, the MOH submitted to CDC the Program's "Human Resources for Health Monitoring & Evaluation Plan" in March 2014 (MOH, 2014b).

In addition to the three main strategic outcomes described previously, the M&E plan provided outputs, detailed process and outcome measures, data sources, annual performance targets, reporting frequency, and baseline and midterm evaluation components; the rigor of this plan reflected PEPFAR's increasing emphasis on M&E (PEPFAR, 2011, 2012) and use of more sophisticated metrics, which had begun in 2009 with the development of PEPFAR's Next Generation Indicators. In contrast to PEPFAR's earlier metrics, which had been largely output measures, the Next Generation Indicators sought to measure program coverage and quality using both process and outcome indicators.

In October 2014, when CDC issued a noncompetitive funding opportunity announcement to continue the Program's funding at a level of $14 million per year for 5 years under its own funding mechanism, PEPFAR's M&E requirements for the Program were both comprehensive and rigorous:

> *CDC will work with the awardee to implement, using PEPFAR and national indicators as a base, a robust monitoring and evaluation system designed to track the implementation of HRH efforts, preservice training, and maintenance of critical health care equipment that have already begun and will continue after [U.S. government] support for these activities concludes. This system will provide evidence needed to drive a programmatic process for decision making. This will be built on a three-tiered approach that captures data through routine program monitoring, program evaluation, and specific surveys (CDC, 2014).*

To fulfill these requirements, the MOH submitted a project narrative and evaluation and performance measurement plan in its award application (MOH, 2014d). Under the new cooperative agreement, CDC required the MOH to revise and submit a more detailed evaluation

and performance measurement plan within the first 6 months of the award (CDC, 2014). In 2015, the MOH submitted a revised programmatic/technical work plan that documented "SMART (specific, measurable, achievable, relevant, and time-based) Objectives," activities, a timeline, responsible parties, and "process measures" (MOH, 2015b).

According to the 2014 M&E plan, a point person, trained in the use of data collection tools for routine reporting, would be available for every teaching hospital and health facility (MOH, 2014b). Three main evaluations at three time points would also be planned to measure the program's outcomes and effect, recognizing that a baseline might only be available for some areas because the Program had already started (MOH, 2014b). Most indicator data for program monitoring would be collected semiannually from the following sources: the Health Management Information System, Human Resources Information System, health education institution records, and program records. A Health Education Institution Survey and Hospital Survey were also planned, although no evidence was found to show that either survey occurred (MOH, 2014b).

The HRH Program midterm review reported that quarterly surveys were administered to individuals involved in the Program, although response rates were low, especially among Rwandan faculty (MOH, 2016b). An organizational case study of the Program concluded that its prioritization of implementation costs and underestimate of administrative, monitoring, and evaluation costs—coupled with the substantial size and scope of the Program—created a "mismatch between needs and availability of resources and expertise" and a lack of resources for M&E (Cancedda et al., 2018).

From the perspective of interview respondents, little investment was made in M&E processes, which had also been noted in the Program's midterm review. A USI respondent commented that having a single M&E officer for the Program was insufficient:

> *One M&E officer, like 100 U.S. faculty on the ground from 21 different institutions across 5 or 6 physical locations in Rwanda and in 4 major disciplines, and an officer barely had the capacity to figure out what kind of questionnaire to write, much less disseminate to collect it, analyze it, and report on it in a way that was receivable by funders, partners, government, and university. Impossible. Totally impossible. Total fail. (83, USI Faculty in Surgery)*

Another respondent stated that there was "a high-level M&E document [referring to the 2014 M&E plan], but it's not specific to actual activities on a yearly basis" (22, Non-Government of Rwanda HRH Program administrator from an international NGO).

SUSTAINABILITY PLANNING

Under PEPFAR's partnership frameworks, an important component of PEPFAR's 2.0 strategy (PEPFAR, 2014, 2019b), sustainability was defined as "supporting the partner government in growing its capacity to lead, manage, and ultimately finance its health system with indigenous resources (including its civil society sector), rather than external resources, to the greatest extent possible" (PEPFAR, 2009). PEPFAR's role was to move from supporting the expansion and provision of direct services to offering technical assistance to partner countries to work towards sustainable programming (PEPFAR, 2019b). This was operationalized through a 5-year Partnership Framework, which aimed to produce results in HIV prevention, care, and

treatment, and to position countries "to assume primary responsibility for the national responses to HIV/AIDS in terms of management, strategic direction, performance monitoring, decision making, coordination, and, where possible, financial support and service delivery" (PEPFAR, 2009).

For the HRH Program, the 2011 proposal referred to sustainability in the context of the intention that, after 8 years, the Government of Rwanda would operate the Program under its own budget. The proposal included a rationale for the availability of the financial resources that would be needed to absorb the newly trained health workers and maintain equipment purchased under the HRH Program. It argued that the government's commitment to allocating 15 percent of the total national budget to health, as agreed to in the Abuja Declaration, combined with the projected 5 percent annual increase in the total Rwandan budget due to GDP growth, would generate enough funds to cover the estimated $43 million per year for Rwandan health professionals produced by the HRH Program, $9 million per year for tuition support, $13 million (over several years) for equipment replacement, and $1.5 million per year for equipment maintenance (MOH, 2011b). The MOH's 2014 funding application program narrative in response to the funding opportunity announcement articulated sustainability as the programmatic aim of building "sufficient Rwandan educators, infrastructure and equipment, and domestic financing to support Rwanda's health care and health sciences education without external support" (MOH, 2014d).

Although it appears that some planning for sustainability took place during the proposal phase, interview respondents expressed variation in how to define and measure HRH Program sustainability, which was linked to how they conceptualized the Program goal and objectives, as articulated by an administrator at the University of Rwanda:

> *It depends on what you mean by sustainability. If you mean a program that goes on forevermore, having a hundred people coming every year … if that's your version of sustainability we need to sit down and talk about it. If it's about building on the gains, that's another issue and that's something that the university takes very seriously…. In terms of sustainability, do we need the same thing forevermore for the next 20 years? Then, no. We would have failed. Do we want input of experts for the expertise that we don't have? Absolutely, you know! Sustainability is about us, being able to do by ourselves, better than it is done anywhere in the world, and that's what we are striving to do at the University of Rwanda all the time. (02, University of Rwanda Administrator)*

Among respondents who believed the intent was to build capacity within the University of Rwanda to continually produce high-quality health workers, sustainability was seen as built into the design:

> *[T]he goal was to mentor teachers and train faculty. So, in the design, the program is already sustainable. (43, Government of Rwanda HRH Program Administrator)*

One respondent explained that the design included a gradual phasing out of USI faculty and a simultaneous increase in Rwandan faculty:

> *The program was implemented with the target that after 7 years the program will end…. [T]he sustainability plan was kind of [a] mechanism of decreasing gradually the U.S. faculty, while increasing retained and available local faculty. That is one thing. On the other side, the [University of Rwanda] had in their planning to have to increase the college faculty so the local Rwandan faculty in the university funded for 2 years, I think that was the initial plan for the 2 last years of the program, with the program funding while negotiating to be integrated in the structure of the university. I think that is how the sustainability plan was thought. (20, Government of Rwanda HRH Program Administrator)*

In contrast, for another respondent, who had expressed that the objective of the HRH Program was to build capacity of Rwandan health education institutions, most directly the University of Rwanda, the Program failed to clearly understand and build on the capacity of local institutions:

> *[L]ocal institutions were … involved, but there was nothing really done to understand the local institutions' capacity, strength, readiness, levels, interest, priorities, process. And nothing was really done to understand how we could integrate successfully this faculty and effectively in the local institutions, you know, how they were going to support the leadership, how they were going to complement and not replace local faculty in the way that built on synergies and not mix with redundancies which happened a lot, I think. (22, Non-Government of Rwanda HRH Program Administrator)*

Respondents external to the government were skeptical of the sustainability and long-term planning that was done in the design phase:

> *I think the attitude of a lot of Rwandan institutions, departments, was that "Ok, we will take the support and enjoy it while it's there. It is really helpful; it is filling a gap." And then one day it ends and there's something else coming in. And that's fine, but not really long-term planning. (22, Non-Government of Rwanda HRH Program Administrator)*

CONCLUSIONS

The HRH Program represented a confluence of unusual circumstances and an opportunity in foreign assistance. Its design endorsed Rwanda's larger vision of strengthening the country's workforce, including in the health sector, although there were missed opportunities to learn systematically. PEPFAR 2.0 marked "a new era of collaborative planning and health systems strengthening activities with … partner governments" (PEPFAR, 2014). PEPFAR's investments in the HRH Program were a critical contribution to launching an Academic Consortium that leveraged (1) existing and new partnerships with individual USIs, (2) the political commitment of a government with record of successfully managing health systems programs, and (3) a holistic PEPFAR strategy that emphasized HSS.

PEPFAR's investments in the HRH Program in Rwanda were relatively unique, departing from U.S government and many other big donors' models for "business as usual," but aligned

with prevailing principles established by the Busan Partnership for Effective Development Co-operation, in which funding partners would support shared goals according to specific country situations (Fourth High-Level Forum on Aid Effectiveness, 2011). PEPFAR investments have continuously supported programs and activities implemented in partner countries and, consistent with PEPFAR's strategy to move toward sustainability, have directed their funding over time to local prime partners, although the proportion of funding to partner country governments has been relatively stable (IOM, 2013).

From the outset, Rwanda expressed a strong commitment to national ownership, as articulated in *Vision 2020*, and sought to increase the direct management of externally funded health and HIV programs. To move toward this vision, the Government of Rwanda and its PEPFAR-funded partners promoted a transition plan that shifted HIV program leadership from partners to the host country, including direct PEPFAR financing to the government (Government of Rwanda, 2012). The management transition took place by February 2012, when the MOH became a direct recipient of PEPFAR funds and gained responsibility for coordinating critical service delivery (Binagwaho et al., 2016). These investments challenged the conventional model, and used country ownership and shared responsibility as a new paradigm when the HRH Program commenced in 2012 (Goosby et al., 2012a,b).

The investments in the HRH Program also were an opportunity to add to the evidence around twinning because the Program's Academic Consortium was designed not only as a departure from short-term faculty stints in Rwanda, but also to completely phase out by the end of the Program, as the "twins" and new graduates gained skills to serve as local faculty. The twinning arrangements were between individual USI faculty and University of Rwanda faculty, not between the two institutions. The implications of this arrangement, discussed more fully in subsequent chapters, were felt in terms of sustained capacity at the institutional level to provide ongoing health professional education.

There was concurrence among HRH Program participants on a high-level vision and intent, which aligned with broader health-sector goals. However, there was a lack of clarity around the mechanisms and pathway for achieving a world-class health care system, the consequences of which were felt during the implementation of the Program, as discussed throughout subsequent chapters. The relative importance of building health education capacity, including enhancing the skills of Rwandan faculty and the learning environment at the University of Rwanda, was inconsistent during the life of the Program. In particular, it was unclear whether activities for building institutional capacity for health professional education were prioritized simply as a mechanism to produce the desired number of health professionals across cadres, or viewed as complementary goals to having a sustainable, skilled, and specialized workforce, as expressed in the later strategic outcomes (MOH, 2011b, 2014b, 2015b).

The downstream effects of the shifting language in MOH documents was a lack of clarity across stakeholders around the Program's goals and objectives, which had implications for the design and for sustainability planning and were further compounded by differing (and sometimes conflicting or restrictive) administrative practices across participating institutions (Government of Rwanda, USIs, and PEPFAR). Planning for sustainability evolved from accounting for funding of the established training activities under the HRH Program after 2019 to more holistically ensuring the quality of health professional education and service delivery.

Although the Government of Rwanda recognized the unprecedented scale and nature of the HRH Program's strategies, there was insufficient planning to exploit the opportunity to learn systematically from this endeavor by establishing rigorous M&E processes and supportive

mechanisms at the outset (MOH, 2011b, 2014b, 2016b). The original program objectives were incorporated into various indicators for the M&E plan and midterm review; however, the development of an M&E plan after implementation had begun resulted in a lack of baseline data for some cadres and program areas, as well as unexplained differences in baseline and target values (MOH, 2011b, 2014b, 2016b). Even as the post hoc M&E plan articulated an intention to "provide a reliable data-driven approach … to ensure accountability, program improvement, impact, and learning," there was lack of follow through by the Government of Rwanda in providing dedicated resources to establish an M&E platform (for example, M&E working groups were composed of volunteer HRH Program participants, as opposed to designated roles), to carry out planned assessments, and to build overall capacity for monitoring, evaluation, and learning (MOH, 2014b).

Overall management of the HRH Program was challenged by the lack of time for operational management, both at the outset of implementation and continuously, as unexpected circumstances arose. More time between the design, launch, and execution phases would have supported stakeholders' ability to better anticipate and develop contingent strategies for issues such as PEPFAR funding processes and restrictions.

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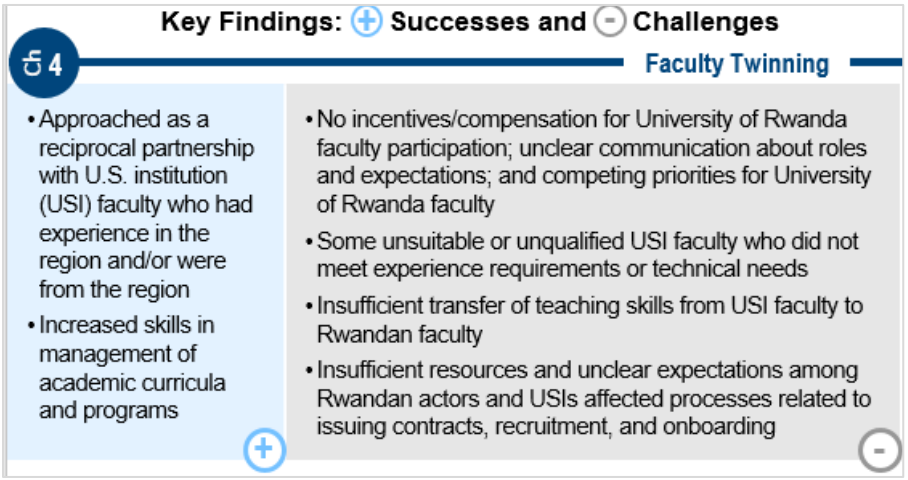
4

Faculty Twinning



Capacity building in the Human Resources for Health (HRH) Program occurred through a number of activities, including the creation of the Academic Consortium, discussed in Chapter 3, comprising U.S. institutions (USIs) that would conduct mentoring or "twinning"[1] with University of Rwanda faculty (CDC, 2012; MOH, 2011b, 2012, 2014, 2016). Although twinning was a key mechanism by which the HRH Program intended to build Rwandan health professional educators' capacity, the 2011 Program proposal makes only two mentions of the practice, one in reference to building leadership teaching capacity, with specific reference to obstetrics and gynecology, and the other in relation to research capacity, whereby a Rwandan principal investigator would be twinned with a foreign co-principal investigator (MOH, 2011a).

In practice, the HRH Program launched and supported 22 training programs across health cadres and specialties, through 16 to 25 participating USIs that collectively deployed about 100 faculty members each year to twin with University of Rwanda faculty members (see Figure 3-6 for a time line showing participating USIs). Twinning under the HRH Program was individual, focusing on one-to-one faculty relationships, with the aim of the USI faculty building University of Rwanda capacity in teaching and clinical care. Although some USIs, such as Harvard Medical School, had longstanding partnerships in Rwanda, most were selected for their specialties and their commitment to recruiting high-quality professionals to stay in Rwanda for extended periods.

Many USI "faculty" members were independent contractors, hired for this specific, time-limited twinning assignment, and many had not worked at the USIs previously. Most of these contractors were based in the United States; others were based regionally, such as in Botswana

[1] The World Health Organization defines twinning as a formal, two-way exchange and collaboration between two organizations (WHO, 2001).

and Kenya. These characteristics of USI faculty twins would prove important for the mixed outcomes of the twinning process, as confirmed in the literature (Cancedda et al., 2018; MOH, 2016; Ndenga et al., 2016) and in qualitative data collected throughout this evaluation. Overall, although most respondents agreed that the first few years of twinning activities faced challenges, by 2019, USI and University of Rwanda faculty and HRH students all reported a mix of successes and challenges.

Twinning was designed as a departure from historically short-term visits (Binagwaho et al., 2013; MOH, 2011a) and was intended not only to promote teaching skills (as well as skills within clinical specialties) to Rwandans, but also to foster mutually beneficial academic partnerships beyond the 7-year HRH Program (Cancedda et al., 2017, 2018; Ndenga et al., 2016). As one respondent noted:

> *Additionally, HRH helped people to open eyes about partnerships. There were people who have had professional exchanges—those are connections. So, [the] HRH [Program] helped Rwandans to open eyes and to make connection in other countries, especially in the United States. So, that was not a bad thing. (Former HRH Student in Surgery)*

Faculty spanning a variety of health-related disciplines (such as medicine, dentistry, nursing and midwifery, and health management) began arriving and teaching in late 2012 from Academic Consortium institutions (see Chapter 3 for details on the Consortium) to support the 22 training programs (Cancedda et al., 2018). However, not all programs were launched in the same year, reflecting implementation issues with procurement and shifting Ministry of Health (MOH) funding priorities. The initial range of programs included rapid skills upgrading for cadres such as nurses and midwives, targeted boosting of the production of health professionals, and the establishment of specialties and disciplines such as dental surgery and health management.

The midterm review confirmed, as did respondents discussing program management in this evaluation, that the

> *goals of the twinning—to improve the teaching and clinical specialty skills of Rwandan faculty—were well understood at a senior management level from the beginning … [but] this vision was not trickled down to the faculty and administrative units (e.g., schools, departments) who were meant to drive the model. (MOH, 2016)*

This illuminates an important finding: The HRH Program's twinning approach had a strong vision but lacked operational cohesion in efforts to realize that vision. This was particularly caused by two challenges, first in clearly defining the USI faculty contractors' scopes of work, and then in communicating the scope of the relationship to the University of Rwanda.

USI faculty filled multiple roles during the twinning program, as the midterm review also notes; there was an expectation that USI faculty would have dual roles as sole faculty members in new specialties and as mentors to the first cohort of trainees (MOH, 2016). From the perspective of HRH Program trainees, this expectation came to fruition. They reported that their main mentors and teachers were USI faculty, and the trainees expressed strong appreciation for

the education they had received from these individuals. Indeed, throughout data collection, when interviewees referred to "HRH faculty," they were consistently referring to USI faculty, rather than Rwandan faculty from the University of Rwanda:

> *So, I actually started to know much about HRH when I was rotating in [obstetrics and gynecology]. So, that's where I met some doctors from [the] U.S. They were so eager to teach us. Since that time then, up to when I—even now, we're still communicating (84, HRH Program Trainee, Pediatrics)*

HRH trainees reported the USI faculty members' biggest contribution was in their direct training and professional support of University of Rwanda students, followed by providing clinical services, and, less consistently, in building the capacity of University of Rwanda faculty to teach in these new specialties. Chapters 5 and 6 discuss in more detail the benefits of the USI faculty's teaching and mentorship on specific outcomes for HRH trainees and the University of Rwanda more broadly.

SUCCESSES OF TWINNING

University of Rwanda respondents, USI faculty, and HRH trainees all reported important positive outcomes resulting from twinning relationships, including the approach to twinning as a partnership, rather than a mentor–protégé relationship. The longer duration of USI faculty engagement (1-year contracts versus a more typical 3-month rotation) was noted as a key success factor; one USI faculty member (16) reported that the longer stay showed "a sense of commitment to a department" that helped foster more productive relationships. There is some evidence that being twinned in programs with established University of Rwanda faculty (nursing, pediatrics, and internal medicine) generated more effective twinning relationships than newer programs with fewer Rwandan faculty, such as the Master of Hospital and Healthcare Administration (MHA) program.

Respondents also noted positive twinning outcomes related to increased skills in the management of academic curricula, and the value of having committed USI faculty not only from U.S.-based institutions, but also from the Eastern and Southern Africa regions, as well as others with experience working in the region.[2] This latter factor supported twinning relationships grounded in the cultural humility necessary to form strong relationships between twinned faculty members. Notably, USI faculty who were already in Rwanda and had established relationships there before the start of the HRH Program reported easier transitions into their partnerships with University of Rwanda faculty.

Program Management Skills

University of Rwanda staff most often mentioned transferring program management skills between individually twinned USI faculty and University of Rwanda faculty, resulting in improvements in University of Rwanda faculties' skills related to their departments' and residency programs' organizational structures and processes. They cited specific improvements in planning classes and replacing instructors on leave, scheduling residencies, and organizing

[2] For example, some USIs were able to hire staff from outside of the United States to be twins, whereas other universities had restrictions on hiring only individuals from their home states.

internal department structures and external events and conferences, in addition to the in-person support they received in supervising postgraduates:

> *[In terms of] skills transfer with the twinning model … for instance, the School of Nursing … organized a first group [to attend] the national conference with the HRH Program. Before that, we didn't have that experience. It is not going to be lost … the skills in terms of planning, working together, and training courses—so there are so many things that I can count that are going to be sustained even after the Program. (81, University of Rwanda Faculty in Nursing)*

> *[F]or some of them [the programs supported through the HRH Program], faculty were well positioned in Rwanda now to think about a new idea or an existing course and have better pedagogical skills…. You know, better skills to think through, like have you develop[ed] a syllabus for a new topic or have you taken a course that seems stale and revamp[ed] it. I definitely think there are more faculty here that can do that in certain programs…. I don't think there is more physical infrastructure, but I think the teaching infrastructure is better. (64, USI Faculty in Public Health)*

Some respondents highlighted the importance of helping with rotation plans. One discussed a sustained rotation plan and evaluation plan for the pediatrics program:

> *[T]hey did [a] table of rotation, which would be helping even in further years…. And it's become easier when you have to plan the rotation of residents to follow that the exams before, and it was also helpful to see how they organize the evaluation tools…. Before, people were really evaluated subjectively, which is not professional. And they tried to make it more objective … they also helped us making some modules…. And to categorize a plan to teaching, depending on the field. In pediatrics, it is like general medicine on children then you have to know what way and about cardiology…. So, they [are] trying to specify which field was the required [one] to learn before becoming a pediatrician. It was very good. (85, University of Rwanda Former Student in Pediatrics)*

Successes from Sustained Twinning Relationships

Many University of Rwanda and USI faculty discussed the sustained relationships the twinning process created, such as ongoing mentorship, increased University of Rwanda faculty publications, support in curriculum development, and increased partnerships between the University of Rwanda and USIs (see Chapters 5 and 6 for details).

> *[There are many] things that we have achieved, including that twinning period or using the twinning model. One of the things that have been a success was the writing. As I am talking with my twin, especially we wrote book chapters together on simulation. That is successful. That was great for me. (80, University of Rwanda Faculty in Nursing)*

USI faculty reported that their twinning experiences contributed to University of Rwanda faculty members' professional development in a variety of ways, most evident in the University of Rwanda twins who subsequently led new departments established by the HRH Program. For example, USI faculty in surgery, obstetrics and gynecology, and nursing all reported that their Rwandan twins had taken over the departments. Some USI faculty also highlighted unexpected effects, including their twins' taking curricula regionwide and establishing sustained partnerships with USIs:

> *He's introduced broad technical skills in [redacted] curriculum, which has then expanded, and [he's] now going Africa-wide with it. So, a lot of really cool things came out, not just for Rwanda's [redacted] education but for quality improvement … for the continent, thanks to that partnership. (83, USI Faculty)*

> *Finally, I think, beyond just training in medical, there have been long-lasting friendships and exchange[s] … between Rwanda and different universities in the United States. This went beyond the program itself…. [As] one example, there is one [USI] faculty, who came and … when he returned, … he supervised two, now he has three Ph.D. students, who are completing statistics and epidemiology research in HIV, hepatitis, and drug resistance … and this was not originally planned for HRH, for him to do this this kind of training. He was sharing his time in the School of Public Health teachings, research and also working with statistics in RBC [Rwandan Biomedical Center] …. This is what I call beyond Ph.D. scope, no, beyond HRH scope. There have been other benefits, other continuation of linking or bridging Rwanda to the world and universities in the United States. (01, Government of Rwanda HRH Program Administrator)*

USI faculty also reported some unexpected and lasting outcomes for USIs that participated in the HRH Program. This included USI staff whose contracts had not been renewed; when they moved to work in other countries, many took the experiences and curricula they had gained through the HRH Program with them (16, USI Twinned Faculty in Obstetrics and Gynecology). USI faculty also talked about applying lessons from the HRH Program twinning experience in other countries' twinning programs.

CHALLENGES WITH TWINNING

Challenges with the twinning program identified during the midterm review were consistent with this evaluation's data collection across USI faculty, University of Rwanda staff, program administrators, and other stakeholders. Challenges were attributed to a combination of factors and reported consistently across groups. Many respondents noted that although many of the challenges were magnified during the first few years of the HRH Program, there was some improvement as it continued.

Gaps in Incentives and Clarity of Communication

A main challenge reported was the lack of incentives and clear communication to University of Rwanda staff on the purpose and benefits of the HRH Program, which resulted in lack of participation by many in twinning. Many HRH trainees and USI faculty reported that

University of Rwanda faculty did not have the time to commit to the twinning process, as many were already fully booked in their existing work, including the concurrent rollout of online curricula. The midterm review similarly revealed a "limited availability of Rwandan faculty to participate in twinning, due to competing clinical, administrative, and teaching responsibilities, as well as sheer faculty shortages" (MOH, 2016).

HRH trainees and USI faculty reported other reasons why Rwandan faculty did not want to participate, most frequently citing poor communication between the MOH and the Ministry of Education (MOE)—and then, between the MOE and its faculty—on the purpose, design, and added value of the HRH Program for University of Rwanda staff. Many University of Rwanda staff reported being surprised when the HRH Program was rolled out. As described in Chapter 3, the MOE was not actively engaged in the design of the HRH Program; the consequence of this was poor communication during early implementation, although communication improved as the Program went on, as discussed below.

In addition, there were no incentives for University of Rwanda faculty to participate; they received no additional compensation for participating in the Program, a fact that was amplified in USI faculty members' much higher salaries. Moreover, University of Rwanda faculty had many other responsibilities and commitments, and were called on by the MOH to perform other functions outside of the educational setting. Respondents noted that University of Rwanda faculty had no agency in choosing whether they would be twinned, or with whom, as part of the HRH Program:

> *Before they overcommitted … they already had responsibil[ities] and you are not paid by the university to teach. So, now… I decide to make you a teacher without asking you, because I employ you,… there had to be the discussions—you know, we are trying to help the system, we are doing our best, you know we have limited resources and we have this opportunity we are going to manage it this way. I don't think, anyone took even one minute to invite people—maybe over dinner and say: I am about to overcommit you, I know it may require 2 extra hours of your time and take 2 hours maybe away from your family, but this is what we got do to make our system strong. That never happened. (29, University of Rwanda Former Student in Internal Medicine)*

Mismatches in Expectations for Twinning Assignments

There was also a mismatch of expectations and skills between USI and University of Rwanda faculty. The Government of Rwanda reported that many USIs did not provide qualified faculty, mostly (although not exclusively) referring to medical faculty, at the beginning of the Program:

> *Over time, as we went on mentioning this challenge, the profiles changed and I think they would even send better people. (48, Government of Rwanda HRH Program Administrator)*

USI and University of Rwanda faculty concurred, noting that the initial issue was that USIs were sending physician specialists who did not meet the experience requirements in terms of geographic experience or career stage (e.g., sending early-career USI faculty members to pair

with senior University of Rwanda faculty), or who did not match the needed technical area or specialty. As one University of Rwanda faculty member reported, "the mentorship I was expect[ing], I didn't have it as I expected" (80, University of Rwanda Twinned Faculty in Nursing). Other mismatched expectations related to scopes of work, divisions of labor, and cultural humility:

> *U.S. faculty, Americans, need to have a huge dose of humility in terms of nothing works there the way it does here. So, if you have an American doctor who orders oxygen [and] it doesn't come, if it isn't on the floor, it isn't good or productive for the American to get angry and frustrated and take it out on the Rwandan staff who [took] the order. You have to figure out how to deal with those situations. (24, USI Faculty in Internal Medicine)*

> *[S]ome people who came with the HRH program were not deans, by [and] large. Very few people have been deans of school and that's just the nature of the system in [the] U.S. For example, my dean was twinned with an [American] who had been I think CPD [continuous professional development] in a hospital. Now,… you can say there [were] some general features, in terms of leadership and management. The kind of leadership in mentoring or twinning that would be required for a dean of nursing in an African University that is growing very fast. (02, University of Rwanda Administrator)*

USI–University of Rwanda–MOH Relationships and Coordination

USI–University of Rwanda Relationships and Recruitment

Successes in recruiting University of Rwanda faculty varied by specialty. Some new programs, such as the MHA, struggled to recruit sufficient Rwandan faculty to twin with USI faculty. There is some evidence that twinning worked better in more established departments, such as the Master of Science in Nursing (MSN), which had more staff to twin with USI faculty. For specialty programs with challenges in twinning, this resulted in select instances where USI faculty ended up without a twin once they arrived in Rwanda, and instead spent their contracts teaching and providing clinical services. The following discussion compares the MHA and MSN twinning experiences, with a more comprehensive comparison of the programs in Table 5-1.

Graduates from the first MSN cohort were reportedly filtering back to the University of Rwanda, and MSN graduates were seen as motivated to stay at the university because their advanced degrees had more relevance in academia than in direct patient care. By comparison, it was difficult to engage Rwandan faculty in the delivery of the MHA curriculum:

> *[T]heir entire careers in public health and asking them to shift to hospital management is a completely different career move. So, a lot of faculty, they just don't want to do this program. Eventually, we had to move the program from the School of Public Health to the School of Health Sciences. We met the same problem. It's just the University of Rwanda, they don't have a lot of resources to hire new faculty … specifically for hospital management. So, everybody was doing whatever they [had] been doing, plus this program. Time-wise, one it was a*

> *problem and two whether they're interest[ed] … to actually shift into a different career is a different story. (15, USI Faculty in the MHA Program)*

In the MHA program, and in others, the result was that USI faculty taught students, rather than training faculty to become better teachers. In the emergency medicine residency program, for example, USI faculty had to primarily train students because there were no existing faculty and the first pool of Rwandan faculty recruits were not ready until year 6 of the HRH Program (MOH, 2016).

In the MSN program overall, there were positive reports regarding the skills of USI faculty, many of whom were regionally based, and reports of good twinning relationships, despite some cultural challenges. It also seems that the Rwandan faculty took on more responsibility as USI staff began to wind down in 2017:

> *From the first cohort, which is quite different from the second, the U.S. staff were the primary one[s] who were teaching us, but currently, as the number was reduced … now Rwandan staff [are] working, but with the collaboration of available staff from [the] USA. (62, University of Rwanda, Former Student in Nursing)*

One respondent reported a very positive working relationship with a USI faculty twin who was engaged in the MHA program during the third cohort. Another faculty member from Ethiopia came to Kigali for the second half of the third cohort, and was reportedly very experienced, "because they had the same MHA program in Ethiopia" (81, University of Rwanda Faculty in the MHA Program). These respondents also reported shared learning between USI and Rwandan faculty.

Also in the MHA program, however, some USI faculty who went to Rwanda for the summer were seen as "worse than our own faculty," in that they did not support students, did not have the answers to students' questions, and were unable to provide helpful feedback on dissertations (50, University of Rwanda Administrator of Public Health and the MHA Program).

USI–MOH Challenges

USI faculty and administration confirmed many of these challenges in recruitment, administration, and onboarding of USI faculty—a good number of which the midterm review also documents:

- Difficulty finding physician subspecialists available for the 8-week period required by medical curricula (especially for dentistry, radiology, pathology, and ear/nose/throat specialties);
- Delays in funding and contract renewals that delayed or hindered recruiting the necessary physician specialists requested by the MOH, as well as time lines in conflict with U.S. academic calendars;
- Lack of funding for HRH Program advertising and human resources for recruitment
- Insufficient salaries to attract midcareer, senior, or physician specialist USI faculty, resulting in the recruitment of early- or late-career professionals (MOH, 2016c); and

- USIs perceived the cost of losing their own faculty as too high, precluding certain staff from participating as twins (MOH, 2016).

Finally, all respondents reported a lack of regular monitoring of the twinned pairs. Anecdotal reports indicated that the Government of Rwanda initially conducted exit interviews with twins, but the lack of consistent monitoring of these relationships challenged the HRH Program's ability to learn what was working and what was not, and adapt in real time to improve management and implementation of the twinning process.

CONCLUSIONS

Twinning has been suggested as an effective and collaborative approach to empowering health care professionals in low-resource settings, although it is necessary to gain clarity on the concept before conducting a rigorous impact evaluation. A recent analysis of peer-reviewed publications on twinning projects in global health (Rwanda was not included in the sample) found definitional variation, but identified four attributes of twinning: reciprocity, personal relationship building, a dynamic process, and involvement of two named organizations across cultures. From the concept analysis, the following definition of twinning was generated: "a cross-cultural, reciprocal process where two groups of people work together to achieve joint goals" (Cadée et al., 2016), pointing to a relationship at an institutional level. Twinning programs can also be used to strengthen professional medical associations in low- and middle-income settings (Azimova et al., 2016).

There are several examples of long-term institutional twinning that build teaching and research capacity. The partnership between Makerere University in Uganda and the Karolinska Institute in Sweden, which emphasized strengthening research capacity, has graduated 40 doctoral students from Uganda since 2003, and more than 300 faculty and students have been a part of the exchange (Karolinska Institutet, 2018). Although that program's focus was on a joint Ph.D. program, students spent a majority of their time in Uganda to ensure research remained focused on local issues, with the remainder spent in Sweden, where they enrolled in specialty courses (Sewankambo et al., 2015).

The institutional partnership between Muhimbili University of Health and Allied Sciences in Tanzania and the University of California, San Francisco (UCSF), Institute for Global Health Sciences focused on incorporating innovative teaching in curriculum, finding short-term solutions to faculty shortage, and increasing clinical exposure of medical students (Tache et al., 2008). These activities grew to shift from "medical education" to "health professions education" and emphasized interprofessional teamwork. The partnership also benefited UCSF and focused on the institutions' shared challenges despite differing resources, such as large class sizes and more engagement with a wider range of stakeholders (Pallangyo et al., 2012).

In contrast, the HRH Program twinned USI faculty and University of Rwanda faculty at an individual level, and experienced mixed results in twinning, mostly owing to varied experiences in design, management, and implementation across specialties. Strengths of the model include bringing external faculty and other experts via the memoranda of understanding (MOUs) with USIs, and gains in University of Rwanda staff members' capacity to manage and plan for new specialty programs and the increased number of students and residents who were flowing through the university and teaching hospitals. However, there was variation across

programs, with Rwandan faculty in the MSN program, for example, demonstrating notably increased capacity. The reciprocal nature of twinning relationships was evident in some pairings of USI and Rwandan faculty, though not all, and was found to be more successful where interpersonal relationships had developed between twins. The formation of continued partnerships resulted in new publications and advancement in University of Rwanda faculty's professional development. However, respondents reported a perceived lack of equality, which is key to reciprocal relationships, between USI faculty and Rwandan faculty's compensation (Cadée et al., 2018).

Nonetheless, twinning did not meet its original objective of widespread teaching and clinical skills transfer between USI faculty and University of Rwanda faculty, in part because the original design lacked clarity on how to operationalize this unique model, which worked across 25 USIs and 22 programs. On both sides of the relationship (U.S. and Rwandan), lack of resources and time committed to setting up and then managing the initiative created challenges in issuing contracts, recruitment, and onboarding, affecting the overall success of the model. Further, the lack of incentives to encourage University of Rwanda faculty to participate, given their other responsibilities—combined with challenges caused by cultural differences between the USI and University of Rwanda twins—impaired the model's sustained success. The result was the absence of a dynamic twinning process that allowed for tactical adjustments to improve implementation and likelihood of success.

It is unclear whether learning generated from a twinning program supported by the President's Emergency Plan for AIDS Relief to bolster emergency medicine training was incorporated into the design and management of the HRH Program. In the first year of the Ethiopia project, courses were delivered by U.S. and South African instructors; during year 2, courses were co-taught by foreign and Ethiopian educators, during which time curricula were adapted to the local context; by the third year, capacity had been built in sufficient numbers of Ethiopian instructors to independently deliver the nine emergency medicine modules (Busse et al., 2013). Other twinning and partnership experiences could have offered insights into effective and productive collaborations, including identifying models outside of twinning that could have enabled Rwandan faculty to access USI faculty who were more advanced in their careers but could not physically be in Rwanda for extended periods.

Additionally, the HRH Program did not seem to take into account what is needed or how to teach health professionals to be health professional educators. Evidence indicates that courses designed specifically to build teaching skills can improve teaching confidence, effectiveness, and student outcomes (Brown and Wall, 2003; Godfrey et al., 2004; McLeod et al., 2008).

During implementation, other challenges arose from lack of clear communication from the MOH (and MOE) to University of Rwanda staff (which did improve over time), and between the MOH and USIs. This resulted in mismatched expectations and poor communication, cultural differences, and lack of coordination across specialties. A midwifery twinning project between the Netherlands and Sierra Leone identified 10 key steps to a twinning program, including evaluating organizational capacity; matching twins based on key criteria; creating avenues and opportunities for twins to communicate, bond, and "create joint stories" and joint projects; and celebrating achievements and successes to encourage ongoing twin relationships (Cadée et al., 2013). Regular interinstitutional communication is also critical to share progress, discuss challenges, and hold partners accountable (Busse et al., 2013). The HRH Program did not appear to incorporate these types of considerations into the planning and implementation process. The short duration of USI faculty stays in Rwanda was seen as another barrier to effective transfer of

teaching and clinical skills, reinforcing the evidence that suggests long-term peer-to-peer support is necessary for effective twinning (Kelly et al., 2015).

Where there were successes in management and implementation, these were driven more by individual commitments than longer-term institutional partnerships, especially among USI faculty who had already been in Rwanda or had a particular passion for making this program a success. They often took time out of their own schedules to manage overhead and internal communication issues. On the University of Rwanda side, individual faculty members who had the time, background, and interest in a given specialty also committed to making it a success. Institutionally, despite the recognition that longer-term engagements strengthened twinning relationships, two related factors made longer-term commitments challenging: (1) MOUs were signed for only one year at a time; and (2) many USI faculty were contractors, not tied to a specific institution but only hired for that 1-year contract (see Chapter 3 for more detail on the contracting process).

Many of the other successes of the HRH Program are attributed to the overall health professional institutional capacity, findings that are detailed in Chapter 5, and the increased production and capacity of HRH trainees, findings that are detailed in Chapters 6 and 7.

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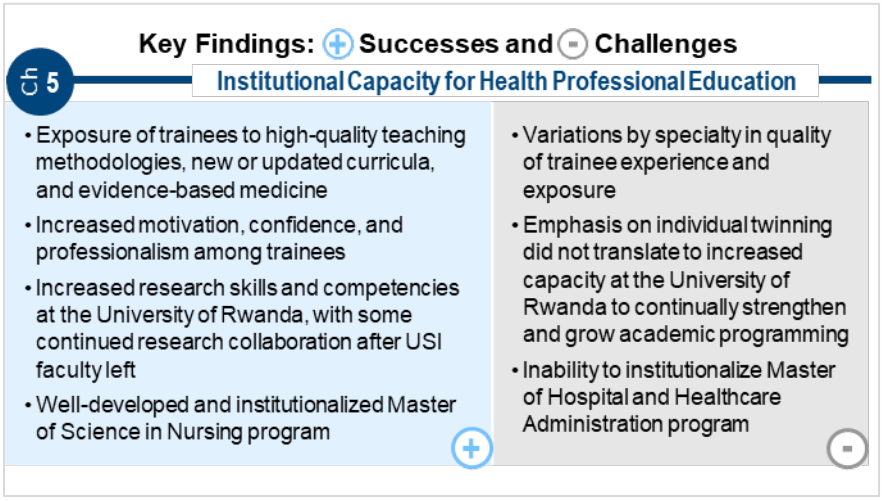
5

Institutional Capacity for Health Professional Education



An educational institution's capacity to provide ongoing, high-quality health professional education requires adequate administrative infrastructure and institutional support to recruit and sustain dedicated faculty, enable them to improve their teaching skills and update curricula as the evidence base changes, and provide them with the necessary teaching equipment and materials. A 2008 report by the World Health Organization and the Global Health Workforce Alliance calls for a rapid and significant scale-up of education and training of health workers and highlights several innovative educational activities shown to be an efficient and effective means for expanding teachers' capacity, improving the quality of care provided by trainees, increasing the number of available instructors and the stock of future teachers, promoting the quality of instruction, and meeting the needs of the health system (WHO and GHWA, 2008). These activities include curriculum innovations for pre- and in-service training, academic partnerships, the use of nontraditional teachers and teaching programs, and incentives for health workers. Nontraditional teaching programs have encompassed twinning programs, continuing education, programs that reduce overall training time, train-the-trainer models, and "chain" education (WHO and GHWA, 2008). In Rwanda, several training programs and other efforts along these lines have been expanded or introduced to address the critical shortage of qualified health professionals.

In 2013, concurrent with the initiation of the Human Resources for Health (HRH) Program, the Rwandan government restructured its overall public higher education system, merging seven institutions into the newly established University of Rwanda to improve coordination,[1] collaboration, and coherence (Cubaka et al., 2015; Flinkenflögel et al., 2015a).

[1] In addition to the public University of Rwanda, three private institutions in Rwanda provide medical training.

The former National University of Rwanda Faculty of Medicine merged with the Kigali Health Institute and three former schools of nursing and midwifery to form the College of Medicine and Health Sciences (CMHS) in the University of Rwanda (Flinkenflögel et al., 2015b). CMHS also joined the newly launched East Africa Health Professions Educators Association, a regional network of universities and health professional educators (Flinkenflögel et al., 2015b). Five schools are housed under CMHS: Medicine and Pharmacy, Nursing and Midwifery, Dentistry, Public Health, and Health Sciences.

This chapter describes HRH Program outcomes across the landscape of health professional education in the University of Rwanda, as well as in clinical training sites. Increased institutional capacity for health professional education during the HRH Program included training a new cadre of health professionals and educators, expanding the skills of existing faculty, and building capacity within the University of Rwanda to continue to produce these professionals in the future. Although the 2013 integration brought together students in the health professions, USI faculty reported that the university's infrastructure was not initially set up to accommodate such large cohorts and that classrooms were unavailable for some classes. Although there were improvements in institutional capacity through the HRH Program, many of those challenges remain. Trainees and University of Rwanda faculty reported two key challenges—large student cohort sizes and insufficient equipment and infrastructure to practice on at the university and in teaching hospitals. The latter challenge is addressed in Chapter 6.

QUALITY OF TEACHING

HRH trainees, University of Rwanda faculty, and U.S. institution (USI) faculty respondents in this evaluation all concurred that the quality of teaching improved dramatically during the HRH Program, in terms of the teaching methodologies and the approaches. However, these improvements were reported solely in reference to USI faculty members.[2] HRH trainees did not report observed improvements in Rwandan faculty members' teaching abilities or competencies, partly resulting from challenges in recruiting HRH faculty to participate in the twinning initiative, and partly owing to the lack of availability among existing faculty members at the University of Rwanda to teach HRH trainees. In the obstetrics and gynecology program, for example, there were reportedly only two Rwandan faculty members in the entire country when the HRH Program started, so by default, many of the students were trained only by USI faculty members.

USI Faculty Teaching Approaches and Methodologies

Successes

HRH trainees highlighted the improved teaching methodologies USI faculty brought to their studies, especially the importance of introducing the concepts of evidence-based medicine and an increased focus on research and publication. USI and University of Rwanda faculty reported didactic teaching as an important output of their HRH experiences:

[2] As Chapter 4 notes, respondents consistently used the term, "HRH faculty," to refer only to USI faculty.

> *With the HRH Program, I really, really appreciated the quality [of] education I received, because [they] really taught us to follow evidence-based treatment or any procedure, to try to know why—is this really the advanced method to do anything that we are doing? They really showed us…to do evidence-based medicine…. [I]t was a very good approach. (85, University of Rwanda, Former Student in Pediatrics)*

HRH trainees also reported that the quality of teaching was linked to the instructors' focus on building their capacity to be effective health educators—teaching skills on presentation, teaching methodologies, and management:

> *Our presentation skills have improved and teaching skills have improved. I think some of my … management skills have improved, because I am much more mature, can take decisions, I can initiate priorities and engage people to do it, and I think that's through my education. (49, University of Rwanda Faculty and Current Student in Nursing)*

USI faculty, University of Rwanda faculty, and HRH trainees highlighted an important change in pedagogical approaches to teaching, based on questioning and iterative dialogue, with simulations and other methods, rather than the previous, more lecture-based instruction:

> *[T]here was different educational styles that people talked about forever, francophonic style, top-down, the presenter knows everything and the students just absorb, versus what we like to think of [as] in America, and not sure that this is always the case but a flatter organizational structure, more interchange and more inductive…. There's certainly things like dedicated time for teaching and learning and question[ing]. Certainly, [this approach] became integrated early on and has remained as such for learning. (84, University of Rwanda, Former Student in Pediatrics)*

Some University of Rwanda faculty also reported a clear difference in the quality of teaching after the HRH Program. USI faculty and HRH trainees attributed this increase to USI faculty members' holding HRH trainees to a "higher standard," in terms of what was expected in class and during rotations:

> *There's a difference, especially if you see how the practical teaching and learning was done before and how it is done and was done during this period where HRH Program started, and even today. There is a satisfaction. I mean, I can say it from some of the students, but also mainly from the faculty. (80, University of Rwanda Faculty in Nursing)*

As further reported in Chapter 6, respondents from the Government of Rwanda made particular note of increased professionalism.

Hands-on training was another improvement all stakeholders mentioned as being a feature of the HRH Program. Government of Rwanda HRH Program administrators, students, and staff highlighted more practical, hands-on experience with patients because of the exposure

to the high standards for quality of education USI faculty members implemented at the clinical teaching sites. HRH trainees and USI faculty also identified the value and importance of the more informal and interactive teaching approaches USI faculty employed, which treated HRH trainees as colleagues, rather than students. HRH trainees reported that USI faculty were more approachable than their previous Rwandan instructors, and appreciated having the time to sit with instructors, ask questions, and debrief after treating patients:

> *I always say that HRH is the best thing that probably that has ever happened to the Rwandan medical system…. I think the standards have changed, even when you look at now really that they are willing to kind of be part of a global kind of practice community and live up to the global standards…. So, I think there was that mindset that came up, and…the way we interacted also was changed. (29, University of Rwanda, Former Student in Internal Medicine)*

All respondents for this evaluation reported that training under the HRH Program increased motivation, confidence, and professionalism, which better prepared HRH trainees for their careers. Government of Rwanda respondents highlighted professionalism in particular as critical for enabling HRH trainees to succeed not only in Rwanda, but at a regional and global level:

> *[W]ith the HRH [Program], there were a lot of changes, especially in professionalism. I can say that maybe you could not really have all specialties you have, like surgical everything, but at least you could see people who guide you to become a good professional. I was lucky to do one rotation at one of the universities in the region for a year during my third year and I could find really a difference. So, I can say that when I completed I was really competent, not only for the country, but even outside. (28, University of Rwanda Administrator and Former Student in Obstetrics and Gynecology)*

HRH trainees highlighted that it was not only their new specializations that made them confident, but also the ability to think analytically:

> *I got used to the HRH personnel because when they gave us a standard … it helped a lot in the professional life that we are now in, because we also learned something important, it is to allow when you don't know something, it might be somewhere else and enough to know where to find that thing. And it helped me a lot. (85, University of Rwanda Former Student in Pediatrics)*

At the facility level, particularly in the nursing program, some HRH trainees reported being better teachers and mentors to their colleagues. For example, in-service midwifery mentoring was introduced at Muhima Hospital in Kigali (Rwanda's largest maternity specialty hospital) in August 2012, before expanding to Centre Hospitalier Universitaire de Kigali/University Teaching Hospital of Kigali (CHUK), Byumba, Kabgayi, Masaka, Ramagana, Muhima, and some health centers (Ndayambaje et al., 2017). Mentors were experienced midwives with at least master's degrees and were employed by USIs through the HRH Program. Their role was to support midwives through their Bachelor of Science in Nursing upgrade at the

University of Rwanda, promote collaborative in-service training and individual bedside training activities, and increase exposure to theories and best practices:

> *[A]t CHUB [Centre Hospitalier Universitaire de Butare/University Teaching Hospital, Butare] I remember that I never learnt how to teach others, those twins helped me to be confident and stand in front of people teaching them about different topics. (60, A0 Nurse Trained in the HRH Program)*

Challenges

Alongside the overwhelming praise for USI teaching approaches, there was a recognition that USI faculty members' effectiveness had been, at first, hindered by cultural and linguistic challenges. Before the HRH Program, Rwandan students had been taught in French, but French was not a requirement for USI faculty, and all HRH-supported programs were taught in English. HRH trainees reported that cultural differences exacerbated this issue in identifying when they were struggling. For example, trainees reported that most Rwandans who did not understand English would not admit that to the instructor during class, instead relying on their peers to translate outside of class. Not surprisingly, those who spoke English were reported to be some of the highest-performing trainees, and self-reported getting more out of their HRH training than classmates with weaker English skills. As this disparity became more apparent, the HRH Program adapted its requirements. HRH trainees who came out of the facility microsystem sample reported that English fluency became a requirement to participate in the HRH Program during its later years.[3]

In addition, a few USI faculty and HRH trainees mentioned USI faculty who had not been qualified or prepared to teach. For example, although the HRH Program had an important focus on research, not all USI faculty were qualified to support and teach research skills:

> *One of my biggest challenges actually within HRH was so many of the other [USI] faculty had research as a goal and had [been] developing long-term research collaboration as a goal, but they just didn't have the skills. So, the number of requests … to help faculty think through research projects they could do with their twins—I think that could have been positions funded or even … nested training programs within HRH that could join the [USI] and Rwandan faculties' research projects together. (64, USI Faculty in Public Health)*

From the facility microsystem perspective, the quality of teaching varied by specialty. In surgery, one HRH trainee respondent did not feel the USI faculty had contributed to his education, although when speaking of teachers more broadly, he referred to them as "family" (57, University of Rwanda, Former Student in Surgery). In midwifery and nursing, the quality of classroom teaching was seen as very high, but there was a deficiency in the quality of supervision during clinical internships (58, University of Rwanda, Former Student in Nursing). Moreover, students who were also working full time did not gain access to as much practice time and felt "overloaded" (71, HRH Program–Trained A1 Nurse).

[3] The facility microsystem in-depth examination looked at a teaching hospital and a lower-level hospital that referred to the teaching hospital. Both were located outside of Kigali.

Quality of teaching also depended on the specialty. For example, the anesthesiology residency faced consistently low enrollment for its 20 residency spots (5 per year); no new residents entered in the 2013 to 2014 period and only two enrolled in 2014 to 2015 (Chan et al., 2016). One factor affecting recruitment to this specialty was lack of meaningful exposure to anesthesia training for medical students before graduation. Medical students were often trained in the same operating rooms as anesthesia technicians, but given the reality that most patients were seen by technicians, the focus was not dedicated to residents, who sought more specialized training and mentorship (Chan et al., 2016). Similar to surgery, medical students perceived anesthesiology to be more stressful than most specialties because of the long hours without the ability to supplement their base pay in the private sector, as well as the lack of proper equipment, medicines, and supplies in their work environments (Chan et al., 2016).

Finally, HRH trainees reported that the quality of teaching declined when funding from the President's Emergency Plan for AIDS Relief (PEPFAR) was cut. Trainees and faculty members attributed this decline to the fact there were fewer HRH faculty available to teach and not enough Rwandan faculty with the skills or time to take over. Although the HRH Program may have facilitated improved teaching skills while it was fully funded and running, the decline in teaching quality following a drop in investment indicates that the effect of the Program may have been a short-term injection of faculty.

RECRUITMENT AND RETENTION OF HEALTH PROFESSIONAL EDUCATORS

Recruiting HRH Trainees to University of Rwanda Faculty

The University of Rwanda had mixed results in retention of Rwandan faculty, but showed early progress in recruiting those trained under the HRH Program. In 2019, the university revised its policies and procedures for hiring academic staff to lessen the requirements for promotion, emphasizing the importance of research, and quantifying student mentorship responsibilities (University of Rwanda, 2019). Published data report that between 2012 and 2016, 24 new Rwandan faculty members and 31 tutorial assistants were recruited by CMHS, and an additional 22 faculty members were recruited by the School of Nursing and Midwifery (Cancedda et al., 2018). Sixty graduates from the HRH Program who were employed by teaching hospitals in Kigali and Butare were issued contracts that devoted 20 percent of their time to mandatory teaching responsibilities (Cancedda et al., 2018). Primary data received from the University of Rwanda for this evaluation indicated that 54 faculty were generated in the Master of Hospital and Healthcare Administration (MHA) program between 2015 and 2018. The HRH Program also generated 10 School of Nursing and Midwifery faculty for the postgraduate program but none for the undergraduate program. USI and University of Rwanda faculty, program administrators, and students also reported in interviews that HRH trainees were starting to filter back into the university, in both faculty and administrative roles. This is also evident in this evaluation's data collection; of the 22 HRH trainees interviewed, 8 are now University of Rwanda staff.

When interviewed, HRH trainees reported varied reasons for their interest in continuing with academia at University of Rwanda, rather than in clinics, as part of their Ministry of Health (MOH) bonding period. HRH trainees most frequently mentioned an interest in conducting additional research, and aspirations to continue knowledge exchange with their HRH professors. A few also mentioned that they were interested in becoming faculty members to supplement their low salaries as health care professionals in clinics and hospitals.

Current and former HRH trainees also reported significant challenges to continuing their careers in the health profession (in education and in clinical work). Reasons for not continuing their education included a lack of funding support from the MOH; low salary after graduation was also a deterrent. According to the University of Rwanda, in 2011 to 2012 the MOH provided tuition support for 35 percent of the total cost of either 4 years of medical school or 2 years of postgraduate training. This increased to 48 percent starting in 2013, because the total cost of tuition declined from 8,400,000 Rwandan francs to 6,400,000 Rwandan francs. For MHA students, the MOH offered 100 percent tuition support from 2013 to 2017 and no tuition support starting in the 2018 academic year. The MOH supported the entire first cohort (2015 to 2017) of Master of Science in Nursing (MSN) students (tuition cost 2,400,000 Rwandan francs). Subsequent cohorts were self-financed (an estimated 70 percent) or supported by individual hospitals, or were employees of the University of Rwanda.

Although few activities focused on recruiting and retaining students, nursing student dropout rates were low (1.43 percent in the undergraduate program; 3.53 percent in the postgraduate program). Tuition and travel costs to Kigali continued to be an obstacle to further education for many respondents working at CHUB and Bushenge hospitals (facility microsystem), including for respondents who had received training under the HRH Program:

> *I would like to continue studying, but if I get an opportunity to study for a Master's, even if I can afford the tuition, studying from here cannot work for me. I don't have accessibility because [the program] is in Kigali, and I can't study in Kigali while residing here. There may be opportunities to study abroad, but when you work in this [remote] environment, you barely get to hear that information. (68, Nurse Who Had Upgraded from A2 to A1 under the HRH Program)*

Reportedly, the Minister of Health had recently announced that clinical staff could not work while pursuing further education, compounding the obstacles to gain more skills and knowledge.

Recruiting and Retaining Existing University of Rwanda Faculty

As reported in the HRH Program midterm review and confirmed in data collection for this evaluation, there was a recognition that not enough attention had been paid to building current faculty to train future generations of health workers. The midterm review noted there were no formal planning exercises to facilitate the phasing out of USI faculty and ensure a permanent faculty pipeline for a sustainable health system as the program time lines evolved (MOH, 2016). With significant increases in overall enrollment across training programs, the production of health workers was not matched by a Rwandan faculty recruitment plan to sustain production (some programs like obstetrics and gynecology were at risk of falling below baseline enrollment with the departure of USI faculty).

One of the identified challenges was developing a career ladder with incentivizing pay structures for clinicians who train at teaching hospitals without faculty appointments. Health cadre subgroups were intended to review faculty terms of reference, and a key recommendation was for the University of Rwanda to start developing an attractive educator career ladder for all cadres (MOH, 2016). One Government of Rwanda HRH Program administrator (03) cited that career progression and pay structures were developed in 2013 to motivate and incentivize health professionals to be retained. The midterm review recommended that university heads of

departments intentionally deploy graduates toward clinical and faculty positions, and identify the number of Rwandan faculty required to provide quality education to the growing student cohorts and graduates to be recruited as faculty. A possible scheme could give honorary or adjunct faculty appointments to clinicians during their 5-year public service contracts before promoting to full-time faculty roles (MOH, 2011b, 2016).

Faculty recruitment was a major issue; for example, the obstetrics and gynecology program had lost and had not recruited any additional Rwandan faculty since 2013, and the capacity to enroll first-year students was at risk of dipping below baseline to only three or four students per cohort without Academic Consortium faculty starting in 2017 (MOH, 2016).

Consortium faculty contributed to updating obstetrics and gynecology guidelines, hosting weekly interdisciplinary morbidity and mortality conferences, and introducing quality measures in 12 district and 4 teaching hospitals to standardize care and prevent maternal deaths (Hill et al., 2015). Long hours, lack of exposure to surgical faculty during medical school training, and heavier workload than nonsurgical physicians without higher pay also have been perceived as barriers to postgraduate recruitment. Further, surgical jobs in the private sector are scarce, unlike other specialties such as obstetrics and gynecology, where physician specialists can supplement their income by working after hours in private clinics in addition to their public hospital positions (Quinn et al., 2015). Despite political will apparent in the HRH Program investments to develop new surgical programs in neurosurgery, orthopedics, and urology, recruitment of surgical postgraduates in year 2 of the HRH Program actually decreased from 19 trainees in the first year to 9 trainees (Quinn et al., 2015)

Since the midterm review, University of Rwanda and USI faculty reported, the HRH Program had not been successful in increasing motivation and retention of existing University of Rwanda faculty. In fact, although all faculty acknowledged an increase in the number of doctors and nurses created through the Program, they did not see this translating into an increase in existing faculty. One HRH trainee suggested that faculty motivation was reduced owing to the frustrations with this program, to the point where he saw some going into private clinics or leaving the university system altogether:

> *I think all of the faculty are still there, but they just end of filling the roles that they are not prepared for. I think some of the brightest stars from that group go straight from "I just got my Ph.D." to [pause] deans or whatever; it's just like again, should be a much longer arc. And then another swath of faculty who are very talented but maybe not tapped for those high-level positions, just kind of idle and doing fine for what the task is at hand, but not really growing in ways that would be helpful for them or for the university…. I don't see them leaving … but I don't see them necessarily flourishing in their careers in public health. (64, USI Faculty in Public Health)*

The University of Rwanda has tried to retain faculty by offering accredited Ph.D. programs (see "Accreditation and Specialty Programs" in Chapter 5), which have shown early success and interest:

> *I am doing a Ph.D. and I am not alone. We [have] nursing faculty who are doing their Ph.D.s…this is what the school has been working on. Maybe not through HRH, but through other partnerships and through the university to have people*

> *who can sustain what has started so that we don't go back to where we came from … we know that even a master's holder who were trained, were skilled can also help in sustaining what is there. So I found that we are having that force, that willingness, good communication, and good leadership that has been developed and implemented through the HRH Program. (80, University of Rwanda Faculty in Nursing)*

University of Rwanda faculty and many of its staff attributed some of these challenges to a lack of building institutional capacity into the HRH Program's original design. Because the Program was designed for only 7 years, it did not allow enough time to train sufficient master's students to become Ph.D. holders, who would be able to train, mentor, and support future generations of HRH trainees. Consequently, it had implications on recruitment and retention, as well as the long-term sustainability of benefits. In emergency medicine, for example, the first nine participants in postgraduate diploma course in emergency and critical care medicine enrolled in 2013 (Mbanjumucyo et al., 2015). By 2017, the program was expected to graduate the first 5 emergency physicians, with more than 40 general practitioners completing the postgraduate course (Kabeza et al., 2013); 19 residents were still in the first 3 years of the 4-year program (Yi et al., 2017). The intention was to have enough Rwandan emergency physicians to begin phasing out Consortium emergency medicine faculty to take over training of both tiers by 2019. However, the time required to build a cadre of faculty was not aligned with the pace at which HRH trainees were graduating.

> *The challenge that still remains is to have Ph.D. holders to run the master's program. We have just a number of Ph.D. holders, but it is still low and if the program was at least extended for a given period to make sure that the programs are self-sustained, it may be much better. (67, University of Rwanda Faculty and Former Student in Nursing and Midwifery)*

CURRICULA AND PROGRAMS FOR HEALTH PROFESSIONAL EDUCATION

Overall Curriculum Developments

Curricula for nursing and midwifery and medical training had developed over the years, with a shift to competency-based curricula and a mix of didactic teaching and more interactive activities becoming evident since the nursing and midwifery education reforms implemented in 2007 (Flinkenflögel et al., 2015c; Uwizeye et al., 2018). For example, flipped classroom models and team-based learning became frequent approaches (Uwizeye et al., 2018).[4] Competency-based curricula were seen as tools to move away from a theoretical, hospital-based education to a more practical, patient-centered, and community-oriented education (Murararaneza and Mtshali, 2017). As part of the 2007 to 2008 curriculum review for undergraduate medical training, modular teaching was introduced in first-semester basic courses, such as math and study skills, as well as physiology, which was taught in parallel with anatomy, histology, embryology, and

[4] In a flipped classroom, students are first exposed to material outside of the classroom, through readings and assignments, and then process the material through discussion in the classroom, while building problem-solving skills (Berrett, 2012).

cell/molecular biology and biochemistry. The first semester of the second year included modules on microbiology, pathology, and organ systems (Gahutu, 2010).

In addition to increasing engagement with students, curriculum innovations aimed to increase flexibility and access to education for existing health workers. In particular, e-learning programs for nurses and midwives were designed to rapidly increase the number of qualified health workers without a significant increase in faculty (Harerimana et al., 2016). With sufficient technological infrastructure and institutional support, e-learning can help provide access to education in resource-constrained environments. In Rwanda, it has helped the existing nursing workforce upgrade from A2 to A1,[5] increasing the number of qualified nurses in the workforce overall, although effective e-learning would require continuous capacity building and planning (Harerimana and Mtshali, 2018).

Successes in Curriculum Development

Nursing and Midwifery Training

In 2004, the MOH deemed the quality of services delivered by A2 nurses insufficient and initiated plans to cease the A2 training level by 2007 (Mukamana et al., 2015). A0 level nursing, offered only at Kigali Health Institute, was introduced in 2006, with two tracks: a direct entry, 4-year Bachelor of Science in Nursing degree, and a 2-year Bachelor of Nursing Education degree for nurses upgrading their A1 to A0 (MOH, 2011b; Mukamana et al., 2015). In 2007, the number of A1 nursing programs was reduced to five schools (Byumba, Kabgayi, Kibungo, Nyagatare, and Rwamagana) to focus on the quality of education, but this limited the capacity to admit approximately 100 A2 nurses per year (MOH, 2011b; Munyemana, 2012).

As part of these reforms, the A1 curriculum was revamped to be competency-based and mix didactic learning in the first year with clinical mentorship by year 3 (MOH, 2011a), placing a value on community-oriented training over hospital-based training (Murararaneza and Mtshali, 2017). The IntraHealth Capacity Project's *Learning for Performance: A Guide and Toolkit for Health Worker Education and Training Programs* was used to strengthen the HIV/AIDS prevention and treatment, family planning, and gender components of the nursing and midwifery curricula, as part of a 5-year (2004–2009) cooperative agreement (Capacity Project, 2009). In January 2007, the Capacity Project, Belgian Technical Corporation, APEFE,[6] and Columbia University provided funding and operational support to the five nursing schools, including for classroom renovations, dormitories, office equipment, computers, Internet, training equipment, technical reference materials, library management training, and updated faculty and clinical preceptors (Capacity Project, 2007, 2009). Despite these efforts, a shortage of A1 nurses persisted and more than 90 percent of Rwandan nurses were still at the A2 level in 2012 (Harerimana et al., 2016).

The HRH Program supported the upgrading of nurses and midwives from A2 to A1, the development of postgraduate master's programs for eight nurse specialty tracks, a review of the undergraduate physician training curricula, and the launch of six new postgraduate residency programs. Development and improvement of curricula were reported across specialties and

[5] A2 nurses have completed secondary school education, and A1 nurses receive a diploma after 3 years of training at a higher-education institute (Uwizeye et al., 2018).
[6] Association pour la Promotion de l'Éducation et de la Formation à l'Etranger.

stakeholders as a main success and contributor of the HRH Program, but one that was dependent on the specialty and department within the University of Rwanda:

> *I know there were new programs that were created. The curricula were put in place which didn't exist before in nursing, medicine, and postgraduate programs. (01, Government of Rwanda, HRH Program Administrator)*

The HRH Program built on previous nursing training reforms to dramatically increase the nursing and midwifery workforce through the E-Learning Diploma Nursing program, established in 2012, to upgrade A2 nurses to A1 levels, targeted to upgrade 1,500 nurses and midwives by 2020 (Uwizeye et al., 2018). Administered through the University of Rwanda's Center for Instructional Technology, this competency-based curriculum alternated between face-to-face sessions and self-directed learning. Uwizeye and colleagues (2018) reported that the Government of Rwanda viewed this curriculum as a prime example of adapting to the learning needs of existing health workers who needed to advance their training without leaving their jobs and disrupting the functioning of health centers and hospitals:

> *Because it was an e-learning program, we did a face-to-face part which didn't go further than 2 weeks. We returned at work but after work hours, we would work on our online courses. We used a platform called Moodle…. Teachers would upload notes, assignment on there, then we would take exams. We also had a chat room where you could chat with your teacher. We would all meet online at the same hour and whoever had a question could ask the teacher. (68, A0 Nurse Trained under the HRH Program)*

In a study assessing the satisfaction levels of full-time undergraduate nursing students in years 2–4 at the University of Rwanda during the 2016 to 2017 academic year, a majority of students reported high satisfaction with the clinical learning environment (58 percent), the ward atmosphere (54 percent), the leadership of the ward manager (58 percent), and the supervisory relationship (62 percent). However, at every class level and clinical placement, there was need for individual student supervision and improvement to the supervisory relationship (Musabyimana et al., 2019).

No postgraduate programs in nursing and midwifery were available before the HRH Program started. USI faculty collaborated with University of Rwanda faculty to develop curricula for eight master's-level nursing specialty tracks in pediatrics, critical care and trauma, nephrology, medical–surgical, neonatal, oncology, perioperative, and education leadership and management. Development of these specialty nursing curricula was cited as a significant contribution of the HRH Program:

> *So, not only they came for the curriculum and improve the existing one, but during that time, especially in the nursing department, they created … a relative[ly] big number of new programs…. So, that was amazing. Not only bachelor's level nursing program, but also master's-level nursing program as well. (45, Government of Rwanda, HRH Program Administrator)*

The MOH reported that the support of USI faculty also helped develop nursing clinical guidelines for prenatal, newborn, and postpartum history and physicals, as well as a pre-op checklist, that were implemented in 2013 (MOH, 2016). This is consistent with reports from HRH trainees and University of Rwanda faculty, who noted that updates to curricula and national protocols were conducted with the support of USI faculty. Furthermore, evidence-based practice guidelines were integrated into the didactic teaching curriculum, which emphasized the role of the nurse in implementation of best practices (Relf et al., 2015).

Master of Science in Nursing Program As more nurses were upgraded from A2 to A1, the HRH Program shifted priorities to building a cohort of master's-level trained nurses, contributing to the skills and quality of care provided by nurses. The 2-year MSN program was launched in 2015 with a first cohort of 121 students, and more than 100 graduated in 2017, as the second cohort entered their second year (MOH, 2016; NYU, 2017). Despite a delay in launching the program, the MOH expanded intake to meet the HRH Program's overall goal of enrolling 120 MSN-level nurses by 2019, reflecting a deprioritizing of activities to strengthen A0 nursing and midwifery programs in order to develop the master's programs (MOH, 2016).

Academic Consortium faculty collaborated with Rwandan faculty to develop curricula for the eight master's-level nursing specialty tracks described above; these areas were selected by the MOH based on morbidity and mortality rates and health needs in Rwanda (Uwizeye et al., 2018). In addition, a "mini-consortium" (the American Association of Critical Care Nurses, the American Nephrology Nurses' Association, the Association of Perioperative Registered Nurses, the Oncology Nursing Society, and the Academy of Medical-Surgical Nurses) supported the MSN program with membership donations and educational materials, such as core curriculum textbooks for the specialty tracks (Mukamana et al., 2016a,b,c).

Graduate nursing students described learning concepts of global health, research design and biostatistics, leadership and management, nursing theory, and pathophysiology and clinical management before applying their knowledge in a two-part focused clinical, starting in the second semester (Mukamana et al., 2016a). Practicums took place at CHUK, King Faisal Hospital, and Rwanda Military Hospital where, despite reported challenges with limited resources and suboptimal equipment (see also "Equipment Procurement" in Chapter 6), trainees noted benefits from the clinical training and from the experience of mentoring other hospital nurses (Sindayigaya et al., 2018). One emphasis of the MSN program was on molding nursing graduates into "change agents" who could drive policies and develop solutions in the Rwandan health care system (Mukamana et al., 2016b).

Primary data from the University of Rwanda indicate that 82 students graduated from the MSN program. According to one respondent, because the initial focus in nursing was on upgrading A2 nurses to A1 nurses, the MSN program started "3 years late" (46) which was a barrier to recruiting and graduating even more nurses. University of Rwanda reported low dropout rates among students in the undergraduate nursing program (1.43 percent), with only slightly higher dropout rates in postgraduate programs (3.53 percent).

Upgrading A2 nurses Upgrading nurses was seen as essential to building a health workforce capable of addressing the needs of the Rwandan population and viewed as the key for "transform[ing] care for the vast majority of people living with HIV" (12, International NGO Representative). The existing A2 nurses' limited training hindered their ability to provide direct care without clear direction and supervision:

> *An A2-level person only does what you tell him/her to do for the patient without enough critical thinking, which means that they are working as robots. (60, A0 Nurse Trained Under the HRH Program)*

Even though A1 nurses were trained to provide high-quality services, many Rwandans were seen as still preferring to receive care from doctors:

> *Being a doctor is the highest degree and in some of us, in our minds, the higher you go, the more knowledgeable you are … we will need time and public health education to convince the entire population that your boss can be a nurse. (10, Professional Association Representative in Obstetrics and Gynecology and Public Health)*

The e-learning mechanism offered an opportunity for A2 nurses to upgrade their skills to A1 while continuing to work as A2 nurses. However, one nursing respondent expressed that the quality of students graduating from the A1 programs had declined, due to less emphasis on supervision and follow-up during internships:

> *They are just putting the students over there in the hospital, and yet there is nobody to follow up [with] them with that responsibility. They are saying that there is someone who is supposed to … [but] the nurse who is in the ward, they have a lot of work and … they are looking to someone who can help in the ward instead of just coming to study…. [T]hat is why internships take longer and the knowledge is lower, as students do not have any follow-up. When nurses see internees, they consider them as help workforces; they start to share their responsibilities with them instead of teaching them first. (60, A0 Nurse Trained Under the HRH Program)*

Physician Training

Under the HRH Program, six new postgraduate residency programs in emergency medicine, neurosurgery, orthopedic surgery, pathology, psychiatry, and urology were launched in the CMHS School of Medicine and Pharmacy in 2013. The HRH Program funding proposal had planned to launch eight residencies, including family and community medicine, oncology, neurology, and radiology. However, investments to strengthen internal medicine and general surgery programs were prioritized over family and community medicine, oncology, and neurology before the start of the HRH Program, and the launch of the radiology program was delayed for 2016 (Cancedda et al., 2018; MOH, 2016).

Development of curricula or strengthening of existing curriculums was reported across all stakeholder groups, as well as specialties interviewed from USIs (pediatrics, obstetrics and gynecology, nursing and midwifery, internal medicine, MHA, and surgery), who perceived this as a key success of their work:

> *[W]e definitely created a curriculum for them. There were a lot of new [curricula] that did not exist and a lot of new material did not exist before. That is*

> *actually, I think, the legacy of this program, because now they have something they can actually use. What they need to do, they probably need to revisit the curriculum or do a curriculum review on a regular basis, maybe every 3 years or 2 years, so they can see whether the curriculum is up to date or needs modification. (15, USI Faculty in the MHA Program)*

For internal medicine, the HRH Program aimed to improve the integration of didactic modules with clinical rotations through bedside teaching that correlated with competency-based didactic content. The residency program included the establishment of a medical chief resident position to improve the educational and administrative structure (Kabakambira et al., 2017; Walker et al., 2017). Kabakambira and colleagues reported an overall improvement in the collaborative training program, where 73.7 percent of residents perceived the medical chief residents as their role model, with first-year residents (100 percent) being the most enthusiastic about this statement (Kabakambira et al., 2017).

For surgery and anesthesia, curricula aimed to embed more interactive, hands-on sessions, and dedicated consultant-student interaction in operating rooms (Chan et al., 2016). Gaps in this training curriculum for surgery were identified to inform its development by evaluating the operative activity (Rickard et al., s2016). The pediatrics specialty centered on a 2-year didactic core program that included hospital-based learning through morning reports, bedside teaching rounds, simulations and practical skills sessions, morbidity and mortality meetings, research training, and leadership development workshops (McCall et al., 2019). Representatives from professional associations cited that USI faculty were critical in developing clinical content for the curricula, as well as instilling a teaching ethic. In the "other" stakeholder group interviewed for this evaluation, although most may have not had direct involvement with the development of curricula, a select sample were aware that the HRH Program did improve or strengthen curricula.

In addition to the strong emphasis on supporting postgraduate medical education, the curricula for undergraduate medical training was reviewed and several reforms enacted during the HRH Program (Flinkenflögel et al., 2015a). The curriculum was reduced from 6 years to 5, and adapted the CanMEDS physician competency framework to describe core competencies for the "desired Rwandan medical health care provider" (Flinkenflögel et al., 2015a). Additionally, a new integrated Social and Community Medicine curriculum under the Discipline of Primary Health Care (formerly the family and community medicine department at the College of Medicine and Pharmacy) was structured to cover five domains: public health, health systems, social medicine, communication, and professionalism in years 1–4, culminating in a senior internship in year 5 that would use the primary health care knowledge and skills trainees had gained in previous years (Flinkenflögel et al., 2015a). The curriculum incorporated team-based learning, a flipped classroom model, and online learning platforms (Flinkenflögel et al., 2015b). The design was based on the premise that continued exposure to social medicine concepts would help students gain greater appreciation in their practice, particularly in serving rural populations (Flinkenflögel et al., 2015a; Stevens et al., 2015).

Health Administration and Public Health

Under the HRH Program, the MHA was launched in 2013 in the University of Rwanda School of Public Health after 3 years of curriculum development with Yale University (MOH,

2011b, 2016).[7] With the decentralization of health to the district level, health managers trained in public health or management were deemed essential to a functional health facility. The 2-year executive program targeted professionals who were already performing facility management and administration functions in the health system, and focused on increasing the number of trained hospital managers, ensuring equitable distribution of managers, and strengthening institutional capacity to sustain the MHA program locally (MOH, 2016). The curriculum included didactic blocks and hospital rotations, in which students participated in and designed hospital-based or quality improvement projects (MOH, 2016). Program administrators and faculty reported that the curriculum had been adapted from a similar MHA program in Ethiopia, also developed by Yale University (MOH, 2011). USI respondents included the MHA program in their reports, across all specialties, that development or strengthening of curricula was a marked success of the HRH Program. By 2015, 52 trained managers had resulted from the first graduated cohort of the MHA program (MOH, 2016). A Senior Leadership Program also trained 30 senior hospital leaders in 2013.

The MHA program was initially housed in the School of Public Health, but it was shifted to the School of Health Sciences, formerly the Kigali Health Institute. The Vice Chancellor of the University decided to relocate the program because the School of Health Sciences "has this experience working with hospitals … the School of Public Health was not really experienced with working with hospitals in terms of training and supervision of student trainees in the hospitals" (50, University of Rwanda Administrator in Public Health). The faculty delivering the courses did not change after the program moved, and the School of Health Sciences had no experience with administering a master's-level program, raising questions among some University of Rwanda respondents about the effectiveness of the move. The change in Minister of Health and the resulting perceived shift in priorities were also seen as contributing to changes in the MHA program's effectiveness:

> *[T]his program was created by the former Minister of Health. She sees the need of hospital management or this training. Now, when the new Minister of Health came to the picture, I'm not sure if their objective or mission aligned. (15, USI Faculty in the MHA Program)*

An international NGO respondent felt that additional investments were needed to build a cadre of effective health managers "to manage our health systems better and to have more functional health system and more motivated workers [which] could have really had more transformation across the country" (12, International NGO Representative). However, respondents expressed that the MHA program graduates did effect change in hospital administration, financial management at the hospital level, and quality:

> *[A] health facility is totally different from a transport company, from a financial company,… because you must know that any delays in implementing anything can affect the health of Rwandan population. So, training them, equipping them with that knowledge of managing medical teams, improving the management finance which links to the health care system was really a big achievement. (03, Government of Rwanda, HRH Program Administrator)*

[7] Yale University originally helped develop a Certificate of International Health Management curriculum, but the MOH deprioritized it prior to the HRH Program (MOH, 2016).

Other initiatives were concurrently being implemented. For example, as of 2017, a Master in Health Supply Chain Management was offered through the East African Community Regional Centre of Excellence for Vaccines, Immunization, and Health Supply Chain Management (RCE-VIHSCM, 2019). The 2-year blended learning program employs face-to-face teaching, distance learning, and multiple field placements for its target cohort of health and supply managers across the East African Community partner countries (RCE-VIHSCM, 2018, 2019). Similarly, building on their existing partnerships, in February 2012 Partners in Health, Harvard Medical School, and Brigham & Women's Hospital with the MOH launched the first Global Health Delivery course for health professionals in Rwanda, bringing Harvard Medical School faculty to Rwanda (Cancedda et al., 2014). The course was delivered twice a year in the village of Rwinkwavu, and six local students were trained in the first course to become faculty members for future offerings of this field course (Novak, 2012).

In 2015, the HRH Program also launched the Master in Global Health Delivery program. This 2-year, part-time curriculum emphasized global health policy, management, public health research, health finance, and leadership, and enrolled a first cohort of 27 students from varied disciplines (such as veterinary medicine, agriculture, and NGO management) (MOH, 2016). Partners in Health subsequently established the University of Global Health Equity (UGHE) in 2015 as a private institution to deliver community-centered health care and facilitate retention of qualified health professionals oriented toward serving rural populations (Binagwaho, 2017; UGHE, 2017). The first cohort of 24 students graduated in 2017; the university expected to enroll its first cohort of medical students in its 6.5-year dual degree program in July 2019, with the Master in Global Health Delivery degree woven into its medical training (UGHE, 2017).Although this view was not widely expressed, one USI faculty respondent involved in the design and accreditation of the Master in Global Health Delivery program commented that the UGHE "stole the curriculum from the University of Rwanda and have been running it ever since. The University of Rwanda was left with nothing" (24, USI Twinned Faculty in Internal Medicine and Public Health).

The committee performed comparison analysis, drawing on Program documents, published literature on the Program, and interview data, to examine why the MSN program had achieved greater success and sustainability than the MHA program (see Table 5-1). Both programs were developed under the HRH Program, building on similar programs elsewhere. For example, the MHA program was reportedly based on a similar curriculum in Ethiopia. The quality of the USI faculty and the interest among Rwanda faculty to teach in the MSN program was greater than in the MHA program. Both programs faced challenges with sustainability, and more time is needed to evaluate how these programs will be sustained.

TABLE 5-1 Comparative Analysis of MHA and MSN Programs

MHA Program	MSN Program
Program Origin	
New program in Rwanda.	New program in Rwanda.
Program Design	
Blended program: Students spent 25 percent of their time in Kigali in classroom learning and 75 percent of their time in their hospital applying what they learned. In the early cohorts most students were paired with a USI faculty who would work with them at their hospital; however, this changed after a few years to a more theoretical education with less practical application. (06, USI Faculty in Pediatrics)	Blended program: Eight specialties (critical care; education, leadership, and management; medical–surgical; neonatal; nephrology; oncology; pediatric; perioperative) were selected based on morbidity and mortality rates with a focus on upskilling A2 and A1 nurses already working in the health system, at the University of Rwanda, or in undergraduate nursing studies. One block of face-to-face learning was followed by two to three blocks of "hospital attachments," followed by a Capstone. (79, University of Rwanda Administrator and Faculty in Nursing and Former Student in the MHA Program)
Program Evolution	
As initially planned, USI faculty would work alongside hospital administrators in the facility—more practice-based learning on "day-to-day operations"—but eventually a decision was made to develop an "official curriculum for hospital management" in the SPH. However, the SPH "did not know what [health administration] means" so the program was moved to the "School of Health Sciences" in 2014 to 2015. (15, USI Faculty in the MHA Program) Perception was of miscommunication ("people were not talking on the same level") when the program was in the SPH which prompted the move. Vice Chancellor made the decision to move the program from SPH to Health Sciences, but faculty delivering the lectures were still under SPH. SPH had previous experience with postgraduate training, while Health Sciences did not.	The first phase of nursing under the HRH Program emphasized upgrading A2 nurses to A1. In 2014, there was a shift in focus to develop an MSN program, with the first cohort enrolled in 2015.
Curriculum Development	
Adapted from MHA program in Ethiopia: Rwandans were not engaged in the process, but had "final say" before submitting it to the Higher Education Council for approval. (15, USI Faculty in the MHA Program)	Adapted from existing curriculum elsewhere: Rwandan and USI faculty collaboratively created curricula in eight specialties, though the extent of curriculum development in each track is unclear.

MHA Program	MSN Program
Curriculum Approval	
It took about 10 months (2012 to 2013) for approval from the Higher Education Council.	It is unclear about whether some/all of the curriculum were approved, but USI respondents were aware of the approval process: "it's got to go through the Minister of Education and that is going to be painful." (23, USI Faculty in Nursing)
Student Selection/Recruitment	
Students were not being recruited at the time of data collection. In the first two cohorts, all current hospital administrators were required to participate as a condition of employment though they had to compete an exam and interview to "make sure they meet the academic standards" (50, University of Rwanda Administrator of Public Health and the MHA Program); the program was expanded to include Chief of Nursing—the "idea initially was to train people, three people, at the hospital so if there is any turnover, or there is any trained staff who leave the hospital, they remained with someone to continue working at the hospital." (50, University of Rwanda Administrator of Public Health and the MHA Program)	The first cohort of students (2015 to 2017) was chosen from (1) existing University of Rwanda faculty; (2) clinical nurses that had been planning to go abroad for their masters; and (3) existing undergraduate students that wanted to continue their studies. The first cohort was fully funded by the HRH Program. The second cohort (2017 to 2019) was not funded by the HRH Program and was funded by University of Rwanda for their own staff. Private money, other donors, and hospitals were also reported to be used to support the second and third cohorts.
Bonding Period	
Yes: "Usually they had a contract to make sure that the person, when you complete, you are in the hands of the Ministry of Health." (13, Government of Rwanda, HRH Program Administrator)	No bonding period by the MOH was mentioned by nursing staff, faculty, or students. However, some specific hospitals or private institutions may have individual policies. The University of Rwanda may also have a policy if the MSN was paid for by the university.
Perceived Effect of Program on Students	
Hospital administrators enjoyed the program—they benefited from the training and "having an extra body to teach them what to do and work with them" (15, USI Faculty in the MHA Program)	Overall there were clear examples of benefits to MSN students, both in upgrading their skills and being on par with the rest of the region. Many reported now that others from the region are interested in the MSN program.
Perceived Effect of Program on Faculty	
No apparent effect of the efforts to build the MHA program on MHA faculty could be discerned.	MSN students were able to take over administration of the MSN program, which may indicate sustainability.

MHA Program	MSN Program
Perceived Impact of Program on Quality of Care	
The MHA program was viewed as contributing to quality improvement projects at hospitals, addressing patient flow, infection control, organization of medical records, and patient satisfaction (81, University of Rwanda Faculty in MHA Program). However, in the first few years this seemed to be limited to CHUK and a few district hospitals (06, USI Faculty in Pediatrics).	The MSN program was seen as producing specialized nurses who could provide more complex care and could train others working in their department.
Sustainability	
The MHA program was not seen as having been sustained due to: no University of Rwanda faculty taking over; change in MOH priorities; restructuring of leadership in hospitals which meant that those who were trained were no longer in leadership positions; and not as well supported as other areas of the HRH Program	Faculty teaching in a master's program were required to have a Ph.D., and there was a concern about whether there would be enough Ph.D.-level staff to train the next cohort of students, though a new Ph.D. program in nursing reportedly began in 2017–2018, though this could not be confirmed.
Future of the Program	
There was hope the MHA training would be expanded to health center managers.	The future plans of the MSN program are unclear. However, it does seem that the twinning model switched from 2-1 U.S. to Rwandan faculty to 2/3-1 Rwandans to U.S. faculty. Additionally, there has been a reduction in the number of students accepted.

NOTE: CHUK = Centre Hospitalier Universitaire de Kigali/University Teaching Hospital, Kigali; HRH = human resources for health; MHA = Master of Hospital and Healthcare Administration; MOH = Ministry of Health; MSN = Master of Science in Nursing; SPH = School of Public Health; USI = U.S. institution.

Challenges in Curriculum Support

Despite notable achievements with the curricula for various health professional education programs, USI faculty reported that those who were recruited as USI faculty often did not have experience in curricula development or that if curricula were developed, they were not formally approved. Meanwhile, an HRH trainee reported the need for more revisions to existing curricula.

> *The first year of the HRH Program we revised completely the EM-MED [emergency medicine], which is the residency program curriculum. That revision was never truly approved. We have been working the whole HRH Program through this draft. It is complicated to get it approved [at] the University of Rwanda level…. It never made it all the way up, probably because our head of departments have never pushed this as priority, because they are also overwhelmed and don't have any admin[istrative] support… So, the curriculum was revamped, the rotation style was revamped, the evaluation was revamped and changed. (06, USI Faculty in Pediatrics)*

For the MHA program, the curriculum that was developed underwent a lengthy process for approval and was reportedly copied, as noted in the previous section.

Indeed, use of the HRH Program-supported curricula seemingly expanded beyond the University of Rwanda and the HRH Program to UGHE, other established schools of medicine or health professional education institutions, and the East African Community for accreditation. One USI faculty member reported taking the curriculum they had developed with them to a similar program in another country in the region. As the quote above illustrates, this expansion had mixed reviews from evaluation respondents. Although it took time for different institutions and the East African Community to develop, adapt, and approve curricula, evaluations of the curricula were very positive:

> *[The HRH Program] did a wonderful job, because curricula was not existing in country because no one was trained to be a specialist here in Rwandan. So, at least you should recognize that achievement is really linked to the vision of HRH, because curricul[a] were developed for different specialists in different domains in Rwanda…. [W]e can really prepare for candidates that will be in the training for specialization. So today you have new faculty of medicine coming in country the Global Health University, and another one with the Seventh Day Adventist Church … coming with an established school of medicine and [they] are using curricul[a] that are here in country and they were developed and refined by HRH. (65, Government of Rwanda, HRH Program Administrator)*

ACCREDITATION AND SPECIALTY PROGRAMS

Alongside assessment of academic curricula, accreditation processes and standards were also widely discussed in the region. Mullan and colleagues state that in a survey of 146 medical schools, there was "little use of external accreditation" and that "various levels of accreditation and certification were noted in the countries visited" (Mullan et al., 2011). The World Health Organization indicates that

> the most common approach to accreditation of institutions and programs is the process model that includes self-evaluation based on agreed standards; a peer-review that usually includes a site visit and a report indicating the outcome of the accreditation.… However, in more than half the countries of the world, reviews of schools and programs are not done at all or not adequately.

However, it should be noted that "there is only weak evidence of a causal link between accreditation and higher quality" (WHO, 2013).

Respondents in this evaluation highlighted improved institutional capacity within the University of Rwanda due to the HRH Program with regard to accreditation at the university level and advances in each specialty program. One University of Rwanda faculty member attributed the university's most recent accreditation by the East African Accreditation Board partly to the HRH Program and suggested that improvements in the quality of education were linked with this accreditation:

> *[T]he program has been upgraded…It has been accredited. So now they are doctors, graduated, and can go work in all Eastern African countries. So many have left to go to work in East Africa. Now we have international recognition because they have a standard training, which has really benefited from the HRH support … that was also a success from the [University of Rwanda]. To be able to have a structure, organized, which can be confirmed by the accreditation Board of the East African community. (14, University of Rwanda Administrator in Pediatrics)*

However, East African Accreditation Board accreditation could not be verified. All residencies across all disciplines were university-based, and graduates received a Master in Medicine (M.Med.) from the Ministry of Education (MOE). All HRH programs were approved by the University of Rwanda Senate, Higher Education Council, under the MOE. However, different specialties also reported varying additional approvals. The nursing program was also approved by the Nursing Council for Nurses and Midwives.[10] Surgeons looked to a separate, nonuniversity body, the College of Surgeons of East, Central, and Southern Africa (COSECSA), and University of Rwanda surgical graduates were encouraged to sit the COSECSA exams to become fellows—FCS(ECSA).

In 2014, the Rwanda Emergency Care Association was established as the first interdisciplinary organization bringing together emergency medicine physicians, residents, emergency nurses, and prehospital providers in Rwanda, as a result of introducing the postgraduate diploma in emergency medicine that evolved into the Emergency M.Med. (MOH, 2016; RECA, 2019). The launch of the Emergency M.Med. program also led to the development of the Emergency Medicine Clinical Guidelines in 2016 to standardize care at district and referral hospitals, the introduction of the first formal emergency triage system in Rwanda's public health system, and restructuring of the CHUK Emergency Department (MOH, 2016). HRH Program-purchased equipment specific to emergency medicine, such as resuscitation equipment and portable x-ray machines at CHUK, was anticipated to facilitate a high-quality training environment for the new residents (MOH, 2011b).

[10] Levels A2 and A1 were both approved by the MOE, but A2 no longer exists.

RESEARCH AND PROFESSIONAL DEVELOPMENT

Data from this evaluation show that the HRH Program also increased HRH trainees' research outputs, professional development opportunities, and overall preparation and motivation as they entered the health workforce.

Support for Research Outputs

The 2011 HRH Program proposal stated that "research undertaken related to the HRH Program by U.S. faculty must be co-authored with Rwandan researchers and must adhere to the conditions established by the Rwandan Authorities" (MOH, 2011b). According to an evaluation of the Program's collaboration with the University of Rwanda that was sponsored by the Swedish International Development Cooperation Agency (SIDA), Rwanda's research output has grown by an average of 26 percent annually since the early 2000s, with medical research constituting almost half of the country's more recent output (Tvedten et al., 2018). U.S. universities and medical institutions "dominate" the list of affiliated international partner institutions for research articles with Rwandan authors and co-authors published between 2013 and 2017 (Tvedten et al., 2018). Although the SIDA evaluation credited the HRH Program as a driving factor in these research partnerships, two of these institutions were not involved in the Program and two had multiple longstanding relationships with the MOH and other Rwandan institutions that predated the HRH Program; it is more likely that the Program was one among many factors supporting Rwanda's increased research output during this period (Tvedten et al., 2018).

A more recent review of the literature, concurrent with the timing of the HRH Program, notes similar findings with respect to overall Rwandan research output. A Scopus review of published primary literature,[11] performed as part of this evaluation, found 1,626 articles in the fields of medicine and health professions, nursing, public administration, public health, social sciences, and life sciences published between 2012 and 2018 by authors affiliated with Rwandan institutions.[12] Moreover, annual research output among Rwandan-affiliated authors grew at an average of 20 percent per year, nearly tripling during this period (from 117 articles in 2012 to 334 in 2018). Of the total research output for Rwandan-affiliated authors, nearly half (782) of all publications were in the fields of medicine and health professions, and 320 publications focused on HIV. Rwandan-affiliated authors produced on average 46 HIV-focused publications annually during this period.

Average annual growth in HIV-focused publications was slightly negative, however, with 2015 as the year of peak output. Further analysis indicated that for more than a third of these HIV articles, a Rwandan-affiliated author was listed as the first author; moreover, among these first authors, fully 40 percent were serving as lead author for the first time. Across all 320 HIV-focused publications with Rwandan-affiliated authorship, 14 percent had a lead Rwandan-affiliated author serving in this role for the first time. Although this increased research output

[11] Primary literature is defined as literature that excludes the Scopus-defined categories of "editorials," "notes," and "letters."

[12] Authors affiliated with Rwandan institutions, also referred to as Rwandan-affiliated authors, indicate authors who are listed in a publication as being affiliated with an institution that is based in Rwanda.

cannot be attributed to the HRH Program, it is likely that the Program was one of multiple contributing initiatives.

Metrics such as "first author" and "first-time first author" are important to consider, because much of the research in Rwanda is both funded by foreign donors from higher-income countries and conducted in partnership with academic and other institutions from these countries. The literature indicates that such partnerships "are often imbalanced," fostering the "careers and priorities" of Western researchers over those of their African collaborators (Boum II et al., 2018). A higher proportion of Rwandan first authors and first-time first authors may indicate a more equitable partnership. This is desirable, as more equal and "truly cooperative" (Costello and Zumla, 2000) research partnerships are more likely to foster the development of academic infrastructure within the country and result in the translation of research into practice and national policy (Boum II et al., 2018; Costello and Zumla, 2000).

Across all respondents for this evaluation, one of the main reported outcomes of the HRH Program was the development of HRH trainees' skills and competencies in research, grant writing, and publication. A focus on research was emphasized in some curricula, such as the MHA program and pediatrics specialty, whose graduation requirements included a built-in requirement to integrate research and write a thesis. HRH trainees from the facility microsystem reported that increased research collaboration with USI faculty increased their understanding of data, statistics, and evidence-based practices:

> *I was trained how to do research and how to write a manuscript and how to produce an article to publish, and before I was not aware of it. Now… I can write a research project in 6 months and it is completed; before I would not even think about how do it. So, my research activities [were] improved. (49, University of Rwanda Faculty and Current Student in Nursing)*

Respondents reported that research collaborations, publications and mentorship with HRH trainees continued after USI faculty left Rwanda (see Chapter 4 for details, in the context of the HRH Program's twinning activities). Many HRH trainees are now pursuing their Ph.D.s, and have contributed their research knowledge to the HRH Program.

> *People continue doing research together, publishing, even if they are no longer part of the program. Do you know that in the University of Rwanda—I think that was last year it came out this information?—from 2015 to 2018, think we had 700 and something articles published in good journals. (37, University of Rwanda Administrator)*

USI faculty continued collaborating with students they advised after their departure from Rwanda, predominantly in supporting students to complete their theses and prepare and submit publications.

Other support for research outputs included a 6-month scholarly writing workshop, designed and implemented by the HRH Program from January to July 2015 with funds from the Wellcome Trust, to help University of Rwanda faculty learn the process and strategies for preparing manuscripts for publication and other research activities (Ewing et al., 2017). Participants of the writing workshop met every 2 weeks and were offered mentorship and

supportive feedback, with the goal of producing a research-related output by the end of the workshop. Although low post-test responses and a high workshop attrition rate led to no significant conclusions, Ewing and colleagues report a high level of overall satisfaction with the workshop; 77 percent also self-reported they had developed an abstract or draft manuscript during the workshop, 69 percent planned to publish in the next year, and 85 percent noted they planned to deliver a presentation at a conference within the next year (Ewing et al., 2017). Increased research also led to increased opportunities to present research at regional and international conferences. A few USI faculty reported supporting HRH trainees and twins to present at a conference with additional funding, raised outside of the HRH Program. Across respondents, there were multiple examples of HRH trainees speaking and attending international conferences in the United States, the United Kingdom, and regionally.

A few HRH trainees reported an increase in research on HIV. One pediatric HRH trainee presented HIV research on antiretroviral therapy adherence at an international conference. However, according to the Scopus review of published primary literature, the number of HIV-related primary publications by authors affiliated with Rwandan institutions rose from 45 in 2012, peaked at 57 in 2015, then dropped each subsequent year, to 40 publications in 2018.

Support for Continuing Professional Development

Professional councils have supported continuing professional development (CPD) across cadres in Rwanda for a decade. In February 2009, the Rwanda Medical and Dental Council established a CPD program. The National Council for Nurses and Midwives followed with its own CPD strategic plan in June 2013. Subsequently, four professional councils (Rwanda Medical and Dental Council, National Council for Nurses and Midwives, National Pharmacy Council, and Rwanda Allied Health Professionals Council) established a joint CPD policy, requiring health professionals to continually update their skills and knowledge as a condition of licensure (Health Professional Councils of Rwanda, 2013). International NGOs also reported working to strengthen professional councils and associations:

> *We've been working on a number of different initiatives particularly in this project. One is strengthening the professional association or professional councils in their regulatory role. You know, we've been supporting them for data management so they can put systems in place so they can license and register people, things like that. So mainly working with the nurses and midwives' council, and medical council. And then there's allied professional, is another group. (05, Other International NGO)*

Each profession has a minimum number of credits required every 3 years (see Table 5-2). Being the first author on a scientific paper or article in a peer-reviewed journal is worth 20 credits (Health Professional Councils of Rwanda, 2013).

TABLE 5-2 Required CPD Credits by Profession

Profession	CPD Credits Required Every 3 Years
Medical Doctors/Dentists	150
Pharmacists/Pharmacy Technicians	75
Nurses/Midwives	60
Allied Health Professionals	90

NOTE: CPD = continuing professional development.
SOURCE: Health Professional Councils of Rwanda, 2013.

HRH trainees from the facility microsystem and the University of Rwanda reported CPD activities hosted by the MOH, Rwanda Biomedical Center, and professional associations as critical to their development. At the facility level, HRH trainees reported that the MOH deployed 2-day to 3-day CPD training courses on topics including tuberculosis, malaria, and hepatitis. Professional associations played an important role in setting the policy on CPD as well as delivering the courses. One respondent reported a new five-module certificate course for midwives, which trainees could present to the National Council for Nurses and Midwives for renewal of their license. One respondent speculated that CPD activities motivated local health staff to further pursue training in subspecialties as they witnessed HRH staff pursuing such opportunities (28, University of Rwanda Administrator and Former Student in Obstetrics and Gynecology).

> *Since that time that [the] HRH [Program] started, it was a privilege, not only [for] clinics and not only [for] nursing, but even [for] medical staff. So, we lived with them in the clinics…. They were helping us in skills development, in coaching, training, CPD. They were helping us to get CPD because they prepared the lessons so that they help us to refresh our daily practice. In clinics it was about skills development, coaching, and CPD. (62, University of Rwanda Former Student in Nursing)*

Aside from formal CPD activities, respondents spoke of more informal ways the HRH Program advanced their careers. For example, one respondent who had formerly worked with the MOH as part of the HRH Program attributed her exposure to health care improvement through the Program as something she carried to her community-level work with people living with HIV.

Many HRH trainees were fast-tracked to higher positions following their training, not only as faculty and deans of departments at the University of Rwanda, but also at the facility level. One respondent discussed being promoted to head of their department after HRH training, and another spoke of moving from being a nurse to head of department:

> *Today I am the matron of internal medicine and I have been working as such for 1 year, but from 2011 up to 2013 I was normal nurse working in surgery, from 2012 to 2013 I was the coordinator of infection control and prevention, from 2013 to May 2018 I was the matron in surgery department. (58, University of Rwanda Former Student in Nursing and A0 Nurse)*

Another nurse respondent reported not feeling well-prepared to provide clinical services immediately following her preservice education, but that working alongside doctors following her placement had allowed her to learn practical application of her knowledge. Another respondent highlighted that some HRH Program colleagues had continued to advance their education outside of the health system and outside of Rwanda:

> *I know most of my colleagues I went to medical school with … some of them have even moved on to become consultants and some of them have used the HRH Program to advance their skills and are now in better positions even in the U.S. and elsewhere. All of this is thanks to the HRH Program. (48, Government of Rwanda HRH Program Administrator)*

As many graduates under the Program were still bound by the bonding period,[13] and other cohorts were still in their studies at the time of this evaluation, the movement of HRH Program trainees could not be assessed. It will be important to monitor the flow of HRH Program trainees over time to determine any resulting brain drain. Chapter 6 expands on student and faculty advancements.

CONCLUSIONS

In reexamining health professional education, Frenk and colleagues (2010) identified a series of 10 institutional and instructional education reforms for postsecondary education in medicine, nursing, and public health that were not only responsive to local needs, but also connected globally and extended beyond the silos of individual health professions. Such instructional education reforms include

- adapting global resources to local contexts "while using global knowledge, experience, and shared resources, including faculty, curriculum, didactic materials, and students linked internationally through exchange programs;"
- "strengthening educational resources" such as "faculty, syllabi, didactic materials, and infrastructure";
- "promot[ing] … interprofessional and transprofessional education that breaks down professional silos while enhancing collaborative and non-hierarchical relationships in effective teams;" and
- using "the power of information technology for learning" (Frenk et al., 2010).

Meanwhile, recommended institutional reforms include

- "establish[ing] joint planning mechanisms… to engage key stakeholders, especially ministries of education and health, professional associations, and the academic community, to overcome fragmentation by assessment of national conditions, setting priorities, shaping policies, tracking change, and harmonizing the supply of and demand for health professionals to meet the health needs of the population;" and

[13] Students whose received tuition support from the MOH were bonded, or required to serve for a certain number of years, depending on cadre and specialty, in the public health system before being able to pursue employment opportunities outside of the public sector.

- (2) "[l]inking together through networks, alliances, and consortia between educational institutions worldwide and across to allied actors, such as governments, civil society organisations, business, and media" (Frenk et al., 2010).

All these reforms provided a set of requisite components to transform education and strengthen country health systems, most of which the HRH Program has addressed in some capacity.

At the outset of the HRH Program, there was an underestimation of the degree of structural change within the University of Rwanda, and across sectors, that was needed for institutionalized capacity for health professional education and that would occur as a consequence of the HRH Program. The perception of its success was first in training health workers, second in augmenting service delivery, and third in building the University of Rwanda faculty capacity in teaching. The institutional reform of greater joint planning among ministries was an unplanned outcome, while expanding linkages with regional and global networks was not observed. Literature on the HRH Program since 2015 has documented processes and outputs primarily in the following domains: trainees' perceptions of HRH Program curricula or activities; measurements of knowledge acquisition or teaching and clinical skills transfer among HRH trainees; factors affecting recruitment of trainees and faculty; and general gaps and improvements to the HRH Program curricula.

Development of University of Rwanda faculty capacity occurred through a number of activities, including mentoring and twinning, as discussed in Chapter 4. In a faculty development program for medical education in the East African region, implementation of varied activities (such as workshops, exchange visits, visiting professors program, advanced leadership training, and curriculum development) provided positive developments in strengthening health professional education at the college as they enhanced their expertise and skills (Matsika et al., 2018). Bringing in external faculty and other experts via the memoranda of understanding with USIs added value to the quality of health professional education and training, as determined by the development of new programs and curricula or the updating of existing curricula, increased research output, and the provision of high-quality teaching by USI faculty. As illustrated by some of the instructional reforms above (Frenk et al., 2010), this was a key in strengthening and developing the capacity of health professional education. Exposure to the twinning model, USI faculty, and teaching quality also had a positive effect on Rwandan faculty and students, providing a mechanism for those trained to take on leadership roles in providing quality of care and to train the next generation of health professionals in Rwanda; this resonates with the notion that twinning is a values-based methodology (Kelly et al., 2015).

Although there were successes in producing an increased number of health workers across cadres and specialties, the story is less clear in the production and retention of University of Rwanda faculty to educate future cohorts of students. Theoretical frameworks addressing worker turnover and retention point to the idea that for faculty, structural factors within an academic institution (e.g., "collegial communication, equitable rewards, work autonomy, job security, and a role in organizational decision making") may influence retention (Ngure and Waiganjo, 2017). Faculty members who perceive the institution as meeting their expectations in these areas may be more likely to "report higher levels of job satisfaction and stronger commitment to the employing organization," thereby "strengthening the[ir] intent to stay" in their position (Ngure and Waiganjo, 2017). In contrast, for faculty with unmet expectations in these areas, "levels of satisfaction and commitment decline and intent to leave increases" (Ngure

and Waiganjo, 2017). Thus, faculty perceptions surrounding these structural factors may affect "psychological dispositions toward staying or leaving the institution" (Ngure and Waiganjo, 2017). This evaluation's proximity to the end of PEPFAR's investments make it difficult to say conclusively that additional faculty have been produced or retained; however, the qualitative data do point to organizational limitations at the University of Rwanda level that could hinder faculty retention, including career progressions and compensation.

In addition to the value added to the quality of health professional education via new and upgraded education programs and curricula, research output continued to increase. Research capacity was highlighted as a key priority in the original proposal, although there was no clear funding mechanism or pathway. Given the number of strong institutional research collaborations that predated the HRH Program (such as the University of Rwanda–Sweden program, which provided research grants and funded doctoral students, and Harvard University and its affiliate institutions, which had longstanding partnerships with Partners In Health and the MOH), the HRH Program was likely one of many efforts contributing to a steadily growing body of research output during this period. For HRH trainees, the Program specifically increased their research outputs, professional development opportunities, and overall preparation and motivation as they entered the health workforce, although a cross-sectional descriptive study of interns and pediatric residents at the University of Rwanda identified "barriers to research such as faculty lacking time to mentor, lack of funding, lack of statistical support, and lack of faculty experienced in conducting research" (Habineza et al., 2019). As a successful example, the institutional and long-term partnership between Makerere University in Uganda and Karolinska Institute in Sweden, which started in 2000, successfully bolstered research capacity and collaboration. While that program's focus was on a joint Ph.D. program, students spent a majority of their time in Uganda to ensure research remained focused on local issues, with the remainder spent in Sweden, where they enrolled in specialty courses. The productive nature of this collaboration and focus had positive implications in terms of publications, increasing research output with a majority of Ugandan first or last authors (Sewankambo et al., 2015).

Improvements in the accreditation of programs developed or improved under the HRH Program were uneven (Rogo, 2019). Accreditation standards differed by specialty, with varying levels of subsequent approval, such as those for the nursing program or the surgery specialty, for which additional approvals were required by a Council or separate, nonuniversities bodies. Although the University of Rwanda's medical, dentistry, and pharmacy programs were noted as participating in the regional East African Community accreditation process, their regional accreditation status could not be independently verified (Yumbia, 2019). In the East African Community, under a common supranational inspectorate framework, programs currently undergo two layers of accreditation, first at the national level and then at the regional level. At this regional level, there is a harmonization of curricula and a formal joint inspection by regulators representing the six countries in the East African Community (Rogo, 2019).

Although experiences with twinning were positive, as described in Chapter 4, the HRH Program's individual twinning approach, as opposed to institutional twinning, resulted in limited improvements in institutional capacity for health professional education. During the period of PEPFAR's investment, the HRH Program did not place adequate emphasis on building and retaining faculty, and insufficient time was dedicated to building a cohort with terminal degrees to fill gaps in faculty following the reduction in numbers of USI faculty. The result was new programs and curricula, but without sufficient University of Rwanda faculty to deliver the courses. There was an initial pipeline of trainees feeding back into the education and training

systems as faculty and administrative leaders, but retention strategies for current and new faculty were an underdeveloped aspect of the HRH Program's portfolio of activities. Following the end of PEPFAR investments, the University of Rwanda did not have sufficient resources to carry on providing the same volume of high-quality postgraduate teaching; this manifested in large class sizes, insufficient infrastructure, and low salaries that challenged retention (see Chapter 6 for more information on how salaries affect retention). However, the improved relationship and communication between the MOH and MOE, as well as with professional associations and professional councils, as a result of the HRH Program could provide momentum to continue building institutional capacity.

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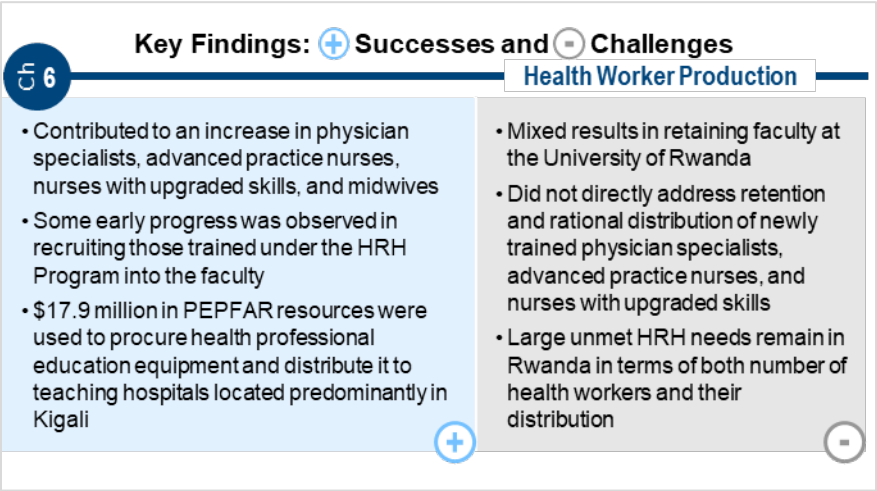
6

Health Worker Production



Literature on the Human Resources for Health (HRH) Program that has emerged since 2015 has documented processes and outputs primarily within the following domains: trainees' perceptions of HRH Program curricula or activities; measurements of knowledge acquisition or teaching or clinical skills transfer among HRH trainees; factors affecting recruitment of trainees and faculty; and general gaps and improvements to the HRH Program curricula.

HEALTH IN THE RWANDAN LABOR MARKET

In 2018, Rwanda's population was recorded at more than 12 million, with a working age population of 6.9 million and a labor force of approximately 3.9 million (NISR, 2018). It also has one of the highest rates of female labor force participation and is the only low-income country of the five countries (Iceland, Finland, Norway, Sweden, and Rwanda) that have closed at least 80 percent of the gender gap (Thomson, 2017; World Bank, 2018). The latest Labor Force Survey from the National Institute of Statistics of Rwanda reported that of the population of 3,207,336 employed individuals, 49,072 (1.5 percent) are working in the field of human health and social work activities (NISR, 2018). The health workforce has increased in both number and proportion at a rate of 6.9 percent since 2002; data from the Rwanda Population and Housing Census reported that the health workforce numbered 15,084 (0.46 percent) in 2002, and 29,413 (0.7 percent) in 2012 (NISR, 2014).

Health Workforce by Cadre

The 1994 genocide against the Tutsi nearly destroyed the health infrastructure and resulted in acute shortages of a supply of qualified and specialized health workforce, which

hindered health service delivery and served as a major barrier to HIV care and treatment. In 2009, it was estimated that a 14.2 percent rate of health workforce growth per annum was required, according to Rwanda's population growth rate at that time (Kinfu et al., 2009).

Between 2009 and 2015, as Figure 6-1 illustrates, the number of health workers in Rwanda remained relatively consistent, with 7.8 to 8.9 doctors, nurses, and midwives per 10,000 people (MOH, 2015). When disaggregated by cadre, the majority of these health professionals were nurses (7.27 to 8.31), with significantly fewer doctors (0.58 to 0.64) and midwives (0.05 to 0.8). More recently, Rwanda was reported to have 1 physician (2018), 7 nurses and midwives (2018), and 3 other health workers per 10,000 population density (Open Data for Africa, 2018).

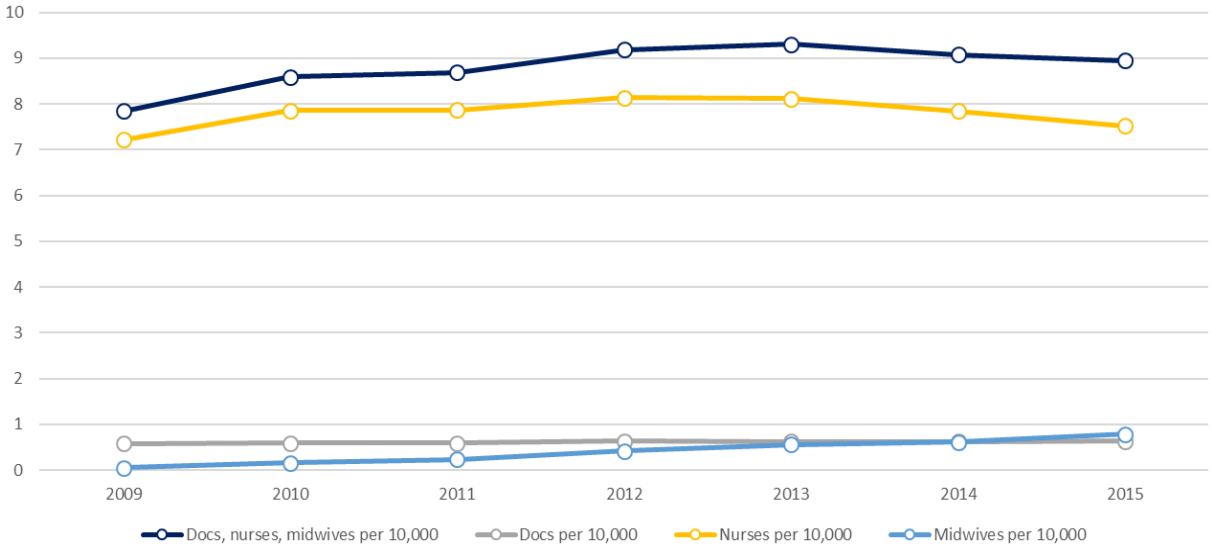


FIGURE 6-1 Doctors, nurses, and midwives per 10,000 population.
SOURCE: MOH, 2015.

However, this was still far below the World Health Organization (WHO) recommended critical minimum threshold of 23 doctors, nurses, and midwives per 10,000 people in 2006, and even farther below the newer (2016) threshold of 44.5 per 10,000 (WHO, 2016). This shortfall represents a production challenge, meaning there is an insufficient number of trained health professionals relative to the need.

In 2011, 625 medical doctors, 8,273 nurses, and 240 midwives were providing care in Rwanda's referral and district hospitals and health centers (MOH, 2012a). In 2015, it was reported that there were 114 pharmacists, 1,545 laboratory technicians, and 263 anesthesia practitioners in Rwanda (MOH, 2015). Most doctors in Rwanda are general practitioners and perform a majority of the surgical care; 82 percent of the general surgery and obstetric procedures are performed at district hospitals (Kansayisa et al., 2018). Only about 50 fully trained surgeons and 170 anesthesia technicians were reported in Rwanda in 2012 (Petroze et al., 2012).

Compounding the shortage of doctors are absenteeism and the presence of "ghost workers," people who draw a salary from the public sector although they are mostly absent. Doctors in urban areas combine public- and private-sector work, and usually at the cost of public-sector health service delivery through their lack of attendance (Lievens et al., 2010). Patients and health facility staff alike benefit from the doctors' time and expertise, but

absenteeism leads to low quality and inadequate health care owing to low output and productivity (Lievens and Serneels, 2006; Scheffler et al., 2016). The Rwandan government initiated a pay-for-performance strategy to improve the quantity and quality of health services provided in the public sector, making positive contributions to health worker performance (Ngo et al., 2016; Sekabaraga et al., 2011; Suthar et al., 2017; Zeng et al., 2014).

Rwanda is relatively better resourced with nurses, who predominantly staff health centers, where 85 percent to 89 percent of the mostly rural population receives care (Iyer et al., 2017; Uwizeye et al., 2018). As one approach to help alleviate the shortage of human resources for health (HRH) and linked to decentralization of the health system, the health sector introduced task shifting in 2009,[1] shifting many clinical decisions and activities to nurses and community health workers (CHWs), including in the delivery of HIV care. With a deficit of physicians, task shifting would increase the ability to care for patients and would also decrease labor costs of the HIV program. The Ministry of Health (MOH) transferred the ability to prescribe antiretroviral therapy and provide routine follow-up care of HIV-positive patients on first-line drugs without complications to nurses (MOH, 2009b). The program trained more than 500 nurses to deliver HIV care and has achieved high levels of retention and improved patient health outcomes (Nsanzimana et al., 2015). The 2013 HIV and AIDS National Strategic Plan reemphasized task shifting of routine HIV care to nurses and the upgrading of nursing skills to equip them to care for pediatric patients and those on second-line prescriptions (MOH, 2013c).

Through further task shifting and a reformation of the national community health system, care for 80 percent of the disease burden was offloaded to CHWs at the village level through health promotion activities as well as preventive, diagnostic, and curative care (Binagwaho et al., 2012; Condo et al., 2014; MOH, 2013b). The Rwanda CHW Program was established in 1995, growing from 12,000 CHWs to now approximately 45,000 (RGB, 2017). Each village has three CHWs—a pair of general CHWs (*binomes*), who provide community health, nutrition, and HIV/AIDS prevention services, and a maternal health worker (*animatrice de santé maternelle*), who provides infant, and pre- and postnatal maternity care. CHWs are elected by the communities they serve and undergo at least 6 years of education (Condo et al., 2014). Although task shifting has positively contributed to the supply of adequately trained health professionals, there are still significant shortages of physicians and physician specialists in the health workforce.

Publicly available data from the MOH's Annual Statistics Booklet, Annual Report, and the Master Facility List demonstrate an increase in health workers across type during a period concurrent with the HRH Program (see Table 6-1). These numbers encompass the newly trained health workers who participated in the HRH Program, those who were already working in the health system, and those who entered the Rwandan health system after being trained elsewhere. The committee was unable to disaggregate these data by source or career stage.

[1] Shifting health care services to nurses and CHWs has been a key strategy for expanding access to primary care in Rwanda and elsewhere. Cancedda and Binagwaho (2019) point that the HRH Program was designed to complement existing and ongoing efforts that strengthened primary care, including task shifting.

TABLE 6-1 Number of Health Practitioners in Rwanda by Level

	2010	2011	2012	2013	2014	2015	2016	2017	2018	HRH Target
General Practitioners	604	625	683	684	709	742			783*	1,182**
Physician Specialists		150**				197**			567*	551**
Nurses and Midwives	8,202	8,513	9,230	9,607	9,590	9,661			10,758*	11,384**
Community Health Workers***		~60,000	~60,000						~45,000	

* Ministry of Health: Rwanda Master Facility List, 2018 (MOH, 2018b). The Master Facility list counts health workers in the following categories: General Practitioner, Specialist, A1 Nurse, A2 Nurse, Midwife, Lab Technician, Physiotherapist, Anesthetist, Pharmacist, and Dentist.
** Midterm review of the HRH Program (MOH, 2016). The definition of specialists according to the midterm review was "of specialized physicians in public-sector workforce with an M.Med., excluding those in exclusively administrative roles," which may differ from "specialist physicians" as used in the Master Facility List, which did not include a definition.
*** Comprehensive Evaluation of the Community Health Program in Rwanda (LSTM, 2016).
SOURCES: MOH Annual Statistics Booklets or MOH Annual Reports unless otherwise noted. MOH, 2010, 2012a, 2013a, 2014a, 2015,

Including physician specialists and general practitioners, there were 1,350 physicians in Rwanda in 2018, which translates to 1 doctor per 8,919 population—below the Fourth Health Sector Strategic Plan (HSSP IV) national target of 1 doctor per 7,000 population by 2024 (MOH, 2018a,b).[2] Physician specialists, before embarking on specialization training, become general practitioners. Although trend data provide the number of health practitioners by level, these data do not highlight the number of general practitioners who became specialists, which might have some implications achieving targets for generalists.

As of 2018, five of Rwanda's 30 districts had more than 1 doctor per 7,000 population and eight districts had fewer than 1 doctor per 25,000 population (MOH, 2018b). Likewise, Rwanda's 9,551 nurses equate to 1 nurse per 1,261 population, below the HSSP IV target of 1 nurse per 800 population, and the 1,207 midwives equate to 1 midwife per 2,504 women of childbearing age, close to the national target of 1 midwife per 2,500 women of childbearing age (MOH, 2018a,b). In total in 2018, there were 10.5 doctors, nurses, and midwives per 10,000 population, an increase from 8.8 in 2011, before the start of the HRH Program and a 19 percent increase in total, led by a per population increase of 176 percent in physician specialists, a 10 percent increase in general practitioners, and 10 percent increase in nurses and midwives. However, Rwanda remains well below the Sustainable Development Goal index threshold of 4.45 doctors, nurses, and midwives per 1,000 population established by WHO as necessary to

[2] There is no singular guidance on the number or density of medical specialists in low- and middle-income countries. In fact, the WHO's Global Health Observatory data repository, which tracks health worker density, does not disaggregate medical specialists at all. A review of the literature revealed little guidance on the topic as well. One recent modeling exercise suggests that four physician anesthesia providers per 100,000 population is a "modest target" (Davies et al., 2018).

deliver essential health services (WHO, 2016). If Rwanda meets its HSSP IV targets, it will have 15 doctors, nurses, and midwives per 10,000 population by 2024.

Data from the University of Rwanda indicate that although more medical students graduated from undergraduate and postgraduate training programs after the HRH Program started, there was variability by specialty (see Table 6-2). The higher numbers of graduates in 2016, 2017, and 2018 reflect the increase in enrollment rates in the first 3 years of the Program. A maximum likelihood time series analysis was performed to assess the statistical significance of this increase (see Chapter 2 section for the rationale and methodology). Results indicated that the total number of physician specialists graduating per year from 2014 through 2018 increased significantly ($P < 0.001$), compared to the 2007–2013 period (see Figure 6-2). Data provided by the MOH indicated most medical specialists were distributed with high numbers at Rwanda Military Hospital, CHUK (University Teaching Hospital, Kigali), CHUB (University Teaching Hospital, Butare)—and with smaller disbursements, in comparison, in Ruhengeri and Muhima hospitals—most of whom were internists, pediatricians, obstetricians and gynecologists, and/or surgeons. The effect of reduced investments in the HRH Program on graduation rates requires more time to assess.

TABLE 6-2 University of Rwanda Medical Student Graduation Numbers by Program

Department	2010	2011	2012	2013	2014	2015	2016	2017	2018
Bachelor of Medicine and Surgery	117	42	88	130	75	96	72	83	103
Postgraduate									
Anesthesiology	2	2	1	2	3	2	5	—	—
Internal Medicine	3	3	6	1	6	10	14	12	17
Pediatrics	5	5	8	—	1	6	14	13	11
Obstetrics/Gynecology	6	—	7	—	5	6	14	10	13
Ear, Nose, and Throat	—	—	—	—	2	3	3	1	—
Family and Community Medicine	—	—	—	—	2	—	—	—	—
Surgery	4	—	4	—	4	5	9	5	4
Neurosurgery	—	—	—	—	—	—	—	1	1
Orthopedics	—	—	—	—	—	—	—	—	1
Urology	—	—	—	—	—	—	—	1	—
Anatomical Pathology	—	—	—	—	—	—	—	4	4
Psychiatry	—	—	—	—	—	—	—	3	2
Emergency and Critical Care	—	—	—	—	—	—	—	—	6

SOURCE: Graduation data provided by the University of Rwanda.

FIGURE 6-2 Total physician specialists graduated under the HRH Program by year.
NOTES: The 2016 HRH Program midterm review indicates that in 2015 there were 197 specialists in Rwanda; the 2018 Rwanda Master Facility List indicates this increased to 567 in 2018. The number of new physician specialist graduates between 2015 and 2018 totals 264, which does not equal the difference of 370. It is unclear whether additional physician specialists were trained outside of Rwanda or entered the system through other means. This is a challenge with data from diverse sources that, due to their late receipt, could not be validated or cross=checked.
SOURCE: Graduation data provided by the MOH.

Additional MOH data on nursing specialists indicated that 111 nursing specialists graduated from the first Master of Science in Nursing (MSN) cohort from 2015 to 2017, with the most graduates from the pediatrics specialty, followed by medical surgical, and critical care and trauma (see Figure 6-3). Although the MSN program is still in its infancy, the number of specialist nurses produced in its early years is promising and could contribute to continued specialization of nurses and the provision of specialty care, although more time would be needed to evaluate the sustained effect.

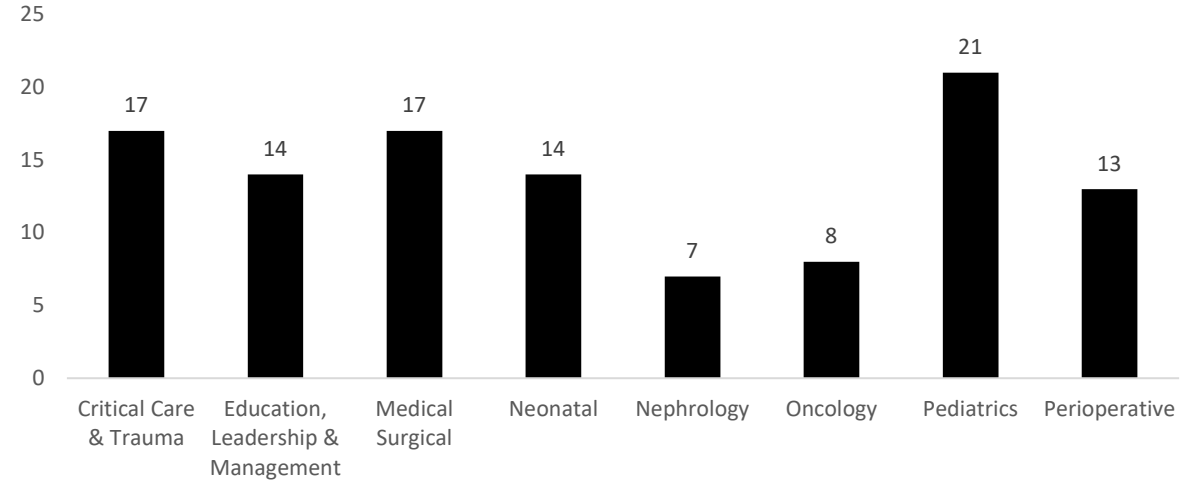


FIGURE 6-3 Total nursing specialists graduated under the HRH Program by specialty.
NOTES: The MSN program commenced its first cohort in 2015. Presented data show the first graduated cohort for the 2-year programs from 2015 to 2017.
SOURCE: Graduation data provided by the MOH.

The Rwanda Medical and Dental Council, established in 2003, is responsible for registering and licensing all medical and dental professionals practicing in both the public and private sectors in Rwanda. Doctors are required to renew licenses annually after completing a minimum of 50 continuing professional development credits. The National Council of Nurses and Midwives registers and licenses nurses and midwives in the public and private sectors. Licenses must be renewed every 3 years. According to their data, the number of general practitioners, physician specialists, and dentists receiving licenses has been increasing (see Table 6-3). The number of nurses and midwives receiving their licenses peaked in 2014 when the licensing system was newer. Another peak would have been expected in 2017 or 2018 as licenses issued in 2014 came up for renewal, but this was not observed in the data.

TABLE 6-3 Number of Practitioners Receiving Their Licenses

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Internal Medicine	61	70	83	102	106	120	117	103	93	95
Obstetrics and Gynecology	50	64	59	77	92	94	95	94	86	85
Neurology	4	3	3	4	5	5	4	5	4	3
Cardiology	6	7	6	7	6	6	8	8	9	8
Dentistry	—	—	—	21	28	50	48	48	38	47
Pediatrics	50	62	61	85	87	85	88	84	78	80
Surgery	27	38	44	60	60	65	59	57	57	47
Anesthesiology	23	27	28	33	32	33	28	29	26	26
Psychiatry	11	12	14	13	11	15	10	9	10	12
Emergency Medicine	1	2	3	3	11	11	11	8	9	6
General Practitioners	413	448	487	606	612	726	822	864	893	850
Nurses					2,988	5,027	2,298	2,954	1,369	1,116
Midwives					504	686	293	245	51	117

NOTES: 850 general practitioners received their licenses in 2018, while only 783 were in public practice, according to the Master Facility List. Physicians in private practice and those renewing their licenses but not practicing account for the difference. Per the Master Facility List, only 51 percent of all facilities in Rwanda are in the public sector, meaning a large portion of providers work in private, nongovernmental (NGO), and faith-based facilities.
SOURCE: Licensure data provided by the Rwanda Medical and Dental Council and National Council of Nurses and Midwives.

Across all cohorts, 58 students graduated from the Master of Hospital and Healthcare Administration (MHA) program; another 3 received postgraduate certificates, and 5 were expected to graduate in 2019.

Interview respondents across all stakeholder types agreed that more physician specialists were trained and more nurses with advanced skills were produced under the HRH Program. One MOH representative who received her medical training before the program began expressed appreciation for the improved skills HRH trainees gained under the program:

> *The HRH Program was amazing—helped cover the gaps in-country, including specializations such as pediatrics and internal medicine. There is a difference in the quality of training and doctors from before the HRH Program…. We had high level, skilled teachers from top tier U.S. institutions. When I was training, we didn't learn how to treat HIV or co-infections, so that is a big difference the HRH Program has made. We don't have to retrain the graduates coming out now; they are integrated into the system, and their education is providing them the required skills. They are very well equipped. (87, Government of Rwanda HRH Program Administrator)*

Respondents also credited the establishment of postgraduate specialty training programs in medicine and nursing under the HRH Program with producing more health workers with specialized skills. However, there were conflicting opinions on the distribution of these new specialists in medicine and nursing. One respondent from an international NGO commented that during a recent visit to a district hospital, he had observed that there were now 15 doctors, including physician specialists in obstetrics and gynecology and pediatrics, which was an increase from when his organization started working with the hospital (04, Other Donor Representative). Such increases were seen as strengthening the district hospital level and reducing the burden on referral hospitals (05, international NGO representative). However, one international NGO respondent observed that despite the increase in the number of doctors, there was variation by specialty and uneven geographic distribution:

> *This last graduation round, I think for the first time I saw internal medicine graduates pumping up more rural district hospitals. Pediatricians have spread out a little bit more. I think the bigger residency programs have spread around a little bit further. I haven't seen any of the other specialties. So, most district hospitals don't have a pediatrician and … it's a part-time job and not a full-time placement. I don't think I have seen any advanced practice nurses spread out to the district level yet. (12, International NGO Representative)*

Data from the Master Facility List showed that in 2018, 447 of the 567 physician specialists worked in four districts—Gasabo, Huye, Kicukiro, and Nyarugenge—while six districts had no specialists and another five districts had only one each.

Evidence from qualitative data collection supports the claim that the HRH Program produced more health care workers and academics with specialized skills who are feeding back into the health system. For example, of 25 HRH trainees interviewed for this evaluation, 9 went on to work in district hospitals, 9 went to work in teaching hospitals, 4 became University of Rwanda faculty, 1 continued studies in Rwanda, and only 1 left to pursue other studies in the United States (see Figure 6-4).

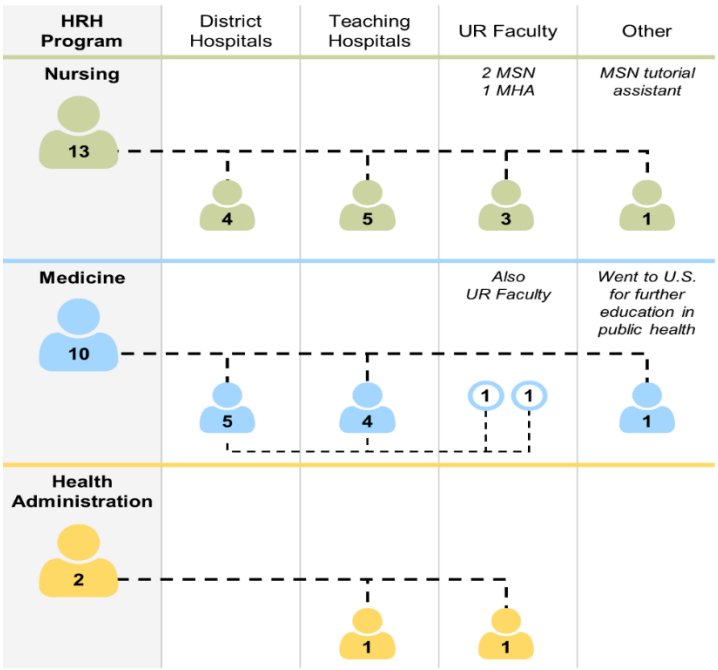


FIGURE 6-4 Career trajectory of interviewed HRH Program graduates following graduation.
NOTE: UR = University of Rwanda.

There is also clear evidence of upgrading of nurses in the interview respondent sample. Before the HRH Program, four were working as faculty in district nursing schools, four were working as A1 nurses, and four were working as A2 nurses. All 13 nurses improved their skills by one level through their courses under the HRH Program and have returned to or continued working in the health system, with four working in district hospitals, five working in teaching hospitals, three serving as faculty at the University of Rwanda, and one working as an MSN tutorial assistant while she finishes her degree (see Figure 6-5).

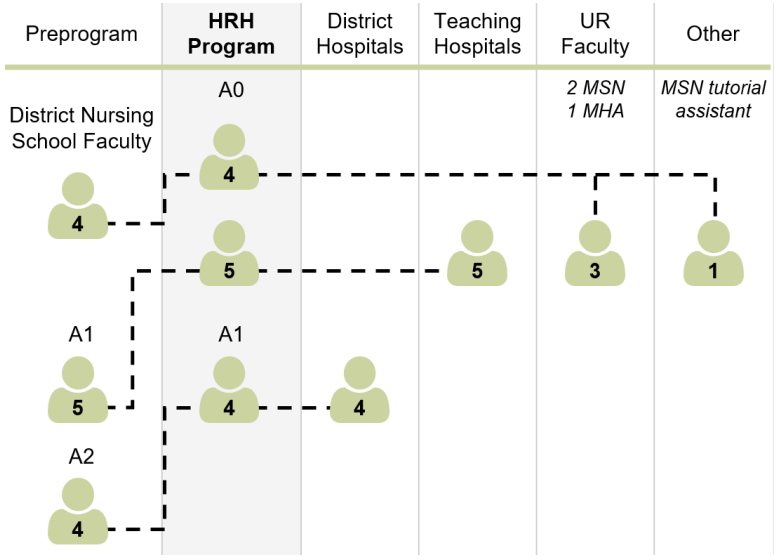


FIGURE 6-5 Career trajectory of interviewed HRH Program trained nursing respondents.
NOTE: UR = University of Rwanda.

Of 567 physician specialists in Rwanda in 2018, 222 (39 percent) worked at the national referral and teaching hospitals, 221 (39 percent) at private facilities, 46 (8 percent) at the intermediate level, and 78 (14 percent) at the peripheral level (MOH, 2018b). The distribution of general practitioners is different, with the majority (53 percent) stationed at the peripheral level and only 11 percent at the national referral and teaching hospitals (see Table 6-4).

TABLE 6-4 Distribution of All Physician Specialists and General Practitioners by Health Facility Level

Level	General Practitioners	Physician Specialists
National Referral and Teaching Hospitals	85 (10.9%)	222 (39.2%)
Intermediary Level	64 (8.2%)	46 (8.1%)
Peripheral Level	417 (53.3%)	78 (13.8%)
Private Facilities	217 (27.7%)	221 (38.9%)
Total	783	567

SOURCE: MOH, 2018b.

RECRUITMENT AND RETENTION OF HEALTH WORKERS

Retention of adequately trained graduates is among the ubiquitous challenges facing the region and is key to addressing an imbalanced health workforce (WHO, 2013). While sub-Saharan African medical schools have expanded student enrollment, "faculty-related issues were most commonly identified as key to improving the quality of graduates" (Mullan et al., 2011). In a survey of 146 medical schools, 26 percent of domestic graduates were reported to have migrated from their respective home countries within 5 years after graduation, with "80 percent of that emigration being to countries outside of Africa" (Chen et al., 2012). Even so, the "assessment of retention strategies has been challenging because of the poor ability by most health systems to track medical school graduates" (Mullan et al., 2011).

The 2011 Human Resources for Health Strategic Plan set a goal to increase the number of skilled, motivated, and equitably distributed health care workers in Rwanda (MOH, 2011a). However, challenges persist in meeting this goal, including high health worker turnover rates that result in needing staff to provide training for many new health care providers (MOH, 2013a), low salaries, and lack of career growth and opportunities for further training that cause attrition; and a move from public to private service (MOH, 2011a). Other difficulties encountered with the health workforce include poor social and economic incentives to work in health care, lack of management tools, plus a weak human resources information system (MOH, 2009a). High turnover of trained service providers is a major hurdle in maintaining sufficient levels of qualified staff (MOH, 2012b). As seen in other countries, an exodus of health care workers from Rwanda after receiving training also needs to be addressed (Alleyne, 2015), though given the timing of this evaluation, it was not possible to assess whether the newly trained nurses, midwives, and medical specialists were retained in Rwanda. Several of these factors are discussed in more detail in the sections that follow.

Distribution of the Health Workforce

Rwanda's health worker shortage poses a major bottleneck for the population (of whom 10 million are rural) seeking health services. However, the challenges are more complex than volume alone. The health sector is suffering from geographic imbalances in the distribution of qualified health workers who favor urban areas, preference of workers for the private sector, and low levels of motivation and performance in the public sector (Lievens et al., 2010). Additionally, a lack of relevant data on health worker migration in Rwanda means neither the causes nor the effects of health worker migration are well established (Asongu, 2014; Scheffler et al., 2016). There is some information about the geographic distribution that suggests health workers' preferences to avoid rural areas. In 2006, only 17 percent of public sector health workers took a job in a rural area (Serneels and Lievens, 2008).

One study used valuation questions to assess the willingness of the incoming health workforce (students) to work in rural areas and found substantial heterogeneity. Individuals had lower rural wage preference for those who had a high intrinsic motivation to help the poor, had a rural background, or participated in an Adventist local bonding scheme (Serneels et al., 2010). Conversely, students had more reservations about wages if they were from a more prosperous background and could afford to be selective about their work location (Serneels et al., 2010). Additionally, Lievens et al. (2010) found that medical students were generally less inclined to work in rural posts than nursing students, but they were all inclined to work in these rural posts early in their careers. In an earlier study, location decisions were not only influenced by salaries but also by benefits (e.g., house and access to health care), job attributes (e.g., access to training, promotion opportunities), access to infrastructure (e.g., electricity, water, quality housing, roads, and transport), and location-specific factors such as access to schools for children (Serneels and Lievens, 2008). One doctor working in a rural district in Rwanda noted a lack of career development in rural areas (Serneels and Lievens, 2008).

There is also migration in the Rwandan health workforce between the public and private sectors. The public sector is the biggest employer in the health sector in Rwanda, but it is not necessarily preferred by the health workforce. Lievens et al. (2010) found that 40 percent of nursing students preferred to work in the public sector and 31 percent for an NGO, whereas 48 percent of medical students preferred to work for an NGO than in the public sector (31 percent) in the long term. Career growth, opportunities for further training, and salary levels are key factors contributing to HRH attrition from the public to the private sector (MOH, 2011a). A study of comparative salaries in public and private sectors issued by the Ministry of Public Service and Labour in 2007 (amended in 2008) captures the historical reality of higher salaries in the private sector at all levels of the health workforce (MIFOTRA, 2007).

The guidelines for determining salaries in the public sector in Rwanda have evolved over time; starting in 2006 the shift has been toward a system in which salary amounts are attached to the requirements of a specific position (in terms of responsibility and decision making, knowledge and experience, skills, and working environment) rather than to the qualifications of the employee who occupies a position (MIFOTRA, 2012; Vujicic et al., 2009; World Bank, 2018). As a result, the job level for every position is established through objectively based job analysis, evaluation, and classification and everyone who holds an equivalent position should have the same base salary (Vujicic et al., 2009). The intended outcome of this standardization is to "reduce variability in wages among employees occupying posts of the same level" (Vujicic et al., 2009). In addition to a basic salary, monetary allowances exist that are "associated with the

normal duties, responsibilities and requirements of a job, transportation, housing and nonperformance bonuses or payments" (MIFOTRA, 2012). Of note, "in the health sector, allowances have been used historically to circumvent the base salaries in the civil service. In [this] sector, new housing allowances and loans that target doctors who fulfill a set of criteria have been introduced" (Vujicic et al., 2009).

Mobility and Migration in a Regional and Global Health Labor Market

As the nature of health-related issues in the region increasingly calls for cross-border coordination and partnerships, Africa has seen a growing trend toward regionalism in its health sector. The entire continent faces a shortage of health workers, gaps in service coverage, high rates of attrition, and migration of skilled personnel to more favorable work environments (USAID, 2014). Thus, in addition to the internal distribution of the workforce, another key issue contributing to the shortage of HRH in Rwanda is emigration. On a continent already dealing with a high burden of disease and low volume of health care personnel (Chen et al., 2012), as many as "47 [sub-Saharan African] countries have lost more than 60 percent of their doctor workforce to migration" (Greysen et al., 2011). More than 30 percent of locally trained doctors migrate in half of the countries in sub-Saharan Africa (Kasper and Bajunirwe, 2012).

Poppe and colleagues interviewed 27 health professionals (doctors, nurses, and medical assistants) who originated from a wide range of countries, four of whom were from Rwanda, and found three primary reasons for emigrating out of the country: for educational purposes, for political instability and insecurity, and for family reunification (Poppe et al., 2014). Scheffler and colleagues additionally describe congruent categories as motives to immigrate, noting financial motivations, professional development concerns, and personal and family reasons. African doctors migrating to higher-income countries cite that being surrounded by accomplished and motivated colleagues is an advantage that creates knowledge spillovers, increase in productivity, and greater job satisfaction (Scheffler et al., 2016). Other factors that incentivized migration is that they work with heavier and dangerous health care burdens as a result of working in very limited resource settings in comparison to their counterparts in high-income countries (Ghebreyesus, 2013).

Recognizing the challenge of migration, effective regional coordination in Africa—among economic communities, networks, associations, and technical organizations as well as donors, governments, and implementing partners—will enable African countries to maximize their collective effect in each country sustaining a strong national health workforce and accelerating progress toward improved health and economic outcomes (USAID, 2016). For example, Kenya has bilateral agreements with Rwanda, Namibia, and Lesotho for collaborative health workforce training and the promotion of circular migration of health workers (Taylor et al., 2011).

Health Worker Retention

A notable emphasis of the HRH Program was to address low recruitment for residencies by increasing students' exposure to certain specialties during undergraduate medical training and by providing mentorship. In a 2018 gender-based analysis of factors that affected selection of specialties, surgery was preferable for 46.9 percent of male medical students, and obstetrics and gynecology for 29.4 percent of females. Although female medical students were less likely than

their male counterparts to pursue surgery as their first option, females were more likely to join surgery, based on perceived research opportunities, and males were more likely to drop the selection of surgery as a specialty when an adverse interaction with a resident was encountered. Medical students were more likely to consider surgical careers when exposed to positive clerkship experiences that provide intellectual challenges, as well as focused mentorship that facilitates effective research opportunities (Kansayisa et al., 2018). Factors influencing the lack of selection for the anesthesia program included long work hours and high stress level, insufficient mentorship, and low job opportunity (Chan et al., 2016).

The requirement to serve in a district hospital for 2 years was recognized as a deterrent to postgraduate recruitment, particularly for women; the MOH proposed waiving that requirement for female physicians as an incentive, among other strategies that aimed to make medical training more compatible with Rwandan cultural practices (MOH, 2011b). However, the MOH did require a "bonding period" for all new graduates under the HRH Program: In return for tuition coverage, graduates were expected to remain in Rwanda and commit to working in the public sector for 4 to 5 years (Cancedda et al., 2018). According to the University of Rwanda, the MOH provided different levels of tuition support to students through the HRH Program: between 34 and 48 percent of tuition for medical students (undergraduate and postgraduate); 100 percent tuition for MHA students from 2013 to 2017; 0 percent tuition for MHA students from 2018 to 2019; and 100 percent tuition for nursing students from 2016 to 2019.

Government of Rwanda policies were seen as the key mechanisms for retaining HRH Program trainees. Respondents' most frequently cited policy was the government's bonding period. The consequences for not fulfilling the bonding period were unclear, although one government document states that "failure to remain in the service would result in … refunding all or a portion of the training cost to the Government" (MIFOTRA, 2012). The Wage Bill states, "it is unclear what sanctions are for defaulters, or if any have been implemented" (World Bank, 2008). Health workers who pursued education outside of the country were also committed to a bonding period, although the requirement was 3 years, upon their return to Rwanda.

HRH trainees did see the bonding period as positively affecting the retention of graduates:

> *In our class, for example, we were 14. All of us are still working in public institutions, because in our contract we sign at the end of training…. No one is working in a private clinic. We are all in public institutions where the Ministry of Health has placed us. (86, University of Rwanda Faculty and Former Student in Pediatrics)*

However, respondents also reported that long-term retention of HRH trainees was impossible to predict, owing to the early timing of this evaluation relative to HRH trainee bonding periods:

> *I don't know much about the longer-term retention that it will have on the public health system…. There aren't a ton who have truly finished their payback time. They are increasing the pool. I think the retention will be a longer-term question. (12, International NGO Representative)*

Some respondents made the link to broader HIV-prevention goals, even in the discussion of retaining health workers in the Rwandan public health system as an HRH Program goal. As one respondent representing a professional association stated,

> *[I]f you are an HIV-trained person [and] you leave Rwanda to go working in Tanzania, Burundi, or Kenya, you are still taking care of HIV patients, you are dropping down the risk of transmission … which is the goal of [PEPFAR] funding anyway. (35, University of Rwanda Non-Twinned Faculty and Professional Association Representative in Internal Medicine)*

Program administration respondents viewed the MOH as providing a work environment that would increase health workers' job satisfaction and thus improve retention. This environment included regularly paid and acceptable salaries,[3] opportunities for career progression, and equipment necessary to provide health care services, which had an interactive effect with increased health worker skills produced through the HRH Program:

> *There are two parts of retention, one is to increase the salary. I have heard there was some salary increase. The second part of it was with buying equipment, so there is this job satisfaction. You have better trained nurses, you have better equipment, so now you are doing your job [with] satisfaction. (45, Government of Rwanda HRH Program Administrator)*

> *There is that … career progression structure which is now implemented to assess movements upwards of different doctors [and] strong professional bodies that keep developing capacity and meet the requirements to move upwards. (43, Government of Rwanda HRH Program Administrator)*

In contrast, representatives from professional associations expressed that weak infrastructure, including equipment, posed a challenge to health worker retention, particularly at lower-level facilities:

> *[I]n a district hospital … it is regular to not have what you need, it is chronic and it is very frustrating and you don't want to stay there and you go wherever because it is a huge frustration. (10, Professional Association Representative in Obstetrics and Gynecology).*

Similarly, U.S. institution (USI) faculty felt that the low salaries, as compared to private or NGO positions, pulled health workers out of the public system:

> *[T]hey have departed for NGOs within Africa in conflict or humanitarian zones. They get paid $5,000 a month rather than $1,000 a month. (83, USI Twinned Faculty in Surgery)*

[3] Salaries were set via job classifications, which fell under the purview of the Ministry of Public Service and Labour. At the time of data collection, it was reported that job classifications should have been reviewed in 2017. Salaries are determined based on the position, rather than on "the diploma carried by the person who occupies a position" (Vujicic et al., 2009).

Respondents also noted that some MOH policies and practices impaired retention. Notably, blanket retention policies were seen as a hindrance, regardless of urban or rural location of the job posting, in line with the literature:

> *The same staff retention policy that we apply in Kigali would be completely different from health facilities very far away, where you find social services are very limited, the milieu of work is really inappropriate. But in design, you didn't find specific activities that are specific to areas, then you end up benefitting some areas but not others. (04, Other Donor Representative)*

Respondents described the MOH practice of moving health workers from one facility to the next as "disruptive" (05, International NGO Representative), especially for staff with families; the practice also prompted health workers to seek opportunities outside the public health system.

UPGRADING AND PROCURING EQUIPMENT

Across the region, issues of infrastructure permeate health professional education. A literature review of medical education in sub-Saharan Africa cited infrastructure as a common challenge because of the "inadequacy of overall funding to maintain or update facilities as well as the insufficiency of staff resources for teaching and administration" (Greysen et al., 2011). Additionally, "the quantity and quality of a number of resources—student and teaching resources, technology, and clinical teaching sites—were perceived by respondents on average to be below adequate" (Chen et al., 2012). Chen and colleagues (2012) also write:

> Medical schools report inadequacies in a number of key physical resource areas, including skills and research labs, journals, student residences, and computers.… The most significant reported barriers to improving quality and increasing graduate numbers are insufficient physical infrastructure (labs, computers, teaching resources, and libraries) and faculty shortages.

In fact, physical infrastructure was included as one of the "greatest needs for medical schools" (Chen et al., 2012).

Enhancing education-related infrastructure and equipment in health facilities and educational sites was a critical challenge to address within the HRH Program to facilitate improved health professional education and its sustainability (MOH, 2014b). With a total budget of $151.8 million for the 8-year project period, $29.8 million was projected for infrastructure and equipment upgrades under the line item "Rwandan Schools" (MOH, 2011b). Of that projected budget, $1.5 million was allocated for equipment maintenance. The 2014 monitoring and evaluation (M&E) plan cited two key output indicators for semiannual monitoring: (1) number of newly procured equipment and installed at site level, and (2) number of staff trained on equipment maintenance (MOH, 2014b).

According to MOH records, President's Emergency Plan for AIDS Relief (PEPFAR)-supported HRH Program expenditures totaled $59.1 million, including $17.9 million on health professional education-related equipment procurement, almost $2 million more than the $16.1 million budgeted for equipment. Equipment procured with PEPFAR funds included a range of

items: teaching and reference books, thermometers and stethoscopes, teaching simulators, and larger equipment for clinical services, such as echocardiograph machines and portable blood testing machines. Equipment primarily went to facilities in 24 of Rwanda's 30 districts (see Figure 6-6), with the largest portion going to Nyarugenge District (see Table 6-5), specifically to CHUK, the country's largest teaching hospital (see Table 6-6). Huye District and CHUB, another large teaching hospital and the previous site of Rwanda's medical school, received the second largest amounts of equipment.

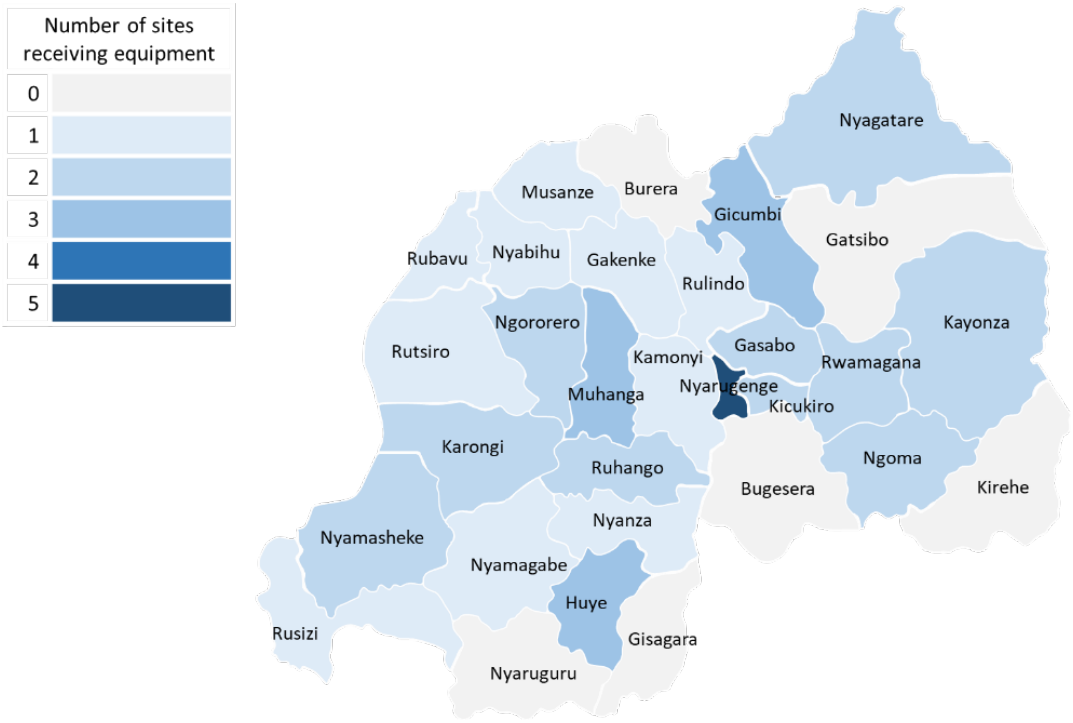


FIGURE 6-6 Distribution of sites receiving health professional education equipment through PEPFAR support under the HRH Program by district.

TABLE 6-5 Equipment by District Procured with PEPFAR Support Under the HRH Program, 2013 to 2017

District	Number of Sites Receiving Equipment	Number of Pieces of Equipment*	Value of Equipment (U.S. Dollars)**	Percentage of Total Equipment Value
Nyarugenge	5	1,797	$4,436,711	27.6
Huye	3	1,031	$3,366,489	20.9
Kicukiro	2	299	$1,313,672	8.2
Ngoma	2	172	$1,215,297	7.6
Karongi	2	84	$959,520	6.0
Gasabo	2	376	$902,598	5.6
Rwamagana	2	120	$571,644	3.6
Nyamasheke	3	131	$365,803	2.3
Musanze	2	31	$302,082	1.9
Rutsiro	1	22	$281,986	1.8
Rusizi	1	17	$279,700	1.7
Nyabihu	1	15	$270,865	1.7
Nyanza	1	15	$232,281	1.4
Ruhango	2	79	$232,169	1.4
Kayonza	1	14	$227,894	1.4
Rubavu	3	203	$210,564	1.3
Muhanga	1	121	$156,895	1.0
Gakenke	2	9	$151,393	0.9
Rulindo	1	10	$143,965	0.9
Ngororero	2	8	$125,057	0.8
Nyagatare	1	15	$91,280	0.6
Kamonyi	2	89	$86,193	0.5
Gicumbi	1	21	$84,418	0.5
Gatsibo	1	1	$43,590	0.3
Bugesera	1	1	$16,169	0.1
Total	46	4,709	$16,083,568	100

* Includes items ranging in value from books and printed job aids to computerized tomography scanners.
** 13 (0.3 percent) of the pieces of equipment were missing a value in the database, including high-priced equipment such as backup generators.
SOURCE: HRH Program Equipment Master List provided by the MOH.

TABLE 6-6 Equipment by Site Procured with PEPFAR Support Under the HRH Program, 2013 to 2017

Site	Number of Pieces of Equipment*	Value of Equipment (U.S. Dollars)	Percentage of Total Equipment Value
CHUK	1,138	$4,020,767	25.0
CHUB	996	$3,127,022	19.4
RMH	242	$1,312,212	8.2
Kibungo	48	$1,197,401	7.4
Kibuye	81	$928,974	5.8
King Faisal Hospital	364	$802,954	5.0
Rwamagana	71	$539,005	3.4
All other sites (38)	1,769	$4,155,082	25.8
Total	4,709	$16,083,568	100

NOTE: CHUB = Centre Hospitalier Universitaire de Butare/University Teaching Hospital, Butare; Centre Hospitalier Universitaire de Kigali/CHUK = University Teaching Hospital, Kigali; RMH = Rwanda Military Hospital.
* Includes items ranging in value from books and printed job aids to computerized tomography scanners.
SOURCE: HRH Program Equipment Master List provided by the MOH.

One HRH Program administrator from the Government of Rwanda respondent described equipment as a component in the M&E plan; however, no such details were actually included. The financial sustainability of the HRH Program assumed 5 percent growth in the Government of Rwanda's budget and commitment to increased health-sector spending to meet Abuja Declaration targets estimated at $54.5 million, which would presumably include equipment maintenance costs (MOH, 2011b). Donor restrictions in what the HRH Program could fund were highlighted in the 2016 midterm review. Necessary infrastructure and medical equipment investments outlined in the funding proposal could not be funded, affecting planned hospital upgrades and development of new training programs such as dentistry[4] (MOH, 2016). Challenges with procurement processes were also cited by respondents. The midterm review recommended improvements in infrastructure and equipment deficiencies as well as procurement delays moving forward. Non-Rwandan respondents noted similar challenges within the context of this evaluation.

Rwandan respondents reported that equipment was procured under the HRH Program, while non-Rwandan respondents were largely skeptical about whether teaching sites actually received such equipment. Government of Rwanda HRH Program administrators reported positive achievements in the increased procurement of equipment to fill gaps at the health facilities (e.g., ultrasound machines, autoclaves, anesthesia machines, pediatric monitors, radiotherapy and other heavy equipment, equipment to facilitate training at the simulation center, wireless Internet connections, computers, and other similar devices). One respondent from this stakeholder group stated:

> *The Program equipped the teaching site from the schools to the hospitals with innovative equipment. To equip them with wireless [equipment]… to upgrade*

[4] The development of the dentistry program at the University of Rwanda was not supported by PEPFAR's investments and therefore not included in this evaluation.

> *their online library, buying some mannequins for simulation constructing for simulation labs, and some heavy equipment. Even radiotherapy, they helped to buy a radiotherapy [device]. Even a cancer center, which is under building now. Not only that, for the nursing school which was upgraded, there was a simulation lab, a library with books, Internet connection, videoconference, even tablets for them to really access online courses. All these really have been achieved from the support of the HRH Program. (03, Government of Rwanda HRH Program Administrator)*

Procurement data provided by the MOH demonstrate that the equipment with the greatest value was for radiology, while the greatest number of pieces of equipment purchased went to internal medicine as well as critical care and surgery. More sites received equipment for obstetrics and gynecology than other specialties (see Table 6-7).

TABLE 6-7 Types of Equipment Procured with PEPFAR Support Under the HRH Program, 2013 to 2017

Type	Number of Sites Receiving Equipment	Number of Pieces of Equipment*	Value of Equipment (U.S. Dollars)	Percentage of Total Equipment Value
Radiology	15	32	$4,242,599	26.4
Internal Medicine and Critical Care**	32	1,404	$3,858,533	24.0
Surgery***	30	612	$3,755,514	23.4
Any or Unclear Purpose****	31	402	$1,245,445	7.7
Obstetrics and Gynecology	34	653	$1,001,418	6.2
Pediatrics*****	11	294	$481,128	3.0
Clinical Teaching******	12	151	$423,717	2.6
Patient Care	16	150	$366,217	2.3
Laboratory	6	19	$222,464	1.4
Nursing	12	88	$216,267	1.3
Book	12	627	$143,946	0.9
Teaching Facility	1	123	$71,720	0.4
Patient Room*******	10	154	$54,600	0.3
Total	44	4,709	$16,083,568	100

NOTES: Categorizing equipment by specialty is challenging as some equipment can be used for multiple purposes.
* Includes items ranging in value from books and printed job aids to computerized tomography scanners.
** Includes internal medicine; critical care; anesthesia; emergency medicine; trauma; cardiology; emergency medicine; gastroenterology; hematology; nephrology; ophthalmology; neurology; ear, nose, and throat; pulmonary; and surgery.
*** Includes surgery, plastics, obstetrics and gynecology, orthopedics, neurosurgery, and urology.
**** Includes items that can be used for multiple purposes such as thermometers and scales, and general purposes such as generators.

***** Includes items for pediatrics, pediatric critical care, pediatric anesthesia, and pediatric emergency medicine.
****** Includes clinical teaching for internal medicine, surgery, critical care, anesthesia, emergency medicine, urology, nursing, obstetrics and gynecology, pediatrics, and gastroenterology.
******* Includes wall clocks that may have been used for patient rooms or teaching facilities.
SOURCE: HRH Program Equipment Master List provided by the MOH.

Given that many of the resources went to purchasing equipment for tertiary care, it is understandable that the geographic distribution was weighted more toward urban locations, where tertiary care hospitals are located.

HRH trainees generally agreed that equipment had been procured, and reported improvements in infrastructure, such as access to research websites and educational materials; ultrasound machines; ear, nose, and throat materials; high-fidelity mannequins; new centers of excellence; and simulation labs. University of Rwanda administrators reported new e-learning programs, fiber-optic Internet, books, and subscriptions to journals. Nonetheless, HRH trainees reported that needs remained, and that some of the infrastructure the HRH Program had provided did not match their skill sets. An HRH Program administrator in the Government of Rwanda and a former HRH trainee further noted that training in equipment use and maintenance was lacking or a challenge. Almost all respondents reported that it was unclear which procurements were supported through the HRH Program or were unable to specifically link it to the Program.

Non-Rwandan respondents reported skepticism on equipment procurement, citing that requests were changed or not delivered and that projected funds for procurement did not fund what they were intended to, or reported defensiveness from MOH. One respondent supplemented procurement from Partners in Health funds. Specifically, for HIV, a donor agency respondent commented that her organization had procured equipment and other commodities for HIV service delivery. However, equipment was still viewed as missing or insufficient.

CONCLUSIONS

The HRH Program succeeded in increasing Rwanda's health workforce, with particular success in increasing the qualifications of nurses (both general and specialty) and increasing the number of physician specialists. The number of specialist physicians grew from 150 in 2011 to 567 in 2018, surpassing the HRH Program target of 551 (MOH, 2011b). It is important to note that the considerable gains in the number of specialists in Rwanda have not come at the expense of the number of general practitioners, which also increased. Although the targeted numbers of general practitioners and the targeted number of nurses and midwives were not reached, both have increased by 10 percent on a per-population basis since 2011. Also, while the absolute number of nurses fell short of the HRH Program target, the qualifications of nurses increased considerably, with 111 nurses graduating with specialty qualifications in the first cohort. According to the Master Facility List, there were 5,676 practicing A1 and A0 nurses in Rwanda in 2018 (MOH, 2018b). In 2011, there were 104 practicing nurses and midwives with bachelor's credentials and 797 with advanced diploma credentials according to the HRH Program midterm review (MOH, 2016).

More health workers, physician specialists, nurses, and midwives were produced but there is still an unmet need. Rwanda continues to lag well behind the WHO recommended 44.5 physicians, nurses, and midwives per 10,000 population with only 10.5. The country's HSSP IV

targets call for increasing the health workforce to 15 doctors, nurses, and midwives per 10,000 population by 2024 (MOH, 2018a). This continued shortage poses a major bottleneck for the population of 10 million Rwandans seeking health services, with implications on their health outcomes.

Further, distribution of health workers throughout the country remains inequitable. The geographic imbalances in the distribution of qualified health workers is exacerbated by those who favor urban areas, preference of workers for the private sector, and low levels of motivation and performance in the public sector (Lievens et al., 2010). Although some physician specialists have begun working at the district hospital level, the vast majority are concentrated in four of Rwanda's 30 districts (Gasabo, Huye, Kicukiro, and Nyarugenge). Likewise, the numbers of general practitioners, nurses, and midwives vary considerably. Five districts exceed the HSSP IV target of one doctor per 7,000 population, while 18 districts have fewer than one doctor per 15,000 population (MOH, 2018a). Four districts exceed the HSSP IV target of one nurse per 800 population, while 10 districts have fewer than one nurse per 2,000 population.

Retention strategies for trainees once they were placed into practice were outside the scope of the HRH Program, with a reliance primarily on the bonding mechanism and limited approaches to bolster retention beyond that bonding period. Although graduates did work in the health system, in large part because of the government-established bonding scheme, the long-term effect on retention remains unclear, owing to the timing of this evaluation. Retention in both Rwanda and in underserved areas is important to address. The availability of supplies and equipment, especially in remote and rural areas, is key to retaining health workers and promoting productivity and performance. In Ghana, midwives cite having time off for training after 2 years of rural service, an acceptable work environment to include a reliable supply of medications, electricity and appropriate technology, and adequate housing (Ageyi-Baffour et al., 2013). In Nigeria, inadequate facilities and medication supplies, poor management of the public health sector, and primitive living conditions affect retention of rural health workers (Awofeso, 2010), with midwives citing poor job satisfaction, low salaries, and lack of career opportunities (Adegoke et al., 2015).

Multiple studies have found decreased risk of emigration of health workers from low- and middle-income countries with expanded in-country specialty training, opportunities for research, and partnerships with universities that can offer research and leadership training. In-country training of physician specialists has been shown to improve retention, with 87 percent to 97 percent of surgeons trained at the Ghana College of Physicians and Surgeons from 2003 to 2016 remaining in Ghana (Gyedu et al., 2019). In the 25 institutions that train surgeons in the 10 countries that are covered by the College of Surgeons of East, Central and Southern Africa (COSECSA), 85.1 percent of 1,038 graduates from 1974 to 2013 stayed in the country of training, 88.3 percent stayed in the COSECSA region, and 93.4 percent stayed in Africa (Hutch et al., 2017).

Despite the increase in health workers and the upgrading of skills, there was a tension between the perceived need for specialized care and advanced practice skills and the perceived need for more general practice and primary care. The Alma Ata Declaration of 1978, reiterated in 2018, identified primary health care as pivotal to attaining the goal of health for all. Although significant advances have been made in primary health care, including health benefits across the social gradient, many have drifted away in preference for specific vertical health care programs (WHO, 1978, 2008). The imbalance between primary and specialist care is further compounded

by universal health coverage (UHC) schemes that have minimized the financial burden for those seeking care, which prioritizes preventive or curative care (Rao and Pilot, 2014).

Rwanda's movement toward UHC is often cited as an example of success. Rwanda is continuing to make progress toward improved access to and use of health care through community-based health insurance and performance-based financing. Both options emphasize primary and preventive care, contributing to the envisioned Alma Ata Declaration with positive effects on the use of health care services such as curative care visits, institutional deliveries, antenatal care, or child health care (Collins et al., 2016; Rusa et al., 2009). The annual per capita use rate for community-based health insurance members surpassed the WHO recommended average of 1.0 visit, with 1.23 visits at the health center level and 0.18 at the district hospital level in 2012 and 2013. This has been a marked increase from 0.25 visits recorded in 1999 (Kalisa et al., 2016).

A specialty care model, when implemented successfully, can also expand access to care and care delivery through the implementation of management systems that emphasize standardization and continuous improvement, attracting and training of a specialized health workforce, access to equipment and low-cost technologies, and generation of patient volume (Bhandari et al., 2008). The growth of specialization in graduate medical education and physician practice, despite a specialty distribution that is imbalanced, has had an effect on the physician workforce composition, with a resulting shortage in general practitioners, all while aiming to address the shortage of and critical need for specialized physicians, illustrating the tensions and imbalances between primary and specialized care (Hoyler et al., 2014). Allowing nurses and midwives to practice to full scope can save lives and improve health outcomes, as has been noted for HIV and improved mother and baby outcomes (Colvin et al., 2010; Dohrn et al., 2009; Fairall et al., 2012; Iwu and Holzemer, 2014; Sanne et al., 2010; Lancet Series on Midwifery Executive Group, 2014). Rwanda's pursuit of specialized physician care and upgraded nursing practice in some ways combined elements of both schools of thought (vertical/specialty versus horizontal/primary). Whether the balance was right, and can be maintained, remains to be seen. The concurrent role of CHWs and their support by health professionals was unaddressed in the HRH Program.

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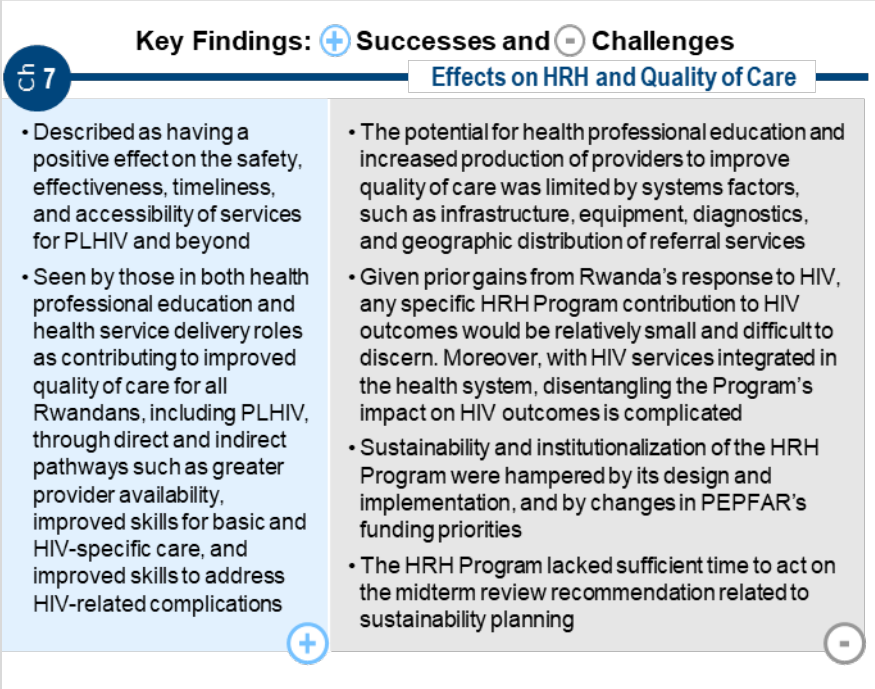
7

Effects on Human Resources for Health and Quality of Care



OVERALL EFFECT OF THE HUMAN RESOURCES FOR HEALTH PROGRAM

Rwanda made substantial progress to reach the Joint United Nations Programme on HIV/AIDS (UNAIDS) 90-90-90 targets prior to the Human Resources for Health (HRH) Program, which was facilitated by the Government of Rwanda's commitment to confronting its HIV epidemic. The development of national strategic plans on HIV/AIDS, the decentralization of the Rwandan health system, and the movement toward community-based health insurance and performance-based financing facilitated its achievements and remarkable progress toward expanding access to HIV services and achieving HIV epidemic control (MOH, 2009a,b, 2018). Rwanda had also made substantial progress in achieving Millennium Development Goal 5 (improve maternal health), with the maternal mortality ratio decreasing dramatically, from 1,160 deaths per 100,000 live births in 2000 to 373 in 2010, and to 275 in 2015 (WHO, 2017). There has been notable progress in all five provinces in Rwanda since 2005 with regard to births attended by a skilled health professional, from 31 percent in 2000 to 69 percent in 2010 (MDG Monitor, 2015). By 2015, 91 percent of deliveries were reportedly assisted by a skilled provider, most often by a nurse or medical student, followed by deliveries attended by a doctor, and then by a midwife (NISR et al., 2016).

In this respect, this context created an opportunity to make a broader impact in Rwanda's HIV program. The third Health Sector Strategic Plan (2012–2018) called for the integration of HIV services at a decentralized level, the need to improve quality, and the need to maintain

trained and adequate numbers of staff at all facilities (MOH, 2012). The result of decentralization has been a rapid increase in the number of facilities offering antiretroviral therapy (ART) services, from four facilities in 2002 to 552 in 2016, as reported in the Rwanda Integrated Health Management Information System. The increase in output and distribution of high-quality trained health professionals across Rwanda as a result of the HRH Program was seen by all respondent groups in this evaluation to have had a positive effect on the quality of care as an outcome of increased access, although that is not explicitly noted in the overall design of the Program.

THE HIV EPIDEMIC IN RWANDA

With the first National Strategic Plan on HIV/AIDS in 2009, the Government of Rwanda cemented its commitment to tackling HIV by calling for universal access to HIV treatment and establishing goals of reducing infections, morbidity, and mortality, as well as ensuring equal opportunities for people living with HIV (PLHIV) (MOH, 2009b). In addition, the plan stated that all PLHIV should receive prophylaxis for opportunistic infections. Even before the plan's release, in 2008, national policy had eased the cluster of differentiation 4 (CD4) count threshold for ART treatment to less than or equal to 350 cells/mm^3 from 200 cells/mm^3 (Nsanzimana et al., 2015). Further reductions in the CD4 count threshold for ART initiation were made in 2013. By 2014, Rwanda was fully implementing Option B+ in which HIV-positive pregnant women are enrolled on lifelong ART regardless of CD4 count. This expansion included anyone with tuberculosis co-infection, hepatitis B or C, and all children under 5 years old (MOH, 2013; Ross et al., 2019). On July 1, 2016, the Government of Rwanda rolled out the Treat All plan that required treatment of all HIV-positive patients regardless of CD4 count, age, comorbidities, or clinical staging (Nsanzimana et al., 2017; Ross et al., 2019).

As Figure 7-1 shows, HIV prevalence among adults age 15–49 in Rwanda, as reported by both the President's Emergency Plan for AIDS Relief (PEPFAR) and UNAIDS, has been steadily decreasing since its peak around 6 percent between 1994 and 1995, when sexual violence was used as a mechanism of terror and a means to spread HIV following the genocide against the Tutsi (Donovan, 2002; Nsanzimana et al., 2015).

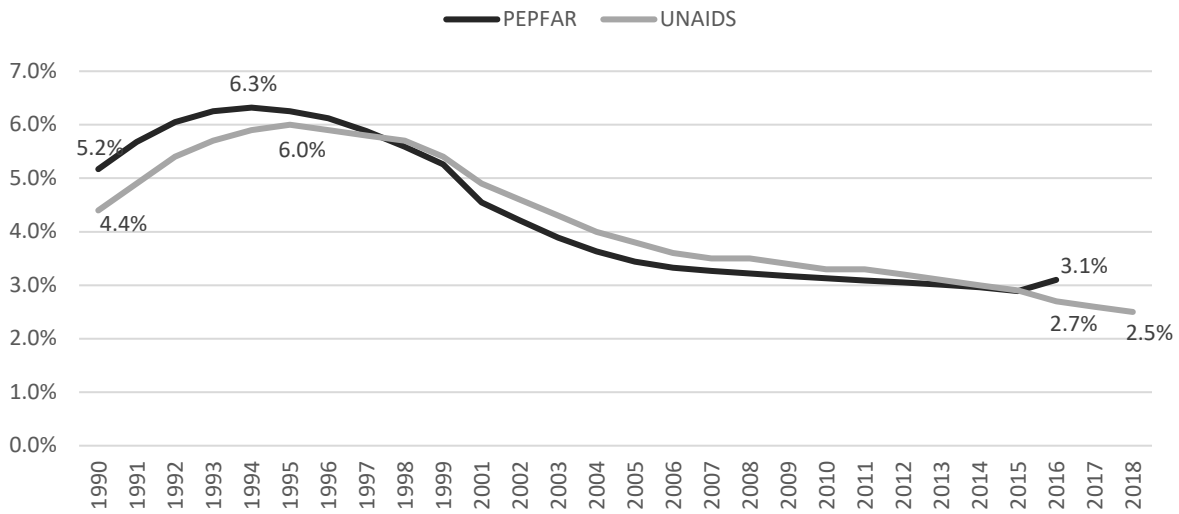


FIGURE 7-1 HIV prevalence among Rwandan adults aged 15–49.
SOURCES: PEPFAR, 2018; UNAIDS, 2018a,b.

The 2019 Rwanda Population-Based HIV Impact Assessment (RPHIA) estimated HIV prevalence among adults aged 15–49 as 2.6 percent and 3 percent among adults aged 15–64 years, totaling approximately 210,200 adults in Rwanda living with HIV (RPHIA, 2019). These are in line with the UNAIDS 2018 estimates of 2.5 percent of adults aged 15–49 living with HIV, totaling 210,000 people (UNAIDS, 2018b).

As discussed below, the RPHIA estimated that the annual incidence of HIV among adults was approximately 5,400 new cases per year, higher than the UNAIDS estimate of 3,600 total new infections per year and PEPFAR's estimate of 4,409, although the confidence intervals for both estimates overlap. The variation between the RPHIA and UNAIDS estimates likely point to methodological differences (PEPFAR Rwanda, 2019; RPHIA, 2019; UNAIDS, 2018b).

In the past decade, Rwanda has made steady improvements in increasing access to and coverage of ART (see Figure 7-2), although there is some discrepancy in the data. PEPFAR and UNAIDS reported ART coverage as 66 percent and 58 percent, respectively, in 2013, while elsewhere it was reportedly 92 percent in the same year (Binagwaho et al., 2016). Additionally, both PEPFAR and UNAIDS data present an approximately 8 percent differential, likely owing to methodological differences. PEPFAR collects programmatic data from select core indicators, whereas UNAIDS compiles estimated HIV data produced by host countries. The Ministry of Health (MOH) 2016 Annual Statistics Booklet indicated ART coverage was 83 percent in 2016 (MOH, 2016a). In 2014, mortality was estimated to be greatest among those who were untested (35.4 percent) and those on ART (34.1 percent)—reflective of the increased and aging population on ART—followed by patients lost to follow up (11.8 percent) (Bendavid et al., 2016). More information about care and treatment services for PLHIV is covered in the subsequent sections about the health system and human resources for health in Rwanda.

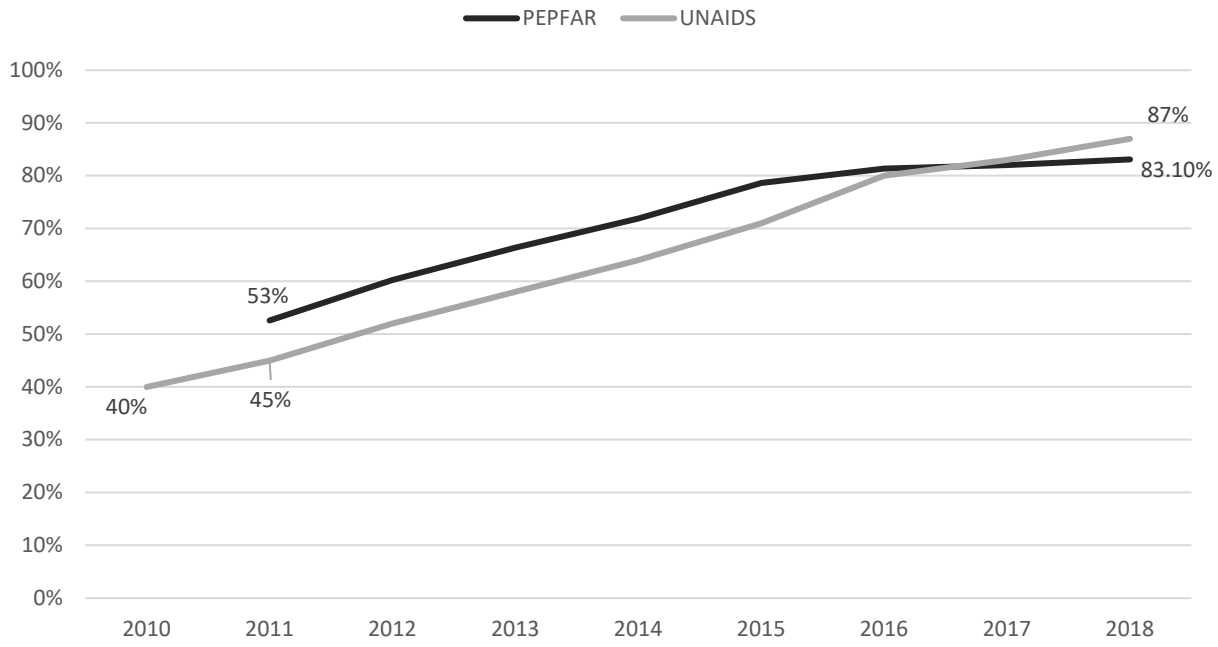


FIGURE 7-2 Antiretroviral therapy coverage, 2010 to 2017.
SOURCES: PEPFAR, 2018; UNAIDS, 2018a,b).

Effect on HIV/AIDS Outcomes

The RPHIA and UNAIDS both estimate that approximately 74 percent of PLHIV have achieved viral suppression (RPHIA, 2019; UNAIDS, 2018b); however, estimates of the three 90-90-90 elements are different (see Table 7-1). Results from the RPHIA show that 76 percent of HIV-positive adults (aged 15–64) and almost 80 percent of HIV-positive women have achieved viral load suppression, a key indicator of effective HIV treatment in a population (RPHIA, 2019). Overall, the RPHIA found that approximately 84 percent of adults living with HIV knew their status, 98 percent of adults who knew their status were on ART, and 90 percent of those on ART achieved viral suppression.

TABLE 7-1 Progress Toward 90-90-90 Treatment Cascade Targets in Rwanda

Indicator	2015	2016	2017	2018	2019
Percentage of PLHIV who know their status	88%	90%	92%	94%	83.8%
Percentage of people who know their status who are on ART	81%	88%	90%	93%	97.5%
Percentage of people on ART who achieve viral suppression	—	82%	83%	85%	90.1%
Percentage of all PLHIV who achieve viral load suppression	—	65%	69%	74%	76%

NOTES: ART = antiretroviral therapy; PLHIV = people living with HIV. Data for 2019 are taken from the RPHIA for adults aged 15–64 years.
SOURCES: RPHIA, 2019; UNAIDS, 2018b.

Effect on Quality of Care

Dimensions of Quality

The landmark 2001 *Crossing the Quality Chasm* report from the Institute of Medicine (IOM) presents six dimensions of high-quality health care (IOM, 2001) which were adapted in 2018 for application in global health (NASEM, 2018):

1. Safety: avoiding harm to patients from the care that is intended to help them;
2. Effectiveness: providing services based on scientific knowledge to all who could benefit and refraining from providing services to those not likely to benefit (that is, avoiding both overuse of inappropriate care and underuse of effective care).
3. Person-centeredness: providing care that is respectful of and responsive to individual preferences, needs, and values and ensuring that people's values guide all clinical decisions. Care transitions and coordination should not be centered on health care providers, but on recipients.
4. Accessibility, timeliness, and affordability: reducing unwanted waits and harmful delays for both those who receive and those who give care; reducing access barriers and financial risk for patients, families, and communities; and promoting care that is affordable for the system.

5. Efficiency: avoiding waste, including waste of equipment, supplies, ideas, and energy, and including waste resulting from poor management, fraud, corruption, and abusive practices; Existing resources should be leveraged to the greatest degree possible to finance services.
6. Equity: providing care that does not vary in quality because of personal characteristics such as gender, ethnicity, race, geographic location, and socioeconomic status.

Effect on HIV/AIDS Care

The design of the HRH Program emphasized developing a good quality health care system through an increased output and cadre of high-quality trained health professionals and would in turn increase the quality of care. As mentioned above, the increase in output and distribution across Rwanda was seen to have had a positive effect on the quality of care as an outcome of increased access, although that is not explicitly noted in the overall design of the program. HRH Program trainees gained skills and knowledge that were seen as having a positive effect on the quality of care for all Rwandans, including PLHIV. With highly trained health workers distributed across Rwanda, the management of patients with HIV was seen to be improving. Most notably, the HRH Program was credited with bringing specialties that PLHIV required for comprehensive care, including treatment for people with advanced HIV disease or in need of specialized care:

> *[I]n 2012,… we were at a certain stage in the way we treat HIV; we [had] started giving antiretrovirals around 2005 or 2006 … American had bigger experience because they started giving antiretrovirals in 1998, 1999, 2000. So, they were ahead of us in terms of … [how to manage the] complications of medication, the side effects…. So we benefitted directly from their [U.S. institution faculty's] presence…. HRH [also] brought specialists … which helped people to grasp … some of the areas they were not familiar, with most importantly the teaching…. [T]hey helped us to know what exactly is normal and what HIV does on systems and in that way we were capable of better understanding and better treating our patients. (35, University of Rwanda Faculty in Internal Medicine and Professional Association Representative)*

A respondent from a PLHIV group noted that specialized care was particularly relevant for HIV-positive pregnant women, as "residents' level has improved as they have been well taught to minimize [the] risks" of mother-to-child transmission (30, Former Government of Rwanda Program Administrator and PLHIV Representative). Exposure to U.S. institution (USI) faculty was also seen as contributing to reduced stigma and improved treatment of HIV-positive women presenting with cervical cancer:

> *Patients with HIV are much more likely to get cervical cancer and have much more aggressive forms of cervical cancer. I encountered a lot of HIV patients in our practice and a lot … we worked a lot to try to keep them from getting discriminated against … in treatment choices. (16, USI Faculty in Obstetrics and Gynecology)*

Another respondent commented that "as more internal medicine residents go out to districts, I think that will help with the management of more advanced opportunistic infections and some of those things" (12, International NGO Representative). Here, it is important to note that not enough time had lapsed between the graduation of internal medicine doctors under the HRH Program and this evaluation to assess this type of impact. However, it was also observed that some specialties required for providing comprehensive services to PLHIV (notably, nephrology) were absent from the HRH Program. As combination ART has led to substantial improvements in opportunistic-disease associated mortality among PLHIV, comorbid noncommunicable diseases have become increasingly common for HIV management, in part as a natural consequence of longevity, but compounded by dysmetabolism associated with antiretroviral drugs (Koethe, 2017). Thus, HIV care must also focus on prevention and management of these illnesses, and on the complexity that arises in caring for an aging PLHIV population with multimorbidity, polypharmacy, and frailty (Guaraldi and Palella, 2017).

For program administrators, the effects on HIV were observed through the increases in the quality of care and management at health facilities by HRH trainees, reinforcing the integrated HIV service delivery Rwanda had been working toward since 2009. This was facilitated by the existing structures of HIV service delivery, which included doctors and nurses at hospitals who functioned as infectious disease specialists (including for HIV and tuberculosis), and received ongoing training from the MOH outside of the HRH Program.

> *Because the HRH came in within the framework that already exist[ed] to already deal with HIV/AIDS … it eased the task since the framework was already there, and people had already started to get awareness on HIV. I think it has been a trampoline for the HRH, because it did not have to start afresh and build a structure. It came into a structure that already existed. (43, Government of Rwanda HRH Program Administrator)*

One program administrator from the MOH drew a direct link between the improvements in HIV-related indicators and the increase in clinicians' skills and knowledge as a result of the HRH Program:

> *[If I compare the HIV incidence] report from 2010 … to 2015, it's a decline of about of 15 percent of new infections, so incidence is reduced by half.…Second is the mortality [related to AIDS]… it was around 50 percent, and today the mortality has declined to around 5 percent. And this is the highest mortality declined around the world…. Third, it is the transmission of HIV from mother to child … reduced from 4 percent [in] 2012 to 1.5 percent today. (Actually by 2016 it was 1.8 percent.)… because of several factors…. It is important to show that this outcome, [these] good results, are attributed to HRH, this program…. And this is probably going to be kind of [a limitation], given the methods I have seen applied. But I'm sure the results are coming because people did something. It's humans who are driving the changes and doctors, nurses are those who are forefront of the management. The pills have improved, it is true, the infrastructure has also improved, but probably the expertise, this and the knowledge has its own*

important place in the results we are talking about. (01, Government of Rwanda HRH Program Administrator)

After declining from a high of more than 30,000 per year in the early 1990s, the number of new infections reported by PEPFAR leveled off to approximately 7,500 new infections per year in 2018 (see Figure 7-3). In 2019, this number was reported to be 4,409 in PEPFAR's Country Operational Plan 19 using the UNAIDS EPP Spectrum estimate (PEPFAR Rwanda, 2019). However, UNAIDS HIV incidence data suggests a gradual decline in the number of new HIV infections, reportedly estimated at 3,600 new infections per year in 2018.

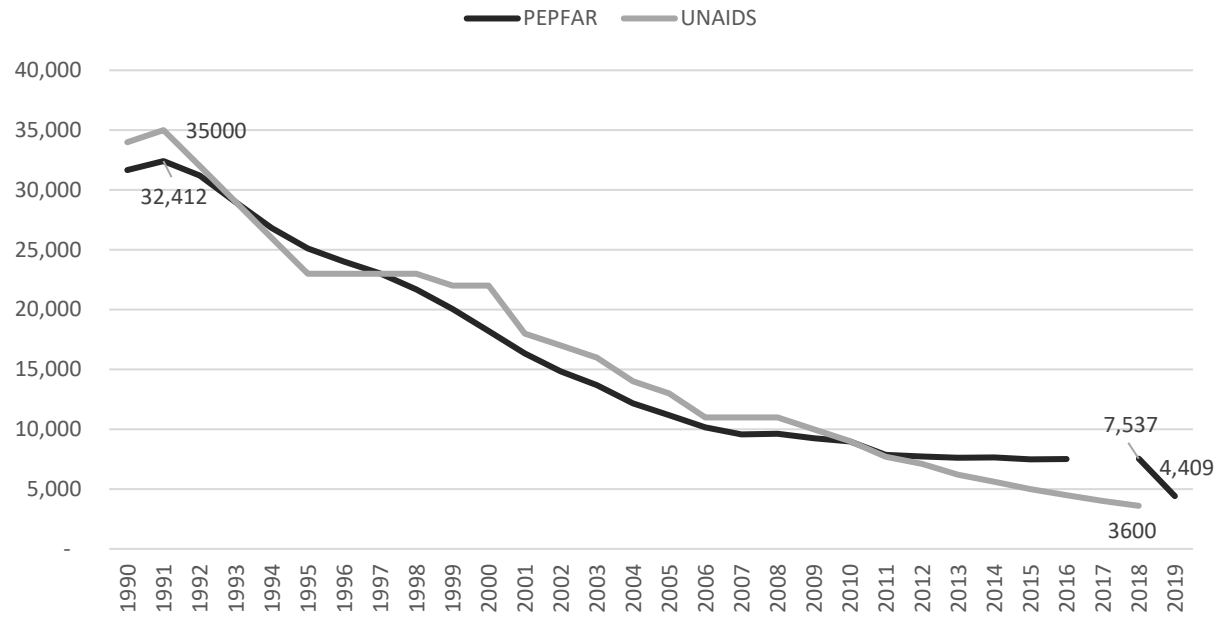


FIGURE 7-3 New HIV infections, 1990 to 2018.
SOURCE: PEPFAR, 2018; UNAIDS, 2018a,b).

Further, annual incidence reported by the RPHIA in 2019 was 0.08 percent, which corresponds to approximately 5,400 new cases (RPHIA, 2019). Although the incidence rate has continued to decline since 2008 and is reflective of a successful national HIV program, the discrepancies in these data are notable, with implications for assessing the nature of the HIV epidemic in Rwanda even with methodological differences. Other indicators, such as the prevention of mother-to-child transmission (PMTCT) coverage, estimated a decline in coverage from 113.1 percent in 2011 to 80.9 percent in 2016 for PEPFAR (see Table 7-2). UNAIDS estimates of PMTCT coverage have increased significantly, from 58 percent in 2010 to a leveling of around or above 95 percent. The estimated increases in coverage were seen throughout the years of the HRH Program implementation, although its estimations of coverage vary significantly in comparison to PEPFAR, likely pointing to methodological differences. This drop in coverage percentage occurred as the estimated need for PMTCT coverage rose from 9,416 pregnant women in 2011 to 11,000 in 2016, while the number of pregnant women who were provided ARVs dropped from 10,646 to 8,900 (see Figure 7-4).

TABLE 7-2 UNAIDS and PEPFAR Estimates of PMTCT Coverage in Rwanda, 2011 to 2016

	2010	2011	2012	2013	2014	2015	2016	2017	2018
UNAIDS	58%	91%	81%	86%	93%	> 95%	> 95%	94%	> 95%
PEPFAR	—	113%	100%	97%	96%	93%	81%		

SOURCES: PEPFAR, 2018; UNAIDS, 2018b.

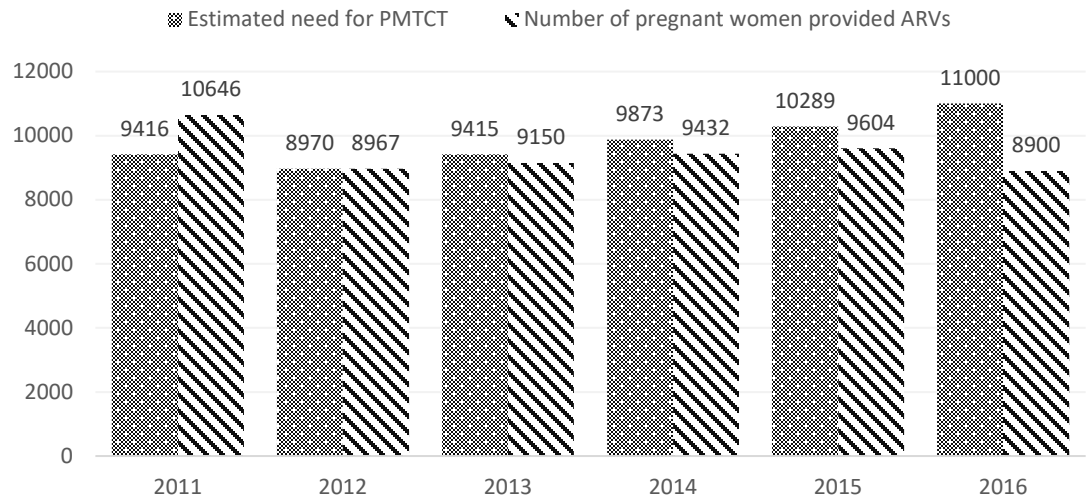


FIGURE 7-4 PMTCT need and PMTCT on ARV, 2011 to 2016.
NOTE: ARV = antiretroviral (drug); PMTCT = prevention of mother-to-child transmission.
SOURCE: PEPFAR, 2018.

Effect on Other Clinical Areas

The HRH Program was also seen as having a positive effect on other clinical areas. The production of obstetricians/gynecologists through the Program was viewed as contributing to Rwanda's 2015 achievement of Millennium Development Goal 5—to reduce the maternal mortality ratio by three quarters between 1990 and 2015—which decreased from 1,160 deaths per 100,000 live births in 2000 to 373 in 2010, and to 275 in 2015 (WHO, 2017). More broadly, improvements around hand hygiene and use of personal protective equipment were observed and contributed to improved patient outcomes.

Other aspects of quality care were seen to have improved. Many respondents noted patient flow as having been positively influenced by interactions between USI and Rwandan faculty and students. Improving clinicians' time management, triage practices, and scheduling rosters, and improved clinical guidelines (although the ever-changing HIV-related clinical guidelines was seen as challenging) were all seen as contributing to reduced patient waiting times and flow through the hospitals (30, Former Government of Rwanda HRH Program Administrator; 58 and 59, University of Rwanda Former Students in Nursing). This interaction also enhanced Rwandan faculty and student awareness and implementation of evidence-based medicine, which respondents saw as directly related to improved quality of care:

> *HRH changed the way the doctors look for evidence. Initially, we do routine things because someone told you, "We do this, you do that"; you do not know why and what is the basis to do this and not to do that. HRH were very specific to teach people before doing something, know why you are doing it, what else, how is it done elsewhere, what is the evidence, what to expect. (35, University of Rwanda Faculty in Internal Medicine and Professional Association Representative)*

Effect of Other Quality Improvement Activities

Quality improvement activities supported by concurrent projects and initiatives also contributed to improved quality of care. In Bushenge Hospital, for example, which was included in this evaluation's in-depth facility microsystem examination, a quality improvement project supported by a United States Agency for International Development implementing partner to reduce postsurgical infections was seen as improving care, although there was also an interactive effect with the HRH Program, as specialists produced by the Program and working in Bushenge Hospital "will make it easier for those hospitals to improve" (05, International NGO Representative).

Other activities that affected the health workforce and the provision of care include identifying gaps in service delivery, in-service training on HIV service delivery, continuing professional development and mentorship programs, external provision of ARVs, and results-based financing. A strong program of community-based HIV service delivery by community health workers was seen as having an effect on patient-level outcomes (Abbott et al., 2017). Similarly, the Centre Hospitalier Universitaire de Butare/University Teaching Hospital, Butare (CHUB), also included in the facility microsystem in-depth examination, received support from the U.S. Centers for Disease Control and Prevention (CDC) to provide comprehensive pediatric HIV services, which could have had a plausible impact on HIV outcomes.

Although these improvements in quality of care were observed in tertiary care facilities, CHUK (Centre Hospitalier Universitaire de Kigali/University Teaching Hospital, Kigali) or CHUB for example, it was recognized that most Rwandans did not seek services from these hospitals; rather, they accessed care in health centers and district hospitals, which were not as affected by the HRH Program:

> *I think the care available at places like CHUK, CHUB today is profoundly better than what it used to be and I think HRH does have a lot of inputs into that. Absolutely. The reality is that the vast majority of people in Rwanda do not seek care from CHUK or CHUB or these teaching institutes…. [T]he vast majority of HIV care is provided at the health centers by nurses. The next level is the district hospitals, and so I think you have to recognize the limitation of what an investment in the tip of the pyramid has on the entire base of the pyramid. (12, International NGO Representative)*

Related was the purchase and distribution of equipment for clinical teaching, which predominantly went to CHUK and, to a lesser extent, CHUB (see Chapter 6). This respondent, however, did not take into account the nurses whose skills were upgraded from A2 to A1 as a

result of the e-learning platform developed under the HRH Program,[1] or other efforts and investments made in upgrading nurses' skills. Although shifting HIV care tasks to nurses had occurred in 2009,

> *nurses were trained to [provide HIV services], but with not having enough capacity and enough background to address and tackle everything, but through this program, people were getting more knowledge on how to handle HIV conditions on clinical and psychological and economical aspects of the problem. (32, University of Rwanda Non-Twinned Faculty and Former Student in Obstetrics and Gynecology)*

Hospital-level leadership was also seen as influencing quality of care. Although management processes were well defined, quality improvement tended not to be institutionalized at the leadership level for ongoing improvement. Additionally, 2017 saw a significant "shake up of the system" in which hospital directors were moved or removed, causing "huge management instability" (12, International NGO Representative). Simultaneously, however, more team-based approaches to decision making were installed, in part owing to the HRH Program, which was seen as a forward step.

Other factors also affected health workers' ability to provide quality of care. At the facility level, the absence of infrastructure and equipment impaired their work. Conditions in rural and remote areas made them undesirable locales to work and live, impeding health worker retention and contributing to a situation in which there were insufficient human resources for health at the facility level, creating a more burdensome workload for health workers who stayed.

Linking Quality of Care to Patient Outcomes

Data from this evaluation suggest revisions to the theoretical causal pathway that guided the evaluation design, presented in Chapter 1, that more clearly link HRH Program activities and outputs to the domains of quality presented in Figure 7-5. Through building awareness and use of evidence-based medicine and quality improvement methodologies, the safety and effectiveness of clinical interventions were seen as improving. The HRH Program was seen as building a cadre of physician specialists, including in specialties for which there previously were no providers, thereby increasing access; however, the geographic distribution of some specialties was an ongoing barrier.

Beyond building clinical skills, the Program also was seen to have an effect on time management and patient flow, thereby improving the timeliness of services. Although this view was not widespread, one USI faculty member noted that there had been some improvements in treatment for and reduction in stigmatization of HIV-positive cervical cancer patients, which may point to small inroads in improving equity. Therefore, the committee has revised the causal pathway to highlight the role of improved quality of care as a longer-term outcome that is required to effectively impact health outcomes for all and HIV-related outcomes. Investments in human resources and other health systems strengthening blocks need to evolve over time as the context and needs of the population change; however, ongoing investments are required to continue to improve the health outcomes of Rwandans.

[1] A2 nurses have completed secondary school education, and A1 nurses receive a diploma after 3 years of training at a higher education institute (Uwizeye et al., 2018).

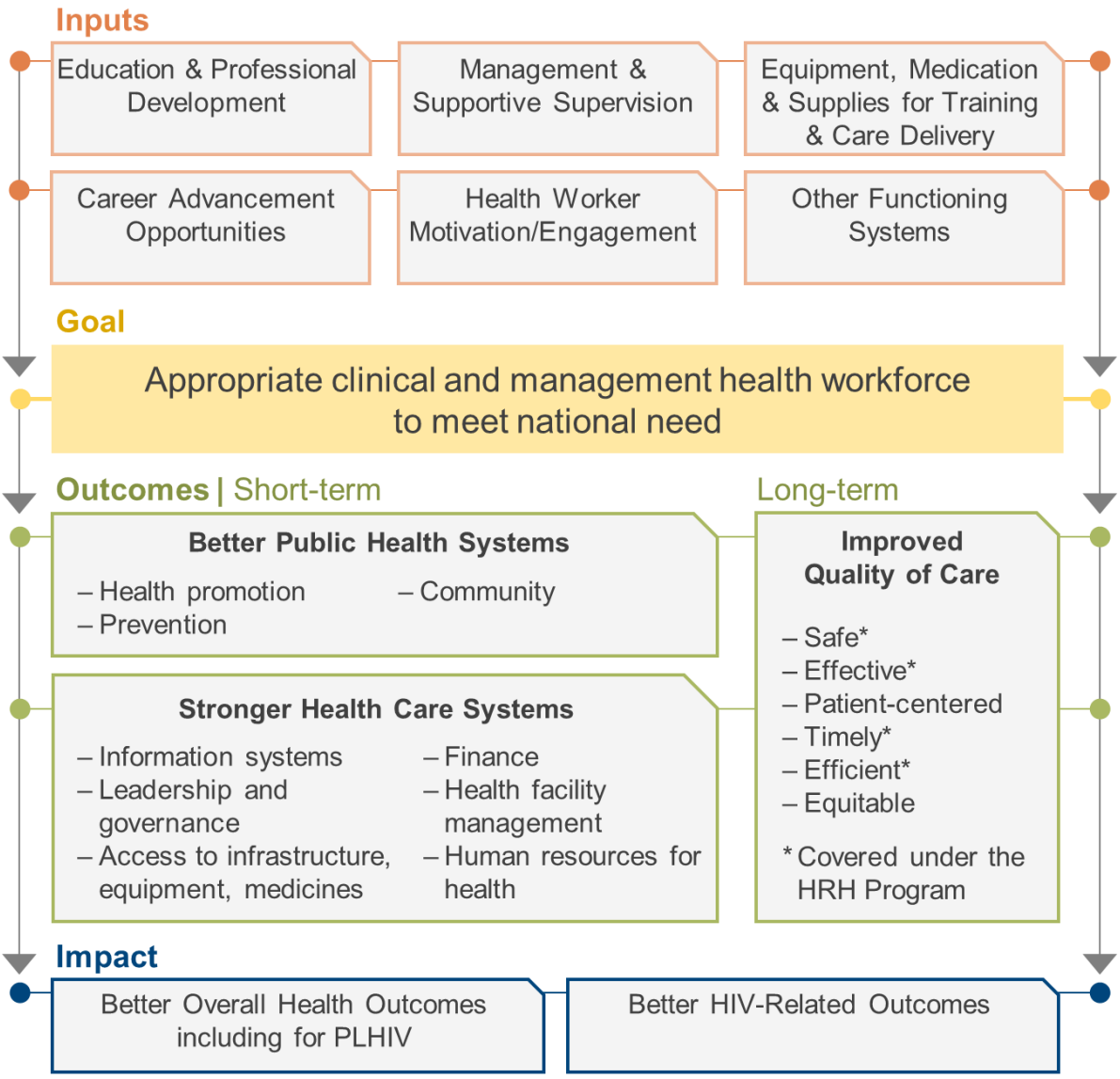


FIGURE 7-5 Data-driven causal pathway.
NOTE: HRH = human resources for health; PLHIV = people living with HIV.

Measuring Impact

The committee did not have sufficient data to provide a quantitative assessment of the HRH Program's impacts on health outcomes. That said, the design of the Program, in principle, would have allowed a quantitative assessment of changes in outcomes following implementation. The clear outset of the Program, its defined set of training activities, and the distribution of HRH trainees across Rwanda mean that a quantitative assessment of impact with reasonable potential for causal attribution could, in principle, be carried out as follows. The design would conceptualize Rwandan districts that received HRH trainees as independent units with their own trajectories of health outcomes such as HIV testing, treatment, and viral suppression rates. The

new infusion of HRH trainees would then be tested as an "intervention" that is applied to each district at a unique "dose" that is represented by the quantity and type of HRH trainees who enter each district, ideally characterizing dose in relation to population or disease burden. Designs such as regression discontinuity, interrupted time series, or difference-in-difference could then use district-level fixed effects to estimate the pooled effect of the Program on the outcomes of interest.

The information needed for such an analysis would allow the creation of panel data of districts, with two central pieces of data: (1) repeat observations over time (e.g., monthly or quarterly) of the health outcomes of interest, before and after the implementation of the HRH Program; and (2) detailed information on the trajectory of HRH trainees to districts, including the timing, type of health professional, and any ancillary information about the types and intensity of clinical services provided by the trainee. These two data elements could provide minimal but sufficient foundation for a quantitative assessment of impact. Unfortunately, neither of these key data elements were available to the committee. The committee felt that future HRH efforts could fill key knowledge gaps around their potential for impact on a range of individual and population health outcomes by conceptualizing, a priori, a rigorous evaluation design that fits with the planned HRH intervention. Such evaluations should be designed with input from implementers and stakeholders, but executed by independent teams who are separate from those implementing the program.

SUSTAINABILITY AND INSTITUTIONALIZATION

Continuing the HRH Program

Government of Rwanda program administrators shared that the HRH Program continued, following the end of PEPFAR investments, as there was an ongoing need to build specialists in medicine and nursing. Referring to the 2011–2019 period as phase one, one of these respondents declared, "the HRH Program will never end. That is our motto" (03, Government of Rwanda HRH Program Administrator). The HRH Program was seen as being "Rwandan owned, where Rwandans decide what they want to do and decide who they want to hire" (13, Government of Rwanda HRH Program Administrator). The end of PEPFAR funding was seen as causing "a kind of unbalance" in terms of sustainability, but the Program continued with government commitment and resources from the Global Fund to Fight AIDS, Tuberculosis, and Malaria (20, Government of Rwanda HRH Program Administrator).

There was a general interest in continuing the HRH Program and making "longer-term investments" to facilitate USI faculty members' staying for longer periods in the University of Rwanda to continually build capacity and "give the residents a lot more security and faith in the program when they don't just see people coming and going all the time" (16, USI Faculty in Obstetrics and Gynecology). There was a perceived need to continue building physician specialists and subspecialists and

> *through this project, establishing a further project on how to train subspecialists will be much easier…. I think we are now self-reliant, but we want to go much deeper so that we have specialists in the country who can manage everything. (32, University of Rwanda Faculty and Former Student in Obstetrics and Gynecology)*

University of Rwanda and USI respondents alike expressed confusion about the future of the HRH Program. University of Rwanda respondents were unclear as to whether additional USI faculty would be coming and were concerned about being able to continue their programs without the support:

> *We have been twinning until June, but we are promised to get other faculty to assist in August, next month, because we are still running the programs, and some of them have been getting the Ph.D. holders, but others are still missing some faculty with Ph.D. that may continue to run programs. We hope that in August we get other faculty to come and join. (67, University of Rwanda Faculty in Nursing and Midwifery and Former Student in Nursing)*

USIs had differing understandings, with one respondent reporting he had not heard from the MOH about continuing to support the surgery program and another who had only recently heard from the MOH that her institution would be issued a memorandum of understanding for another year to support the nursing program.

Additional partnerships with other USIs were reportedly being formed directly with the University of Rwanda, which was motivating to Rwandan faculty:

> *We are connected to the University of Utah in the U.S., which has a Ph.D. program in neonatal and they're coming soon … 3 faculty and 12 students, they're coming to join us for 2 weeks [of] training. And because we created those networks, [so] that you can have further qualification in our specialization of neonatology, I feel motivated and my eyes are open to keep moving. (47, University of Rwanda Faculty and Former Student in Nursing)*

Sustaining HRH Program Outputs

Investments in the University of Rwanda, both in faculty and in postgraduate training, were key to sustaining the HRH Program's gains. For Government of Rwanda program administration respondents, the fact that university departments were all headed by Rwandans was an indication that the Program had been institutionalized:

> *[T]he University of Rwanda itself and all departments, there is no department that is headed by foreigners or visiting faculty. All departments were headed by national faculty. (03, Government of Rwanda HRH Program Administrator)*

That the health workers trained under the HRH Program brought higher skill levels and qualifications to the health sector was viewed as another measure of sustainability. Similarly, the experience of being twinned with USI faculty was viewed as contributing to Rwandan faculty members' professional development and growth:

> *If I work with you, you will always be my role model. So, in a way, I will always know I have this and that, and that. That is the sustainability. (46, Professional Association Representative in Nursing and Midwifery)*

One respondent external to the HRH Program (12, International NGO Representative) expressed that some of the products of the Program, such as curricula and formal degree programs, could be sustained, but it was unclear whether there would be faculty to continue delivering these programs.

Sustaining the Institutional Capacity to Train Health Workers

As indicated in the design phase, the MOH did not engage the Ministry of Education in the design of the HRH Program; however, throughout implementation, the relationship between the two ministries grew. Building the capacity of new and existing faculty at the University of Rwanda was seen as contributing to the sustainability of the Program:

> *I think HRH has invested a lot in Ministry of Education. They have invested a lot in a future, or maybe current and future faculty. And that's sustainable. They always have teachers; they will always have people in the hospitals who are capable to train future health workers. (13, Government of Rwanda HRH Program Administrator)*

Another Government of Rwanda respondent expressed that having a university capable of producing more health workers was an unplanned benefit of the Program, making it "even more sustainable than what we believe" (18, Former Government of Rwanda HRH Program administrator). An HRH trainee who went on to work as a physician specialist at CHUB and joined the faculty at the university felt that the transition from USI faculty to Rwandan faculty was successful, facilitating the university's sustained capacity to educate future health workers:

> *I think this was just well done, because they had made this transition period. It was not an abrupt window, so, the 5 years was just over surveying everything but the last 2 years was just transition period where local faculty has to take everything, and we are just like us taking into the hands and share managing things and giving feedback under how things should be and this has helped local faculty to feel comfortable because there was period of time for them to be like supervisors, to see how they are handling things, so it was a smooth ending to things. (32, University of Rwanda Non-Twinned Faculty and Former Student in Obstetrics and Gynecology)*

USI faculty perspectives contrasted with this view. The notion that they trained Rwanda faculty "to become better teachers in a specific area … didn't work that way" (15, USI Twinned Faculty in the Master of Hospital and Healthcare Administration Program). Another USI faculty member who had four consecutive contracts with the MOH to provide teaching, twinning, and direct services for complex gynecology oncology cases in Kigali noted:

> *I've been here as a constant for 4 years, there's been a lot of services built up around my presence and it's just—I don't know what's going to happen to it. There's really been no kind of preparation for a very smooth transition. So, I worry about that. (16, USI Faculty in Obstetrics and Gynecology)*

For example, a sustainability plan in the gynecology/oncology program was developed, driven by USI faculty, but did not come to fruition, partly because of a lack of flexibility in the planning:

> *They sent out a couple of people to do maternal fetal medicine fellowships in England…. So, I sort of—one is sort of coming back and he'll be at RMH [Rwanda Military Hospital]. The other one, we thought was coming back would be at CHUK, but he extended a year probably to do research. Two more are going. For maternal fetal medicine, there is a plan in place. There was. There kind of always was. Once you sort of picked the two best ones from our initial trainees, and that was the plan…. When something gets thrown into the loop but doesn't happen—there's no budget for this stuff. (17, USI Faculty in Obstetrics and Gynecology)*

The midterm review also reported there were no formal planning exercises to facilitate the phasing out of USI faculty and ensure a permanent faculty pipeline for a sustainable health system as the HRH Program time lines evolved (MOH, 2016b). A general practitioner working at CHUB observed that

> *since [USI faculty's] departure, the main thing that is affecting us is the fact that we have junior specialists who have not yet acquired enough experience for them to train the generation behind them, we do not have people who are able to train those who would replace them. That is the main issue. (61, General Practitioner Not Trained in the HRH Program)*

Finally, building local ownership over the HRH Program as a means of continuing it after the end of PEPFAR or other external funding was viewed as being hampered by changes in MOH leadership and their accompanying management style:

> *I think when we started to work on HRH at the very beginning with Dr. Richard Sezibera, who was minister at the time, in a very collaborative way with different partners. I think we were trying to involve everyone. Then Dr. Binagwaho came in and a lot more hands-on in her approach. She is very smart and a remarkable person, but she … very direct and very top-down in her management style … a lot of Rwandan institutions or even partners in Rwanda couldn't say "no," or … have an open discussion about pros and cons, about things to consider, about anything really. And people, you know, heads of institutions or heads of departments in local institutions, in Rwandan institutions, they just went with it but they couldn't really say "no," and they didn't really foster a sense of ownership within institutions. They were just kind of took what they were told and went with it. But I know from my context with them, a lot of them were critical and never really accepted the HRH Program. (22, Non-Government of Rwanda HRH Program Administrator)*

CONCLUSIONS

Program Impact

Using the IOM dimensions of quality as a frame, the HRH Program investment had a qualitative impact on the safety, effectiveness, timeliness, and accessibility of services for PLHIV and beyond. A small amount of qualitative data indicates that there may have been some contributions to improving equity in care and reducing stigmatization for PLHIV. The HRH Program was seen by those in both health professional education and health service delivery roles as contributing to improving quality of care for all Rwandans, including PLHIV, through direct and indirect pathways (greater provider availability, basic skills, HIV care-specific skills, skills to address HIV-related complications).

The relationship between HRH training and patient-level outcomes is well documented in newborn survival, postpartum hemorrhage, surgical outcomes, and health care-associated infections (Aiken et al., 2003; Gomez et al., 2018; Grayson et al., 2018; Nelissen et al., 2017). For example, in critical care and emergency services, the presence of advanced practice nurses has been shown to have a positive effect on patient outcomes and may improve efficiencies (Woo et al., 2017). In HIV, there is less evidence linking the relationship between health professional education and PLHIV outcomes. However, there is evidence pointing to community health workers' role in the provision of HIV care and improved outcomes for PLHIV, including psychosocial support and viral load suppression, yet they were not a part of the HRH Program (Han et al., 2018; Kenya et al., 2013).

As noted in the revised causal pathway (see Figure 7-3), the potential for health professional education and increased production of providers to improve quality of care is limited by other systems factors that affect quality (such as overall health worker density, infrastructure and diagnostics, and geographic and transportation-related barriers) (Farahani et al., 2016; Lankowski et al., 2014; Mashamba-Thompson et al., 2017). For example, research from Tanzania found that at the facility level, increased loss to follow-up was associated with delays in testing and laboratory results, limited access to nutritional services, and poor patient flow (Rachlis et al., 2016).

Rwanda had made notable achievements in HIV service provision prior to the HRH Program. Successes included high rates of ART initiation, low loss to follow-up and mortality prior to initiation, and high retention rates (Teasdale et al., 2015). The implementation of the Treat All approach for HIV-infected children in 2012, in which all HIV-positive children under 5 years were initiated on combination ART, has positively affected pediatric outcomes in Rwanda, including growth, retention, and viral load suppression (Arpadi et al., 2019). The Treat All approach for all HIV-positive patients was implemented in 2016. Given these gains, the HRH Program's contribution to HIV outcomes was relatively small. Considering that HIV services were integrated in the health system, as per health-sector policies and plans, disentangling the Program's effect on HIV outcomes is further complicated.

Long-Term HRH Needs for PLHIV

The potential impact of the HRH Program on other health outcomes for PLHIV, including noncommunicable diseases, could not be determined by this evaluation. Although the Program invested in building a cadre of specialists, there did not appear to be an expansion of specialist cadres skilled to address the noncommunicable disease needs of PLHIV on long-term treatment, such as cardiologists or nephrologists. Evidence points to the need for future HRH planning to ensure the evolving health needs of an HIV population are met.

Recent population-based surveys from Tanzania and Uganda have shown that cardiovascular risk factors, including hypertension and other components of the metabolic syndrome, are at least as prevalent in HIV populations as in the general population (Gaziano et al., 2017; Kavishe et al., 2015). Benjamin and colleagues (2016) demonstrated a double burden in Malawi, with traditional risk factors contributing to higher stroke risk in older PLHIV, while HIV status conferred higher risk among younger persons, especially those initiating ART within the 6 months prior to stroke onset. This finding suggests that immune reconstitution after immunodeficiency may require different clinical management strategies than those associated with traditional vascular risk factors for stroke (Benjamin et al., 2017).

Furthermore, PLHIV are at increased risk of kidney disease. With the widespread use of ART, HIV-associated nephropathy has become less common, but the prevalence of other kidney diseases has increased and long-term exposure to ART has the potential to cause or exacerbate kidney injury (Swanepoel et al., 2018). Among adult PLHIV initiated on ART in Zambia, renal insufficiency, even when mild, has been associated with increased mortality risk (Mulenga et al., 2008). A number of subsequent studies have assessed the prevalence of renal dysfunction among PLHIV in Africa starting ART, most of which show improvement in renal function after ART initiation for those with baseline renal dysfunction, including those initiating tenofovir disoproxil fumarate (TDF), which has known nephrotoxicity and is a common component of first-line ART for many countries in the region (Chikwapulo et al., 2018; De Waal et al., 2017; Deckert et al., 2017; Mulenga et al., 2014). Yet, studies with 12–24 months' follow-up have shown small, but steady declines in estimated glomerular filtration rates for some patients exposed to TDF, particularly those with initial normal renal function (Chikwapulo et al., 2018; De Waal et al., 2017; Mulenga et al., 2014). As national ART guidelines across the region adapt to World Health Organization recommendations for earlier ART initiation, the increased duration of exposure to ART may shift the risk–benefit balance for kidney health (Swanepoel et al., 2018).

The resources and services needed for monitoring and managing renal and cardiovascular diseases among PLHIV in sub-Saharan Africa are, to date, insufficient. Preventative and treatment strategies for addressing these and other chronic diseases are needed, particularly among aging populations. The successful integration of HIV care in sub-Saharan Africa may offer critical insights into leveraging improvements in primary health care services, either through horizontal integration or within HIV health care delivery.

Sustainability and Institutionalization

Sustainability and institutionalization of the HRH Program were significantly hampered by the design and implementation, and PEPFAR's changes in funding priorities. There was general agreement among respondents that prolonged engagement of USI faculty in an intensive twinning program was not the desired outcome, but there was also recognition that there had been insufficient time to institutionalize the ability to continually update curricula and teaching methodologies in the University of Rwanda. The HRH Program's midterm review also pointed

to the need for improved sustainability planning, but PEPFAR's decision to end funding before the planned end of the Program limited the MOH's ability to act on this recommendation.

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8

Recommendations

This report spans from the Human Resources for Health (HRH) Program's vision of increased institutional capacity to produce highly qualified health workers, to this evaluation's specific charge to assess the Program's effects on outcomes for people living with HIV (PLHIV). It thus reflects a balancing act that is widespread in the global health landscape. Most countries have both broad health system needs, including health workforce needs, and deep unmet needs with respect to specific disease burdens.

In the context of President's Emergency Plan for AIDS Relief (PEPFAR) funding, this balancing act takes the form of decision making about how to meet HIV-specific needs, which is the core of its mission, in the context of health systems that lack sufficient capacity to meet either HIV-specific or broader population health needs. Over time and across different investments, PEPFAR has exhibited both relatively siloed (or "vertical") approaches, focused on HIV-specific efforts, which might have spillover effects on the health system as a whole, and broader (or "horizontal") approaches, focused on systems-based efforts that also meet the needs of PLHIV who are served within that system (PEPFAR, 2011a,b, 2014, 2019; Samb et al., 2009). The vision for the HRH Program framed its effect through the latter, horizontal perspective. The charge of this evaluation framed effect from a more vertical perspective.

OVERARCHING EVALUATION CONCLUSIONS

The HRH Program had many successes with respect to its goal to expand the quantity and quality of the health workforce in Rwanda, with particular examples in the value it added to the quality of health professional education and training for different cadres of health professionals, especially in nursing, and improvements in the overall preparation and motivation of new professionals entering the workforce. The Program was seen by those in both health professional education and health service delivery roles as contributing to improving the quality of care for all Rwandans, including PLHIV, through direct and indirect pathways. Some of these successes resulted from the original design, as intended, whereas others were more unexpected, resulting from adaptations that were made in response to operational realities or challenges encountered. Given the complexity of the health system and HRH within that system, these successes were accompanied by challenges that offer opportunities for learning.

There were mixed results with respect to the ambitious goals of the HRH Program to increase institutional capacity for health professional education, resulting from a truncated time frame, operational challenges in its implementation, and insufficient design and planning around the intended mechanisms of change and the complexity of structural changes needed to achieve improvements in health professional education.

With respect to outcomes for PLHIV, it was much more difficult to assess the Program's effects. There are indications that it contributed to improved quality of care, and the evaluation found no indications to suggest that the allocation of funds to this Program undermined Rwanda's continuing progress in the HIV response. However, the evaluation was constrained in

being able to fully assess the Program's contribution to impact on PLHIV-specific health outcomes.

The HRH Program represented what was, at the time, a relatively uncommon (although not unique) donor-funded approach to strengthening HRH capacity in low- and middle-income countries by focusing on a large investment, at a foundational level, for capacity building in institutions for health professional education. For PEPFAR, it also represented a departure from the usual operational model between funder and government. When seen in light of this committee's charge, the exceptional nature of the Program ended up being a missed opportunity to learn from what could have been a more intentionally designed approach that could have added new insights to the knowledge base not only for how to strengthen HRH capacity, but also, more broadly, for how to navigate the balancing act between disease-specific priorities and broader health system needs.

IMPLICATIONS FOR HIV AND HUMAN RESOURCES FOR HEALTH PROGRAMMING

Lessons learned from the experience of this Program point to broader implications for how to undertake this balancing act in future HRH programming. For HIV in particular, as Rwanda and other countries make laudable progress toward targets related to epidemic control and improved coverage of antiretroviral therapies, more PLHIV are living longer, with health needs that increasingly lie at the intersections of managing HIV and its complications over time, managing comorbid conditions, and attending to quality of life. Increasingly, supporting the needs of PLHIV and sustaining comprehensive control of the HIV epidemic rely on the foundation of a strong and comprehensive health system. It is therefore in the interests of PEPFAR and other disease-specific funders to contribute to HRH and other health systems efforts that, to be most effective, are not designed around a specific disease, but meanwhile need not interfere with progress related to that disease. Yet, it is also reasonable for funders to expect that those investments in broader efforts will have effects that contribute, albeit not exclusively, to disease-focused outcome goals. Programs or initiatives can be designed in ways that optimize and monitor that disease-specific effect, without interfering with the broader systems effects. Such investments have the greatest potential to yield sustainable results when aligned with long-term systems strengthening strategies and coordinated with concurrent investments from governments and other donors.

RECOMMENDATIONS

The committee was tasked with making recommendations "to inform future HRH investments that support PLHIV and to advance PEPFAR's mission." The committee's recommendations are therefore framed with the intention of helping to make the balancing act between disease specificity and systems strengthening more achievable, and more measurable, for future investments in HRH. The recommendations presented here posit that a future role for PEPFAR, or any other funder with a disease-specific mandate, would be to make investments in HRH that take a more explicit, intentional, and longer-term "diagonal" approach that focuses on finding the intersections between the vertical and the horizontal.

These recommendations provide a framework for how future efforts could build on the lessons learned from this Program, both reinforcing its successes and making accommodations to

address its challenges, with a design that more fully accounts for needs and feasibility at baseline and ensures more of the needed information will be available to learn about the effects on the system and the effects on the response to HIV. Although the primary audiences for this evaluation's findings and conclusions are PEPFAR and the government of Rwanda, the committee hopes that the conclusions and recommendations will inform other funders and other institutions contributing to strengthening the health workforce, such as medical and health professional training institutions, professional societies, patient advocacy groups, and other civil society organizations. Furthermore, the hope is that the lessons learned from this Program and the committee's recommendations might inform not only future efforts in Rwanda but also elsewhere in the region.

Recognizing the inherently complex interactions among many factors, stakeholders, institutions, and sectors when it comes to HRH, these recommendations emphasize the following aspects of an integrated approach to improving HRH through health professional education:

- Codesign among relevant stakeholders;
- A systems approach with adequate needs assessment and planning time;
- Operational planning that emphasizes adaptive management;
- Selection of a tailored set of components from models for improving health professional education;
- A prospective and multifaceted approach to monitoring, evaluation, and learning; and,
- In all of the above, an explicit connection from disease-specific elements to interrelated broader systems elements.

Program Codesign

To ensure a robust and feasible programmatic design, an effective approach is to employ a collaborative design process at the level of key decision makers representing funders and government leadership across relevant sectors, while including implementers and beneficiaries (in the case of health professional education, faculty, trainees, the public and private health systems that will employ program graduates, and ultimately, patients). When embarking on a health systems strengthening program, it is important to engage all relevant government entities beyond the Ministry of Health, including the Ministries of Finance, Labor and Civil Service, and other government bodies, to ensure the national budget and policies support the programmatic objectives. This inclusive, multilayered design process can ensure that the effort responds to the need, reflects contextual realities, and has the potential to be executed effectively.

Recommendation 1: Funders investing in strengthening human resources for health should support a codesign model through a process that engages representatives from diverse stakeholders as the designers,[1] including

[1] Later recommendations that actions be taken by "designers of programs to strengthen human resources for health" refer to this group of diverse stakeholders: funders (e.g., multilateral donors, bilateral external government donors, philanthropic donors, national governments, and private payors), program administrators (e.g., government leadership in relevant sectors and nongovernmental leadership), implementers (e.g., program managers and health

funders, program administrators, implementers, regulatory bodies, and those who will use or benefit from the funded activities.

The 2008 Accra Agenda for Action and the 2011 Busan Partnership for Effective Development and Co-operation both endorse collaborative approaches throughout the program cycle. The Accra Agenda noted that partnership efforts for development should "fully harness the energy, skills, and experience of all development actors—bilateral and multilateral donors, global funds, CSOs [civil society organizations], and the private sector" as only then are development efforts most effective (OECD, 2008). The Busan Partnership elaborated, with development partners pledging to encourage parliaments and local governments to strengthen their role "in the oversight of development processes" and to "[f]urther support local governments to enable them to assume more fully their roles above and beyond service delivery, enhancing participation and accountability at the subnational levels" (Fourth High Level Forum on Aid Effectiveness, 2011). Similarly, Busan acknowledged civil society organizations' key roles in "shaping development policies and partnerships, and in overseeing their implementation" and urged development partners to create an enabling environment that allows these organizations to maximize their contributions (Fourth High Level Forum on Aid Effectiveness, 2011). In addition, Busan strongly encouraged the expansion of South-to-South partnerships and "triangular cooperation," noting that these "have the potential to transform developing countries' policies and approaches to service delivery by bringing effective, locally owned solutions that are appropriate to country contexts" (Fourth High Level Forum on Aid Effectiveness, 2011).

Busan also supported "participation of the private sector in the design and implementation of development policies and strategies" and encouraged "representatives of the public and private sectors and related organizations to play an active role in exploring how to advance both development and business outcomes so that they are mutually reinforcing" (Fourth High Level Forum on Aid Effectiveness, 2011). When it comes to strengthening HRH, the role of the private sector is particularly salient, given the increasing presence in low- and middle-income countries of both private-sector health care delivery and private medical, nursing, and other health professional schools.

As one example of a version of codesign, the United States Agency for International Development (USAID) has begun applying cocreation methods to the design of its funded activities (USAID, 2017). During this process, diverse stakeholders (such as implementing partners, host-country governments, private-sector representatives, and local organizations and experts) are invited to a participatory workshop, in which they contribute to the design and structure of an upcoming activity. The aims of this approach are to enhance local ownership of the activity and to increase the probability that the activity will achieve its intended results, because its design is informed by diverse stakeholders.

For complex and long-term initiatives such as the HRH Program, which sought to strengthen HRH through building health professional education, including a process whereby different stakeholders formally articulate their commitments over different time spans can reduce longer-term risk. These risks include the donor's ceasing funding of the program, as occurred with the HRH Program, or the host government's not following through on

professional education program leaders), regulatory bodies (e.g., accreditors and professional councils), and those who will use or benefit from the funded activities (e.g., faculty, trainees, public or private health systems, and patients, including people living with HIV).

commitments to recruit and retain the health care workers who have graduated. These eventualities can always occur, but any steps to minimize this risk should be considered.

Design with a Complex Systems Thinking Lens

The World Health Organization (WHO) has described the application of systems thinking to health systems strengthening, recognizing that "every intervention, from the simplest to the most complex, has an effect on the overall system, and the overall system has an effect on every intervention" (WHO, 2009). The interactive, nonlinear, and often unpredictable relationship among parts of a health system warrants approaches to strengthening HRH that are designed around its inherent complexity.

> **Recommendation 2: Designers of programs to strengthen human resources for health should employ a complex systems thinking lens, including multisectoral approaches that mix top-down and bottom-up models with long-term flexible funding that can support both the immediate needs of a health system and longer-term issues, such as the retention of health workers.**

Applying complex systems thinking can change how program designers conceive of the challenges in the health system, the questions they ask about how to improve the system, and their understanding of the environment that either supports or hinders improvement (Swanson and Widmer, 2018). A systems approach to strengthening the health system should also recognize that the health system is nested within a larger government and the health workforce is nested within regional health labor markets. This necessitates multisectoral collaboration and coordination across the health, education, labor, and finance sectors and among governmental and nongovernmental institutions.

Other features of the system also need to be recognized as additional layers of complexity, such as cultural considerations and concurrent shifts in standards and norms. The HRH Program, for example, accompanied a transition in Rwanda from French- to English-language health professional education and a transition in the region away from the Francophone model of medical education. Global health movements should take such local transitions into account in the design and implementation of programs that aim to affect systemwide changes. Similarly, the quality of primary and secondary education need to be considered to ensure that students progressing to health professional education programs have adequate foundational knowledge to be successful. Therefore, complex systems thinking needs to be an integral part of the codesign process described under the first recommendation.

Time Frame Considerations for Strengthening HRH

Effective systems strengthening for HRH, especially in relation to faculty production and building university infrastructure, requires decades. Investments in health professional education and training should be expected to take many years to yield effects, given the time required for students to complete training programs, for trainees to make their way as fully qualified health professionals into the service delivery system, and for new or newly upgraded faculty to produce ongoing cohorts of providers.

There are examples of longer-term projects that have yielded systems changes, such as a nearly 20-year collaboration between Uganda and the Swedish International Development Cooperation Agency, executed via a partnership between Makerere University and the Karolinska Institute of Sweden, that has produced a joint Ph.D. program and a wealth of research products contributing to policy and program design (Sewankambo et al., 2015). This example indicates that the duration required to build institutional capacity is on the order of decades, whereas the HRH Program, as laid out in the 2011 proposal, was planned for 9 years and faced a significant drop in funding following the cessation of PEPFAR investment after 5 years, which had implications for addressing sustainability, institutionalization, and other issues that surfaced in the midterm review.

Although it may be more feasible to invest in shorter, concrete projects with observable benefits, such as infrastructure and commodities distribution, doing so may overlook investments that require more time but have more widespread effects. There is value in being strategic about the investments, "with an eye toward making long-term investments in global health instead of focusing on short-term expenditures" (NASEM, 2017). With respect to HIV/AIDS, these investments need to be made in response to the anticipated future of the epidemic, strengthening a health system to be able to care for an aging PLHIV community with an increasing burden of comorbid conditions. Building systems thinking approaches into health professional education is one mechanism for moving toward a "culture of health," positioning clinical staff as leaders (Phillips and Stalter, 2018).

Funding Considerations for Strengthening HRH

Because systems strengthening takes decades and the HRH pipeline spans multiple stages—from recruitment of students to preservice training through specialization and continuing professional development of the workforce, to longer-term issues such as health worker motivation and retention—designers of HRH programs should articulate and work toward comprehensive, long-term goals and outcomes. This will require local governments and funders to collaboratively develop funding strategies that can outlast political terms and agendas, as well as typical donor funding cycles, and enable a built-in transition to sustained country-led ownership and financing.

Governments should focus on assembling diversified funding sources and partners for HRH programming, recognizing that some donors have adopted a more broad-based approach to development assistance, while others take an approach focused on specific outcomes or interventions. Reliance on a single donor can jeopardize broader goals for sustained systems change if donor priorities shift over time. Governments are also positioned to identify and bring together public- and private-sector actors with vested interests in national HRH goals in order to coordinate financing initiatives. When aligned with a comprehensive HRH strategy based on a decades-long time frame, a diversified approach would enable governments to assemble a portfolio of shorter-term investments and programs with disease-specific, activity-specific, or time-bound parameters that are all coordinated toward achieving the defined overall strategy.

Donors should accommodate this longer-term, coordinated funding approach by being open to the explicit integration of their investments into a broader strategy that catalyzes sustainable change. This can be achieved through participation in a codesign process that encompasses not only a specific donor-funded program, but also how it ties into the broader national HRH strategy and building sustainable local capacity. This coordinated funding and

design approach would also provide an opportunity to attend to the extent to which donor funding adheres to the Addis Ababa Action Agenda, which calls for shifting the balance toward domestic funding and away from donor funds that ultimately go to external parties, as was the case in the design of the HRH Program, with the majority of the budget dedicated to U.S. institutions for faculty contracts (UN, 2015).

Once committed to contributing to a longer-term approach, it is important for donors to recognize that subsequent shifts in their priorities that affect funding midcourse, as occurred with PEPFAR's funding for the HRH Program, will have broader consequences. Mutual expectations for a transparent process around potential revisions in funding and programming should be clearly outlined from the outset, and if anticipated shifts in funding arise, they should be considered and planned collaboratively and in relation to the broader coordinated strategy.

Donors should also, to the extent feasible, offer greater flexibility in shaping and adapting program budgets and processes to more readily accommodate a role in a broader funding strategy. U.S. government funders should build on USAID practices that have begun to address program funding constraints. Some of that agency's procurement processes have incorporated an "inception period" to flexibly yet systematically revisit initial objectives, targets, and outputs, instead of requiring program proposals to commit rigidly to achievements and outputs within an established time frame. Additionally, USAID has allowed "windows of opportunity" to dedicate a portion of project budgets for adapting strategies and development programming based on changing conditions and enhanced understanding of needs (Brinkerhoff et al., 2018).

Systematic Approach in the Context of the Labor Market

Although programs and policies that focus on boosting health professional education are key to addressing the health workforce shortage, adopting a labor market lens can both leverage health professional education investments and redress factors that undermine the capacity of the health workforce (Evans et al., 2016; Sousa et al., 2013). Health service delivery is highly labor intensive and requires the appropriate number and mix of trained and motivated health professionals to provide high-quality health services. A health labor market is a dynamic relationship between the supply of health workers and the demand for health workers (McPake et al., 2013; Scheffler et al., 2016). When supply and demand are placed in the context of national goals for access and coverage, the need for health services and the health needs of the whole population come into play as a third important and dynamic factor. It is important to identify the optimal mix of cadres and their geographic distribution in response to different needs and goals, such as addressing the HIV epidemic, having a broader effect on health, and teaching and workforce professionalization. This mix will need to be adjusted as goals and needs change over time.

In a health system, prevailing demand-side forces, especially in the absence of universal health coverage, can skew the supply of health workers away from population health needs; the private sector can fuel such imbalances with competing wages, working conditions, and regulations for health professionals (Evans et al., 2016; Sousa et al., 2013). Governments should develop production policies in the education sector in tandem with policies that address how the new supply of health workers can be absorbed into the labor market (Sousa et al., 2013). Furthermore, career progression, which differs according to cadres of health workers, needs awareness and consideration to ensure that existing health workers have opportunities for growth

that can be absorbed by the health system and that sufficient numbers of health workers are being produced to take on the duties of those who have advanced.

Governments also have a role in regulating the private sector to ensure the quality of training, given the rise of private health training institutions, and the equitable distribution of health care workers (Evans et al., 2016; Sousa et al., 2013). In turn, the private sector can drive innovative public–private models for financing growth in health worker education in response to market opportunities and other areas where governments are unable to respond (Evans et al., 2016).

Planning and Adaptive Management

Because it relies upon complex systems change, strengthening HRH requires not only visionary leadership and effective program activities, but also an appropriate and sufficient management structure to shepherd a program through an inevitably multifaceted and complicated implementation process. The experience of the HRH Program points to the need for strong management structures and processes that allow for continuous learning and improvement as a means of moving toward the defined programmatic goals, even in the face of policy pivots such as PEPFAR's shift from its 2.0 to 3.0 strategy, which resulted in a determination to cease funding.

Recommendation 3: To maximize the effectiveness of investments in human resources for health, which inherently require change within a complex system, designers of programs to strengthen human resources for health should spend time before implementation to establish a shared vision, proposed mechanisms to achieve that vision, and an operational plan that takes an adaptive management approach.

Often, the reality of implementation after program design necessitates changes to the proposed mechanisms to ensure progress toward the original vision and goals. This is particularly true in projects aimed at making changes in complex systems, such as human resources and the health system. Adaptive management, or problem-driven iterative adaptation, enables an intentional approach to making decisions and adjustments to programmatic activities in response to emerging information, unintended consequences, unexpected challenges, or changes that take place in the context in which the program is being implemented (USAID, 2018; Woolcock, 2018).

An adaptive approach can begin as early as the design stage—with a focus on adapting best practices and external solutions to create a "best fit" version for the context (Woolcock, 2018)—and continue throughout the life cycle of the program. The key principles of adaptive management include

- Reframing project design and implementation from a linear project trajectory to a more flexible sequencing;
- Building in management structures that are capable of being flexible;
- Creating explicit, periodic windows for assessing and reconsidering implementation decisions; and

- Linking adaptation to learning by creating a feedback loop between decision making and real-time information on the program's progress and its struggles (Brinkerhoff et al., 2018).

The intent is not to find the best action, but rather to identify which of the available and feasible options move closer to realizing the systems-level changes the program envisioned (Ripley and Jaccard, 2016).

Adaptive management is also underpinned by robust and continuous data collection for real-time information and decision making (Brinkerhoff et al., 2018). Processes for reviewing the data generated and documenting the rationale behind decisions taken should also be institutionalized. As discussed under Recommendation 6, there is a need for HRH programs to include a comprehensive approach to monitoring, evaluation, and learning as an integrated responsibility not only for designated staff but also for other technical and operational staff.

Adaptive management is only possible if the people implementing the program are open to critically engaging with and learning from rapidly collected and analyzed data to make programmatic adjustments. This requires a culture of improvement at the programmatic and organizational levels. Debating the decisions being made, including consideration of effects on other aspects of the system, both within and beyond the program, can strengthen the quality of decisions while fostering a culture of learning and improvement (Allana, 2016). These conversations need to happen not just within the program, but in consultation with a department within a Ministry of Health that holds the broader HRH strategy, comprising not only administrators and managers, but also economists and finance experts, political scientists, and other scientific and technical. Although there are various potential modalities to achieve this, it is the coordinated consultation across functions that is essential for effective adaptive management. Simultaneously, defined roles and responsibilities around decision making are necessary to move beyond debate and data review and into action. One lesson from the HRH Program is that it could have benefited from a more clearly defined and more robustly supported decision-making structure to facilitate timely and data-driven adaptive management to enable improved implementation.

For adaptive management to succeed in the context of reliance on multiple funding sources, external donors and governments that fund HRH programs need to embrace the approach of expecting well-executed implementation to include clarity of rationale and specificity of design at the outset, and learning-based adjustments as implementation proceeds. Program assessment and accountability mechanisms should be based partly on the process of implementation and on achieving reasonable progress toward goals, in the context of the realities encountered during implementation, rather than basing accountability narrowly on adherence to the original design. Where incremental changes are made as part of an adaptive management plan, sufficient time needs to be given to allow the changes to yield improvements. Donors are increasingly recognizing this need for adaptability to make effective investments, as evidenced by initiatives such as the World Bank's Global Delivery Initiative and the Doing Development Differently manifesto (ODI, 2016; USAID, 2018).

Models for Improving Health Professional Education

Varied models and approaches have been developed for improving health professional education (including twinning, interprofessional education, and technology-enabled education),

and have been established as options that could be considered in the design phase of a program, depending on the program's needs and goals and the country context.

> **Recommendation 4: Designers of programs to strengthen human resources for health should, on the basis of the vision and goals of the program, evaluate different models for improving health professional education that best fits the workforce needs to be met and the local structural and contextual considerations for human resource capacity building.**

Crosscutting Considerations Across Models

Selection of a health professional education model should be based on the goals and vision of the program and the needs of the health workforce. There should also be a focus on future institutionalization through:

- Ensuring structures are in place to support faculty in the longer term (career progression, time to commit to the program)
- Ensuring faculty have time built into their schedules to commit to additional health professional education development
- Ensuring time and funding are provided to focus on accreditation, research skills, and other elements that are not a direct transfer of teaching skills
- Emphasizing longer-term institutional partnerships
- Teaching models that require less time from faculty (blended learning)

Technology is used in a wide variety of ways for health professional education throughout low- and middle-income countries. E-learning, distance learning, web-based training, and m-learning (using mobile devices) enable remote education and training interactions and can be key strategies for reaching the workforce in resource-limited environments (Ballew et al., 2013; Buabeng-Andoh, 2018; Murebwayire et al., 2015). Simulation-based tools are another use of technology to provide training and assessment to improve quality of care and reduce medical errors (Puri et al., 2017).

Blended learning—combining technology tools with traditional face-to-face teaching approaches (Pavalam et al., 2010)—has been put forward as a way to create a more learner-centered environment, build student engagement, and relieve overcrowding (Frantz et al., 2011). It is a growing model owing to its effective pedagogy, cost-effectiveness, and increased faculty time for student mentorship (Geoffrey, 2014). In Rwanda, students and staff have reported positive attitudes toward the integration of blending learning (Pavalam et al., 2010), and the implementation of a blended e-learning approach has been used for nursing education to make access to training and classes more feasible for those living in rural areas (Murebwayire et al., 2015). When blended learning is adopted, however, it is important to consider the potential implications and additional needs it can create, such as requiring additional training to understand how to implement blended learning, designing appropriate curricula, and the need for adequate access to reliable technology (Geoffrey, 2014).

Optimizing the Use of Twinning

When twinning models are used as part of efforts to improve health professional education, this evaluation offers several lessons for potential improvements to the process and effectiveness, depending on the time frame, the goals, and the desired type of skills transfer. Under the HRH Program, the objective was to transfer teaching and clinical skills to University of Rwanda faculty.

Recommendation 5: Designers of programs to strengthen human resources for health who want to employ paired partnerships, or "twinning," should identify clear objectives to drive design decisions and consider an integrated design, with twinning partnerships at both the institutional and individual levels that are based, to the extent available, on best practice guidelines.

There is wide variation in the use of terminology to describe the types of activities that could fall under the concept of twinning. There are a few categorical distinctions that can be mapped to different strengths and to different considerations for implementation.

Institutional twinning Institutional twinning comprises partnerships based on the relationships between institutions, through which individual faculty members or practitioners may participate. WHO, the European Union's ESTHER[2] Alliance for Global Health Partnerships, and the United Kingdom's Tropical Health Education Trust have been employing institutional twinning partnerships with African hospitals and other institutions since at least 2009 (European ESTHER Alliance Secretariat/GIP ESTHER, 2018; THET, 2019; WHO, 2019b). These organizations have well-developed definitions, practices, processes, and tools for designing, implementing, and assessing the effectiveness of institutional twinning models as well as an evidence base to support their use.

Effective institutional twinning needs clear objectives that can be operationalized in the context of available funding and country environment. Broadly speaking, however, programs should focus on longer-term institutional partnerships and should consider different models of twinning and adapt to what best fits the context and need, including forming South-to-South partnerships, when possible. Institutional twinning partnerships require clearly communicating objectives, aligning interests across institutional partners, and taking into account the inherent cultural and historical dynamics of involved institutions.

Individual twinning Individual twinning comprises partnerships based on the pairing of individuals in peer-to-peer, mentoring, or trainer–trainee relationships. These can occur with or without the context of an institutional twinning partnership. Individual twinning may be mandated, typically by an institutional partnership wherein no prior relationship exists among twins, or emergent, developing out of an established personal relationship or other interactions.

All types of peer-to-peer support should be considered as partnerships. However, there is a need to clearly define roles and relationships within these partnerships to enable effective and efficient outcomes. For example, roles could include exchanging knowledge while dividing or sharing responsibilities (clinical or teaching duties, or shared curriculum development),

[2] The organization's original name was Ensemble pour une solidarité thérapeutique hospitalière en réseau (ESTHER), or Network for Therapeutic Solidarity in Hospitals against AIDS, as it was known in English.

mentorship (coaching and sharing of experience), training (teaching of new clinical, teaching, or research skills), or mixed roles. These roles should be predefined, shared transparently, and formally agreed upon prior to initiating a twinning relationship. Although emergent twinning may have an advantage in terms of the initial quality of the relationship between twins, mandated twinning, when done well under the umbrella of an institutional partnership, may have the advantage of better delineating expectations about roles and responsibilities before the relationship begins.

It is imperative to consider the inherent cultural and linguistic dynamics involved in any type of individual twinning relationship. In mandated twinning, a matching process is needed to align skills, language, and interests of both twins as closely as possible. This matching can be enhanced by using regional experts or incorporating opportunities for emergent twinning. Additionally, offering similar conditions to the twins with respect to compensation and incentives, where possible, could facilitate greater engagement in twinning relationships. Preparing and coaching twins through their relationships can be a mechanism for building skills such as cross-cultural understanding, communication, and conflict management and resolution.

Operationalizing peer-to-peer twinning support should also consider methods such as mixed distance learning or bidirectional international placements of shorter durations. This could be particularly effective for deans of institutions, or for medical or surgical subspecialists for whom longer-term placements are impractical. Using ratios greater than one to one for the partnering between external and local twins could also be an effective approach to optimize capacity building for health professional education.

Contributing to the evidence base on twinning There is a limited evidence base on twinning methodologies and their effectiveness. Programs that develop robust plans for learning, as discussed further in Recommendation 6, will have important and much needed opportunities to contribute to the knowledge base.

Monitoring, Evaluation, and Learning

Although the importance of monitoring, evaluation, and learning in health systems strengthening programming is recognized, operationalizing an effective and adaptive monitoring, evaluation, and learning system is often undervalued and underresourced.

> **Recommendation 6: Designers of programs to strengthen human resources for health should craft and resource a robust and rigorous framework for monitoring, evaluation, and learning that fits the complex, interconnected, and often changing nature of health systems, and that balances costs and feasibility with transparency, accountability, and learning.**

For future investments in HRH, a low-cost but rigorous monitoring, evaluation, and learning plan and system will be most effective if it is included in the design phase and includes ongoing mixed-methods monitoring, with pause points for learning throughout the program, and the resources and staff to achieve realistic and actionable learning. Monitoring and evaluation capacity among in-country program managers and implementers should be strengthened to support ongoing monitoring and data use for decision making. The advantages and disadvantages of also using an external third party for evaluation should be weighed and considered as part of

the design. In addition to planning for learning about implementation processes and program outcomes, it would be valuable for future efforts to prospectively plan for analysis that would allow program designers, implementers, and others looking to learn from such programs to understand the costs of program implementation and select, plan for, and carry out assessments of return on investment.

Below is a breakdown of monitoring, evaluation, and learning options at different points in a program's timeline.

Design and Start-Up

It is important for the program to draw on a wide base of evidence to increase relevance and effectiveness in the country's current context. This could be done in a multitude of ways. One is to conduct background research on other approaches, especially models in the region, and how they would need to be adapted for the Rwandan (or other country) context, as well as what the trade-offs and opportunity costs would be in choosing from among different approaches to achieve the desired objectives. In the HRH Program, although the designers referenced other regional twinning programs, there was not a clear process for how to better understand the operational infrastructure and overhead needed to operationalize such programs in the Rwandan context. Another option is to conduct a landscape mapping of existing actors (nongovernmental organizations, government, private sector) working to improve HRH. To deepen this mapping, a network analysis to investigate the social and organizational structures, relationships, and interactions can help designers understand the roles of different actors in an existing system and how they influence each other and work together toward a common goal, such as strengthening HRH (Ramanadhan et al., 2010).

The design phase should include a priori development of indicators to evaluate the program's effectiveness, efficiency, and outcomes within the overarching structure of the partnership, and a plan, including funding, for analysis and dissemination of findings to improve the knowledge base for similar endeavors in the future. Designers and program administrators should also conduct a baseline assessment that maps the country's HRH needs to the design of the program, helping to assess how to balance specialized care and primary care, the cadres required to address HIV and to have a broader health effect, and the teaching cadres who can continue building the workforce to address the needs. A baseline assessment also gives the program a starting point for midpoint or endpoint learning. As described below, global tools and local evidence can inform a baseline assessment of this kind.

World Health Organization guidance and tools WHO provides guidance on HRH, such as the recommended density of health workers in relation to the general population at a minimum of 4.45 per 1,000 (WHO, 2016), as well as tools and guidelines to assist countries with HRH planning (WHO, 2019a).[3] These serve a number of purposes, such as identifying gaps and estimating specific needs within the health workforce (WHO, 2010),[4] estimating or evaluating

[3] WHO's collection of HRH tools and guidelines can be accessed at https://www.who.int/hrh/tools/planning/en (accessed December 19, 2019).
[4] See https://www.who.int/hrh/resources/WISN_Eng_UsersManual.pdf (accessed December 19, 2019).

the size and mix of nursing teams (Hurst, 2002),[5] and supporting planning, policy, and leadership for HRH (MSH and WHO, 2006).

Several tools are available specifically to assess HIV-specific workforce needs and the intersection between HRH and the response to HIV (MSH and WHO, 2006).[6] These tools can be used according to their relevance to the specific context, and in combination, as needed, with locally tailored needs assessments.

Assessments of evolving workforce needs in Rwanda As life expectancy continues to grow in Africa (Allen Ingabire et al., 2013), the population will face an increased volume of diseases and medical issues, potentially impairing their quality of life and survivability. Many of these fall outside the realm of HIV/AIDS, and indicate a shifting burden of disease over time. In the past decade, several studies in Rwanda have spoken to evolving or emerging clinical needs—and, in some cases, the associated health workforce needs. Many of these have highlighted the needs of children, such as their orthopedic needs (Allen Ingabire et al., 2013) and help with management of type 1 diabetes (Marshall et al., 2013). Surgical needs assessments have included examinations of capacity for emergency surgery (Petroze et al., 2012), nonobstetric surgical care (Muhirwa et al., 2016), and the epidemiology, management, and outcomes of surgically treated malignancies (Atijosan et al., 2009). Other assessments have touched on specialty needs such as trauma care (Ntakiyiruta et al., 2016), oncology capacity building (Stulac et al., 2015), and cancer control (Martin et al., 2019). One study concludes that weak infrastructure for health care, insufficient clinicians and training programs, and a lack of supplies pose risks to the treatment of and capacity building for cancer (Stulac et al., 2015). Another suggests that to improve accurate and timely diagnosis, national cancer control plans should include capacity building for general practitioners, and continuing professional development should address "context-specific educational gaps, resource availability, and referral practice guidelines" (Martin et al., 2019).

There are also more generalized and unifying workforce and capacity-building needs. Rwanda faces barriers of unmet need and educational and resource gaps that affect the quality of care its health workforce can provide. For example, significant variability and fundamental gaps have been described in adult and adolescent primary care delivery (Vasan et al., 2013).

An additional, widespread capacity-building and workforce development challenge lies in the availability of information. For example, Nahimana and colleagues (2015) describe limited information on technology scale-up in rural health facilities, and Egziabher and colleagues (2015) describe a lack of data on quality of care for obstetric fistula management (Egziabher et al., 2015; Nahimana et al., 2015). A similar issue exists in emergency medicine, where there are no data on the effects of training programs on patient-centered outcomes in resource-limited settings (Mbanjumucyo et al., 2017).

These studies provide assessments of need that span a variety of specialties and diseases. While they indicate varied and evolving treatment needs throughout Rwanda as the burden of disease shifts over time, they also reveal overarching commonalities regarding workforce and capacity needs. Future HRH investments would benefit from a more comprehensive and coordinated assessment of these evolving needs, in light of both the common barriers and opportunities and those that are specific to diseases and specialties.

[5] See https://www.who.int/hrh/documents/hurst_summary.pdf (accessed December 19, 2019).
[6] Questionnaires to measure the effect of HIV/AIDS on HRH and tools for planning and developing human Resources for HIV/AIDS and other health services can be accessed at https://www.who.int/hrh/tools/tools_planning_hr_hiv-aids.pdf (accessed December 19, 2019).

Program Implementation

Throughout the life of a program, it is imperative for an adaptive monitoring system to build on existing government data systems and represent a low burden to those implementing and benefiting from the project. Ensuring monitoring plans move beyond collecting outputs and conceptualize implementation outcomes and mechanisms of change, including creating prospective measurement architecture, is necessary for systematically understanding the potential impact of a program and for implementation to be responsive and reactive to the real-world context. Similarly, it is important to include early process indicators to determine whether the initiative is on the right track and make quick course corrections. To ensure data for decision making are accurate, it is helpful to include data quality assessments to examine the quality of implementers' monitoring data at various points throughout the program.

Building in time for capacity-building opportunities for implementers can improve on findings from the data quality assessment. This could include existing courses on standard health and health systems data (such as the District Health Information System, national health accounts, national AIDS accounts), as well as project- or program-specific capacity building. For an HRH program that uses a twinning model, monitoring the twinning process and interactions and adapting recruitment and onboarding based on this evidence could improve implementation and achievement of results. Finally, including a mapping mechanism that tracks where trainees are placed and what their roles are following the program could facilitate comparison analysis to determine the program's effect on patient outcomes.

Pause Points for Accountability, Learning, and Adaptation

Adaptive management and implementation require pause points for evaluating or assessing the program to identify opportunities for improvement. A mix of national and international evaluation mechanisms in HRH and academic programs can provide rich data for informed decision making. Options include hiring an external evaluation team or funding an internal monitor, evaluate, and learn team to conduct learning at pause points throughout the implementation life cycle. This could include more traditional baseline, midline, and end line assessments that use mixed methods and assess not only what progress has occurred, but also why it has or has not occurred. Designers could also build in special research studies between baseline and midline, midline and end line, or after a program's completion. Special studies enable designers and implementers to learn in real time and improve implementation. This could include looking at a particular aspect of the program, such as conducting an assessment of curricula development in year 2 or an ex-post evaluation 5 to 7 years after a program has ended.

If designers are interested in learning about what it takes to establish and maintain an effective HRH system, they could also build in a developmental and/or process evaluation. Process evaluations allow funders to learn in real time, examining outputs and processes of why interventions are or are not working. Process evaluations provide a good platform to teach other designers what they should consider during the design of HRH programs. A developmental evaluation is particularly well suited to stimulating innovative program design in response to dynamic realities, possible desire for program replication, and complex issues and environments (Patton, 2010). Developmental evaluations ask program administrators to work closely with evaluators as partners, sharing data and lessons throughout the program cycle. Another

evaluation approach is social network analysis; in addition to being useful for the design phase, as described above, social network analysis has been applied as a tool for evaluating partnerships (Kamya et al., 2016; Kenis, 2017).

Whatever approach is taken, all future HRH programs should avoid repeating this HRH Program's missed opportunity for learning, evaluated here, and ensure they are funding a sufficient amount of design, planning, management, and staffing with the capabilities to work with the implementers to monitor, evaluate, and learn what it takes to successfully build, implement, and sustain an effective HRH program.

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Appendix A

Committee Member, Consultant, and Staff Biographies

Ann E. Kurth, Ph.D., C.N.M., M.P.H., FAAN, (*Chair*), is the dean and Linda Koch Lorimer Professor of the Yale School of Nursing. Dr. Kurth is an elected member of the National Academy of Medicine and a member of the 2014–2018 U.S. Preventive Services Task Force, which sets screening and primary care prevention guidelines for the United States. She is a member of The New York Academy of Medicine and of the Connecticut Academy of Science and Engineering. Dr. Kurth is the 2018–2020 chair of the Consortium of Universities for Global Health, the more than 185 university member academic global health network. An epidemiologist and clinically trained nurse–midwife, Dr. Kurth's research focuses on HIV/reproductive health and global health system strengthening, particularly in the context of climate change (see www.planetaryhealthnow.org). Her work has been funded by the U.S. National Institutes of Health (NIH)—National Institute of Allergy and Infectious Diseases, National Institute on Drug Abuse, National Institute of Mental Health, National Institute of Child Health and Development—as well as the Bill & Melinda Gates Foundation, UNAIDS, U.S. Centers for Disease Control and Prevention (CDC), Human Resources Services Administration, and others, for studies conducted in the United States and internationally. Dr. Kurth has consulted for the NIH, Gates Foundation, World Health Organization, U.S. Agency for International Development, and CDC, among others. Dr. Kurth has published more than 200 peer-reviewed articles, book chapters, and scholarly monographs and presented at hundreds of scientific conferences and invited talks. Dr. Kurth has received awards for her science and leadership including the Friends of the National Institute of Nursing Research Award and the International Nurse Researcher Hall of Fame award from Sigma Theta Tau International, the global nursing honor society. She chairs the National Academies of Sciences, Engineering, and Medicine's Board on Global Health.

Till Bärnighausen, M.D., Sc.D., M.Sc., M.Sc., is Alexander von Humboldt University Professor at Heidelberg University, Germany's oldest university, and director of the Heidelberg Institute of Global Health in the Faculty of Medicine. He is also adjunct professor of global health at the Harvard T.H. Chan School of Public Health, faculty affiliate at the Harvard Center for Population and Development Studies, and senior faculty at the Wellcome Trust's Africa Health Research Institute in KwaZulu-Natal, South Africa. Dr. Bärnighausen's research focuses on developing and testing population health interventions that address large health care needs in poor countries, in particular for HIV and other chronic conditions such as diabetes and hypertension. He focuses on interventions that can be implemented in resource-poor settings, such as community health worker initiatives and novel interventions in nurse-led primary care clinics. In 2015, Dr. Bärnighausen won the Alexander von Humboldt Professor Award, Germany's most highly endowed international price for science. Dr. Bärnighausen is principal investigator on several U.S. National Institutes of Health grants (including 5 R01s). His research

is also funded by the Wellcome Trust; the Alexander von Humboldt Foundation; the European Commission; the German Federal Ministry of Science and Education; World Health Organization; World Bank; UNAIDS; UNITAID; U.S. Agency for International Development; ANRS; Clinton Health Access Initiative; Gavi, the Vaccine Alliance; Elton John AIDS Foundation; Rush Foundation; and the International Initiative for Impact Evaluation (3ie). Dr. Bärnighausen is a medical specialist in family medicine and holds doctoral degrees in population and international health (Harvard University) and history of medicine (University of Heidelberg), as well as master's degrees in health systems management (London School of Hygiene and Tropical Medicine) and financial economics (SOAS University of London). He previously worked as physician in China, Germany, and South Africa; as a journalist in Berlin; and as management consultant for McKinsey & Co. in Europe. Dr. Bärnighausen has published more than 300 peer-reviewed articles, including in *Science*, *Lancet*, *PNAS*, and *PLoS Medicine*. His work has attracted more than 15,000 citations. His h-index is 58.

Eran Bendavid, M.D., M.S., is an associate professor of medicine at Stanford University, and a faculty affiliate in the Division of Infectious Diseases, the Department of Health Research and Policy, and the Woods Institute for the Environment. His work, broadly, involves studying the drivers of population health improvements, mostly in lower-resource contexts. He explores how decisions about foreign assistance for health are made, and how those decisions affect the health of those whom assistance aims to serve. Dr. Bendavid is also a disease modeler, and uses that skill to explore issues of resource allocation in low- and middle-income countries with cost-effectiveness analyses. His recent research projects include an impact evaluation of the U.S. assistance program for HIV in Africa, and an exploration of the association between drug prices, aid, and health outcomes in countries heavily affected by HIV. He received a B.A. in chemistry and philosophy from Dartmouth College, and an M.D. from Harvard Medical School. His residency in internal medicine and fellowship in infectious diseases were completed at Stanford.

Carla Castillo-Laborde, M.Sc., M.A., is an assistant professor at the Centro de Epidemiología y Políticas de Salud, Facultad de Medicina Clínica Alemana, at the Universidad del Desarrollo, Santiago. Previously, she was a researcher at the Department of Health Economics of the Ministry of Health, Chile, from 2005 to 2012, participating in various studies related to the establishment of health reform, among others associated with areas of health economics, such as financing of health systems and economic evaluations. From October 2012 to June 2014, she was analyst of methodologies at the Department of Methodologies in the Ministry of Social Development, participating in the development and update of methodologies for social evaluation of projects, particularly for projects associated with the health sector or health effects. From April 2014 to January 2016, Ms. Castillo-Laborde worked as technical advisor to the Ministry of Health, specifically on issues related to private health system financing reform, and from April 2016 to July 2018, she was technical advisor at the Social Policies Coordination of the Ministry of Finance, on economic issues related to health. She has also been a professor of introductory courses in economics and introduction to microeconomics at the Pontificia Universidad Católica de Chile from 2006 to 2008, and of economic evaluations in health at the Universidad de Chile (for the Magister Informática Médica) from 2012 and 2014, in addition to various courses related to health economics prepared by the Chilean Chapter of the International Society for Pharmacoeconomics and Outcomes Research since 2012.

Elvin H. Geng, M.D., M.P.H., is a professor of medicine in the Division of Infectious Diseases in the Department of Medicine and Director of the Center for Dissemination and Implementation at the Institute for Public Health, both at Washington University in St. Louis. He earned M.D. and M.P.H. degrees from Columbia University and subsequently completed postdoctoral training through the Aaron Diamond AIDS Institute at The Rockefeller University (posted to Kunming, China) as well as fellowship training in infectious diseases at the University of California in San Francisco. Using the lens of implementation science, Dr. Geng conducts research to optimize the use of evidence-based interventions in the public health response to HIV. His work is carried out through collaborations in Kenya, Zambia, Uganda, as well as in a safety net setting in the United States. His current activities make use of a range of observational, mixed methods, quasi-experimental, and experimental methods. His work is sponsored by the Bill & Melinda Gates Foundation and the National Institutes of Health. Dr. Geng serves in an advisory capacity for the World Health Organization, nongovernmental organizations, and professional organizations. He is an academic editor at *PLOS Medicine*, a member of the editorial board of *JAIDS* and *Journal of the International AIDS Society*, and editor for implementation science at *Current HIV/AIDS Reports*.

Fastone M. Goma, Ph.D., M.B.Ch.B., M.Sc., is an associate professor of physiology and cardiovascular Health at the University of Zambia school of Medicine. He is a medical doctor with a Ph.D. in cardiovascular science from the University of Leeds. He also studied international public health at the University of Alabama at Birmingham and tobacco dependency treatment at University of Toronto. Dr. Goma is also appointed senior scholar at the World Health Organization Collaborating Centre for Health Workforce Planning and Research at the University of Dalhousie, Canada. Currently he is director for the Centre for Primary Care Research (CPCR) which has taken on health systems and noncommunicable diseases (NCDs) as the main areas of focus for research and policy influence. Dr. Goma continues to actively participate in processes of formulating and implementing risk-reduction strategies for NCDs in Zambia and Africa. He is the founding president for the Zambia Heart and Stroke Foundation, and an active member of the African Heart Network and World Heart Federation. The CPCR is the secretariat for the Zambia Tobacco Control Campaign, a community advocacy group, and the International Tobacco Control Evaluation Project. Other research interests include palliative care, knowledge translation, and indigenous knowledge systems. He has been a keen advocate of competency/needs-based approaches to health workforce planning.

Laura Hoemeke, Dr.P.H., is a global health policy consultant, and has nearly 25 years of experience in global health, including field assignments in Benin, the Central African Republic, Senegal, and Rwanda, and short-term assignments throughout East, West, and Central Africa. Her areas of expertise include policy analysis and program design and management. She has worked in family planning, maternal and child health, malaria prevention and control, and HIV/AIDS prevention and control, as well as health systems strengthening and health governance. Dr. Hoemeke served as United States Agency for International Development (USAID) Benin's family health technical advisor for 4 years. In early 2003, she joined IntraHealth International as regional director for West and Central Africa, based in Senegal. From 2005 through early 2010, Dr. Hoemeke was based in Rwanda as the director of IntraHealth's successful USAID-funded Twubakane Decentralization and Health Program, which contributed to the country's impressive results, particularly in the areas of health-sector

decentralization, family planning, and child health. In 2010, she joined IntraHealth's headquarters leadership team and served as director of communications and advocacy then director of health policy and systems through November 2018. Dr. Hoemeke has authored several publications and has spoken and presented at numerous global health conferences and other events. She earned her doctorate in public health from the University of North Carolina at Chapel Hill Gillings School of Global Public Health in health policy and management. She has an M.P.H. from Johns Hopkins University and a B.S. in journalism from Northwestern University.

Angelina Kakooza-Mwesige, M.B.Ch.B., M.Med., Ph.D., is a senior lecturer and a pediatric neurologist in the Department of Pediatrics and Child Health, School of Medicine, Makerere University College of Health Sciences in Kampala, Uganda. Her major research interests are in the fields of neurology and infectious diseases, with considerable experience in the field of HIV/AIDS and neurodevelopmental disorders, particularly cerebral palsy, autism, and epilepsy. Her doctoral study was on cerebral palsy, which she defended in May 2016 as a joint degree from the Karolinska Institute, Sweden, and Makerere University, Uganda. For her postdoctoral fellowship, she will continue to pursue her research interests which will be key to addressing how acquired infections of mothers during pregnancy may have impacts on their pregnancy, as well as the development of neurodevelopmental disorders in their children with a focus on the Zika virus. Her postdoctoral fellowship is funded by the DELTAS Africa Initiative grant #DEL-15-011 to THRiVE-2 (an independent funding scheme of the African Academy of Sciences' Alliance for Accelerating Excellence in Science in Africa that is supported by the New Partnership for Africa's Development Planning and Coordinating Agency, with funding from the Wellcome Trust grant 107742/Z/15/Z and the UK government). Dr. Kakooza-Mwesige is also closely involved in training post- and undergraduate medical and paramedical students on neurological disorders in children and has more than 20 years of experience in medical practice in low-resource settings. She was elected as the 2017–2021 chair of the Commission for African Affairs of the International League Against Epilepsy. She is a board member on the African Child Neurology Association; African Regional Committee of the International Brain Research Organization (IBRO-ARC); and the Women in World Neuroscience, a branch of IBRO. She has been instrumental in the founding of the East African Academy on Childhood Disability, where she is the current treasurer. Dr. Kakooza-Mwesige has served on a previous committee for the outcome and impact evaluation of global HIV/AIDS programs implemented under the Lantos-Hyde Act of 2008 at the National Academies of Sciences, Engineering, and Medicine.

Emmanuel B. K. Luyirika, M.B.Ch.B., B.P.A.(Hons), M.P.A., M.Fam.Med., is the executive director of the African Palliative Care Association (APCA). Dr. Luyirika joined APCA as the executive director in 2012. He holds a bachelor of medicine degree from Makerere University in Uganda, a master's degree in family medicine from the Medical University of Southern Africa, and a postgraduate honors degree and a master of public administration from University of Stellenbosch. As part of the master in family medicine, he conducted research focusing on issues around HIV among school-going teenagers. As part of the master's degree in public administration from the University of Stellenbosch's School of Public Management and Planning, his research focused on the national HIV/AIDS policy of South Africa. He also holds an HIV certificate from the University of Witwatersrand in South Africa. Dr. Luyirika started his career as a medical officer in rural Uganda at Kagando Hospital, near the Rwenzori Mountains

on the border with the Democratic Republic of Congo. He later moved to South Africa, where he worked at the Donald Fraser Hospital in Limpopo Province, after which he trained in family medicine at the Medical University of Southern Africa, where he was also appointed lecturer in the Department of Family Medicine. Apart from practicing medicine in a hospital setting in South Africa, Dr. Luyirika worked as a facilitator in the Rural Health Initiative of the South African Academy of Family Practice, where he trained multidisciplinary teams to care for HIV patients and to develop home care strategies and kits as well as community HIV prevention strategies. Returning to Uganda in 2002, Dr. Luyirika accepted the role of overseeing the health care program run by Mildmay International as clinical director, and after 3 years he became the overall center director; after another 3 years he became Mildmay International's country director. In these roles, he was actively involved in HIV prevention, care, treatment, education, and research and oversaw more than 20,000 patients in care. In his current role at APCA, he is involved in overseeing palliative care development both in Uganda and across Africa. Dr. Luyirika's vision for APCA's work in Africa is to strengthen health systems by integrating palliative care using evidence-based models and for advocating for policy development and change for palliative care across the continent. He also values knowledge and best practice sharing in the region to influence stakeholders to ensure the integration of palliative care into national health-sector plans using available resources. Dr. Luyirika has also authored and coauthored a number of publications related to palliative care and HIV.

Mosa Moshabela, Ph.D., M.Sc., M.B.Ch.B., M.Fam.Med., Dip.HIV (SA), is currently an associate professor and the dean in the School of Nursing and Public Health, University of KwaZulu-Natal, South Africa. A qualified physician in family medicine and primary health care, he works as a chief medical specialist in rural health medicine, and a public health scientist in health services, systems, and policy in KwaZulu-Natal, South Africa, with the aim of improving access, quality, and equity in health care. Dr. Moshabela is also adjunct faculty and a Wellcome Trust research fellow at the Africa Health Research Institute, South Africa, where he collaborates with the London School of Hygiene and Tropical Medicine, and conducts research in several countries in sub-Saharan Africa. He was previously the regional health advisor for the Millennium Villages Project in West and Central Africa, based at the Millennium Development Goals Centre in Mali/Senegal, working with the Earth Institute at Columbia University. Prior to the Earth Institute, he worked for 5 years as a senior lecturer in the School of Public Health at the University of Witwatersrand, Johannesburg, where he was also the director of the Rural AIDS and Development Action Research Programme. Currently, Dr. Moshabela's research portfolio seeks to design, implement, and evaluate complex interventions in public health care services and programs, in ways appropriate for resource-poor settings in sub-Saharan Africa.

Denis Nash, Ph.D., M.P.H., is a distinguished professor of epidemiology at the City University of New York's (CUNY's) School of Public Health and the founding executive director of CUNY's Institute for Implementation Science in Population Health. He has more than 20 years of expertise in implementation science. His experience includes extensive domestic and international work in implementation science, comparative effectiveness research, and large-scale epidemiologic studies examining key outcomes among persons with HIV. Dr. Nash brings seasoned expertise in study design and methodological approaches to large-scale, "real-world" research projects. Prior to joining CUNY, Dr. Nash was an Epidemic Intelligence Service Officer and subsequently the director of HIV/AIDS surveillance, where he played a key role in the

implementation of named reporting for HIV. He also worked at ICAP at Columbia University as the director of monitoring, evaluation, and research—spearheading a multicountry initiative collecting routine medical records electronically. Dr. Nash has vast global health implementation and research experience. He has worked extensively on large-scale initiatives and research projects in sub-Saharan Africa, including on the Guinea Worm Eradication Program in Nigeria, sentinel HIV surveillance in Botswana and Nigeria, and rapid expansion/scale-up of HIV/AIDS care and treatment under the President's Emergency Plan for AIDS Relief in Burundi, Cote d'Ivoire, Ethiopia, Kenya, Lesotho, Mozambique, Nigeria, Rwanda, South Africa, Swaziland, Tanzania, Uganda, and Zambia. Dr. Nash currently leads the U.S. National Institutes of Health (NIH) funded IeDEA Central Africa regional collaboration (as one of the multiple principal investigators with Kathryn Anastos), which is an implementation science study that follows more than 50,000 persons enrolled in HIV care in five Central African countries (Burundi, Cameroon, the Democratic Republic of Congo, Republic of Congo, and Rwanda). He has recently begun research collaborations on noncommunicable diseases, which includes household population health survey of four urban slums in Port au Prince, Haiti. Dr. Nash has published more than 150 scientific articles, and his research is primarily funded by the NIH and the U.S. Centers for Disease Control and Prevention. Dr. Nash also serves as a standing member on NIH study section review panels, and holds secondary faculty appointments in the Department of Epidemiology at Columbia University's Mailman School of Public Health and in the Department of Epidemiology and Population Health at the Albert Einstein College of Medicine.

Charles Ok Pannenborg, Ph.D., is a national of the Netherlands and recently retired from the World Bank, where he served as its chief health advisor/director and chief health scientist. Previously he lived and worked in Bangladesh, Congo, Ethiopia, Pakistan, and Tanzania. Dr. Pannenborg served on the boards of the Tropical Disease Research program, the Global Forum for Health Research, the Council on Health Research for Development, and more recently on the board of IntraHealth International and as an interim director at the Pan American Health Organization. He also served as an advisor to the World Bank's higher education programs, and as chairman of the Netherlands Commission on Global Health Research, as well as the Royal Tropical Institute's Board on Health. In the past 40 years, he has been a global leader in several highly successful infectious disease programs, in the introduction of joint sectorwide health reform programs in Asia and Africa, and in reform of health and medical education worldwide. He holds degrees from the law and medical schools of the Universities of Groningen, of Amsterdam, and of Toronto. Dr. Pannenborg remains active as an advisor for health reform efforts in lower-, middle- and higher-income countries, as well as global multilateral health organizations.

Derek J. Sloan, Ph.D., M.B.Ch.B., is a senior clinical lecturer and consultant infectious diseases physician with a joint appointment at the University of St. Andrews and NHS Fife. He has previously worked extensively in southern Africa. In 2004, he was worked as a clinician at PCEA Chogoria Hospital in Kenya and supported setup of an HIV clinic which provided comprehensive rollout of antiretroviral therapy for the first time in the district. From 2005 to 2006 he was senior medical officer and tuberculosis (TB) lead for Hlabisa subdistrict in KwaZulu-Natal, South Africa, where the dual burden of HIV and drug-resistant TB had become a public health crisis. Subsequently, he completed a Wellcome Trust-funded Ph.D. fellowship at the University of Liverpool Institute of Global Health and Liverpool School of Tropical

Medicine. His work there was on the clinical pharmacology of TB treatment, and included 2.5 years of combined clinical and academic work in Blantyre, Malawi. During that time Dr. Sloan was also an honorary lecturer at the University of Malawi College of Medicine, and edited *The Clinical Book*, a practical pocket textbook of local management protocols for common adult medical conditions that still acts as a standard guide for medical students, clinical officers, and doctors across the country. In 2015, he spent 3 months in Sierra Leone working as clinical lead on the U.K.-Med Quality Monitoring Team, supporting the NHS contribution to the Ebola virus disease outbreak in West Africa. His ongoing research interests are targeted towards clinical therapeutics questions of global public health significance, particularly in the treatment of TB, HIV, and other infections.

Sheila D. Tlou, Ph.D., R.N., FAAN (*until May 2019*), is the chair of the Global HIV Prevention Coalition. From 2010 to June 2017, she was UNAIDS regional director for Eastern and Southern Africa. She was a minister of health of Botswana, former professor of nursing at the University of Botswana, and director of the World Health Organization Collaborating Centre for Nursing and Midwifery Development in Primary Health Care for Anglophone Africa. She has conducted research and taught courses to nursing, premedical, and social science students on gender issues relating to HIV/AIDS, sexual and reproductive health and rights, and aging and older persons. She has played a key role in the development of national nursing and medical education curricula, working to broaden the scope of health sciences education in her home country of Botswana. Dr. Tlou has been involved in the AIDS response since 1985 and has worked to increase community awareness of HIV/AIDS in Botswana using youth groups, nongovernmental organizations, and grassroots women's organizations. She was HIV/AIDS coordinator at the University of Botswana from 2002 to 2004 and facilitated the formation of the Students Against AIDS Society. During her term as minister of health, Dr. Tlou contributed to the improvement of global health care, especially for women and girls. She led a comprehensive HIV/AIDS prevention, treatment, care, and support program in Botswana with achievements including: a rollout of antiretroviral drugs and prevention of mother-to-child transmission to near universal uptake; decreased transmission of HIV from mother-to-child from about 30 percent in 2003 to about 8 percent in 2008; and decreased maternal mortality due to AIDS from 34 percent to 9 percent. As chairperson of Southern African Development Community (SADC) and of the African Union Ministers of Health in 2005 to 2006, Dr. Tlou provided leadership in the adoption of the SADC Malaria Eradication Program, the SADC HIV/AIDS Plan of Action, and the Maputo Plan of Action on Sexual and Reproductive Health and Rights. Dr. Tlou also represented Eastern and Southern Africa in the board of the Global Fund to Fight AIDS, Tuberculosis and Malaria.

STUDY STAFF

Susan F. E. Milner, Ph.D., M.P.H, (*Study Director*), is a senior program officer with the Board on Global Health with the National Academies of Sciences, Engineering, and Medicine. Prior to her work with the National Academies, she served as the deputy coordinator and senior strategic information advisor for the President's Emergency Plan for AIDS Relief (PEPFAR) in Malawi. From 2010 to 2016, Dr. Milner worked abroad as a consultant focusing on monitoring and evaluation (M&E) and policy issues. Her clients included the Elizabeth Glaser Pediatric AIDS Foundation (EGPAF), the U.S. Centers for Disease Control and Prevention and World Health

Organization's Stop Transmission of Polio Program (STOP), and the Liverpool School of Tropical Medicine (LSTM). She has lived and worked in five African countries, including the fragile states of South Sudan and Libya. Earlier in her career, Dr. Milner focused on domestic health care issues, working in the Maryland Department of Health and Mental Hygiene as a policy analyst for the state's Medicaid and S-CHIP programs and as the director of public affairs for Planned Parenthood of Metropolitan Washington. Dr. Milner was the recipient of a 2004–2005 Fulbright Lecturing Award in Global/Public Health in Asunción, Paraguay. She graduated from Cornell University with an A.B. in history and holds an M.P.H. in health policy and management and a Ph.D. in health services research from the Johns Hopkins Bloomberg School of Public Health.

Emma Fine is an associate program officer for the Board on Global Health with the National Academies of Sciences, Engineering, and Medicine. Previously, she has also worked on the Board on Behavioral, Cognitive, and Sensory Sciences. Prior to joining the National Academies, Ms. Fine completed her bachelor's degree at the University of California, Berkeley, where she studied public health and public policy. Prior to joining the National Academies, she interned for the U.S. Department of Health and Human Services in the Office of the Assistant Secretary of Preparedness and Response where she contributed research to the National Health Security Strategy Implementation Plan. Ms. Fine plans to pursue a graduate degree in public health.

Michelle Kvalsund, D.O., M.S., is a clinical neurophysiologist and neuroepidemiologist with special interest in tropical neurology and global health. Her research focuses on intersections between nutrition, infectious disease, and neurologic health and disease in resource-limited settings. As an assistant professor of neurology and director of adult global neurology initiatives within the Michigan State University Department of Neurology's International Neurologic and Psychiatric Epidemiology Program, Dr. Kvalsund spends 9 months annually in Lusaka, Zambia, where she is a principal investigator for the "Research on Assessments of Vitamin B12 and Evaluation of Neuropathy Study" (RAVENS) study. In detailing preventable nutritional and toxico-nutritional neurologic morbidity in resource-limiting settings, her research has important potential public health and health policy implications relating to food production and storage, nutritional supplementation, as well as national and HIV formulary guidelines in resource-limited settings. Dr. Kvalsund also holds an adjunct appointment as an honorary lecturer at the University of Zambia School of Medicine Department of Internal Medicine and participates in clinical educational activities with medical students and postgraduates, holds a weekly general neurology clinic, and conducts inpatient consultations at the University Teaching Hospital. She is also the director of the electromyography division of the University Teaching Hospital electrodiagnostic laboratory.

Julie A. Pavlin, M.D., Ph.D., M.P.H., is the director for the Board on Global Health with the National Academies of Sciences, Engineering, and Medicine. Prior to joining the National Academies, Dr. Pavlin was the research area director for emerging infectious diseases and antimicrobial resistance and deputy research area director for HIV at the Infectious Disease Clinical Research Program, part of the Uniformed Services University of the Health Sciences; before that, she was the deputy director of the Armed Forces Health Surveillance Center. She is a retired Colonel in the U.S. Army and previous assignments included serving as the chief of the Global Emerging Infections Department at the Armed Forces Research Institute of Medical

Sciences in Bangkok, Thailand, where she developed surveillance programs for infectious diseases in Asia; the chief of the Field Studies Department at the Walter Reed Army Institute of Research where she played a pivotal role in developing the Electronic Surveillance System for the Early Notification of Community-based Epidemics, the U.S. Department of Defense real-time surveillance system; as well as two tours in South Korea. Dr. Pavlin received her A.B. from Cornell University, her M.D. from Loyola University, her M.P.H. from Harvard University, and her Ph.D. in emerging infectious diseases at the Uniformed Services University of the Health Sciences.

T. Anh Tran, is a research associate at the National Academies of Sciences, Engineering, and Medicine. She also currently staffs the Global Roadmap for Health Longevity Initiative with the National Academy of Medicine and has previously worked with the Forum on Microbial Threats within the Board on Global Health. Prior to joining the National Academies, Ms. Tran has interned and worked for governmental and nonprofit organizations, including the Office of Global Affairs in the U.S. Department of Health and Human Services, where she supported the Global Health Security Agenda launch, and the American Lung Association, where she reported on state air quality in the United States. Ms. Tran completed her B.S. in public health at The George Washington University.

CONSULTANTS

Bridget B. Kelly, M.D., Ph.D., is a consultant specializing in strategy development, research and evaluation, policy analysis, stakeholder engagement, and meeting design and facilitation. She worked previously at the National Academies of Sciences, Engineering, and Medicine for 8 years leading a portfolio of projects that included early childhood development and education, mental health, chronic diseases, HIV, and evaluation science. Among other projects, she was the study director for the 2010 report *Promoting Cardiovascular Health in the Developing World* and the study co-director for the 2013 *Evaluation of PEPFAR*. In her last position at the National Academies she served as the interim director of the Board on Children, Youth, and Families. More recently she cofounded the nonprofit Bridging Health & Community, with the mission of helping the health sector work more effectively with communities. Originally trained in medicine and developmental neurobiology, she received an M.D. and a Ph.D. from Duke University, and a B.A. from Williams College. She is also an experienced dancer, choreographer, and arts administrator.

EnCompass Team

Sarah Smith Lunsford, Ph.D. (*Team Lead*)*,* is a senior evaluation specialist with EnCompass. For the past 7 years she has served as a senior advisor, research and evaluation, at the United States Agency for International Development-funded Applying Science to Strengthen and Improve Systems (ASSIST) project and Healthcare Improvement (HCI) project. In this role, she supported qualitative research and evaluation efforts on such areas as institutionalization of improvement, adaptation of quality improvement (QI) methods for community-level services, scale and spread of QI in the context of HCI's quality improvement activities. She has a Ph.D. in medical anthropology from the University of Queensland, Australia, where she examined local practices around dengue fever treatment, prevention, and control in Cambodia. She also holds an M.A. in international relations and Spanish from the University of St. Andrews, Scotland, and an

M.P.H. from Tulane University. She has conducted research and evaluation activities for the Futures Group, Inc., and Educational Services, Inc.

Kelsey Simmons, M.A., supports EnCompass' technical assistance and evaluation work, including designing and implementing qualitative and quantitative evaluations of large international and domestic projects. She has lived and worked throughout sub-Saharan Africa researching, designing, and evaluating programs in HIV/AIDS, maternal and child health, malaria, and health systems strengthening. Ms. Simmons also has experience designing monitoring and evaluation frameworks for social enterprises that measure operational efficiency, as well as social impact. She holds an M.A. in international development studies with concentration in global health monitoring and evaluation from The George Washington University. She is fluent in English, and has working proficiency in French and limited working proficiency in Bemba and Hebrew.

Amy Bhopal, M.P.H., is a special projects associate at EnCompass with more than 5 years of experience and key strengths in monitoring and evaluation (M&E), data analysis, research, and program management for both international and domestic projects. Ms. Bhopal has experience designing and implementing M&E frameworks that measure operational efficiency as well as social impact; developing robust data collection, monitoring, and reporting tools; and conducting qualitative and quantitative data analyses. She also has experience providing capacity building and technical assistance in M&E to field-based partners and multisectoral stakeholders. Her portfolio of work includes adolescent health, HIV/AIDS, maternal and child health, sexual and reproductive health, education, democracy and governance, and youth-based entrepreneurship in Cuba, Malawi, South Africa, and Uganda. At EnCompass, Ms. Bhopal plays a key role in supporting the United States Agency for International Development's Latin America and the Caribbean/Cuba Monitoring, Evaluation, and Learning Services project and various strategic initiatives for the chief executive officer. Ms. Bhopal holds a bachelor of science in molecular, cellular, and developmental biology from the University of California, Los Angeles, and a master of public health from the University of San Francisco.

Rebecca K. Cathcart, M.P.H., P.M.P., is a research and evaluation expert with over 15 years of progressive field experience in monitoring and evaluation (M&E), capacity building, program evaluation, operations research, and program management. She specializes in the fields of global health and international development, with a strong focus on strategic planning, report writing, facilitation, quality improvement, qualitative and quantitative research, data management/analysis, and program design and planning. She has worked in 18 countries in Africa, including considerable experience in Rwanda. She has worked with a variety of donors and stakeholders including the United States Agency for International Development, U.S. Centers for Disease Control and Prevention, U.S. Department of Defense, U.S. Department of State, Global Affairs Canada (CIDA), Children Investment Fund Foundation, United Nations, ELMA Foundation, Nike Foundation, and World Bank. Ms. Cathcart holds an M.P.H. from the University of North Carolina at Chapel Hill, and is fluent in English and French.

Sylvestre Musengimana, M.A., is a Rwanda-based evaluation consultant with Encompass. His consulting expertise includes performance assessment and analysis, capacity development and strengthening, project implementation, and monitoring and evaluation. Mr. Musengimana has

extensive experience in qualitative and quantitative research, community engagement, gender, youth empowerment, social and behavior change communication, and workshop and conference facilitation. He has contributed to various donor-supported project evaluations in Rwanda, including efforts for the World Bank; United States Agency for International Development; UK Department for International Development; European Union; United Nations Educational, Scientific and Cultural Organization; United Nations Children's Fund; EKN (the Swedish Export Credit Agency); and Canadian Department of Foreign Affairs, Trade, and Development (formerly known as CIDA). Mr. Musengimana earned his B.A. in school psychology from the University of Rwanda in 2000 and his M.A. in educational management and administration from Kampala International University in 2011.

Appendix B

Public Session Agendas

TUESDAY, OCTOBER 23, 2018
National Academy of Sciences Building
2101 Constitution Ave, NW
Washington, DC 20418
Room 250

8:45 am EST **Welcome and Introductory Remarks**
ANN KURTH, *Committee Chair*

8:50 am **Overview of the Rwanda Human Resources for Health Program**
EMMA MTIRO, *Health Systems Strengthening Advisor, U.S. Centers for Disease Control and Prevention, Rwanda*

Q&A

9:30 am **Sponsor Remarks to the Committee**
SEAN CAVANAUGH, *Senior Tuberculosis Advisor and Rwanda Country Chair, Office of the U.S. Global AIDS Coordinator and Health Diplomacy*

9:50 am **Discussion with Committee**
SEAN CAVANAUGH, *Senior Tuberculosis Advisor and Rwanda Country Chair, Office of the U.S. Global AIDS Coordinator and Health Diplomacy*
LAURA PORTER, *Associate Director for Data Integration and Analysis, U.S. Centers for Disease Control and Prevention, Center for Global Health, Division of Global HIV & Tuberculosis*
EMMA MTIRO, *Health Systems Strengthening Advisor, U.S. Centers for Disease Control and Prevention, Rwanda*
TRACY BURNS, *President's Emergency Plan for AIDS Relief Coordinator, U.S. Embassy Rwanda (remotely)*
ALEXANDRA HOAGLAND, *Deputy President's Emergency Plan for AIDS Relief Coordinator, U.S. Embassy Rwanda (remotely)*

10:45 am **Closing Remarks**
ANN KURTH, *Committee Chair*

MONDAY, DECEMBER 10, 2018
Ubumwe Grande Hotel
Kigali, Rwanda
Room Kivu 1

10:00 am CAT **Welcome and Introductory Remarks**
ANN KURTH, *Committee Chair*

10:15 am **Opening Remarks**
ALEXANDRA HOAGLAND, *Deputy President's Emergency Plan for AIDS Relief Coordinator, U.S. Embassy Rwanda*

10:20 am **Remarks to the Committee**
SABIN NSANZIMANA, *Director, National HIV Program, and Division Manager, HIV/AIDS and Viral Hepatitis, Institute of HIV Disease Prevention and Control, Rwanda Biomedical Center*

10:40 am **Stakeholder Brief Introductions**
ANN KURTH, *Committee Chair*

10:55 am **Overview of the National Academies' Consensus Study Process**
SUSAN MILNER, *Study Director*

11:05 am **Evaluation of the Rwanda Human Resources for Health Program Under the President's Emergency Plan for AIDS Relief**
BRIDGET KELLY, *Independent Consultant*
SARAH SMITH LUNSFORD, *Evaluation Team Lead, EnCompass*

11:25 am **Discussion with Stakeholders**
ANN KURTH, *Committee Chair*

11:55 am **Closing Remarks**
ANN KURTH, *Committee Chair*

TUESDAY, MAY 30, 2019
Ubumwe Grande Hotel
Kigali, Rwanda
Room Kivu 1

2:00 pm CAT **Welcome and Opening Remarks**
ANN KURTH, *Committee Chair*
ALEXANDRA HOAGLAND, *Deputy President's Emergency Plan for AIDS Relief Coordinator, U.S. Embassy Rwanda*
JEAN PIERRE NYEMAZI, *Permanent Secretary, Ministry of Health, Republic of Rwanda*

Summary of Evaluation Scope and Approach
2:15 pm SARAH SMITH LUNSFORD, *Evaluation Team Lead, EnCompass*
KELSEY SIMMONS, *Evaluation Specialist II, EnCompass*

Panel 1: Overview of HIV-Related HRH in Rwanda

Objective: Gain understanding of the historical and current context of HIV-related human resources for health in Rwanda

2:30 pm *Facilitator:* Angelina Kakooza-Mwesige, Makerere University of Health Sciences, Kampala, Uganda

SABIN NSANZIMANA, *Director, National HIV Program, and Division Manager, HIV/AIDS and Viral Hepatitis, Institute of HIV Disease Prevention and Control, Rwanda Biomedical Center*
JOSEPH SHEMA, *Single Project Implementation Unit Coordinator, Ministry of Health, Republic of Rwanda*

Panel 2: HIV Service Delivery—Perspectives from Training and Practice

Objective: Learn from training and service delivery perspectives on areas of progress as well as ongoing challenges in clinical services for people living with HIV in Rwanda.

3:10 pm *Facilitator:* Mosa Moshabela, University of KwaZulu-Natal, South Africa

AGNES BINAGWAHO, *Vice Chancellor, University of Global Health Equity*
PHIL COTTON, *Vice Chancellor, University of Rwanda*
EMMANUEL MUSABEYEZU, *Head of Internal Medicine, King Faisal Hospital*
LAETITIA NYIRAZINYOYE, *Senior Lecturer, Community Health Department, University of Rwanda School of Public Health*

4:10 pm Tea Break

Panel 3: HRH Planning and Policy: Perspectives on the Future HIV-Related Workforce in Rwanda

Objective: Hear from stakeholders about their perspectives on future planning for HIV-related HRH in Rwanda.

4:20 pm *Facilitator:* Emmanuel Luyirika, African Palliative Care Association

ANDRE GITEMBAGARA, *President, Rwanda Nurses and Midwives Union*
RIBAKARE MUHAYIMPUNDU, *Director, HIV Care and Treatment Unit, Rwanda Biomedical Center*
DAVID NTIRUSHWA, *President, Rwanda Medical Association*
SAGE SEMAFARA, *Executive Secretary, Rwanda Network of People Living with HIV (RRP+)*

5:20 pm **Closing Remarks: Future Pathways to Strengthen and Sustain HIV-Related HRH in Rwanda**
JEAN PIERRE NYEMAZI, *Permanent Secretary, Ministry of Health, Republic of Rwanda*

5:30 pm Adjournment