EXPERIENCE REPORT

Learning Health Systems

Developing organizational learning for scaling-up community-based primary health care in Ghana

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Abstract

Introduction: Achieving effective community-based primary health care requires evidence for guiding strategic decisions that must be made. However, research processes often limit data collection to particular organizational levels or disseminate results to specific audiences. Decision-making that emerges can fail to account for the contrasting perspectives and needs of managers at each organizational level. The Ghana Health Service (GHS) addressed this problem with a multilevel and sequential research and action approach that has provided two decades of implementation learning for guiding community-based primary health care development.

Method: The GHS implementation research initiatives progressed from (i) a participatory pilot investigation to (ii) an experimental trial of strategies that emerged to (iii) replication research for testing scale-up, culminating in (iv) evidence-based scale-up of a national community-based primary health care program. A reform process subsequently repeated this sequence in a manner that involved stakeholders at the community, sub-district, district, and regional levels of the system. The conduct, interpretation, and dissemination of results that emerged comprised a strategy for achieving systems learning by conducting investigations in phases in conjunction with bottom-up knowledge capture, lateral exchanges for fostering peer learning at each system level, and top-down processes for communicating results as policy. Continuous accumulation of qualitative data on stakeholder reactions to operations at each organizational level was conducted in conjunction with quantitative monitoring of field operations.

Results: Implementation policies were enhanced by results associated with each phase. A quasi-experiment for testing the reform process showed that scale-up of community-based primary health care was accelerated, leading to improvements in childhood survival and reduced fertility.

Conclusion: Challenges to system learning were overcome despite severe resource constraints. The integration of knowledge generation with ongoing management processes institutionalized learning for achieving evidence-driven program action.

KEYWORDS

Community-based Health Planning and Services, community-based primary health care, Ghana, health systems strengthening, learning health system, research utilization, scaling-up

1 | INTRODUCTION

Ever since Ghana embraced the 1978 Alma Ata Declaration, it has pursued policies aiming to extend accessible community-based primary health care to all rural households.[1] This goal is being realized only now. When research at the onset of the 1990s showed that Ghana's commitment to achieving universal health coverage had languished, a program for developing a community-based primary health care research initiative was launched by the Ghana Health Service (GHS) that is known as "Community-based Health Planning and Services" (CHPS).[2] CHPS combines implementation research with actions that aim to enable Ghana to achieve universal access to primary health care.[3] CHPS research spans over two decades, providing mounting evidence that appropriate phasing of research and action can be used by policy-makers and managers to guide strategic decisions that must be made.[4] Although evidence-driven decision-making has been amply promoted elsewhere, Ghana's policies represent a unique strategy for institutionalizing learning processes. Rather than relying solely on the conduct of research, dissemination, and individualized training, a process of knowledge generation, systems learning, and action has emerged that has informed CHPS scale-up processes and enhanced prospects for achieving universal coverage of primary health care in the near future.

Data were routinely compiled from GHS reports that Dr. Awoonor-Williams managed as the director of the policy unit. In 2015, we published maps and graphs showing progress (*see* citation 37). In this article, we revisit these reported trends, but with a focus on the management of knowledge that is implied by what was learned during the monitoring process.

2 | METHOD

CHPS is the outcome of phased implementation research that integrated successive findings into GHS strategic decision-making.[5] After completing a decade of operation at the onset of 2009, monitoring data showed that reform was required, leading the GHS to revisit this phased research process to guide program improvement.[6]

2.1 | Developing CHPS

Phased embedded implementation research. The Ghana Ministry of Health is the central policy and financing component of the health system, while the GHS is responsible for the provision of preventive and curative care. The GHS organizational structure extends from national directorates in Accra to 16 regional directorates that are responsible for coordinating district public health and primary care services. There are currently 260 districts, each of which is divided into sub-districts charged with supervision of three to five CHPS delivery zones where community-based staff live and work. Each district has a District Director of Health Services who oversees a District Health Management Team (DHMT) comprised of public health paramedics. Each DHMT, in turn, includes a CHPS Coordinator who has supervisory authority over all CHPS community-based activities. A clinical hierarchy for primary health care is provided at hospital outpatient clinics, Sub-district Health Centers, and CHPS facilities termed "Community Health Compounds," where at least one nurse resides and provides care.[7]

Research for developing CHPS was coordinated by the Policy Planning Monitoring and Evaluation Division (PPME)[2,8] and initiated in Ghana's Upper East Region (UER) by a protocol of the Navrongo Health Research Centre (NHRC).[9] NHRC research on CHPS was conducted in collaboration with representatives of each level of the district health care system and pursued with terms of reference to PPME. This approach to research management, termed "embedded science," integrates the conduct of research and dissemination of results into the national health system.[10-14]

Navrongo research for CHPS development commenced in 1994. At this time, nearly 2000 "community health nurses" (CHN) had been hired, trained for 18 months in primary health care services, and deployed throughout Ghana. However, since resource limitations prevented investment in Community Health Compound construction, CHN were based in hospitals and sub-district clinics that were inaccessible to most households and already adequately staffed with resident paramedics. Owing to their deployment redundancy and inaccessibility, CHN posting was associated with only one patient per day per worker.

To address the accessibility problem, the Ministry of Health sought implementation research support from the NHRC for testing practical means of relocating CHN to communities. As a field station that was located in an impoverished district of northern Ghana, the NHRC was deemed to be appropriate for a field trial of community-based health services that would be relevant to rural settings elsewhere.[4,9,15-22] Pervasive poverty and adversity in the setting comprised interlocking health, social, and economic conditions that constrained efforts to provide services of any kind, comprising a context that no external commentator could dismiss as having been selected as a venue for optimizing prospects of success.

CHN who were available for the Navrongo project had been trained for 18 months and provided with a mandate to deliver the WHO mandated "Integrated Management of Childhood Illness" (IMCI) regimen of services,[23] to treat minor adult ailments and to provide prenatal, postnatal, and family planning services.[9] Since their training curriculum had lacked any orientation to community engagement strategies for launching community-based care, the CHN assigned to the project were provided with an orientation to community engagement methods and redesignated as Community Health Officers (CHO), a title that connoted their higher professional credentials as trained community workers.

The initial phase of the Navrongo project involved convening participatory planning activities in three communities for establishing mechanisms for implementing community participation and governance.[15,24] Implementation of services was conducted in conjunction with social research for developing appropriate service and assessing community reactions to strategies that were tried, a procedure that is

known as "participatory planning."[15,25] Traditional leaders, women's social networks, and social networks were continuously consulted to clarify practical means of integrating program management into mechanisms of traditional governance that would ensure operational accountability and sustainability of the care that CHPS would be providing. This phase 1 component of the research process comprised 18 months of participatory investigation and action (Figure 1A). Pursued in conjunction with advisory support from CHOs, supervisors, and DHMT, the pilot comprised a participatory systems appraisal of the operational feasibility of community-based services and strategic guidance on its implementation.[15]

Three intervention strategies emerged from this participatory process: (i) Governance could be delegated to Community Health Committees that marshalled sustainable volunteerism and solved implementation problems, such as the need for community engaged construction of interim facilities and (ii) community consensus could be developed by utilizing a tradition known as "durbars' for assembling all families in an open gathering that elicits community opinion and mobilizes social support for CHPS. Despite traditions that durbars are male-led, CHPS supervisor could focus on convening durbars that were directed by women, thereby contributing to women's autonomy on issues that were relevant to CHPS but not previously openly discussed, such as family planning. (iii) Service delivery could be implemented by resident CHO with social engagement support from volunteers who were recruited by health committees, trained by CHPS coordinators, and deployed to CHPS zones to support CHO services.

In 1996, the Navrongo research agenda was shifted from the phase-1 three-village pilot investigation of appropriate implementation strategy to a district-wide, phase-2 quasi-experiment of reproductive, and child health impact (Figure 1B).[26-28] Communities of three subdistricts were provided alternative experimental treatments represented by community-based services of CHOs vs services by volunteers vs services provided by a joint deployment of CHOs and volunteers. Communities in a comparison sub-district represented a fourth experimental cell where the usual deployment of CHN was sustained at a subdistrict clinic. Communities of all four cells received a common regimen of primary health care.

Childhood mortality declined by a third in 3 years and by half within 7 years in the two treatment subdistricts where CHO were deployed.[29] Independent nurse and volunteer deployment had no fertility effects even though doorstep services were provided. However, in communities where nurses and volunteers were jointly deployed, fertility results were pronounced. A one-birth reduction in total fertility was observed because community mobilization activities of male volunteers generated social accessibility of contraception for women that complemented the service accessibility of nurse provided family planning care.[21,30] The combined approach was therefore adopted as the model for guiding national policy.[17]

In 1998, all district and regional directors of health services were convened in a national conference known as National Health Forum for discussion of the Navrongo preliminary results. Despite definitive evidence that the Navrongo combined nurse with volunteer strategy could save lives and reduce fertility, results were the subject of policy discussion and debate. Regional and district managers in southern and central Ghana questioned the relevance of social conditions in the Navrongo locality to norms and customs that prevailed elsewhere. Also, debate ensued about the sustainability of the economic cost of the Navrongo model when its service strategies were replicated at scale. In response to this controversy, the GHS embarked upon phase-3 research for testing the transfer of the Navrongo model to other regions of Ghana, shifting the focus of research from demographic assessment to questions concerning replicability of the Navrongo service design (Figure 1C).[5] Nkwanta served as the initial pilot of this program.[31] A 1999 repeat National Health Forum was convened to deliberate on the initial Nkwanta replication trial experience. Presentations clarified essential implementation milestones associated with launching CHPS operations and generated consensus for launching CHPS as a means of scaling-up the Navrongo system nation-wide.[2]

Facilitated by this consensus, organizers of the Forum arranged for the Navrongo model to be declared as national policy in 1999.[2] To catalyze scale-up, each Regional Health Administration was requested to select at least one district to serve as a lead locality for demonstrating CHPS implementation procedures. Each designated team was comprised of the District Director of Health Services, the DHMT, and at least one sub-district health service team that included supervisors and clinically qualified CHO. Once these "lead district" teams had been designated, they were deployed to Nkwanta district where CHPS expansion activities were ongoing. Upon their arrival in Nkwanta, participants in lead district teams were paired with Nkwanta district implementation counterparts so that the Nkwanta process of community engagement for launching CHPS could be observed and district implementation plans could be drafted (Figure 1D). This demonstration process enabled district managers and sub-district and community implementers to acquire direct experience with the tasks and milestones associated with involving community leaders in program coordination and oversight, as well as mechanisms for building meaningful community participation in program health education and CHPS promotion. The combination of Navrongo and Nkwanta experiential demonstration with distribution of dissemination products provided participants with an understanding of best practices in initiating community-based care. Community activities also involved training participants in convening durbars for promoting awareness of project implementation milestones, celebrating the achievement of CHPS implementation goals, activities, or outcomes. Knowledge gained by lead district implementation team participants was supplemented with the provision of seed funds averaging $22 000 for financing the start-up cost of a learning locality in each participating lead district where CHPS could function as a demonstration platform for orienting neighboring community leaders to implementation processes. In this manner, while CHPS implementation was being cascaded through Nkwanta District, visiting teams were exposed to the Nkwanta methodical community-by-community spread of CHPS implementation. Once visiting teams were equipped with this experience, they could replicate the process in their home district, using catalytic for financing the cost of implementing a CHPS zone where Nkwanta-like implementation demonstration could commence.

Since the Nkwanta exchange program had worked well for spreading CHPS implementation capacity to participating lead
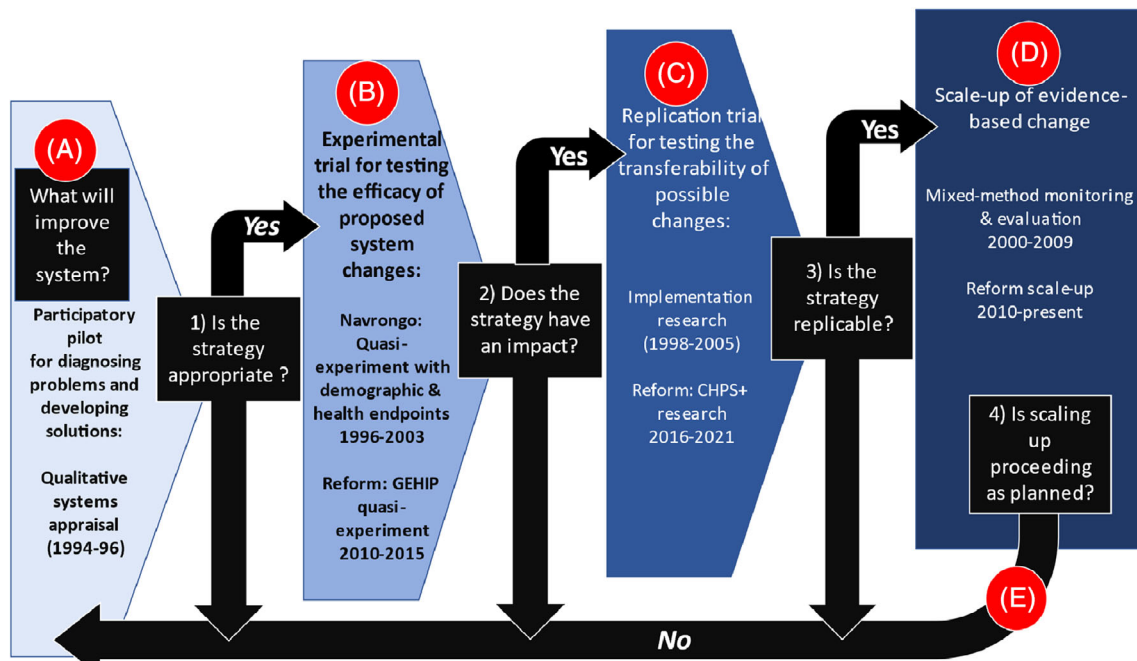
FIGURE 1 The phases of research associated with Community-based Health Planning and Services (CHPS) development and reform

districts, PPME extended its procedure with the goal of fostering CHPS scale-up. Eventually, 32 district teams visited Nkwanta for participatory training over the 2000 to 2004 period (Figure 1D). A monitoring system was developed for tracking and mapping district progress with milestone completion, as illustrated by Figure 2. A regimen of qualitative systems appraisals was convened in collaboration with regional directors of health services for gauging community reactions to CHPS and eliciting frontline worker, supervisor, and DHMT advice on appropriate ways to manage implementation.[33,34] The primary audience for this quantitative and qualitative monitoring output was a GHS Strategic Advisory Committee that was charged with reviewing results for gauging policy implications.[35,36] This combination of knowledge capture and utilization activities equipped CHPS with means for generating the upward flow of information about health systems functioning, implementation challenges, and evidence-based scaling-up.[8,37]

Managing knowledge for creating CHPS. At the onset of Navrongo research in 1994, dissemination of implementation science was limited to presentations at meetings, the circulation of reports, and the dissemination of policy documents that omitted provision for ensuring an upward flow of system learning or the sharing of implementation experience among peer CHPS implementation teams (Figure 3).[32,38] Moreover, research data collection and results dissemination separated the knowledge management process from the structure of managerial leadership and organizational communication. These disjointed episodes of evidence gathering were separate from the continuous process of management communication. For example, evidence used for policy-making was limited to information from survey research conducted in 5-year cycles[39,40] or clinical service volume reports that had no mechanism for feedback to frontline service providers or

district managers. Knowledge about implementation challenges and progress was consequently fragmentary and anecdotal because mechanisms for continuous bottom-up narrative reporting were limited. Budgetary limitations prevented all but the most routine dissemination activities.[38] Despite support among senior officials for its research agenda, dissemination of Navrongo results required supplementing the Figure 3 system with new modes of knowledge communication that would achieve a greater correspondence of information management with management itself.

To address the need for improved information for implementation management, the Navrongo research team established a fortnightly newsletter for orienting mid-level managers to the findings from research: *"What Works? What Fails?'"* As the phase-2 Navrongo experiment progressed, this newsletter was reviewed by an Office of the GHS Director General convened Steering Committee and disseminated to all DHMT to foster understanding of CHPS start-up challenges and solutions. Each edition was comprised of a two-page essay with photographs for building understanding of social problems, social engagement strategies, support from traditional leaders and local politicians, features of women's network support for CHPS, and other implementation issues. At the end of the Navrongo experiment in 2003, 150 of the notes that had been circulated to all DHMT, regional directorates, and national health system managers.

Nkwanta replication research provided opportunities to expand upon Navrongo methods and materials by refining the implementation process, disseminating replication experience through peer leadership and demonstration, and promoting consensus that scaling-up CHPS operations was feasible.[29,32]

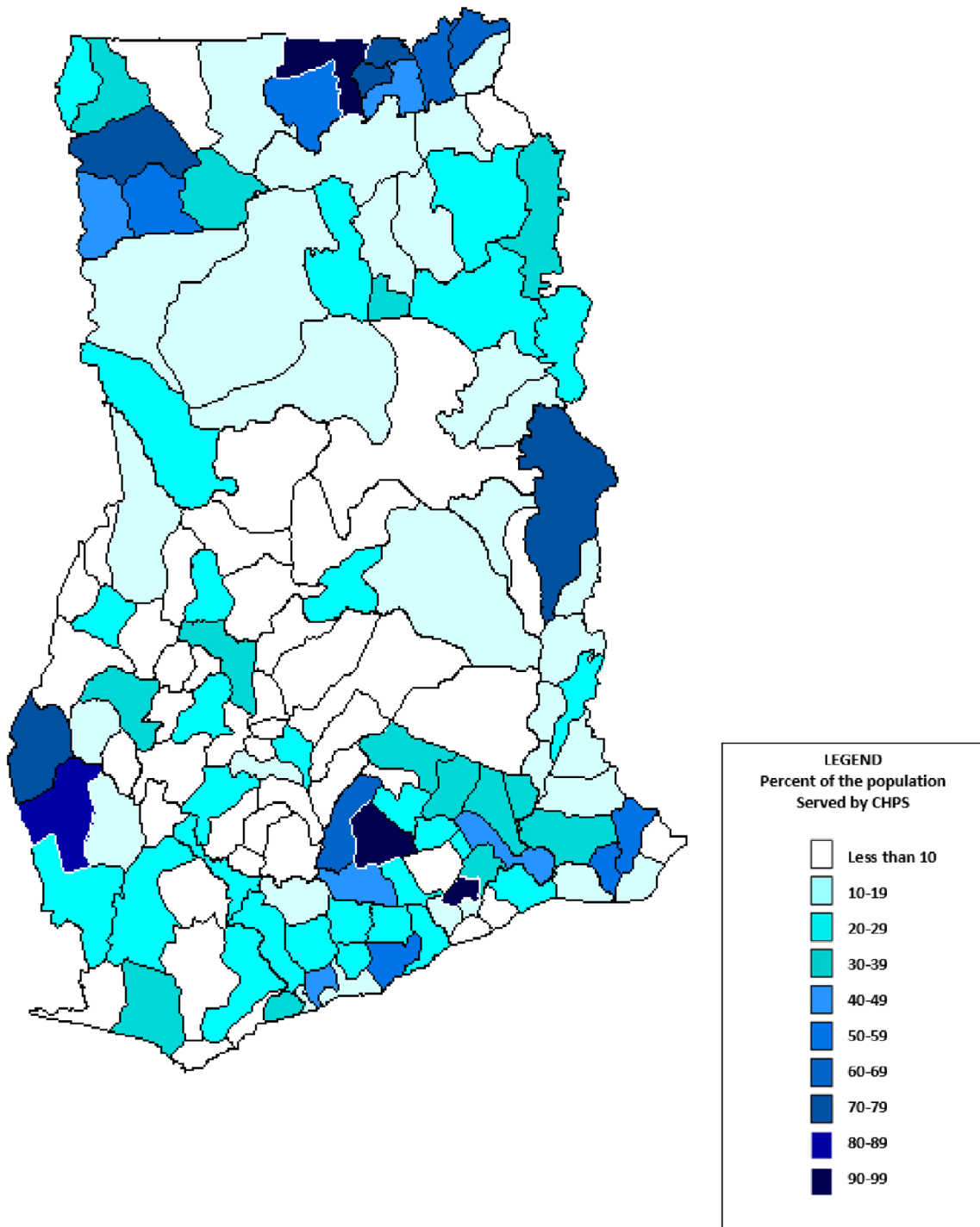Knowledge generated during the first decade of CHPS implementation monitoring provided consistent evidence that health

LEGEND
Percent of the population
Served by CHPS

Less than 10
10-19
20-29
30-39
40-49
50-59
60-69
70-79
80-89
90-99

FIGURE 2 The population density of Community-based Health Planning and Services (CHPS) implementation coverage by district of Ghana, December 2008[32]

benefits that would arise if its services were implemented according to plan.[41,42] And, dissemination of *What Works? What Fails?* provided documentation of the rationale for launching CHPS. Progress with expanding CHPS coverage was nonetheless uneven, as portrayed by the relatively few high CHPS coverage districts that are shaded dark blue in Figure 2.[5] Progress with CHPS scale-up was limited to districts where DHMT had been oriented to CHPS by implementers of the Nkwanta program and were provided with catalytic financing for start-up activities.[34] In other districts, however, progress in reaching the population was unacceptably slow, demonstrating that the spread of CHPS implementation capacity beyond the 32 Nkwanta demonstration districts was not progressing. Reform was needed if CHPS was to ever to function as a national program.
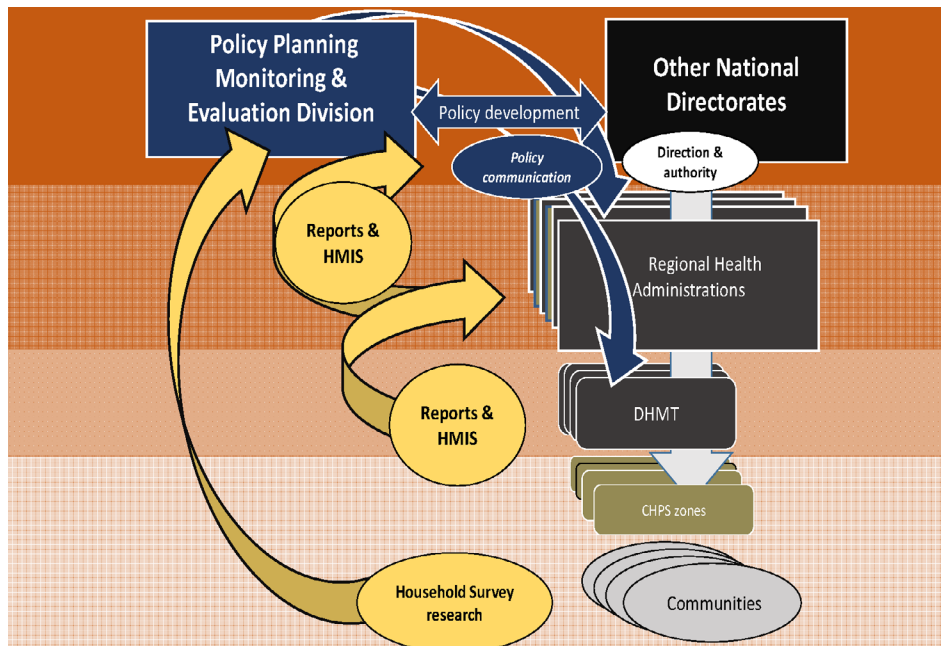
FIGURE 3 The health sector knowledge management system at the onset Navrongo Health Research Centre (NHRC) research operations

2.2 | Reforming CHPS

Phased embedded health system strengthening research. In 2009, three changes in the political context for CHPS implementation fostered an era of reform that accelerated CHPS coverage in the decade that followed: (i) In the course of Ghana's 2008 national election campaign, all presidential candidates endorsed the need to rapidly expand CHPS coverage, recognizing its popularity and health benefits. Once elected, the new government was obligated to follow through on election promises by developing revenue for CHPS from a special levy. (ii) All political and administrative officials at each level of the GHS system were instructed by the newly elected President of Ghana to consign priority to CHPS implementation. Earmarked budget lines were specified to support this priority and funding for CHPS was expanded accordingly. (iii) Prior to reform, CHPS "zones' had been configured by local health officials from groups of villages in a politically arbitrary process. New implementation guidelines were promulgated that reconfigured CHPS zone boundaries to correspond to local political electoral areas for electing district assembly members. This policy established congruence between grassroots political constituencies and implementation zones for CHPS services. This had the effect of converging boundaries for revenue from district development mechanisms with the boundaries for CHPS catchment areas demarcating CHO community engagement and service activities. This convergence of boundaries facilitated political process governing the flow of district development revenue to address the need to cover CHPS start-up costs.[4]

The Ghana Ministry of Health responded to the improved political context for CHPS implementation by launching a new phase 1 of a system learning process (Figure 1E). Reform commenced with the commissioning of qualitative research for comparing leadership perceptions of implementation processes in districts where CHPS had

progressed well relative to perceptions prevailing in districts where implementation had not progressed at a pace that was commensurate with national plans. Led by Professor Fred Binka,[43] this appraisal showed that implementation planning had drifted from the Navrongo-Nkwanta implementation model, reverting from the pursuit of community engaged management to a static community health post approach. Other studies confirmed this finding.[44-46] Although early implementation experience from Navrongo and Nkwanta had been communicated to senior managers and used to produce directives, this national commitment to CHPS was not being translated into effective district-level implementation. DHMT understanding of community engagement processes was generally lacking. Clearly, the knowledge management operations of the CHPS program were deficient.

To address the Binka et al report recommendations, a reform era phase-2 quasi-experiment was launched in 2010 to test the impact of implementing recommendations for reform and assessing the impact of doing so. Midlevel management CHPS implementation challenges were addressed in four UER treatment districts, with seven UER districts serving as comparison areas.[6,47] Known as Ghana Essential Health Interventions Program (GEHIP), the project tested the feasibility and impact of health system reforms that were posited in the MOH report as systems constraints underlying the CHPS implementation problem.[6,32] Nkwanta-like peer demonstration training was launched in conjunction with the provision of to $0.85 per capita per year for four successive years to enable treatment district DHMT to scale-up CHPS and improve emergency referral care.[48-50]

Monitoring showed that the combined effect of GEHIP interventions immediately accelerated the pace of CHPS implementation in treatment districts (Figure 4).[32] While national reforms also contributed to improving the pace of implementation in comparison districts, GEHIP was associated with double the pace of CHPS scale-up than
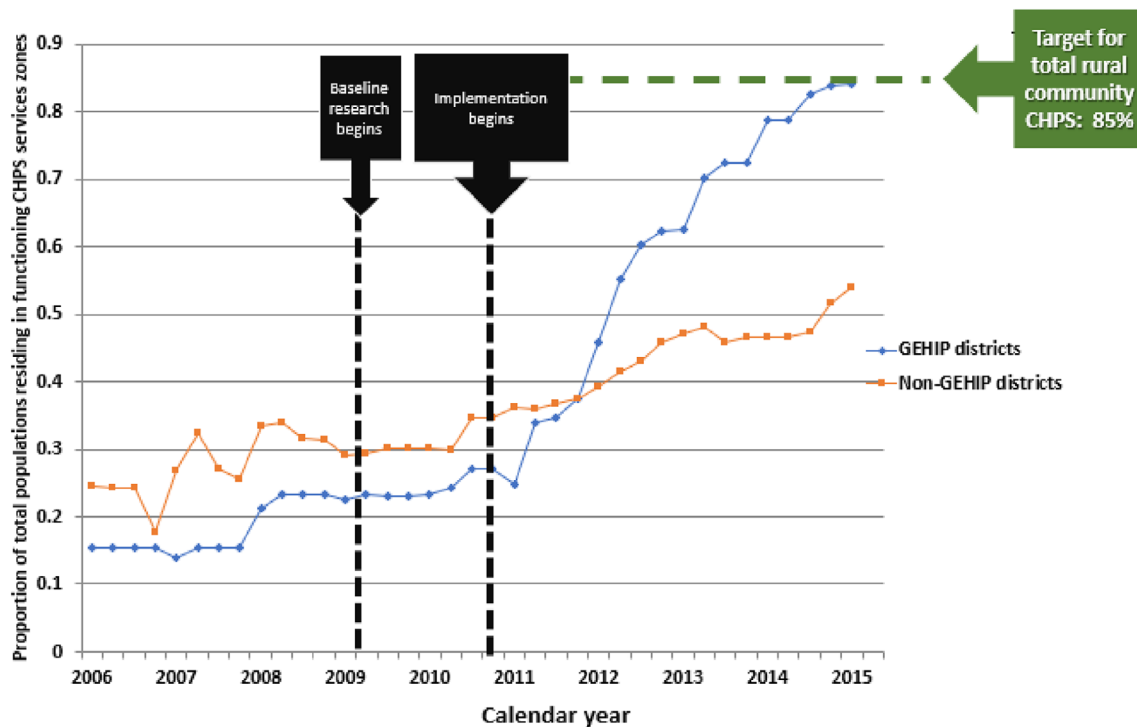
FIGURE 4 Proportion of total populations of Ghana Essential Health Interventions Program (GEHIP) treatment and comparison areas residing in zones where Community-based Health Planning and Services (CHPS) is functioning, Upper East Region, 2006–2015

was observed in comparison districts. CHPS coverage dramatically increased, reaching all targeted communities in GEHIP treatment districts within 4 years (Figure 4). This trend was associated with significant reductions in childhood mortality[51] and fertility.[52,53]

Refining knowledge management in the context of researching reform. The CHPS reform process was associated with a transition from research dissemination to the institutionalization of knowledge as "knowledge curation"[54,55] whereby each Figure 1 phase was repeated, but with knowledge from research organized as a continuous process of institutional learning. A core strategy of the GEHIP information system involved sustaining previous communication themes emphasizing the fact that CHPS is popular wherever it is implemented.[44-46,56] However, the knowledge management process was redesigned to improve the range of information that would be meaningful to managers at each level of the GHS organizational structure. This required implementation research products that were generated by GEHIP participants at each level of the GHS organization in the UER and dissemination procedures that focused on counterpart stakeholder information needs elsewhere in Ghana.

While GEHIP embraced communication processes that had been originally developed in Navrongo and Nkwanta, these mechanisms were supplemented with documentation focusing on implementation milestones.[49,57] This documentation, in turn, was utilized in the course of exchanges that involved GEHIP financed pilot CHPS zones that were used as platforms for demonstration and implementation learning. As this process of peer learning progressed, policy stakeholders were included in the GEHIP implementation demonstration process with the goal of fostering system learning among donors, senior officials, regional counterparts, and district managers. Taken together as a

set of activities that spanned all levels of the GHS organizational structure, with demonstration procedures supported with relevant printed guidelines and information resources, GEHIP research and dissemination mechanisms mirrored the routine management and communication operations of the GHS.[58]

Research knowledge management operations were thereby congruent with the health policy development and management system. By doing so, GEHIP transitioned CHPS research operations from the dissemination of separate products of investigation into an integrated knowledge management system. As such, integrated bottom-up, lateral, and top-down communication products were developed to support systems strengthening (Table 4). The bottom-up component was developed for regional and national program directors in the form of community inspired and frontline worker reports to their supervisors and directors. Activity summaries were focused on implementation processes by integrating results of interviews with frontline workers into routine UER reports to regional counterparts and national leaders. Additional knowledge management themes and activities were added to the dissemination agenda (Figure 5). To expand the audience for this material, the GHS launched periodic National Health Fora for progress communication aimed at building consensus among all implementation stakeholders about means of solving problems and ways to sustain progress.

3 | RESULTS

Several studies of the perceptions of district level managers, supervisors, and frontline workers show that general awareness of
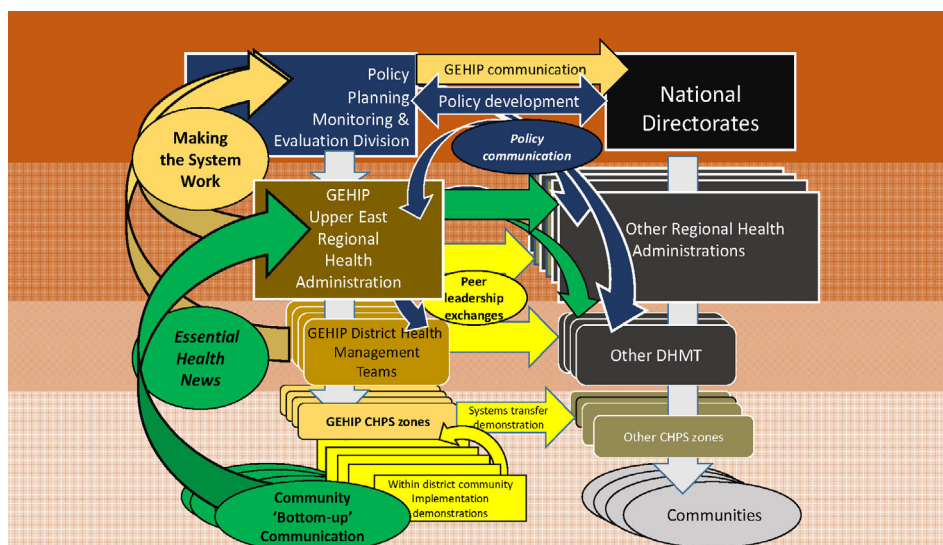
FIGURE 5 The Ghana Essential Health Interventions Program (GEHIP) knowledge management system

TABLE 1 Navrongo Phase-1 pilot findings and policy responses

Implementation research findings (Column 1)	Relevant project operational responses (Column 2)	National programmatic change or policy impact (Column 3)
Social barriers constrain the introduction of family planning and the provision of community-based primary health care.[16,18,61,62]	Community organization and diplomacy added as a training module.	Shift in national policy from training limited to clinical topics to curricula acknowledging the importance of community engagement.
Traditional religious belief systems are neither emphatically pronatalist nor antimodern.[22]	Project strategic planning was focused on gender stratification and outreach rather than religion,	*Nonresponse: Gender development strategies were not replicated or noted in policy documents.*[63]
Traditional gatherings termed "durbars' are valuable for building community consensus for action.	Durbars are used to introduce CHO and celebrate each step in the process of CHPS implementation.	*Nonresponse: Durbars are widely used by CHPS implementers but are unmentioned in policy documents.*
Actual and potential clientele were critical of "community health nurses' who were perceived as being arrogant and uncaring.	Project CHN were trained in community engagement and renamed "Community Health Officers.'	Redesignation of CHN who complete a 6-month internship mentored by CHO. This field internship was added to the clinical training syllabus.[2,8]
The mobility of young women was restricted by social customs that constrain women's autonomy.[18,61,64]	A "gender team' was convened to respond to gender development problems and needs of women through outreach to men.	*Nonresponse: Social engagement for gender development*
CHN were trained in clinical interventions only. Community assignment requires in-service training in community engagement and organization.[15]	Procedures for community liaison were developed and tested. Training procedures were revised to include demonstration and peer mentoring.	Six-month internship for CHN in community liaison training added to the training syllabus. CHN completing internships were redesignated as CHO.
CHO were often unfamiliar with local languages. Recruitment and posting were revised and should be intraregional. However, nurses should not be posted to their home village.[15]	Community engaged development of a center for CHO preservice training in Navrongo town. District-level recruitment without posting to home community.	National expansion of training facilities from 3 to 10, permitting regionalization of CHPS staffing. Nurse training centers developed in each region.
Communities will develop interim community health facilities with volunteer labor, permitting implementation to begin without delays associated with facility construction.[65]	All three community health compounds for the pilot project were constructed with volunteer labor, traditional architecture, and locally available materials.	Nkwanta replicated and refined community engagement methods including the interim facility approach; some districts replicated this approach based on lessons learned during exchanges.

the benefits of CHPS and means of implementing the program is widespread.[44,45,56,59,60] The combined effect of the phase-1 participatory process generated knowledge about implementation

challenges and solutions (Table 1, column 1). While social and economic circumstances posed barriers to aspects of program implementation, phase-1 participatory procedures elicited community

advice that clarified appropriate strategic responses (Table 1, column 2). Policy and action, in turn, were altered in response: Training and worker deployment protocols were modified to bring into account the perspectives of frontline workers and the communities being served (Table 1, column 3). However, gender development strategies[61] that had been demonstrated by Navrongo and Nkwanta research were not directly mentioned in policy documents (Table 1, italic entries). Social engagement strategies that had been demonstrated by research appear to have had limited impact on policy, apart from cursory mention of such activities in project-related manuals.[49,57]

Results from the Navrongo experiment provided credibility to CHPS development. However, the phase-2 implementation impact was less prominent than results emerging from other Figure 1 phases. Findings were anticipated by policy leaders who had planned to deploy nurses even before results were available, but lacked procedural clarity on how to implement this plan. Moreover, key findings regarding the ineffectiveness of volunteers have been ignored (Table 2, italic entries). National and international acknowledgement of impact was nonetheless critical to characterizing CHPS as the health component of the National Poverty Reduction Program.

Because phase-3 Nkwanta replication research was a response to practical concerns of District Directors of Health Services, its procedural impact was pronounced (Table 3). The series, "Putting Success to Work," documented the process of achieving milestones for implementing the program, decentralizing district processes, and other strategic details relevant to CHPS implementation. Documentation clarified the management requirements of implementing multiple CHPS zones that each required a localized process of planning and milestone completion. Documentation of this decentralized scaling-up process directly contributed to national operational policy.[31,32] By doing so, Nkwanta demonstrated practical means of overcoming resource constraints by utilizing demonstration communities to catalyze the spread of CHPS.[78] The program strategy was built upon notions that implementation teams are best equipped to scale-up CHPS if they have had opportunities to interact directly with counterparts who are capable of sharing their experience in addressing the need for implementation leadership and teamwork.

The reform process that was launched in 2009 was associated with incremental communication strategies aimed at supporting CHPS scale-up (Table 4). Each level of the service system was associated with products relevant to implementation managers. For example, a series, *Sharing Best Practices*, enabled frontline workers to communicate implementation innovation to superiors; a parallel series for regional directors, "*Listen Up*,' focused on problems and challenges that district managers encounter. Newsletters for GHS staff based in national directorates were designed to establish implementation learning communication among district-level and regional-level peers. Mechanisms for extending communication to multimedia resources of the GHS were developed by providing material to mass media representatives, leading to GEHIP team participation in radio talk-shows, televised news segments, and newspaper commentaries (Table 5).

4 | DISCUSSION

To support the institutionalization of GEHIP processes and outcomes, a new initiative has been launched to test the replicability of GEHIP in two regions and institutionalize its innovations for supporting CHPS improvement as a national program that reaching all 16 regions,[79] while simultaneously scaling up the initiative in all 13 districts of the UER thereby creating a region of excellence for policy learning.[80] Termed "CHPS+," this initiative aims to provide a framework for supporting the institutionalization of system learning. CHPS+ will not be a project, however. While health systems development projects may come and go, each providing elements of learning, each episode of learning loses momentum when protocol mandated activities end. Instead, CHPS+ will not only generate evidence, it will also curate knowledge as a process that will change the way that Ghana puts knowledge to use.

4.1 | Developing health system learning

Ghana has transitioned from capacity building that is limited to individual technical training to knowledge management activities that institutionalize learning. This approach to capacity building has been termed "knowledge curation."[54,81,82] Five strategic elements of GEHIP underpin its contribution to knowledge curation:

Systems congruence. GEHIP was designed to as a project that achieved "system congruence.' As such, its research was designed to span all levels of the GHS regional, district, sub-district, and community organizational hierarchy with mechanisms for knowledge sharing that was congruent with the information needs of managers at each corresponding level of the authority structure. Communication from GEHIP knowledge managers provided central policy makers and grassroots program administrators alike with organizationally relevant continuously updated information on the CHPS reform process. In this fashion, GEHIP provided support for CHPS implementation reform through "bottom-up" community and frontline worker generated communication of what works and what fails when teams attempt to conduct community-based services. Moreover, knowledge generated in the process was used to formulate "top-down" communication of policy, directives, and experience that would flow from senior officials located at the GHS secretariat in Accra. "Lateral" peer-to-peer communication instituted by GEHIP for regional and district managers provided leaders with field demonstrations of the service delivery model included provision of printed information. By integrating documentation into the peer learning process, GEHIP contributed to the sustainability of learning that was grounded in field observation.[77]

Developing national leadership understanding of CHPS implementation has been critical to CHPS implementation scale-up. Site orientations, conducted in conjunction with staff meetings at the national and regional levels, provide pragmatic review of problems and strategies for solving them. A national secretariat was convened to coordinate the policy requirements of the program, organize

TABLE 2 Navrongo phase-2 trial findings and policy responses

Implementation research finding (Column 1)	Relevant project operational responses (Column 2)	National programmatic change or policy impact (Column 3)
Community governance is critical to the effective implementation of CHPS	Community Health Committees were rapidly developed in 16 experimental project service zones.	Community Health Committee formation was acknowledged by the GHS as an essential milestone.[66]
Interim facility construction could be scaled up for the experiment where community governance is well implemented.		*Nonresponse: Interim community initiated construction not included in policy documents.*
Volunteer-provided basic health care services can lead to parental delay in health seeking and elevated risk to children.[17,67,68]	Volunteer activities modified to focus on health promotion rather than care.	*Contradictory response: Donor-sponsored programs have supported the recruitment, training, and deployment of volunteers for health service delivery.[69-71]*
Volunteer deployment has no mortality impact, but volunteer support for nursing services is essential to family planning.[68,72]	Volunteer activities limited to supporting CHO. Health service activities curtailed.	
Communities will provide support to nurses: Security, backstopping, promotion of care.[15,31,36]	Project implementation of volunteer support activities.	*Nonresponse: Community engagement inadequately emphasized in policy documents.*
CHO deployment reduces childhood mortality, but fertility effects occur only if volunteers provide outreach to men.[29,30]	"Gender development team' constituted to provide support for women; outreach to men.	National policy focuses on implementing CHPS zones with resident CHO.
Scaling up the Navrongo project in comparison areas had sustained childhood mortality impact and equity effects.[73,74]	Nurse provision of the WHO integrated management of childhood illness regimen.[23]	CHPS becomes the health component of the National Poverty Reduction Programme.[75]

TABLE 3 Nkwanta phase-3 replication trial findings and policy responses

Implementation research finding (Column 1)	Relevant project operational responses: (Column 2)	National programmatic or policy changes (Column 3)
The Navrongo model is replicable and sustainable in a contrasting cultural and ecological setting.[31]	The Navrongo-Nkwanta service model is accepted as national policy in 1999.[2]	Implementation of the CHPS policy commences in 2000.[5]
Results for several key indicators exceed impact of the original Navrongo project.[34]	Rapid scale-up to 18 Nkwanta CHPS zones in 2 years.	National policy: Implementation guidelines specify milestones.[8,76]
Six critical milestones are essential for starting CHPS operations in a given service zone.[31]	Milestones used to scale-up CHPS in Nkwanta and disseminated to 10 "lead districts' in each region.	
Catalytic financing is critical to the successful launching of CHPS in a given district.[47]	Integration of visiting teams into Nkwanta CHPS phasing in activities combined with awarding seed funds for launching CHPS in one demonstration zone of each participating district.[77]	A mapping system was developed for national CHPS coverage monitoring by illustrating coverage according to district progress with implementation milestone.
Replication capacity is effectively communicated with exchanges.[14,78]	32 district implementation teams rotated through Nkwanta for peer participatory learning over the 2002-2004 period.	*Contradictory response: The Government of Ghana embraced an unrelated donor-mandated priority district approach.*
Progress with CHPS scale-up was concentrated in districts where management teams had experienced peer learning exchanges in Nkwanta or Navrongo.[78]		Develop one "lead district' in each region to spread implementation capacity.[5,72]

TABLE 4 Ghana Essential Health Interventions Program (GEHIP) knowledge management goals, mechanisms, and audiences adapted from Navrongo and Nkwanta

Knowledge management system				
Strategic component	**Activity**	**Goal**	**Mechanism**	**Audience**
Bottom-up communication	Activity summaries	Bottom-up communication	Digital media: Short email communications every week	UER Regional Director & National PPME Director
Lateral communication (mid-level)	Interdistrict peer exchanges	Participatory learning through peer demonstration	On-site observation of CHPS community engagement processes and leadership development	District Health Management Teams
Lateral communication (community level)	Intradistrict community exchanges	Build grassroots political support and involvement of chiefs, elders, and women's groups	Participatory learning through community leadership participation in CHPS rollout celebration	Development sector leaders, district assemblies, and lineage heads
Lateral communication (senior level)	Site visits	Senior officials and donors visited GEHIP districts for orientations	Interpersonal leadership exchanges	Senior officials
Lateral communication (senior and mid-level)	National Health Forum and National Health Summits	Policy consensus building via a meeting of GHS district, regional, and national directors	Project team lead communication in national leadership meetings known as the: National Health Forum or the National Health Summit	For the National Health Forum: DHMTs, RHAs staff, and health professionals in Ghana For the National Health Summit: Regional and national directors
Lateral communication (external)	International conference presentations and publications	Consensus building: Dissemination of research designs, methods, results, and implication	Presentations in international and national scientific conferences. Publication in scientific and policy journals.	Senior policy community; donors; and international scientific community
Top-down policy communication	Embedded communication	Integrate project communication into routine GHS reports, policy pronouncements, and guidelines	Annual and quarterly reports; policy and program directives; and routine monitoring narrative reports from field visits	Implementation leaders at the regional, district, and supervisory levels

meetings, and generate external resources for sustaining program operations. National health conferences have provided an additional medium of communication about research findings, deliberations on draft policies, and learning emerging from CHPS implementation experience.

GEHIP also adapted its knowledge management strategy to culturally compatible communication norms.[83] Some respected observers have noted ways in which the institutions of lineage, chieftaincy, and traditional social governance can be antimodern or constraining to gender development or social progress.[18,44,61,84] But GEHIP countered this perspective by marshaling traditions of social organization for providing organizational support for the program's social change agenda.[15,16,31] This has involved finding strategies for convening community health committees in providing oversight for CHO care activities, orienting workers to community organization and outreach, and building supervisory understanding of the importance of community engagement. In this people-centered perspective of GEHIP management, CHPS scale-up is more likely to be successful and effective if the organizational culture of the frontline service operation was consistent with social organization and norms.[85-87]

Evidence-based credibility: GEHIP revised the national information system for monitoring the geographic coverage, pace, and content of CHPS-sponsored services. The reformed system was designed to be responsive to DHMT management information needs and yet functioning as a component of the national health management information system. By visualizing relative district progress with CHPS coverage and milestone completion, the provision of progress information could be readily accessed and understood. Dissemination of coverage maps was augmented with the sharing of qualitative research outcomes to ensure that advocacy of project results was grounded in a rigorous body of evidence. Dissemination was designed to support regional and national staff meetings for reviewing lessons, soliciting comments, and planning future policies and site visits for teams of implementers to interact with counterpart teams of innovators. At the heart of the operation was the notion that research-based evidence must continuously guide decision-making and priorities for what must be changed and whether change itself is actually occurring.

TABLE 5 Ghana Essential Health Interventions Program (GEHIP) knowledge management component products and activities

Dissemination strategic component	Dissemination product	Dissemination mechanism goal	Mechanism	Audience
Bottom-up communication	*"Sharing Best Practices'*	Identify and recognize innovators or champions of CHPS improvement.	Print media: • Mailed monthly • Occasionally printed in local newspapers • Social media and emailed.	Regional and District Health Management Teams throughout Ghana
Bottom-up communication (by frontline workers and community stakeholders)	*"Listen Up!'*	Provide personal stories of stakeholders at each level of district health systems as well as clientele or community leaders who have been impacted by CHPS services.	Print media: • Mailed monthly • Social/digital media posted to the blog/website/Facebook and emailed as digital newsletter.	Regional and District Health Management Teams throughout Ghana
Bottom-up communication (by district managers)	*Making the System Work*	Provide detailed implementation guidelines to DHMT.	Printed for national dissemination	Regional and District Health Management Teams
Lateral communication	*GEHIP Newsletter*	Highlight the key activities and findings of the project.	Social/digital media: Websites Emailed as a digital newsletter	Regional Health Management Teams and national directorates, donors, health professionals.
Advocacy	Essential news	Disseminate key program developments to the general public.	Radio broadcasts (regional and, occasionally, national)	General public

Embedded science. Products of GEHIP research were transmitted as officially sanctioned information that embedded into the GHS routine communication operations. Mechanisms for communicating policies for guiding CHPS were utilized for communicating GEHIP findings.[3] Pictorial and textual information on district implementation innovations were presented with maps portraying in visual format activities and progress. System information was shared by regularly updating monitoring results, following principles of embedded implementation science.[10,14,81]

Strategic flexibility. Developing accessible primary health care has been a health sector goal in Ghana for over four decades. CHPS contributions to achieving this goal have required phased research, overlapping periods of investigation, often with multiple methods and endpoints. Each phase has generated new questions requiring new implementation strategies. This flexibility has permitted the refinement of operations and the development of policy over time.[4]

Change as the primary research outcome. Health development project results are typically expressed in terms of the impact of interventions on mortality, morbidity, or fertility. While GEHIP embraced this perspective, it has also aimed to facilitate systems understanding of the reform process. By convening activities that generate evidence-based approaches to improving CHPS operations, GEHIP not only developed relevant information, but it also shared this knowledge in ways that facilitated the use of evidence at each level of the system. As such, the project became a catalyst for fostering continuous organizational change. Understanding whether a program for introducing improvements in a health service system is working requires answers to questions that GEHIP was convened to address: Is operational change occurring? If so, where is change occurring? If not, what

components of the program are delayed, and where are these delays most evident? If change is occurring, how fast is change progressing? These questions were answered by GEHIP research and communicated to CHPS implementation stakeholders at each level of the GHS system to foster consensus that action is needed in response to lessons that have emerged. Evidence-driven action, implementation, and operational improvements are continuous. As such, the GEHIP process will never end.

4.2 | Limitations

Where themes from research dissemination are at odds with social norms or institutional mandates, their impact on implementation has been constrained. Italic entries in Tables 1-3 summarize findings that have not had their intended policy or implementation impact. Research teams in Navrongo and Nkwanta could take concerted social mobilization actions to solving implementation challenges associated with gender stratification, resource constraints, or communication barriers. Volunteer mobilization, community durbars, and health committees could provide resources for construction, communication, or service support. But social mobilization tends to be external to the usual functioning of the health service operations. The need for social action and learning represents a continuing challenge for the effective health sector management of CHPS scale-up. With its 82 distinct ethno-linguistic groups, Ghana is so ethnically diverse, that its community health program must be adaptive, decentralized, and flexible. Thus, there remains a need for continuous development of CHPS research and national strategic programming. Systems learning has

progressed in the past, but achieving further progress remains fragile. It remains possible that externally contrived projects will be created, financed, launched, and completed without reference to the implementation science process that we advocate. Moreover, recent studies in Ghana have shown that implementation is often incomplete, systems support is sometimes deficient, and quality of care merits improvement.[44,88,89] The reform process that we advocate is work in progress that is far from complete. Balanced information on implementation challenges is needed with the goal of progressing from achieving total coverage of CHPS operations to achieving fully functional universal health coverage.[90]

5 | CONCLUSION

Ghana has launched a process of capacity building that is not limited to staff and leadership training, research dissemination, or policy pronouncements. Instead, it has established an integrated systems learning approach with knowledge curation at its core and evidence utilization as its primary outcome. While the initial decade of CHPS development was associated with an unduly prolonged phased research process, knowledge gained set the stage for rapid progress once the political and fiscal context for implementation enabled scale-up to progress. Reform was enabled by a learning health system.

While progress to that end has been substantial, more work on sustaining knowledge curation remains. Political investment during the reform era bridged all levels of the system, including the previously neglected midlevel managers. Once they were engaged with the process of organizational change, policies for enacting change began to work. This systems approach provided a transition from CHPS as the outcome of a research process into a fully articulated GHS learning institutional process. Rather than functioning as a research project, CHPS constitutes a learning system that continuously links evidence with action, and by doing so, curates knowledge gained in the past as a resource for sustaining change in the future.

CONFLICT OF INTEREST

The authors have no conflicts of interest to declare.

AUTHOR CONTRIBUTIONS

The GEHIP and CHPS+ initiatives were designed by James F. Phillips and John Koku Awoonor-Williams. Its protocol was developed by James F. Phillips in collaboration with John Koku Awoonor-Williams. The initial manuscript preparation was drafted by James F. Phillips.

DATA ACCESSIBILITY

This case study is based on the operational and research experiences of the authors. Note that Figures 2 and 4 present routine, publicly available data.

ETHICS STATEMENT

The GEHIP was a GHS project conducted in collaboration with the Columbia University Mailman School of Public Health according to approved GHS protocol number GHS-ERC: 07/7/10 and Columbia University Research and Compliance Administration System protocol number IRB-AAAF3509(Y2M00). The National Program for Strengthening the Implementation of the CHPS Initiative in Ghana (CHPS+) is an ongoing GHS collaboration with program of the GHS, the University of Ghana Regional Program for Population Studies, and Columbia University. IRB approval for CHPS+ and its data collection and research operations has been granted by the ethical review board of the GHS under protocol number GHS-ERC 04/01/2017 and by the Columbia University Research and Compliance Administration System of Columbia University under protocol number IRB-AAAR0315.

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+primary+health+care+development+in+Ghana.+In:+Bisha+D, +Schleiff+M,+eds.+Health+for+All+%E2%80%93+Success+Stories +from+Countries+that+Transformed+People%E2%80%99s+Health: +Essays+t&pg=PA225&printsec=frontcover.

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