



Scaling Up High-Impact Health Interventions in Complex Adaptive Systems: Lessons from MCHIP

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Program Descriptions

The Maternal and Child Health Integrated Program (MCHIP) is the USAID Bureau for Global Health's flagship maternal, neonatal and child health (MNCH) program. MCHIP supports programming in maternal, newborn and child health, immunization, family planning, malaria, nutrition, and HIV/AIDS, and strongly encourages opportunities for integration. Cross-cutting technical areas include water, sanitation, hygiene, urban health and health systems strengthening.

The Maternal and Child Survival Program (MCSP), is a global U.S. Agency for International Development (USAID) cooperative agreement to introduce and support high-impact health interventions in 24 priority countries with the ultimate goal of ending preventable child and maternal deaths (EPCMD) within a generation. MCSP supports programming in maternal, newborn and child health, immunization, family planning and reproductive health, nutrition, health systems strengthening, water/sanitation/hygiene, malaria, prevention of mother-to-child transmission of HIV, and pediatric HIV care and treatment. MCSP will tackle these issues through approaches that also focus on health systems strengthening, household and community mobilization, gender integration and eHealth, among others. Visit www.mcsprogram.org to learn more.

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Abbreviations

AAP	American Academy of Pediatrics
CAS	complex adaptive systems
CHW	community health workers
GOI	Government of India
HBB	Helping Babies Breathe
iCCM	integrated community case management
MOH	ministry of health
NGO	nongovernmental organizations
PPFP	postpartum family planning
PPIUD	postpartum intrauterine device
SBA	skilled birth attendant
SEC	Soins Essentiels Dans La Communauté

Executive Summary

Many global health programs in low- and middle-income countries focus on supporting scale-up to accelerate health gains. Scale-up efforts aim to expand and institutionalize proven health interventions so that they become a part of routine practice within national health systems and available to everyone who needs them.

At the same time as greater attention is being paid to taking interventions to scale, practitioners, donors, and researchers in global health are changing their thinking about how national health systems work. Replacing the traditional view of Ministries of health as unified institutions that can be molded into new forms, national health systems are increasingly being recognized as complex adaptive systems (CASs) with diverse components and actors that interact in multiple ways with each other and with the external environment. When interventions are scaled up within such systems, there are multiple interactions with these various components and actors in complex ways, making outcomes unpredictable.

There are potential tensions between the goal of scaling up specific, well-defined health interventions in every hospital, clinic, and community across a country and the complex reality of how health systems deliver services. Although scale-up efforts frequently attempt to make the desired intervention as simple as possible to implement, even simple interventions require replacing an old behavior with a new one which is an inherently complex endeavor. The variable results of efforts to increase and maintain the use of new health technologies and practices suggest that we have more to learn about how to achieve scale.

Researchers have drawn on practical experience and complexity science to offer insights into how scale-up efforts can best take account of the complex nature of health systems (Paina & Peters 2012; Ramalingam 2013). However, there has been relatively little empirical evidence on how CASs positively and negatively affect scale-up processes and outcomes and, more importantly, how scale-up efforts can harness aspects of CASs to produce desired changes.

BACKGROUND AND RESEARCH OBJECTIVES

This report grew out of a review of the scale up of six maternal and child health interventions in three country settings each (Larson, Ricca, Posner, & Raney 2014). The objective of the review was to identify effective scale-up strategies. The analysis was based on the ExpandNet framework developed by a WHO-led consortium of scale-up practitioners and researchers (ExpandNet 2010). It found several promising implementation strategies that correlated with progress in increasing coverage and institutionalization of the interventions. The strategies included a nimble scale-up team that shepherded the scale-up activities from national policy development to local implementation, post-training support to help implementers overcome obstacles to adopting the intervention at the work site, and responsiveness to community demand. These findings were not novel; they are similar to strategies recommended by the ExpandNet network and other guides to scaling up interventions (Cooley & Ved 2012; ExpandNet 2010; Subramanian, Naimoli, Matsubayashi, & Peters 2011; Yamey 2011).

For this report we shifted our perspective from looking for effective strategies to looking at implications of CASs for taking interventions to scale. We assessed the implications of viewing the health system as a CAS for making sense of the unexpected challenges and opportunities and the responses of stakeholders. We aimed for a deeper understanding not of what strategies worked but of how they worked and under what circumstances.

Our analytical approach—looking at unexpected health system behaviors and responses to these—is derived from approach described by Axelrod and Cohen in *Harnessing Complexity*

(1999). Their purpose was to identify ways that social and other interventions could change complex systems by taking advantage of their adaptive nature. They noted that it was impossible to plan a response to every possible way a CAS might act, as there are too many possibilities. However, one can identify likely CAS behaviors—the ones to address if the intervention is to be a success—by observing what happens and what surprises emerge as one intervenes. Understanding the causes and effects of those surprises makes it easier to determine how to leverage (if they are positive) or suppress or mitigate (if they are negative) the ways in which the CAS reacts to advance the goal of scaling up the target intervention.

METHODS

The data for this report are drawn from four retrospective qualitative case studies of efforts to scale up three high-impact health interventions in diverse national contexts: postpartum IUD (PPIUD) services in India; integrated community case management of childhood illnesses (iCCM) in Mali; and newborn resuscitation using the Helping Babies Breathe (HBB) approach in Malawi and Bangladesh. The two HBB scale-up efforts were included to demonstrate how scale-up strategies, rather than national context, affected outcomes. These in-depth studies drew on interviews with informants at the international, national, subnational, facility and community levels as well as reviews of project reports and evaluations. The PPIUD and iCCM cases studies were led by one independent consultant and the HBB process documentation case study was led by a different consultant, reducing the potential of researcher bias.

Each scale-up effort was described using the ExpandNet framework of five elements and four strategic choice areas. Subsequent analyses used context-sensitive qualitative approaches to generate and test hypotheses about which scale-up strategies drove increased coverage and greater institutionalization. For this study the data were reanalyzed to identify surprises and response by the scale-up effort to those surprises, if any. Lastly, we assessed how the scale-up design and implementation influenced the scale-up effort's ability to respond to these surprises.

FINDINGS FROM THE CASE STUDIES

The four case studies demonstrate most of the elements commonly found in programs to expand and institutionalize a health intervention. However, the scale-up efforts employed different processes and strategies. The scale-up of PPIUD services was highly adaptive, tailored to local administrative and clinical capacity. It expanded in phases, informed by monitoring data and other information. The HBB scale-up efforts were top-down, emphasizing policy development, cascade training, and end-of-project evaluations, all orchestrated from the national level. The iCCM scale-up effort in Mali operated through top-down policies and training, with considerable local autonomy.

Each scale-up effort was subject to surprises or unexpected consequences, both positive and negative, including funding constraints, supply chain problems, resistance from clinicians, support from community members and nongovernmental organizations, and abrupt policy changes. None of the people involved in implementing or coordinating the scale-up efforts could have prevented these surprises from emerging. The effectiveness of their response to the surprises differed greatly.

INTERPRETING THE FINDINGS WITH A CAS LENS

We used properties and behaviors of CASs to understand the causes and consequences of the surprises. CASs have diverse actors and interactions. Some characteristics of CASs that make outcomes unpredictable are path dependency, interdependent subsystems, feedback processes, new forms of self-organization, and nonlinear outcomes. Examining these characteristics helps to make sense of why efforts to scale up health interventions are vulnerable to less than ideal outcomes. Previous policies and tacit norms affect how people and organizations respond to a new intervention. Different parts of the health system and different members of work units have their own behaviors that may be resistant to change.

When a change is adopted by an individual or subsystem, other people and units will either ignore the change or adapt in helpful or obstructive ways. For these reasons, it can take a long time before changes in practices are sustained and expanded, although it is also possible for changes to occur quite quickly.

When viewed using the CAS framework, the surprises encountered in the scale-up efforts were understandable; some were even probable. However, it would not have been possible to anticipate the surprises when designing a multiyear scale-up effort. No amount of planning can ensure that a scale-up effort will be free of surprises. However, in the scale-up efforts that were most effective in responding to surprises, key actors had greater knowledge of the conditions of implementation in facilities and communities and greater resources (financial and human) to adapt their strategies to support improved practices at all levels of the health system.

IMPLICATIONS FOR PRACTICE

Using the insights from the four case studies, we identified features that would make future scale-up efforts better prepared to address the unexpected behaviors of complex, dynamic health systems:

1. **Capabilities to respond** to dynamic and unpredictable health systems
2. Employing **accelerators** of expansion and institutionalization that complement how individuals in a CAS behave
3. **Adaptive mechanisms** for responding to changes of context

Under these three features are ten recommended scale-up design elements. The following *capabilities* are recommended for scale-up efforts working in systems characterized by path dependency, interdependent subsystems, and nonlinear outcomes:

- Adequate, flexible funding with a long range perspective
- Scale-up teams with reach to facilities and communities and the ability to be responsive and adaptable to problems arising in implementation
- Supportive policies to define the essential principles of the intervention
- Mechanisms to collect, share, and take action on information about implementation

The second group of recommendations involves *accelerators* of expansion (i.e., increased adoption of the intervention) within the health system. The strategies leverage the following characteristics of CAS: feedback loops, self-organization, and nonlinear outcomes. Depending on the context, one or more of these strategies can transform the intervention from one that is externally imposed to one that is internally owned:

1. Understanding the motivations and obstacles faced by frontline workers and other significant agents who will implement the intervention
2. Offering tailored support to overcome initial problems with adopting the intervention
3. Encouraging local initiatives to deliver the intervention
4. Guarding against increasing inequity by implementing different strategies, depending on local or subsystem capacity

The final two recommendations are for design elements that enable *adaptive mechanisms* for maintaining and advancing gains in changing contexts:

1. Utilizing communication channels and relationships to create consensus about adapting to new and/or changing contexts
2. Monitoring and sharing broad outcome indicators

CONCLUSIONS

Adopting these recommendations will not guarantee that a scale-up effort will succeed—that is, that utilization of the intervention will expand throughout the country and that it will be institutionalized in the health system. The nature of CAS behavior limits the level of certainty we can have in a system’s ability to adapt successfully to a scale-up effort.

However, we feel that scale-up efforts that take account of these features of CASs stand a better chance of success than those that limit their focus to policy development and training. The key actors involved in the scale up effort should be more likely to recognize sources of resistance, obstacles, and opportunities quickly and be ready to adapt their support strategies to achieve scale up goals.

Our recommendations are not unique. They exhibit similarities to a number of adaptive scale-up models that have already been published and are informing practice. This study confirms that efforts to scale up high-impact interventions should not aim to suppress the unexpected, but rather should harness CAS behaviors and incorporate them for better scale-up design and implementation.

Background and Research Objectives

There is much more to learn about how [Complex Adaptive Systems] theory can be applied in practice to the process of scaling up, particularly in developing countries. . . .Therefore, examining health systems processes from a CAS perspective is an important and underexplored research area, which promises to provide interesting and useful insights for health theory and practice. L. Paina & D. H. Peters, Understanding pathways for scaling up health services through the lens of complex adaptive systems, 2012

The process of “scaling up” a high-impact health intervention is intended to expand and institutionalize a new health care practice, technology, or system with the potential to reduce mortality or morbidity. Taking high-impact health interventions to scale has become the goal of many international development assistance programs as a response to the HIV/AIDS epidemic, as a way to achieve the Millennium Development Goals, and as an approach to implementing global initiatives for the control of malaria, tuberculosis, and polio (Chandy 2013; Mangham & Hanson 2010).

The focus on scale-up stems from dissatisfaction with the impact of projects that are limited in time and scope and designed to meet short-term needs, such as responding to a humanitarian crisis, demonstrating a promising practice, or delivering improved services to an underserved population. In contrast, efforts to scale-up a practice or intervention operate at a national or near-national scale (e.g., all rural districts), deliberately acting to strengthen the capacity of the national health system to sustain an intervention and expand it to reach more people.

Unfortunately, the results of efforts to scale up technical interventions have been variable. For every relative success, such as greater access to antiretroviral medications for people infected with HIV in sub-Saharan Africa and increased coverage and range of childhood vaccines, there are other interventions, such as handwashing in hospitals and distribution of antimalarials to pregnant women in endemic areas that have not become part of routine care. Furthermore, even in some countries where interventions have been expanded, external financial and technical support continue to be required to sustain coverage and health gains.

A growing body of work synthesizes research and practical experience into frameworks to improve the design, implementation, and evaluation of scale-up efforts (Adamou et al. 2014; Atun 2012; Atun, de Jongh, Secci, Ohiri, & Adeyi 2010; Bradley et al. 2012; Cooley & Ved 2012; ExpandNet 2010; Hartmann & Linn 2008; Simmons & Shiffman 2007; Yamey 2011, 2012). Each of these models describes elements, strategies, and activities that should be part of every scale-up effort. Two reviews of scale-up models, which reviewed several of the models cited above, observed that the models had many similarities, including adapting to the local context; engaging stakeholders and users; strengthening capacity in policymaking, management, and delivery; and learning by doing through experimentation and adaptation informed by regular monitoring (Cooley & Linn 2014; Subramanian et al. 2011).

Despite the identification of these promising practices for scaling up interventions, they are not consistently incorporated into scale-up designs. Subramanian and colleagues (2011) have argued that many efforts (especially efforts to implement global health priorities advocated and funded by consortiums of multilateral and bilateral donors) have used blueprint approaches that assume interventions will be implemented in the same way across countries and in every setting within countries. In contrast to the recommended approaches of adaptation and strengthening capacity, these initiatives emphasize acquiring and dispersing funds to achieve rapidly expanding coverage consistent with government policies.

Researchers and practitioners promoting the tailored and adaptive approaches to scaling up interventions argue that these approaches are more effective because the health systems

they are trying to change are complex adaptive systems (CASs) (Lanham et al. 2013; Paina & Peters 2012; Sarriot & Kouletio 2014). CASs are systems that have many different actors who follow implicit or explicit rules and interact with each other and others who might or might not share those rules. These interactions sometimes result in actors adapting their behavior, which may lead others to adapt similarly or in a different way. The outcomes can be unpredictable.

Although there is no universal theory of complex systems, the concept of the CAS has been used as both a tool and a metaphor to understand and influence systems as diverse as the internet, ecosystems, and international development (Axelrod & Cohen 1999; Page 2011; Ramalingam 2013). This approach seeks to improve the effectiveness of efforts to change systems not by minimizing complexity but by taking advantage of CAS behaviors to “harness complexity” (Axelrod & Cohen 1999).

In the past 15 years researchers interested in reforming and strengthening health systems have been exploring how to apply concepts from complexity science (de Savigny & Adam 2009; Plsek & Greenhalgh 2001). Because efforts to reform complex health systems can take unexpected turns and produce unexpected outcomes, studying these processes requires a methodology that is sensitive to change (Gilson et al. 2011). According to Plsek and Greenhalgh (2001), “the only way to know what a complex system will do is to observe it.” Similarly Paina and Peters (2012) have called for a closer examination of how scale-up efforts are affected by the behaviors of the complex systems they are trying to change.

Axelrod and Cohen (1999) propose that it is not practical to experimentally test for the most effective strategies to change CASs because the contexts and interactions are too variable. However, the search can be hastened by looking for “surprises”:

Surprises are actions that came out better, or worse, than expected. Either kind can fuel improvement. The essential thing is to see what factors were observable or predictable in the short-run that were correlated with the surprise. . . . Those are the factors to which you should give increasing credit if you want to speed the process of learning (Axelrod and Cohen 1999, pp. 224–225).

In this study we describe the “surprises” scale-up teams and stakeholders encountered in the four in-depth case studies. We analyze the surprises that occurred across some of the case studies as examples of CAS behavior and studied which responses by the scale-up effort enabled them to address the surprises in a manner that contributed to expanding and institutionalizing the intervention. From these insights we draw implications for practice and compare them to current scale-up frameworks.

We do not offer a recipe for scale-up success. Instead, we have the more modest goal of confirming how scale-up designs that understand, anticipate, and respond to CAS behaviors can contribute to positive change.

Methodology

This study follows a tradition of examining scale-up efforts through qualitative case studies and key informant interviews (Bradley et al. 2012; Greenhalgh, Russell, Ashcroft, & Parsons 2011; Simmons & Shiffman 2007; Woolcock 2013; Yamey 2012). Retrospective multi-case studies are regularly used to investigate a phenomenon in-depth and within its real-life context, especially when the boundaries between the phenomenon of interest and its context are not clear, as is the case with taking interventions to scale (Yin 2009). Through rich descriptions, case studies produce plausible causal chains, and by comparing these within and between cases, we can generate insights that can be adapted or tested in other settings (Bradley et al. 2012).

Case studies have a number of advantages for investigating scale-up. They are comprehensive and can take into account all of the elements of a health system and their interactions as well as interactions between health and other sectors, such as local government, or other national policies (Adam et al. 2012). By drawing information from multiple informants who participated in or were affected by the scale-up effort in different levels and settings, qualitative case studies produce a nuanced narrative of processes from the perspectives of those who were involved (Bradley et al. 2012). They can elucidate the planned and unanticipated triggers, enablers, and barriers to change and their consequences (Resnicow & Page 2008; Yamey 2012). Case studies are more likely to be sensitive to nonlinear impacts—changes that were the result of multiple influences and feedback loops, which only occurred in specific contexts or had larger (or smaller) impacts than had been expected. Because stakeholders are both the subjects of and the audience for case studies, the findings can be presented in a manner that will be meaningful from their perspective and therefore more likely to be relevant to them (Greenhalgh et al. 2011).

DEFINITIONS

Taking interventions to scale has become an explicit goal of many global health programs. These programmatic efforts to achieve scale have surpassed progress on clarifying the exact definition of the term “scale up.” The term “scale-up” has been applied to initiatives at any point along the continuum from advocating for, to piloting, expanding, and even maintaining the delivery of a health intervention new to a setting. Furthermore, it is not clear what constitutes *scale*. Scale-up may move an intervention from a single village to an entire district, and to more districts or more regions. For this study, scale-up efforts are taken to be ones in which resources are directed to expanding the intervention nationally or near-nationally.

Most definitions of scale-up include the two goals of expansion and institutionalization. Expansion is defined in terms of outcomes—in particular, increased coverage of eligible beneficiaries—and outputs, such as geographic reach and number of health workers trained. Institutionalization is more difficult to define and has been interpreted to mean performance of the tasks necessary to deliver a service (Gomez, Dickerson, & Roman 2012), government leadership demonstrated through official policies and integration of an intervention in routine processes and service delivery (Larson et al. 2014), and long-term sustainability (Sarriot, Swedberg, & Ricca 2011). In this study, evidence of institutionalization is sought by looking at the plausibility that the intervention will continue to be practiced in a similar form and with the same or better outcomes within the national health system after the current scale-up effort.

METHODS

The study is part of a larger review of efforts to scale up six high-impact health interventions, each in three country settings. The 18 cases were drawn from work supported by MCHIP, the USAID flagship maternal, newborn, and child health program operating in more than 50 countries between 2008 and 2014 (Larson et al. 2014). MCHIP technical teams

selected the cases as examples of national or near-national scale-up efforts that had achieved some degree of institutionalization and expansion by the end of the period.

Four of the 18 scale-up efforts were selected for a more intensive investigation of the drivers and barriers to institutionalization and expansion across several technical interventions and national contexts. The aim was for the cases to reflect the range of scale-up efforts undertaken by global health donors. The case studies were not intentionally selected to reflect different scale-up outcomes or processes.

One of the case studies looked at the expansion of postpartum IUD (PPIUD) services within health care facilities with high delivery volumes in India. Another examined integrated community case management (iCCM) for increasing treatment of life-threatening childhood illnesses in isolated communities in Mali through the recruitment, training, and support of a new cadre of community health workers (CHWs). These case studies were led by the same international consultant (AL) with the help of local research firms.

The third and fourth case studies, conducted in Malawi and Bangladesh, looked at scale-up efforts to improve newborn survival by using an approach known as Helping Babies Breathe (HBB) to identify and respond to babies who have difficulty breathing at birth. The two HBB cases were based on independent investigations into the processes and outcomes (Centre for Child and Adolescent Health 2014; Gupta et al. 2013; McPherson 2014a, 2014b). The process documentation was conducted by an international consultant (RM), and the questions addressed were similar to those explored in the PPIUD and iCCM case studies.

Including the HBB case studies added robustness to the overall study because they examine the same technical intervention and similar scale-up processes across different national settings. They also reduce the potential for bias when all of the data are collected and interpreted by the same researcher.

Data were collected in early 2014. All scale-up efforts had been operating for two to four years. The case studies drew on similar data collection methods and analysis (Table 1).

Table 1. Processes Used To Ensure Rigor in the Case Study Data Collection

	Postpartum IUD (PPIUD) service provision within a postpartum family planning approach in India	Integrated community case management (iCCM) of childhood illnesses in Mali	Helping Babies Breathe® (HBB) approach to newborn resuscitation in Bangladesh and Malawi
Study design within cases	<ul style="list-style-type: none"> ▪ Two states in which MCHIP had supported taking the intervention to scale ▪ At least two districts (total of 7 districts) in each state and between 1 and 4 facilities within each district visited ▪ Facilities selected based on scale-up implementers' assessment of well- and poor-performing sites 	<ul style="list-style-type: none"> ▪ Two regions in the south of the country ▪ One district in one region supported by MCHIP and two districts in a second region ▪ In each district one community health center visited ▪ Districts selected based on informants' view of good and medium performance 	<ul style="list-style-type: none"> ▪ Process documentations conducted in both countries by an independent consultant ▪ With the advice of informants, consultant visited a range of facilities and observed training sessions

	Postpartum IUD (PPIUD) service provision within a postpartum family planning approach in India	Integrated community case management (ICCM) of childhood illnesses in Mali	Helping Babies Breathe® (HBB) approach to newborn resuscitation in Bangladesh and Malawi
Sampling of informants	<ul style="list-style-type: none"> ▪ Interviews held with representatives of financial and technical development partners, staff of the scale-up teams nationally and in the states, state and local government officials, district managers, in-charges at facilities and labor wards, and all service providers and counsellors available at the time of the visit ▪ Total of 122 individuals interviewed 	<ul style="list-style-type: none"> ▪ All available stakeholders from national, regional, and state government and representatives of main development partners, including MCHIP officers ▪ At the districts, representatives of the federation of community health associations and the district health service ▪ At the community level, the director of the health center, representatives of the community health association, mothers and community leaders and at least three CHWs ▪ Total of 63 individuals interviewed 	<ul style="list-style-type: none"> ▪ Same strategies used in both countries: semi-structured interviews with key stakeholders, including ministry of health officials at the national, regional, district, and subdistrict levels; representatives from regulatory and academic institutions, including nursing and midwife councils, nursing colleges, and medical colleges; health workers and administrators currently providing services at various levels of the health system; representatives from partner organizations, including scale-up team; and researchers leading the ongoing HBB evaluations
Mixed data collection methods	<ul style="list-style-type: none"> ▪ Semi-structured one-on-one and small group interviews; examination of activity records; review and analysis of supporting documentation; secondary analysis of activity reports 	<ul style="list-style-type: none"> ▪ Semi-structured one-on-one and small group interviews; examination of activity records; review and analysis of supporting documentation; secondary analysis of data from independent reviews for 7 MCHIP-supported districts 	<ul style="list-style-type: none"> ▪ Semi-structured interviews; structured observations of the availability and condition of resuscitation equipment and examination of facility records of newborns with birth asphyxia during visits to health facilities; audit of reports and documents pertaining to HBB at the global and country levels

	Postpartum IUD (PPIUD) service provision within a postpartum family planning approach in India	Integrated community case management (ICCM) of childhood illnesses in Mali	Helping Babies Breathe® (HBB) approach to newborn resuscitation in Bangladesh and Malawi
Evidence of impact	<ul style="list-style-type: none"> Information on trends in acceptance rates and follow-up in supported states, incomplete for national trends; information not yet available on impact 	<ul style="list-style-type: none"> Limited information available at present on impact on child mortality or health-seeking behavior 	<ul style="list-style-type: none"> HBB outcome evaluations were conducted by independent researchers in both countries to measure change in provider performance of resuscitation, using multiple rounds of structured observations of deliveries at facilities participating in the program and matching facilities that had not yet had HBB training

Rigorous data collection and analysis of qualitative processes were used to strengthen the validity of the findings through triangulating results in multiple sites, cases, and methods, ensuring internal and external validity by engaging stakeholders at multiple levels, and confirming plausibility of causal relationships through chronology and constant comparison of negative and positive instances (Gilson et al. 2011).

The analysis used a staged process that included both theory-driven and inductive approaches. First, each study team undertook an independent analysis of their case to describe the scale-up process and identify success factors and obstacles, using scale-up frameworks by ExpandNet (ExpandNet 2010) or Yamey (2011). The subsequent country reports were presented to stakeholders for feedback to ensure the accuracy and validity of initial findings.

Second, analysis focused on identifying drivers of scale-up effort success. Drivers were defined as intentional and unintentional actions or attributes of the scale-up effort that led to increased coverage or institutionalization. We derived these by comparing context and strategies between sites within countries and between scale-up efforts across interventions.

Third, we identified “surprises”—incidents in which, according to informants, the scale-up effort faced resistance or obstacles or had unexpected outcomes. We used the identified drivers to understand how, if at all, those surprises were addressed and the consequences for scale-up success.

LIMITATIONS OF THE STUDY

The case studies were confined to scale-up efforts advocated for and supported through external assistance from USAID through MCHIP, in partnership with national ministries of health (MOH) and other financial and technical development partners. The experiences documented and analyzed were collected retrospectively and restricted to a relatively short timeframe of the past four to five years. These experiences are only slices of longer processes of health system change. Lastly, although there were broad similarities between the methodologies used in each case, there were inevitable differences due to time, access to informants and data, and the differing capacities of research teams.

Scale-Up Efforts and Their Surprises

OVERVIEW

Table 2 summarizes the main features of each scale-up case. Because the two efforts to scale up HBB had very similar processes and outcomes, they are examined together.

Despite the differences in interventions, the cases have a number of similarities. They all aimed for national or near-national expansion; they all worked almost exclusively with government health services; and each was supported by external financial and technical assistance.

Table 2: Settings and Characteristics of the Interventions to Be Scaled Up In the Four Case Studies

Intervention	Country	Geographic and health service setting	Characteristics of the intervention
PPIUD	India	High delivery load government facilities in most Indian states, expanding to all district and subdistrict facilities in some states	PPIUD services offered at facilities with high delivery load; services included counselling about postpartum family planning and PPIUD insertion and follow-up for acceptors
iCCM	Mali	Communities located 5 km or greater from a community health center in five southern regions	New cadre of community-based health workers to diagnosis and treat common cases of malaria, pneumonia, malaria, and acute malnutrition in children 2–59 months as part of a broader set of primary health care services to be delivered by the workers under the <i>Soins Essentiels Dans La Communauté (SEC)</i> program
HBB	Bangladesh and Malawi	In Bangladesh, all skilled birth attendants in government facilities, including those working in the community and selected providers in all government facilities in Malawi	Birth attendants follow standardized approach to identify if a newborn is breathing normally and to take appropriate action during the first minute of life if the baby is not breathing.

The following sections describe the four scale-up efforts using the ExpandNet framework. For each we present the relevant political, social, economic, and health landscape that influenced how the scale-up effort was designed and introduce the health workers and other actors who directly or indirectly implemented the intervention. Next we describe the characteristics of the teams supporting the scale-up effort and the strategies they employed.

For each case study we illustrate the dynamic and unpredictable nature of scaling up interventions through several surprises or challenges that arose during implementation and discuss how the scale-up effort responded. These surprises were ones that were salient to the key informants and used to explain the unexpected challenges or barriers they faced. Lastly, we describe the outcomes and likely future of scaling up the intervention.

The scale-up efforts themselves also had elements of complexity. They were the products of international and internal politics and history. They attracted a diverse range of supporters and detractors and therefore were constrained in how they could influence the health system. Understanding a scale-up effort's unique story is important for making sense of its response to surprises.

PPIUD, INDIA

The Landscape

Increasing women's knowledge of postpartum family planning (PPFP) and access to a PPIUD within 48 hours of delivery had high-level support within the Government of India (GOI). The intervention was strategically aligned with a major health reform agenda to reduce child and maternal mortality through numerous nationwide initiatives, including a network of community health agents to educate and motivate healthy practices, policies to enable and reward women to give birth in facilities, and an emphasis on birth spacing and reduced reliance on permanent methods.

Development partners shared this agenda. Many, including USAID, had a long history of supporting India's family planning and maternal and child health programs. Several partners had previously supported the GOI's policy to expand access to interval IUDs as a strategy to promote healthy birth spacing and to stay involved in other maternal and child health initiatives.

Resistance to expanding PPIUD services in India came from two sources. The first was from obstetricians concerned about the safety and acceptability of IUDs, reflecting their prior experience with high rates of expulsion and infection. The second emerged from the strong ethos that family planning programs must be voluntary, ensuring free choice untainted by targets and coercion. This was a particular issue for India given its history with coercive practices during the National Emergency in the mid-1970s.

The Scale-Up Effort

Financing

The GOI funded all of the recurrent costs (training, supplies, and salaries) to expand and institutionalize PPIUD services. Commodities were purchased through the national program. All other operational costs were met through a scheme that funds states to implement 40 priority public health programs. Donors provided funds to meet the non-recurrent costs of the scale-up effort.

Resource Team

Technical and program officers in the Ministry of Health and Family Welfare and state health departments were responsible for scaling up PPIUD services. No coordinating body or taskforce met regularly to discuss the scale-up effort or broader reproductive health programming. Several international donors funded an MCHIP partner with long-term sequential five-year grants to provide technical support. The MCHIP partner formed small teams based in Delhi and high-focus states, led by medical doctors with extensive national and state professional networks.

Implementers/Users

The program was run almost exclusively through government health facilities and medical colleges. These included regional and district hospitals and community and primary health centers with a high delivery load. Labor wards are staffed by obstetrics-trained medical officers, nurse-midwives, and associate nurse-midwives. The lower level the facility, the less likely there is to be a resident doctor and the more likely it is that normal deliveries will be attended by an associate nurse-midwife.

Expansion Strategies

The PPIUD scale-up effort was implemented in stages, driven by changes in government objectives. The program started in 2008 with demonstration sites in one or two district hospitals and medical colleges in a couple of states. By 2010 these sites and a few other large facilities had become training sites, and 16 other states were targeted. In each state two service sites were established as future training sites for staff from other facilities.

In 2012 the GOI decided that most states had the capacity to continue to expand PPIUD services. High-priority states with large populations and poor maternal and child health indicators were targeted for additional support to expand the service to all district hospitals and then to community health and large primary health centers.

Advocacy

Advocacy and dissemination of information was a core part of the scale-up effort. In the earlier years the scale-up team worked closely with leaders of the Federation of Obstetrics and Gynaecological Societies of India (FOGSI) to change medical resistance to PPIUD. They sponsored information booths and gave presentations at conferences; senior clinicians were invited to be trainers.

Sharing information on acceptance and follow-up rates happened at every opportunity. An annual national meeting of PPIUD service providers from all states helped to consolidate broad support and a shared body of knowledge about good practices. These meetings were also held at the state level so that districts could share implementation experiences. The India scale-up team participated in international forums and training programs in other countries.

The national and state scale-up teams also had regular contact with national and state officials to discuss progress, emerging issues, and plans for future expansion.

Organizational Processes

Two strategies were used to foster the sustained delivery of PPIUD services in facilities: training and post-training coaching. The scale-up team provided technical assistance for the preparation of a PPIUD reference manual and related training materials, which were approved by the GOI. The three-day training had a number of essential elements: Training was to be conducted in small groups of no more than eight people, ideally including two people from each facility, and provided at sites and by clinicians who were already providing PPIUD services. Training incorporated knowledge, observation, and hands-on practice of counselling and safe PPIUD insertion with acceptors. Training was the responsibility of the states, but the scale-up teams provided technical support and advice when requested. In the high-priority states the scale-up team visited facilities after staff had been trained to orient managers, health workers, and support staff such as cleaners about postpartum family planning and PPIUDs. They then continued to visit sites every one to three months for 12 to 18 months, until the service was fully institutionalized. The visits were programmed as non-recurrent scale-up costs. State and district officials were not expected to maintain supportive PPIUD visits after the practice had been institutionalized.

Monitoring and Evaluation

The reference manual required every facility offering PPIUD services to maintain insertion and follow-up registers. Selected indicators were extracted and summarized for monthly reports to the district and aggregated at the state and national levels. In high-priority states the state officials and scale-up team received more detailed reports, which included names of providers who did insertions. The national scale-up teams used information shared by the states to produce monthly reports describing recent activity. The national monthly report showed the cumulative number of insertions by state.

Challenges, Surprises, and Responses

Medical Colleges Were Problematic As Service Sites

Many of the first service and training sites were medical colleges. The medical colleges' leadership was expected to facilitate the scale-up of PPIUD. However, the scale-up team and GOI soon realized that medical colleges were problematic sites for service delivery and training because of their role as referral hospitals. They generally served a high proportion

of women who did not attend antenatal care at the facility and were brought in for emergency services. Furthermore, unlike at other government facilities, at medical colleges interns and residents, rather than staff nurses, attend normal deliveries. In addition, medical colleges prefer to use their own training procedures to instruct junior doctors. While they were able to train medical officers from district facilities, some did not embrace the idea of training nurses to do PPIUD insertions. Although some medical colleges in other states were very effective service and training sites, in the states visited for the case study, the district hospital in the state capital and one or two other high delivery load district hospitals conducted more insertions and trainings than the medical colleges.

Health Workers Did Not Offer Services after Training

In the first year or two of implementation the scale-up team became aware that very few service providers conducted PPIUD insertions after training. After discussion with the providers it became clear that there were a number of obstacles to service delivery, and strategies were developed to minimize them.

First, the providers did not have time for postpartum family planning counseling during their busy antenatal care sessions in outpatient departments. The scale-up team tried placing (and training) counselors in high delivery load facilities, and this proved so successful that the GOI introduced and paid for the positions.

Second, providers faced other practical challenges to their confidence in their ability to introduce a new practice. Most providers had done one PPIUD insertion on their own during training, but that was not sufficient to give them confidence to do unsupervised insertions in the labor ward. In addition, their peers and managers were not familiar with the program and only a few had been trained. The scale-up team started visiting each facility soon after the training and then on a regular basis until the service was established, as described above. The monthly reports on numbers of insertions, follow-up rates, and names of service providers who did the insertions assisted them in prioritizing their support visits.

During the visits, the teams did not tell the facilities how to implement the service. However, they offered input, including expert opinions about clinical issues, ad hoc training, and suggestions for ways to address operational obstacles such as the organization of the labor ward, use of IEC materials, and record keeping. This input would not have been available to the facilities in any other way. The doctors and nurses appreciated the visits and said that they helped them gain the motivation and confidence they needed to implement and sustain a PPIUD service.

Peer Learning and Other Unexpected Local Actions

As facilities became more accustomed to offering PPIUD services, some took the next steps to expand and institutionalize the practice on their own. Peer learning was one such step. Experienced doctors or nurses who had formal training would encourage interested colleagues to start inserting PPIUDs, first having them observe and then encouraging them to undertake their own supervised insertion. Peer learning helped work units maintain or increase the numbers of clinicians available to give insertions at each shift, especially in the face of frequent staff transfers. The practice also reflected an internal recognition that the service had become a part of routine obstetric care.

The external scale-up teams, concerned about service quality, kept watch for incidents of service providers inserting PPIUDs without having gone through the training and tried to hold onsite training to be sure that the new providers were skilled. However, peer learning was such a common practice in facilities with high delivery loads and medium to high acceptance rates that it is likely to increase in time, outstripping the capacity of the scale-up team or state training units to keep up with onsite trainings.

Localized Supply Issues

The PPIUD scale-up effort had the advantage of working with a well-functioning national logistics system for contraceptives. There were no stock-outs of IUDs at any level. However, there were other supply needs that, in most cases, the states were responsible for meeting with funds provided by the national government. One large state regularly encountered obstacles in the timely procurement of sufficient numbers of printed training materials. At the suggestion of the scale-up team, state officials agreed that the fees paid to training facilities could include the costs of duplicating the materials. The facilities then took on the responsibility for printing the materials.

Multiple Strategies Needed To Increase Acceptance of PPIUD

The scale-up effort sought to expand PPIUD access by first establishing the capacity to supply the service and then increasing demand. When the service was first introduced in the facility the focus was on providing counselling at the facility during antenatal visits and before and after labor. As service providers and counsellors gained experience they recognized that women took many factors into account when making a decision about accepting a PPIUD. The counselling they received was only one factor. Other factors included the opinions of women's husbands and other family members, the views of other women who were similar to the clients, and the availability of other, perhaps more familiar, methods. At some facilities counsellors and providers found ways to include family members in counselling sessions and sought the support of community health agents who could accompany women for antenatal and birth. The PPIUD team supported these efforts by presenting information on postpartum family planning to all hospital staff (including cleaning staff) who came into contact with pregnant and postpartum women, and by contributing to the training of the community health agents.

Major Policy Changes Posed Risks to the Program

Several significant policy shifts occurred as a result of the scale-up effort. The most far-reaching had yet to be implemented by the time of the fieldwork. The GOI introduced incentive payments to community agents and service providers for each PPIUD acceptor. The implications of this policy were not yet clear. On one hand, PPIUD was one of the only family planning methods that had not previously been associated with an incentive payment, so its introduction could correct prior biases. On the other hand, there was a great risk that the relatively large incentive payment would distort the information and services offered to women, or worse, increase the likelihood of coercion. During fieldwork the scale-up team was in regular contact with national and state officials to discuss the implications of the policy change and specifically how the incentives could be delivered to improve rather than risk service quality. One proposal was that the payment be split: the first part paid at time of acceptance and the second after a follow-up visit.

Outcomes

PPIUD services in India appear to have passed a tipping point from which greater increases in coverage can be expected through an institutionalized service. In very few years PPIUD services grew from a small, potentially high-risk project to an approach central to the government's health and population policies. The practice is now embedded in national and state health services, a critical mass of providers have been trained to give counselling and insert PPIUDs, and there is increasing demand from pregnant women and their families.

Donors and the GOI are calling for the introduction of PPIUD services in even more sites and for greater engagement of community health agents. The supply chains, training, and, to a lesser extent, monitoring are all the responsibility of the government. New donors and nongovernmental organizations (NGOs) are incorporating postpartum family planning, and specifically PPIUD, into their reproductive, maternal, and child health programs, training service providers, educating community-based health agents, and supporting television advertisements to promote the advantages of PPIUD. These activities are occurring outside the scope and control of the original scale-up effort. According to informants, community

support for PPIUD is accelerating as satisfied acceptors and their family members tell others about their experience.

Service expansion has increased rapidly, driven by the increasing targets set by the GOI with support of development partners. Very few government hospitals routinely offered PPIUDs before introducing the intervention. Complete data were not available for the whole country, but at a minimum the effort resulted in growth from five service sites in 2010 to 81 in 2012, 371 in 2013, and a projected 535 in 2014. But the scaling up of PPIUD services is still at an early stage. In early 2014 only 5% of all births were in facilities with PPIUD services. In one state where fieldwork was conducted, 71% of births were in facilities with PPIUD services. In the other state the figure was only 12%, because in this remote state most women give birth at home or in very small facilities.

However, at the end of 2013 population coverage was still low, given India's size. The percentage of women accepting PPIUDs at facilities with the service rose from about 5% to over 16% (these do not include sites outside the supported states). During the same period the follow-up rates remained the same, indicating that expansion did not come at the cost of reduced performance.

In the future, PPIUD services are likely to be available in an increasing number of facilities as a permanent part of postpartum counselling and care. The only risk that can be foreseen at this time would be negative consequences as a result of the new policies to pay providers and community agents incentives for each PPIUD acceptor. Such a policy could result in adverse outcomes such as coercion or unsafe procedures.

ICCM, MALI

The Landscape

In 2009 Mali's MOH and development partners agreed to a trial introduction of a new primary health care policy, *Soins Essentiels dans la Communauté* (SEC), for underserved communities in five southern regions. SEC included iCCM delivered by paid CHWs. The policy was a response to the Millennium Development Goal child health target (Bennett et al. 2014) and the desire to install a new, more highly skilled worker in the community (Diallo, Soumbounou, & Konaté 2013).

Some Mali opinion leaders initially resisted health workers administering antibiotics because of an earlier experience in which volunteers distributed medications inappropriately. A local research study showed that villagers could easily acquire antibiotics from other sources and that community-based distribution by qualified workers trained to follow protocols would reduce misuse of medications (Medical Research Council South Africa 2014). This new information reframed iCCM from a risk to a responsible policy and was crucial for gaining support for the iCCM component (Bennett et al. 2014). Also important was the presence of a large pool of unemployed or underemployed graduates of private health schools who had 18 months of training in primary health care.

Another source of resistance to SEC and iCCM was concern about the sustainability of the program. Primary health services in Mali are the responsibility of community health associations. Representatives of many of these associations opposed the scheme, because, as owners of community health centers, they would be responsible for maintaining the program, including paying CHW salaries. Despite the associations' objections, the MOH, development partners, and other stakeholders proceeded with implementation, without a plan for how the salaries would be paid at the end of the funding period.

The Scale-Up Effort

Financing

External funding paid for CHW salaries, subsidies for supervision, medicines and equipment, training, and some monitoring and evaluation. Most of the scale-up financing

was provided by UNICEF through a Canadian grant to expand iCCM in several countries. Other donor mechanisms supported the purchase of medications and equipment or program implementation in specific regions or districts. Most of the funding streams ended in 2013 or early 2014.

Resource Team

UNICEF was recognized by all informants as the lead organization in introducing iCCM in Mali and was involved in all aspects of the scale-up effort. UNICEF and other development partners were responsible for supporting implementation in specific regions or districts.

A high-level committee of government and development partners, which was established to coordinate SEC implementation, rarely met. A working party of development partners and NGOs met regularly but had limited influence over the direction of the program.

The regional and district health services and the health centers had designated focal points, but because they were under-resourced they had limited capacity to solve problems. Most coordinating committees formed at the regional, district, and community levels met irregularly and did not have clear roles.

Implementers/Users

CHWs implemented iCCM in communities at least five kilometers away from a community health clinic. The typical CHW was responsible for one or two satellite communities as well as her community of residence, but the size of communities, the distances between satellite communities, and the availability of other service providers varied considerably. Following a protocol, CHWs identified and treated or referred children under 5 years old with malaria, pneumonia, diarrhea, or acute malnutrition. They also provided family planning information and methods, assisted with vaccination clinics, visited newborns, and offered health education. They were supervised by the medical director of the community health clinic.

Expansion Strategies

In 18 months about 2,300 community health workers were recruited, trained, and placed, serving about half of sites five kilometers or more from a health center in five southern regions. Delays in developing the implementation guide and training materials meant that recruitment and training proceeded without the benefit of lessons learned from demonstration sites operating the full program.

Advocacy

iCCM was advocated by representatives of UNICEF and USAID as a solution to Mali's very high child mortality rates. A 2009 forum brought national and regional experts and policymakers together to agree to the pro-poor community-based policy. Following the meeting there was a lengthy period of consultation before consensus was achieved on what should be included in the policy. This involved the Government of Mali, UNICEF, MCHIP, and many other nongovernment stakeholders. As the end of the scale-up effort approached, presentations and planning workshops were held to share program achievements and lessons.

Organizational processes

Support for service delivery involved the following:

- Development of an implementation guide and training materials to define the management and delivery of the program, including iCCM protocols
- Recruitment of CHWs, led by the region and districts and involving district and community health associations
- Two-week training for CHWs, with additional training for supervisors

- Placement of CHWs in communities, including a community orientation by health service and community health association representatives
- Travel subsidies to enable community health clinic medical directors to travel to communities to supervise CHWs
- Requirements that the community provide housing and other support to the CHW
- Supply of a starter package of medicines, equipment, and a bicycle to CHWs when installed in the community; replenishment through the community health clinics using normal channels

Every partner followed the implementation guide, but some had additional strategies. For example, MCHIP employed officers to support district and clinic staff supervision and monitoring. This strategy was viewed by some development partners as unsustainable (Medical Research Council South Africa 2014); others remained distant from day-to-day operations.

Monitoring and Evaluation

Using forms from the implementation guide, CHWs recorded the diagnosis and treatment for each sick child they saw. The information was used during supervision visits and to generate aggregated monthly reports that were sent to the district and regional focal points, who reviewed them to stay informed of the program's progress. The monthly reports were not used at the national level, in part because of the decentralized health system in Mali, but also because the CHW data was amalgamated with all activities performed by the health centers.

In partnership with the Government of Mali, UNICEF, and other stakeholders, MCHIP conducted periodic monitoring and evaluation exercises, including quality lot assessments, baseline and endline surveys, and qualitative studies within the 12 districts they supported.

Challenges, Surprises, and Responses

Shortages of Some Medicines

After the first year of operation CHWs throughout the country were experiencing shortages of essential medicines, despite the country's large stock of drugs (Medical Research Council South Africa 2014). Over time the CHWs and community health clinics, sometimes with information from district services and the community health associations, found ways to ensure regular supplies of medicines.

By the time fieldwork was conducted there was large variability in the frequency of stock-outs. Approximately one-third of CHWs reported that they often had stock-outs; one-third said they had them occasionally; and one-third said they rarely or never had them. All of the CHWs said they depended on their health clinics for medicines, and when the medicines were not available at the clinic, they went without.

Community Support of CHWs

The decision to employ qualified CHWs meant that the CHWs often were not from the villages in which they were placed. They needed housing, a place to see patients, and access to food. It was expected that communities would provide these, but not all communities did. In some communities people preferred to use health care services other than the CHW. The exclusive focus on children under 5 years old also created tensions among community members who wanted other services, such as assistance during labor and administration of injections. A relatively high number of CHWs resigned within the first year because of the lack of support and for personal reasons.

Strategies to address the lack of support were ad hoc and came from a number of different sources. Some supervisors made a point of meeting with community leaders during every

visit to address issues such as housing. The community health associations were motivated to become more involved only when the CHW generated fees from consultations, the sale of medicines, and referral to the community health clinics. If the community was not using the CHW there was little motivation for the associations to intervene.

Some partners and districts developed their own ways to encourage local interest in the CHW services (Diawarad 2014), including health fairs on market days, competitions for the best CHW held in some districts, and the engagement of CHWs in programs offered by the health clinic or local programs managed by NGOs. These activities reduced the CHWs' professional isolation and improved their status in their communities, leading to greater demand for services.

There were limits to how much support could come from the community. Even when the communities were very positive about the CHW services and regularly brought their sick children for treatment, practical support did not necessarily follow, especially in very poor communities.

Funding Uncertainty

As funding from UNICEF and other donors for the iCCM/SEC trial came to an end, the lack of a plan for financial sustainability became clear. In most places supervision and wages stopped and CHW resignations were expected to increase.

Some senior officials, such as regional and district officers and representatives of the community health associations, used their power to intervene when problems arose, but others did not consider it their role. For example, one informant from a district community health association network said the lack of wages was not discussed at quarterly meetings because everyone knew the problem and there was nothing they could do. In contrast, in another region, at the request of the chief of regional health services, the governor reportedly intervened to require local governments to pay CHWs.

Political Instability

The scale-up plans prepared in 2009 and 2010 could not have anticipated the droughts, political unrest, and security issues that confronted Mali from 2011 to early 2013. Some of the major donors were not able to interact directly with government. Regions and districts were responsible for running the programs without much capacity to make decisions. During this period there were no changes to the scope of the program. All of the responsible parties from the government and development partners continued to follow the implementation guide.

Outcomes

At the end of fieldwork there were no data on changes in child mortality or the proportion of children with symptoms seeking and receiving appropriate treatment as a result of SEC and iCCM. Nevertheless, there was some evidence that CHWs were providing an important service. In two districts supported by MCHIP, the number of cases of children with fevers presenting to the CHWs grew from 1,697 in 2011 to 7,193 in 2012 and 11,696 in 2013, suggesting increased confidence in and reliance on the CHW.

Informants from all levels of the health system and every region and district were adamant that the SEC had resulted in lower child mortality, especially from malaria. Furthermore, they claimed that having treatment and advice available in the community increased the use of health centers and district facilities, especially for serious conditions. These powerful narratives drove a consensus that the program should continue. Although it is too early to claim that iCCM has reached a tipping point in Mali, the institutionalization of SEC has gained momentum. Certainly there was greater government support. Between 2010 and 2013 SEC was officially considered an experiment, but in late 2013—two years after the first CHWs were recruited—SEC (including iCCM) was adopted as national policy, and there was

discussion of doubling the number of sites in the southern regions and introducing the program in the north. Furthermore, the community health associations and their federations and the council of mayors indicated that they wanted to be part of sustaining the program.

Nevertheless, without the resources required to employ and support CHWs, the future of SEC was not ensured. The cessation of salaries and supervision support were already having a detrimental effect on services. The provision of medications and supervision had not been routinized, and there was no national monitoring system to inform decision-making.

HBB, MALAWI, AND BANGLADESH

The Landscape

HBB is the American Academy of Pediatrics' (AAP's) neonatal resuscitation curriculum for resource-limited settings in low- and middle-income countries. AAP, USAID, the Laerdal Foundation, Save the Children, and the Eunice Kennedy Shriver National Institute of Child Health and Human Development formed a global development alliance in 2010 to expand the use of HBB. HBB organizes and prioritizes birth attendants' actions during the first minute of a newborn's life, to ensure that the newborn is breathing properly and provide assistance if needed. The scale-up effort had two components: teaching health workers a series of steps for observing newborns and responding to difficulties, and regular use of training equipment to practice resuscitation skills.

After discussions with representatives of the alliance, senior government officials and leaders of professional associations in Malawi and Bangladesh endorsed the program, recognizing its potential contribution to reducing neonatal mortality. Both countries have achieved substantial declines in child mortality. The next challenge was to address infant mortality and, particularly, neonatal mortality.

There were significant differences in the health service context in each country. For example, the proportion of births attended by a doctor, midwife, or other skilled birth attendant (SBA) is higher in Malawi (71%) than in Bangladesh (32%).

The Scale-Up Effort

Financing

The USAID Mission in Bangladesh and UNICEF supported the scale-up effort in Bangladesh with sufficient funds to train and equip all government skilled birth attendants. Financing for the HBB scale-up effort in Malawi was cobbled together from a number of partners, including the Malawi government, and was only sufficient to train 30% of the personnel who attend births in government facilities.

Resource Team

The HBB rollouts were assisted by strong national teams that coordinated scale-up activities in Malawi and Bangladesh, but in neither country did the teams provide direct and tailored support to subnational officers, facility managers, or clinicians to facilitate institutionalization of HBB after training.

In each country a small team played a strong role in supporting the HBB rollout. In Bangladesh a Ministry of Health technical working group on newborn health, chaired by a senior neonatologist who was an HBB champion, provided oversight. A prominent medical college was contracted to deliver training and manage the day-to-day implementation of the scale-up in coordination with the MCHIP partner. In Malawi, a government-appointed taskforce advised primarily on matters of policy rather than implementation. With a large number of funders and implementing partners, scale-up activities were sometimes fragmented and difficult to coordinate.

Implementers/Users

The location of births in the two countries affected decisions about how the scale-up was designed. In Malawi the effort focused on government hospitals and in Bangladesh the focus was on hospital staff and skilled birth attendants who assisted in home deliveries.

Expansion Strategies

In both Bangladesh and Malawi, the training schedules and numbers of trainers supported training in multiple districts at once, in theory quickly covering the whole country. All health workers were trained together; there were no separate trainings for nurses, doctors, and workers with lower qualifications.

Advocacy

In both countries HBB had advocates who believed in the importance of the program, framed it as contributing to a national priority, and built a consensus that HBB was the solution to the high level of asphyxia-related newborn mortality. HBB garnered high-level support in Bangladesh in part through a dissemination event of a study showing gains in knowledge and skills in newborn resuscitation among doctors, midwives, and community-based skilled birth attendants who completed HBB training program. This study convinced opinion leaders that there was a deficit in newborn resuscitation skills that could be addressed and resulted in the Minister of Health's declaration of support for HBB. The study did not determine whether participants applied their new skills correctly during live births.

In Malawi the need for newborn resuscitation training was identified through a comprehensive emergency obstetrics care needs assessment conducted in 2010, which found that health care workers who attended births had unacceptably poor knowledge of resuscitation methods, despite the fact that almost all of them had had pre- or in-service training in newborn resuscitation (Republic of Malawi 2010).

During and after the scale-up effort the national scale-up teams and local champions kept awareness of HBB high within the MOHs in both Bangladesh and Malawi.

Organizational Processes

The HBB scale-up efforts built on policy development, review and adaptation of training materials, training, provision of equipment, development of supervision and monitoring protocols, and opportunities for refresher training to facilitate changes in newborn care.

Each country followed an inclusive, consultative process, involving local stakeholders, technical experts, and development partners, to develop and approve official government policy regarding HBB. HBB is now national policy in both Bangladesh and Malawi and is included in policy and strategic documents as they are revised.

The next step was to review the global training package. In Malawi government technical officers, representatives of professional associations, and development partners agreed that the HBB training materials aligned with their current guidelines and were appropriate to use without changes. They developed supervision protocols and tools to complement the training package.

Newborn health specialists in Bangladesh reviewed the training materials and recommended changes to align the materials with existing procedures and policies. The AAP, which holds the copyright on the materials, agreed to incorporate most of the recommendations in an annex but did not allow the core materials to be altered.

National scale-up plans were developed by the scale-up teams in partnership with the MOH and other stakeholders. The plans detailed the training schedules and included orientation sessions with district and facility managers before or immediately after the training to explain the advantages of HBB and the importance of maintaining clinical skills.

The countries used similar national cascade training models to spread knowledge and skills. Training proceeded in stages: first, senior clinicians were trained as core trainers; then they trained national master trainers, who in turn trained trainers selected from the districts. The district trainers, sometime supported by more senior trainers, then trained nurses and doctors (i.e., all SBAs) in a two-day course. In Bangladesh the aim was to train all health workers who attended births, whereas in Malawi the plan was to train 30 providers in each district. The expectation in Malawi was that trained providers would pass their knowledge on to their untrained peers.

Sets of materials and equipment for practice and service delivery, including training mannequins, were procured and distributed to facilities after training. Health workers were encouraged to practice resuscitation skills regularly using the mannequin.

Monitoring and Evaluation

Neither Malawi nor Bangladesh used performance data to monitor adoption of the practice of newborn resuscitation or hold providers and managers accountable. In Malawi a very detailed monitoring system incorporating neonatal resuscitation and other aspects of newborn care was developed. However, in facilities visited by the process documentation team, it appeared that this system was not used by facility managers, the scale-up team, or the MOH to review progress or make decisions. In Bangladesh the scale-up team explicitly decided not to create a monitoring system for HBB that was parallel to the government health information system, preferring to encourage the government to adopt their own indicators to monitor newborn resuscitation.

Challenges, Surprises, and Responses

Amount and Timing of Funds for the Scale-Up Effort

The scale-up teams in Bangladesh and Malawi had to adjust to issues related to the amount and timing of funds allocated to HBB. In Malawi funds from multiple donors were not sufficient to train all SBAs, resulting in a decision to train only 30 SBAs per district (later changed to train 30% of SBAs per district). Because different districts were funded by different donors, there were gaps of up to a year between training district trainers to be HBB trainers and the training sessions for SBAs. Although initially there were three HBB trainers per district, transfers and retirements led to shortages of trainers in some districts. When the original trainers were not available, HBB trainers from neighboring districts were called in to conduct training.

In Bangladesh the overall amount of funding was sufficient, but the timing of funding influenced programming decisions. Early in the HBB scale-up effort the scale-up team and the MOH recognized that sites were going to need additional support to adopt the HBB approach. A plan was devised to follow up initial HBB trainings with a “revisit program” that included refresher training. The revisits were conducted in 22 of the 64 districts, but further visits had to be postponed in order to complete the first round of training under a project grant that was coming to an end.

Delays in Procurement of Training Materials and Practice Equipment

In Malawi the MOH was originally responsible for procuring and distributing resuscitation equipment for use in delivery wards. When it became clear that they could not meet their commitment in the timeframe, the decision was made to continue with training. Of the 26 districts where HBB training had been initiated at the time of the process documentation, only three received full sets of resuscitation equipment in all birthing facilities immediately after the HBB training. The process documentation concluded that this mistiming of components had a negative effect on the Malawi scale-up effort (McPherson 2014b).

Influence on Clinical Practice

The underlying assumptions of the two HBB scale-up plans proved to be faulty. Outcome evaluations in both countries found that providers in facilities participating in HBB training had better knowledge and demonstrated greater ability to perform the new resuscitation practices on a neonatal mannequin than their untrained peers, but there was no meaningful difference in the two groups' practice of resuscitation when attending live births. The process documentations explained why the scale-up strategies were not sufficient.

First, many delivery facilities had no provider with the specific responsibility of promoting the HBB approach. In Malawi, the skilled birth attendants who attended the HBB training were told that it was their responsibility to train their colleagues back at their facilities. Feedback during the process review found that some providers were not enthusiastic about this strategy and that it had limited effectiveness. In neither country were local HBB trainers, who were respected clinicians, developed into champions of HBB who would then have ongoing responsibility for encouraging adoption of the HBB approach.

Second, in both Malawi and Bangladesh relatively few providers regularly practiced on the mannequin, and in some facilities the HBB support team found the equipment still in its original wrappings many months after the completion of training. Mentoring and daily practice of resuscitation skills are key strategies to maintain providers' resuscitation skills.

Third, the scale-up efforts did not anticipate that skilled birth attendants would not see the advantage in changing their behavior. Providers in both countries reported that HBB was an excellent, organized approach to managing the newborn during the first minute of life and differed little from their current practices. Providers might not have felt that their practices were at fault for any newborn deaths, since many of them had experiences of newborns starting to breathe under their care. Training might have reinforced confidence in their current practices. Indeed, the Bangladesh outcome evaluation found that, at follow-up, among newborns who were not breathing at birth and were treated by providers trained in HBB, only 6.3% received asphyxia management in the correct sequence (suctioning and/or stimulation and/or use of a bag and mask) within 60 seconds of birth, as prescribed by HBB.

Examples from three other sites where HBB was introduced provide some lessons into how this could have been done in Malawi and Bangladesh. A trial in Tanzania gave a small stipend to a senior midwife in each facility to keep records and promote regular practice of resuscitation skills. In those sites practitioners were required to record their practice sessions on a training mannequin at the start of each shift (Msemu et al. 2013). Another trial at different sites in Tanzania held only the initial training and had no other strategies to promote practice or encourage local ownership of the approach; no change in clinical practice was observed in those sites (Ersdal et al. 2013). A trial in southern India showed increased knowledge, improved practice, and reduction in stillbirths at sites that used a program involving initial and refresher training (face-to-face and video) and monitoring of junior doctors' performance (Goudar et al. 2013).

Outcomes

The HBB scale-up efforts sought immediate gains in reducing newborn mortality. Confident in the power of training to change practice, the scale-up efforts were implemented as quickly as funding, training logistics, and provision of equipment allowed. Lessons about the process came after the training was complete, when the process documentation and performance evaluation found major limitations in implementation and evidence that there had been no improvement in managing newborns with difficulty breathing at birth.

The HBB approach had been institutionalized within national policies and in some pre-service training curricula in both countries. These provide a foundation, but the next step will be to institutionalize HBB within facilities.

HBB stakeholders in Bangladesh feel that the HBB effort will need to be supported for several more years to ensure its long-term viability and effectiveness. They are currently seeking approval and funding to continue the effort, including revisiting facilities where providers were trained in HBB, through 2017. Stakeholders in Malawi remain committed to the HBB approach but do not have any dedicated funding for additional scale-up activities. They are seeking ways to integrate HBB into essential newborn care programs.

SUMMARY OF CASE STUDIES

The four case studies reflect different approaches to expanding and maintaining the delivery of a new service to more people within a complex health system that has limited central control over service delivery.

The effort to scale up PPIUD services in India built on decades of experience and shared values. Using a phased approach to build capacity for future expansion, the scale-up effort tailored strategies to local administrative and clinical capacity. The service has expanded rapidly into almost all states and into all districts in high-priority states. With intensive support to administrators and clinicians and the financial and policy support of the national government, the PPIUD is becoming an accepted part of postpartum counseling and care. The scale-up team encountered and responded to a number of surprises, including slow uptake of PPIUD services in some facilities and among some practitioners, minor challenges in timely delivery of training materials, and major policy changes.

By comparison, some aspects of the effort to scale-up iCCM in Mali were not as oriented toward enabling change. SEC, the pro-poor primary health care initiative, and iCCM were strongly advocated by global health experts and supported by donors. Based on past experience, the government and civil society were more cautious. However, everyone united around a vision of paid, qualified health workers living and providing essential care in underserved communities. This shared vision, the large initial financial contribution by development partners, and the national recruitment and training process put the scale-up plan in motion. Its emerging success owed a lot to the efforts of many, often uncoordinated stakeholders in communities, districts, and regions. The surprises included a period of political unrest, no resolution of the challenge of making the program financially sustainable, and limited capacity of some communities, health centers, and community health associations to support the CHWs.

The HBB scale-up efforts also had enthusiastic supporters in both countries who shared a common vision of saving the lives of newborns. However, the scale-up effort focused almost exclusively on developing national policies and conducting top-down training through all health facilities and, in Bangladesh, community-based skilled birth attendants. The scale-up team coordinated the national program but was not directly engaged in the implementation of the HBB approach in facilities and labor wards. Challenges included limited funding and delays in supplying service and training equipment in Malawi. Stakeholders were surprised to learn from the outcome evaluation that HBB training had not changed clinical practice.

Interpreting Scale-Up Efforts through a Complexity Lens

In this section we use five relevant properties and behaviors of complex adaptive systems as an interpretative framework to understand the surprises the scale-up efforts encountered. The CAS framework consists of diversity, path dependency, interdependence, feedback loops, emergent behaviors, and nonlinear outcomes. The responsiveness of each scale-up effort to these “surprises” affected how well the intervention was expanded and institutionalized.

DIVERSITY

CASs are composed of diverse entities that tend to loosely follow certain rules but are also relatively free to adapt those rules as they interact with other entities and the external environment. Page (2011) reviewed the theoretical and empirical literature on the role of diversity in the successful adaptation of complex systems. Although too much diversity can be a risk, systems with diverse elements are, in general, more resilient and adaptable. Some elements will benefit from significant changes in the environment outside of their control or new ways of interacting with other members. Diversity matters in the scale-up of health interventions because the goal is to protect and strengthen those entities that might not be able to adjust to change without support. More capable entities are likely to be able to incorporate the health intervention with little or no external support.

Diversity among actors and contexts was a common feature in all of the cases studied. The HBB scale-up efforts trained health workers from a variety of disciplines, with a variety of qualifications, and in facilities of various sizes. The eligible communities for SEC/iCCM in Mali were at least 5 kilometers from a health center, but they were highly heterogeneous, with different population density, remoteness, existing health services, and levels of prosperity. PPIUD was introduced in states of varying sizes and with varying administrative capacity and into facilities with delivery loads ranging from less than 20 to 1,000 births a month.

In the PPIUD scale-up effort, states and facilities with differing capacity to manage the intervention were given different types of support, which proved to be a successful strategy. The Government of India decided that high-performing states only needed support to establish two service and training facilities. The state health departments were then charged with expanding the service to district facilities, with budgetary support only. In other states scale-up teams worked side-by-side with state officials, assisting in training and conducting supportive site visits as needed.

The iCCM and HBB scale-up efforts were similarly diverse in administrative, clinical, and financial capacity, but they did not have strategies that provided different resources or assistance based on capacity or need.

CAS BEHAVIORS AND THE CASE STUDIES

Path Dependency

Path dependency is a familiar concept to health care reformers: where you start and what happens along the way can have a big influence on outcomes. History affects which interventions or processes can be considered and which must be dismissed as inappropriate. To explain how context influences path dependency, Resnicow & Page (2008) use the metaphor of two boulders resting close to each other on top of a cliff. Both boulders are pushed, and as they travel down the cliff they encounter different bushes, gullies, and other rocks that propel them in different directions. When the boulders come to a rest, they are far apart. Although the endpoints cannot be predicted, the obstacles and smooth patches are observable. The small differences in their paths result in great differences in their outcomes.

Path dependency means that the same global health interventions might have to be implemented differently (e.g., different cadres, different monitoring activities) in different country contexts. Some interventions cannot be implemented at all in some health systems because they are incompatible with the structures, standards, and conventions of the system (Bloom & Wolcott 2012; Paina & Peters 2012). Other interventions will be propelled along different paths in different contexts, with the result that, in the end, they are no longer the same intervention.

The case studies included many examples of path dependency in which initial decisions determined the course of the scale-up effort. When obstacles to implementation were encountered, the scale-up effort was restricted in the ways it could respond.

Donors' requirement that activities fit within funding cycles was a major determinant of scale-up designs and decisions made during implementation. For example, having agreed to complete training programs in Mali or Bangladesh within a particular timeframe, it was not possible to pilot interventions and learn from implementing the iCCM program in a few areas or to implement timely HBB refresher training in Bangladesh.

In Mali the decision to use qualified health workers as CHWs was necessary because of concerns about patient safety. However, this meant that communities would have to support a resident health worker who was not local and who needed food and housing, and this became one of the obstacles to institutionalizing the intervention.

The scale-up efforts also confronted practices that had been established over many years and could not be modified to accommodate the intervention. For example, because medical colleges provided maternity services, it was difficult for them to provide PPIUD services in the same way they were provided in other government facilities. The scale-up team responded by relying more on large district hospitals as the primary service and training sites.

Interactions of Interdependent Subsystems and Actors

Health systems are large and have many functions. Subsystems and actors need to specialize and tend to form their primary relationships with those who have similar functions. However, they also have to interact with others or the system as a whole will not function. For example, policymakers set the strategic direction and standards for the health system, but the strategies and standards are not effective unless there is a mechanism to enable health care providers to follow the policies. This can be extremely challenging because subsystems operate in relative isolation and have their own norms and procedures. Policymakers respond to political and other pressures and might not consider the advice of health care providers. Health care providers might not be aware of or might be unable or unwilling to implement the policies. Several of the surprises encountered in the case studies involved subsystems or teams that were not working effectively together.

The management of logistics and commodities is an important component of any health intervention. In three of the four country case studies, we found that surprises involving failures of supply chains threatened the implementation of scale-up strategies, but none of the scale-up efforts had a particular focus on this aspect of the health system. Instead of trying to improve the management of medications and other commodities, the scale-up teams and implementers nudged the rules rather than changing them. CHWs in Mali found ways to order supplies in advance and experienced far fewer stock-outs. The PPIUD scale-up teams suggested shifting procurement responsibilities, which eliminated the need to involve states' procurement processes. These small adaptations to achieve desired results might be more sustainable than attempting to change how the subsystem functions.

Interactions between actors also must be navigated, often at the workplace, while scaling up an intervention. Work relationships that are influenced by power, qualifications, gender, or culture affect how individuals respond to an intervention. Like subsystems, individual

members of work teams have to cooperate in order for the intervention to be delivered and institutionalized. When actors operate separately, it is more difficult to institute change. The HBB scale-up effort did not have effective strategies to reinforce the HBB approach among the birth attendants in the labor wards. Even though one individual adopts a new practice, his or her colleagues might not. In the PPIUD case study the facilities that had the most established service were the ones that had a team approach: almost all of the nurses and doctors who attended births would do insertions, and the counsellors were integrated into the process.

Creating a team culture that supports an intervention requires time, incentives, and reinforcement. Subsidized travel made it possible for some health center directors in Mali to regularly visit the CHWs in their villages. When the travel subsidies ended there was no strategy to reinforce that relationship in other ways. In some settings the relationships were maintained during the regular visits the CHWs made to the health centers to deliver their activity books and pick up medication. However, not all directors used this as an opportunity to meet with and support the CHWs.

Feedback Processes

Feedback occurs when an action in one part of a system produces a response in another part of the system, which sends a signal or response back to the original agent and others. Feedback loops may promote implementation of the intervention, leading to a virtuous cycle of success, or discourage it, leading to a vicious cycle of failure to gain traction. Within health systems, feedback happens between levels, such as the national government and the states; or within units at the same level, such as between the district management team and health care workers; or between two independent but interconnected entities, such as a hospital and their patients.

Feedback processes can be formed and maintained by real or perceived self-interest and the explicit and tacit rules people use to organize their day-to-day work. In a well-functioning, centrally controlled health system, the behavior of individual managers and health providers is guided by policy directives and accompanying training packages and job aids. Changes in policy result in changes in behavior because there are positive consequences for complying and negative consequences for not complying. But usually health care workers are influenced by more than policy directives. Their peers, family members, professional orientation, and patients discourage changes that upset the current equilibrium. Good management takes into account the signals sent back by health workers.

Providers faced negative feedback processes when they returned from PPIUD training. They were discouraged by their own concerns that they were not clinically competent; they could not convince their co-workers to counsel clients about postpartum family planning; and the wider community and their peers were concerned about side effects. Coaching during the supportive visits reversed these negative processes. Scale-up team members helped providers gain confidence in their clinical skills. They made the work environment more conducive by initiating group discussions with members of work units and other facility staff, which reinforced the benefits of postpartum family planning.

CHWs in Mali found that they could not provide services to community members if they did not have adequate housing and medicines. They felt that they were not valued by community members, and the community health associations saw no advantages in supporting their salaries. As community members started to seek treatment, the feedback loops became positive: The CHWs became more valuable to the health associations and community, so they received more support and saw more ill children.

Emergent Behaviors and Self-Organization

In the course of implementing a health intervention, new behaviors sometimes arise, potentially becoming lasting changes in the patterns of interaction among actors in the

system. These emergent behaviors are “a largely undirected process of collective action resulting in increased capacity” (Brinkerhoff & Morgan 2010). Quite often scale-up efforts do not deliberately encourage or even acknowledge them.

Two dynamics that can create emergent behaviors are networks and self-organization. Free or fluid networks can lead to emergent behavior. People who are linked together through formal and informal ties can spread innovation by sharing information and norms within the workplace or community or among occupational or ethnic groups (Paina & Peters 2012).

Not all networks share information. For example, in Malawi some of the birth attendants trained in the HBB approach were unable or unwilling to train others in their workplace. Peer learning emerged among workers in labor wards in India, but only after a PPIUD service was institutionalized in the facility. The PPIUD scale-up team’s first inclination was to discourage the practice, but then they accepted it and sought ways to safeguard quality. These differing experiences suggest that networks are more likely to spread information that supports an intervention if the intervention has already become a desirable practice—not one that is viewed as untested, risky, or otherwise unattractive.

Self-organization refers to the phenomenon of individuals taking up new collective action independent of any directive to do so (Paina & Peters 2012). This includes groups that self-organize to improve local health care practices or agitate for better working conditions. Local innovation can result in an intervention being adapted in ways not envisioned in scale-up plans, or being appropriated by organizations that are not part of the original effort (Hill, Goeman, Sofiarini, & Djara 2014; Sarriot & Kouletio 2014). In Mali, many local communities, health associations, and NGOs undertook initiatives to support CHWs. In India, several health facilities experimented with different ways to improve follow-up rates or organize the use of health counsellors. In these cases the innovations remained local and did not spread to other communities or facilities. They took place beyond the scope or control of the scale-up effort. If these emergent behaviors continue to flourish and the activities under the original scale-up efforts diminish (as project-funded activities do), in the future the implementation of the intervention is likely to be significantly different from the way it was planned during the scale-up effort.

Nonlinear Outcomes

As a result of the dynamic nature of CASs, seemingly small amounts of effort can produce big changes, or perhaps more commonly, large efforts can produce correspondingly small or no changes. Furthermore, change might be delayed or occur only after a certain threshold or tipping point has been reached. Change, intended or unintended, can also occur in parts of the system that had not been directly involved in the scale-up effort.

The case studies demonstrated many paces of change. PPIUD services started to expand slowly, being confined to a few sites. The increasing acceptor rate meant that the numbers of women choosing a PPIUD was outstripping the growth in numbers of facilities and service providers. As the method became established, NGOs introduced it into their programs and community health agents were engaged to promote it. The growth in numbers of cases of childhood illnesses treated by CHWs initially grew slowly. It appeared to take at least a year before community members began to consider the CHW as a first source for medical care (possibly affected by shortages of some medicines), and it is likely that there is a scope for greater increases. The HBB scale-up efforts had not yet shown evidence of changing the practice of newborn resuscitation techniques in live births.

Implications for Practice

If economic and social change are the result of a complex adaptive system, this does not mean we have to accept whatever is served up to us. But it does mean that we cannot engineer success; we have to proceed in small steps, experimenting, learning and adapting alongside all the other parts of the system with which we are co-evolving (Barder 2012).

This section extrapolates from the analysis of the four scale-up efforts, using a CAS lens. It includes recommended practices to enable future scale-up efforts to effect change in situations with multiple interacting actors and subsystems, limited central control, and lack of incentives to adopt an intervention.

Table 3 presents three features that scale-up efforts working within CASs should incorporate to be effective in expanding and institutionalizing new practices: *capabilities* to enable the scale-up effort to respond to dynamic and unpredictable health systems; *accelerators* of expansion and institutionalization; and *adaptive mechanisms* for maintaining and advancing gains as contexts change. Recommended practices, drawn from the case studies, are listed under each element. These are not novel recommendations; the table includes references to other works that address each recommendation.

Table 3: Recommended Practices of Scale-Up Efforts within Complex Adaptive Systems

Elements of scale-up efforts/ <i>Relevant characteristics of complex adaptive systems</i>	Recommended practices	References
Inputs for enabling scale-up efforts (capabilities) <i>Path dependency</i> <i>Interdependency of subsystems</i>	Provide adequate, flexible funding with a long-range perspective	Hartmann et al. (2013); Yamey (2012); Sarriot et al. (2011)
	Form autonomous scale-up teams with reach to facilities and communities	Honig (2014); Bloom and Wolcott (2012); Greenhalgh et al. (2011)
	Establish supportive policies to define the essential principles of the intervention	ExpandNet (2009)
	Set in place mechanisms to collect, share, and take action on information about implementation	ExpandNet (2009); Cooley and Ved (2012); Hartmann and Linn (2008)
Strategies for accelerating delivery of the intervention (accelerators) <i>Feedback processes</i> <i>Emergent behavior</i> <i>Nonlinear outcomes</i>	Take intentional step to understand the motivations and obstacles faced by diverse frontline workers and other significant actors in their work context	Ghiron et al. (2014); Simmons and Shiffman (2007); World Bank (2015)
	Offer tailored support to overcome individually unpredictable but probabilistically very likely initial problems with adopting intervention	Bradley et al. (2012)
	Encourage local initiatives to deliver the intervention	Lanham et al. (2013); Bradley et al. (2012) ExpandNet (2010)
	Ward against increasing inequity by implementing different strategies depending on local or subsystem capacity	Hart (1971)

Elements of scale-up efforts/ <i>Relevant characteristics of complex adaptive systems</i>	Recommended practices	References
Approaches for maintaining and advancing the gains in face of external changes (adaptive mechanisms)	Create a consensus about adapting to new contexts and goals through strong communication channels and relationships	Sarriot and Kouletio (2014)
<i>Path dependency</i> <i>Interdependency of subsystems</i> <i>Nonlinear outcomes</i>	Focus on broad goals by measuring and sharing outcome and impact indicators	Fixen, Lundgren, Igras, Jennings, and Sinai (2013)

These recommended practices will not guarantee a successful scale-up effort, but they will help in navigating the inevitable surprises. Scale-up efforts that incorporate these practices will be better prepared to address sources of resistance, obstacles, and opportunities more quickly. The initial scale-up plans may fail, but the learning from the experience and the re-investment based on this learning will likely be faster. Changes can be made to the intervention or the scale-up strategies; other networks or agents may come forward to lead different approaches.

CAPABILITIES

The case studies illustrate that scale-up efforts need to have access to funding, a team of people who support the change process, policies and guidelines that express a consensus on the essential elements of the intervention, and mechanisms to collect, share, and take action based on information. We refer to these as capabilities or resources that need to be mobilized before and during the scale-up effort as an integral part of the design. These capabilities are very similar to the ExpandNet (2010) elements.

Financial Investment

Scale-up efforts need to be flexible, responsive, innovative, and oriented toward long-term as well as immediate results. Project funding is usually short term, with an emphasis on detailed planning at the start and boundaries put around activities and partnerships. If scaling up is to be the main goal, then donors' policies will need to change (Hartmann et al. 2013). Sarriot and colleagues (2011) have demonstrated that if donors invest in sustainability rather than replicating projects in multiple sites for a fixed period, there will be greater health gains for a lower cost per death averted. The efficiencies come from applying learning as the intervention expands to new sites and continuing improvements in the earlier sites as a result of lower but continued support.

Scale-Up Teams

ExpandNet coined the term "resource teams" to indicate the group or individual who takes responsibility for driving the scale-up effort, recognizing the need to manage and not just coordinate the scale-up process (ExpandNet 2010). In the case studies these teams took a number of forms, but those that had the capacity to reach to the subnational level and into facilities and communities were the most effective in recognizing and responding to poor performance and other service delivery surprises.

Viewed through a complexity lens, the Indian national and state scale-up teams and Mali's virtual team of focal points and officers played a vital role that went beyond coordination and administration. Their effectiveness came from their intimate understanding of the system and its diversity and the respect in which the individuals were held. They had no real power over administrative or clinical performance, so they sought to influence people in other ways. The individual members of the scale-up teams maintained relationships with all of the stakeholders in their network. Through regular formal and informal interactions they maintained and subtly changed the shared vision to accommodate the evolution of the scale-

up effort. They identified implementation bottlenecks resulting from interdependent subsystems (e.g., procurement) and negative feedback processes, and suggested practical, novel solutions. They operated as “boundary crossers” because of their knowledge of how the health system worked at the front line, their technical expertise concerning the intervention, and their broader systems-level understanding of where power and resources existed and how they could be leveraged (Greenhalgh et al. 2011). They also acted as safeguards of the quality of the implementation (Bloom & Wolcott [2012] call these “high reliability officers”) by being aware of what was happening on the ground and acting quickly to influence or nudge different parts of the system to respond.

For scale-up teams to achieve their potential they need mobility and must reach into all levels and sites. In the two HBB scale-up efforts the teams had relatively little direct connection with administrators and clinicians below the national level, even though as individuals they were well known and respected. In Mali the political instability and lack of funding from transport meant that some stakeholders could not collaborate fully, and this limited the ability of the focal points, technical advisors, and implementing partners. Only the PPIUD scale-up teams, led by respected Indian doctors, could perform all of the functions.

When designing scale-up efforts, the Indian experience can be replicated by assembling and resourcing scale-up teams that can perform the essential functions. Equally importantly is creating organizational cultures that give the team members autonomy to take actions based on information, their own experience, and a few procedural guidelines (Honig 2014).

Policies and Guidelines

All of the scale-up efforts in our case studies started with the development of policies or guidelines. The explicit aim was to describe the intervention to ensure consistent, quality delivery. Equally valuable was the process of developing a consensus on the intervention’s essential components and main goals and on the importance of the intervention for the health service and national development (Bennett et al. 2014).

When taking an intervention to scale it is important to allow time for consensus building. In the case studies, the national MOHs often delayed adopting policies and guidelines (e.g., in Mali regarding the SEC/iCCM implementation guide and teaching materials). These delays sometimes are an essential part of the institutionalization process (Barder 2014; Sarriot & Kouletio 2014). Even if they do not substantially change the content of policies and guidelines, debates and delays are part of the process of gaining consensus. Rushing to implement policies and guidelines without a deliberative consensus will make it more difficult to steer the intervention through the health system.

Mali’s SEC/iCCM program benefited from having an implementation guide to which all stakeholders had given their commitment; during the political crisis, the implementation guide remained a concrete statement of government intent. In India the standardized training and reference materials make the essential elements of PPIUD services consistent across the states, including those states with no external assistance for taking the service to scale.

Informed Scaling

An intervention cannot be taken to scale within a complex adaptive system without a regular flow of information (Cooley & Ved 2012; ExpandNet 2009; Hartmann & Linn 2008; Paina & Peters 2012). All scale-up efforts need to collect, review, share, and act on formal and informal information about implementation. This knowledge is needed to correct unsafe practices and warn of obstacles such as supply shortages or lack of confidence. When choosing the information to monitor, scale-up teams should consider trade-offs between comprehensiveness and validity on one hand and timeliness and useability on the other; the HBB scale-up effort in Malawi and the SEC/iCCM scale-up effort demonstrate that although information may be recorded, it is not necessarily available or used for decision-making.

Data to inform scale-up efforts can take many forms. Formal data collection is usually done through parallel record-keeping systems specifically designed to assist during scale-up. For example, record keeping can serve as a prompt on how to implement the intervention, as reported by CHWs in Mali. Unfortunately, the valuable information collected is rarely used to adapt the scale-up effort. Of the 18 scale-up efforts reviewed, half had monthly reports produced by health workers, but only one or two used the data to monitor implementation and take corrective action (Larson et al. 2014). Monitoring information specific to the scale-up process is a nonrecurring investment. The PPIUD case study had an information strategy that included different reports for different users. As the program grew, a single outcome indicator (number of acceptors) was introduced in the national health management information system.

Extensive performance reporting may not be necessary or appropriate. More informal information sources such as feedback from observational visits, regular supportive phone calls, and review-and-share meetings may be an adequate substitute. These mechanisms help the scale-up teams keep their finger on the pulse of implementation, providing an early indication of opportunities and bottlenecks and enabling targeted support.

ACCELERATORS

If an intervention is to be of lasting benefit to the whole population, at some stage it must be spread by agents within the health system without the direct involvement of those involved in the scale-up effort. Support for scaling up the intervention can occur as the result of tailored support to reduce resistance and create positive feedback loops and of devolving ownership to existing formal and informal networks and local innovations. Emergent behaviors are difficult to stimulate and control because they depend on the interactions of many people, with each other and with internal and external institutions. They also inevitably involve some risk to the integrity of the program as a result of unsafe practices or inequitable outcomes.

Understanding Workplace Context

Creating conditions that enable agents to change their practices requires understanding how workplaces function. Who has to do what? What are the reasons they might not be able or willing to do what they are supposed to do? What are the benefits for them? Scale-up efforts and other global health projects are based on incomplete or even biased views about the demand and supply of services. When these inaccurate or simplistic models are embedded in the design of scale-up efforts, it can be difficult or even impossible to recognize and respond when the strategies fail to be effective (Simmons & Shiffman 2007; World Bank 2015; Yamey 2012).

A conventional way of learning about context-specific reactions within health systems that will affect the adoption of an intervention is through a pilot, but pilots have been found to be unreliable models for replication (Bold, Kimenyi, Mwabu, Ng'ang'a, & Sandefur 2013). Pilots are often implemented to demonstrate that an intervention will work. They are run by committed people, and the workers and communities gain benefits (both intrinsic and extrinsic) from participating in something novel. Pilots are even more problematic when viewed through the lens of complex adaptive systems, because they provide insights about only one context—usually a relatively small geographic area. Factors that are important in that context, such as local leadership, may have little relevance in other settings. However, pilots explicitly designed to inform a future scale-up effort can be useful for learning and experimenting (Ghiron et al. 2014).

Another strategy for gaining insights for scale-up is to initiate the intervention in several demonstration sites that have been selected because they represent a range of contexts found in the country. Demonstration projects should be used as an opportunity to experiment with different implementation strategies—a process Pritchett, Samji, and Hammer (2013) describe as “crawling through the design space.” The PPFPP case study developed its main scale-up strategies as a result of insights from early efforts to establish PPIUD service and training sites. If widespread scale-up had been attempted based on the

initial model, which relied primarily on training, the intervention might have been introduced in many sites, but acceptance rates would have been much lower. Using insights about the workplace, the GOI, with the support of the PFP scale-up team, was able to devise strategies that broke the feedback loops that discouraged institutionalization of PPIUD services. Employing counselors increased the numbers of women who were informed about PPIUD services before labor. Regular supportive visits to facilities for up to 18 months after training gave service providers more confidence in their abilities, and helped them to overcome the practical obstacles in the way of offering the service. These strategies were developed by Indian professionals with decades of reproductive health experience.

Tailored Support

A key strategic choice to institutionalizing change in the workplace is selecting between a high-touch, tailored approach to facilitating change and more distal accountability mechanisms to enforce change. In health systems with relatively weak administrative capabilities, the facilitation approach is more likely to be successful. The PFP case study was an example of high-touch facilitation in which the scale-up teams coached service providers to overcome barriers until offering the PPIUD service generated greater demand from clients and more support from providers. Other promising approaches to facilitating behavior change within work groups could also be considered when designing scale-up efforts to foster positive feedback loops. The following methods have been shown to work:

- Strategies from behavioral economics that stress incentives and disincentives to make it easier for people to change practices (Thaler & Sunstein 2008)
- Financial or intrinsic incentives for adopting new behaviors (Linn 2013)
- Change agents identified through initial waves of introducing a service in selected sites (Massoud & Mensah-Abrampah 2014)
- Delivery units deployed to coach managers and frontline staff and reorganize processes within service units (Todd, Martin, & Brock 2014)
- Use of events such as public meetings and health fairs to reinforce the social desirability of adopting change (Sarriot & Kouletio 2014)

There is no body of evidence to inform the choice of one method over another. The best choice depends on the fit with institutional norms, availability of motivated personnel, and resources. Working from a CAS model, using multiple methods could increase the likelihood of success (Resnicow & Page 2008; Sutton & Rao 2014). Of course, every method should be tested to make sure it has positive results before it is expanded nationally.

Devolving

Once work teams and other subsystems have become accustomed to the intervention, coverage and institutionalization will accelerate if agents take the initiative to make adjustments to the intervention to suit the circumstances. In a health system with thousands of facilities and hundreds of districts, uniformity of delivery strategies is not possible or even desirable. For the case studies of scale-up efforts in India and Mali, both high- and low-performing sites were visited. The reasons for the differences in performance were not always apparent, but their manifestations were similar. In high-performing sites, informants eagerly discussed their efforts and described what they had achieved.

As long as there are safeguards and a shared understanding of the essential components of safety, the spread of local initiatives is a sign that institutionalization has occurred. Sometimes initiatives are taken by stakeholders, such as NGOs and the private sector, who were not part of the original design. Scale-up efforts should be open to opportunities to encourage this devolution (Bradley et al. 2012).

Another reason for resisting local initiatives is that they might lose the support of other stakeholders. For example, when some CHWs with health qualifications wanted to deliver

services beyond the scope of practice defined in the SEC/iCCM implementation guide, they were reprimanded and even removed from their posts. Both patient safety and potential competition with other providers were at risk.

Attention to Equity and Other Local Variations

When selecting strategies to accelerate change, consideration should be given to providing more support to settings and subsystems with less capacity. The gains from positively reinforcing local initiatives can direct attention away from facilities and communities with the greatest need. This is often seen in health care; services flow to those who are most easily served rather than those with the greatest need (Hart 1971). Impoverished communities in Mali were less likely to provide CHWs with housing or proceeds from their harvests. Facilities with acute workforce shortages were not able to sustain a PPIUD service in India.

A two-tiered scale-up strategy that gives more support to the most vulnerable may be required. The PPIUD scale-up effort created the foundation for high-functioning states to scale up their own programs by assisting in the establishment of two service and training facilities. Other states received much greater administrative and technical support to expand their service.

ADAPTIVE MECHANISMS

Instead of an emphasis on sustaining the intervention, scale-up efforts should contribute to reinforcing the understanding of the health goal and sharing information about progress (Greenhalgh, Macfarlane, Barton-Sweeney, & Woodard 2012). Even over the relatively short timeframe of the study, significant changes outside of the control of implementers occurred that had consequences for the scale-up efforts. The GOI introduced incentive payments to community health agents and service providers, which were linked to PPIUD acceptance. The sources of external funding for CHW salaries in Mali ended without a clear strategy for how and by whom they would be paid in the future.

These examples illustrate that the expectation that interventions, once taken to scale, will be sustained is based on the implicit assumption of a static environment. This is often an unrealistic assumption. Even well-supported interventions that informants believe are making a positive difference and are becoming an integral part of their health systems are subject to external forces that require agents who had been relatively satisfied to make significant changes or perhaps abandon the intervention altogether and move to other priorities. Over the last generation, the AIDS crisis has forced a major reorientation of health priorities. More recently, the Ebola crisis altered health priorities in West Africa.

The need to evolve is not limited to external shocks. As an intervention becomes institutionalized, different strategies may be needed to achieve new goals, such as achieving 100% coverage or transitioning away from external financing. These phase shifts in policy are themselves an example of complex adaptive behavior.

As views change regarding a health problem or the benefits of an intervention as implemented, or as pressure increases for other approaches, the indication that a scale-up effort has been successful might not be that the specific intervention continues to be practiced but that the experience of expanding and institutionalizing the intervention positively contributes to the next iteration of addressing the health problem. In other words, the intervention should evolve rather than remain as originally conceived or be abandoned altogether.

The case studies in this report describe scale-up efforts that were relatively new. There has not been enough time to see how relevant the interventions and the scale-up strategies remain. However, in all four countries there were frank and public discussions about the strengths and weaknesses of the intervention, the scale-up effort, and the next set of challenges to improving reproductive, maternal, newborn, and child health.

Conclusions

While health systems as adaptive systems are complex, their understanding informed by systems thinking need not be complicated. (Atun 2012)

This report responds to a frequently expressed need to convert concepts and principles of complex adaptive health systems from the abstract to actual practice (Adam & de Savigny 2012). It proposes a set of capabilities, accelerators, and adaptive mechanisms for scale-up efforts based on an analysis of the challenges that are likely to be faced within dynamic health systems.

Achieving sustainable health gains is possible; however, the process of achieving those gains often is not linear, predictable, or controllable. Old practices are resistant to change and new practices are not readily embraced. New approaches to taking interventions to scale, already being implemented through an accumulation of practical lessons from many case studies, offer more levers to achieving change by working with what may initially appear to be insurmountable obstacles.

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