Dissemination, Diffusion, and Scale Up of Family Health Innovations in Low-Income Countries

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Executive Summary

In this report, we present the AIDED model for guiding dissemination, diffusion, and scale up of family health innovations in low-income countries. The model was developed using in-depth interviews with experts and practitioners, a systematic review of peer-reviewed and gray literature, and pressure testing with multiple audiences. The AIDED model posits five interrelated components to the complex process of scale up: 1) assess, 2) innovate, 3) develop, 4) engage, and 5) devolve. We identify key activities in the five components that have been linked to successful scale-up efforts of selected family health innovations: Depo-Provera, exclusive breastfeeding, community health worker approaches, and social marketing.

The model represents scale up as a complex adaptive system in which the several interlocking parts interact in diverse and sometimes unpredictable ways. Nonetheless, the in-depth interviews and literature synthesis suggests important patterns that are prominent in successful scale-up efforts and less apparent in failed efforts. These include explicit, early investment in assessment of community receptivity to the innovation and of the key environmental forces that may promote or limit scale up; tailoring of the innovation to fit target user groups; development of political, regulatory, socio-cultural, and economic support for the use of the innovation in target user groups; deep engagement with target user groups to ensure that the innovation is translated, integrated, and replicated effectively; and devolving of efforts to spread the innovation from the index user groups to additional sets of user groups often through social and professional networks and relationships. We found only limited evidence for differences in effective scale-up approaches across the different innovation types.

Glossary

Absorption capacity	*groups' ability to recognize new information, assimilate it, and apply it to meet the groups' objectives*
Adaptation	*the process through which the user groups redesign the innovation to better fit their preferences and environment*
Assess	*to obtain a precise understanding of the index user groups' receptivity to intended innovations and of the environmental context and stakeholders that influence user groups' decisions and practices*
Breastfeeding 1-6-24	*the practice of initiating breastfeeding within one hour of birth, breastfeeding exclusively for six months, and continuing to breastfeed while introducing complementary feeding until at least two years of age*
Community health worker	*person trained to assist professional health personnel in communicating with community residents concerning health needs, health behaviors, the availability of health services, and/or in providing basic health care*
Complex adaptive system	*system that includes several interlocking parts, multiple feedback loops, and several pathways to success; characterized by emergent and somewhat unpredictable events*
Depo-Provera	*long-acting contraceptive administered by intramuscular injection*
Develop	*the process of priming the environment to be supportive of increased use of the innovation*
Devolve	*the process through which the index user groups release and spread the innovation for its re-introduction in new user groups within their peer networks*
Diffusion	*passive spread of an innovation, which is typically informal and largely uncontrolled*
Dissemination	*active and planned efforts to encourage target groups to adopt an innovation*
Engage	*the process of introducing the innovation from outside the user group to inside the user group through such methods as boundary spanners, translating the innovation so that user groups can assimilate the new information, and integrating the innovation into the routine practices and social norms of the user group*
Failure	*an outcome in which an innovation was used by the index user groups but not subsequently taken up by additional user groups*

Index user groups	*the first target of dissemination efforts; the first set of targeted user groups who put the innovation to use*
Innovate	*the process of designing, redesigning, and packaging an innovation so that it is acceptable and perceived as advantageous by potential user groups in their specific context or environment*
Innovation	*the process of putting an idea into practice among groups for whom the idea is new*
Integration	*the process by which user groups assimilate the innovation into routine practices and social norms*
Introduction	*the process by which information about the innovation is given to potential user groups by someone who has an essential, pre-existing role in the potential user groups and who also has contact with people outside the potential user groups*
Replication	*the process by which identical copies of the original innovation are created by index user groups*
Scale up	*widespread use among target populations*
Social marketing	*the application of commercial marketing techniques to design and implement programs to promote socially beneficial behavior change*
Translation	*the process by which user groups interpret the innovation so that user groups can more readily assimilate the new information*

Chapter 1 - AIDED: A Model for Dissemination, Diffusion, and Scale Up in Low-Income Countries

Introduction

Examples abound of innovations that have been shown to be both efficacious and cost-effective and yet are not widely implemented in practice. Why this occurs is the subject of much scholarship and debate, particularly in global health where the need for scale up of effective practices is dire; understanding the underlying mechanisms is essential for identifying strategies to promote dissemination, diffusion, and scale up of such innovations.

Dissemination: active and planned efforts to encourage target groups to adopt an innovation

Diffusion: passive spread of an innovation, which is typically informal and largely uncontrolled

Scale up: widespread use among target populations

Several factors have been proposed to explain why effective innovations fail to scale up for widespread use. These factors can be classified in several broad domains: 1) features of the innovations, 2) characteristics and preferences of potential users of the innovation, 3) social, economic, and political environments in which dissemination and take up occur, and 4) methods by which the innovation is disseminated (Yamey, 2011; Simmons et al, 2007; Greenhalgh et al, 2005; Rogers, 1995; Greenhalgh et al, 2004; Yuan et al, 2010; Wejnert, 2002; McCannon and Perla, 2009). Such broad domains are conceptually useful; however, they provide limited practical guidance on how to successfully scale up evidence-based innovations in global health. Individual empirical studies of scale-up efforts in low-income countries have been published (Billings et al, 2007; Douglas et al, 2010; Noor et al, 2007; Shumbusho et al, 2009; Enarson et al, 2009; Kikumbih et al, 2005; Nunn et al, 2007), but we lack a practical model for dissemination, diffusion, and scale up of innovations in such settings where the need is most acute.

Accordingly, we sought to develop a practical model for dissemination and diffusion of innovations to understand what works in scaling up evidence-based health innovations in low-income countries. Because extensive literature already exists about models of individual behavior change (Prochaska and Norcross, 2010; Prochaska and DiClemente, 1983; Bandura, 1997; Janis and Mann, 1977; Prochaska, 2008; Velicer et al, 1985; Adams and White, 2005; Brug et al, 2005; Ajzen, 1985; Ajzen, 1991; Godin and Kok, 1996; Rivis et al, 2009; Mullen et al, 1987; Rise et al,

2010; Armitage and Conner, 2001) and about dissemination and diffusion of innovation in health service organizations in high-income countries (Greenhalgh et al, 2005), we focused on spread processes at the organizational and community level in low- and middle-income countries, which may be distinct from those examined in previous literature. We view spread as an ecological phenomenon involving interactions among groups and their environments. This complex process of scale up involves many highly diverse groups, including user communities, provider organizations, non-governmental organizations, funders, and policy making groups. We sought to develop a model that would be applicable to different types of family health innovations, including products, health behaviors, organizational forms, and business models. We used Depo-Provera as an example of a product innovation, exclusive breastfeeding as an example of a health behavior innovation, community health workers (CHWs) as an example of an innovation in organizational form, and social marketing as an example of a business model innovation. We focused on exclusive breastfeeding instead of breastfeeding 1-6-24 because breastfeeding 1-6-24 is not discussed in adequate depth in the literature. These sample innovations provided useful lenses through which to examine the dissemination, diffusion, and

scale-up processes because of their strong evidence base and potential impact in improving health globally.

Methods

Overview

We used multiple methods in this study, including in-depth interviews, systematic literature review, and 'pressure testing' with selected key informants and third party experts. This combination of methods was selected to enable integration of findings from both peer-reviewed academic sources and firsthand practitioner experience. In addition, we examined the theoretical literature on dissemination, diffusion, and scale up from diverse disciplines including biology, economics, psychology, organizational theory, sociology, and knowledge management. The study had several phases. First, we conducted in-depth interviews, following principles of grounded theory (Glaser and Strauss, 1967) to generate a hypothesized a five-component conceptual model, which we called the AIDED model. Second, we completed a systematic review of peer-reviewed and gray literature relevant to scale up of the four innovations. As part of this synthesis, we employed a standardized data extraction process to identify enabling factors and barriers to dissemination, diffusion, scale up, and sustainability reported in the literature. We also mapped the enabling factors and barriers identified by the literature to the five AIDED model components to determine the degree to which the empirical literature supported the AIDED model and to

Methods at-a-glance

Interviews with 27 key informants with expertise in family health innovations in low-income countries

A systematic review of peer-reviewed and gray literature for each of the innovations

'Pressure testing' feedback sessions with 5 key informants in 4 independent audiences

identify evidence gaps. Third, we pressure tested the model by 'member checking' (Lincoln and Guba, 1985), or 'respondent validation' (Mays and Pope, 2000) a commonly used technique to establish credibility of qualitative research findings. During this process, the findings were given back to several of those interviewed for the study and discussed in forums of experts and practitioners. We refined the model based on feedback as appropriate (see **Appendix** for feedback and our responses).

Key informant interviews

We conducted in-depth interviews with key informants who had a broad range of experiences with dissemination and diffusion of the four selected family health innovations in low-income countries. We chose a qualitative approach because this method is well suited for studying complex social processes (Patton, 2002; Sofaer, S. 1999) and for generating novel insights (Crabtree and Miller, 1999; Mays and Pope, 1995; Glaser and Strauss, 1967) through the use of inductive approaches. We developed a purposeful sample of key informants using several sources including relevant peer-reviewed or gray literature, our team's professional networks, and the Bill & Melinda Gates Foundation, which has launched major initiatives in the selected family health innovations. We enrolled respondents until we achieved theoretical saturation (Morse, 1995; Patton, 2002), i.e., until successive interviews produced no new concepts, which occurred with 27 interviews.

> *"Pilot and pray is what most people do in global health. They pilot test some intervention in a district...and then hope for and look for a positive result and then are always somewhat surprised and disappointed when it doesn't scale."*

Interviews were conducted by research team members with experience in qualitative interviewing; two researchers with diverse backgrounds conducted each interview using a

standard interview guide (**Figure 1**) with broad, open-ended questions and probes to clarify concepts and elicit detail. Respondents were asked to consider relevant experiences in both their current and any previous professional roles. Interviews were conducted in person as feasible (n=12) and via telephone (n=15). Interviews were approximately one hour in duration and were audio-taped and professionally transcribed. In two cases where we had technical difficulties, we used a dedicated note taker instead of a tape recorder. Prior to agreeing to participate in the study, each interviewee received a detailed information sheet describing the study including the risks and benefits and the procedures for confidentiality. Interviewers reviewed and confirmed participants' oral consent to participate and be recorded before initiating each interview. The study was reviewed by the Yale Human Subjects Committee and granted an exemption under 45 CFR 46.101(b)(2).

Analysis was performed by a core multidisciplinary team with expertise in qualitative data analysis. We developed a code structure in stages using systematic, inductive procedures to generate insights grounded in the views expressed by study participants, using principles of grounded theory (Glaser and Strauss, 1967). We used the constant comparison method (Patton, 2002; Glaser and Strauss, 1967; Bradley et al, 2007) to classify key concepts, expanding and refining properties of the codes with review of successive transcripts. We reconciled differences in coding through consensus and finalized a comprehensive code structure, which was systematically applied to all transcripts. We integrated the final codes into larger themes to generate five interrelated, core components of the dissemination, diffusion, and scale-up process as described by key informants.

We employed several methods recommended by experts in qualitative research to improve the trustworthiness and reliability of the findings (Patton, 2002; Curry et al, 2009; Mays and Pope, 2000). These included tape-recording interviews after consent, using a team of five data coders and analysts who reflected different disciplines, and retaining an audit trail of methods and coding decisions throughout the analysis. For a subset of key informants, we performed member checking (Mays and Pope, 2000; Lincoln and Guba, 1985; Mays and Pope, 1995) and incorporated their additional insights from review of the initial findings. We used ATLAS.ti Scientific Software, version 6.1, to facilitate organization, analysis, and retrieval of data.

Systematic literature review

We conducted a systematic review of peer-reviewed and gray literature for each of the four selected innovations. The objective of the literature review was to synthesize the empirical evidence on enabling factors and barriers to dissemination, diffusion, scale up, and sustainability of each of the innovations in low- and middle-income countries. We included studies conducted in middle-income countries in the review because many countries with middle income (e.g., India, Brazil) today had low income in the past. For each innovation, we searched for peer-reviewed literature in 11 electronic databases (MEDLINE, CINAHL, EMBASE, Web of Knowledge, PsycINFO, Global Health, EconLit, Social Sciences Citation Index, International Bibliography of Social Sciences, Social Services Abstracts, and Sociological Abstracts), including any literature published since the earliest date indexed in each database up to 2010. In addition, we searched the websites of 20 leading global health donors, implementers, and technical agencies to identify relevant gray literature (WHO, UNICEF, UNDP,

UNFPA, the World Bank, the African Development Bank, the Inter-American Development Bank, the Asian Development Bank, USAID, CIDA, DFID, SIDA, GTZ, the Global Fund to Fight AIDS, Tuberculosis and Malaria, CARE, GAIN, Family Health International, Partners in Health, Management Sciences for Health, and John Snow, Inc.). All searches used a standard set of search terms related to dissemination, diffusion, scale up and sustainability and a tailored set of search terms specific to the innovation; the specific search terms for each innovation are presented in Chapters 2 through 5 of this report.

For the peer-reviewed literature, we screened the abstracts of all search results and screened the full text of those articles retained following abstract screening. Screening was conducted independently by two team members to ensure consistent application of the predetermined exclusion criteria. An article was excluded if it did not meet the study's definition of the innovation, if it did not address dissemination, diffusion, scale up, or sustainability of the innovation, if it did not address low- or middle-income countries, if it was superficial in its discussion and/or did not provide empirical evidence about scale up of the innovation, if the full text of the article was not available online, or if the article was not available in English, French, Spanish, or Portuguese.

Gray literature searches included any documents available via the organization's web site on the February 2011 search dates. Due to the large volume of hits generated from these web site searches, the titles of all hits were screened first. If a document appeared relevant on the basis of its title, the full text was reviewed using the same exclusion criteria as applied to the academic literature. Results from the peer reviewed and gray literature searches are presented in Chapters 2 through 5 of this report.

Data extraction from the final sample of peer-reviewed and gray literature was conducted independently by two research team members using a pre-established data extraction form to identify enabling factors and barriers to dissemination, diffusion, scale up, and sustainability. The resulting enabling factors and barriers were then mapped to the five AIDED model components to determine the degree of support in the empirical literature for the scale-up process captured in the AIDED model. These mappings of empirical findings to AIDED model components are reported in Chapters 2 through 5 for each of the innovations, respectively.

Validation with key informants and external experts

We also conducted 'member checking' (Lincoln and Guba, 1985), or 'respondent validation' (Mays and Pope, 2000) a commonly used technique to establish credibility of qualitative research findings. In this process, data and interpretations are shared with study participants so that they can react to and provide feedback on the information; these reactions are then addressed and accounted for in the analysis. We conducted 5 of these sessions with study participants; we also conducted 4 additional feedback sessions with non-participant expert groups.

Results

Analysis of in-depth interview data from 27 key informants (**Table 1** on page 40) revealed five interrelated components in the process of dissemination, diffusion, and scale up: assess, innovate, develop, engage, and devolve, which together comprise the AIDED model (**Figure 2** on page 39). Key informants highlighted the complexity of the process, indicating that

the overall process was nonlinear with multiple feedback loops, and suggested that donors and implementers rarely appreciated this complexity:

> *There's a lot of magical thinking about what this pilot project or proof of concept will do because it's not very real in terms of the stakes necessary to actually sustain for impact and scale.* (Interview #3)

> *Pilot and pray is what most people do in global health. They pilot test some intervention in a district...and then hope for and look for a positive result and then are always somewhat surprised and disappointed when it doesn't scale.* (Interview #5)

With complexity and non-linearity as cross-cutting themes, the following five components consistently emerged from informants' descriptions of their experiences; taken together, they comprise the AIDED model. **The remainder of this chapter describes the five components of the AIDED model, supported by data from the key informant interviews. The subsequent four chapters present applications of the AIDED model to the innovations using the results of the systematic literature review.**

Five components of the AIDED model

Assess: Understand user groups' receptivity to the innovation and the degree of support for the innovation in the political, regulatory, economic, socio-cultural, and technological environments

Innovate: Design and package the innovation to fit with user groups and their environmental context, and to enable index user groups to spread the innovation via social networks

Develop: Build on sources of support and address resistance among stakeholders and opinion leaders; encourage policies, social norms, and infrastructure that will support take up of innovation

Engage: Use existing roles and resources within user groups to introduce, translate, and integrate the innovation into each user group's routine practices

Devolve: Capitalize on existing social networks of index user groups to release and spread the innovation to new user groups

The AIDED model

Assess the landscape.

The first component involves obtaining a precise understanding of the index user groups' receptivity to the intended innovation as well as the environmental context and stakeholders that influence user groups' decisions and practices. Receptivity was distinguished from either need or demand. Need referred to what would be necessary to improve family health from a public health perspective whereas demand referred to what a family may desire, given the net costs and benefits of alternative choices. In contrast, receptivity referred to a state of being open to possible use of the innovation. Key informants suggested that a primary limitation in many scale-up efforts was conflating need and want:

> *In public health, there is often a lot of confusion between the need and the demand for innovations. There is a tendency to approach the idea with, "okay, if I look at the incidence of this particular disease and I know that this particular intervention can solve that disease…then, why isn't this diffusing more?" You have to work from what consumers want.* (Interview #23)

In addition to needs assessment, which is commonly done, the assessment component includes examining environmental conditions that may promote or impede take up of the innovation. Key informants explained that such conditions include the political, regulatory, economic, social, cultural, technological, and information environments. Such assessments may span multiple levels from the local to the global, as expressed by one key informant with regard to breastfeeding programs:

> *Assessments occur at various levels. You have the assessment in the community to find out the beliefs and practices in the community. You have opinion leader research…to find out where you stand in terms of policies and their attitudes towards breastfeeding, and then stakeholder analysis. So we have all those types of assessments at the very beginning.* (Interview #12)

Assessment should also examine previous experiences with the innovation in order to avoid past pitfalls and identify present barriers to scale up, as one key informant explained:

> *Has there been any prior experience with whatever process of change you are trying to implement? And if so, what were the formal and informal, explicit and implicit lessons learned by the actors involved? What were these collective pearls of wisdom?* (Interview #9)

Innovate to fit.

This component includes designing, redesigning, and packaging an innovation so that it is acceptable and perceived as advantageous by potential user groups in their specific context or environment. Key informants described the process of designing, re-designing, and packaging the innovation as achieving "fit" between the innovation and the user group. Involvement of stakeholders from the user groups at this early stage facilitated matching of the innovation to the user group needs and wants. One key informant highlighted the importance of precise fit to a particular context in the case of Depo-Provera:

> *To activate this [the injection], it is very simple. A super simple device, it was not a hand-me-down. This was reengineered for the developing country. There was no developed country use for this technology at all.* (Interview #1)

Also important in the process were non-technical features of the innovation design and packaging. For instance, in the case of CHWs as an innovation, experts spoke about CHW task assignments, role definitions, and community perceptions as examples of design and packaging. Key informants highlighted how the visible benefits of using CHWs generated a perceived advantage for the innovation, which was critical to its fit with the community needs and wants, and subsequent take up:

> *The community has to see CHWs as valuable. If they are doing something the community really values, it will work….In Nepal, CHWs were valued by the community mostly because [of] the Vitamin A program where the community health worker would give*

> *Vitamin A to kids. And that lowered mortality fast, and the communities really valued that. It raised the community health worker status quickly because they had Vitamin A. [Also], kids are dying of pneumonia and [if] the community health worker can save the kid by getting them to the right place and having medicines, then [the] community values that. It is very visible.* (Interview #11)

Develop support.

This component refers to priming the environment to be supportive of increased use of the innovation. Developing support involved not only enhancing awareness of the innovation but also building on support and addressing resistance in the environment. This component was therefore directly informed by the environmental assessment. Key informants described resistance from groups that might suffer economic or political losses if the innovation became routine practice:

> *What you hear at the ministries of health is from people whose livelihood may be affected or whose turf or influence they think is being diminished…we are getting from the nursing association that we have unemployed nurses in Kenya. Why should we have community workers giving Depo injections …the midwives and doctors will give similar answers and… it turns out to be a turf battle.* (Interview #14)

Also involving such groups in the other components such as assessment and innovation was viewed as helpful to addressing resistance and building support.

In addition to potential resistance or lack of support from user groups, key informants also described resistance from diverse groups at local, national, and global levels. These levels included clinicians whose market is threatened by CHWs, Ministry of Finance officials who must balance investments in health with other development priorities, and global agencies that focus on specific diseases rather than broader family health innovations. Key informants indicated that the potential supporters and resisters differed by innovation, market, country, and the

time period; hence actions were viewed to be most effective when they were tailored to the specific context in which the innovation was being disseminated or diffused.

Key informants emphasized the importance of strategic networking and collaboration in the development of political and economic support and support at the regional, national, and global levels.

> *If you understood the political science and the political economy you'd see actually what I need to do is I need to target policy makers first.* (Interview #5)

> *One [effort is] focused at the policy level and working with decision makers…getting them the information that they need to then further promote or, if they are not already convinced, to help them be convinced.* (Interview #14)

Legislation and regulatory action that supported the innovation also played a critical role according to key informants. For instance, in the case of exclusive breastfeeding, a key informant related the importance of legislation to provide four months paid maternity leave and to curb the marketing of substitutes for breast milk in Brazil:

> *Another important aspect that came…were the policies that were...elected by the government…[it was] decided to provide four months of paid maternity leave to formal working women....so '88 came this decision, this law, and also in 1988...an approval of the National Code of Marketing of Breast-Milk Substitute…also important for the continuation of the pro-breastfeeding campaign.* (Interview #22)

Several participants also described the development of new policies endorsing task-shifting, which was noted as fundamental to the spread of both CHWs and Depo-Provera. Here, one participant describes unsuccessful efforts to encourage take up of injectable contraception in India due to resistance to task-shifting among policy makers and providers:

> *The task shifting point is a major policy decision that needs to be made at the country level of saying CHWs [are] able to use injectables. And despite the fact that there was any number of demonstration projects that showed that you could train easily a frontline worker to be able to use an injectable like this one, there typically was no appetite to switch policy.* (Interview #1)

Understanding and addressing resistance was sometimes accomplished by using data, in some cases from controlled trials funded in the country and in other cases through more non-traditional forms of data. For instance, the highly successful scale up of CHWs in Pakistan involved building political support through evidence-based advocacy:

> *We spent a year collecting and generating local data from the district on perinatal mortality, its distribution, and causes of death. This more than anything was critical in focusing the attention of the local politicians and policy makers. [We] made several presentations to the Minister of Health and the Director General …to persuade them of the importance of doing something and getting the buy-in from the program people.* (Interview #27)

Key informants also discussed the role of economic incentives in developing support for the innovation and to propel dissemination and diffusion. In the case of Depo-Provera, for instance, key informants discussed the importance of developing sufficient incentives to produce, sell, and buy the product:

> *It's really not rocket science. You get a product; you put it in a box….If it's cheap enough, people will buy it. If it's too cheap, retailers won't stock it. Play with those two variables. The margins have to be attractive to those within the retail chain, but the end price has to be affordable to the consumer.* (Interview #7)

> *You promise [the manufacturer] more volume, asking them for lower margins. And the premise was that that drug now would go to the supply chain and end up at the frontline at between 30 and 50 cents, more or less.* (Interview #3)

Several key informants also noted economic disincentives as major sources of resistance, particularly in the areas of exclusive breastfeeding and use of CHWs, which were viewed by infant formula companies and clinicians, respectively, as crowding out their businesses. Some key informants in this context indicated that economic incentives (monetary or non-monetary) for end users were important if the innovation required substantial personal behavioral change, such as adherence to exclusive breastfeeding:

> *Despite their desire to breastfeed, [women] cannot do it because of economical reasons, social reasons...what kind of incentives should be given to women and families in order to increase the prevalence of choosing breastfeeding….It's a competition between different priorities that women go through. It's not that they don't want to. They have to do something else, to go to work. So the financial incentives would be important I think and that has not been done.* (Interview #8)

Engage with user groups.

This component encompasses a set of complex actions to embed the innovation in the social norms of the index user groups. Engagement with user groups was viewed by key informants as occurring throughout the scale-up process and involved: 1) introduction of the innovation from outside the user group to inside the user group via boundary spanners, 2) translation of the innovation so that user groups could assimilate the new information, and 3) integration of the innovation into the routine practices and social norms of the user group.

Introduction of the innovation referred to giving information about the innovation to the potential user group. Critical to the process, however, was that this introduction be accomplished by someone who had an essential, pre-existing role in the potential user group and who also had contact with people outside the potential user group. Key informants described this boundary-spanning role:

> *We were using community volunteers that were already active in the community….So when we trained them, one of the first activities that they did was community meetings to introduce the new service. So they went out to different types of meetings with different members of the community and that was awareness going in the community about the new service.* (Interview 25)

Translation was the facilitation of transmission of the new information so that it may become embedded in the routines and social norms of the user group, allowing new information about the innovation to be assimilated by the potential user groups. Key informants indicated that this is also most effective if led by members of the user groups. In

contrast to the innovate component, which includes design and packaging activities that occur more commonly outside of the user group, translation refers to activities that occur inside the user group and within existing social structures of the group. In the most concrete manifestation of this function, translation included the development of practical guides, blueprints, and protocols in the spoken language of the user group. In reflecting on the success factors in implementing the community health worker model in Nepal, one key informant described how people in the community collaborated in translation:

> *But I think one of the reasons the manual was particularly good [was] …we contracted with the literacy group and with UNICEF because they had the only good artists…And the three groups [the literacy group, UNICEF, and the Ministry] had to work together to produce the sort of communications…that worked with the CHWs.* (Interview #11)

Translation also included more subtle ways to contextualize or frame the innovation in a way that made it appealing to larger numbers of people in the user group, such as describing the innovation using local idioms, stories, or historical examples, or associating the innovation with important values or practices within the group. For instance, describing the implementation of a community health worker program, a key informant said:

> *We realized that the best [health] counselors were our cleaning ladies because they knew how to talk with the ladies. They knew the vocabulary, you know….They were from the same neighborhoods…They were more or less the age of the ladies...They were also mothers having the same problems. They talked to them very easily, not [acting as if] I am the boss here…I think it feels as if they were having a conversation.* (Interview #21)

In some cases, translation occurred via opinion leaders who, because of their position in the community, were effective in translating information pertinent to the innovation to be assimilated by the larger community. For example, one participant described the experience in Haiti in which condom use had not been acceptable in the community until a pastor translated the use of condoms into terms that resonated with the larger community:

> *[A] pastor agreed to lead up a survey of church goers questioning people in the church about sexual behavior and condom use, and the results came out that showed everybody that that level of promiscuity was as pervasive in the churches as it was outside the churches…It really, really made a huge breakthrough. It broke down barriers and it had an incredible impact on how the churches stopped giving the messages [that were] stigmatizing and discriminating. The bishops there were letting condoms be distributed and actually talking about protection. You know, it just turned them around.* (Interview #13)

Integration, the final aspect of the engage component, referred to the embedding of the innovation in the routines and social norms of a user group. Experts highlighted that such integration was possible, but rare, and manifested in a variety of ways. In some instances, integration was enabled because support for the innovation had already been developed in the user group's environment, such as through legislation and changes to broader cultural norms beyond the immediate user group. For instance, a key informant described this kind of integration relative to breastfeeding in Brazil:

> *The behavior change comes with this facilitation [by] the facilities that the woman finds in society. Instead of being sent out of the bus because she's breastfeeding or out of the health center because she's breastfeeding, on the contrary, she is well received so this behavior became normal.* (Interview #22)

In other instances, the innovation became part of social norms of the community, reflecting its integration into the routine practices of the user groups and its sustainability over time. For instance, the CHW position in Nepal was viewed as an honor as it was believed to contribute to one's *dharma* for community service, which was thought to increase their acceptance in what they understood as the "afterlife."

> *Each of the communities wanted to be a quality midwife and to wear the brand of a Bidan Delima. There was an advertisement campaign, but much more so, it was a peer pressure, a sisterhood….* (Interview #10)

At this stage of integration and replication, the innovation was understood as part of the status quo (rather than a threat to the status quo) passed on through routine social interactions, as described by one key informant:

> *[The diffusion] is not something that a funder or a grantee, not even the Ministry, can really say that they handle. These are social systems that are already operating. I mean the relations between neighbors and households…serve a purpose other than the delivery of healthcare services…they serve a human purpose.* (Interview #9)

Devolve efforts for spreading the innovation.

This component involves the index user groups releasing and spreading the innovation for its re-introduction in new user groups within their peer networks. The release of the innovation from the index user groups may result in replication, adaptation, or failure. Key informants indicated that exact replication was a rare phenomenon. Adaptation, the process in which the user groups redesign the innovation to better fit their preferences and environment, was reported as more common by key informants. Failure, when an innovation was used by the index user groups but not subsequently taken up by additional user groups, was also perceived by informants as a common occurrence. Key informants underscored the importance of peer networks in facilitating the process of release and spread to new user groups, suggesting that trust among the network members was essential, as described in these examples:

> *It's true for Depo. We're having huge success now in family planning in Africa by putting early adopters to counsel other women…getting them to talk about their experience in family planning…I think we are seeing a real normative change in a whole bunch of communities in which we operate around family planning, IUDs, sterilization, injectables because, you know, you get women talking to other women.* (Interview #19)

> *It is human social networks. In the case of vaccination, [we identified] women in communities that had what we thought were natural leadership skills. And in a very haphazard, often times not a real structured manner, we went out en masse as a health system in my state to look for these women and they became the ones that we marketed*

> *to. And they were the ones who actually drove the adoption of vaccination among their peer communities.* (Interview #9)

In this component, the external parties that helped to establish the innovation in the index user groups may be most important in continuing to help strengthen user groups' networks to facilitate the spread of innovation. Supporting convening of such networks was as described by one key informant:

> *We did try to bring stakeholders together so they could learn from each other on their experience….In Madagascar, we had the nutrition task force where they might be 50 different organizations…By exchanging information, these groups picked up the tools and the approaches and they would implement them. In Ghana, we worked with support groups [of women to] bring people from different areas of the country together…you [have one] community influencing another community…. So we just try to facilitate some of this, bringing people from different parts of the country together to exchange information.* (Interview #12)

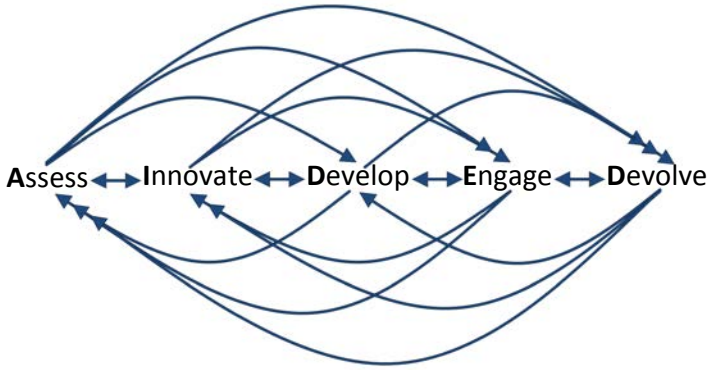
Key informants noted that relinquishing the process of group-to-group spread to the networks had risks, highlighting that "some innovations have some negative and positive spinoffs" (Interview #11). Positive spinoffs of spread included the take up of innovation complements. For example, key informants described how increasing the use of CHWs also spread messages and services that they promoted, such as antenatal care, better hygiene, HIV testing, and other public health efforts. In contrast, negative unintended consequences were also identified and some key informants were concerned that scale-up success should be determined based on comprehensive monitoring and evaluation efforts.

> *We need a balanced view and measurement impact because sometimes things [can have negative effects]. Think about the pneumonia vaccine. It is good, but it increases illness too maybe. If we can predict that ahead of time, we can plan for it and maybe lessen the negative impacts.* (Interview #11)

Discussion

We identified five distinct but interrelated components that comprised the AIDED model for dissemination, diffusion, and scale up of selected family health interventions in low-income countries: assess the landscape, innovate to fit, develop support, engage with index user groups, and devolve efforts for spreading the innovation. Critical to implementing such an approach is the recognition that the progression through these components may be nonlinear and involve multiple feedback loops, which can necessitate reversions to previous components. For instance, resistance in the environment that arises in the component of engaging index user groups may require returning to the components of assess the landscape, innovate to fit, and develop support in order to address the barriers to spread.

Progression through the AIDED components is not linear
Engagement with user groups and development of support in the environment can begin in the assessment and innovation components. For example, user group members and key political and economic stakeholders can be involved in identifying receptivity to the innovation and/or designing the innovation to fit.



The model further indicates that successful scale up is not fully under the control of the donor or innovator but rather grows organically out of a deep understanding of and engagement with user groups and their environmental context. Although the model that emerged identified five common components, key informants cautioned that there was no single, definitive way to achieve effective scale up in every context. Rather, they noted the "myth of the magic bullet (Interview #23)," which was summarized by explaining that "these things are often very contextual, and there isn't a magic bullet. Just because something worked

well in one country, doesn't mean it's going to work elsewhere" (Interview #23). Hence, specific actions and strategies within each component remain context-dependent.

The findings suggest that the full process of dissemination, diffusion, and scale up is dependent upon a complex adaptive system, which includes several interlocking parts, multiple feedback loops, and several pathways to success. The emergent and somewhat unpredictable nature of the system has several implications. First, real-time, valid information flow across the system is essential to effective scale up. Because actors in the system adapt based on what they understand as environmental conditions, misinformation can create suboptimal situations quickly. Therefore, investments in the data infrastructure and the relationships that underpin valid and reliable information flow are paramount. Second, the achievement of widespread innovation use is the result of a multi-factorial process and cannot be attributed simply to specific, planned actions. Because there are multiple paths to the same outcome, system interventions that include coordination of multiple levels of action (e.g., global, national, local) are most likely to produce successful scale up. Last, because the full outcomes are somewhat

Complex adaptive systems: Implications for scale up

Issue	Implication
Real-time, valid information flow across the system is essential because misinformation can create suboptimal situations quickly.	Invest in data infrastructure and information-sharing relationships.
Scale up is a multi-factorial process that cannot be attributed simply to specific, planned actions.	Use system interventions that coordinate multiple levels of action (e.g., global, national, local).
Outcomes are somewhat unpredictable in complex adaptive systems.	Develop contingency plans for potential unintended negative consequences.

unpredictable in complex adaptive systems, it is important to anticipate unintended negative consequences that may emerge and to develop contingency plans for these potential occurrences. Furthermore, careful attention to incentives and accountability systems to limit negative consequences is essential to ethical and effective efforts to disseminate and diffuse innovations.

The AIDED model builds on and extends previous literature about scaling up health innovations. Substantial literature exists on scaling up disease-specific interventions such as anti-retroviral therapy for the treatment of HIV/AIDS (Hirnschall and Schwartländer, 2011; Hecht et al, 2010; McCarthy et al, 2006; Gupta et al, 2004), DOTS therapy for the treatment of tuberculosis (Marais et al, 2010; Cobelens et al, 2008; Elzinga et al, 2004), and bed nets for the prevention of malaria (Dunn et al, 2011; Alonso et al, 2011; Flaxman et al, 2010). These studies have consistently identified factors related to product availability, mass and social marketing, funding subsidies and price as driving scale-up success. In an effort to broaden this understanding of the scale-up process, the AIDED model was developed to apply to a range of different innovation types including not only products, but also health behaviors, organizational structures, and business models across diverse diseases and health conditions. Second, the AIDED model traces out the full arc of dissemination, diffusion, and scale up, rather than simply the final step of achieving widespread use of the innovation. Because the AIDED model takes as its point of departure the question of how an innovation is introduced to initial index groups, it offers novel insights into the micro-dynamics of spread that must precede and drive any widespread take up of the innovation. Third, the AIDED model focuses on groups (e.g., organization or community) as mechanisms of spread, in contrast to prior scale-up studies of

individual behavior change (Fischer Walker et al 2011; Larson et al, 2009; Msellati, 2009; Gaziano et al, 2007). Fourth, the AIDED model highlights how the process of dissemination, diffusion, and scale up reflects a complex adaptive system with implications for innovators and funders. Although some studies have addressed the system effects of health innovation scale up, (Peterson, 2010; Assefa et al, 2009; Van Damme et al, 2008; Knippenberg et al, 2005; Lamptey and Wilson 2005), previous work has not fully described the inherent resistance to change and important leverage points for rapid spread, which derive from the complexity and adaptive nature of the scale-up process. Finally, the AIDED model proposes a practical tool for applying the model components to activities and measures that could be used by those designing and implementing scale-up initiatives. Similar to other scale-up frameworks (Yamey, 2011; Simmons and Shiffman, 2007), the AIDED model recognizes the importance of features of the innovation, the user group, and the environment as central to scale up; however, the AIDED model as presented here offers an added level of practical guidance for how these characteristics can be assessed and leveraged for scale up.

Our findings should be interpreted in light of several limitations. First, the inductive approach used to construct the AIDED model did not allow for simultaneous empirical testing of the model. Although this qualitative approach enabled us to identify distinct components within the complex system of dissemination, diffusion, and scale up, future research is required to validate the AIDED model in new contexts other than those described by our key informants. Second, social desirability response bias (Sudman and Bradburn, 1996), in which participants may have misrepresented their experiences in order to provide desirable answers, may have occurred. To minimize this potential bias, our interview teams sought to elicit details that would

be difficult to misrepresent, and instructed respondents to share both positive and negative experiences. Finally, the AIDED model does not address long term sustainability of interventions that are successfully scaled up. This will require further research that can help identify lessons learned based on contrasting levels of success sustaining the scaling up of the same intervention (e.g., breastfeeding promotion, support, and protection) in different countries.

Paradoxically, complex adaptive systems are at once capable of fast and sweeping changes and homeostatic, as each part of the system responds to disturbances in such a way that the system maintains the status quo. We identify several leverage points for launching substantial changes in large systems. Nevertheless, recognizing the fundamental complexity of the dissemination, diffusion, and scale-up process, funders and innovators alike will require flexible strategies of assessment, innovation, development, engagement, and devolution to enable effective change in the use of family health innovations in low-income countries.

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Chapter 1 Figures and Tables

Figure 1. Discussion guide used in key informant interviews.

1. Let's start by having you describe your role in your current organization.
2. We are interested in your experience with Family Health interventions. Thinking of one intervention in particular, can you describe the process, from implementation to scale up of the intervention?
3. What kinds of challenges came up and how were those handled?
4. Looking back, is there anything that might have been done differently?
5. Is there anything else we should have asked to help us understand your experience with the intervention and process of implementation and scale up better?

Figure 2. AIDED model of dissemination, diffusion, and scale up (CAPTION)

The figure on the following page illustrates the user groups (shaded circles) of an innovation (puzzle piece) within their shared environment (rounded rectangle). The model begins with the assess component, which surveys index user groups' receptivity to the innovation and the economic, political, regulatory, socio-cultural and technological environmental conditions. This component also includes identification and engagement stakeholders. The innovate component involves designing and packaging the innovation to fit the index user groups based on the assessment results. The develop component creates a supportive environment for spread of the innovation (represented here by the shaded boundary around the environment). The engage component introduces the innovation to index user groups, where the innovation is translated, integrated, replicated and/or adapted. In the devolve component, the innovation is released from the index user groups to new user groups as a replication, adaptation, or failure of spread. Although the figure is arrayed from left to right, the model recognizes that components may need to be undertaken simultaneously or returned to in iterative feedback loops, as indicated by the blue circular arrows following the list of AIDED components.

Figure 2. AIDED model of dissemination, diffusion, and scale up

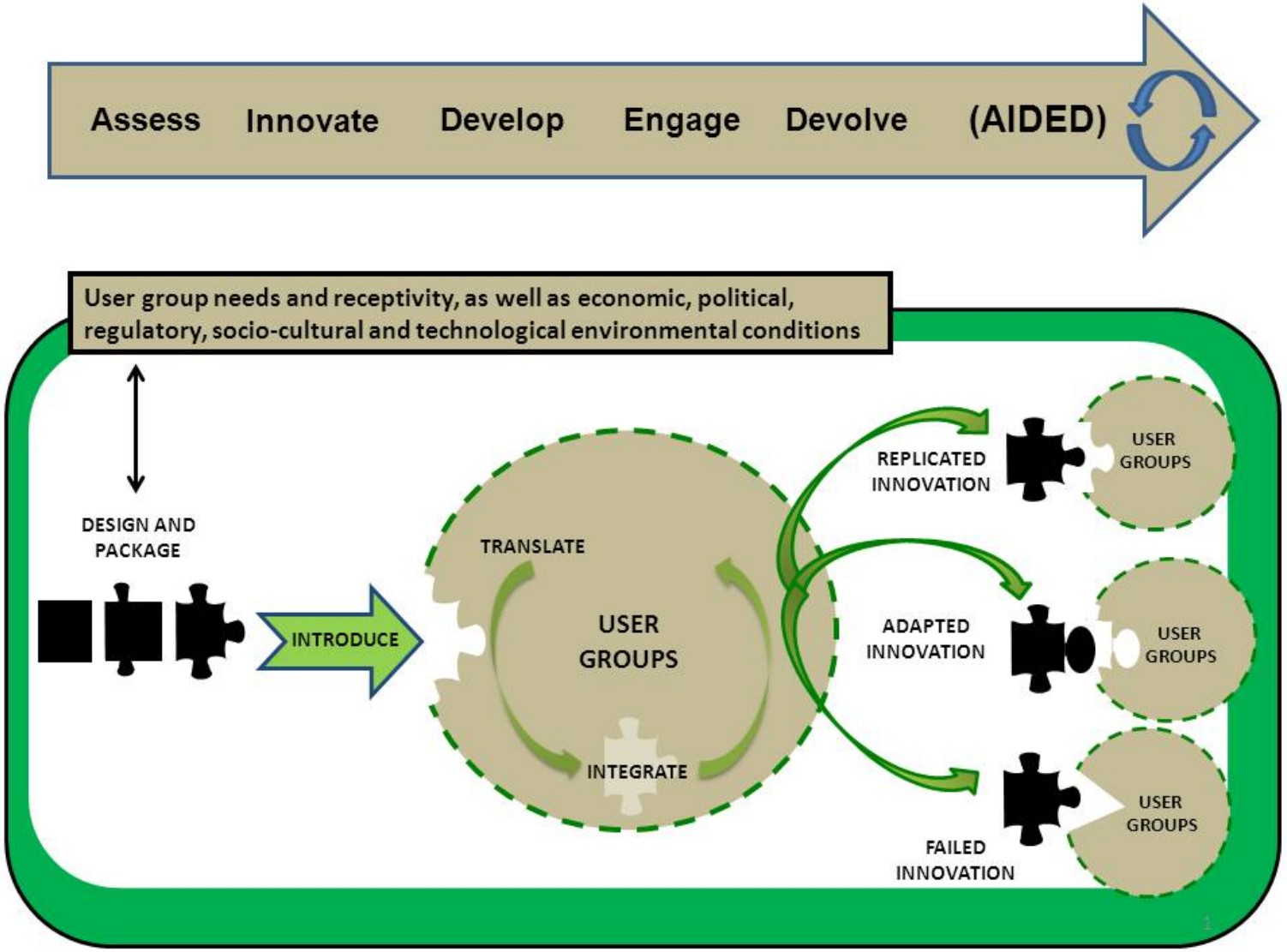

Table 1. Table of key informants.

Area of expertise	Number	Organizations
Depo-Provera	4	Bill & Melinda Gates Foundation
		Family Health International (2)
		Marie Stopes International
Exclusive breastfeeding	4	Alive & Thrive
		Bill & Melinda Gates Foundation
		MCH Division, Sao Paulo State Department Brazil
		Pan American Health Organization
Community health worker	4	Bill & Melinda Gates Foundation (2)
		Division of Maternal and Child Health, Aga Khan
		Malaria Consortium, Uganda
		University Medical Center, Pakistan
Social marketing	6	Abt Associates
		Bill & Melinda Gates Foundation
		The Manoff Group
		Population Services International, Guatemala
		Private Sector Partnerships One (PSP-One) Project
		USAID, Guatemala
Policy making	4	Bill & Melinda Gates Foundation (4)
Miscellaneous	5	Bill & Melinda Gates Foundation (5)
Total	27	

Chapter 2 - Depo-Provera: An Application of the AIDED Model

Background

Depo-Provera, a long-acting contraceptive administered by intramuscular injection, is an effective, convenient and increasingly popular family planning method (Malarcher et al, 2011; Stanback et al, 2010; WHO, 2009; Weil et al, 2008). Widespread recognition of these benefits, accompanied by approval by the US Food and Drug Administration in 1992, catalyzed a global doubling of injectable contraceptive use between 1995 and 2005 (Lande et al, 2006). This trend is particularly prevalent among low-income countries; one study found the percentage of married women using injectable contraceptives including Depo-Provera increased between 1995 and 2005 in 40 out of 44 low-income countries (Lande et al, 2006). Nevertheless, Depo-Provera remains out of reach for many women in low- and middle-income countries, particularly those living in rural areas and those who rely on clinic-based distribution systems. Community-based models of distribution have been implemented in a number of countries from diverse development contexts including Afghanistan, Bangladesh, Bolivia, Ethiopia, Guatemala, Madagascar, Malawi, Nepal, Peru, and Uganda (Green, 2010; Stanback, 2010; Malarcher, 2010). These models have had varying degrees of success in reaching new and underserved populations for whom the introduction of Depo-Provera and, in some cases, the availability of any form of contraception, is novel.

Despite its demonstrated efficacy, and dramatic increases in its use, little is known about the process of moving from implementation to scaling up models of community based distribution of Depo-Provera. The scale-up has been described in several countries including Uganda (Akol et al, 2009), Ghana (Lande et al, 2006), Vietnam (Fajans et al, 2007), Afghanistan (Huber et al, 2010), Malawi (Hamblin et al, 2009), India (Levy et al, 2009) and Rhodesia (Kaler,

2000). In this chapter, we summarize relevant peer-reviewed and gray literature on scale up of Depo-Provera to illustrate key elements of each of the 5 components of the AIDED model, and identify unifying themes regarding scale up of Depo-Provera that may have relevance for other contraceptive technologies in low- and middle-income countries.

Methods

We conducted a systematic review of the literature on the scale up, and sustainability of Depo-Provera in low- and middle-income countries. We searched 11 electronic databases including MEDLINE, CINAHL, EMBASE, Web of Knowledge, PsycINFO, Global Health, EconLit, Social Sciences Citation Index, International Bibliography of Social Sciences, Social Services Abstracts, and Sociological Abstracts. We included any literature published since the earliest date indexed in each database up to the December 2010 search date. More than ten keywords were used to search for articles related to Depo-Provera (**Table 1**). The keywords were replication, scale up, sustainability, diffusion, dissemination, take up, innovation, diffusion of innovation, technology transfer, information dissemination, acculturation, assimilation, and fidelity.

The searches yielded an initial sample of 249 unique articles after eliminating duplicates (**Figure 1**). We screened the abstracts of all articles in this initial sample (n=249). An article was excluded at the abstract screening stage if it did not address Depo-Provera as defined in this study or if it did not discuss the scale up or sustainability of Depo-Provera (n=222). We then reviewed the full text of the articles retained following abstract screening (n=27). At the full text screening stage, exclusion criteria were: superficial in its discussion and/or did not provide empirical evidence about the scale up or sustainability of Depo-Provera (n=7), did not address

scale up or sustainability of Depo-Provera (n=4), did not meet the study's definition of Depo-Provera (n=3), did not address low- or middle-income countries (n=3), or full text of the article was not available online (n=1). Following the full text screening, 9 articles were retained for data extraction and analysis.

The gray literature searches targeted the publications/resources databases and websites of the World Health Organization (WHO), UNICEF, UNDP, UNFPA, the World Bank, the African Development Bank, the Inter-American Development Bank, and the Asian Development Bank. We also reviewed the project reports published by major international aid organizations (USAID, CIDA, DFID, SIDA, GTZ), the Global Fund to Fight AIDS, Tuberculosis and Malaria; and other influential nongovernmental organizations and partnerships in global health including CARE, GAIN, Family Health International, Partners in Health, Management Sciences for Health, and John Snow, Inc. Due to the large volume of hits generated from these web site searches, the titles of all hits were screened first. If a document appeared relevant on the basis of its title, the full text was reviewed using the same exclusion criteria as applied to the academic literature. Finally, we conducted purposeful searches using the same general approach for cases widely recognized as major Depo-Provera implementation initiatives. This process resulted in 9 documents that addressed the scale up and/or sustainability of Depo-Provera in low- and middle-income countries.

Data extraction from the final sample of academic articles (n=9) and gray literature documents (n=9) was conducted independently by two research team members using a pre-established data extraction form. For each article, the data extraction process identified the study design, geographic location, key findings related to scale up and sustainability of the

intervention. Differences in preliminary data extraction results were harmonized through discussion between the two team members to arrive at a final set of factors influencing the success of Depo-Provera program scale up and/or sustainability. Enabling factors and barriers to scale up and/or sustainability were then grouped into thematic categories, with disagreements resolved through negotiated consensus between the two team members.

Results

The final sample of 18 sources (9 academic articles and 9 gray literature documents) included studies representing a wide range of geographies and methodologies (**Table 2**). These studies examined Depo-Provera programs from 12 unique countries; 5 studies included multiple countries. Among the literature from which we extracted data, 5 of the studies used qualitative methods, such as in-depth interviews, focus groups, or observations, 2 sources presented findings from pre/post interventional studies, 3 used mixed methods (2 document review augmented with key informant interviews, 1 pre/post intervention augmented with key informant interviews), 2 were cross-sectional, 3 were literature reviews or commentaries and 1 involved time-series modeling. 2 of the papers failed to report their methodologies (**Table 2**).

The data extraction process identified 15 enabling factors and 10 barriers to dissemination, diffusion, scale up, and/or sustainability of Depo-Provera programs, which were then mapped to the five AIDED components (**Tables 3 and 4**)**.** In the following section, we summarize the factors (or key activities) and barriers identified in the literature as they relate to each component of the AIDED model, and provide illustrative examples for each. We present four unifying themes characterizing the scale up of Depo-Provera that may also have relevance for scale up of technologic interventions in family health in low- and middle-income countries.

Assess

Key enabling factors. The assess component refers to assessment of the broad landscape within a potential user group , including the needs and wants of the user community, its absorptive capacity, and the political, economic, legal/regulatory, technological and social conditions within its internal and external environment. In the literature we reviewed, the activities described included conducting broad landscape and stakeholder assessments from community to international levels (n=6 articles), dialogue with the community at early stages to understand cultural and religious norms relevant to contraception and family planning (n=5), piloting to determine feasibility in the particular context(n=3), creating structures to ensure use of assessment findings through implementation and scale up (n=1), and identifying potential sources of resistance (n=1).

Barriers: Two barriers to scale up were noted for the assess component, suggesting that a landscape assessment might have identified and addressed such impediments early in the process, ultimately facilitating scale up. These barriers were misaligned government policies (e.g., favoring provision of contraceptives my medical personnel) (n=1), opposition by medical professionals (n=1) and social and cultural norms and dynamics (n=2).

Illustrative example. The process of a comprehensive baseline assessment was described as critical to the introduction of Depo-Provera as part of a package of family planning interventions in Vietnam (Fajans et al, 2007). In 1994, guided by the Strategic Approach to Contraceptive Introduction sponsored by the World Health Organization (Fajans, WHO Report, 2007), the Vietnamese government began the intervention planning with a participatory needs assessment, carried out by the Ministry of Health, the National Committee of Population and

Family Planning and the Vietnam Women's union and together with several international partners. The purpose of the assessment was to determine the suitability and need for contraceptive introduction within a larger initiative to strengthen quality of care in the service delivery system. A dissemination workshop followed in 1995, in which stakeholders reviewed and approved the assessment findings; the pilot intervention began in 1996. Though time intensive, this process served to generate consensus on a dual goal: to improve quality while successfully introducing Depo-Provera to broaden the range of contraceptive choices for women. Individuals who had participated in the strategic assessment were subsequently involved in the design and management of the pilot studies, ensuring continued responsiveness to the issues identified through the assessment. This core team also became the resource team to provide supervision, guidance and mentoring in scale up efforts, as the project grew in scale from 4 to 21 provinces (Depo-Provera is now available in all 64 provinces). In addition to the national level process, tailored, focused assessments were carried out to inform implementation at the local level. Situational analysis was conducted at each of the four pilot sites before implementation; findings were used to improve client flow, logistics and infection control practices at the sites.

Innovate

Key enabling factors. The innovate component includes designing, re-designing, and packaging an innovation so that the innovation is acceptable and perceived as advantageous by potential user groups in their specific context or environment. These processes of designing, re-designing, and packaging the innovation are aimed at achieving 'fit' between the innovation and the user group. In the literature we reviewed, activities in this component included

tailoring the innovation to the existing system capacity (n=9), creating innovative design and packaging features (n=3), ensuring 'fit' between design and socio-cultural norms (n=3); and tailoring innovation to current system capacity (n=9). In particular, the ability for a woman to receive Depo-Provera injections without having to inform her husband or family was highlighted as a critical design feature that enabled scale up in several low-income contexts.

Barriers: Two barriers identified in the literature mapped to the innovate component: lack of system capacity (n=5) and social and cultural norms and dynamics (n=1).

Illustrative examples. Illustrations of the design, redesign, and packaging of Depo-Provera were highly diverse across the case reports. In Rhodesia (now Zimbabwe), for instance, the degree of 'fit' with cultural and religious norms was defined as a key element in the process of creating design features. These norms were manifest in a strong taboo against women controlling fertility, with male dominance and desire to control family size and ensure marital fidelity. Depo-Provera's injectable form allowed 'fit' despite these norms. Administered every 3 months, the Depo-Provera enabled women to take the injection in secret, allowing women navigate the traditionally patriarchal authority without creating friction in their own relationships (Kaler, 2000). The "private acceptors," as the literature refers to them, were married women who used Depo-Provera without consent or knowledge of husbands. This secretive use was facilitated by mobile well-baby clinics that also supplied contraceptives and an approved system of bookkeeping that allowed private acceptors' records to be segregated from others to ensure confidentiality. The scale up of Depo-Provera in Rhodesia was substantial; between 1994 and 2006, the proportion of women choosing injectables for contraception rose from 3% to 10% (Lande et al, 2006).

Literature from a variety of low- and middle- income countries has also supported the use of a specific type of design, the Uniject syringe, for provision of contraceptive injections. In a small pilot among 20 Brazilian providers of another injectable contraceptive, Cyclofem, 80 percent reported that the device was easier to use than a traditional vial and syringe because it did not require disinfection or filling prior to administering the injection. The providers also believed that their clients were reassured knowing that the syringe and needle had not been previously used (Childress, 2011).

The importance of the messaging aspect of the innovation's design was illustrated in the experience of Afghanistan. In addition to detailed information on effectiveness and safety, quotations from the Quran (the holy book of Islam) on the value of birth spacing and breast feeding were included in the packaging of the Depo-Provera. Each quotation was approved by religious leaders known as *mullahs* to allow women to feel that their contraceptive choice was endorsed by the religious structures in the community. Program staff identified the increased social acceptability provided by this kind of packaging as a factor in scale up of Depo-Provera. Overall, the absolute number of women using Depo-Provera doubled, moving the proportion using Depo-Provera from 14 to 40% of women in target groups and use of injectable contraceptives increased most dramatically when compared to other methods (Huber et al, 2010).

Develop

Key enabling factors. In the develop component, attention is directed to fostering enabling relationships, environments and networks among partners that can support and facilitate spread of the innovation. In the literature we reviewed, development activities

included the development of delivery system supports (n=9), collaboration with stakeholders to identify or create supportive structures in the economic, political and technological spheres (n=5), effective education through social marketing (n=4) and nationalistic messaging about Depo-Provera's value (n=2).

Barriers: Five barrier factors were related to the develop component, suggesting the importance of directing attention during development efforts to potential impediments. These included lack of system capacity (n=5), competing alternatives for political or consumer attention (n=3), misaligned government policies and priorities (n=3), data collection challenges (n=3) and lack of knowledge/awareness (n=1).

Illustrative examples. Investment in building and strengthening relationships was common to programs that reported success in scaling up. In Uganda, substantial outreach and advocacy efforts included leadership from the Ministry of Health (MOH) and its non-governmental organization (NGO) allies; these efforts have been fully catalogued in an advocacy guide (Green, 2010). In this case, the development of cooperative partnerships between the public and private sector required particular attention to the political climate including key decision makers and influential stakeholders, as well as flexibility to adapt to unforeseen shifts in the political environment. This required MOH and NGO partners to develop clear role definitions for all involved; it was agreed that the public sector would be the primary implementer, with the private sector organizations providing mainly technical assistance. This division of labor facilitated scale up and sustainability as the functions were largely detached from transient funding agendas. Together, both the public and private sector also undertook

"continuous community sensitization" efforts, which aimed at creating awareness and educating the community as to the availability of Depo-Provera (Akol et al, 2009).

In addition to developing cooperative environments amongst stakeholders, building systems capacity that can support the innovation's scale up also emerged as a factor facilitating scale up. For instance, in Vietnam, where the introduction of Depo-Provera was framed as a quality improvement effort, new management and supervisory practices were introduced before the launch of the intervention, and included management information tools such as a logbook for clients to record side effects and other information. This required substantial investment in training program staff across the system, from the MOH to provinces, to individual providers and field motivators. The program adopted a philosophy and practice of supportive supervision (in contrast to inspection and attainment of quotas), which included managers discussing service implementation and problem solving with providers (Fajans et al, 2007).

In India, a USAID-sponsored project introduced in 2003 aimed to scale up availability and access to Depo-Provera in three provinces. The project relied on a private-sector distribution strategy using well-regarded obstetricians and gynecologists to stress the effectiveness and safety of Depo-Provera; however, program managers described the lack of public sector support as being an impediment to success. Specifically, the absence of government endorsement of Depo-Provera in the public sector slowed the pace of growth of the overall market. Not only did the absence of the product from the public health system affect volumes, but as a result some private providers and marketers may have taken a very cautious approach to adopting Depo-Provera themselves (Levy et al, 2009).

In Zambia, training was essential to making providers more confident about and comfortable with administering Depo-Provera and managing side effects and complications. One of the training approaches involved a popular kit with an innovative system that categorized clients according to lifestyle and then identified the family planning methods that would most likely meet their specific needs. The Central Board of Health recently described this model of profiling clients as a best practice, calling attention to its benefit of grouping clients by needs, rather than generic overview of various contraceptive methods (Solo et al, 2005). Between 1992 and 2001–2002, injectable use (both Noristerat and Depo-Provera) increased from 0.1% to 4.5%. Depo-Provera was found to be particularly popular and was finally approved for use in the country in 2004 (Solo et al, 2005).

Engage

Key enabling factors. Although engagement occurs throughout the process of dissemination and diffusion, it is particularly central to the tasks of introducing the innovation from outside the user group to inside the user group, translating the innovation so that user groups can assimilate the new information, and integrating the innovation into the routine practices and social norms of the user group. In the literature we reviewed, these tasks included activities carried out within and across multiple groups, including religious, government and community groups; they are iterative in nature, and may occur from inception through devolution of the innovation. Factors related to engagement included: dialogue with community at early stages and throughout implementation (n=5), effective education through social marketing (n=4), use of data to improve program performance (n=3) and compatibility with religious norms (n=1).

Barriers: Three barriers related to the engage component were identified. They included social and cultural norms and dynamics (n=1), lack of knowledge and awareness on the part of the community (n=1), and opposition by medical professionals (n=1).

Illustrative examples. In Afghanistan (Huber et al, 2010), local *mullahs* were engaged by program staff to carry the innovation into the community, where they ultimately grew to play a central role in contraceptive education. Through prolonged and candid discussions, all 37 mullahs in the three focal areas accepted the presence of modern birth control (of which Depo-Provera was one option) for the purposes of birth spacing. While their initial role had been to approve Depo-Provera packaging, the mullahs soon began preaching about the benefits of injectables at Friday morning prayers. The involvement of these community leaders, all of whom were men, provided additional means by which to inform women of risks and benefits and understood instructions. The close and visible participation of mullahs in contraceptive education was reported as one of several key factors to scaling success.

At the time of the family planning intervention in Vietnam (Fajans et al, 2007), health care providers had historically been paternalistic in their approach to patient care, particularly in the realm of contraception; this orientation was reinforced by the health care system. The family planning initiative required a major shift in these provider norms toward a patient-centered model of care in which a woman's autonomous decision regarding contraception was supported. This shift required medical professionals to facilitate patient choice through sharing comprehensive information, and practicing informed consent. These changes were encouraged by supervisors and supported with revised patient education materials for clients stressing voluntary choice. A related feature of the program was aimed at increasing community

involvement in health care service planning. Pilot sites were encouraged to seek views of clients and community and to respond to them through action plans and follow up activities; the degree of involvement was monitored and reinforced through quality of care indicators.

Engaging community leaders has helped the introduction of injectables and other methods in Ghana and Vietnam (Lande et al, 2006). The Navrongo Initiative in Ghana, for example, encouraged support for family planning by enlisting the help of opinion leaders and using men's and women's social networks. Councils of elders formed health care action committees, and village leaders and elders convened regular community gatherings that offered opportunities for village leaders to endorse family planning and encourage open communication around reproductive health. This form of engagement employed by the Navrongo Initiative team was identified as central to increases in women choosing injectable forms of contraception offered by community providers (Lande et al, 2006). The role of patient counseling and one-on-one engagement with target users has proven particularly critical in scaling up Depo-Provera. In part, this finding reflects the well-documented side effects of Depo-Provera (i.e., amenorrhea) that many women may find worrisome and which ultimately cause some to discontinue use.

Devolve

Key enabling factors. This component involves the index user groups releasing and spreading the innovation for its re-introduction in new user groups within their peer networks. These user groups and their networks replicate and release the innovation (in adapted and potentially failed forms) in the way they see most appropriate. In the literature we reviewed,

activities in this component included providing adequate supports (n=9) and using peer social networks (n=5).

Barriers: Four barriers at this stage of the process included the rural nature of target program areas (n=5), inadequate resources for scaled-up activities (n=4), misaligned government policies and priorities (n=3), and lack of stakeholder support (n=1).

Illustrative examples. Social networks were reported as a key mechanism in the devolution of Depo-Provera. In Rural Thailand (Entwisle et al, 1996),"conversational networks" and interpersonal influence were central to flow of information about family planning and contraceptive choice. Women discussed birth control with neighbors and friends during the course of daily activities (e.g., at the rice mill, the communal well, in the fields). These interactions occurred across age and generation boundaries; however, class and status boundaries were less permeable and information was less likely to be shared across these groups. Furthermore, contraceptive method dominance varied widely between neighboring villages, suggesting the interlocking networks within a village may be a conservative force, making villages less amenable to information from external sources.

In some circumstances, external supports facilitated the devolution process. For instance, in Vietnam (Fajans et al, 2007), substantial attention was directed at supporting scale up of the four pilot programs. Resources from international donor partners and the national government were used to develop a modular tool kit as a guide to adapting and implementing the innovation. Developers of the guide anticipated it would be useful for subsequent sites, yet also expected there would need to be some adaptation to 'fit' local contexts. The kit included a comprehensive enumeration of core implementation steps from establishing a task force and

conducting situational analysis to identifying appropriate sites through to quality improvement activities.

Discussion

This systematic review of existing empirical and gray literature identified a limited number of publications of use in understanding the process of successful dissemination, diffusion, scale up, and sustainability of Depo-Provera in low- and middle- income countries. Nevertheless, the results offer empirical support, in varying degrees, for each of the AIDED model components. The majority of the evidence relates to the activities described in the model's innovate, develop and engage components; there is some support for the assess and devolve components. Several general lessons are suggested from the findings and may be applicable to the scale up of other technology-based innovations in low- and middle- income countries.

First, the design and packaging of technological innovations should be broadly conceived and iteratively refined in order to ensure 'fit' with end user groups. Attributes of innovation design and packaging are diverse in nature and form; they may include physical properties as well as psychological or emotional aspects of messaging. Taken together, these highly diverse attributes determine the degree to which the innovation will 'fit' the needs and wants of the desired user group. Particularly in family planning, where the role of cultural and religious context is paramount, deep understanding of the potential user group is central, and is acquired through an iterative process of assessment and engagement. This understanding must be manifest in the design and packaging of the innovation, including the potential need for refinement as the scale-up unfolds. In the case of the introduction of Depo-Provera in

Zimbabwe, understanding cultural norms such as male dominance of sexual relationships and family planning directly informed the design of features to enable women to use Depo-Provera without the knowledge of their husbands. Importantly, design and packaging of an innovation does not happen in isolation or at single, bounded point in time but is rather highly iterative in nature. For instance, as in Afghanistan, the act of engaging opinion leaders (such as religious leaders) can include involving them in packaging and messaging to ensure that qualities of the innovation are compatible with norms.

Second, technological innovations should be embedded in existing programs and delivery systems; this requires attention to, and sometimes investment in, both structural and managerial capacity. The embedding of the innovation within existing systems was commonly described as a core principle, even when investment in developing systems capacity to support the integration of the innovation may be required (Akol et al, 2009; Simmons et al, 1994, Montgomery, 1998). Particularly in cases where Depo-Provera is being distributed through community-based distribution models, the identification or development of adequate managerial capacity has proven to be essential for quality and efficiency, for instance in order to ensure injections are being given safely and supply chain is maintained. Similarly, structural features of the delivery system can maximize 'fit' and therefore increase the likelihood of scale up. In Rhodesia, having women deliver injections, and having them dispense those injections in non-clinic settings such as well baby clinics and markets to allowed women to use Depo-Provera without the knowledge of others.

Third, anticipating and managing resistance from a variety of constituencies both inside and outside the target user groups is a critical activity throughout the scale-up process.

The constituencies affected by the introduction of the innovation may be highly diverse (e.g., medical professionals in Vietnam and husbands and mothers-in-law in Rhodesia). While the interests and beliefs of some stakeholders are likely to be known in advance of the introduction of an innovation, others may only be identified through the assessment process. Nevertheless, resistance must be anticipated and managed on multiple fronts and throughout the scale-up process. Strategies for addressing resistance may be applied in the innovation design and packaging (e.g., the case of Afghanistan), the development of the environment (e.g. the case of Uganda), and in processes of engagement (e.g. the case of Vietnam).

Fourth, diffusive spread beyond the index group is enabled by existing networks within the user groups, and may require diverse and continuing support from external entities. The power and potential of existing peer networks was leveraged in several cases we reviewed. The literature we reviewed suggested spread of family health innovations through peer networks might not require additional external resources, in one example from Vietnam, the external group that introduced the innovation was very deliberate in investing financial and human resources in the transfer of knowledge activities for scale up beyond the pilot sites. This took the form of a training kit that was intended to provide guidance about essential programmatic elements yet also be adapted for local context. In addition to knowledge transfer activities, external entities may also provide various financial and non-financial supports to strengthen or create new user group networks to facilitate spread (Fajans, 2007).

The evidence base for the safety and efficacy of Depo-Provera, including administration by community-based paraprofessionals has been well established (Malarcher et al, 2011; Stanback et al, 2010; WHO, 2009; Weil et al, 2008; Levy et al, 2006). Furthermore, data show

steady increases in its use in a variety of low- and middle-income country contexts. Nevertheless, the specific process and component parts of scaling up Depo-Provera programs have not been well documented or described. Available empirical and gray literature provides support, in varying degrees, for each of the 5 components of the AIDED model. Recurrent themes derived from the synthesis of this literature may also be of use in understanding the process of scale of other technology-based family health interventions.

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*denotes peer-reviewed article used for data extraction in systematic literature review
**denotes gray literature source used for data extraction in systematic literature review

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Chapter 2 Figures and Tables

Figure 1. Literature review schematic

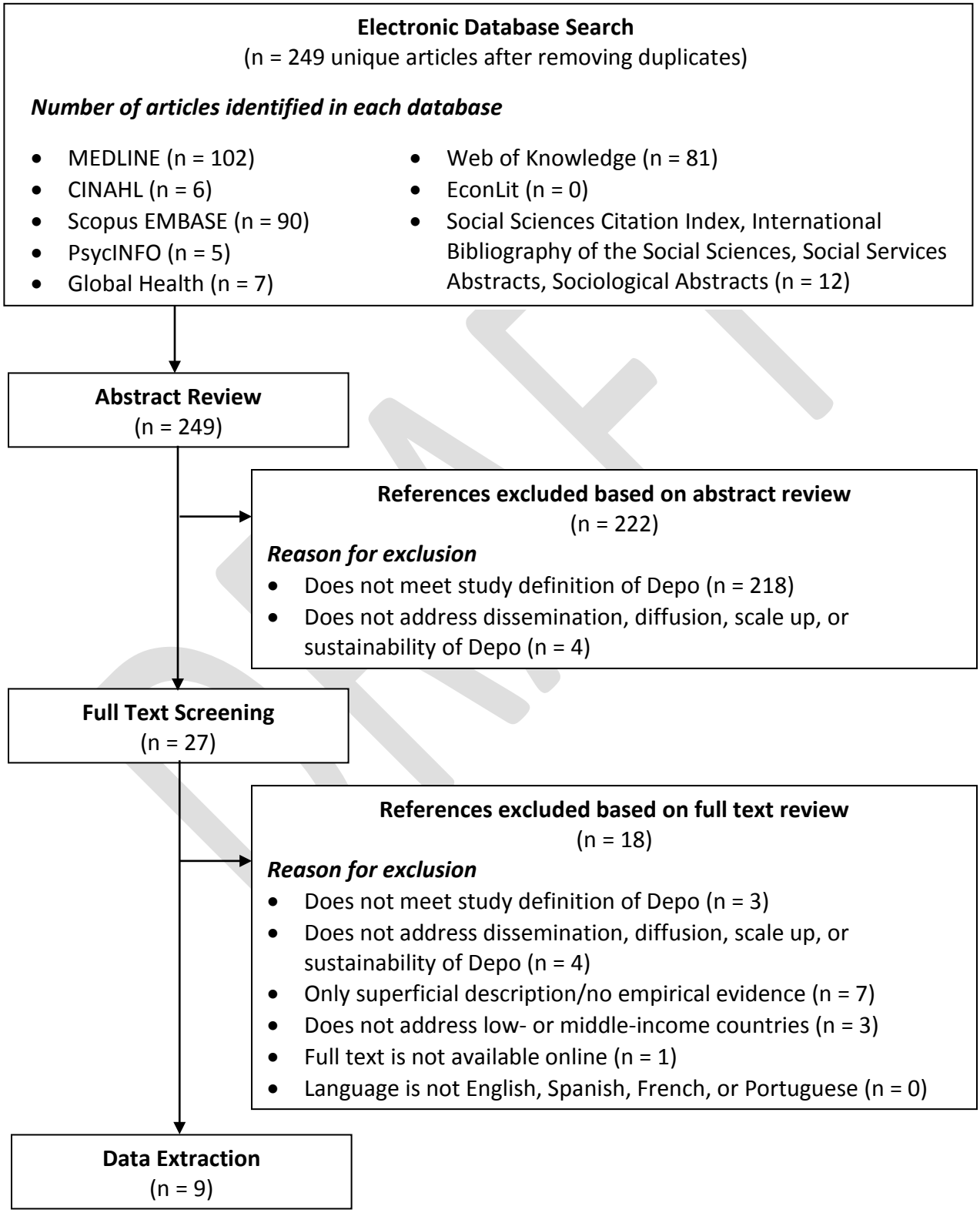

Table 1. Final start list of text words used for Depo-Provera literature search

Depo-Provera (Medroxyprogesterone acetate)	Medroxyprogesterone Acetate Injectable medroxyprogesterone Injectable medroxyprogesterone acetate DMPA Depo- Depo-Provera Depo-Provera Depo-Provera Contraceptive Depo-SubQ Provera 104

Table 2. Characteristics of final literature sample (n = 18 sources)

		# of sources
Methodology		
Qualitative interview, focus groups or observations		5
Cross-sectional interviews, questionnaires or chart review		2
Pre-post intervention without comparison group		2
Literature review or commentary		3
Simulation modeling		1
Mixed methods		3
Methods not described		2
	TOTAL	**18**
Geographic Area		
Rhodesia		1
Afghanistan		1
Indonesia		1
Thailand		2
Viet Nam		1
Ghana		1
Taiwan		1
Phillipines		1
Zambia		1
Madagascar		1
Uganda		1
India		1
Multiple LMIC Countries (eg. literature review)		5
	TOTAL	**18**

Table 3. Enabling factors for the dissemination, diffusion, scale up, and sustainability of Depo-Provera by AIDED model components

Enabling factor	# sources citing factor	AIDED model component(s) mapped to factor
Development of delivery system supports (training of health workers/field motivators, creation of training manuals or checklists, supply chain improvements, recruitment of women, chart tracking)	9	Develop
Tailoring innovation to existing system capacity (CBD systems already in place, women in CHW roles, other existing program infrastructure (ie. Well baby clinics), current supply chain flows) -	8	Innovate
Landscape or stakeholder assessment	6	Assess
Use of social networks	5	Devolve
Collaboration with stakeholders to identify or creating supportive structures in the economic, political and technological spheres	5	Assess, Develop
Dialogue with community at early stages	5	Assess, Engage
Effective education through social marketing re: risks and instructions (including community input)	4	Develop, Engage
Piloting to determine feasibility	3	Assess
Innovation design features (injectable at 3 month intervals)	3	Innovate
Ensuring 'fit' with cultural norms (can take in secret)	3	Assess, Innovate
Use of data to improve program performance	3	Engage
Nationalistic messaging (population control, etc.)	2	Develop
Adherence to religious norms (support of leaders)	1	Innovate, Develop, Engage
Identifying potential sources of resistance, such as from the professional medical community	1	Assess
Creating structures to ensure use of assessment findings through implementation and scale up (e.g., the same individuals that conducted the assessment remained involved through the process of scaling)	1	Assess

Table 4. Barriers to the dissemination, diffusion, scale up, and sustainability of Depo-Provera by AIDED model components

Barrier	# sources citing factor	AIDED model component(s) mapped to factor
Lack of system capacity (delivery/administrative challenges, lack of equipment, supply chain stockouts due to mismanagement, staff burden)	5	Innovate, Develop
Rural nature of program areas (made supply chain and human resource chain difficult to maintain)	5	Devolve
Inadequate resources for scaled-up activities (declined as expansion proceeded)	4	Devolve
Competing alternatives (in family planning product; eg. other brand names, delivery sector; eg. public vs private)	3	Develop
Misaligned government policies and priorities (favored HIV/AIDS projects, within FP, emphasized long acting methods , favored provision of FP through medical personnel)	3	Assess, Develop, Devolve
Data collection challenges (contact between front line and supervisors too rare, front line not understanding tools, follow-up challenges etc.)	3	Develop
Social/cultural norms (male dominance/power concerns about fidelity and family size; mothers in law)	1	Assess, Innovate, Engage,
Lack of knowledge/awareness (inadequate counseling/patient education/lack of patient centered care, information sharing)	1	Develop, Engage
Opposition by medical professionals	1	Assess, Engage
Lack of ongoing stakeholder support (key leaders left after pilot phase)	1	Devolve

Chapter 3 - Exclusive Breastfeeding: An Application of the AIDED Model

Background

Breastfeeding (BF) provides substantial advantages for both mothers and children through its nutritional and immunological benefits, as well as favorable hormonal changes in the maternal body stimulated by the infant sucking of the breast. BF is associated with a lower risk for diarrhea and pneumonia among young children, sudden infant death syndrome (SIDS), obesity during childhood and adolescence, and better cognitive development (Brion et al, 2011; Harder et al, 2005; Hauck et al, 2011; Lamberti et al, 2011). Mothers who breast feed are less likely to experience severe post-partum hemorrhaging and less likely to develop breast and ovarian cancer (Collaborative, 2002). In addition, in societies where modern methods of contraception are not readily available, BF acts as a powerful fertility regulator (Labbok and McDonald, 1990). Maternal and child health benefits associated with BF are maximized when infants are exclusively breastfed (i.e., breast milk only) for the first six months, followed by the introduction of nutritious and safe complementary foods and the continuation of BF until two years of age (WHO, 2001).

Epidemiological evidence strongly supports the need for strengthening BF promotion, protection, and support worldwide[1], with particular emphasis in the endorsement of exclusive breastfeeding (EBF) and the timely initiation of breastfeeding (within one hour after birth). For example, this need is evident by the fact that the prevalence of the timely initiation of

[1] Comprehensive BF programs need to address the dimensions of promotion (e.g., behavior change communication campaigns), protection (e.g., enforcement of WHO Code) and support (e.g., facility and community based BF support programs). In this article the term 'BF Promotion' acknowledges these three dimensions.

breastfeeding is 48% in the 68 "countdown" countries[2] that experience 90% of the global maternal-child mortality burden. In addition, despite that prolonged BF is a common practice in these countries, the prevalence of EBF among infants less than six months old is only 34% (Bhutta et al, 2010). Thus, increased BF promotion has great potential to improve global maternal-child health. It has been estimated that large scale BF promotion has the potential to prevent 11.6% of infant deaths and reduce 21.9 million disability adjusted life years (Bhutta et al, 2008).

BF promotion programs have focused on timely initiation of BF, EBF for the first 6 months and/or continued BF until the child is at least 24 months old (1-6-24 model). In recent times, EBF promotion has become a top priority for these programs because most mothers in the world, including those living in the "countdown" countries, do not practice EBF. In addition, successfully promoting EBF requires avoiding prelacteal feeding (i.e., non-breast milk sources of nourishment offered to newborn before first BF episode), and thus fostering a timely initiation of BF. Likewise, there is a strong correlation between the length of time that women breastfeed exclusively and the continuation of BF once complementary foods are introduced into the infant's diet. We lack evidence-based knowledge about how to promote and ensure the effective scale up of EBF. Accordingly, from a combination of peer reviewed and gray literature,

[2] These are countries targeted by "The Countdown to 2015" global initiative launched in 2005 with the aim of holding governments accountable for their commitments to achieving the Millennium Development Goal related to child mortality (MDG 4). This global initiative was subsequently expanded to monitor progress in maternal health (MDG 5). The initiative partners include UN and multilateral agencies, non-governmental organizations, health professional associations, bilateral donors and foundations, and academic and research institutions.

we sought to identify the key factors and approaches that promote or impede the scale up of EBF in low- and middle-income countries (LMICs).

Methods

We conducted a systematic review of the academic and gray literature on the dissemination, diffusion, scale up, and sustainability of EBF programs in low- and middle-income countries. We defined a comprehensive EBF program as one that promotes the 1-6-24 model, or initiation of breastfeeding within one hour of birth, conducted exclusively for six months, and continued along with complementary feeding until at least two years of age. For both the academic and gray literature, we searched for publications that contained keywords related both to breastfeeding and scale up or sustainability. The keywords used to search for breastfeeding were breast, feeding, exclusive breastfeeding, baby-friendly hospital initiative, and complementary feeding. The keywords used to search for scale up or sustainability were replication, scale up, sustainability, diffusion, dissemination, take up, innovation, diffusion of innovation, technology transfer, information dissemination, acculturation, assimilation, and fidelity. The electronic search strings were repeatedly refined in response to emerging data and modified as appropriate for different databases, while retaining a consistent set of core search terms. We included papers that: (i) discussed breastfeeding, (ii) addressed factors related to the diffusion, dissemination, and take up and sustainable breastfeeding, and (iii) went beyond superficial description or commentary.

Searches for academic literature were conducted in 11 electronic databases, including: MEDLINE, CINAHL, EMBASE, Web of Knowledge, PsycINFO, Global Health, EconLit, Social Sciences Citation Index, International Bibliography of Social Sciences, Social Services Abstracts,

and Sociological Abstracts. We included any literature published since the earliest date indexed in each database through December 2010. These academic literature searches yielded an initial sample of 69 unique articles after eliminating duplicates (**Figure 1**). We screened the abstracts of all articles in this initial sample (n=69), and excluded any articles that did not address breastfeeding as defined in this study (n=25) or did not discuss the scale up or sustainability of breastfeeding (n=27). We then screened the full text of the remaining articles (n=17), and further excluded any articles that did not meet the study's definition of breastfeeding (n=2), did not address scale up or sustainability of breastfeeding (n=5), was superficial in its discussion of breastfeeding and/or did not provide empirical evidence about the scale up or sustainability of breastfeeding programs (n=1), and did not have the full text of the article available online (n=4). Five articles were retained for data extraction and analysis. Three articles that were not detected through the electronic searches but available in the first author's files were included (de Oliveira et al, 2003; de Oliveira et al, 2005; Horton et al, 2006). In addition, an article published after the electronic searches had been conducted was also included (Tylleskär et al, 2011). Thus, we retained a total of 9 articles for final data extraction.

The gray literature searches targeted the publications/resources databases and websites of the World Health Organization (WHO), UNICEF, UNDP, UNFPA, the World Bank, the African Development Bank, the Inter-American Development Bank, and the Asian Development Bank. We also reviewed the project reports published by major international aid organizations (USAID, CIDA, DFID, SIDA, GTZ); the Global Fund to Fight AIDS, Tuberculosis and Malaria; and other influential nongovernmental organizations and partnerships in global health including CARE, GAIN, Family Health International, Partners in Health, Management Sciences for Health,

and John Snow, Inc. Gray literature searches included any documents available via the organization's web site on search dates within February 2011. Due to the large volume of hits generated from these web site searches, the titles of all documents were screened first; if the title appeared relevant, then the full text was immediately reviewed using the same exclusion criteria as applied to the academic literature. This process resulted in four documents that address the scale up and/or sustainability of exclusive breastfeeding in low- and middle-income countries. An additional four documents identified from the lead author's files were also included (Jelliffe and Jelliffe, 1988; Labbok and McDonald, 1990; Pérez-Escamilla, 2004; Timpo 2007) for a total of eight gray literature documents.

Data extraction from the final sample of academic articles (n=9) and gray literature documents (n=8) was conducted independently by the lead author using a pre-established data extraction form. For each article, the data extraction process identified the study design, geographic location, characteristics of the breastfeeding intervention, key findings related to scale up and/or sustainability of the breastfeeding intervention, and the degree of success in scaling up and/or sustaining the intervention. Preliminary data extraction results were presented and discussed with the remaining of the co-authors, and a final set of factors influencing the success of breastfeeding program scale up and/or sustainability was identified. Enabling factors and barriers to scale up and/or sustainability were then grouped into thematic categories, with disagreements resolved through negotiated consensus between the team members.

Results

The final sample of 17 sources (9 academic articles and 8 gray literature documents) included studies representing a wide range of geographies and methodologies (**Table 1**). There were 24 countries included, with the majority of studies taking place in Latin America (seven countries), followed by sub-Saharan Africa and East Asia (five countries), South and South East Asia (three countries), and Central Asia (one country). Study designs varied greatly as well, as six studies followed a case study approach, four were literature reviews, four thought pieces, four included secular trend analyses (i.e., changes in BF outcomes across time), four used pre/post intervention designs without a control group, four were based on interviews with program officers, and one used focus groups and in-depth interviews with decision makers. We also identified one cost-effectiveness analysis based on pre/post studies with control groups and one large scale randomized controlled community trial.

The data extraction process identified 22 enabling factors and 15 barriers for dissemination, diffusion, and scale up and/or sustainability that were then mapped into the five AIDED components (**Table 2**). In the following section, we summarize the enabling factors and barriers identified in the literature by each component of the AIDED model, and provide illustrative examples for each. Finally, we conclude with the key unifying themes characterizing the scale up of BF promotion, which may also have relevance for scale up of other family health behavioral interventions.

Assess

The assess component refers to assessment of the broad landscape within a potential user community, including its needs and wants, absorptive capacity, and the political,

economic, legal/regulatory, technological and social conditions within its internal and external environment.

Key enabling factors: The empirical evidence indicates that successful dissemination, diffusion, and scaling up of breastfeeding promotion programs has relied heavily on baseline facility and community needs assessments (Baker et al, 2006; Rea, 2003; Salud et al, 2009; Timpo, 2007), as well as operational (formative) research/pilot studies (Baker et al, 2006; Bhandari, 2008; Rea, 2003; Salud et al, 2009; Tylleskär et al, 2011; UNICEF, 2010; WHO, 2008). These efforts have been particularly successful when needs assessments are conducted with the scale up of BF promotion in mind, and take into account the input from key stakeholders working in different sectors (Salud et al, 2009; UNICEF, 2010; WHO, 2008).

Illustrative example: In Pembo, Philippines, a BF promotion scale up project team launched the process by conducting secondary data analyses of national infant feeding practices, an analysis of infant feeding formula advertisement and questionable promotional practices, and community based participatory research with the local target community (Salud et al, 2009). This formative work provided the impetus for designing and launching a proof of concept pilot BF promotion intervention with the ultimate goal of bringing breastfeeding up to scale. After finding that peer counseling was effective at improving EBF based on a pre-post interventional study design with 312 dyads, the program was then scaled up in less than 2 years to reach 161,612 people in urban areas. Now, a new goal of further scale to a one million people catchment area has been set. The evidence-informed political sensitization and community mobilization resulting from the formative evaluation phase was key to the success of this program.

Innovate

The innovate component includes designing, redesigning, and packaging an innovation so that it is acceptable and perceived as advantageous by potential user groups in their specific context or environment. These processes are aimed at achieving a 'fit' between the innovation and the user group.

Key enabling factors: Three innovations that have been key for effectively fitting and packaging of BF promotion programs, resulting in successful scale up, are: (i) communications and mass media campaigns that set the stage for the introduction of a BF promotion program in target areas (Baker et al, 2006; Bhandari et al, 2008; Rea, 2003; UNICEF, 2010; WHO, 2008); (ii) facility-based delivery systems (e.g., Baby Friendly Hospital Initiative, BFHI)[3] (Horton et al, 1996; Jelliffe and Jelliffe, 1998; Labbok and McDonald, 1990; Pérez-Escamilla, 2004; Rea, 2003; Timpo, 2007; WHO, 1998; WHO, 2008); (iii) community-based EBF promotion & support programs that include peer counselors, CHWs, mother-to-mother support groups (Baker et al, 2006; Salud et al, 2009; Tylleskär et al, 2011; WHO, 2008), and visible community events (e.g., world breastfeeding week) (Rea, 2003; Salud et al, 2009).

[3] The Baby-Friendly Hospital Initiative (BFHI), launched in 1991, is an effort by UNICEF and the World Health Organization to ensure that all maternities, whether free standing or in a hospital, become centers of breastfeeding support. A maternity facility can be designated 'baby-friendly' when it does not accept free or low-cost breastmilk substitutes, feeding bottles or teats, and has implemented 10 specific steps to support successful breastfeeding. These steps include helping women initiate BF within half an hour after birth, rooming-in, BF support, and facilitating community level BF support once women leave the facility (a list of each step can be found at link below). The process is currently controlled by national breastfeeding authorities, using Global Criteria that can be applied to maternity care in every country. Implementation guides for the BFHI have been developed by UNICEF and WHO. Source: http://www.unicef.org/programme/breastfeeding/baby.htm#10 [accessed: September 18, 2011]

Illustrative examples: First, between 1975 and today, Brazil has experienced an increase of more than eight months in average BF duration, accompanied by an impressive eight fold increase in EBF rates among infants under six months old. The Brazilian program that has led to these remarkable results has included innovative community approaches to improve the 'fit' of the organization to local needs. A good example is the 'Baby Friendly Primary Health Care Unit' (BFPHCI) innovation that was built upon the facility-based Baby Friendly Hospital Initiative, and was successfully scaled up in the state of Rio de Janeiro, Brazil. This new initiative includes ten universal steps that should be met at local primary health care units (i.e., not at the hospital level) in order to promote and support breastfeeding at the community level. Some of these steps include breastfeeding training for all primary health care unit staff, including community health agents (equivalent to peer counselors), and the formation of breastfeeding support groups. In the state of Rio de Janeiro, where BFPHCI has been scaled up, EBF rates among children < 6 months were significantly higher in those primary health care units with better BFPHCI implementation (De Oliveira, 2003; De Oliveira, 2005).

A second set of examples are the many mass media BF promotion campaigns that have been designed with the specific goals of increasing the acceptability of BF and creating an atmosphere where this infant feeding behavior is perceived as advantageous (Jelliffe and Jelliffe, 1998; Rea, 2003; Tognetti 1985). These campaigns can be particularly effective when based on formative marketing research that fully takes into account the needs and community wants (Jelliffe and Jelliffe, 1998). After doing extensive formative research, Brazil launched its national BF program in March 1981 through a mass media campaign that had the specific goal of preparing the ground for receptivity of implementation; this goal was achieve by sensitizing

the public and government about the need for and the types of major structural and behavioral changes expected ahead. This initial campaign lasted 45 days and included reaching out to 13.5 million households via TV, and many more via radio. Other components included press advertisements and messages on lottery tickets, telephone bills, electricity bills, water bills, and bank statements. Overall, the campaign was very successful at preparing the ground for the implementation of the program.

Lastly, the annual World Breastfeeding Week celebrated worldwide is an innovation that has also served the purpose of fostering a BF friendly atmosphere and preparing target institutions and communities for the introduction of forthcoming BF programs. For example, the previously discussed Pembo project was formally launched at a highly visible event during World Breastfeeding week, and was attended by the local and state department of health officials as well as women from the community. The 'packaging' for the delivery of BF promotion through peer counselors followed soon thereafter. As illustrated in the following sections, both mass media and visible community events are approaches that have also been used for the 'development' and/or 'engagement' components of the AIDED scale-up.

Develop

In the develop component, attention is directed to fostering enabling relationships, environments and networks among partners who can support and facilitate the spread of the innovation. This section summarizes how international consensus meetings, fostering political will, legislation, workforce development and infrastructure investments are key for developing the intersectoral partnerships needed for successful scale up (Bhandari et al, 2008; Jelliffe and Jelliffe, 1998; Rea, 2003; Timpo, 2007; Tognetti, 1985).

Key enabling factors. Global BF promotion efforts have been built upon the foundation established by evidence-based international consensus meetings/declarations (Bellagio and beyond) (Baker et al, 2006; Bhandari et al, 2008; Horton et al, 1996; Jelliffe and Jelliffe, 1998; Labbok and McDonald, 1990; Rea, 2003; Salud et al, 2009; Tognetti et al, 1985) and global infant feeding recommendations issued by UNICEF and WHO (Baker et al, 2006; Bhandari et al, 2008; Rea, 2003; Salud et al, 2009; Tylleskär et al, 2011). Translating this support into action has greatly benefited from the efforts of international advocacy groups (e.g., International Baby Food Action Network (IBFAN), World Alliance for Breastfeeding Action (WABA)) (Baker et al, 2006; Jelliffe and Jelliffe, 1998; Rea, 2003; Salud et al, 2009) and local advocacy groups, as well as coalition building with various stakeholders, including public opinion leaders (Baker et al, 2006; Bhandari et al, 2008; Jelliffe and Jelliffe, 1998; Rea, 2003; Salud et al, 2009; Timpo, 2007; UNICEF, 2010; WHO, 2008). Before scale up can proceed, it is crucial to elicit will (Burke, 2004; Rea, 2003; Salud et al, 2009; Timpo 2007; WHO, 2008) and long term commitment for scale up (Baker et al, 2006; Bhandari et al, 2008; Jelliffe and Jelliffe, 1998; Rea, 2003; Salud et al, 2009; Timpo, 2007; UNICEF, 2010; WHO, 2008) from policy makers through political sensitization (Baker et al, 2006; Rea, 2003; Salud et al, 2009; Timpo, 2007; WHO, 2008) based on cost/savings analyses (Baker et al, 2006; Bhandari et al, 2008; Rea, 2003; Salud et al, 2009; UNICEF, 2010), and civil society mobilization and engagement (Baker et al, 2006; Bhandari et al, 2008; Rea, 2003; Salud et al, 2009; WHO, 2008).

Maternity leave and work place legislation, as well as the enforcement of the WHO International Code of Marketing of Breast Milk Substitutes (WHO Code)[4], are key for attaining the supportive environment needed for EBF promotion to succeed on a large scale (Bhandari et al, 2008; Rea, 2003; Salud et al, 2009; UNICEF, 2010). The frequent violation of the WHO Code has consistently been identified as a major barrier for BF promotion (Burke, 2004; Jelliffe and Jelliffe, 1998; Labbok and McDonald, 1990; Rea, 2003; Salud et al, 2009; Tognetti, 1985; Tylleskär et al, 2011).

The back bone of sustainable large scale BF promotion is the training of administrators, health professionals, and paraprofessionals (Baker et al, 2006; Bhandari et al, 2008; Burke, 2004; Rea, 2003; Salud et al, 2009; Tylleskär et al, 2011), a process that can be facilitated by improvements in medical/nursing school curriculums (Rea, 2003; Jelliffe and Jelliffe, 1998; Labbok and McDonald, 1990; Timpo, 2007; WHO, 2008). The physical infrastructure for the delivery of BF support at the facility and community level needs to be in place for successful large scale up to occur. For example, a major barrier for the initial implementation of BFHI in many countries was that maternity wards were not designed to accommodate rooming-in (Jelliffe and Jelliffe, 1998; Labbok and McDonald, 1990). Lack of community-level infrastructure for lactation management support continues to be a major barrier for EBF promotion globally (Bhandari, 2008; UNICEF, 2010; WHO, 2008).

Illustrative example: The BF promotion literature illustrates the value of reaching global consensus, and explains both why it is necessary and how to successfully promote desired

[4] A detailed description of the WHO code can be found at http://www.unicef.org/programme/breastfeeding/code.htm [accessed: September 18, 2011]

family health behaviors. The evidence-based outcome recommendations (e.g., EBF for 6 months) and the effective evidence-based approaches for promoting the desirable behavior (e.g., BFHI, community peer counselors) led intersectoral coalitions to organize highly visible consensus conferences. These, in turn, led to consensus declarations or global calls for action that provided the momentum for global BF promotion scale up.

In the 1970s, a global coalition formed by civil society and other stakeholders pressured infant formula companies to change their marketing approaches. This movement eventually led to the development of the WHO Code, adopted in 1981 by the WHO Assembly. In 1990, The Innocenti Declaration on the Protection, Promotion, and Support of Breastfeeding[5] recommended four actions: establishment of national BF committees, implementation of the ten Steps to Successful Breastfeeding in maternity services, national legislation to protect the BF rights of employed women, and implementation of WHO Code. In 1991, after being successful at generating strong political will, WHO and UNICEF launched the BFHI, leading to the rapid global uptake and spread of this innovative program. Subsequently, the 2002 Global Strategy for Infant and Young Child Feeding (IYCF) reaffirmed the goals of the 1990 Innocenti Declaration and emphasized the need for strengthening BF support at the community level. The empirical evidence strongly supports the major influence that these consensus meetings have had in the successful launching and sustaining of BF promotion programs at scale in low- and middle-income countries (Bhandari et al, 2008; Burke, 2004; Horton et al, 2006; Jelliffe and Jelliffe, 1998; Labbok and McDonald, 1990; Pérez-Escamilla, 2004; Rea, 2003; Salud et al, 2009; Timpo, 2007; Tognetti, 1985; Tylleskär et al, 2011; UNICEF, 2010; WHO, 1998; WHO, 2008).

[5] http://www.unicef.org/programme/breastfeeding/innocenti.htm [accessed: September 18, 2011]

Media campaigns have also been used to generate support among stakeholders, which is key for the successful implementation of the program. For example, in the Brazilian program, the National Nutrition Institute requested funds from UNICEF in 1980 to develop an audiovisual presentation to document the need for a BF promotion program and elicit support among politicians, health officials, mass media, community leader and the Catholic Church (Jelliffe and Jelliffe, 1998; Rea, 2003). The audiovisual featured well known and highly respected pediatricians. The key messages were (i) "BF promotion saves money", and (ii) "we understand how to promote BF." After touring the country and presenting this audiovisual to the ministers of health and welfare, the government agreed to launch the Brazilian National BF promotion program in 1981. The success of this strategy for generating political will and support can be traced back to the extensive formative assessment phase upon which the content of the messages and the dissemination strategies were based.

Engage

Although engagement occurs throughout the process of dissemination and diffusion, it is particularly central to the tasks of introducing the innovation from outside the user group to inside the user group through such methods as boundary spanners, translating the innovation so that user groups can assimilate the new information, and integrating the innovation into the routine practices and social norms of the user group.

Key enabling factors: BF promotion programs ultimately seek to engage the mother in considering the utilization of optimal infant feeding behaviors, including EBF. There are many factors that influence a mother's infant feeding decisions, including the advice from health care providers, family, neighbors, friends, media and others. Small trials have shown that women

across cultures are significantly more likely to practice EBF when they are presented with innovative approaches that take into account the contexts in which they live. The key for the success of these interventions has been addressing cultural beliefs surrounding their infant feeding choices, such as the often unfounded belief that women are not able to produce enough milk for EBF their infants (Burke, 2004; Baker et al, 2006; Salud et al, 2009; UNICEF, 2010; WHO, 2008). This pervasive belief has consistently been identified as one of the strongest risk factors for the early introduction of replacement infant feedings including infant formula. Once infant formula is introduced, the likelihood that the mother will revert to EBF is exceedingly low, and any BF duration becomes shortened as a result. Because women are more likely to experience an insufficient milk supply during the first days after delivery, it is crucial to understand the roots of this pervasive belief in different cultures in order to address it effectively (Otoo et al, 2009).

A key barrier for the scale up of BF promotion programs is the lack of adequate communication skills among health care providers and peer counselors/community health workers (UNICEF, 2010; WHO,2008). Thus, developing a work force that is well trained on the technical aspects of lactation management and BF promotion is necessary, but not a sufficient condition for successful scale up. Scale up requires developing the communication and counseling skills of individuals providing BF support to women. Good receptivity is most likely when women and individuals in their circle of influence fully engage in the decision making process (UNICEF, 2010); otherwise, efforts to successfully engage target individuals are compromised and scale up eventually fails. Innovative facility and community-based BF promotion approaches (through peer counselors, CHWs, mother-to-mother support groups,

etc.) are indeed crucial for proper engagement of target individuals (Baker et al , 2006; Salud et al, 2009; Tylleskär et al, 2011; WHO, 2008).

Illustrative example: Bangladesh is a country where significant BF promotion efforts have taken place; however, less than half of Bangladeshi infants under 5 months are exclusively breastfed and this rate has remained stable since 1997. Although the Bangladeshi program was successful at implementing the WHO Code in the country, introducing maternity leave legislation, and promoting heavy investment heavily in BFHI efforts, the program failed to recognize that 85% of Bangladeshi newborns are delivered outside health facilities. Recognizing that the program has to be improved to be successful at engaging a key target audience (i.e., women who still have little contact with health sector maternity services), the country is currently piloting innovative community-based BF promotion approaches such as community nutrition promoters and mother support groups (UNICEF, 2010).

Sri Lanka, a country where 95% of women attend prenatal care and deliver in health care facilities, in contrast with Bangladesh, was able to increase EBF among children under 5 months from 17% in 1995 to 76% in 2006. Two major components of the country's program were: (i) extensive lactation management training of the vast majority of health workers posted in hospitals and field clinics; (ii) working together with public health midwifes providing home visits within the first 10 days after delivery. The Sri Lanka experience strongly supports the need for national BF promotion programs to engage target women at both the health facility and community level through innovative approaches (UNICEF, 2010).

Mass media in Brazil was also used for engaging women with the BF program, in addition to its use during the components of innovate and develop steps discussed before, and

focused on directly empowering women to breastfeed through messages combating the belief that women do not produce enough milk to breastfeed exclusively. Messages were delivered through highly innovative methods, such as being printed on electricity bills, bank statements, and TV spots. The TV spots featured well-known sports stars and other celebrities, and were aired during commercial breaks of a popular soap opera with an audience reach estimated at 500 million viewers in just two cities. Thus, large numbers of women and families were exposed multiple times to these messages (Jelliffe and Jelliffe, 1998; Rea, 2003).

Devolve

This component involves the index user groups spreading the innovation within their peer networks, shifting the process to be mostly driven by the user groups and their networks rather than by the original innovator or external party. These user groups and their networks replicate and release the innovation (in adapted and potentially failed forms) in the way they see most appropriate.

Key enabling factors: Once a BF promotion program has been successfully scaled up and EBF uptake is widespread among the index user groups, efforts to devolve for continued spreading among the next generation of 'users' are critical for sustaining the initial scale up phase. For this to happen, six conditions need to be met. First, effective sustainable lactation management and communication/counseling through train-the-trainers programs need to be in place (Jelliffe and Jelliffe, 1998; Labbok and McDonald, 1990; WHO, 1998). Second, a sustainable workforce development pipeline including medical, nursing, and technical schools needs to be developed (Jelliffe and Jelliffe, 1998; Labbok and McDonald, 1990; UNICEF, 2010). Third, national intersectoral BF coordination with adequate budget allocation should not rely

heavily on foreign aid and it should be highly decentralized, as in the case of Brazil (De Oliveira, 2003; de Oliveira, 2005; Rea, 2003). Key sectors to be involved should be: target women and communities, government, civil society (eg, Non-Governmental Organizations (NGOs), philanthropists), international agencies, medical societies, academic researchers, and mass media (Baker et al 2006; Bhandari et al, 2008; Rea, 2003; UNICEF, 2010; WHO, 2008). Fourth, systems to avoid redundancies by incorporating BF promotion through existing programs (diarrhea, immunizations, family planning, growth monitoring) must be in place (Bhandari et al, 2008; UNICEF, 2010; WHO, 2008). Fifth, facility and community based infrastructure needed for effective BF promotion must also be in place (Bhandari et al, 2008; UNICEF, 2010; WHO, 2008). Sixth, there must be monitoring and evaluation systems that include low-cost rapid response management information systems to facilitate local decentralized management of BF promotion efforts (Baker et al, 2006; Bhandari et al, 2008; Pérez-Escamilla, 2004; Rea, 2003).

Scale-up experiences have also identified specific barriers for devolving, including lack of proper incentives for staff, program "fatigue", draining of trained workforce members from the index user groups, and attempting to devolve through staff who are already overburdened with other duties (Bhandari et al, 2008; Horton et al, 1996; Pérez-Escamilla, 2004; UNICEF, 2010; WHO, 2008). Program "fatigue" has been identified to be one of the reasons for a decline in BFHI quality in several countries (Pérez-Escamilla, 2007), including El Salvador (Pérez-Escamilla, 2004), where BFHI was launched over a decade ago. It is apparent that the fidelity to the 'package' of steps has declined with time, especially once initial certification and recognition is obtained (Pérez-Escamilla, 2004).

Illustrative example: Whereas the case of Brazil illustrates a successful decentralized scale-up model that meets the six devolving criteria outlined above, the literature is full of examples of initiatives (e.g., Pérez-Escamilla, 2004; Pérez-Escamilla, 2007) and countries where initial programs do not devolve.

The national Brazilian BF program illustrates how a well-coordinated multi-sectoral national BF promotion program likely explains the increase in median BF duration from 2 to 10 months in a 25 year long period (Rea, 2003). Impressive improvements in EBF were documented over the same period of time. The process that led to the successful scaling up of BF promotion in Brazil included the following steps (IOM, 2011): (i) baseline needs assessment including data on infant feeding practices, (ii) advocacy (including the sensitization of decision makers based on scientific evidence of BF health and economic benefits and international consensus on BF policies/recommendations), (iii) national and local mass media campaigns, social mobilization (e.g., world BF week), (iv) implementation and spread of BFHI, (v) lactation management and communications/counseling trainings (development of human resources), (vi) legislation (maternity/paternity leave, BF at work), and (vii) monitoring and evaluation (including monitoring of the WHO Code). There was a lag time of about six years before significant BF duration increases began to be detected, although this time frame for scale up results may differ in other contexts. During the first three to four years, barriers for BF (free formula distribution, unethical advertisement by infant formula companies, medical education biases) were much stronger than facilitators (e.g., single institution/small scale BF promotion efforts, small advocacy efforts). The balance between barriers and facilitators improved significantly across time. Dependency on foreign assistance for sustainability also declined as

the country continued building its own critical capacity to succeed, and eventually reaching a point where it has become self sustained.

A recent analysis of the work of Rea and others in Brazil by Pérez-Escamilla posits that the successful national program can be represented by a social marketing framework (IOM, 2011, **Figure 2**). The Brazilian experience offers two important lessons. First, social marketing can be a very useful conceptual framework for guiding the scale up of BF promotion programs. This framework, which is fully consistent with the AIDED model, suggests that when a product is available (such as BF) to fulfill a need (maternal-child health improvement), can be offered to consumers in highly affordable and accessible attractive packages (e.g., BFHI, peer counseling, mother support groups), and is positioned through key locations (health facilities, communities), then the dissemination, diffusion, and scale up of a public health intervention is easily facilitated. The successful social marketing of BF promotion in Brazil relied on (i) strong support from government, civil society, international agencies, academic and philanthropic organizations, (ii) mass media (public opinion, behavior change communications), (iii) strong intersectoral coordination, and (iv) decentralization. Second, the relatively long initial lag time observed in Brazil may be shorter in countries with fewer initial barriers for BF promotion scale up. Empirical evidence supporting this proposition is accumulating from other countries (Salud et al, 2009; Timpo, 2007).

In contrast with Brazil, the Philippines national experience illustrates how initial scale up can become unsustainable when the conditions for effective devolution are not met. In the Philippines, EBF increased in the mid 1990's after a vigorous launching and spread of BFHI and WHO Code implementation. Nevertheless, little improvement was observed thereafter with

only about one third of Filipino infants under 3 months being exclusively breastfed. A case study analysis (UNICEF, 2010) concluded that the main reasons for lack of sustainability were: (i) disengagement of ministry of health with the program due to restructuring, (ii) high turnover of staff involved with BF program without replacements, (iii) collapse of monitoring and evaluation system, (iv) re-strengthening marketing efforts by infant formula companies (very likely as a result of the weakening of the WHO Code implementation), and (v) highly centralized system with little devolving capabilities, especially at the community level.

The Philippines case study, together with the Brazilian experience, provides empirical support to the notion that multi-component, well-coordinated intersectoral programs are the engine that drives not only successful initial scale up, but the ability to devolve or sustain the program. The key program components are highly interdependent on each other; thus, once any of the key elements in the system starts to fail, the engine that drives the BF promotion program starts unraveling.

Discussion

An integration of the peer reviewed and gray literature evidence covering Sub-Saharan Africa, Latin America, and Asia (Central, Pacific Rim, South, and Southeast) suggests that scale up of BF promotion & support programs may be accomplished with deliberate attention to and investment in the components of the AIDED model, in combination with conceptual frameworks such as social marketing. Successful scale-up efforts have built upon evidence-informed advocacy to achieve social mobilization, foster political will, and eventually to implement hospital and community-based BF promotion policies and legislation (e.g., WHO Code, maternity leave legislation, BF friendly work environments).

Scale up has been facilitated through extensive use of health communications strategies and massive professional and paraprofessional training/education efforts based on 'cascade training' models. Scale up requires a high degree of inter-sectoral coordination, usually at the national and local levels, based on a flexible decentralized structure, and sustainability requires the availability of low-cost and rapid response monitoring and evaluation systems. Scale up at the community level has usually been attained by incorporating BF promotion into multiple existing programs (e.g., c-IMCI, growth monitoring, diarrhea, immunizations, family planning). Although the process of adoption and spread is now relatively well understood, we still have much to learn about how best to sustain the impacts that have been demonstrated to happen in a relatively short period of time (i.e., less than three years**).**

Large scale, mixed methods studies are needed to better understand how to: (i) develop national and local coordination of flexible decentralized system with adequate quality controls, (ii) incorporate BF promotion through existing programs whenever possible (but ensuring that critical mass is in place for adequate EBF support), (iii) develop a sustainable pipeline of highly qualified lactation management professionals and paraprofessionals via training of trainers programs and strengthening of health professional school curriculums, (iv) strengthen monitoring and evaluation systems (including quality control), (v) provide innovative incentives to empower communities to develop a sense of ownership of the programs, (vi) better define the optimal background, training, roles, tasks, and incentives needed for a well prepared and sustainable workforce of community-based paraprofessionals (rapid turnover is a big problem), and (vii) avoid high reliance in foreign aid for sustaining program.

The well documented case-studies of Brazil (Rea, 2003) and Ghana (Timpo, 2007), together with the scale-up studies conducted by UNICEF (2010) and WHO (2008) in numerous countries, indicate that the evidence-informed recommendations emanating from consensus meetings were critical steps needed for national and global scale up. The challenges of the scale-up process may potentially be met through well planned devolving strategies accompanied by low-cost rapid response BF counseling monitoring systems as illustrated by the national MADLAC experience in El Salvador (Pérez-Escamilla, 2004).

Community-based BF support (represented by step 10 of BFHI) has become the focus of national programs seeking to improve and sustain EBF rates. The PROMISE-EBF large scale randomized trial conducted in Sub-Saharan Africa (Tylleskär et al, 2011) demonstrates that BF peer counseling can indeed be effective at scale at the community level. However it also demonstrates that context matters. In this instance, the major EBF improvements found in Burkina Faso and Uganda could not be detected in South Africa, a country with exceedingly low EBF rates perhaps as a result of widespread availability of infant formula. There is indeed a critical need to conduct health economics studies to understand the cost-effectiveness of community-based BF promotion in diverse settings.

The AIDED model encapsulates the essential steps needed to successfully scale up BF promotion in LMICs. Although major knowledge gaps remain, substantial progress over the past two decades provides a wealth of knowledge ready to be used for scaling up BF promotion in diverse socio-economic and cultural contexts. We recommend the implementation of large-scale studies to test the empirical validity of the EBF scale-up AIDED model, and to continue filling in the knowledge gaps in the long term in different socio-economic and cultural contexts.

Because most BF problems initially develop during the first hours or days after delivery, it is crucial that scaling up efforts targeting EBF are preceded by formative research to understand how best to reach out to women with sound BF information and support prenatally and in the immediate hours/days following delivery, regardless of where it takes place (IOM, 2011; UNICEF, 2010).

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*denotes peer-reviewed article used for data extraction in systematic literature review
**denotes gray literature source used for data extraction in systematic literature review

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Chapter 3 Figures and Tables

Figure 1. Academic literature review sample selection

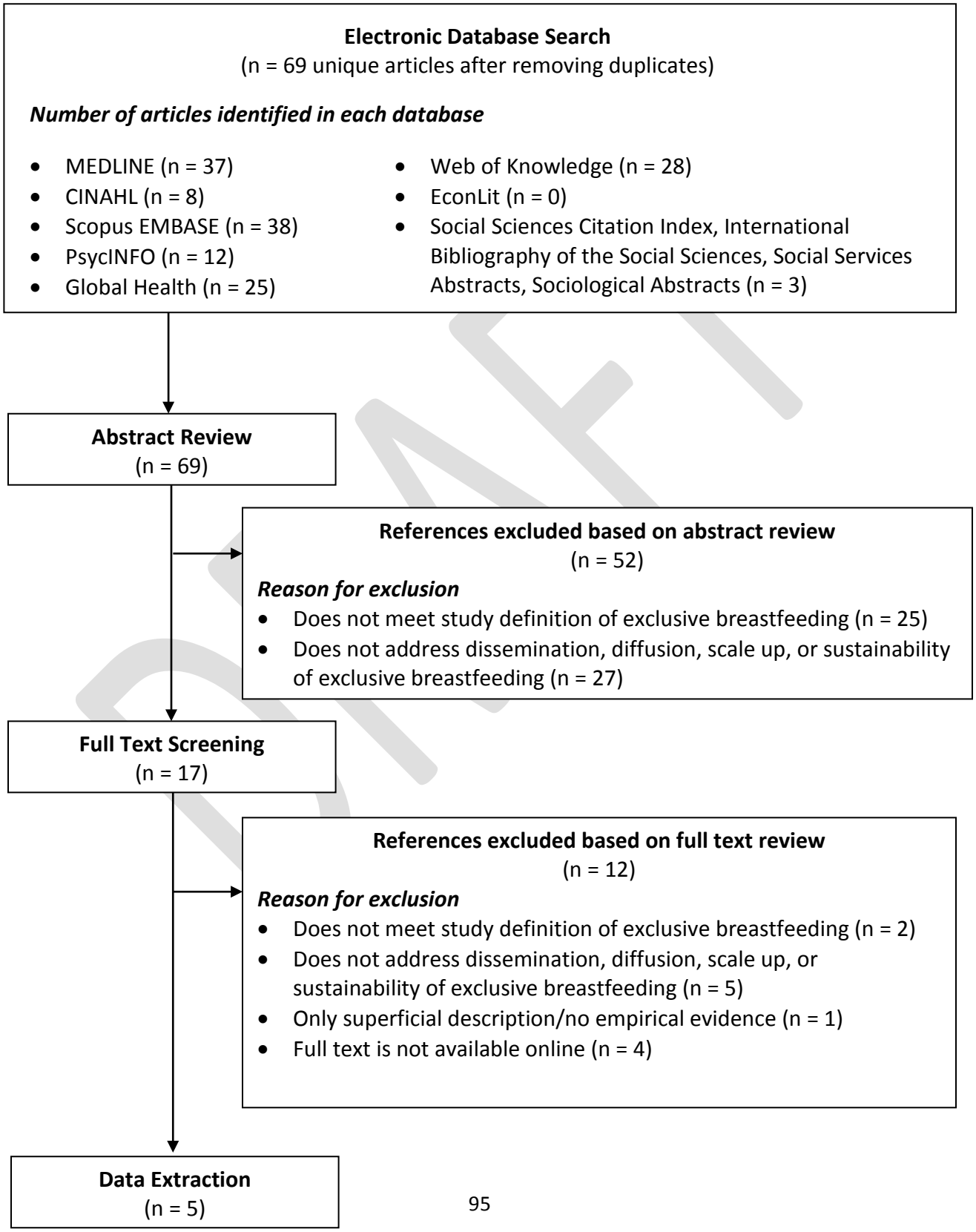
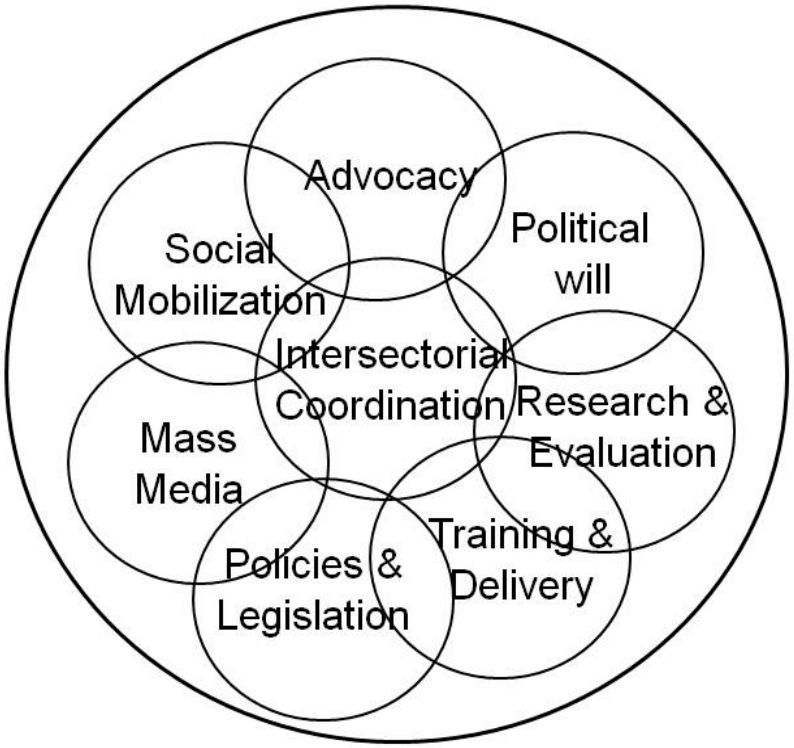


Figure 2. Social marketing framework for breastfeeding programs presented at Institute of Medicine (IOM) United States Department of Agriculture (USDA) BF Campaign Workshop



Source: Pérez-Escamilla (2011). Presented at the IOM USDA BF campaign workshop IOM (2011)

Table 1. Characteristics of final literature sample for data extraction (n=17)

	# of sources
Geographic area of BF promotion program [1]	
Latin America & Caribbean: Bolivia, Brazil, Colombia, Costa Rica, El Salvador, Honduras, Mexico, Trinidad & Tobago	7
Sub-Saharan Africa: Benin, Burkina Faso, Ethiopia, Ghana, Kenya, Madagascar, Mali, Uganda, South Africa, Tanzania	5
East Asia: Papua New Guinea, Philippines	5
South Asia: Bangladesh, India, Nepal, Sri Lanka	4
Southeast Asia: Cambodia, Indonesia, Thailand	3
Methods used in study [1]	
Case study	6
Literature review	4
Thought piece using empirical evidence from other studies	4
Pre-post intervention without comparison group	3
Cross-sectional interviews/questionnaire	2
Qualitative in-depth interview/focus group/participant observation	2
Pre-post intervention with comparison group	2
Randomized Controlled Community Trial	1
Cost-effectiveness	1

[1] *Total is greater than 100% as some sources covered multiple countries, and/or used multiple methods.*

Table 2. Enabling factors for the dissemination, diffusion, scale up, and sustainability of exclusive breastfeeding by AIDED model components

Enabling Factor	# sources citing factor	AIDED model components mapped to factor
Contextual		
International advocacy groups: IBFAN, WABA	5	Develop
Evidence-based recommendations: timely initiation of BF; EBF for 6 months (WHO)	5	Develop
International consensus meetings/declarations: Bellagio and beyond	8	Develop
Political support		
Cost/savings analyses	6	Assess
Local advocacy & coalition building, including public opinion leaders	8	Develop
Civil society mobilization & engagement	6	Develop
Political sensitization	6	Develop
Political will	6	Develop
Long term commitment to scaling-up	9	Devolve
Process and sustainability facilitators		
Research & evaluation		
Baseline facility and community needs assessments	7	Assess
Operational (formative) research/pilot studies	8	Assess
Program delivery		
Facility-based delivery system: e.g., BFHI	8	Innovate, Develop, Engage, Devolve
Community-based EBF promotion & support: baby friendly primary health care units, peer counselors, community health workers, mother-to-mother support groups	8	Innovate, Develop, Engage, Devolve
Communications/mass media campaigns; targeting opinion leaders, policy makers, mothers; simple and doable messages; celebrities	8	Innovate, Develop, Engage
Visible community events: world breastfeeding week, other	3	Innovate, Engage, Devolve
Program delivery through other existing programs: immunizations, diarrheal control, family planning, and other programs	6	Innovate, Develop, Engage, Devolve
Workforce development		
Training: administrators, health professionals, and paraprofessionals	10	Develop, Devolve

Endorsement from medical societies	3	Develop
Medical/nursing school curriculums	3	Develop
Legislation		
Legislation: maternity leave, work place, WHO Code	6	Develop, Devolve
Program coordination & quality control		
Intersectoral coordination: government, civil society (NGOs, philanthropists), medical societies, academic researchers, mass media	8	Develop, Engage, Devolve
Monitoring and evaluation; low-cost; rapid response	6	Assess, Devolve

Table 3. Barriers to the dissemination, diffusion, scale up, and sustainability of exclusive breastfeeding by AIDED model components

Barrier	# sources citing factor	AIDED model component(s) mapped to factor
Unethical marketing of infant formula	7	Develop, Engage, Devolve
Maternal employment	2	Engage
Unsustainable workforce development system (affects sustainability)	3	Devolve
Overburdened staff in medical facilities & in community health settings	1	Devolve
CHW investment just to promote BF difficult to justify	5	Develop, Devolve
Strong dependency on international aid (affects sustainability)	3	Devolve
Weak M&E systems	3	Assess, Develop, Devolve
Prolonged lag time before impacts can be detected	1	Devolve
Lack of community-level BF promotion and support	3	Develop, Engage, Devolve
Unpaid "volunteers" high turnover	3	Develop, Devolve
Cultural beliefs: "insufficient" milk, other	5	Innovate, Engage
Lack of multilevel incentives	1	Assess, Devolve
Program "fatigue"	2	Devolve
Lack of referral system for lactation management problems	1	Engage
Poor interpersonal communication skills among peer counselors/community health workers	2	Assess, Develop, Engage

Chapter 4 - Community Health Worker Approaches: An Application of the AIDED Model

Background

Community health workers (CHWs) are a critical element of primary health care delivery, particularly in low- and middle-income countries. CHWs provide basic public health services and medical care and are typically members of the communities in which they work. CHW activities may include educating community members about health risks, promoting healthy behaviors, or linking community members with providers at formal health care facilities. CHWs are often volunteers although some receive financial compensation or other benefits; however, CHWs lack a professional health care certification, which distinguishes them from other health care providers such as doctors or nurses (Lewin et al, 2010). CHWs are also known in some contexts as village health workers, community health promoters, lay health workers, *promotores*, and other terms (Bhattacharyya et al, 2001; Bhutta et al, 2010). Because of their ability to reach community members at relatively low cost, CHWs have been proposed and deployed as a means for achieving a wide range of disease prevention and health system strengthening objectives (Haines et al, 2007; Hermann et al, 2009).

The positive impact of CHWs on disease prevention, healthy behavior adoption, and access to care has been documented in diverse contexts (EHSE/JSI Project, 2001; Lewin et al, 2010; Bhutta et al, 2010). In low- and middle-income countries, CHWs have been found to be effective in reducing neonatal mortality (Baqui et al, 2008), child mortality due to pneumonia (Sazawal and Black, 2003), and mortality due to malaria (Kidane and Morrow, 2000; Wibulpolprasert, 1991). CHWs have been successful in promoting improved health behaviors including exclusive breastfeeding (Agrasada et al, 2005), adherence to HIV antiretroviral therapy and counseling (Hermann et al, 2009; Torpey et al, 2008), childhood immunization

(Lewin et al, 2010), early prenatal care usage (Ahluwahlia et al, 2010), and tuberculosis treatment completion (Clarke et al, 2005). CHWs have also been a central component in the implementation of Integrated Management of Childhood Illness (IMCI) strategies, which have succeeded in reducing child mortality in multiple low- and middle-income countries (Arifeen et al, 2009; Bhattacharyya et al, 2001).

Despite the substantial evidence about the positive impact of CHWs as a model of care, less is known about effective approaches to scaling up and sustaining CHW programs. Although the scale up of individual CHW initiatives has been studied (Dawson et al, 2008; Gilson et al, 1989; Glenton et al, 2010; Koenig et al, 2004), we lack a synthesis of these studies to distill and extract key factors in the successful scale up of such programs. Accordingly, we sought to summarize existing empirical literature on scaling up and sustaining the CHW model in low- and middle-income countries with attention to factors associated with successful scale up of these programs. In addition, we sought to map the findings from the empirical literature to the conceptual components of the AIDED model to offer insight into the more general question of how to scale up innovations in organizational forms, i.e., innovations in how health services are organized for delivery. This information can provide useful guidance to policymakers, researchers, and practitioners seeking to promote CHW models of primary care or other innovations in health service delivery.

Methods

We conducted a systematic review of the peer-reviewed and gray literature on the dissemination, diffusion, scale up, and sustainability of CHW programs in low- and middle-income countries. We defined CHWs as persons trained to assist professional health personnel

in communicating with residents in the community concerning health needs, health behaviors, and/or the availability of health services. For both the peer-reviewed and gray literature, we searched for publications that contained keywords related both to CHWs and to dissemination, diffusion, scale up, or sustainability. The keywords used to search for CHWs were community health worker, community health aide, community worker, village health worker, barefoot doctor, health mediator, lay health worker, *promotores de salud*, peer counselor. The keywords used to search for dissemination, diffusion, scale up, or sustainability were replication, scale up, sustainability, diffusion, dissemination, take up, innovation, diffusion of innovation, technology transfer, information dissemination, acculturation, assimilation, and fidelity. The electronic search strings were refined iteratively in response to emerging data and modified as appropriate for different databases, while retaining a consistent set of core search terms across all searches. We included papers that (i) discussed CHWs, (ii) addressed factors related to the diffusion, dissemination, scale up, or sustainability of CHWs, and (iii) went beyond superficial description or commentary.

Searches for peer-reviewed literature were conducted in 11 electronic databases: MEDLINE, CINAHL, EMBASE, Web of Knowledge, PsycINFO, Global Health, EconLit, Social Sciences Citation Index, International Bibliography of Social Sciences, Social Services Abstracts, and Sociological Abstracts. We included any literature published since the earliest date indexed in each database up to the December 2010 search date. These peer-reviewed literature searches yielded an initial sample of 590 unique articles after eliminating duplicates (**Figure 1**). We screened the abstracts of all articles in this initial sample (n=590). An article was excluded at the abstract screening stage if it did not address CHWs as defined in this study (n=283) or if it

did not discuss the dissemination, diffusion, scale up, or sustainability of CHWs (n=203). We then screened the full text of the articles retained following abstract screening (n=104). At the full text screening stage, an article was excluded if it did not meet the study's definition of CHWs (n=9), if it did not address dissemination, diffusion, scale up, or sustainability of CHWs (n=39), if it did not address low- or middle-income countries (n=3), if it was superficial in its discussion of CHWs and/or did not provide empirical evidence about the dissemination, diffusion, scale up, or sustainability of CHW programs (n=2), or if the full text of the article was not available online (n=33). Following the full text screening, 18 articles were retained for data extraction and analysis.

The gray literature searches targeted the publications/resources databases and web sites of the WHO, UNICEF, UNDP, UNFPA, the World Bank, the African Development Bank, the Inter-American Development Bank, and the Asian Development Bank. We also reviewed project reports published by major international aid organizations (USAID, CIDA, DFID, SIDA, GTZ), the Global Fund to Fight AIDS, Tuberculosis and Malaria, and other influential nongovernmental organizations and partnerships in global health including CARE, GAIN, Family Health International, Partners in Health, John Snow, Inc., and Management Sciences for Health. Gray literature searches included any documents available via the organization's web site on the February 2011 search dates. Due to the large volume of hits generated from these web site searches, the titles of all hits were screened first. If a document appeared relevant on the basis of its title, the full text was reviewed using the same exclusion criteria as applied to the peer-reviewed literature. This process resulted in five documents that addressed dissemination,

diffusion, scale up, or sustainability of community health workers in low- and middle-income countries.

Data extraction from the final sample of peer-reviewed articles (n=18) and gray literature documents (n=5) was conducted independently by two research team members using a pre-established data extraction form. For each article, the data extraction process identified the study design, the geographic location and type of health activities of the CHW intervention, the key findings related to scale up or sustainability of the CHW intervention, and the degree of success in scaling up or sustaining the intervention. Differences in preliminary data extraction results were harmonized through discussion between the two team members to arrive at a final set of factors influencing the success of CHW program scale up or sustainability. Enabling factors and barriers to scale up or sustainability were then grouped into thematic categories, with disagreements resolved through negotiated consensus between the two team members. These enabling factors and barriers were then mapped to the five AIDED model components.

Results

The final sample of 23 sources (18 peer-reviewed articles and 5 gray literature documents) included studies representing a range of geographies, methodologies, and focus areas for the CHW programs (**Table 1**). The studies included CHW programs from 25 countries, with South Asia and sub-Saharan Africa having the greatest number of studies in the sample (n=10 respectively). The most frequently studied CHW focus area was maternal, child, and newborn health and family planning (n=9); multiple sources examined CHW programs focused on specific diseases such as HIV/AIDS and/or tuberculosis (n=6), malaria (n=5), river blindness (n=4), and pneumonia (n=1). Nine of the studies used quantitative methods with either cross

sectional (n=6) or longitudinal (n=3) designs. Six of the studies used qualitative methods, such as in-depth interviews, focus groups, or observations. Seven sources presented retrospective case studies and four used literature reviews on topics related to CHW performance. The sample also included a commentary on one of the qualitative studies in our sample.

The data extraction process identified 29 enabling factors and 22 barriers to dissemination, diffusion, scale up, or sustainability of CHW programs. These enabling factors and barriers were then mapped to the five AIDED components (**Tables 2 and 3**), with some being mapped to multiple AIDED components. In the following section, we summarize the factors and barriers identified in the literature as they relate to each component of the AIDED model and provide illustrative examples for each.

Assess

The assess component refers to assessment of the broad landscape within and around a potential user community, including the needs and wants of the user community, its absorptive capacity, and the political, economic, legal/regulatory, technological and social conditions in its internal and external environments.

Enabling factors: Three enabling factors mapped to the assess component. In some cases, assessment activities were explicit; in other cases, the assessment process was inferred from a demonstrated awareness of community or environmental conditions that informed CHW program design. These enabling factors were alignment of the CHW approach with religious, moral, or ideological norms of social service (n=8), assessment of and adaptation to community needs (n=3), and targeting the CHW program to a community with favorable characteristics (n=2).

Barriers: The AIDED model suggests that the main barrier to scale up related to the assess component is the absence or inadequacy of assessment, which limits the ability of program implementers to tailor the CHW program to community needs and wants or to environmental conditions. Although a lack of assessment was not specifically mentioned in any of the literature sources as a barrier to scale up, five of the barriers found in the literature related to community or environmental conditions that might have been identified through assessment. These barriers were insufficient pay or incentives for CHWs relative to other employment opportunities (n=12), lack of support from family members/spouses for CHWs' role (n=2), CHW health messages that conflicted with community values/beliefs (n=2), inequitable distribution of incentives among different types of CHWs (n=1), and social norms around gender roles, specifically resistance to women working as CHWs (n=1).

Illustrative example: In the Gadchiroli district of India, a field trial of the impact of community health workers on neonatal mortality began by assessing the attitudes and behaviors of community members towards neonatal health (Bang et al, 2005). The researchers used focus groups of mothers and grandmothers to determine the level of knowledge around neonatal health in the target communities. These early-stage assessments revealed a fatalistic attitude towards neonatal survival, examples of taboos and harmful practices, as well as a lack of information about appropriate neonatal care within these communities. The focus group findings were used to inform the design of the CHW intervention, which focused heavily on health education to equip mothers with better knowledge and skills to care for their newborns.

Innovate

The innovate component includes designing, re-designing, and packaging an innovation so that the innovation is acceptable and perceived as advantageous by potential user groups in their specific context or environment. These processes of designing, re-designing, and packaging the innovation are aimed at achieving "fit" between the innovation, the user group, and environmental conditions.

Enabling factors: There were 24 enabling factors that mapped to the innovate component. These "design and packaging" enabling factors included the development of processes for CHW selection, training, motivation, supervision, and integration with the community and the larger health system. The most frequently cited enabling factors under this component were the recruitment of CHWs from and by the community (n=11), consistent management and supervision of CHWs and the CHW program (n=10), CHW integration or cooperation with the broader health system and existing providers (n=9), the selection of respected and motivated individuals to serve as CHWs (n=8), the alignment of the CHW approach with religious, moral, or ideological norms of social service (n=8), the provision of pay, stipend, or transportation support to CHWs (n=7), community perception of CHW tasks as valuable and focused (n=6), the existence of strong community partnership, support, or champions, including cooperation of the CHW program with existing community organizations (n=6), intensive initial or ongoing training (n=5), and the involvement of women in the CHW program (n=5). Additional enabling factors mapped to the innovate component are reported in **Table 2**.

Barriers: Eleven barriers mapped to the innovate component. The most frequently cited barriers were insufficient pay or incentive for CHWs relative to other employment opportunities (n=12), weak management and supervision of CHWs or the CHW program (n=9), lack of community support or perceived value of CHWs (n=8), lack of integration or respect for CHWs within the formal health system (n=7), poor training of CHWs (n=6), and lack of supplies needed by CHWs (n=5). Additional barriers from the literature that mapped to the innovate component are reported in **Table 3**.

Illustrative example: Supervision was a frequently cited aspect of the design and packaging of CHW programs that either enhanced or inhibited scale up and sustainability. Design questions relating to supervision included who would serve as supervisors, how frequently supervision would occur, where supervision would take place, and what purpose supervision would serve. The literature did not suggest a single supervision model that was effective in all circumstances; however, the consistency of supervision was identified as a critical determinant of successful CHW program scale up and sustainability in Bangladesh, Burma, Ethiopia, India, Nepal, Nigeria, Pakistan, and South Africa (Lee et al, 2009; Bang et al, 2005; Dawson et al, 2008; Emukah et al, 2008; Van Ginneken et al, 2010; Bhutta et al, 2010).

In terms of the choice of supervisors, several CHW programs scaled up using existing health care professionals as supervisors, including Brazil (Bhutta et al, 2010), Nepal (Dawson et al, 2008), Ethiopia (EHSE/JSI Project, 2001), and Honduras (Bhattacharyya et al, 2001). In other cases, however, supervision by health professionals inhibited scale up, as in Botswana where health facility staff who supervised CHWs assigned them additional facility-based responsibilities that detracted from CHWs' community work (Gilson et al, 1989), or in South

Africa where respondents indicated that nurse supervisors were unfamiliar with community-based work and were unable to support CHWs in meaningful ways (Van Ginneken et al, 2010). An alternative approach, used by large-scale CHW programs, was to deploy more senior CHWs as supervisors, either formally as in Haiti, Pakistan, and Uganda, or informally as in Thailand (Bhutta et al, 2010; Katabarwa et al, 2005). In Uganda, a mechanism of joint supervision by the community and by the health system was established, with both parties contributing to evaluations of CHW performance (Bhutta et al, 2010).

The frequency of supervision among successful CHW programs cited in the reviewed literature ranged from daily to biweekly to monthly, although some sources did not report the frequency. A number of CHW programs, such as the *shasto shebikas* in Bangladesh, conducted supervision in the communities where CHWs worked whereas others, such as the Female Community Health Volunteers in Nepal, scheduled supervision to coincide with meetings or refresher trainings of CHWs in a centralized location (UNICEF, 2004). CHW programs used supervision as an accountability mechanism for evaluating CHW performance and/or an opportunity for continuing training and troubleshooting. The use of data as an explicit part of the supervisory session was identified as an enabling factor in multiple CHW programs (Bhattacharyya et al, 2001; Bhutta et al, 2010). For example, in Afghanistan, the Health Sector Support Project's systematic approach to checking CHWs' reports was a source of encouragement and motivation to CHWs, who felt that it increased the fairness of the program's compensation scheme by identifying CHWs who were and were not fulfilling their obligations (Bhattacharyya et al, 2001). These dimensions of supervision are aspects of the design of CHW programs that were tailored to fit the target community.

Develop

The develop component comprises efforts to foster enabling relationships, environments, and networks among partners that can facilitate spread of the innovation. Activities within the develop component address political, economic, socio-cultural, technological, and infrastructure conditions outside of the user group to create an environment that enables and supports take up of the innovation.

Enabling factors: Seven enabling factors mapped to the develop component. These enabling factors were integration or cooperation of CHWs with the health system or existing health care providers (n=9), Ministry of Health or other government support as reflected in financial support and rewards for CHWs, advocacy for CHWs, or initiation of the CHW program (n=9), granting CHWs preferential access to other health and development services (n=2), CHWs' coordination of their activities with non-health sector development programs (n=1), the availability of sufficient funding for the CHW program (n=1), co-financing of the CHW program by multiple levels of government (n=1), and the definition of the CHW role in a way that is clear to the CHW, community, and health system (n=1).

Barriers: Eight barriers mapped to the develop component. These were the lack of integration or respect of CHWs within the hierarchy of the health system (n=7), resistance to the CHW role from other health care providers (n=4), inadequate support from the Ministry of Health, sometimes due to competition from other health programs (n=4), unpredictability or reduction of donor funding for the CHW program (n=4), inequitable distribution of incentives among different types of CHWs (n=1), competition from private sector drug vendors (n=1),

failure to secure local government support for the CHW program (n=1), and political upheaval (n=1).

Illustrative example: In Nepal, a technical working group composed of representatives from the government of Nepal and international partners (UNICEF, WHO, USAID, and John Snow International) proposed a new CHW program to provide community-based pneumonia care using an existing CHW platform, the Female Community Health Volunteers (FCHV), that had been developed for vitamin A distribution (Dawson et al, 2008). Although the FCHV program had been successful in vitamin A distribution and other health tasks, some government officials were skeptical about whether the FCHVs – women with limited literacy and living in rural areas – would be able to correctly diagnose and treat pneumonia cases. To develop support among these government stakeholders, the technical working group conducted a trial of the new FCHV pneumonia model in two intervention districts and compared the results against two non-intervention districts that did not use FCHVs for pneumonia management. The trial found that the FCHVs' diagnoses of pneumonia matched those of an external surveyor in 81% of cases, and that when classification was correct the FCHVs always chose the correct treatment. In the intervention districts, the proportion of expected cases receiving treatment increased from a baseline of 18% to 35% in the first year of the trial; there was no change in the non-intervention districts. This evidence from the trial influenced government decision makers to scale up the program from the two initial intervention districts to 42 districts across the country over the next decade, expanding the role and sustaining the value of FCHVs in their communities.

Engage

Although engagement occurs throughout the process of dissemination and diffusion, it is particularly central to the tasks of introducing the innovation into the user group, translating the innovation so that user groups can assimilate it, and integrating the innovation into the routine practices and social norms of the user group. This component includes activities analogous to those of the innovate component but with the key difference that these activities occur within the user group.

Enabling factors: There were nine enabling factors mapped to the engage component. These enabling factors were the recruitment of CHWs from and by the community (n=11), the selection of respected and motivated individuals as CHWs (n=8), the alignment of the CHW approach with religious, moral, or ideological norms of social service (n=8), community perception of CHW tasks as valuable and focused (n=6), CHWs' perception of their role as a path to a job later (n=4), assessment of and adaptation to community needs (n=3), the targeting of the CHW program to communities with favorable characteristics (n=2), the incorporation of community or health facility field experience into CHW training (n=1), and the definition of the CHW role in a way that is clear to the CHW, community, and health system (n=1).

Barriers: Six barriers mapped to the engage component. These were lack of community support or lack of perceived value of the CHW (n=8), lack of support from a CHW's family members for the CHW's role (n=2), conflicts between CHW health messages and community values or beliefs (n=2), community perceptions of the CHW as a government employee rather than as a community volunteer (n=2), social norms around gender roles, specifically resistance

to women working as CHWs (n=1), and community mistrust of the external NGO sponsoring the CHW program (n=1).

Illustrative example: Multiple CHW programs leveraged existing social norms and structures to facilitate entry, acceptance, and success of the CHW program in new communities. In Uganda, CHWs distributing ivermectin, a drug for the control of onchocerciasis, were found to be improperly charging fees for the drug to community members who were not of their same kinship group (Katabarwa et al, 2005; Katabarwa and Richards, 2001). To mitigate the incentive for CHWs to charge fees to non-kin community members, the NGO running the onchocerciasis control program revised the selection procedures and service areas to follow kinship rather than geographic lines, with CHWs selected by their respective kinsmen in a general meeting and responsible for providing services only in their respective kinship zones rather than to a geographically-defined community. Because these kinship networks were governed by social norms of mutual aid and accountability, reorganization of the CHW program along kinship lines reduced the practice of CHWs charging for their services and enabled the onchocerciasis control program to achieve and maintain its coverage target.

In Nepal, the FCHV program was scaled up to the national level and sustained for more than 20 years without the use of financial incentives for CHWs, supported instead by CHWs' belief that they had an obligation to their communities and that their service to the community garnered religious and moral merit (*dharma*) (Glenton et al, 2010; UNICEF, 2004; Maes et al, 2010). Some FCHV program informants reported that FCHVs did not want to receive a formal salary because their volunteer status garnered respect and moral approbation in the community, which would be jeopardized if FCHVs were paid for their services (Glenton et al,

2010). Although some debate exists around whether or not FCHVs should receive monetary or other material benefits (UNICEF, 2004; Maes et al, 2010), the evidence from Nepal demonstrates the potential scale, endurance, and cost effectiveness of CHW programs that succeed in integrating themselves with existing community norms.

Devolve

This component involves the index user groups releasing and spreading the innovation to new user groups within their peer networks. These user groups and their networks replicate and release the innovation (in adapted and potentially failed forms) in the way they see most appropriate. The literature reviewed on CHW programs identified only one enabling factor mapped to the devolve component, namely when children or family members of CHWs assumed the CHW role when the CHW retired (n=1). None of the barriers mapped to the devolve component.

Illustrative example: Thailand offers an example of the spread of CHWs from one generation to the next. In Thailand, the Village Health Volunteer (VHV) program has operated since 1978, with nationwide coverage since 1986 (Bhutta et al, 2010). Many VHVs serve for life, with their children or other family members assuming the role when the original VHV retires. This transmission of the VHV role within families across generations was identified as a factor that has enhanced the sustainability of the program within the broader context of continued support and supervision from Thailand's formal public sector health system.

Discussion

Our results offer empirical support, in varying degrees, for the five AIDED model components. Activities within the components of innovate, develop, and engage were

consistently described as essential to CHW program expansion and endurance. Key aspects of innovate, develop, and engage included designing the CHW program in tailored ways to be acceptable and attractive within community norms, addressing potential resistance from potentially competing providers and other environmental forces, and working in close collaboration to integrate within existing community activities. In contrast, activities in the assess and devolve components of the AIDED model were supported in the literature but in more implicit ways. For instance, many of the barriers to scale up and sustainability that were identified in the literature might have been addressed through early-stage assessment, although this was not explicitly documented in the literature. Examples of barriers that might have been detected by assessment included competition from other CHW programs or private sector drug vendors, the availability of non-CHW paid employment in a community, and social norms around gender roles and family responsibilities in the community. We hypothesize that the lack of assess component activities may reflect a relatively 'top down' approach to CHWs, which the AIDED model suggests will be less successful in scale up and sustainability. In the case of the devolve component, we hypothesize that the literature offers few examples of community members or CHWs themselves spreading the CHW program to new communities because CHW programs are typically not designed to be self-replicating in this way, mainly for reasons of quality control and the non-profit nature of many CHW programs.

Our findings suggest several lessons for efforts to scale up CHW programs as well as other organizational form innovations in low- and middle-income countries. First, integrating CHWs with existing health service delivery organizations and the formal health system contributes to successful dissemination and sustainability. Integration with the existing health

system spans the components of assess, innovate, and develop. Integration begins under the assess component through such activities as identifying the structure, functions, and success of existing health care providers and other CHW programs. Under the innovate component, integration with the health system involves defining CHW roles relative to those of professional health care providers, setting CHW incentives that are compatible with those in the existing health system, developing referral systems from CHWs to health care facilities, and creating reliable supply chains. Under the develop component, fostering support to facilitate integration may include securing public endorsements of the CHW program from government leaders, employing professional health care providers as supervisors of CHWs, or cultivating sustainable sources of financing for the CHW program from government, donors, and the community. These different aspects of integration enhance the likelihood of a CHW program successfully embedding and sustaining itself in index user groups and subsequent user groups.

Second, CHW programs need to be designed in such a way as to be acceptable to the community in which they will operate. The literature suggests that CHW programs need to be evidence-based and aligned with epidemiological need as well as responsive to community preferences and demands. Activities under the assess, innovate, and engage components are important to designing CHW programs that not only respond to objective health needs in the community but that are *perceived* as valuable by that community. Designing and packaging CHW programs to be accepted by the community requires understanding a community's perceived needs, such as for curative care rather than preventative education (Bhattacharyya et al, 2001). CHW programs may need to start with 'quick wins' and visible life-saving interventions such as obstetric care or pneumonia treatment for infants to gain credibility and

secure an audience for preventive activities such as counseling on reproductive health and nutrition. A repeated finding from the literature is that CHWs need to be credible people in the community in order to be accepted by that community. In many of the cases reviewed, credibility required that the CHW had to be a member of the community that he or she served, whether this community was a target population, a geographically-delimited territory, or a kinship group; in addition, successful programs often involved the community in nominating or selecting individuals to join the CHW program. CHW services also need to be effective in order for the program to be accepted by the community. Effectiveness of CHW services also depends on inputs such as consistent supervision, monitoring and feedback systems, continuing education through refresher training, and training of CHWs in communication and facilitation skills in addition to technical care giving. These inputs can be designed under the innovate component and they are implemented and refined through engagement with the community.

Third, CHW programs need to be designed to withstand competition from the broader economic environment. Although CHW programs operate in environments with social, political, and technological dimensions, the economic environment was consistently highlighted in the literature as a potential threat to the survival and success of CHW programs. As many CHWs are de facto volunteers working without any formal salary, the availability of more lucrative employment alternatives was a leading cause of attrition among CHWs in multiple studies (Delacotte et al, 1996; Edwards and Roelofs, 2006; Emukah et al, 2008). Even among CHWs who did receive monetary remuneration of some kind, irregular payment of these stipends led CHWs to drop out of the program in search of more consistent income sources (Bhutta et al, 2010; Bhattacharyya et al, 2001). Some CHW programs in which CHWs sold

medicines and supplies also faced competition from existing private sector vendors (UNICEF, 2004). In communities in which multiple types of CHW or other community development workers operated, inequalities in the levels of financial incentives bred jealousy and discontent, which may have lessened some CHWs' enthusiasm for their work (Bhutta et al, 2010; Bhattacharyya et al, 2001). In addition, CHW programs also faced competition from other health sector programs that attracted donor and government support away from CHWs (Van Ginneken et al, 2010; Edwards and Roelofs, 2006). Several studies cited CHWs' desire for professional advancement through their CHW activities (Gilson et al, 1989; Schneider et al, 2008), and where such opportunities for professional advancement were formally incorporated into CHW programs, such as in Pakistan, Ethiopia, and Haiti, they were viewed as contributing to CHW motivation and program success (Bhutta et al, 2010).

These findings suggest that the economic environment must be considered in the components of assess, innovate, and develop. Under the assess component, existing CHW programs and competing suppliers of goods and services in the target user groups need to be identified. Prevailing employment opportunities for individuals who might be selected as CHWs should also be considered. For example, some CHW programs explicitly targeted communities with a high proportion of educated residents but few job opportunities for those residents (Gilson et al, 1989; Bhutta et al, 2010). Assessment also includes diagnosis of the likely funding situation, including the sustainability of donor or government funding and the degree of competition from other health priorities. Under the innovate component, the literature suggests that designing CHW programs to withstand competition chiefly involves developing the right mix of monetary and non-monetary incentives to maintain CHW participation, or

developing a low-cost training model that reduces the costs of attrition. Building explicit opportunities for continuing education, certification, or other professional advancement into the CHW program and setting CHW selection criteria to choose those with fewer alternative employment prospects may also insulate CHW programs against economic competition in the environment. The develop component may involve activities such as cultivating ongoing funding for the CHW program from donors and governments, leveraging the CHW platform to secure funding from other health and development programs, or advocating for regulations that restrict competition from other service providers such as unlicensed pharmacies.

Fourth, mechanisms for maintaining morale and motivation of CHWs need to be built in to the program. Maintaining CHW morale and motivation was described in the literature primarily as an issue of program design, which was mapped to the innovate component of the AIDED model. Multiple studies described the need to supply some ongoing form of incentive or motivation to CHWs; however, CHW programs differed as to whether this source would be CHWs themselves, the community, or an external agency. Programs in which CHWs were self-motivated included those in which CHWs believed their service to be religious in nature (or contributing to a personal religious goal) and those using peer networks or teams of CHWs to deliver services or to provide feedback and support. Examples of community-based motivations for CHWs included community management committees to which the CHW was accountable (Uganda; Bhutta et al, 2010), selection of CHWs to serve their own kinship group rather than a geographic community (Uganda; Katabarwa et al, 2005), creation of community funds to support the costs of the CHW program (Nepal; UNICEF, 2004), exemption of CHWs from community labor requirements (Bhutan; UNICEF, 2004), and regular festivals held by the

community to celebrate CHWs' work (Madagascar; Bhattacharyya et al, 2001; Thailand; Bhutta et al, 2010). External agency motivations often took the form of either non-monetary material or status rewards. Non-monetary material rewards included preferential access to micro-credit or health care services or in-kind gifts such as foodstuffs. Status rewards included special forms of identification, such as badges or t-shirts, or public recognition through ceremonies or certificates. Some of the CHW programs described in the literature combined multiple sources of motivation from CHWs themselves, the community, and external agencies; no single best combination of motivational approaches emerged, but rather the combination of motivational sources depended on the program's specific context.

A related series of findings on CHW morale and motivation emphasized the need to avoid overloading CHWs, especially when they were volunteers with other household or employment responsibilities. Even CHW programs with motivational elements could fail if CHWs were required to spend too much time traveling between houses or communities (Nigeria; Emukah et al, 2008), if their CHW duties conflicted with other household or family obligations (India; Sivaram and Celentano, 2003; Ethiopia; EHSE/JSI Project, 2001), or if the CHW was assigned too many tasks without adequate training or supervision (Bhattacharyya et al, 2001). An important activity under the innovate component is therefore matching CHWs' responsibilities with their available time and with the resources available for training and supervision so as to maintain CHW morale and motivation.

Fifth, each CHW program must address the inherent tension between the community and the larger formal health care system in a context-appropriate manner during both design and implementation, which may require adaptation throughout the life of the program. The

literature suggests that CHW approaches are successful if they are at once strongly connected to the community and also have a clearly defined role and relationship with the formal health system that is supported by government and other health service providers. CHW integration with the existing health system can provide increased investment, training, coordination, and motivation for CHWs as their role may open future employment opportunities in the health system. CHWs' close ties to the health system may also enhance the community's perception of CHWs' competence within the community as well. Nevertheless, such ties may also alienate the CHW from his or her community or cause the community to lose trust in the CHW. In some settings, affiliation with government services such as health care or community education may have negative connotations for historical reasons (EHSE/JSI Project, 2001). Some sources noted that when CHWs were paid a salary by the government, the community began to perceive them as government employees rather than as volunteers serving their own communities, which reduced the CHW's acceptance in the community (UNICEF, 2004; Bhattacharyya et al, 2001). In addition, material benefits afforded to CHWs, such as priority access to health care, had the potential to breed resentment among community members (Bhattacharyya et al, 2001). Thus the factors that motivate CHWs to continue their work may simultaneously limit the effectiveness of that work in the community. Managing this tension may require adjustments in the design of CHW incentives, the criteria for CHW selection, or the content of CHW training. The right balance between CHWs' identification with the community and integration with the broader health system will vary by context; this should be considered during both the assess and innovate components and further adjusted during the engage and devolve components.

Finally, activities within the devolve component of the AIDED model where CHW programs would be self-propagating to new communities are uncommon in the literature. Health system decision makers and CHW program managers must determine whether designing CHW programs to be self-replicating is desirable and feasible. The CHW program spread envisaged in the devolve component of the AIDED model was not described in the literature reviewed, except in the instance of transmission of the CHW role from parent to child (i.e., from one generational community to the next). Instead the CHW programs that achieved large-scale coverage and that were sustained over an extended period were all actively promoted and supported by government agencies or NGOs that were at least partially external to the communities served. These results highlight the importance of developing support among external stakeholders in scaling up and sustaining CHW programs but also raise the question of why communities or CHWs themselves do not spread the program to new communities.

We suggest that the literature's lack of examples of spread consistent with the devolve component of the AIDED model reflects both the non-revenue generating structure of many CHW programs and the need for quality control over CHW services. As a result of this combination of features, expansion of CHW programs to new communities tends to impose new costs (e.g., of training and supervision) but tends not to generate new revenues for the program. First, CHW programs are typically not profit-generating, which limits the incentive for CHWs or members of communities served by CHWs to establish CHW programs in new communities. In addition, many of the CHW programs reviewed for this study were designed to target groups with limited purchasing power, such as women and children. CHW programs also

frequently focus on preventive education, the benefits of which may not be immediately evident or may only accrue if a large enough segment of the population adopts new health behaviors, which limits the potential for CHWs to charge individuals for services rendered. The literature included selected examples of programs in which CHWs earned a small profit margin on drug sales, which was a potentially sustainable source of revenue; however, these programs experienced difficulties including supply chain interruptions and community suspicions of CHWs' motives in selling drugs (EHSE/JSI Project, 2001; UNICEF, 2004). Second, for reasons of ethics, legality, and efficacy, CHW programs, like other health programs, need to meet certain standards of quality health education and care. One mechanism for maintaining quality of CHW services is limiting training provision to only a few authorized sources (typically a government agency or NGO). As a result, the establishment of new CHW programs typically requires training, materials, or a certification of the CHW's expertise that must be provided by an entity external to the community. In theory, CHWs could be equipped not only with the skills needed for their educative or curative functions but also with skills for introducing the CHW program to new communities (e.g., for explaining the CHW role and its benefits to community leaders or referring interested individuals and communities to CHW program managers). One question for further research may be whether some training and CHW selection aspects of programs might be devolved while maintaining centralized control over quality of services and program accountability.

The lessons discussed above should be interpreted in light of several limitations. First, the final sample of peer-reviewed and gray literature sources on CHW program scale up and sustainability in low- and middle-income countries was limited (n=23). Although the literature

on CHW programs in general is substantial, there are still relatively few detailed studies of how CHW programs in these contexts expanded from idea to large scale sustained implementation. Nonetheless, the literature we reviewed included CHW programs from 25 different countries, allowing us to distill common themes across diverse programs. Second, our inclusion of gray literature, which has not been peer-reviewed, carries a potential risk that the data extracted from these sources may have been biased by the political or financial interests of the authors or publishing agencies; however, as the specific agencies publishing our gray literature (USAID, WHO, UNICEF, and the Asian Development Bank) are commonly cited sources of technical analysis and statistical data, we decided that the benefits of including this literature outweighed the risks. Finally, we analyzed the results of the literature review with respect to the AIDED model; although the model was developed using insights from key informants with extensive field experience, it has not been tested in full in a field-based setting. We acknowledge that the enabling factors and barriers for CHW program scale up and sustainability identified from the literature might be organized in ways other than the AIDED model, and that subsequent field testing of the AIDED model may update the model's components in ways that would imply a reorganization of the identified enabling factors and barriers.

Conclusions

CHW programs have been successfully scaled up and sustained in multiple low- and middle-income countries including Nepal (Dawson et al, 2008; Glenton et al, 2010), Bangladesh (UNICEF, 2004; Bhutta et al, 2010), Pakistan (Sultan et al, 2002; Bhutta et al, 2010), Thailand (Bhutta et al, 2010), and Brazil (Bhutta et al, 2010). Based on our review of the literature, shared characteristics of successful programs included strong support from both the

communities in which CHWs worked and the entities in the broader environment surrounding these communities, in particular the formal health care system. These programs also featured CHW programs designed to be effective in the respective contexts in which they operate through particular combinations of CHW role definition, selection, training, motivation, and supervision. The activities of designing effective CHW programs, developing support in the broader environment, and engaging beneficiary communities map to components of innovate, develop, and engage in the AIDED model. A frontier for further research is determining the relative importance of the components of assess and devolve in the AIDED model in contributing to CHW program scale up and sustainability. Furthermore, the development and testing of new CHW program designs in targeted geographies that can devolve with limited ongoing external investment would be a marked step forward in promoting large-scale spread of the CHW model. Such research can support the further scale up CHW programs and help realize the potential of this proven innovation to improve health in low- and middle-income countries.

References

*denotes peer-reviewed article used for data extraction in systematic literature review
**denotes gray literature source used for data extraction in systematic literature review

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Chapter 4 Figures and Tables

Figure 1. Peer-reviewed literature review sample selection

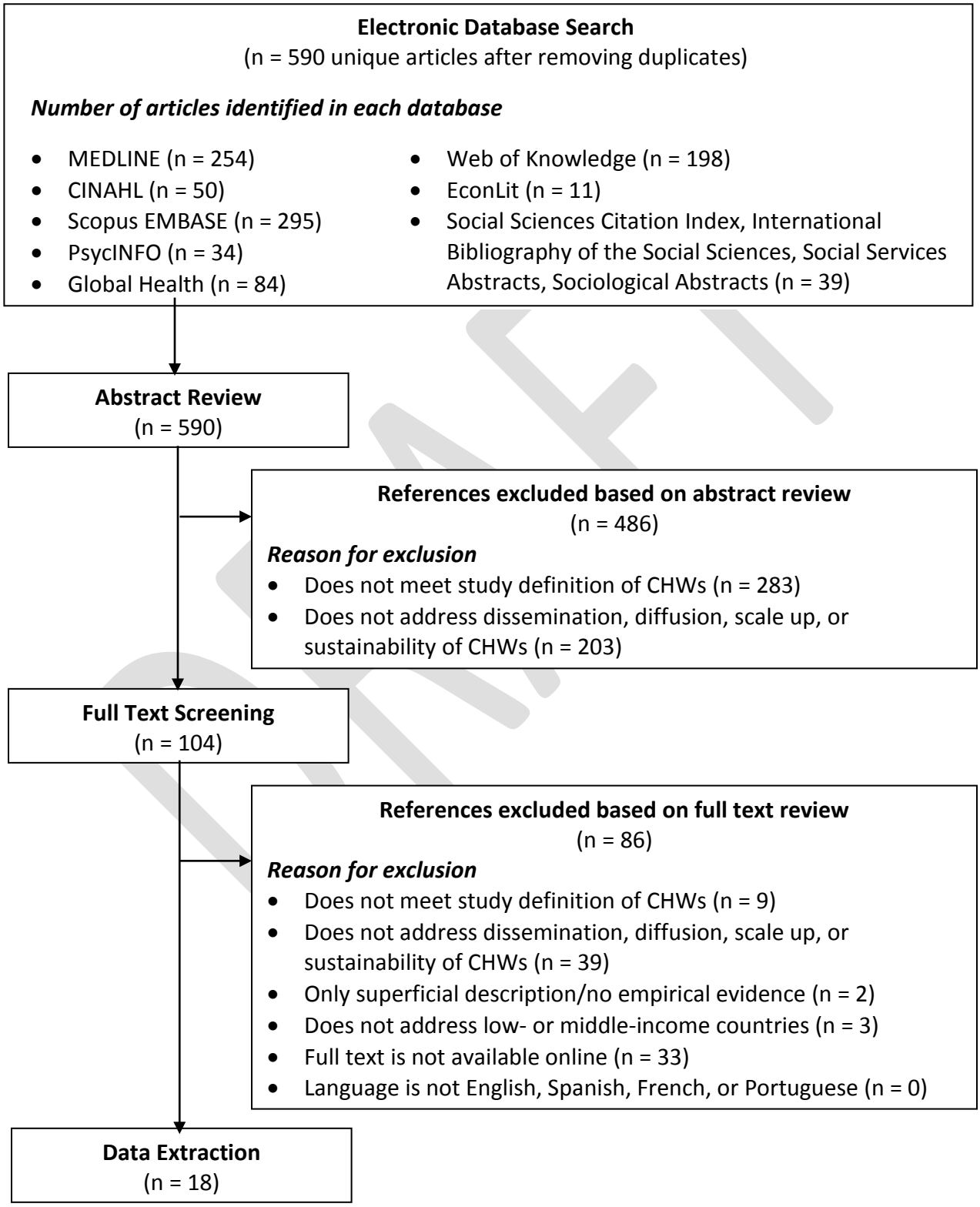

Table 1. Characteristics of final literature sample (n = 23 sources)

	# of sources
Geographic area of CHW program [1]	
South Asia: Afghanistan, Bangladesh, Bhutan, India, Nepal, Pakistan, Sri Lanka	10
Sub-Saharan Africa: Botswana, Ethiopia, Ghana, Madagascar, Mozambique, Nigeria, South Africa, Uganda, Zaire	10
Latin America & Caribbean: Brazil, Colombia, El Salvador, Haiti, Honduras	4
Southeast Asia: Burma, Indonesia, Thailand	3
East Asia: China	1
LMICs (General)	1
Responsibility area of CHWs [1]	
Maternal, child, and newborn health/family planning	9
AIDS/HIV and/or tuberculosis	6
Malaria	5
General primary health care	4
River blindness	4
Nutrition	1
Pneumonia	1
Methods used in study [1]	
Case study	7
Cross-sectional interviews/questionnaire	6
Qualitative in-depth interview/focus group/participant observation	6
Literature review	4
Pre-post intervention with comparison group	2
Pre-post intervention without comparison group	1
Thought piece using empirical evidence from other studies	1
Success of scale up or sustainability of CHW program	
Success	7
Mixed success and failure	12
Failure	3
Unclear	1

[1] *Total is greater than 100% as some sources covered multiple countries, and/or used multiple methods.*

Table 2. Enabling factors for the dissemination, diffusion, scale up, and sustainability of community health workers (CHW) by AIDED model components

Enabling factor	# sources citing factor	AIDED model component(s) mapped to factor
CHWs were recruited from and/or by the community	11	Innovate; Engage
Consistent management and supervision of CHWs and CHW program	10	Innovate
Ministry of Health or other government support, as reflected in financial support and rewards for CHWs, advocacy for CHWs, or initiation of CHW program	9	Develop
Integration/cooperation with broader health system/existing health care providers	9	Innovate; Develop
Respected and motivated people were selected as CHWs	8	Innovate; Engage
CHW approach was aligned with religious, moral, or ideological norms of social service	8	Assess; Innovate; Engage
Pay, stipend, or transportation support provided	7	Innovate
Strong community partnership/support/champions, including cooperation of CHW program with existing community organizations	6	Innovate
Tasks of CHW viewed as valuable and focused by community	6	Innovate; Engage
Gender/female involvement	5	Innovate
Intensive training (some sources specify ongoing or interval training)	5	Innovate
CHW position was viewed as path to a job later	4	Innovate; Engage
Regular monitoring and feedback; evaluation data used	3	Innovate
Assessment of/adaptation to community needs	3	Assess; Innovate; Engage
Effective supply chain	3	Innovate
Sufficient funding available for CHW program (specific funding mechanisms for CHW program established)	2	Develop
CHWs were given preferential treatment/access to other health and development services (e.g., micro-credit, appointments at health clinic)	2	Innovate; Develop
CHWs work in teams/networks	2	Innovate

Narrowly focused set of tasks/role (disease-specific)	2	Innovate
Program targeted to communities with favorable characteristics (e.g., educated residents but limited employment options, commitment to improving own health)	2	Assess; Innovate; Engage
Children or family members of CHWs assumed CHW role when CHW retired	1	Devolve
CHW role is well defined and clear to CHW, community, and health system	1	Innovate; Develop; Engage
CHW training involves community and/or health facility field experience	1	Innovate; Engage
CHWs coordinated their activities with non-health sector development programs	1	Develop
Co-financing of CHW program by multiple levels of government (e.g., central, state, and municipal)	1	Develop
Design of CHW incentives based on behavioral science models	1	Innovate
Nonmonetary incentives provided (e.g., food or household goods, certificates, identification badges, job aids)	1	Innovate
Flexible schedule for fulfilling CHW role	1	Innovate
Charismatic initial leader of CHW program	1	Innovate

Table 3. Barriers to the dissemination, diffusion, scale up, and sustainability of community health workers by AIDED model components

Barrier	# sources citing factor	AIDED model components mapped to factor
Not enough pay or incentive for CHWs; CHWs wanted other employment, found other employment that paid more, or had other employment/work that competed with CHW role	12	Assess; Innovate
Weak or inconsistent management and supervision of CHWs and CHW program	9	Innovate
Lack of community support or lack of perceived value of CHW	8	Innovate; Engage
CHW was not respected or not integrated in hierarchy of health system	7	Innovate; Develop
Poor training of CHWs	6	Innovate
Lack of supplies needed by CHWs	5	Innovate
Unpredictability or reduction of donor funding for CHW program	4	Develop
Provider resistance to CHW role	4	Develop
Lack of or reduction in support from Ministry of Health, competition from other health programs	4	Develop
Distance between houses/work sites	3	Innovate
Lack of support from family members/spouses for CHWs' role	2	Assess; Engage
Stress/low morale among CHWs; CHWs feel overwhelmed by assigned tasks	2	Innovate
Inconsistent payment of monetary incentives (e.g., payment did not come on time or in promised amount)	2	Innovate
CHW health messages conflicted with community values/beliefs	2	Assess; Innovate; Engage
Lack of fidelity to recommended disease diagnosis and treatment practices	2	Innovate
Community views CHW as government employee rather than community volunteer	2	Engage
Inequitable distribution of incentives among different types of CHWs (e.g., some categories paid, others unpaid)	1	Assess; Innovate; Develop
Social norms around gender roles/ resistance to women working as CHWs	1	Assess; Engage

Community mistrust of external NGO sponsoring CHW program	1	Engage
Competition from private sector drug vendors	1	Develop
Failure to secure local government support for CHW program	1	Develop
Political upheaval	1	Develop

Chapter 5 – Social Marketing: An Application of the AIDED Model

Background

Social marketing is the application of commercial marketing techniques to design and implement programs to promote socially beneficial behavior change (Grier and Bryant, 2005). First termed 'social marketing' in the early 1970s by Philip Kotler and Gerald Zaltman (Ling et al, 1992; Sherris et al, 1985), the social marketing methodology is derived from the commercial marketing conceptual framework that includes exchange theory; audience segmentation; competition; the marketing mix of product, price, place, and promotion; consumer orientation; and continuous monitoring (Grier and Bryant, 2005). Social marketing methods have been applied all over the world, including low- and middle-income countries, with aims as diverse as promoting iron-folic acid supplementation (Cavalli-Sforza, 2005), increasing contraceptive prevalence rates (Agha et al, 2006), and enhancing human rights campaigns (Mendelson and Gerber, 2007).

Social marketing efforts have been linked to increases in targeted behaviors but not without controversy. Successful social marketing programs have resulted in increased use of insecticide-treated nets and antimalarial drugs (World Health Organization, 2006), expansion of intrauterine device and medical abortion services (Ewasechko, 2009), scale up of exclusive breastfeeding practices (Institute of Medicine, 2011), and increased utilization of effective family planning methods (Solo et al, 2005). Social marketing is also credited with contributing to the sustainability of product supply in some middle-income countries (Agha et al, 2006). At the same time, experts have argued that some social marketing campaigns have employed top-down approaches with limited local ownership (Wisner, 1988) and have been overly focused on individual behavior change with inadequate attention to the systems and social forces that

result in individuals' choices (Ling et al, 1992; Pfeiffer, 2004). Additionally, some critics have suggested that social marketing relies too much on encouraging product sales and focuses on reported behavior rather than on changing actual behavior (Pfeiffer, 2004), as was the case with a Department for International Development-funded contraceptive social marketing initiative in India. The project was designed around the target of selling 45 million condoms and 550,000 cycles of oral pills. Despite this large scope, no funding was allocated to raising public awareness, monitoring results, or collecting feedback from consumers. Additionally, while the program made impressive progress on its goals (selling 44 million condoms and 776,000 cycles of oral pills) the emphasis on sales targets over consumer awareness objectives prompted an over-stretch in resources that rendered the initiative unsustainable (DFID, 1998).

Although extensive literature exists on the use of social marketing methods to promote particular health interventions, we know less about the dissemination, diffusion, and scale up of social marketing as a field or practice. We therefore conducted a review of peer-reviewed and gray literature related to the dissemination, diffusion, scale up, and sustainability of social marketing with an emphasis on the enabling factors and barriers for widespread scale up of social marketing. Findings may offer useful guidance to donors, educators, researchers and practitioners seeking to develop replicable social marketing programs and to promote social marketing as a field.

Methods

To identify the relevant peer-reviewed literature, we searched 11 electronic databases (CINAHL, Econlit, Global Health, IBSS, MEDLINE (Ovid), PsycINFO (Ovid), Scopus (EMBASE), Social Sciences Citation Index, Social Services Abstracts, Sociological Abstracts, and Web of

Knowledge) for literature addressing the diffusion, dissemination, scale up and/or sustainability of social marketing. For the purposes of our study, we defined social marketing as the application of commercial marketing techniques to promote ideas, attitudes and behaviors in a target audience; focusing on the design and use of programs seeking to achieve specific behavioral goals for the benefit of the general society. Programs in which the primary goal is to earn a profit were excluded.

The searches yielded an initial sample of unique articles after eliminating duplicates (**Figure 1**). We screened the abstracts of all articles in this initial sample (n=538) in two phases. First, in the abstract-screening phase, the article was included if two criteria were met: (1) the intervention met our study's definition of social marketing, and (2) the paper specifically addressed factors related to the diffusion, dissemination, scale up, or sustainability of the intervention. We excluded studies in which the full-text paper was not available online or were written in languages other than English, French or Spanish. We also excluded studies that were judged to be clearly irrelevant based on the abstract alone.

In the second phase of the screening process, the full-text papers were reviewed. In addition to the inclusion criteria applied in phase 1, the paper had to "go beyond superficial description or commentary and/or provide empirical evidence" in order to be included. We excluded papers that referenced social marketing projects only in high- or upper-middle-income countries, as well as papers that only referenced the scale up of a particular health intervention through social marketing, rather than the scale up of social marketing itself. Two of the documents retrieved through this method were published by UN agencies (WHO and UNAIDS), so they were set aside to be assessed as part of the gray literature review. A review of

gray literature was performed using the web sites of major global health organizations, including multilateral technical assistance and funding agencies (the World Health Organization, the United Nations Development Programme, the United Nations Population Fund, the United Nations Children's Fund, the World Bank, the African Development Bank, the Asian Development Bank, and the Inter-American Development Bank), bilateral development assistance agencies (the U.S. Agency for International Development, the UK Department for International Development, the Canadian International Development Agency, the Swedish International Development Cooperation Agency, and the German Technical Cooperation), public-private partnerships (the Global Fund to Fight AIDS, Tuberculosis, and Malaria and the Global Alliance for Improved Nutrition), and nongovernmental implementers (CARE, Family Health International, Partners in Health, Management Sciences for Health, and John Snow, Inc.). Gray literature searches included any documents available via the organization's web site on the February 2011 search dates. While this process retrieved several documents in which social marketing was discussed as a means of scaling up other family health innovations, only three of these were considered appropriate to addressing the scale up of social marketing itself. These were then combined with those that were retrieved as part of the academic literature review, making a total of five gray literature documents appropriate for data extraction.

Data extraction from the final sample of academic articles (n=9) and gray literature documents (n=8) was conducted independently by two research team members using a pre-established data extraction form. For each article, the data extraction process identified the study design, geographic location, and key findings related to scale up and/or sustainability. Differences in preliminary data extraction results were harmonized through discussion between

the two team members to arrive at a final set of factors influencing the success of social marketing program scale up and/or sustainability. Enabling factors and barriers to scale up and/or sustainability were then grouped into thematic categories, with disagreements resolved through negotiated consensus between the two team members.

Results

The final sample of 17 sources (9 academic articles and 8 gray literature documents) included studies representing a range of geographies and methodologies (**Table 1**). The final sample included 10 reports on social marketing in multiple low- and middle-income countries, 1 from Mozambique, 1 from Zambia, 1 from Peru, 1 from Senegal, 2 from East Asia, and 1 study that did not report a specific country. Nine of the final 17 sources used a case study methodology, 6 were thought pieces using empirical evidence from other studies, and 2 were literature reviews.

The data extraction process identified 6 enabling factors and 8 barriers to the scale up or sustainability of social marketing programs in the 17 articles that were retained in the final sample. These enabling factors and barriers were mapped to the 5 AIDED components (**Tables 2 and 3**). In mapping the enabling factors and barriers to the AIDED components, we included both cases where social marketing as a business model spread from one organization to another as well as where social marketing campaigns spread to new geographic or demographic communities. Some enabling factors and barriers mapped to multiple components, and we discussed these within the component with which they were most aligned. In the following section, we summarize the factors (or key activities) and barriers

identified in the literature as they relate to each component of the AIDED model, and provide illustrative examples for each.

Assess

The assess component refers to assessment of the broad landscape within a potential user community, including the receptivity and demands of the user community, its absorptive capacity, and the political, economic, legal/regulatory, technological and social conditions within its internal and external environment.

Enabling factors: One enabling factor was mapped to the assess component: comprehensive formative research to enable market segmentation, tailored promotional and educational materials and delivery strategies (n=5). One barrier factor mapped to the assess component, essentially the converse of the enabling factor: lack of formative research to understand social/cultural norms, preferences and concerns of target user groups (n=1).

Illustrative examples: Bangladesh saw great success with contraceptive social marketing in the 1980s, with over 130 million condoms and more than 2.2 million cycles of oral contraceptives distributed in a 10-year period (Ling et al, 1992). These high distribution rates have been attributed in part to qualitative formative research that helped to effectively segment the audience and identify potential sources of resistance. The research identified men as the target audience of the media program because of their perceived unwillingness to accept contraceptive use (Ling et al, 1992). Research also found that men were most receptive to messaging that promoted family planning as a vehicle for enabling them to better educate their children (Sherris et al, 1985). Fourteen months after the start of the radio campaign, the program witnessed an increase in interpersonal discussions about family planning and a

decrease in the number of people who believed that modern contraception is unsafe (Ling et al, 1992).

Another example of successful scale up of social marketing comes from the Global Public-Private Partnership for Handwashing with Soap (GPPPHS), which in the ten years since inception has moved from a three-country pilot to hand washing with soap campaigns in 15 countries. The Partnership also launched the world's first ever Global Handwashing Day, which had events in 73 countries in 2008, and in 2009, had participation from 600,000 schools across 83 countries (GPPPHS: History of the PPPHW). Founded in 2001, the GPPPHS was heavily influenced by the lessons learned from the hand washing initiative Programma Saniya, in Burkina Faso, which found that careful consumer research at the outset of a hand washing promotion program was a key factor for achieving results (Favin and Alfaro, 2004). As a result, the GPPPHS pilot project in Senegal implemented a large quantitative study to identify which behavioral determinants were correlated with hand washing with soap among mothers, finding that access to soap and to a designated place for hand washing were statistically correlated with hand washing (Devine and Koita 2010). The project team therefore identified the creation of a designated place for hand washing, as well as improving the availability of soap and water in the household as key objectives. In the same campaign, a billboard was developed to address a woman's commitment to the health of her family. An image of a mother and her children was used with the statement, 'I commit myself to getting my family to wash hands with soap.' During a monthly meeting with project teams, in response to men's frustration with being excluded from the campaign and from household visits with fieldworkers, GPPPHS produced a

revised billboard depicting husband and wife with the saying, 'We commit ourselves more than ever to getting our family to wash their hands with soap.' (Devine and Koita, 2010)

The potential consequences of failing to assess social/cultural and religious norms and concerns is highlighted in an example from Mozambique, where a national condom social marketing project produced a destructive backlash within the country's deeply religious communities when the messaging employed controversial images and suggestive slogans. Communities were not substantively consulted in the design of the campaign to promote the 'Jeito' brand of condom, nor was the influential network of Pentecostal and African Independent Churches (to which more than 50 percent of the peri-urban populations belong) substantially engaged. This group later became a vocal protestor to the campaign, which was perceived as promoting the promiscuity that they ultimately came to believe was the cause of HIV (Pfeiffer, 2004). This example illustrates how a top-down approach that ignores community participation in all phases of scale up can not only alienate important segments of the population that could have been allies, but also spread messages that are harmful and deepen the complexity of the problem.

Innovate

The innovate component includes designing, redesigning, and packaging an innovation so that it is acceptable and perceived as advantageous by potential user groups in their specific context or environment.

Enabling factors: Three factors mapped to the innovate component: use of comprehensive, formative and ongoing research data to tailor and refine design and packaging

(n=5), use of indigenous institutions (e.g., local authorities) and people in program planning (n=6), and public-private partnership in delivery of social marketing campaigns (n=7).

Barriers: Two barriers mapped to the innovate component: lack of community participation/top down strategies (n=3) and insufficient attention to social determinants of health in innovation design (n=3).

Illustrative examples: A project focused on improving reproductive health education for women in remote and inaccessible areas in Kenya designed the program to fit the local environment and practices. Because women travelled regularly to markets in their districts, the 'Market Day Midwives' project placed kiosks in the markets of 12 districts, staffed by trained midwives. Initially, the midwives had been trained to emphasize family planning and maternal-child health; however interest and demand prompted the program to grow to include perinatal care and prevention of sexually transmitted diseases, and to expand the target groups to include adolescents of both sexes and men. Although local authorities (secular and religious leaders and district health management teams) initially opposed this expansion of services, as public enthusiasm increased they became supportive, with important roles in leading publicity drives to raise awareness. Kiosks were outfitted with supplies such as male condoms, medical supplies and vaccines, essentially evolving into informal clinics. After two years, the number of clients attending these kiosks grew by 600 percent – from 164,600 in the first year to 989,000 in the second (Fox, 2000).

In Zambia, partnership with the commercial sector allowed for expanded reach of a campaign to promote the use of insecticide-treated nets. A voucher program sponsored by NetMark posted advertising in Zambian railway lines and encouraged the sale of ITNs through

local distributors. Of the 389,000 ITNs distributed by NetMark in the period between 2002 and 2005, nearly a quarter were facilitated by the voucher process. At the same time, partnership with the Mama Safenite brand of ITN has allowed for subsidized distribution at antenatal clinics, expanding into seven of the country's nine provinces by 2005 (WHO, 2006).

An example of the failure to design an innovation so that it would be acceptable to potential user groups comes from a contraceptive social marketing campaign in Honduras. In the packaging phase, program staff considered input from formative research with community members, but had failed to work with government officials. Program staff chose to name the condoms "Guardian". All of the packaging and promotional materials were produced before the program staff discovered that "guardian" is the name the Honduran Ministry of Health had given its rural health workers (Sherris et al, 1985) and would likely confuse or not appeal to potential user groups.

Develop

The develop component refers to priming the environment to be supportive of increased use of the innovation, not only enhancing awareness of the innovation but also building support from stakeholders and addressing resistance that might exist.

Enabling factors: Two enabling factors mapped to the develop component: government support for the innovation (n=2) and public-private partnerships (n=7).

Barriers: Four barriers mapped to the develop component: inadequate documentation of lessons learned and success of social marketing (n=3), limited evidence of cost-effectiveness (n=4), perception of social marketing as a poorly defined or insufficiently rigorous field (n=2), and competition from public sector and subsidized programs (n=1).

Illustrative examples: Multiple examples of the ways in which public-private partnerships may be advantageous in social marketing efforts are described in *Partnerships for Malaria: engaging the formal and informal sectors* (WHO 2006). A multi-stakeholder partnership in Tanzania aimed at reducing malaria had representation from private sector (including net and insecticide manufacturers, and marketing firms), public and NGO sectors, research and academic institutions, donors, and multilateral agencies. Each stakeholder's unique strengths were leveraged as part of a taskforce against malaria. For example, the government created an enabling environment for ITNs by focusing on policy and regulatory issues such as the removal of taxes, favorable insecticide regulatory conditions, net quality control and generic demand creation. The NGO sector focused on developing grass root demand, the research community assisted with informing the innovation design through product development and market research, and bilateral donors provided strategic funding support and helped with strategic thinking across sectors. The resulting social marketing project SMARTNET, managed by PSI Tanzania, supported the expansion of the Tanzanian net manufacturers' market through advertisement of their products, help with distribution and transport subsidies to remote locations. By 2004, nearly 2 million insecticide-bundled nets had been distributed and growth was projected to continue (WHO, 2006).

One example of how social marketing can expand commercial markets and support increased use of the innovation comes from Nigeria, where a Futures Group initiative used donor funds to support and strengthen the marketing efforts of competing manufacturers of insecticides and nets. The project partnered with the commercial sector on product branding and enhancement of distribution networks and led to a boost in competition that has driven

down prices, created wider choice for consumers, encouraged distributors to improve their own marketing strategies, and generally increased business confidence into the ITN market (WHO, 2006).

Engage

Although engagement occurs throughout the process of dissemination and diffusion, it is particularly central to the tasks of introducing the innovation into the user group, translating the innovation so that user groups can assimilate the new information, and integrating the innovation into the routine practices and social norms of the user group. Descriptions of activities within the engage component were uncommon in the literature, although social marketing case studies do describe engaging users through tailored messaging. When the engage component was discussed, it was often in the context of failing to introduce, translate, or integrate social marketing successfully.

Enabling factors: Three factors pertinent to the engage component were identified in the literature: use of indigenous institutions (e.g. local authorities) and people in program planning, operation and evaluation of social marketing campaigns (n= 6), development of professional standards and academic training programs to legitimize social marketing as a field (n=1), public-private partnerships (n=7) and engagement at all levels with the various stakeholders identified as essential to social marketing's success (n=1).

Barriers: Two barriers to scale up related to the engage component pertain to perceptions that social marketing pays insufficient attention to the social determinants of health (n=3), and is perceived as a poorly defined or insufficiently rigorous field (n=2).

Illustrative examples: One example of a public-private partnership helping to take social marketing to scale comes from a program in India that is working to expand the provision of intrauterine devices and medical abortion services in two of the poorest regions. Indian nonprofit Janani combines social marketing with a clinic-based service delivery program and franchise network through which doctors in rural areas provide low-cost services. Janani's network of franchised 'Titli' centers is run by over 22,000 rural medical practitioners who are trained to sell condoms, oral contraceptives and over-the-counter pregnancy tests. Importantly, each practitioner is partnered with a woman from the community who acts as liaison between the rural communities and the clinics. Large subsidies provided by the Government of India for condoms and pills make contraceptives affordable to Janani's predominantly poor clients. Additionally, Janani's IUD program has benefited from the National Rural Health Mission Public-Private Partnership, through which the government accredits NGOs and private sector health facilities and provides financial support for some health services. Over a 9-year period, Janani protected 10.2 million couples and averted 5.8 million unwanted pregnancies, and in 2009 was in the process of increasing its Suriya clinics from 18 to 40 in order to expand IUD and medical abortion services (Ewasechko, 2009).

The hand washing initiative demonstrates the importance of local translation of the innovation in ways that can be appreciated by the target user group. The same core message "wash your hands with soap," had to be delivered in a way that was particular to each community. While the innovation successfully replicated in more than a dozen settings, in each country the Partnership took the time to evaluate hand washing behaviors and find local champions to oversee the initiative (GPPPHS, History of the PPPHW). The insight collected in

each user group informed the development of effective, locally-appropriate campaigns. When piloted in Peru, research found that a major barrier to using soap was the misconception that rinsing hands in water is sufficient for making them clean. To counteract this belief, the project team developed a superhero character, Super Jaboncín, who "gains the power to fight germs by adding soap to water (Devine and Peschiera, 2010)." A later campaign, initiated in Vietnam, crafted a culturally relevant character called Bi, a local schoolboy whose adventures with hand washing were presented in comics in a popular children's magazine and later modified into an animated cartoon (Dutton et al, 2011).

Devolve

The devolve component involves the index user groups releasing and spreading the innovation for its re-introduction in new user groups within their social or professional networks. We found little discussion of enabling factors and barriers for devolve in the literature, although some of the prominent social marketing campaigns in public health have demonstrated sustainability and have expanded to new communities and contexts over time (Sherris et al, 1985; Institute of Medicine, 2011; GPPPHS, History of the PPPHW).

Enabling factors: Two enabling factors related to the devolution of an innovation was public-private partnerships (n=7) and the use of indigenous institutions in program planning, operation and evaluation (n=6).

Barrier: Three barriers to scale up were mapped to devolve: limited evidence that social marketing of certain behaviors or products is cost-effective (n=4), a weak commercial infrastructure (n=1), and competition from the public sector and other subsidized programs (n=1).

Illustrative examples: In Morocco and the Dominican Republic, donor-funded projects partnered with commercial entities that marketed their contraceptive brands at prices lower than the prices of other commercial brands. Termed the 'manufacturer's model,' the partnership made it profitable for the commercial entity to continue the distribution and marketing of the product after the donor support ended. In both countries, the commercial sector share of the oral contraceptive market increased among lower- and middle-income women during the donor-supported period of implementation; with some variance, these increases were sustained in the period following donor withdrawal (Agha et al, 2006). Importantly, the manufacturer's model is likely to be successful only if certain conditions are met. Evidence from contraceptive social marketing suggests that the manufacturer's model should only be considered in middle-income countries that already have developed markets for the particular health product to be marketed (Hovig, 2001).

Discussion

Our results offer empirical support, in varying degrees, for the five AIDED model components. A significant limitation in our analysis was the focus on scaling up social marketing in low-income countries, which is not often studied. While ample research has been conducted on social marketing campaigns in high-income countries, these were excluded as part of our research design. Furthermore, when social marketing is discussed in the literature, in any setting, it is almost always a vehicle for scaling up other public health interventions. Very little has been written about how to scale up social marketing as an innovation in itself.

The literature includes examples of activities in assess, innovate and develop that were described as vital to the scale up of social marketing. In particular, formative research,

conducted at the earliest stages of the process using multiple approaches and sources of data, is essential for the development of social marketing campaigns. Potential sources of data include demographic, psychographic (attitudes, preferences) and social structure (church, work, family) information as well as communication and information distribution channel maps. The lack of such research has substantially undermined change efforts. As demonstrated by the hand washing and family planning programs described here, tailored messaging informed by in-depth research of consumer behaviors and preferences is central to the process of both designing and implementing successful social marketing campaigns.

Less commonly described in the literature are activities that might comprise the engage and devolve components of the AIDED model. The lack of examples of engage (including entry, translation, and integration) is consistent with criticisms that social marketing is often more top-down in its approach. The absence of devolve reflects the relative rarity with which social marketing has become self-propagating and diffused across user groups. This is likely due to the current ambiguity about the definition and methodology of social marketing, the lack of academic research and compelling evidence about its cost-effectiveness, and the perceptions in some low-income countries that marketing approaches cannot be used effectively in public health. Future work to scale up social marketing will require investment in strategies to overcome these barriers to its widespread application as a public health intervention.

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*denotes peer-reviewed article used for data extraction in systematic literature review
**denotes gray literature source used for data extraction in systematic literature review

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Chapter 5 Figures and Tables

Figure 1. Literature review schematic

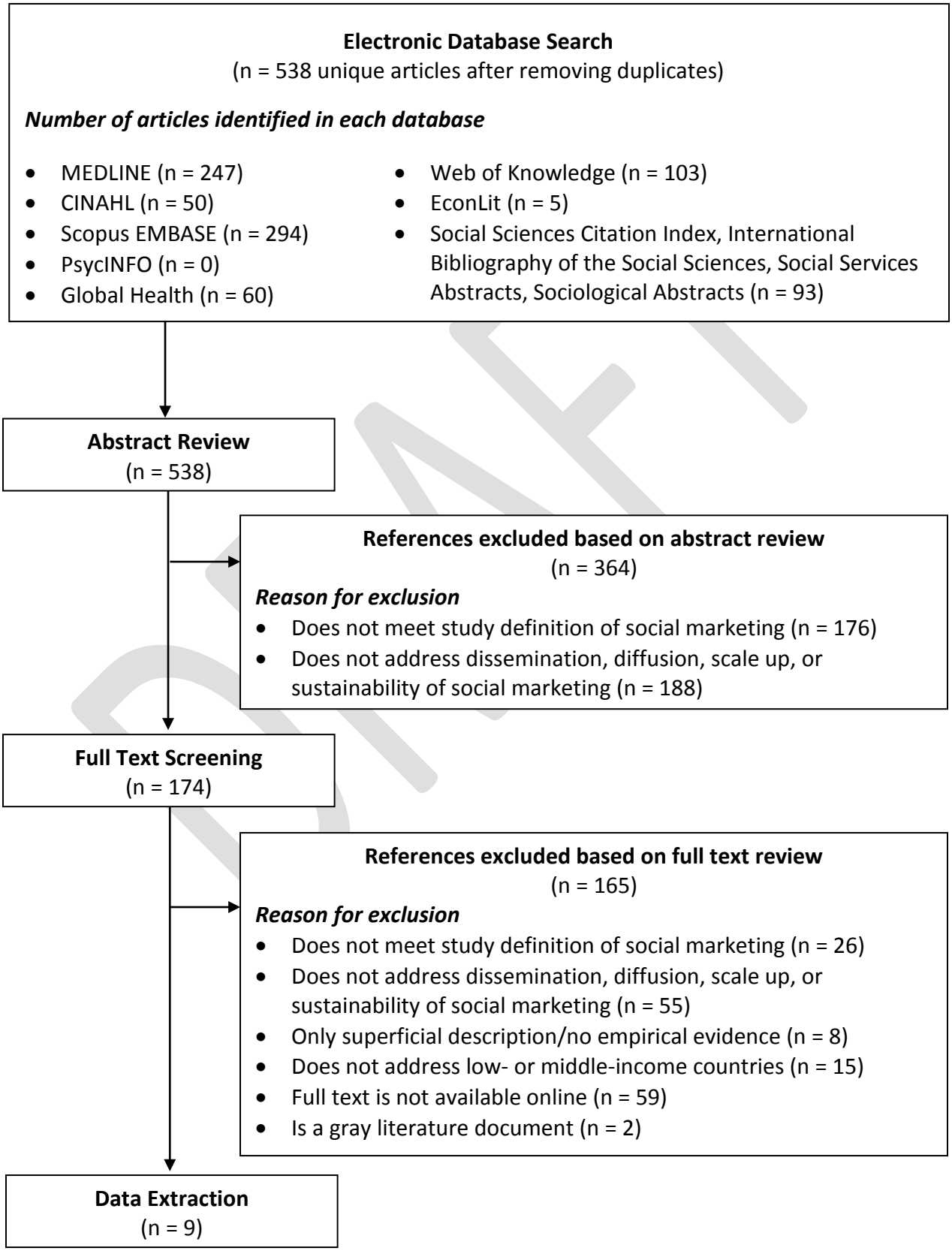


Table 1. Characteristics of final literature sample (n = 17 sources)

	# of sources
Methodology	
Comparative case study	2
Case study	3
Mixed methods case study	3
Thought piece with empirical evidence from other studies	6
Case control study	1
Literature review	2
TOTAL	**17**
Geographic area	
Multiple (LMIC)	10
East Asia	2
East Africa	2
West Africa	1
South America	1
None stated	1
TOTAL	**17**

Table 2. Enabling factors for dissemination, diffusion, and scale up, and sustainability of social marketing by AIDED model components (n=17)

Enabling Factor	# sources citing factor	AIDED model component(s) mapped to factor
Comprehensive formative research to enable market segmentation, tailored messaging and delivery strategies	5	Assess, Innovate
Professional standards/training for social marketing practitioners	1	Engage
Use of indigenous institutions (e.g. local authorities) and people in program planning, operation and evaluation	6	Innovate, Engage, Devolve
Government support (economic, regulatory)	2	Develop
Public-private partnerships	7	Innovate, Develop, Engage, Devolve
Purposeful engagement at all levels with the various stakeholders identified as essential to social marketing's success	1	Engage

Table 3. Barriers to the dissemination, diffusion, scale up, and sustainability of social marketing by AIDED model components (n = 17)

Barrier	# sources citing barrier	AIDED model component(s) mapped to factor
Lack of community participation/top-down strategies	3	Innovate, Engage
Weak commercial infrastructure	1	Devolve
Lack of formative research to understand social/cultural norms, preferences and concerns of target user group	1	Assess, Innovate
Insufficient attention to social determinants of health	3	Innovate
Inadequate documentation of lessons learned and success stories of social marketing	3	Develop
Limited evidence of cost-effectiveness	4	Develop
Perception of social marketing as poorly defined or insufficiently rigorous field	2	Develop, Engage
Competition from public sector and subsidized programs	1	Develop, Devolve

Chapter 6 - Summary and Next Steps

In this report, we present the product of a multi-pronged effort of our multidisciplinary team: the AIDED model. Our team consisted of representatives from a broad range of scientific disciplines, including cell biology, economics, history, management, organizational behavior, political science, public health, and social psychology; this diversity of perspectives was critical to generating new insights into the process of scale up. We conducted a comprehensive, systematic review of relevant empirical evidence in peer-reviewed and gray literature and original qualitative data from experts and practitioners in global health and family health innovations. Feedback from 'pressure testing' has been incorporated to the extent feasible within the scope of this project (See **Appendix** for feedback and our responses).

Despite the in-depth analysis that resulted in the AIDED model, it is nonetheless in a nascent stage. Central to validating the model are prospective studies in which the AIDED approach is applied in low-income countries, and its evolution tracked systematically using appropriate measures for the five components and their constituent activities. In this chapter, we summarize evidence supporting the AIDED model and propose a framework for measurement.

Summary of evidence supporting the AIDED model

As presented previously in this report, we found strong evidence from the literature that supports the model's innovate, develop, and engage components; however, although the model's assess and devolve components were described by key informants, we found relatively weak evidence for these components in the peer-reviewed or gray literature. One possible explanation for the lack of inclusion of assessment processes in written reports on scale-up efforts is that program implementers or evaluators may consider assessment as a standard

practice and therefore may limit their description in reports. In reports that include descriptions of assessment, little detail was provided. Consequently, important questions remain pertaining to the optimal investment in and approach to assessment activities. Key informants indicated that such activities were essential to successful scale up; however, the peer-reviewed literature has not examined this question in sufficient detail to support a conclusion.

We also found relatively weak evidence in the literature pertaining to effective approaches to the activities in the devolve component, despite substantial discussion of this issue by the key informants. The limited data on devolve activities was especially apparent for the CHW approach and social marketing innovations, whereas devolve activities were better documented for Depo-Provera and exclusive breastfeeding. We hypothesize that devolve activities may be limited in cases where continued external investment is needed to sustain programs (such as with the organization of government service delivery required with CHW approaches) or where negative perceptions of the innovation persist (such as in the case of social marketing in some geographies). The devolve component, particularly the role of social networks of user groups, is a critical focal area for future investigation. To what extent do innovation designers, funders, or program managers consider the potential for devolve activities in developing their designs and implementation strategies? In cases where scale up occurs, what is the role of social networks and can the process of spread from the index user groups to the second generation of user groups be mapped and evaluated precisely? These questions merit further research using rigorous qualitative and quantitative approaches, including case study methods and of social network mapping.

A key question for funders and other family health stakeholders is whether programs that use the AIDED model scale up more rapidly, more sustainably, or more cost-effectively than do programs that do not use the AIDED model. Given the substantial investment of time and resources required to carry out the activities in assess, develop and engage components, full application of the AIDED model will require substantial time investment. Nevertheless, we propose that programs using the AIDED model are more likely to be sustained than those that do not make such investments. We hypothesize that the higher upfront investment required in activities in the components of assess, develop, and engage may offset subsequent costs in the devolve component. These hypotheses require further investigation to confirm.

Central to addressing these questions is improved measurement of the key activities and outcomes of each component of the AIDED model. Development of the framework and tools for measurement is both feasible and important for validating the AIDED model in prospective studies and for evaluating its potential use with other public health innovations. Following is a framework for measurement of scale up activities and success using the AIDED model.

Framework for measurement of the AIDED model

We developed a template of activities, outputs, outcomes, outcome indicators, and means of measuring progress for the five components of scale up using the AIDED model (**Figures 1-5**). These figures display approaches and measures that may be applicable in a variety of environments and for a range of family health innovation types (e.g., product, health behavior, organizational form, or business model innovations). Many of the proposed outcome indicators could be measured using existing methods such as needs assessment, stakeholder

mapping, situation analysis, and knowledge or opinion surveys; however, such methods may be time consuming or difficult to conduct in an increasing number of user groups simultaneously as an innovation scales up. The tools developed to implement these measures could be refined with application and validated to ensure that the activities identified within each component are associated with more successful scale up.

Next steps

Our systematic literature review indicates that we lack a robust evidence base for the practical "how to" of scaling up family health innovations in low-income countries. The number of studies that describe scale up of family health innovations in low-income countries remains limited, and only a small fraction of these studies provide detail sufficient to allow future innovators to replicate scale-up successes or avoid scale-up failures. Prospective studies that include in-depth and precise analysis over longer time periods are needed to document the trajectories of decisions and conditions that lead to both successful and failed scale-up efforts are needed. In addition, assuming support for the AIDED model, we suggest that the model might also be used to inform the following next steps:

- Creation of project proposal guidelines that explicitly require prospective implementers to consider and plan for activities in each of the five components of the AIDED model of scale up at the proposal stage;
- Development of proposal evaluation methods to enable prospective funders to assess the scale up potential of proposals;

- Adaptation of existing or creation of new user-friendly, field-ready social network mapping tools appropriate for mapping social networks relevant to family health innovations in low-income countries;
- Establishment of an "Assessment Fund" mechanism that would finance early stage diagnostic activities such as those included in the assess component of the AIDED model to ensure that prospective implementers have collected the information needed to inform scale-up strategy, and to assist prospective funders in selecting among possible scale-up investments; and
- Establishment of a "Devolution Fund" mechanism that would fund a variety of supports for social networks and ongoing convening of stakeholders in diverse formats. These assessment and devolution funds are particularly critical, particularly because such activities are not typically or explicitly supported through existing funding programs.

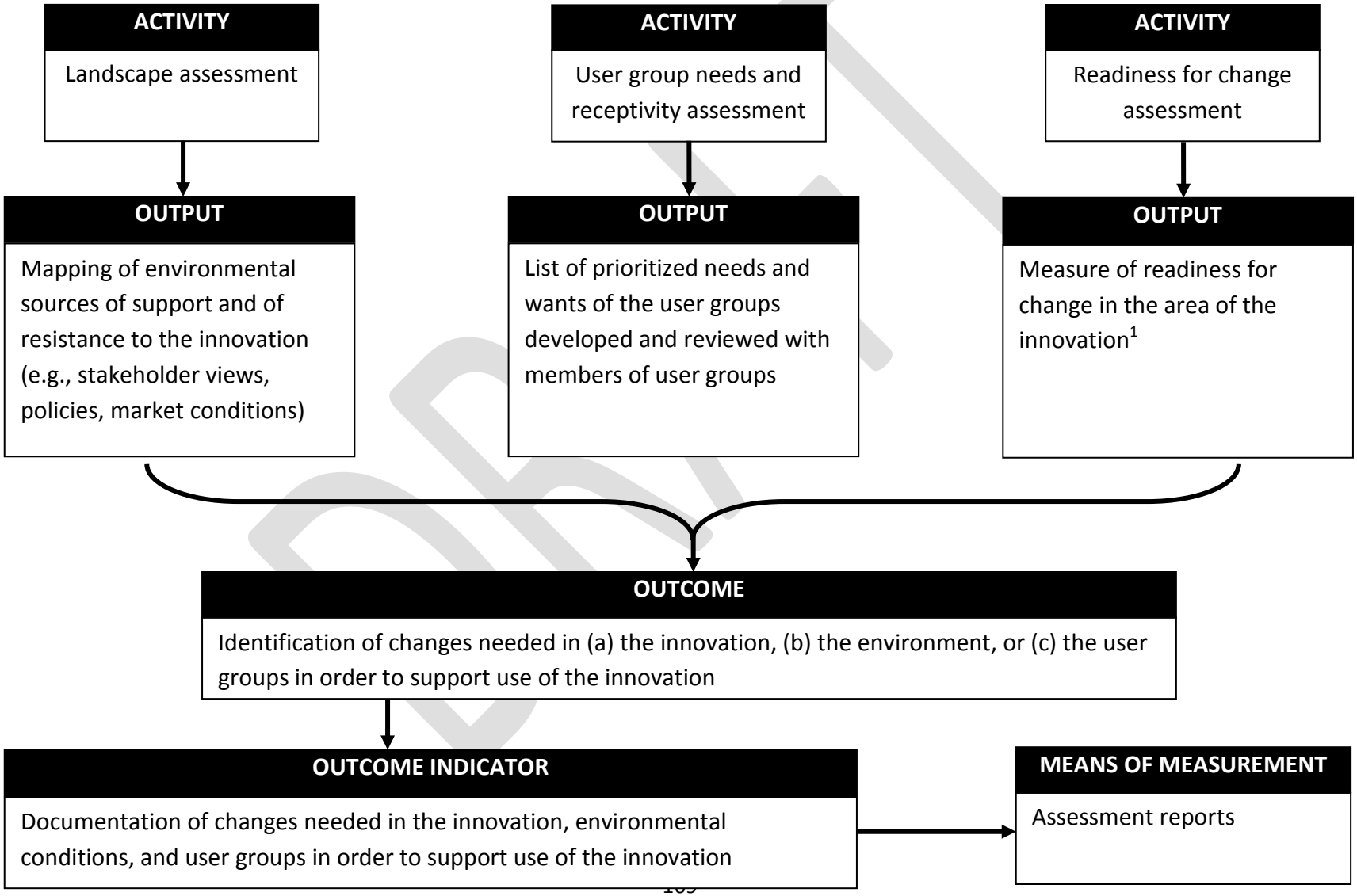
Conclusion

We sought to develop a practical model for dissemination and diffusion of innovations to understand what works in scaling up evidence-based health innovations in low-income countries, with particular focus on spread processes at the organizational and community levels, where adopting entities could include user communities, provider organizations, and policy making groups. Additionally, we sought to develop a model that would be applicable to different types of family health innovations, including products, health behaviors, organizational forms, and business models. The AIDED model reflects a comprehensive synthesis of the current knowledge base on scale up of four family health innovations, derived from empirical research and diverse conceptual and theoretical literature. Further refinement

and application of the AIDED model offer promise to improve family health in low-income countries globally.

Chapter 6 Figures and Tables

Figure 1. Assess component: Flowchart of activities, outputs, outcomes, indicators, and means of measurement



[1] See forthcoming work by Dearing et al. on system readiness, expected to be submitted to BMGF in 2012.

Figure 2. Innovate component: Flowchart of activities, outputs, outcomes, indicators, and means of measurement

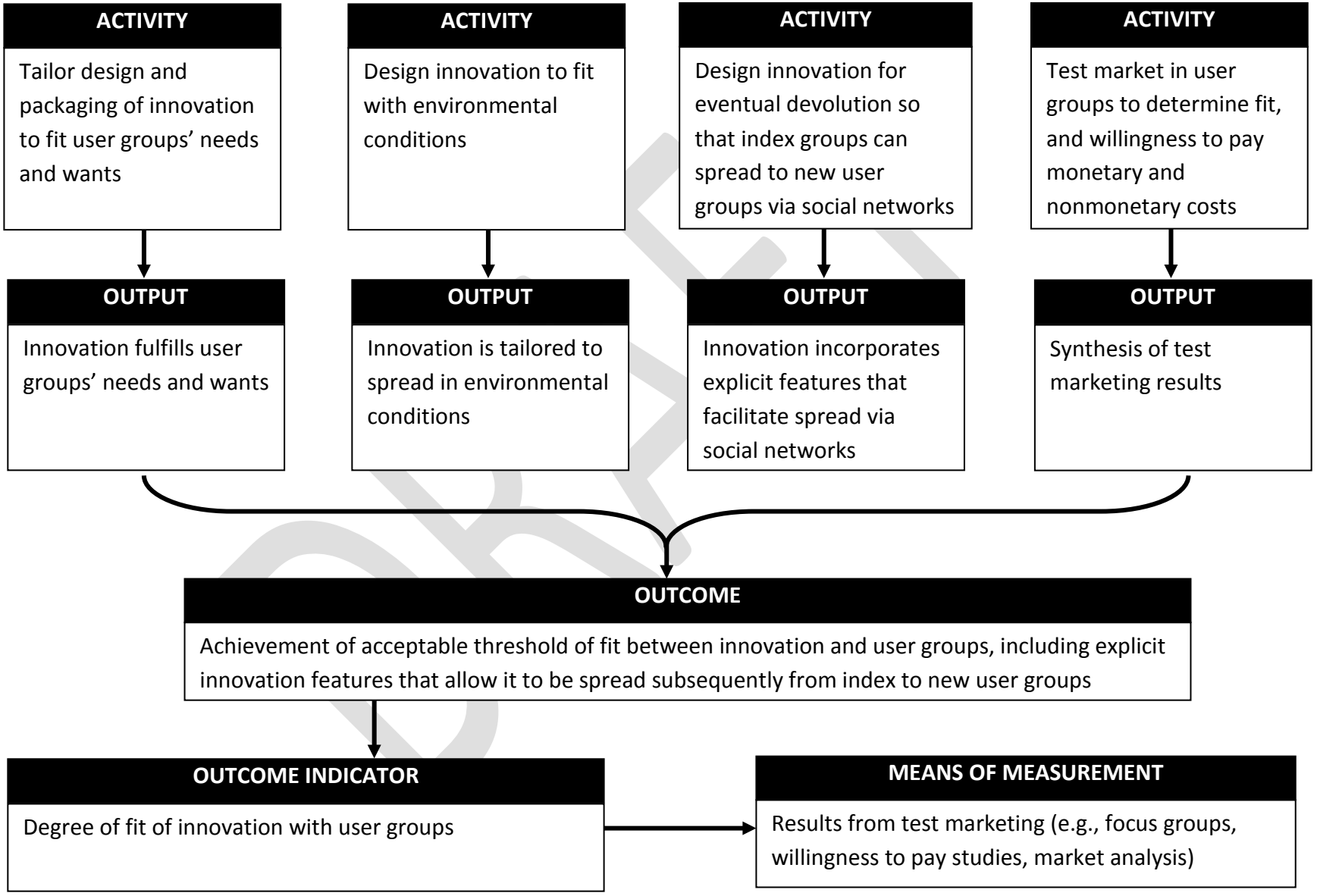


Figure 3. Develop component: Flowchart of activities, outputs, outcomes, indicators, and means of measurement

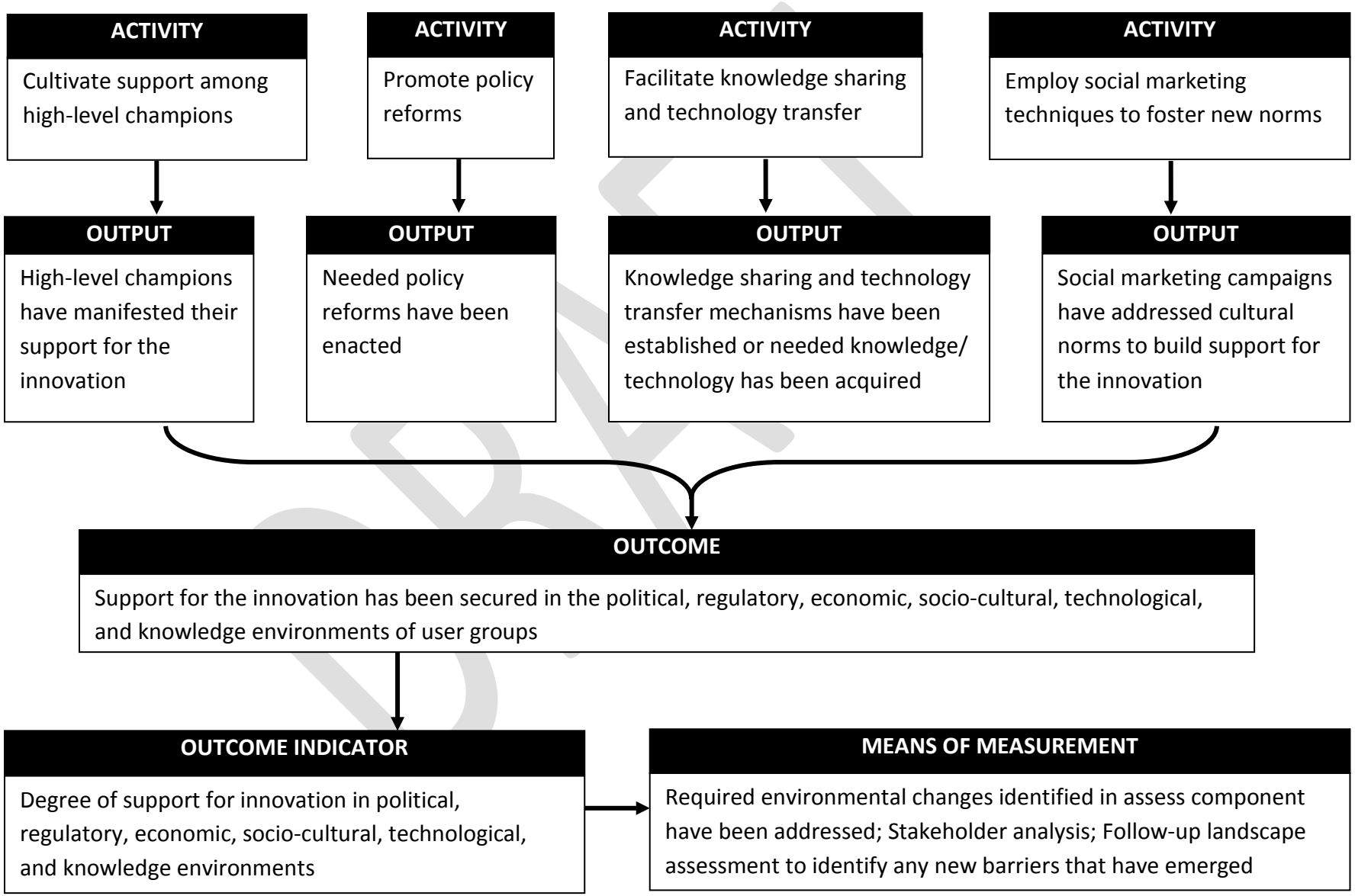


Figure 4. Engage component: Flowchart of activities, outputs, outcomes, indicators, and means of measurement

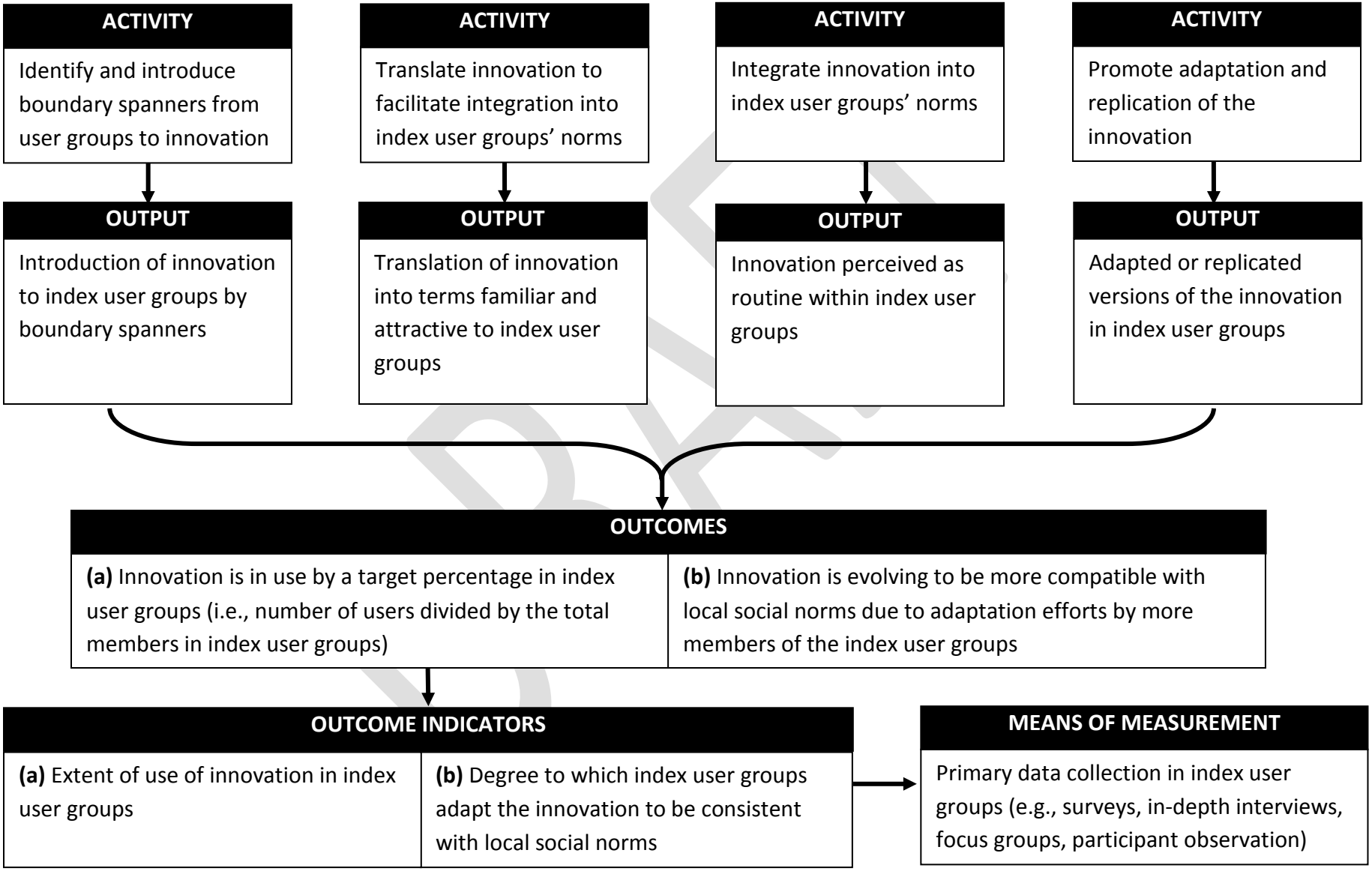
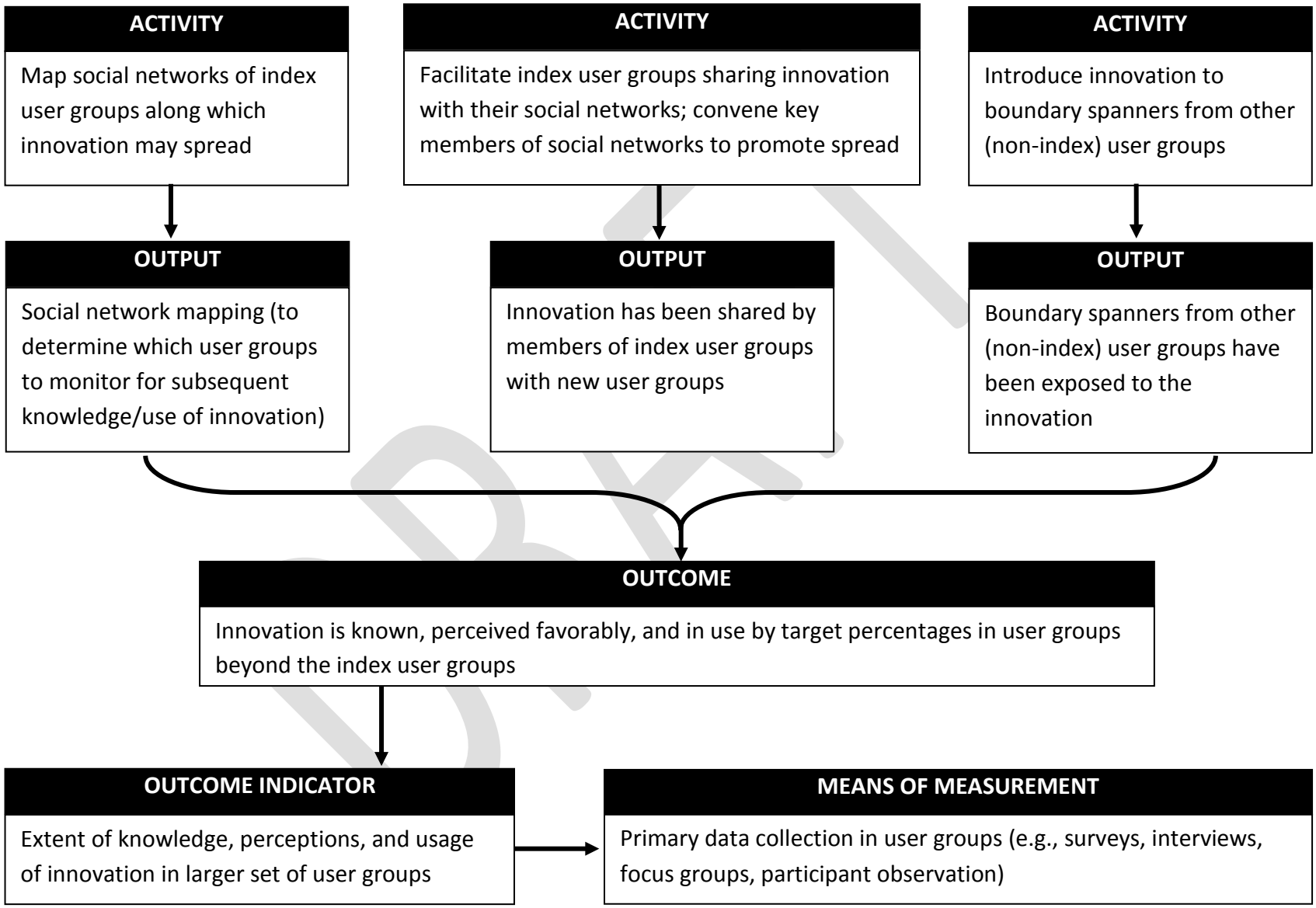


Figure 5. Devolve component: Flowchart of activities, outputs, outcomes, indicators, and means of measurement



Appendix

Summary of feedback in "pressure testing" sessions and our responses

To ensure that our work would have practical use, we 'pressure tested' the AIDED model with experts. Each expert provided excellent feedback, which we have summarized below with our responses to each comment. We believe our work has been strengthened substantially by this expert review and our revisions.

Pressure testing activities

We used two approaches for pressure testing the AIDED model. First, we conducted 'member checking' (Lincoln and Guba, 1985), or 'respondent validation' (Mays and Pope, 2000), a commonly used technique to establish credibility of qualitative research findings. In this process, data and interpretations are shared with study participants so that they can confirm credibility of the information. Participant reactions to the analyses are then incorporated into the analysis. We conducted these sessions with 5 of the key informants participating in the in-depth interview component of the projects. Second, we presented the model in five venues, with the explicit goal of obtaining reactions and feedback; these venues were The Unite for Sight meeting (April 2011), a presentation to knowledge network experts Kate Pugh and Larry Prusak (May 2011), a telephone conference with experts from the London School of Hygiene and Tropical Medicine (June 2011), and the Yale Global Health Leadership Institute Research in Progress seminar (September 2011). Some of the suggestions were relatively minor, specific and easily incorporated into the materials. In this document, we summarize the major substantive feedback, together with a brief summary of our response to integrate this feedback into the report and power point depiction of the AIDED model.

Response to feedback

The various pressure testing activities provided useful input throughout the development of the model. The feedback ranged from very detailed to high level conceptual issues. We have carefully considered all of the feedback and incorporated suggestions as feasible and appropriate

1. Discussion of community assessment relative to need, demand, and receptivity

Respondents underscored the importance of community receptivity to the innovation and cautioned against beginning the model with the innovation, rather than beginning with the user groups' receptivity to the innovation.

Response: We have revised the assessment aspect of the AIDED model to include assessment of user groups' receptivity. We also have noted the differences between public health need and

economic demand and suggested that receptivity is the more precise way to describe users groups where spread is possible.

2. Clarification of the concept "user group"

Our use of the term "user group" generated some confusion or concern among some respondents who considered the term "group" an oversimplification. They highlighted the diversity of actors involved in successful dissemination from national to district level to community levels, and the fact that environmental barriers would have different influences on different groups.

Response: The user groups in the AIDED model are end user groups, although we recognize the critically important roles of other groups (e.g., NGOs, Ministries of Health, providers) in the assess and develop components of the model.

3. Empirical testing of the model and measurement

Respondents were interested in empirical testing of the model, with the central recommendation being the development of measurement approaches for the model. Experts suggested that our previous tables were difficult to digest. People suggested streamlining their content, cutting words wherever possible. In addition, there was a request to reflect linkages across components, to convey that outputs in one stage may become inputs at the next stage.

Response: We agree that measurement is central to the implementation and empirical testing of the model. Comprehensive development of measures exceeds the scope of the present contract; however, we address issues of measurement and knowledge gaps in chapter 6, where we provide a draft framework that suggests activities, outputs, outcomes, outcome indicators, and means of measuring progress for each of the five components. We also improved the readability of the tables, not a set of 5 figures, and we suggest a series of next steps for this work.

4. Feedback on the AIDED figure/PowerPoint image

We have solicited extensive input on the graphic since its earliest version in Fall 2010. Key issues have included: a) reflect feedback loops in the model, b) begin with assessment of community receptivity, c) illustrate the principle of 'fit' better, d) represent constituent activities within each major component; and e) represent relationships between different actors in the process.

Response: The graphic of the AIDED model (Chapter 1, **Figure 2**) has been refined through several iterations in an effort to most effectively convey this highly complex process in an accessible format. We have expanded the figure to several slides, which together we believe address all of the above major comments.

5. Terminology

We received extensive feedback on the terminology throughout the pressure testing activities. Respondents suggested we be clear about the meaning of each term and avoid jargon when possible.

Response: In our final choice of terminology in these instances, we sought to be precise, concise and use language that is comprehensible and clear to the greatest extent possible. We provided explanatory text in the report to ensure clarity of key terms and concepts. In addition, we developed a glossary of terms which appears at the front of this report.

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