

Exploring Knowledge Broker Influences on Sharing and Use of Evidence for Health Policy and Practice in Low- and Middle-Income Countries

Theresa Canova Norton
2019

Promotor: Prof. Dr. Sara Willems

Co-Promotor: Dr. Daniela C. Rodriguez



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PhD Thesis

Department of Public Health and Primary Care
Ghent University, Belgium

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Exploring Influences on Knowledge Broker Sharing and Use of Evidence for Health Policy and Practice in Low- and Middle-Income Countries

Theresa Canova Norton

Thesis submitted in fulfillment of the requirements for the degree of Doctor in Health Sciences, Ghent 2019

Promotor: Prof. Dr. Sara Willems,
Department of Public Health and Primary Care,
Ghent University, Belgium

Co-Promotor: Dr. Daniela C. Rodriguez,
Johns Hopkins Bloomberg School of Public Health,
Department of International Health,
Johns Hopkins University, USA

Promotors

Prof. Dr. Sara Willems, Ghent University, Belgium
Dr. Daniela C. Rodriguez, Johns Hopkins University, USA

Advisory Committee

Prof. Dr. Maureen Dobbins, McMaster University, Canada
Dr. Nasreen Jessani, Johns Hopkins University, USA, and
Stellenbosch University, South Africa
Dr. Devaki Nambiar, The George Institute for Global Health, India

Examination Board

Prof. Dr. Olivier Degomme, Ghent University, Belgium
Prof. Dr. Benedicte Deforche, Ghent University, Belgium
Prof. Dr. Rudi Roose, Ghent University, Belgium
Prof. Dr. Kristien Michiels, Ghent University, Belgium
Prof. Dr. Koen Vlassenroot, Ghent University, Belgium
Dr. Nicola Francesco Dotti, Vrije Universiteit Brussel, Belgium

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*“Do not go where the path may lead, go instead where there is no path
and leave a trail.” —Ralph Waldo Emerson*

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Finally, I would like to note that any errors in my doctoral thesis are attributable to me alone and possibly my Maine Coon cat, Shadow, who kept laying on my keyboard.

Dedication

Dedication

To the strong women living in low- and middle-income countries who are persevering in caring for their families and their communities in the face of unbelievable challenges. You are my heroes.

Dedication

List of Abbreviations and Definitions

Academic Network for Sexual and Reproductive Health and Rights Policy (ANSER)

An international consortium of researchers led by Ghent University that supports appropriate use of evidence in sexual and reproductive health and rights policy.

Boundary Spanner

A professional who develops relationships external to the organization to meet objectives such as evidence uptake. In the context of this paper, it particularly refers to crossing boundaries at a local, national, and global level.

Community of Practice (CoP)

Group of people interested in a common topic who interact to foster learning, communication, and advancement of a field of practice or concept. In the context of the global health programs in this project, the community of practice concept was operationalized through forming groups with voluntary member affiliation and a focus on knowledge exchange across boundaries.

Diffusion

The spread of knowledge that occurs naturally.

Diffusion of Innovations Theory

Theory proposing how an innovation spreads over time through communication channels and across a social system (Rogers, 2003).

Dissemination

Managed diffusion of knowledge to target audiences.

Dissemination and Implementation Research (D&IR)

A multi-disciplinary field that studies how evidence is communicated and incorporated in sustainable improvements to health policy and practice in a variety of real-world settings.

Evidence-Based Medicine

Use of rigorously produced evidence in making decisions about the care of individual patients.

Evidence-Informed Decision Making (EIDM)

Systematic access and consideration of the best available evidence, while also considering other factors relevant to a decision in public health, such as available resources, population preferences, political context, and workforce capacity.

Evidence Into Policy Network (EVIPNet)

A global network of partners who provide services such as policy briefs, facilitating deliberative dialogs between researchers and policymakers, and rapid response services to advance evidence use in health (The World Health Organization, 2016).

Global Health Program

In the context of this thesis, refers to an integrated collection of projects funded by the U.S. Agency for International Development in partnership with international and national public and private organizations in multiple regions and countries to broadly promote the health and well-being of poor and vulnerable populations.

Healthy Newborn Network

Online community of partner organizations, stakeholders, and other individuals working to fill crucial knowledge gaps in newborn health and increase global commitment to the advancement of newborn health (healthynewbornnetwork.org).

“Know-Do” Gap

The gap between knowledge of clinical and implementation evidence and its context-appropriate application in health policy and practice.

Knowledge Broker (KB)

Individuals or organizations who are acting as linkage agents between researchers and users of scientific knowledge to help the process of applying evidence to public health policy and practice.

Knowledge Management (KM)

The systematic use of people, processes, and technology or tools in the generation, capture, sharing, and application of knowledge to meet the objectives of organizations.

Knowledge-to-Action (KTA)

Process of fostering the use of research evidence in health policy and practice.

Knowledge Translation (KT)

Making evidence understandable and accessible when and where decision-makers and practitioners need it to inform health policy and practice for better health outcomes.

Lives Saved Tool (LiST)

A model developed by the Johns Hopkins Bloomberg School of Public Health to estimate the impact of health care interventions on newborn, child, and maternal health with widespread implementation (Walker, Tam, & Friberg, 2013).

Low- and Middle-Income Country (LMIC)

Combination of the World Bank's world economy classification groups of gross national income per capita that excludes the high-income group. For the purpose of this thesis, LMIC will be treated synonymously with the term, "developing countries," though it is acknowledged that development concerns more than economic factors.

Non-Governmental Organization (NGO)

A non-profit group that operates outside of government on a local, national, or international level.

Pan American Health Organization (PAHO)

An international agency working to improve standards of living and public health of the people of the Americas.

Sustainable Development Goals (SDGs)

Part of a wider United Nations agenda of development goals aimed at ensuring the well-being of people globally, such as ending poverty.

Technical Working Groups (TWGs)

Ad hoc or longer-term groups of professionals with targeted expertise who discuss and debate evidence as it relates to needed actions and decisions, such as determining change to policy.

Theoretical Domains Framework (TDF)

A framework that combines psychological theories into a structure of domains and constructs that aid understanding of individual determinants of behavior change for evidence uptake (Cane, O'Connor, & Michie, 2012).

Theories, Models, and Frameworks (TMFs)

Underpinnings that provide a basis for understanding studies in D&IR, and its sub-specialty of knowledge translation, across complex health system settings to help predict when efforts to foster evidence uptake will succeed.

World Health Organization (WHO)

An agency of the United Nations that is located in Geneva, Switzerland and aims to improve public health internationally.

Preface

This doctoral thesis presents an exploration of the often-cited gap between evidence-based solutions and the reality of healthcare policy and practice. It examines approaches to dissemination and health system actor decisions on the abundance of evidence that is generated and made available each year, yielding a potential information overload. The exploration includes looking at how international organizations disseminate evidence through health system levels to actors in low- and middle-income countries. The view presented of these pathways stems from the experiences of public health professionals as they are exposed to evidence and consider its use for improving health outcomes. The resulting mixture of broad and individual perspectives aims to inform implementation research and approaches to strengthening evidence-to-action capacity in low- and middle-income countries for better health outcomes.

The sections in this thesis are arranged in a progression from problem identification to research to findings leading to future opportunities for implementation research. The **Introduction** section frames the problem of evidence dissemination and use in healthcare, reviews the relevant literature, presents the global health programs serving as context, and presents the author's orientation to the research. **Research Aims** provides a matrix cross-referencing the aims of the research and their methodologies with the published papers and book chapters. The **Methods** section provides additional detail about the research methods above what is presented in the published papers and book chapters in the thesis. The **Publications** section includes the full-text of each of the published papers and book chapters comprising the core of this doctoral project. **Limitations** presents potential issues with the PhD project findings. **General Discussions and Critical Interpretation** synthesizes the main findings across the studies and suggests avenues for future research building on the findings. The **Relevance of Work and Future Outlook** section links the findings to the initially presented problem of evidence dissemination and use as it relates to achieving global goals for well-being. It also outlines implementation research areas to build the capacity of low- and middle-income countries for translation of evidence to action in health policy and practice. **Final Conclusion** reflects on the learning derived from the research and its implication for the way forward in addressing needless deaths in populations worldwide.

Preface

1 Introduction

1.1 The Health Burden of Inadequate Use of Evidence in Low- and Middle-Income Countries

Women, newborns, and children are dying needlessly every day throughout the world. Of the estimated 15000 children who died each day in 2017, most could have been saved by making life-saving interventions more widely available and ensuring the quality of care (UNICEF, WHO, Group, & Nations, 2018). Common complications during pregnancy and childbirth—such as severe bleeding and infection—could be prevented or treated to avoid the 830 deaths of women that occur daily (Alkema et al., 2016). Vulnerable populations bear the highest burden, with most preventable maternal and newborn deaths occurring in low- and middle-income countries (Alkema et al., 2016). Acknowledgment of the magnitude of the problem leads to the question: why do preventable deaths still occur?

1.2 Scope and Limitations of Preventable Deaths in Low- and Middle-Income Countries

Discussions of preventable deaths often cite insufficient consideration of evidence in healthcare decisions as a contributing factor. A progress report of the Sustainable Development Goals—a global call to action to improve lives by 2030—cites the need for better use of evidence in decisions such as policymaking (United Nations, 2018). In public health, however, the term “evidence” can refer to different types of knowledge used in context-dependent ways to prevent deaths. Evidence is often discussed as the product of research, though it also can refer to empirically generated knowledge (Orem, Mafigiri, Nabudere, & Criel, 2014). Data that describe health problems (e.g., surveillance, facility reports) and are used for decision making also constitute evidence. The least context-dependent evidence—biomedical evidence—relates to the human body and pathogenic mechanisms (Green, Ottoson, García, & Hiatt, 2009a). This type of evidence is sometimes also referred to as clinical evidence, and its application in healthcare decision-making is often called Evidence-Based Medicine.

Implementation evidence, however, depends on a wide range of variables such as context and psychological factors of individuals involved in implementation (Green et al., 2009a). Because of the complexities of public health issues—especially contexts in LMICs where cultural and socioeconomic factors, among others, vary widely—the generation or application of implementation evidence is less straight-forward (Green et al., 2009a). Implementation evidence cannot be generated or applied in a controlled setting like a laboratory: it needs to be adapted for real-world contexts (C. A. Estabrooks,

Thompson, Lovely, & Hofmeyer, 2006). Closing the gap in use of evidence in healthcare to prevent deaths—commonly called the “know-do” gap (The World Health Organization, 2006)—requires considering both clinical and implementation evidence and the complex, continually changing ecosystems of individuals, organizations, and groups in which healthcare takes place (R. Rushmer, Ward, Nguyen, & Kuchenmüller, 2019).

The “Know-Do” Gap

The gap between knowledge of clinical and implementation evidence and its context-appropriate application in health policy and practice.

Given the significant resource limitations in LMICs, more recently public health professionals have modified their calls for overall evidence use to instead advocate for the prioritized implementation of evidence that has high impact in LMICs. Designated high-impact healthcare interventions improve healthcare through better affordability, access, and effectiveness. Experts have ranked them as having the highest lifesaving potential (PATH, 2016). One example of ranking was done in 2016 by PATH, an international non-profit organization, using the Lives Saved Tool to model population effects of using high-impact healthcare interventions. According to PATH’s estimate, 6 million maternal, newborn, and child deaths could be prevented between 2016 and 2030; of these, 600,000 lives could be saved in one year by scale-up of eleven high-impact interventions, such as Kangaroo Mother Care (continuous skin-to-skin contact between mother and low-birthweight newborn) and use of chlorhexidine for umbilical cord care (PATH, 2016). Even with a narrowed-down list of recommended interventions, gaps in implementation exist because of reasons such as lack of awareness, conflicting needs for resources, or barriers insufficiently addressed. For example, in 2015 only 44% of 75 priority countries for reducing maternal, newborn, and child deaths had national policies providing for Kangaroo Mother Care of low-birth-weight or pre-term newborns in facilities (Vesel et al., 2015).

Box 1. Why is Kangaroo Mother Care Not Adopted More Widely?

Low birth weight and other complications of pre-term birth account for most newborn deaths (UNICEF et al., 2018). Kangaroo Mother Care—sustained skin-to-skin contact with the mother and frequent breastfeeding (Figure 1)—has been demonstrated in multiple settings to be effective in reducing newborn deaths (Chan, Labar, Wall, & Atun, 2016). The intervention is a low-cost alternative to an incubator. It has its origin in a low-resource setting (Colombia) and has been adopted in many LMIC and higher-income contexts (Ruiz-Peláez, Charpak, & Cuervo, 2004). Despite its advantages, Kangaroo Mother Care is not adopted more widely because of barriers such as lack of awareness and training of health workers, demands on new mothers who also care for others, traditional customs of separating mother and newborn, and lack of support from families (Chan et al., 2016).



Figure 1. Kangaroo Mother Care is an evidence-based practice to reduce deaths of pre-term newborns using skin-to-skin contact. Photo by Jhpiego/Kate Holt (KMC Photo).

1.3 Intersections of Science, Politics, Environment, and Beliefs in Evidence Use

As demonstrated with the example of Kangaroo Mother Care presented above, even practices backed by strong evidence may fail to make it into health practice or policy for a variety of reasons. While systematic reviews point to a hierarchy of evidence, other prioritization factors come into play in decision-making, such as with competing priorities and practices with equally strong evidence. Power imbalances and political agendas among stakeholders may influence priorities, as well as pressure from populations (Parkhurst & Abeysinghe, 2016). Both decision-makers and their constituents may be influenced by beliefs and cultural norms that conflict with evidence adoption. For example, in Africa and Asia, promoting evidence-based use of chlorhexidine (to avoid newborn infections) and misoprostol (to combat postpartum hemorrhage) has been challenged by fears from faith leaders that misoprostol will be abused as an abortifacient (Orobato et al., 2017) and family resistance to chlorhexidine replacing alternative cultural practices (Herlihy et al., 2013). Decision-makers may also have personal beliefs

about what can be considered evidence and the type of evidence that is most relevant for action, such as knowledge gained from experience versus data produced by rigorous studies (R. Rushmer et al., 2019). The production of evidence or knowledge, such as resulting from research agendas, likewise may be driven by politics, power struggles, professional incentives, and funders external to LMICs rather than through a neutral examination of data about health issues in a country (Malla, Aylward, & Ward, 2018).

The implementation of evidence successful in one setting to another is not without challenges. In cases where governments use policy solutions from other countries, whether as a quick fix for problems or because decision-makers have been “sold” on the idea, the transfer may fail in balancing contextualization application of evidence or fidelity in implementation (Dolowitz & Marsh, 2000).

Operationalizing evidence-informed decisions such as policy is challenging and requires additional decision-making, such as in prioritizing resource allocation and development of workforce capacity (Dobbins, Traynor, Workentine, Yousefi-Nooraie, & Yost, 2018). Even simple practices such as hand-washing may depend on the availability of clean water or antiseptics. Ultimately, selecting evidence for use in public health involves weighing the evidence for its fit for a healthcare or near-term policy question (e.g., response to an Ebola outbreak), stakeholder beliefs, and context (Parkhurst & Abeyasinghe, 2016).

1.4 Making Evidence Accessible, Understandable, and Useable: Knowledge Translation and Knowledge Brokers

A key aim of the global health programs serving as context to this PhD project was making evidence accessible, understandable, and useable to improve health policy and practice and, ultimately, health outcomes in limited resource settings. The following sections summarize the literature about promoting health policy and practice that is informed by evidence.

1.4.1 Theories, Models, and Frameworks Relevant to Knowledge Translation

Theories, models, and frameworks (collectively referred to as frameworks hereafter) provide a basis for studies in knowledge translation across complex health system settings to help understand when and where efforts to foster evidence uptake will likely succeed (Nilsen, 2015; Tabak, Khoong, Chambers, & Brownson, 2012). These conceptual tools include ones that relate to behavior change, the spread of

innovations, and knowledge translation process planning (Harvey & Kitson, 2016). Studies examining knowledge translation broadly—such as those considering multiple contexts and health system levels—and narrowly—such as those exploring why individuals act on evidence—will require selecting different types of frameworks or merging versions.

In deciding on which frameworks to focus for use in the PhD project, the candidate considered ones related to knowledge brokers at the global, organizational, and individual levels of LMIC health systems. The candidate made use of reviews of frameworks in knowledge translation, particularly those of Nilsen (Nilsen, 2015) and Tabak and colleagues (Tabak et al., 2012). At the beginning of the project, in preparing the case study book chapters, the candidate identified several frameworks relevant to knowledge exchange approaches in global health programs. With the abundance of relevant frameworks and overlap of constructs, the candidate decided to focus use based on three criteria chosen from those identified by Tabak and colleagues: broad applicability to a variety of contexts, a focus on dissemination (rather than implementation and interventions), and usefulness in understanding individual characteristics and motivations for selecting evidence. The selected frameworks consist of Diffusion of Innovations Theory, the Knowledge-to-Action Framework, and the Theoretical Domains Framework, which are described in the following sections.

1.4.1.1 Diffusion of Innovations Theory

In examining the human pathways by which evidence travels globally and is accepted for use, the classic Diffusion of Innovations Theory (Rogers, 2003) provides a useful starting point and frequently appears in the literature to explain knowledge translation and knowledge brokering (Dobbins et al., 2019; P. A. Estabrooks, Brownson, & Pronk, 2018; Harvey & Kitson, 2016; Mallidou et al., 2018; Nilsen, 2015). The theory addresses how a new idea or innovation spreads through social systems and time and the influences on the spread and uptake of the idea.

One aspect of the theory notes that people who adopt an innovation have different characteristics related to when they adopt after the innovation's introduction. Rogers proposed five basic adopter categories associated with a bell-shaped timeline, with Innovators and Early Adopters accepting innovations at earlier parts of the timeline and Late Majority and Laggards adopting innovations later after introduction. Most people fall in the middle, between the Early Majority and Late Majority. The literature about characteristics of knowledge brokers note that the ones with an entrepreneurial or

visionary spirit and skill in driving change related to evidence can help accelerate the process for later adopters (Dobbins et al., 2019). Communities of practice provide opportunities for knowledge brokers to interact with people falling along the adoption spectrum and serve as conduits for evidence diffusion (Green et al., 2009a). The case studies in this thesis provide examples of using communities of practice for this purpose. The individual papers in the thesis provide accounts of knowledge brokers mobilizing evidence in a variety of ways, providing insight into their role as influencers.

Rogers proposed a model of stages through which decision-making units learning of innovations undergo a decision process in considering adoption, which can be distilled into four elements of diffusion (Figure 2) (European Public Health, n.d.). The perceived attributes of the innovation include its relative advantage over current approaches, compatibility with context and other factors, complexity in adopting, ease of trialability or piloting, and observability of outcomes. Upon learning of an innovation, decision makers consider these characteristics. Awareness of an innovation may take place through mass communication channels (such as a journal article or webinar) or through interpersonal channels (such as knowledge brokers). Steps in the decision process progress from an initial awareness and opinion through decision, implementation, and confirmation or evaluation. Knowledge broker change agents or mobilizers play a role in advancing this decision process. In global health programs a broad range of decisions and decision-making bodies are involved, including policy and policymakers, providers and service delivery, educators and trainers of providers, and community action by groups and community health workers, among others.

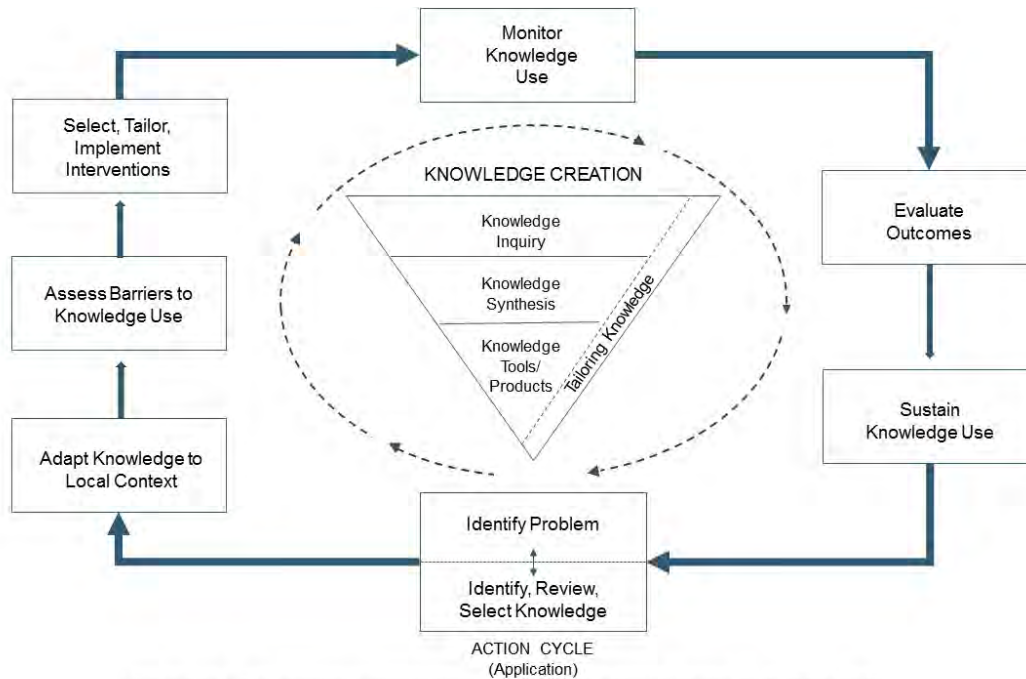
Four elements of diffusion



Figure 2. Rogers' model of the innovation-decision process includes four elements that address the attributes of the innovation, how it is communicated over time, and the decision-makers.

1.4.1.2 Knowledge-to-Action Framework

The Knowledge-to-Action Framework (Graham et al., 2006a), shown in Figure 3, illustrates a cyclical process for moving evidence to action in healthcare interventions in adaptive ways and returning feedback for evaluation. The framework is often cited in knowledge translation literature (Field, Booth, Illott, & Gerrish, 2014). It includes elements described in the literature as relevant to knowledge brokering activities, such as distilling and packaging evidence to address timely and relevant decisions in a given context.



Graham I, et al. *The Journal of Continuing Education in the Health Professions*, Volume 26, pp. 13–24. 2006

Figure 3. The Knowledge-to-Action Framework highlights the need for context- and audience-appropriate tailoring of interventions that address barriers to evidence uptake.

The core knowledge creation inverted pyramid in the center of the figure represents functions such as determining the knowledge needs of evidence users and producing synthesis products. Examples of products discussed elsewhere in the thesis include knowledge toolkits, key messages, electronic learning modules, and policy briefs. The literature frequently mentions producing rapid reviews, which are an abbreviated version of systematic reviews that may be commissioned by decision makers in response to timely public health needs. Knowledge may also be created in the course of knowledge exchange and discussions, such as in community of practice forums.

Other elements of the framework that are often mentioned in the literature are tailoring knowledge to be appropriate for a given context, considering factors such as cultural norms, resource availability,

health workforce skills, politics, and beliefs and motivations of health system actors. Knowledge brokers in the conference studies described later in this thesis raised these factors in their accounts.

The evaluation of outcomes and sustainability of knowledge use have been noted as challenging aspects of the framework to implement, and may rely on how well the knowledge translation function is institutionalized in an organization and expectations clarified.

The Knowledge-to-Action Framework omits mention of actor roles in the process, ways of sharing evidence other than through products, or at which stage of implementation the framework is most useful. For these reasons, it may be used with other frameworks: the literature notes the common practice of using constructs from multiple theories, models, and frameworks in knowledge translation (Brehaut & Eva, 2012; P. A. Estabrooks et al., 2018).

1.4.1.3 Theoretical Domains Framework of Psychological Theory

Understanding beliefs and motivations that affect individual behavior regarding evidence provides an important piece of the puzzle in addressing gaps in evidence use. The Theoretical Domains Framework of psychological theory provides a useful conceptual tool. The framework synthesizes 33 theories into a framework of theoretical domains containing constructs that further detail each domain (Michie et al., 2005). The domains, which are listed on the right side of Figure 4, include internally reflecting concepts, such as Beliefs about Capabilities, and externally oriented concepts, such as Environmental Context and Resources. Constructs comprise the topics included under each domain (e.g., Professional Role within the domain Social/Professional Role and Identity).

The Theoretical Domains Framework has been used extensively to identify why evidence-based practices are not incorporated in patient care and less often for other purposes, such as evaluating behavior change in populations. The Theoretical Domains Framework provides a useful range of constructs reflecting individual decisions on making use of evidence. This doctoral project applied the framework in the 2015 conference study to understand the influences on knowledge brokers in selecting evidence for action.



Figure 4. The Theoretical Domains Framework consolidates psychological theories into a structure useful for understanding the behavior change needed to adopt evidence and change healthcare practice.

1.4.2 Knowledge Translation

With foundations in theory, several terms have come into use throughout the literature to identify the concept of advancing evidence to action in healthcare, such as knowledge translation, knowledge transfer, and dissemination and implementation research. For the purpose of this thesis, the term knowledge translation will be treated as an overarching concept incorporating approaches intended to promote accessibility, understandability, and usability of evidence. The Canadian Institutes of Health Research first used the term and defines it as:

“A dynamic and iterative process that includes synthesis, dissemination, exchange and ethically-sound application of knowledge to improve the health of [populations], provide more effective health services and products and strengthen the healthcare system” (Canadian Institutes of Health Research, 2015)

The underpinnings of knowledge translation include the fields of psychology, sociology, education, and epidemiology, which are applied to understand the behavior of individuals, organizations, and communities surrounding evidence use (Theobald et al., 2018).

Discussions of knowledge translation in LMICs often cite challenges. LMIC contexts are noted as constantly changing and influenced by emerging factors such as new diseases or civil unrest and the beliefs and motivations of stakeholders (Theobald et al., 2018). Local organizations and governments lack resources to either disseminate locally produced evidence widely or access evidence developed elsewhere, leading to the often-cited reliance on international development partners (Malla et al., 2018). Looking to partners outside of LMICs to lead dissemination may miss opportunities to forge trusted, collaborative relationships within and between LMICs, which have been shown to support the uptake of evidence (Theobald et al., 2018).

Opportunities for knowledge translation in LMICs also exist. The tensions inherent to the challenging contexts can spark innovative healthcare implementation solutions that can be adapted for other contexts (Yapa & Bärnighausen, 2018), such as in the case of Kangaroo Mother Care.

A systematic approach to knowledge translation links the type of evidence being shared, with whom it is shared, why it is shared, and how knowledge translation is achieved (R. Rushmer et al., 2019). Knowledge translation processes often involve making people-to-people connections between researchers and decision-makers for deliberative dialog on public health issues and relevant evidence. Likewise, knowledge translation may emphasize people-to-knowledge connections between decision-makers and explicit sources of knowledge such as evidence repositories and systematic or rapid reviews.

Stakeholders and potential collaborators in knowledge translation include both individuals and organizations in healthcare and other sectors (Lapaige, 2010). Actors throughout health systems who are involved in knowledge translation include patients and their communities, healthcare providers and facilities, researchers and research institutions, and policymakers and government agencies. Knowledge translation processes may involve intersections between the healthcare sector and other sectors (Malla et al., 2018) such as manufacturing (e.g., for production and distribution of medicines) and education (e.g., for health workforce development).

Given the mixture of stakeholders, facilitating knowledge translation requires considering the characteristics of both individuals and organizations and how they interact, which has been an area not well studied (Damschroder et al., 2009). Fostering research use in organizations and government

agencies involves an appreciation of local roles and processes (Haynes et al., 2018) and understanding of factors that support knowledge translation, such as the strategic priority of evidence use, leadership, organizational readiness for evidence use, and appropriate staffing (Dobbins, Robeson, et al., 2009). With individuals, beliefs and motivations drive reactions to evidence that can affect knowledge translation outcomes. For example, in a study of farmers with small holdings in Sub-Saharan Africa, the complex interaction of intrinsic variables (e.g., which evidence attributes the farmer valued) and extrinsic variables (e.g., environmental factors) were found to influence uptake of new evidence through their effect on farmers' knowledge, perceptions, and attitudes (Meijer, Catacutan, Ajayi, Sileshi, & Nieuwenhuis, 2015).

A body of literature has grown attempting to identify in detail what helps or hinders knowledge translation. Green and colleagues suggested that barriers and facilitators influencing evidence uptake can be categorized as relating to attributes of the evidence, its source, how it was acquired, the user, and the context for its use (Green et al., 2009a). Essential attributes of evidence at the time it is accessed include timely relevance to a near-term decision, cultural appropriateness, and local applicability and feasibility (e.g., requiring only technical changes rather than extensive structural modifications) (Malla et al., 2018; Witter et al., 2019). Evidence coming from a local source is often given preference by decision-makers (particularly in LMICs), as is evidence originating from a setting similar to the user's (Witter et al., 2019), or resulting from research commissioned by the user (Haynes et al., 2018). Evidence gained through trusted relationships (Dobbins, Robeson, et al., 2009; Malla et al., 2018) and communicated in ways preferred by decision-makers and other users (Haynes et al., 2018; Witter et al., 2019) also facilitates uptake. Users need to have the skills (and time) to locate, filter and appraise evidence (Dobbins et al., 2018; Witter et al., 2019) and appreciation for its value and relevance to their work (Aldugieman et al., 2018). Finally, institutions need to be willing to fund knowledge translation as part of the research process, either in the form of researchers interacting with decision-makers or writing communications (e.g., briefs, journal articles) used in knowledge translation, and support knowledge translation strategies (Malla et al., 2018).

1.4.3 Knowledge Brokers

1.4.3.1 *What are Knowledge Brokers?*

Emphasis on interpersonal interaction appears in particular with the knowledge translation strategy of knowledge brokering. Knowledge Brokers act as intermediaries between evidence producers (such as

researchers) and users (such as policymakers) to facilitate the availability and use of evidence when, where, and how it is needed for health policy and practice. In some cases, knowledge brokers also help communicate research needs of evidence users back to producers. Knowledge brokers have been called the “face of knowledge translation,” and the strategy is based on the assumption that human interaction aids the uptake of evidence (Bornbaum, Kornas, Peirson, & Rosella, 2015; Green et al., 2009a).

Knowledge brokers may be individuals, organizations, or social networks. Individual knowledge brokers also have roles as healthcare providers, health faculty members, and academic researchers. Global health program partners and non-government organizations may act as organizational knowledge brokers. A community of practice or regional evidence network may also act as a knowledge broker. Broker activities have different foci depending on the needs of the evidence user’s context, including building capacity to assess evidence, managing knowledge, driving change based on evidence, and forging linkages between evidence producers and users (Bornbaum et al., 2015; Dobbins et al., 2018; Glegg & Hoens, 2016; Green et al., 2009a). Organizational knowledge brokers have even surfaced to facilitate the process of connecting researchers with funders (Dotti & Spithoven, 2017). Individual knowledge brokers may be embedded in organizations and interact with decision-makers in the same organization, or they may be external consultants or contractors serving on a project basis (R. Rushmer et al., 2019). Hybrid professional roles of some knowledge brokers, such as faculty member and healthcare provider, provide value in knowledge translation by supporting the creative combination of knowledge through an understanding of multiple professional contexts (Lam, 2018). The scope of a knowledge broker role depends on the needs and desires of the organization. Glegg and Hoens (Glegg & Hoens, 2016) proposed five basic role domains for knowledge brokers, which are shown in Figure 5. A knowledge broker may fill one or all five roles. In the Linking Agent role, the knowledge broker forges relationships between research producers and users for the exchange of evidence and research needs. Facilitation involves activities that support evidence implementation and communication. Capacity building addresses barriers to evidence use through approaches such as learning opportunities for evidence appraisal and organizational strengthening to support knowledge translation. In the Information Manager role, knowledge brokers access, synthesize, and package knowledge in collaboration with users to develop a shared understanding. Finally, evaluators assist in monitoring and assessing outcomes of evidence implementation.

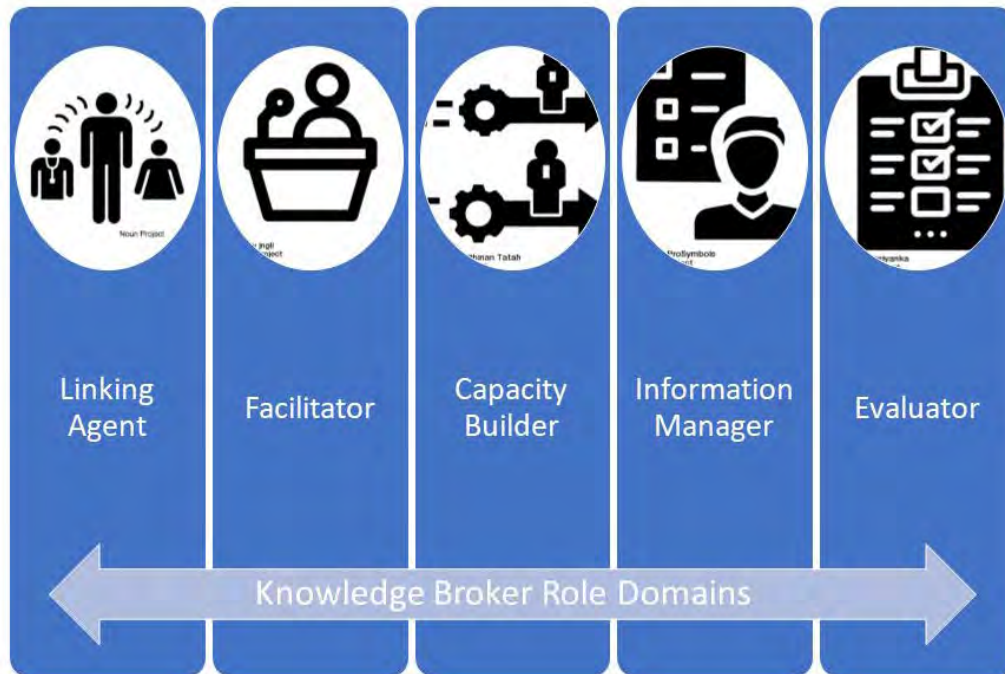


Figure 5. Knowledge broker activities fall within one or more of five basic domains, depending on the needs of the organization, according to Glegg and Hoens.

1.4.3.2 Characteristics that Support the Knowledge Broker Role

Characteristics of knowledge brokers seen as mobilizers of evidence include the ability to function as a trusted source of filtered and vetted evidence who can drive change and who is also viewed as an opinion leader (Dobbins et al., 2018; Green et al., 2009a). Individuals with extensive professional networks and considered as central actors in health systems work well as both knowledge brokers and drivers of change (Dobbins et al., 2018). In the context of the global health programs in this project, knowledge brokers acted as “boundary spanners” with the ability to forge connections across organizational and geographic boundaries at the local, national, or global level (Sheikh, Schneider, Agyepong, Lehmann, & Gilson, 2016).

Knowledge brokers need a broad range of knowledge, skills, and attitudes to work well with both evidence producers and users. When working with policymakers, knowledge brokers need an understanding of the political context, especially regarding controversial public health issues under debate (McGinty, Siddiqi, Linden, Horwitz, & Frattaroli, 2019). Similarly, knowledge brokers interacting with communities require an understanding of community member perspectives, especially when

engaging them in their healthcare (such as with community health workers), and the ability to forge a trusted relationship (Bowen, Martens, & Crockett, 2005).

Given the importance of context in evidence use, an ability for systems thinking benefits knowledge brokers, as do skills in facilitating dialog, resolving conflicts, conducting assessments, locating and managing information resources, and conducting training according to adult learning principles (Mallidou et al., 2018).

Personal attributes such as confidence, commitment, and love of lifelong learning (Mallidou et al., 2018), respect for others, trustworthiness, and social conscience (N. Jessani, Kennedy, & Bennett, 2016) appear to be desirable qualities of knowledge brokers. The priority of attributes for the role, however, has not been determined (Elledge, Avworo, Cochetti, Carvalho, & Grota, 2018).

Competencies of knowledge brokers have been recognized as important for their role, with some insight into priorities. Foremost, knowledge brokers need to have effective communication strategies for encouraging multi-directional learning between research producers and users (Lomas, 2007; Sarkies et al., 2017), including helping them clarify expectations of both groups in how they will interact and the services that knowledge brokers will provide (Campbell, Donald, Moore, & Frew, 2011; N. S. Jessani, Boulay, & Bennett, 2016; Leys, 2014; Gabriel Moore, Redman, D'Este, Makkar, & Turner, 2017; Sarkies et al., 2017). Understanding of the decision making environment and political climate are crucial for the knowledge broker role (Bornbaum et al., 2015; El-Jardali & Fadlallah, 2015; N. Jessani et al., 2016; Leys, 2014; McGinty et al., 2019). The presence of trust, quality of relationships, and timely responsiveness to decision-maker needs all influence effectiveness in knowledge brokering and other knowledge translation strategies (Green, Ottoson, García, & Hiatt, 2009b; Leys, 2014; Theobald et al., 2018).

1.4.3.3 Knowledge Exchange Approaches Incorporating Knowledge Brokers

A variety of knowledge exchange approaches exist that support dissemination, sharing, and appraising evidence and provide a platform for action by knowledge brokers. Organizations and groups acting as knowledge brokers may initiate the approaches, which then engage individual knowledge brokers, or individuals may undertake knowledge exchange approaches apart from a program or organization. The following approaches were evident in the global health programs in this PhD project and highlighted in the associated case studies.

One approach is that of communities of practice, which link people with a shared interest so that they can interact online or in-person for learning, communication, and advancement of an approach or concept (Wenger & Trayner, 2016). The global health programs described in this project operationalized the community of practice concept by forming groups with voluntary member affiliation and a focus on knowledge exchange across boundaries. The operationalized communities of practice functioned by bringing together geographically dispersed experts and stakeholders seeking to address public health issues of crucial importance in LMICs (Sheikh et al., 2016). The community of practice group approach has roots in social learning theory and has been demonstrated to promote the sharing of experience and undocumented knowledge (R. Rushmer et al., 2019)

Task-oriented technical working groups bring together experts such as researchers, implementers, and policymakers to discuss and debate evidence as it relates to decisions on public health issues, such as determining change to policy, or to accomplish other goals (Lairumbi et al., 2008; Mwendera et al., 2016; Orem et al., 2014). Conveners of technical working groups include Ministries of Health in LMICs, global organizations such as the World Health Organization, and health program implementing partners (Witter et al., 2019).

Social networks support evidence sharing and use and may be formally designated or informally come into being. Formal networks exist at international, regional, and national levels to promote evidence use in health. Global networks include the World Health Organization's Evidence Into Policy Network (EVIPNet), which was established in 2005 and works through partners in 36 countries to provide knowledge translation services such as policy briefs and deliberative dialogs between researchers and policymakers (The World Health Organization, 2016; Welch, Ueffing, & Tugwell, 2009). Regional networks include the Pan-American Health Organization's Cooperation Among Countries for Health Development Framework, a mechanism for fostering technical collaboration among LMICs (United Nations Office for South-South Cooperation, 2018). Universities also play an instrumental role in forming networks that engage researchers and policymakers. Examples include the Academic Network for Sexual and Reproductive Health and Rights Policy (ANSER), led by Ghent University, Belgium (Ogbe et al., 2018), and the Family Impact Seminar Series, currently led by the Family Impact Institute of Perdue University, USA (Bogenschneider, 2018). In some cases, formal networks provide opportunities to work with funders and other partners to bring together experts on a larger scale for global and regional conferences and meetings to share and discuss evidence (Neves, Lavis, Panisset, & Klint, 2014).

Informal social networks and interpersonal relationships have also been demonstrated to positively influence evidence sharing among health system actors (Shearer, Dion, & Lavis, 2014; Yousefi-Nooraie, Dobbins, Marin, Hanneman, & Lohfeld, 2015). Evidence requests and sharing may occur through dyads, through new relationships formed through mutual acquaintances, and through opinion leaders as central actors in a network. Networks operating without a formal hierarchy of authority and crossing organizational boundaries support sharing evidence more broadly (Shearer et al., 2014; Yousefi-Nooraie et al., 2015).

1.4.4 Discussions of Knowledge Brokering Effectiveness in the Literature

Over the past decade, research has increasingly provided insights into how the relationship between connecting people and knowledge translation works; that is, the mechanisms and influences on effectiveness. The literature discusses multiple dimensions of effectiveness, such as an individual knowledge broker's performance, the value of the knowledge broker role within health settings, and specific knowledge brokering approaches or interventions. It should be noted that the literature contains debate on how effectiveness should be defined (Elueze, 2015) and how to differentiate effects of the individual, the role, and the process or specific interventions. Definitions of effectiveness include meeting the requirements defined by an organization (e.g., a knowledge broker job description), measuring policy and practice changes that use evidence (e.g., scientific paper citations in a policy), associating improved health outcomes with knowledge translation interventions, or increasing capacity of decision-makers to understand and use evidence. For the purpose of this thesis, all definitions will be considered valid.

Whether and how knowledge brokering is effective as a knowledge translation strategy has received much attention; however, no one approach emerges as having strongest evidence for multiple reasons. Variations in contexts and stakeholder groups make measurements challenging and little knowledge broker research has used study designs regarded as rigorous (e.g., randomized controlled trials), so systematic reviews tend to say that evidence is inconclusive (Bornbaum et al., 2015; Leys, 2014; Rowe et al., 2018; Sarkies et al., 2017).

Some aspects of the knowledge broker role have been broadly recognized as useful. Internationally, knowledge brokers perform a variety of supportive duties across health system settings, including managing knowledge to suit organizations and the populations they support, building EIDM capacity, linking evidence producers and users, and advocating for change based on evidence (Bornbaum et al., 2015; Dobbins et al., 2018; Leys, 2014; Lomas, 2007; Ward, 2009). In LMICs, a highly valued knowledge broker service is preparation of policy briefs (Dagenais, Laurendeau, & Briand-Lamarche, 2015; Ongolo-Zogo, Lavis, Tomson, & Sewankambo, 2014; Sarkies et al., 2017), while in higher-income settings EIDM training and organizational support, rapid synthesis services, and stakeholder convening have been particularly noted (Dobbins et al., 2018; Sarkies et al., 2017).

How knowledge brokering integrates with aspects of the context is critical for effectiveness. Initiatives that have knowledge brokers in active, sustained contact (e.g., 18 months or more) with evidence users, such as through embedded organizational roles, support effectiveness more than one-off activities such as single training events, both in LMICs and higher-income countries (Bornbaum et al., 2015; Dobbins et al., 2018; El-Jardali & Fadlallah, 2015; Haynes et al., 2018; Leys, 2014; Gabriel Moore et al., 2017; R. K. Rushmer, Hunter, & Steven, 2014; R. Rushmer et al., 2019; Waqa et al., 2013). Knowledge brokers as mentors providing ongoing support for EIDM has been shown to be a promising approach both in higher-income countries and LMICs (Dobbins et al., 2018; Haynes et al., 2018; Padek et al., 2018; Waqa et al., 2013).

Knowledge broker initiatives work best when organizational strengthening is included. Organizational readiness to demand and use evidence and contribute resources to knowledge translation, such as for knowledge broker staffing, figure prominently in knowledge broker effectiveness across economic levels of countries (Bornbaum et al., 2015; Dobbins et al., 2018; El-Jardali & Fadlallah, 2015; Hawkes et al., 2016; Leys, 2014; Malla et al., 2018; Mallidou et al., 2018; R. K. Rushmer et al., 2014; Russell et al., 2010; Sarkies et al., 2017; Waqa et al., 2013). Effectiveness is not driven by a knowledge broker approach alone, however, but is dependent on the interaction of knowledge brokering with health system, organization, and individual factors, and specific situations and contexts (Bornbaum et al., 2015; Dobbins et al., 2018; Elledge et al., 2018; Hawkes et al., 2016; Leys, 2014).

Promising strategies to build knowledge translation and knowledge broker capacity include combining training and mentoring of knowledge brokers (Dobbins et al., 2018), hiring staff members with the aim of collectively having necessary knowledge broker skills available (N. Jessani et al., 2016), and strengthening knowledge translation capacity of individuals, teams, organizations, and systems (Dobbins et al., 2018; Mallidou et al., 2018).

Some factors influencing effectiveness of knowledge brokering have been noted. Access to electronic repositories of evidence and bibliographic databases may pose a challenge in LMICs because of unreliable Internet and electricity and debates on who will bear the cost of Internet connectivity within institutions (Malla et al., 2018). Decision makers may differ in their viewpoints as to what constitutes evidence (e.g., empirical data versus experience), making capacity building in EIDM challenging (Orem et al., 2014). International aid to LMICs has yielded unintentional consequences influencing effectiveness

of knowledge brokers in the form of staff turnover and corruption in ministries (Dagenais et al., 2015) and external pressure to prioritize evidence according to outside agendas (Malla et al., 2018).

1.4.5 Calls for Research on Knowledge Brokers

For all that has been published about knowledge brokers, more has been stated regarding further research needed.

Researchers have pointed out the need for greater insights into knowledge broker experiences when facing the complexities of resource-constrained settings (Cummings, Kiwanuka, Gillman, & Regeer, 2018; McSween-Cadieux, Dagenais, Some, & Ridde, 2019; Yapa & Bärnighausen, 2018). The field would be aided by greater understanding of the contexts, stakeholder groups, and circumstances influencing the knowledge broker role (Bornbaum et al., 2015; N. Jessani et al., 2016; Mallidou et al., 2018; Orem et al., 2014). There have also been calls for identification of the common elements of knowledge broker roles and activities found in multiple contexts (G. Moore, Redman, Butow, & Haynes, 2018).

Greater understanding is needed of the Internal and external influences on knowledge brokers as they function in the evidence-to-action process (Elledge et al., 2018; N. Jessani et al., 2016; Oliver, Innvar, Lorenc, Woodman, & Thomas, 2014; Reid et al., 2017; Ward, 2009). Few frameworks exist to inform dissemination, an element of the knowledge broker role (Harris et al., 2012).

Introduction

Research Aims

Research Aims

Global, regional, and local dissemination and translation of evidence is complex. The overall aim of this PhD research project is to aid understanding of how evidence is disseminated and translated into action through knowledge brokers for use in health policy and practice in LMICs in the context of a global health program.

The specific research aims are:

1. To describe knowledge exchange approaches used in a global health program to promote evidence uptake in multiple contexts of LMICs for health policy and practice
2. To identify common attributes and activities of knowledge brokers working in LMICs
3. To understand what influences knowledge brokers in selecting evidence for sharing and use in health policy and practice in LMICs

There has been little research examining knowledge brokers in multiple contexts of LMICs and identifying common approaches, activities, and influences. The candidate believes that by describing and explaining aspects of the contextual, social, and psychological elements influencing knowledge brokers, evidence-informed healthcare policy and practice in LMICs will better be able to advance.

Research Aims

Methods

3.1 Methods Overview

The doctoral project employed multiple research methods and data sources, which are described in more detail in the individual papers and chapters. Table 1 summarizes the methods used in the project.

Table 1. The table summarizes the research aims and corresponding methods used, reasons for choosing the methods, and the papers and chapters documenting results

Aim	Method	Reason	Paper/Chapter
1. Describe knowledge exchange approaches used in a global health program	Case studies	Abundance and depth of details able to collect	1 and 2
2. Identify common attributes and activities of knowledge brokers working in LMICs	Online surveys, semi-structured interviews, and document reviews for three contexts (i.e., conferences)	Ease of data collection from respondents located globally (survey); Richness of details (interviews); Triangulation of data sources and additional details (documents)	3 and 4
3. Understand influences on decision processes of knowledge brokers in selecting evidence	Qualitative data analysis using the Theoretical Domains Framework	Theoretical basis for understanding decisions; History of use in behavior change and decision-making; Coverage of constructs related to decisions	5

Papers 1 and 2—describing knowledge exchange approaches for disseminating evidence and influencing evidence uptake through global health programs—used a case study approach with a discourse on the theoretical underpinnings of the approaches, and depended on secondary data sources. These sources included program reports and online discussion activity logs. The series of global health programs are identified in the following section of this thesis.

Paper 3 presents findings from the conference studies conducted in 2012 and 2013. Paper 4 reports findings on the study conducted in 2015. Paper 5 is a methodological article describing how the Theoretical Domains Framework was adapted to analyze the influences on and decision processes of knowledge brokers in selecting evidence, using data from the 2015 conference study. The process of using the framework in this way generated new knowledge, which the candidate deemed would merit its own paper apart from the study findings. The idea of using the Theoretical Domains Framework evolved later based on earlier learning in the project.

Appendix A includes the research plans, including survey and interview instruments, for the 2012 and 2013 conference studies, and Appendix B contains the plan and instruments for the 2015 conference study.

3.2 Context of the PhD Project: Global Health Programs

The context for this PhD project is three, successive global health programs (Figure 6) sponsored by the U.S. Agency for International Development between 2004 and 2019 in more than 25 countries with poor, vulnerable, and marginalized populations (Jhpiego, n.d.; Maternal and Child Health Integrated Program, 2015). The programs aimed to improve health outcomes by implementing evidence-based interventions with the greatest potential to save lives (referred to as high-impact interventions) and by strengthening health systems and provider performance. The programs initially focused on maternal and newborn health and later expanded to also include healthcare areas such as family planning, malaria, and HIV/AIDS. The candidate worked for the lead international partner for the three programs. The figure shows the variety of collaborating organizations, both international and local country, working together throughout the life of the global health programs.

This PhD project made use of the complexity inherent to global health programs—country contexts, politics, resource limitations, and multiple partners, among other factors—as an opportunity to explore strategies used to disseminate evidence in challenging circumstances on a global scale and to advance its uptake. Organizations and individuals in the programs worked to evidence-based healthcare practices, employing multiple approaches described in the papers and chapters in this thesis (e.g., communities of practice, global and regional conferences). Data used in this PhD project were collected from sources (people, document repositories, and websites) associated with these programs. The book

chapters in this thesis include case studies about these global health programs as background and to provide insights into some of the approaches used in disseminating evidence and through which knowledge brokers worked.

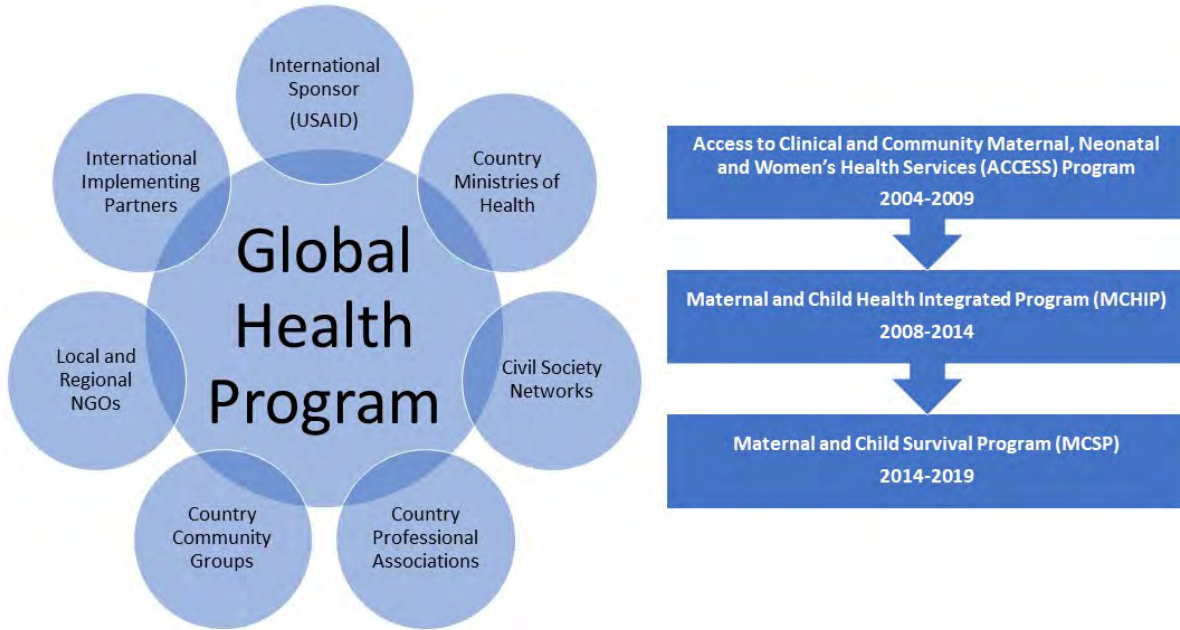


Figure 6. Three global health programs aimed to improve health outcomes for vulnerable populations by implementing evidence-based solutions in collaboration with partners in more than 25 countries.

It should be noted that both international partners and country partners on the programs had roles in generating, disseminating, and brokering evidence. For example, program funding supported Private Voluntary Organizations, Non-Governmental Organizations, and their local partners in generating implementation evidence through more than 100 community-focused projects from 2008 to 2014 (Maternal and Child Health Integrated Program, 2015). Funding supported local partners in disseminating evidence using approaches such as sponsoring attendance to present at global and regional conferences and to participate in technical working group meetings, and providing editorial assistance to local authors writing journal manuscripts. Input from local partners also were incorporated in WHO guidelines through technical advisory committees. International partners served as conveners of regional and global conferences (with design input from local partners) and global disseminators and synthesizers. The multiple roles and linkages among international and local partners on the global health programs informed understanding of study results in this PhD project.

3.3 Additional Notes on Methods of the Conference Studies

The following notes expand on the details about methods included in the published papers in this thesis.

The intent of repeating the methodology for all three conference studies using the same core survey and interview questions was to strengthen external validity through repetition in different contexts. Each conference was held in a different country (i.e., Bangladesh, South Africa, Mexico). Review of program documents was also part of the methodology to provide a triangulation of data sources and methods, also intended to strengthen validity. Figure 7 presents the core questions.

Years Working in Field	Country	Organization type	Work Type
With Whom Shared	Types of Knowledge Shared	How Used	Example of Use

Figure 7. Core questions repeated in the conference studies consisted of questions about demographics and those about knowledge sharing and use.

Non-core questions varied among those used for the three conferences. Reasons for variation included preferences of conference organizing partners, who desired additional information associated with the aims of the specific conference, and lessons learned about usefulness of some of the questions for gaining insights. Two examples of conference-specific questions relevant to knowledge sharing were:

- “Are you a member of the Healthy Newborn Network?” (2013, South Africa)
- “Did you have an abstract accepted to the conference?” (2015, Mexico)

For the 2012 and 2015 conference studies, Inductive thematic saturation during analysis (Saunders et al., 2018) was judged by seeing the same types of responses over and over while coding and re-coding the interview transcripts and open-ended survey questions. Checking was done by having one researcher perform initial coding and thematic analysis, which was then reviewed by another analyst, who discussed results with the initial coder until agreement was reached that the process had ended.

Limited conference attendee data were available from conference organizers only for the 2012 conference. Reasons for the difficulty in obtaining attendee data included differences between pre-registered attendees and actual attendees and differences between registration data collected. A comparison of 2012 attendees' countries and survey respondent countries appears in Figure 8. The highest number of attendees and survey respondents from an LMIC was from Bangladesh, with 69 attendees and 34 survey respondents.

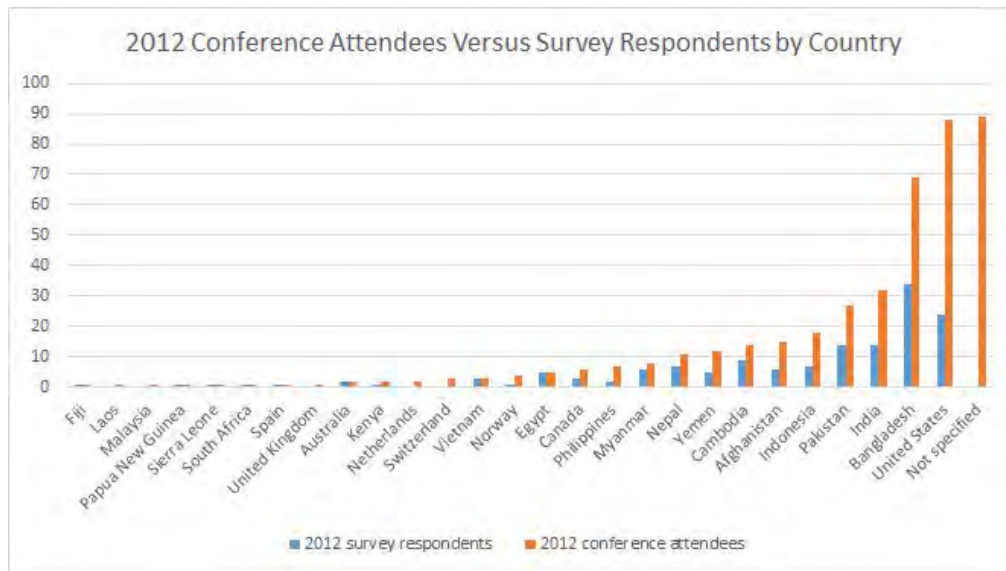


Figure 8. For the 2012 conference study, the highest number of attendees and survey respondents from an LMIC was from Bangladesh, with 69 attendees and 34 survey respondents.

In reviewing descriptive statistics for 2015 study respondents, the candidate cross-tabulated variables using SurveyMonkey for the type of work and type of use questions. Nearly all respondents chose multiple types of use other than the one aligned with their type of work; for example, respondents chose type of work as “health/medical service delivery” and type of use as “improve service delivery” and also “advocate for policy change,” and “design training materials.” Noting this multi-dimensional aspect of professional roles contributed to describing the characteristics of the knowledge brokers in the study.

Respondents who reported the country in which they were based as a high-income country were not excluded from the surveys and interviews for multiple reasons. First, the stated aim of the conferences was to address issues relevant to maternal and newborn healthcare in LMICs, and so it was expected that attendees worked in that field. Many attendees were specifically invited by organizers because of their roles in supporting LMIC health systems. Second, the country in which an attendee was currently based might not be the same as past countries due to migration or temporary duty assignment. Staff in the United States working on global health programs often spent months or years based in LMICs. For these reasons, the candidate decided to focus on knowledge exchange and brokering for work in LMICs rather attempting to restrict data collection to respondents from LMICs.

The candidate's process for developing the proposed reflective comparative decision process framework analyzing the 2015 qualitative data took a deductive and inductive analytical approach, drawing from the literature and re-visiting the data over and over again. She reviewed the literature on barriers and facilitators to evidence use, behavior change in evidence uptake (e.g., Theoretical Domains Framework), and decision processes in evidence uptake (e.g., Truth and Utility tests (Weiss & Bucuvalas, 1980)). In reviewing the data, she noted that knowledge broker accounts described how they considered aspects of evidence and implications for action that were internal and external to them and weighed those aspects in a non-linear fashion in making a decision. The candidate developed and refined the framework and repeatedly compared it to rich descriptions to determine fit.

3.4 Ethical Approval

Ethical approval for the human subjects research in this PhD project was obtained from the Johns Hopkins Bloomberg School of Public Health Institutional Review Board in the United States (IRB00004383, IRB00005366, and IRB00007142).

3.5 Overall Scope of the PhD Project (Geographically and Topically)

This PhD project—while focused on the overall topic of knowledge exchange and brokering—represents diversity in locations of study participants and topical areas of evidence.

Across the conference studies conducted in 2012, 2013, and 2015, data were collected by surveys and interviews from 598 participants in 68 countries. Figure 9 shows the countries of the study participants.

The darker gradient represents more total combined responses for all three studies in the country than lighter gradients.



Figure 9. Participants across studies in 2012, 2013, and 2015 were based in 68 countries globally. Map by Bing Maps and MapPoint Web Service, data points by author.

Participants worked in a variety of roles in health systems—such as policymakers, faculty members, in-service trainers, healthcare providers, and community advocates—and types of organizations—such as ministries of health, local and international NGOs, and universities. Content areas of evidence mostly included the topics related to maternal and newborn health described at the conferences, such as preventing postpartum hemorrhage (severe bleeding after birth) and newborn asphyxia (difficulty breathing). The book chapters discussing communities of practice and technical working groups mentioned additional content areas relevant to global health. These topics included the integration of family planning and HIV services, emerging diseases such as Ebola Virus Disease, and postpartum family planning.

3.6 Philosophical Orientation

The author's orientation to this doctoral project can be framed as realism or, as Miles and colleagues called it, pragmatic realism (Miles, Huberman, & Saldana, 2014). The candidate's interpretation of the orientation maintains that social phenomena have objective and subjective aspects, including both things that can be measured or readily observed and less obvious, underlying mechanisms or beliefs and motivations. Within this project, the candidate used a mixture of methods to explore the objective and subjective aspects of evidence sharing and use. For example, global health program documentation and online discussion logs provided artifacts of knowledge exchanges that could be observed. Interviews with the social actors (i.e., knowledge brokers) provided insights into underlying influences on acting upon evidence.

In the candidate's studies from 2012-2015, the pursuit of subjective answers served as the major focus because of its potential to fill an unmet need to contribute to understanding of the gap between evidence generation and evidence-informed decisions in healthcare. The studies focused more on the participants' accounts of their learning about evidence, how they thought through their decisions regarding evidence selection and use, and their accounts of outcomes from use: the participants' actual experiences, as they saw them. From a pragmatic standpoint, the author did not attempt to determine a reality apart from empirical data and actual accounts for multiple reasons. The author views health systems at a global, national, and subnational level as continually changing and characterized by a complexity for which determination of reality in the many settings of the studies was not feasible within time and funding constraints. Also, the studies aimed for a rich understanding of the knowledge broker experience and views, rather than evaluation of specific knowledge interventions, though richer understanding is expected to lead to stronger interventions and outcomes. Analysis of participant experiences, informed by relevant frameworks and literature, were instead used to move closer to objective means to inform future research and applications.

Publications

Publications

This section contains the full-text of five publications forming the core of the doctoral thesis. The authors, titles, publishing information, and journal impact factor at time of publication (where applicable) appear below. For all papers, the author of this thesis served as either lead or sole author.

- **Paper 1:** Norton, T. Enabling Knowledge Exchange to Improve Health Outcomes through a Multi-Partner Global Health Program. In: *Knowledge Management Handbook: Collaboration and Social Networking, Second Edition*. J. Liebowitz (ed.). Taylor-Francis. 2012. <http://bit.ly/11Wyl03>
- **Paper 2:** Norton, T. Knowledge Management for Public Health Subspecialties Using Diffusion of Innovations Theory and Information and Communication Technology. In: *Contemporary Discourses on IE&C Theory and Practice*. New York: NOVA Science Publishers. 2009.
- **Paper 3:** Norton, T., Howell, C., and Reynolds, C. Exploratory study of the role of knowledge brokers in translating knowledge to action following global maternal and newborn health technical meetings. *Public Health*. 2016. <http://dx.doi.org/10.1016/j.puhe.2016.04.012>. 2-year impact factor: 1.538
- **Paper 4:** Norton, T., Rodriguez, D., Howell, C., Reynolds, C., and Willems, S. "Maybe we can turn the tide:" An explanatory mixed methods study to understand how knowledge brokers mobilize health evidence in low- and middle-income countries. In press. *Evidence & Policy*. 2-year impact factor: 1.127
- **Paper 5:** Norton, T. C., Rodriguez, D. C., & Willems, S. (2019). Applying the Theoretical Domains Framework to understand knowledge broker decisions in selecting evidence for knowledge translation in low- and middle-income countries. *Health Research Policy and Systems*, 17(1), 60. <https://doi.org/10.1186/s12961-019-0463-9>. 2-year impact factor: 2.179
-

Publications

4.1 Paper 1. Enabling Knowledge Exchange to Improve Health Outcomes through a Multi-Partner Global Health Program

Enabling Knowledge Exchange to Improve Health Outcomes through a Mutipartner Global Health Program

Citation:

Norton, T.C. (2012). Enabling knowledge exchange to improve health outcomes through a multipartner global health program. In J. Liebowitz (Ed.), *Knowledge management handbook: Collaboration and social networking, second edition* (pp. 63–88). Boca Raton: CRC Press.

Research Aim:

To describe knowledge exchange approaches used in a global health program to promote evidence uptake in multiple contexts of LMICs for health policy and practice

Candidate's Note:

Since this chapter was published, some of the knowledge exchange approaches described have continued mostly unchanged as of 2019 and some have evolved. The PFP community of practice online group has grown from approximately 700 to 1484 members (Source: <https://knowledge-gateway.org/directory>, accessed 31 August 2019). The electronic toolkits and electronic learning center continue to exist in 2019, but their future form is uncertain with changes in global health programs and sponsorship. It should be noted that use of the terms “success” and “successful” regarding the knowledge exchange approaches are based on indicators aligning with aims of the approaches, such number of participants of LMICs posting messages to an online forum designed to foster global engagement.

INTRODUCTION

Global health programs have grown significantly in size and complexity over the past decade. Programs frequently involve multiple partners, such as national governments, multilateral agencies, corporations, nongovernmental organizations (NGOs), and private foundations (Esser, 2009). Large global health initiatives such as the President's Emergency Plan for AIDS Relief (PEPFAR) and President's Malaria Initiative (PMI) add to the complex environment with many partnerships among donors, implementing partners, and stakeholders. According to one report, there are now over 100 global partnerships in the health sector alone (Action for Global Health, 2011), while some donors are increasingly bundling disparate project activities in multisectoral "mega-programs" that yield more coordination challenges (ACVFA, 2007).

With increasingly complex global health programs, effective use of aid funds requires a rigorous approach to knowledge management—the systematic use of people, processes, and technology to capture and share "know-how." The flow of knowledge needs to occur within and among partner organizations, across geographic and language boundaries, so that program teams can learn from each other and function as a cohesive whole. Ultimately, global programs aim to scale up the adoption of high-impact health practices¹ for better health outcomes of populations. Meeting this goal requires that the right information gets to the right people at the right time—one of the basic tenets of knowledge management—in a way that will grab their attention, motivate them to act, and be compatible with the environment in which they act.

The case study presented below illustrates a mixed approach to knowledge management interventions used for a large-scale global health program. The interventions used provide for variations in technology access and networking preferences. A discussion of knowledge translation, social networking, and team collaboration concepts, drawn from literature, follows the case study to provide insight into the effectiveness of the approaches used.

BACKGROUND ON THE GLOBAL HEALTH PROGRAM

Since the 1960s, international health programs have explored the benefits of offering women family planning services in coordination with maternal health services in order to prevent unwanted pregnancies (Ringheim, 2011). Reports show that less than 5 percent of women in developing countries want to become pregnant soon after childbirth, yet more than one-third are pregnant again within 15 months (Ross and Winfrey, 2001). With the growth of programs to integrate family planning and maternal, newborn, and child health services, countries such as Thailand that made integrated services part of a national strategy realized an increase in contraceptive use, decrease in fertility, and strengthening of their economies (Ringheim, 2011).

¹ High-impact practices, when scaled up and institutionalized, will maximize investments in comprehensive health strategies, (USAID, 2011). In other words, high-impact practices yield high returns in terms of health outcomes for the investment.

Studies also show that family planning after childbirth (called postpartum² family planning or PFP) has life-saving benefits as well. Evidence shows that averting unplanned/unwanted pregnancies, as well as using healthy birth spacing, saves lives of mothers and children (Campbell and Graham, 2006; Cleland et al., 2006). Yet despite the fact that the proven benefits of PFP have been known for years, global health programs have been inconsistent in their approaches, resulting in a continuing gap in access and quality of healthcare services for mothers and their families (ACCESS-FP, 2006).

To respond to the need for stronger PFP services worldwide, in 2005 the U.S. Agency for International Development (USAID) funded a 5-year program called Addressing Unmet Need for Family Planning in Maternal, Neonatal, and Child Health Programs (ACCESS-FP). The program, associated with USAID's flagship maternal and newborn health program called ACCESS, focused on reducing unmet need for family planning among postpartum women by strengthening maternal, neonatal, and child health service delivery programs (USAID, 2006). Program objectives included

- Testing alternative ways of delivering healthcare services to increase use of PFP methods
- Improving use of the lactational amenorrhea method (LAM) of family planning³ and transition to longer-term methods
- Promoting healthy spacing of births
- Looking for ways to integrate family planning services more effectively in maternal, neonatal, and child health programs

Jhpiego led implementation of the ACCESS-FP and ACCESS programs. An international, nonprofit health organization affiliated with Johns Hopkins University, Jhpiego is based in Baltimore, Maryland. Founded in 1974, Jhpiego has worked in more than 150 countries with health experts, governments, and community leaders to provide high-quality healthcare for their people. The organization develops strategies to help countries care for themselves by training competent healthcare workers, strengthening health systems, and improving delivery of care. In designing programs, Jhpiego focuses on practical, evidence-based interventions for low-resource settings.

² For this paper, postpartum is defined as the first year after childbirth

³ LAM involves use of breastfeeding to delay return to fertility, particularly in the first 6 months after childbirth.

Five implementation partners worked with Jhpiego on ACCESS-FP; Save the Children, the Futures Group, the Academy for Educational Development, the American College of Nurse-Midwives, and Interchurch Medical Assistance. Country stakeholders included ministries of health and healthcare facilities such as maternity hospitals and primary healthcare in 11 countries:

- Afghanistan
- Albania
- Bangladesh
- Burkina Faso
- Guinea
- Haiti
- India
- Kenya
- Nigeria
- Rwanda
- Tanzania

To continue the work of ACCESS, ACCESS-FP, and other maternal, newborn, and child health programs that were ending, USAID funded a large global health program called the Maternal and Child Health Integrated Program (MCHIP) in 2008. This \$600 million program increased the number of partners and countries involved from the previous ACCESS-FP program—from five to eight partners, and from 11 to more than 30 countries. The partner organizations were selected as leading experts in their field with large-scale experience. Each partner organization takes the lead in developing projects around specific technical areas within the scope of MCHIP, which is somewhat broad, ranging from clinical areas such as maternal, newborn, and child healthcare to nonclinical interventions such as social marketing. By scaling up evidence-based, high-impact maternal, newborn, and children health interventions, MCHIP aims to help reduce maternal and child mortality by 25% across 30 priority countries through field-based implementation and global leadership (MCHIP, 2011).

ROLE OF KNOWLEDGE MANAGEMENT IN THE ACCESS-FP AND MCHIP PROGRAMS

The requirements for ACCESS-FP and MCHIP include a key knowledge management objective to generate and share "program learning." In program learning, emphasis is placed on developing and sharing evidence in the field of what works well in meeting health goals (i.e., best practices), so that this knowledge can be documented, replicated, used, and scaled-up, and even improved upon in other settings. The implicit, multidirectional aspect of program learning in a complex program (among countries, among partners, etc.) poses knowledge exchange challenges from a number of standpoints, such as

- Engaging geographically dispersed program participants and potential beneficiaries which leads to challenges (e.g., time zone differences for real-time discussion, travel expenses, and language differences)
- Carrying out program activities in low-resource settings with unreliable Internet connectivity and limited access to scientific literature
- Encouraging dialogue among experts so that they reach consensus on evidence indicating best practices
- Obtaining documented success stories and lessons learned from busy program staff members and healthcare professionals in the field
- Effectively disseminating program learning so that it gets noticed and acted upon appropriately in an era of information overload

From a sociological standpoint, additional challenges influence the suitability of knowledge management or program learning interventions, such as

- Personal learning style
- Organizational culture
- Regional culture
- Political environment
- Social networking dynamics (linkages to other individuals and organizations) and preferences (face-to-face versus electronic contact)

ACCESS- FP and MCHIP approached these challenges by using a mix of knowledge management approaches that take into account personal, organizational, and environmental factors, including

- *Technical Consultation Meetings*: Face-to-face, technical⁴ consultation meetings with experts and leaders in reproductive health and maternal, neonatal, and child health to review the state of the PFP literature; share programmatic experiences, lessons learned, and tools; and recommend a research agenda (2006, 2008, 2009, 2010)
- *Community of Practice*⁵: Formation of a PFP community of practice (CoP) for continuing support and dialogue; communication through annual, face-to-face meetings, and online engagement (2006)
- *Online Collaboration and Forums*: Online collaboration of CoP members through a mega-CoP platform called the Implementing Best Practices (IBP) Initiative Knowledge Gateway (2006); includes a series of online global forums conducted via e-mail with guest expert "speakers" and message archives in the CoP collaboration area (2007 to 2011)
- *Synthesized Knowledge for Use*: Creation of an electronic toolkit to provide practical information for developing and implementing PFP programs to assist policymakers, program managers, trainers, and service providers
- *E-Learning Course*: Development of a Web-based course for low-bandwidth Internet connection, part of USAID's Global Health eLearning Center, which offers more than 40 online courses for public health professionals working in the field, particularly those at USAID missions and USAID implementing partners

The programs use other knowledge management approaches as well, such as an online collaboration area for partners, partner events, conference presentations, and journal articles to promote awareness of evidence. This case study focuses on the approaches listed above. The following section provides more detail about each approach.

⁴ The term *technical* refers to public health or medical information.

⁵ * A "community of practice" is a group of people who share an interest in a common topic, such as family planning, and are engaged in activities related to that topic (e.g., as part of their job).

Building Consensus: Technical Consultation Meetings

Following an extensive literature review to determine the state of PFP programming, ACCESS-FP and USAID convened the first in a series of technical consultation meetings with experts to discuss and analyze the findings of the review. Held in 2006 in Washington, DC, the first meeting brought together 40 experts from more than 23 global organizations. It had the following objectives:

- Develop guidance for providing PFP services
- Identify gaps in knowledge and areas for future research
- Discuss opportunities and approaches to improving integration of maternal health and family planning services (ACCESS-FP, 2006)

Participants represented a cross section of maternal, neonatal, and child health and family planning professionals.

The meeting format consisted of

- Presentations synthesizing the state of the PFP literature
- Small-group work to identify gaps, recommendations, and opportunities for programs based on the literature review and the participants' experiences
- Group "report-outs" during a plenary session
- Call to action for participants (e.g., taking recommendations back to participants' programs)

The meeting format built a sense of team affiliation and encouraged consensus among participants. The initial presentations on state of the literature ensured that all participants started discussions with the same baseline knowledge of basic issues, an important step for team building and collaboration. With a consistent understanding of the issues, participants could then work together in small groups to analyze findings and evaluate possible actions. Finally, the groups were called to make recommendations on actions related to promoting PFP. Participants were also strongly encouraged to continue the dialogue, by means of annual face-to-face meetings and as an online community.

The subsequent meetings held in 2008, 2009, and 2010 grew to include over 60 participants from global health organizations. These later meetings provided a forum for sharing programmatic strategies, state-

of-the-art knowledge, and lessons learned (ACCESS-FP, 2010). Participants also shared pretested tools to support PFP programming and prioritized programmatic topics for research and learning.

Perpetuating a Sense of Team Affiliation: The Postpartum Family Planning (PFP) Community of Practice and Online Collaboration

Meeting participants were asked to perform an important follow-up action—use an online collaboration platform to continue the dialogue and form new linkages so that progress would continue beyond the 2006 meeting. Participants were asked to become members of the Implementing Best Practices (IBP) Initiative. Started by the World Health Organization and USAID, the IBP Initiative provides a forum for the global reproductive health community to share evidence-based practices that can be used in low-resource settings. Members receive invitations to face-to-face meetings and can sign up for a free account on the related IBP Knowledge Gateway (http://www.ibpinitiative.org/knowledge_gateway.html). The Gateway is an online platform designed for use by global health CoPs. Communities can request collaboration space on the Gateway where they can post announcements, create a community-specific digital library, and establish a discussion board. Use of the Gateway is free. Since its creation in 2004, membership in the Gateway has grown to 17,850 members from 215 countries and territories who participate in over 400 communities (O'Brien and Richey, 2010).

ACCESS-FP invited meeting participants to join the PFP CoP housed on the IBP Knowledge Gateway. Members of the PFP CoP receive notifications about events and activities related to PFP and can participate in the online discussions. ACCESS-FP encouraged members to share their experiences and tools or other documents by posting them to the online collaboration area. As a result of continued dialogue through the online CoP space and the face-to-face meetings, the following four working groups were formed so that partners could address specific issues: (1) Lactational Amenorrhea Method and the Transition to Modern Contraceptive Methods, (2) Postpartum Intrauterine Contraceptive Devices, (3) Immunization and Family Planning Integration of Services, and (4) Infant and Young Child Nutrition and Family Planning Integration of Services.

Global PFP Online Forums: Formal and Informal Learning

ACCESS-FP organized a series of global online forums that generate growing interest and involvement. From 2007 to 2011, nine forums offered "mini-lectures" on practical PFP service delivery and programming in low-resource settings and engaged participants to share their experiences. Topics for each forum relate to the special interests and recommendations posed by participants at the technical consultation meetings.

The format of the forums consists of

- Two-week, moderated discussion via e-mail
- Daily digests
- Five to 10 global health experts per forum posting mini-lectures with discussion questions
- Web-based archives of messages
- Attachments for further reading
- A focus on practical experience, lessons learned, and evidence-based practices

The mini-lectures provide concise, formal learning opportunities for participants, while the online discussions with other CoP members provide informal learning opportunities.

The Knowledge4Health Project, led by the Johns Hopkins Bloomberg School of Public Health, Center for Communication Programs, and also funded by USAID, manages the online platform and provides usage statistics to the CoP facilitators. A coordinator from ACCESS-FP serves as facilitator for the PFP online forums, managing memberships and posting daily digests. To help members feel a sense of connection, the facilitator notes in digests the countries that are actively participating in the discussions. Although Internet connectivity generally poses challenges in low-resource settings, a review of the digests and forum archives shows between 3 and 11 developing countries participating in each forum. (See Table 5.1.) This level of activity, along with anecdotal evidence, suggests that e-mail use is sufficiently low in bandwidth to enable online participation by developing countries that have some level of Internet connectivity.

Table 5.1. Between 3 and 11 Developing Countries Post Messages on Each Global Forum

Forum Title	Date	Countries Posting Messages
Integrated Service Delivery of Immunization and Family Planning	July 2011	Bangladesh, Democratic Republic of Congo, Kenya, India, Nigeria, Tanzania, Vietnam
Maternal, Infant, and Young Child Nutrition and Family Planning Integration	February 2011	Afghanistan, India, Malawi
Online Forum on the “Guide to Developing Family Planning Messages for Women in the First Year Postpartum”	June 2010	India, Kenya, Nepal, Nigeria
Lactational Amenorrhea Method (LAM) and the Transition to Other Modern Methods	January to February 2010	Afghanistan, Albania, Bangladesh, Cameroon, Côte d’Ivoire, Ghana, Guinea, Madagascar, Mexico, Nigeria
Postpartum Intrauterine Contraceptive Devices (PPIUCD)	October 2009	Cameroon, Côte d’Ivoire, Ghana, India, Kenya, Pakistan, Uganda, Zambia
Strategies for Community-Based PFFP	March 2009	Bangladesh, Egypt, Ethiopia, Guinea, India, Kenya, Niger, Nigeria, Rwanda, Uganda, Zambia
PFFP Contraceptive Technology	September 2008	Cambodia, Democratic Republic of Congo, Georgia, Guatemala, Kenya, Malawi, Pakistan, Uganda
Key Messages for PFFP	April 2008	Bangladesh, Democratic Republic of Congo, Egypt, Guatemala, India, Kenya, Mexico
Health Timing and Spacing of Pregnancy	November to December 2007	Democratic Republic of Congo, Egypt, India, Jordan, Kenya, Philippines

Despite the bandwidth friendliness of e-mail communication, a review of the forum messages (many of which note the participant's organization) indicates that participation is largely from members who work for developed country organizations. Although these participants are based in developing countries, most are staff members from programs such as ACCESS-FP. Frontline healthcare providers in developing countries may not always be able to participate directly in the online activities; however, they can still benefit from and enrich the shared dialogue. One participant, a program officer in Nigeria, noted that he works in healthcare facilities that do not have Internet connectivity. He acts as the liaison between the forum participants and the frontline healthcare providers, passing along reports of field challenges to the forums and tapping into expert knowledge during the forum to gain insight into solutions. For example, a forum discussing women's misperceptions about return to fertility led the program officer to include the topic of return to fertility counseling in a service delivery supervision checklist (Figure 5.1) (Samaila Yusuf, personal communication, August 17, 2011).

Checklist Administration during Supportive Supervisory Visits to MCHIP Supported Facilities in Northern Nigeria

Name of Health Facility: _____ State: _____
 LGA: _____ Date: _____
 Completed by: _____ Signature: _____

Specific checklist	Tick if completed during the visit	If not completed during the visit, state reason/s	Comments
IUD Counseling & clinical skills			
FP counseling skills			
Postabortion care clinical skills			
PPFP Counseling skills			
Choice of methods for PPFP			
Counseling for PPFP clients---immediate postpartum and six weeks postpartum (exclusive breastfeeding, return to fertility, HTSP, etc.)			

FIGURE 5.1

A postpartum family planning (PPFP) community of practice (CoP) online forum discussion about return to fertility helps craft a service delivery checklist. (LGA stands for local government area; HTSP stands for Healthy Timing and Spacing of Pregnancy). (From Samaila Yusuf, personal communication, August 17, 2011.)

In other examples, during a forum on essential medicines, discussions led a participant from India to use a new forecasting model to reduce stockouts (lack of supplies), and another participant reported plans to use the forum information to shape the Ethiopian government's assessment of reproductive health commodity procurement (O'Brien and Richey, 2010).

Of the CoP online activities, the online forums have the largest impact on membership. According to the Gateway records, over the course of nine forums, the PFPF CoP online membership grew from 200 members in 35 countries in 2007 to 976 members in 79 countries in 2011. (See Figure 5.2.)

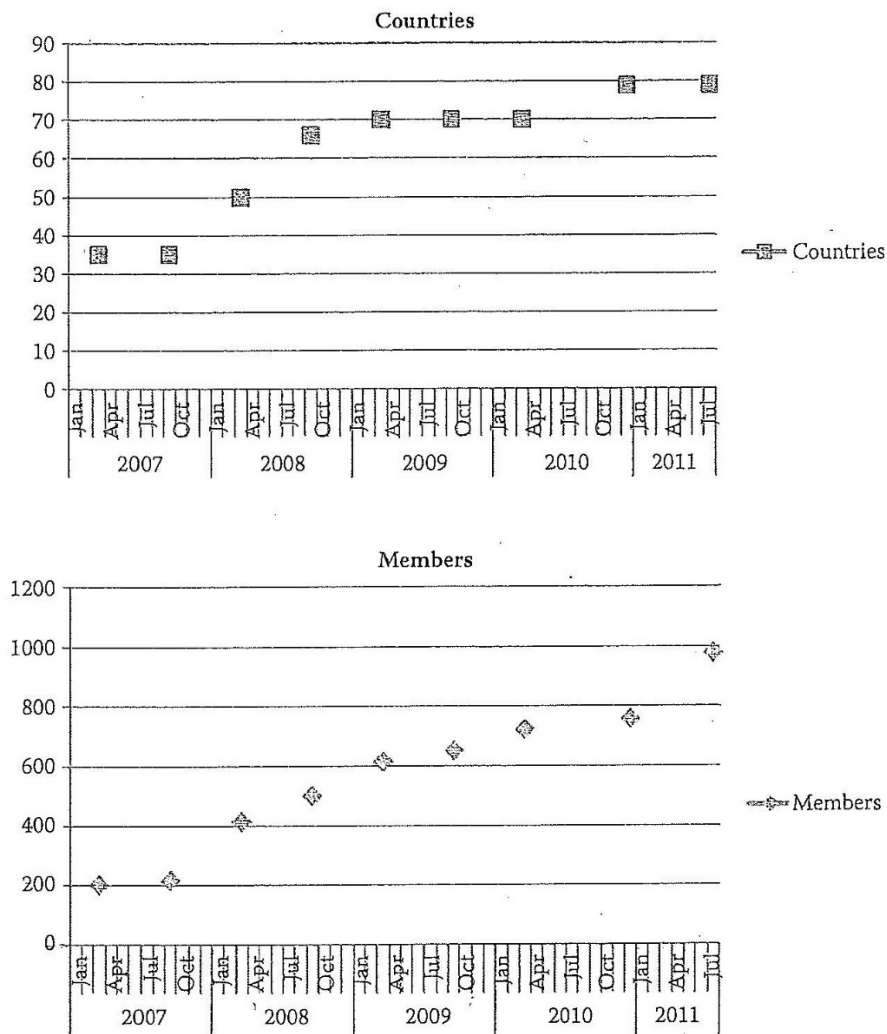


Figure 5.2. Postpartum family planning (PFPF) community of practice (CoP) online membership grew in number of members and countries over the course of nine online forums (2007 to 2011).

Postpartum Family Planning E-Toolkit: Synthesized Knowledge

As part of the effort to help program staff locate practical information to improve PFP programs, ACCESS-FP used an electronic toolkit model developed by the Knowledge4Health program. The e-toolkit provides a comprehensive collection of best practices and evidence-based tools and documents on PFP to assist policymakers, program managers, trainers, and service providers. (See Figure 5.3.) The Web version of the toolkit is housed on Knowledge4Health's Web site at <http://www.k4health.org/toolkits/ppfp>. Knowledge4Health also distributes offline versions of e-toolkits on flash drives.

By using Knowledge4Health's existing e-toolkit platform, which was already funded by USAID, ACCESS-FP was able to make prudent use of USAID funding and avoid creating a duplicate platform. In addition, the e-toolkit skeleton is a template used to create 36 toolkits from 70 organizations on global health topics to date. Use of a replicated model benefits users of the other toolkits by providing a recognizable format.

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Home Advocacy & Policy BCC Tools Bibliographies Country Materials Lactational Amenorrhea Method Reports Monitoring, Evaluation & Research Postpartum IUD Presentations & Posters Technical Briefs Training ACCESS-FP Technical Meetings

About Join the Discussion

Family planning offered in the first year postpartum provides an opportunity to meet the needs of women who want to prevent unintended pregnancies or who want to delay having more children. Yet, globally, nearly 65% of women in their first postpartum year have an unmet need for family planning services.

This toolkit provides a comprehensive collection of best practices and evidence-based tools and documents on postpartum family planning (PPFP) developed through the ACCESS-FP Program. The toolkit will assist policymakers, program managers, trainers, and service providers to develop and implement effective service delivery approaches that address the family planning needs of the postpartum women they serve.

Information is presented in the following categories:

- Advocacy and Policy
- Bibliographies
- Behavior Change Communication (BCC) Tools
- Country-Specific Materials
- Lactational Amenorrhea Method (LAM) Technical Materials
- Reports from Key PFP Meetings
- Monitoring, Evaluation and Research
- Postpartum IUD
- Presentations and Posters
- Technical Briefs
- Training
- Access-FP Technical Meetings

Information on these categories is listed under the main thematic navigation tabs at the top of this page. They contain tools and resources to help you implement a variety of PFP-related activities. Browse the topics, then click on the full-text resources to open or download them to your computer.

Of particular interest is the "Country Materials" tab which links to materials from Afghanistan, Albania, Bangladesh, Haiti, India, Kenya, Nigeria, and Tanzania. You will find visual aids, training packages, case studies, analyses, assessments, and more. If you have an experience to share about the introduction or provision of PFP services, we invite you to tell us about it on the Discussion Board where you can also suggest new resources. Another comprehensive section is Lactational Amenorrhea Method (LAM) which contains more than a dozen resources for promoting and providing the method, an important part of PFP services.

To find out if a resource has already been included in this toolkit, type the title in the search box at the top of any toolkit page and click on the magnifying glass logo. For more detailed information about this and other K4Health e-Toolkits go to the About link at the top of this page.

Learn more about postpartum family planning. [Take the Global Health eLearning course \(registration required\)](#).

Featured Resources:
Panel 1 Presentations: "Learning about LAM and the Transition: Beyond the Barriers"

Most Downloaded Resource:
Postpartum family planning methods—Afghanistan

SHARE

Figure 5.3. The postpartum family planning (PPFP) toolkit provides a comprehensive collection of best practices and evidence-based documents to support programs. (Used with permission from

Publications | Paper 1. Enabling Knowledge Exchange to Improve Health Outcomes through a Multi-Partner Global Health Program

Knowledge4Health Program at Johns Hopkins Bloomberg School of Public Health, Center for Communication Programs, <http://www.k4health.org/toolkits/ppfp>.)

Information in the PFP e-toolkit is presented in the following categories:

- Advocacy and Policy Bibliographies
- Behavior Change Communication (BCC) Tools
- Country-Specific Materials
- Lactational Amenorrhea Method (LAM) Technical Materials
- Reports from Key PFP Meetings
- Monitoring, Evaluation, and Research
- Postpartum IUD
- Presentations and Posters
- Technical Briefs
- Training
- ACCESS-FP Technical Meetings

Country-specific materials from Afghanistan, Albania, Bangladesh, Guinea, India, Kenya, Nigeria, Rwanda, and Tanzania are included.

According to Web server logs, from 2010 to 2011 the PFP e-toolkit received over 3,000 visits from 122 countries.

Practical Learning for a Geographically Dispersed Audience: The PFP E-Learning Course

ACCESS-FP made use of another USAID-funded, electronic platform to offer an online course for global health professionals working on PFP programs. The platform, called the Global Health eLearning Center (<http://www.globalhealthlearning.org/>), was sponsored by USAID in response to many requests from USAID field staff for updated technical information: With over 40 courses on global health topics, the eLearning Center emphasizes program learning—state-of-the-art technical information combined with program experiences and lessons learned presented in case studies (USAID, no date). USAID staff as well

as other global health professionals use the eLearning Center. Experts from a variety of organizations author the courses.

Courses take approximately 2 to 3 hours to complete and include pre- and post-tests, as well as progress checkpoints (questions). Learners register for a free account to take courses and manage their progress. Learners who pass the final exam, submit an action plan of how they intend to use the course information in their work, and complete the course evaluation are allowed to print a certificate of completion. Approximately 2 months after completing the course, learners receive an automated e-mail (if they included a valid e-mail address with their registration) that includes their action plan and reminds them to continue steps to achieving the plan objectives. The eLearning Center has over 80,000 registered users; and more than 100,000 course completion certificates have been awarded. Although the main delivery platform for the e-Learning Center is the Web, selected courses have been distributed on flash drives and on CD-ROM. In addition, course materials may be printed out for offline use. ACCESS-FP developed the PFP course to orient global health professionals to service delivery, contraceptive methods, and programmatic considerations for family planning during the postpartum period. According to the eLearning Center administrative logs, over 1,300 learners visited the course at least once, and over 700 learners from more than 80 countries completed the certificate requirements for the course since its launch in 2008.

KNOWLEDGE TRANSLATION, SOCIAL NETWORKING, AND TEAM COLLABORATION CONCEPTS AS RELATED TO SCALING UP HIGH-IMPACT HEALTH PRACTICES

Of the knowledge management interventions that ACCESS-FP and MCHIP used to help programs scale-up high-impact health practices, the PFP CoP provides the largest body of evidence for analysis. This evidence includes significant growth in CoP membership over time, anecdotal evidence of use of forum-communicated knowledge in programs, and a progression of activities arising from the CoP, such as formation of working groups to improve specific practices (e.g., LAM).

What makes a CoP effective? Recognizing that a CoP is characterized by sustained interaction and linkages among members, an examination of literature that focuses on interaction—knowledge translation, social networking, and team collaboration—may help provide answers to this question.

These answers may, in turn, provide insights that can help programs become more effective in scaling up high-impact practices.

Defining Knowledge Translation

The term knowledge translation implies interaction between originators of research and implementers of healthcare programs and services.

A technical brief by the National Center for Dissemination and Disability Research (NCDDR, 2005) defines knowledge translation as active assessment and use of research knowledge to improve health practices and outcomes. Translating knowledge goes beyond just publishing research findings in journal articles; it extends to instituting process improvements and effecting behavior change in health systems (Davis et al., 2003).

The NCDDR brief summarizes several models for knowledge translation that were proposed in the literature. A framework proposed by Jacobson et al. (2003) guides design of a translation process through a series of questions about the user groups involved. Some of the questions and Jacobson's commentary on literature in the field provide insight into why the composition of the PFP Community of Practice is well-suited to taking evidence to practice:

- *Centralized versus Noncentralized Decision-Making Power:* Starting with the technical consultation meeting in 2006, the PFP CoP displayed broad sources of program decision-making power in its membership. Participants from more than 20 organizations and health programs analyzed research findings, formulated recommendations for programs, and took the recommendations back to their programs and another level of decision-makers (e.g., project directors, country ministries of health). Jacobson notes that several studies linking the composition of user groups to knowledge translation suggest that groups in which the decision-making power is not limited to a small, central group are more likely to use research evidence. The large size of the CoP's online platform (the IBP Knowledge Gateway) broadened the base of decision makers who were exposed to the knowledge translation process.
- *Sophistication of the User Group's Knowledge of Research Methods and Terminology:* It has been shown that if research findings are to be used, they must match the user group's level of

sophistication (Jacobson et al., 2003). The CoP's multi-tier communications helped filter PFP program research findings. For example, through its comprehensive literature review, ACCESS-FP staff members provided the first refinement of research findings. Participants in the technical consultation meeting, who were sophisticated in assessing research, analyzed the filtered review results. Still more filtering and rephrasing took place when the mini-lectures were developed for the global online forum audiences who were more likely to be program implementers than researchers. Finally, forum participants report passing along knowledge from the forums to health facilities and frontline health workers. Multiple levels of filtering and rephrasing can aid acceptance of the knowledge because the audience often received the knowledge from someone he or she knew professionally through a program or professional association.

- *Consensus on an Issue:* Drawing from the literature Jacobson notes that conflict or consensus on an issue and level of ambiguity affect knowledge translation by the user group. For this reason, the technical consultation meeting format was important for reaching consensus and reducing ambiguity on the PFP program issues. The beginning plenary presentation of the literature review helped develop a common understanding; the later small group work to define recommendations aided consensus building, which would be important for later interaction among CoP members.
- *Dissemination Strategies:* According to Anderson et al. (1999) (cited in Jacobson et al., 2003), knowledge translation occurs through three key processes—awareness, communication, and interaction—whose forms need to be tailored to the preferences of the user groups for the amount and level of detail. The mix of knowledge management interventions used for PFP attempted to touch on all of these key processes. Although a number of interventions were used—meetings, online CoP collaboration area and forums, and the electronic toolkit—surveys gather the most assessment data. For example, in one survey of global forum participants using the IBP Knowledge Gateway in 2008⁶, 42% of respondents reported forwarding forum messages to other people (IBP, 2009). The tendency to forward messages to colleagues supports the view that CoP interaction leads to a multi-tier dissemination and filtering of knowledge.

⁶ Range of 200 to more than 760 participants; 11% to 14% response rate to survey

Another study suggests reasons why the CoP activities seem to be particularly effective in promoting change in PPF programs. A randomized controlled trial (Dobbins et al., 2009) of 108 Canadian public health departments conducted in 2005 aimed to determine which are more effective as knowledge translation and exchange strategies—knowledge brokers, tailored and targeted messages, or an online research repository. The researchers viewed "knowledge brokers" as specialists who work one-on-one with decision makers to facilitate use of evidence in decision making. "Tailored" messages focus on a particular decision-making role, and "targeted" messages relate to a particular issue that requires a decision. An example of an online repository is a Web site with a searchable database of research findings.

The findings of the study again point to the importance of user group composition and culture in selecting knowledge translation and exchange strategies. For user groups whose culture placed a high value on evidence for decision making—and who were assumed to be more sophisticated in their knowledge of research methods—the labor-intensive role of the knowledge broker was less useful than tailored or targeted messages.

For user groups with a low organizational research culture, the role of the knowledge broker was most helpful in encouraging use of evidence in decision making.

The study findings suggest a reason why the PPF online forums may have gained increasing interest over time. Large global health donors such as USAID have a high organizational research culture, which leads them to give program funding to organizations that, similarly, have a high organizational research culture. Because many global online forum participants are based in these types of organizations (i.e., those that have a high research culture), the targeted and tailored messages of the forums would be appealing. Taking knowledge exchange one step further, some forum participants in turn work with healthcare facilities and government entities in low-resource settings to help them put evidence into practice. Whether these organizations have low or high research cultures would be a useful avenue for further research.

E-Learning Participants as Knowledge Brokers

According to the About page on the Global Health eLearning Center Web site, the courses blend technical content with program principles, best practices, and case studies in order to help learners

improve global health programs (USAID n.d.). This approach is associated with the primary audience for the eLearning Center, which is USAID staff overseeing field programs, and the secondary audience, which is the staff of partner organizations implementing those programs, such as program officers. In order to assess the usefulness of the courses to the target audiences, at the completion of courses learners are invited to complete a course evaluation. (Completing the evaluation is required in order to print the certificate.) One open text question on the evaluation form asks how the learner intends to use the course information in his or her work.

In course evaluations completed from 2008 to 2011, 258 respondents specified how they intended to use the course information. Given the goal of the eLearning Center to support program development and oversight, one would expect responses to the use question to predominantly mention improving programs. Instead, only 33 or 12.8% stated they intended to use the course information to improve programs, while 95 or 36.8% expressed intent to share knowledge from the course with colleagues, healthcare clients, the community, or participants of training or education. The remaining answers identified a variety of intended uses, such as improving his or her care of clients or furthering the learner's career.

Knowledge sharing, rather than program improvement, as the predominant intended use of the course presents a challenge in understanding the motivating factors for learners of the PPFPP course. Perhaps most learners view themselves as knowledge brokers among their colleagues, clients, and other contacts, and so have a self-expectation to share knowledge that they think will benefit their contacts. Learners may be sharing valued knowledge as a "gift" to other members of a community of practice in the hope that it will help someone and transform healthcare (Bell, 2010). (This type of "gift giving" is championed by Seth Godin [2008, 2010] who likens communities to "tribes" with strong ties and affiliation.) Viewing e-learning courses as a social networking tool, and so as a catalyst for knowledge exchange and translation, supports the approach of bundling e-learning with an online collaboration platform for communities of practice.

Because the literature shows that a key ingredient for successful knowledge sharing is trust (Holste and Fields, 2010), using multiple trusted sources supports widespread exchange of important knowledge. Worded another way, the use of a trusted, well-known knowledge source (USAID) via e-learning and

knowledge brokers (learners) who are known and trusted by clients, policymakers, and program staff successfully creates a continuum of trust and knowledge sharing.

Social Networking Effects on PFP Program Change

The entities involved in scaling up high-impact practices in PFP span a wide variety of organizations and roles: international government and nongovernment organizations, public and private service delivery facilities and providers, education and training institutions, and others. Examining the linkages among these players in terms of social networking concepts provides insight into how the relationships may play a part in scaling up high-impact practices.

A growing body of literature examines public health systems as inter-organizational networks. One such paper examined the relationship between governance, urbanization, public health domain, and health status in terms of social network structure (Wholey et al., 2009). The research found that collaboration among members of a network was more likely to occur when assessing or advocating for a particular public health problem than when seeking co-funding, unless a funder dictated it. This finding supports the technical consultation meeting format that (1) focuses on collaboration for problem solving among multiple organizations not tied to one funded program, and (2) "endorsement" for the event by a large funding organization.

Another study (Ramasamy et al., 2006), looking at relationship as a bridge to knowledge transfer, identifies three components for operationalizing a knowledge transfer relationship⁷:

- Trust
- Relationship commitment
- Communication

These three components play a part in the PFP CoP interaction. Whenever possible, the facilitators of the global online forums identify contributors and their organizations in the daily digests. By identifying

⁷ Though the study specifically addressed Chinese business relationships, its findings agree with those for other settings.

and crediting the sources of informal knowledge sharing, the facilitators help build relationships and trust.

Becoming a member of the CoP expresses a kind of relationship commitment to the domain that encourages knowledge exchange (Wenger, 2006; O'Brien and Richey, 2010). The CoP can be viewed as having just the right amount of structure for knowledge exchange: according to research (Ramasamy et al., 2006), too many rules for interaction (as might be defined in a contract) can stifle knowledge exchange, while too few rules can create ambiguity and inhibit exchange (e.g., a lack of rules may lead to questions about who is responsible for supplying knowledge and who should receive it). Regular communications through the IBP Knowledge Gateway to members, such as e-newsletters and announcements, maintain the sense of relationship.

Relationship plays a particularly important role in uptake of high-impact practices. A practice conveyed by a trusted colleague is more likely to be noticed and adopted than research findings that are published and disseminated widely. The role of opinion leaders in adoption of innovations is well known from Everett Rogers' *Diffusion of Innovations*, published in 1962. Yet other studies contend that any trusted contact, even if the contact does not fit the conventional image of a leader, can influence adoption. In one study (Williamson et al., 1989), researchers surveyed 625 physicians and 100 physician opinion leaders about their awareness and use of clinical advances. Even though physicians and opinion leaders said that publications were the most useful source of information on clinical advances, as many as one-fifth to one-half were not using or were not aware of the clinical advances identified in the study. This study found that practitioners actually relied more on colleagues and their own experience to validate information than they relied on published sources. This finding supports the importance of CoP interaction, particularly through the online forums, to drive adoption of high-impact practices. Other research in social networking addresses the importance of how well an individual fills a "structural hole" between members of a network (Dekker and Hendriks; 2006; Nelson and Hsu, 2006). Individuals with ties that bridge gaps can serve as knowledge brokers and facilitate the flow of information and resources through the network (Nelson and Hsu, 2006). The concept of knowledge brokers as bridges that strengthen and extend networks supports the value of using a CoP platform (i.e., the IBP Knowledge Gateway) developed and endorsed by two major global health knowledge brokers: the World Health Organization (WHO) and USAID. WHO's and USAID's wide networks of contacts worldwide can generate more awareness for the work of a CoP than any other organization alone.

Team Collaboration and Macrocognition

Operationalizing the technical consultation meetings and CoP working groups requires use of effective team collaboration approaches. For the technical consultation meeting in 2006, in particular, it was important that participants work together as a team to analyze issues with PFP programs and identify solutions for the way forward. A comparison of the 2006 technical consultation meeting format with stages described in macrocognitive process literature suggests components that can be replicated to ensure the success of future meetings.

Macrocognition describes the high-level mental processes that people use to solve complex problems in the real world, as opposed to problems presented in a controlled laboratory environment. Research on the macrocognitive processes of teams suggests they go through four stages of collaboration (Letsky et al., 2007). Table 5.2 compares the format of the PFP technical consultation meetings with these stages.

In the Knowledge Construction stage, the meeting organizers arranged to debrief participants on the state of the literature regarding PFP programming. Because the meeting was intended to be a practical, team-driven activity (rather than a general knowledge update frequently provided by conferences), it was important for organizers to identify the knowledge threshold they wanted individual participants to achieve by the end of this stage. This threshold was then the basis for the Collaborative Team Problem-Solving stage, during which participants broke into small groups and began functioning as teams to assess portions of the literature review findings. Organizers needed to be prepared with a plan for how to frame the problem so that it could be addressed with a team approach. By the end of the small group analysis, the participants needed to come together to form one group during the Team Consensus stage for the purpose of identifying the specific action plan that would result from the meeting. Finally, the organizers needed to plan for follow-up on the action plans during the Evaluation and Revision stage, with checkpoints at annual meetings.

Table 5.2. The Technical Consultation Meeting Can be Compared to a Macrocognitive Process Format

Technical Consultation Meeting Feature	Macrocognition/Team Stage
Technical update presentations	Knowledge construction (individual knowledge building)
Small-group analysis of literature review	Collaborative team problem solving
Small-group recommendations based on literature review findings	Team consensus
Plans for follow-up on recommendations and annual meetings	Evaluation and revision

LESSONS LEARNED

Large global health programs with defined knowledge management strategies face some of the same challenges that individuals in public health systems face; that is, there is an abundance of published information to filter, and the best knowledge is often in someone's head. A coordinating entity, such as the ACCESS-FP program staff, can help with filtering information through literature reviews and electronic toolkits. However, tapping into the "know-how" and lessons learned of health professionals working in low-resource settings is a greater challenge. In these settings, time—to document experiences, evidence of best practices, and success stories—is usually not allocated as part of health professionals' jobs. These health professionals may not have access to or awareness of as many publishing opportunities as colleagues who work in regions with reliable Internet connectivity and access to scientific publications. Global health programs need to explore innovative ways of collecting disseminating know-how from the field—other than the traditional journal articles and conference presentations. Use of consumer products such as mobile phones (to record mini-podcasts) or flip cameras (to capture video for success stories) may offer solutions.

For global health programs with worldwide partners, language barriers may make it difficult to encourage interaction. A perennial problem for discussion forums, for example, is whether to hold separate forums by language, rather than by topic. Use of more sophisticated translation tools may help solve this dilemma in the future.

In discussing the case study, relatively little was stated about using information from the PFP electronic toolkit to improve PFP programs. For all global health information repositories, identifying how the information was used in programs is a challenge. Typically, Web-based surveys are used to collect this

type of information, but the results give only a partial view of use. Cross-promotion and cross-evaluation of information services can help obtain a broader sense of how the information was used. Finally, a discussion of global health programs would not be complete without asking, "What about sustainability?" When developing a knowledge management strategy for a global health program, it is important to ask, "How will users access that valuable knowledge after a funded program is ended?" Plans for hosting Web sites, storing knowledge in repositories, and archiving discussions need to be made early in the program to ensure a life cycle that matches the global health domain, not just the life of the program.

FUTURE RESEARCH NEEDED

Social networking analysis of global health programs could go a long way toward answering the question: "How did this program improve health practices?" During the course of a large global health program, many organizations and individuals may be exposed to the program's knowledge outputs through regional meetings, online discussions and collaboration, Web sites, electronic learning courses, and other means. Research to track the knowledge exchange and translation "trail" from organization to organization and person to person would help to develop evidence of which knowledge management approaches work best to scale up awareness and use of high-impact health practices.

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4.2 Paper 2. Knowledge Management for Public Health Subspecialties Using Diffusion of Innovations Theory and Information and Communication Technology

Knowledge Management for Public Health Subspecialties Using Diffusion of Innovations Theory and Information and Communication Technology

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Research Aim:

To describe knowledge exchange approaches used in a global health program to promote evidence uptake in multiple contexts of LMICs for health policy and practice

Candidate Note:

Several of the technology-supported, knowledge exchange approaches reported in this 2009 book chapter continue in 2019. Use of low-bandwidth approaches such as e-mail-based discussions still have value in 2019 as technology infrastructure challenges with costs and connectivity continue in places such as Sub-Saharan Africa. An update to this chapter, however, would be merited to address the more recently adopted technology-based knowledge exchange approaches such as social media, webcasting, and messaging applications for mobile phones, such as WhatsApp.

As the public health field evolves, new subspecialties emerge—such as HIV/AIDS and family planning integration—some of which comprise hybrids of existing knowledge areas. Professionals working in these new subspecialties require a body of scientific literature, evidence-based information, and communication mechanisms tailored to their needs in order to advance the field. The evolution of a public health subspecialty poses a particular knowledge management challenge in that, in the early stages, important information may yet to have made it to formal scientific publications. For this reason, much tacit information sharing takes place in the form of presentations and conversations at professional conferences and meetings and in unpublished (grey) literature, such as project reports. This type of information sharing has significant access restrictions (geographic) and poses a problem to advancement of a field that needs innovative global solutions, often with a critical time consideration, such as halting mortality due to HIV/AIDS. Considering Diffusion of Innovations, Everett Rogers' book

(1995) on the ways in which new ideas spread, knowledge management strategists can address Rogers' elements of diffusion, particularly the time element, and encourage innovation through effective use of Information and Communication Technology.

Introduction

As the public health field addresses a wide range of issues posing a threat to community health, new subspecialties develop to address emerging concerns. Identification of a subspecialty may stem from changes in demographics—such as an aging population and demand for services from that subgroup leading to, for example, a subspecialty of geriatric dentistry (Hebling 2007). Evolution of infectious diseases can lead to new specialized avenues of public health research and thus subspecialties, such as with HIV/AIDS, Avian Influenza, and Severe Acute Respiratory Syndrome (SARS). But perhaps the most challenging emerging type of subspecialty—from the perspective of knowledge management to bring about innovation—comes from a hybrid of two existing public health specialty areas, such as with HIV/AIDS and Family Planning Integration. In the case of an emerging subspecialty with a rapidly escalating global health threat—as is the case with HIV/AIDS—professionals seeking to address health problems within the subspecialty need to use systematic approaches to developing the field for maximum effectiveness. These approaches need to incorporate proven knowledge management strategies, aided by information and communication technology where appropriate, and be guided by diffusion of innovations theory to speed the timeline of adoption of innovations. This chapter steps through the key concepts of diffusion of innovations as they apply to a public health subspecialty, and presents a model of knowledge management incorporating judicious use of information and communication technology. It then presents a case study demonstrating use of knowledge management and diffusion of innovations principles with an emerging subspecialty.

Diffusion Of Innovations Concepts As They Apply To Public Health

Examples abound of innovations in medicine that have been eagerly embraced, such as rapid government approval of Salk's polio vaccine after clinical trials (Maybury Okonek 2008). But there are also cases of innovation not so readily adopted for betterment of health. In Everett Rodgers book, *Diffusion of Innovations* (1995), he presents the memorable example of the innovation of citrus fruit use to combat scurvy, which took over 100 years for the British merchant marines to adopt. The rate at which an innovation—an idea perceived as new by members of a social system—is adopted relates to

the way in which it is diffused throughout a group of potential adopters. Rogers (1995) defines diffusion as “the process by which (1) an innovation; (2) is communicated through certain channels; (3) over time; (4) among members of a social system.”

Diffusion of innovations theory suggests that key factors predict the rate of adoption or diffusion of an innovation. One may match these key factors with illustrative public health considerations, as shown in the following table.

By examining the public health considerations related to diffusion factors, those seeking to advance a public health subspecialty can design strategies that aid diffusion. The following case example illustrates how the key factors of diffusion have posed challenges to adoption of an innovation in a particular subspecialty.

Key Factors in Diffusion of Innovations	Related Illustrative Public Health Considerations
Attributes of the innovation For example: <ul style="list-style-type: none">• relative advantage,• compatibility,• complexity,• trialability,• observability	<ul style="list-style-type: none">• Will the mortality rate drop more rapidly using the innovation than with other approaches? (advantage)• Can it be offered within existing health care facilities? (compatibility)• Can behavior change information be easily explained to the public? (complexity)• Can a pilot program be implemented to test the innovation? (trialability)• Can policy makers be convinced to incorporate indicators into health care service delivery

	<p>guidelines so that impact of the innovation can be measured? (observability)</p>
<p>Attributes of the audience</p> <p>For example:</p> <ul style="list-style-type: none"> • exposure to media and interpersonal channels • information seeking behavior, • innovator vs. laggard, education, literacy, • social mobility, size and connectedness of networks, • attitude toward change, • tolerance for ambiguity and risk 	<ul style="list-style-type: none"> • Is the innovation being mentioned at professional meetings and conferences that the audience attends? (exposure) • Does the health professional read scientific journals? Participate in on-line discussions? (information seeking) • Is the innovation appropriate for the health care cadres involved? (education, literacy) • Is the innovation perceived as a possible health risk? (risk)
<p>Environmental constraints/facilitators</p> <p>For example:</p> <ul style="list-style-type: none"> • access to information and means of communication, • access to the innovation, • access to education, • normative pressure 	<ul style="list-style-type: none"> • Does the health professional have access to the Internet? Access to distance learning options? (access to information) • Does the innovation involve medical supplies such as new vaccines not available everywhere? (access to innovation) • Does the health professional have disincentives not to innovate (national service delivery guidelines)? (normative pressure)
<p>Characteristics of the communication system</p>	<ul style="list-style-type: none"> • Do the health program managers who are communicating tend to

For example:

- homophily (similarity of people communicating about innovation)
- heterophily (dissimilarity of people communicating about innovation)

develop similar programs with similar environmental attributes, with similar barriers to innovation?

- Is communication of innovation occurring between different health care service delivery cadres, which may pose a social barrier? (heterophily)

Diffusion Factors and A Public Health Innovation: Male Circumcision and HIV

In public health, a field characterized by focus on the health outcomes of groups of individuals, the social implications of an innovation can play a key role in its adoption. One example of social considerations in public health innovation adoption concerns a public health subspecialty that has evolved, which is referred to as HIV/AIDS and Sexual and Reproductive Health (SRH) Integration. This subspecialty concerns the benefits to both HIV prevention, care, and treatment outcomes, and sexual and reproductive health of individuals when health care services are offered together at a facility (or with client-friendly referral systems). One HIV/SRH integration innovation that has gained much attention in the public health community is male circumcision for HIV prevention. Since about 2000, there has been growing advocacy for male circumcision to help HIV prevention. This advocacy escalated in 2006, when the U.S. National Institutes of Health announced that two trials studying the impact of male circumcision on HIV risk would be stopped because the interim data clearly pointed to a strong protective effect of the intervention. Trials in Kenya and Uganda revealed at least a 53% and 51% reduction in risk of acquiring HIV infection, respectively (NIAID 2006). This followed results from a 2005 study in South Africa that demonstrated at least a 60% reduction in HIV infection among circumcised men. Yet despite these impressive results, much debate surrounds potential adoption of this innovation. Why the resistance? As one journal article asks, wouldn't a similar announcement of an HIV vaccine that reduced risk by at least 60% been met with a massive surge of excitement (Klausner et al 2008)?

The reasons for a relatively slow adoption of this public health strategy, in the light of the HIV crisis, can be seen by examining the key factors of diffusion involved.

Attributes of the innovation

Supporters of male circumcision for HIV prevention point to its relative advantage—an approximately 60% risk reduction according to clinical trials, while others question the relative advantage if requirements are not met: if the surgery is not done in a sterile environment, men do not wait for the wound to heal before resuming intercourse, or risk behavior increases. Scaling up circumcision services by trained providers in a sterile environment poses a compatibility challenge: capacity of health care systems need to be increased. The caveats to male circumcision protective benefits make the intervention complex: men and their partners need clear communication that explains the health risks of circumcision in an unsterile environment, not waiting for healing, or increased risk behavior (such as multiple concurrent partners). The trialability and observability of male circumcision—in the form of clinical trials—poses potential ethical issues, as do many clinical trials, and relates also to complexity—researchers must strive to ensure informed consent by trial participants, who must understand the risks.

Attributes of the audience

This is a particularly important factor in adoption of male circumcision for HIV prevention, as the innovation has sparked heated debate due to its social implications. Throughout history, male circumcision has been done as a rite of passage for men, as part of religious ceremonies, to mark hierarchy and social difference, and as part of political and power struggles (Aggleton 2007). While HIV researchers may eagerly embrace the protective benefits of male circumcision—serving as early adopters—change agents must appeal to other audiences in a “culturally appropriate, rights-based and gender sensitive way” (Aggleton 2007). Communication channels for male circumcision information have expanded since 2000, and have included surveys of potential circumcision clients to determine acceptability (Westercamp 2007), scientific journal articles, blogs, e-mail lists, bulletins from the World Health Organization, community meetings, and more. Both risk and relative advantage have been presented in these communication channels, effectively slowing down the rate of adoption. And as this is a relatively new posed benefit for male circumcision—following negated ones through history—information seeking behavior is by and large coming from the scientific community (highly educated, early adopters) rather than the ultimate beneficiaries of the innovation.

Environmental constraints/facilitators

As mentioned under Attributes of the Innovation, scaling up health care systems to offer safe male circumcision services presents a significant environmental constraint for adoption, as providers need to

be trained (education factor) and health care facilities prepared (access factor). And, unlike a potential vaccine or substance, there is no pharmaceutical company to speedily champion adoption of the innovation with the lure of future profits (Klausner 2008). A facilitator to innovation, however, came in two steps, when (1) the World Health Organization—clearly an opinion leader in public health—recommended male circumcision as an important HIV risk reduction approach, followed by (2) the U.S. President’s Emergency Plan for AIDS Relief announcing support (i.e., funding) for safe male circumcision services when included in a country’s HIV prevention strategy.

Characteristics of the communication system

Communication about male circumcision for HIV prevention has occurred within and between similar and dissimilar social systems. Scientific researchers, a similar group, have clearly shared research results. However, behavior change communication between public health experts and men in communities where circumcision is not already practiced clearly is an example of communication among dissimilar members of a channel. In addition, communications from social activists who have protested male circumcision from a human rights standpoint have muddied the waters of debate.

Knowledge Management in Public Health

The confounding effects of mixed factors in getting a public health innovation diffused and adopted, as described with the male circumcision example, can be mitigated with effective use of knowledge management. Knowledge management (KM) refers to the process of systematically creating, gathering, organizing, sharing, adapting, and using knowledge to achieve goals and objectives (Kols 2004). As a public health subspecialty emerges, those seeking to advance the field face three main knowledge challenges (Kols 2004):

- **Sharing knowledge:** Public health professionals conducting research and implementing innovating programs need to share their findings and experiences.
- **Learning from experience:** Program managers need to use proven practices and lessons learned to design public health programs and make decisions.
- **Coping with either too much or too little information:** In the case of a new hybrid subspecialty, professionals may be overwhelmed with information related to the separate fields, but not easily identifiable as relating to the hybrid field (e.g., HIV/AIDS and Family Planning Integration). In addition, with global health issues, a professional may be located in a remote region

geographically separated from access to information via personal exchange or the Internet with others sharing his interest.

KM tools and approaches can help overcome these challenges and accelerate the timeline for adoption of innovation in a subspecialty.

Leveraging KM and ICT To Advance Innovation

Information and Communication Technology (ICT)—encompassing electronic devices such as telephones, computers, and the Internet—increasingly plays a part in knowledge management and diffusion of innovations on a global scale because of growing capabilities. According to a United Nations report (2006), developing countries accounted for more than 60 percent of the world’s telephone lines in 2005, most of the growth coming from mobile telephones, which outnumber fixed ones. In addition, worldwide Internet use more than quadrupled between 2000 and 2005 (United Nations 2006).

ICT makes a likely support tool for diffusion of innovations because of its nature, which involves an interrelationship between technology and the social environment: information systems require interaction with people (Berg 2003). Similarly, Rogers (1995) stresses the critical part that interpersonal networks play in diffusion of innovations. Taking the similarities one step further, the nature of health care as a field involves a social system of clients and providers, matching problems and solutions, through interaction of members of the system (Berg 2003). When the social aspects of knowledge management are considered (e.g., personal sharing of tacit—undocumented—knowledge), one can envision a model of KM using ICT that addresses the social contact aspect of diffusion. For example, for each of the KM challenges described previously, using tools and approaches that also address factors in diffusion of innovations while making use of ICT to speed the timeline can be particularly effective. The table below lists KM approaches and tools used in public health (Kols 2004) with their related diffusion factors and ICT aids.

KM Approach or Tool	Diffusion of Innovations Factor	ICT Aids
Challenge: Share Knowledge		
<p>Build social networks:</p> <ul style="list-style-type: none"> • Hold meetings and conferences • Establish teams • Form communities of practice (COPs)(i.e., network of people with a common interest sharing knowledge and support in-person or on-line) 	<ul style="list-style-type: none"> • Access to information and means of communication • Connectedness of networks • Homophily and heterophily (e.g., COPs bring together people similar in interest, but different in ways such as job titles, organizations, and geographic location) 	<ul style="list-style-type: none"> • On-line collaboration tools • On-line forums and listservs (e-mail discussion lists) • Videoconferences • Webcasts (presentations over the Internet) • Teleconferences • Short message service (text messages over cell phones)
<p>Help people locate key sources of knowledge:</p> <p>Knowledge maps (identifies where all knowledge exists on a given topic, be it with people, documents, etc.)</p>	<p>Opinion leaders need organized information from which to base a decision to adopt or reject an innovation</p>	<ul style="list-style-type: none"> • Web site maps • Canned search queries of database for popular topics • On-line information indexed by terminology commonly used in the subspecialty
<ul style="list-style-type: none"> • Preserve institutional memory: • Knowledge harvesting through 	<p>Sharing of recommendations from opinion leaders or change agents throughout a social system</p>	<p>Audio and video recordings of interviews with experts, digitized and offered on the Web or CD-ROM</p>

KM Approach or Tool	Diffusion of Innovations Factor	ICT Aids
interviewing of experts <ul style="list-style-type: none"> • Storytelling 		
Challenge: Learn from Experience		
Collect lessons learned and best practices: <ul style="list-style-type: none"> • Evaluation tools and results • Adapt proven approaches to local context (more efficient than starting brand new) 	<ul style="list-style-type: none"> • Help perceive reduced risk of innovation • Improve attitude toward change by viewing positive results of others 	<ul style="list-style-type: none"> • Electronic data entry and analysis tools for evaluation results • Searchable on-line repositories of evaluation results
Exchange tacit knowledge of best practices	<ul style="list-style-type: none"> • High identification with source of knowledge if viewed as similar to recipient (homophily) • Interpersonal contact aids diffusion 	<ul style="list-style-type: none"> • Listservs • Blogs (Web-based journals) • On-line forums
Challenge: Coping with too much or too little information		
Find trustworthy sources to filter, prioritize, and validate knowledge and information: <ul style="list-style-type: none"> • Use content experts • Author publications • Create systems to share knowledge 	<ul style="list-style-type: none"> • Receiving information from trusted content expert reduces perceived risk of innovation • Decreasing time to awareness of innovation may also 	<ul style="list-style-type: none"> • Electronic publications • E-mail alerts • RSS feeds (Real Simple Syndication—news aggregators from multiple sources)

KM Approach or Tool	Diffusion of Innovations Factor	ICT Aids
among workers at isolated locations	shorten entire timeline to decision to adopt	displayed in one software program) • Distance education

Teaming of KM approaches and ICT can result in unexpected complications, though. While technology-based outreach approaches can be useful in developing subspecialties in regions where there is a lack of specialists and dedicated departments (Pradeep 2007), the social implications may not be readily apparent. For example, participants around the world of a videoconference may not know the power struggles behind the scenes that determined which content experts were selected to make presentations. In addition, global knowledge sharing facilitated by the Internet (e.g., on-line forums) may still entail language barriers and cultural biases (e.g., reluctance to offer insights and lessons learned in the virtual presence of a perceived “expert”).

The following case example illustrates an approach to using the intersection of innovation theory, good practices in knowledge management, and information and communication technology to advance a public health subspecialty.

Bringing Together Innovation Theory, KM, and ICT: Case of The Family Planning and HIV/AIDS Integration Working Group

According to the United Nations Population Fund (UNFPA) and the World Health Organization (WHO) (2006), there are clear interactions between reproductive health and HIV/AIDS, most HIV infections being sexually transmitted or associated with pregnancy, childbirth, and breastfeeding. In addition, as people living with HIV experience a better quality of life with effective use of antiretrovirals, the need for family planning or fertility services rises among this group. There is emerging evidence of important synergies between reproductive health (RH) and HIV prevention, care and treatment interventions. Both expert organizations have stated that public health will benefit from linkages between reproductive health and HIV service delivery. The relative advantage of Integration innovation is clear—at least to

many public health experts—and a subspecialty of public health has emerged specifically addressing these linkages.

But adoption of Integration innovations in health systems must be funded and effectively sustained, posing equally clear environment challenges. Donors say “show me the evidence” that Integration innovation benefits—before releasing funds. And further among the communication channels, program planners and providers say “show me the best practices”—to help them implement integrated service programs. So a critical need to advance the field of HIV and RH Integration is knowledge management.

Forming a Knowledge Sharing Network

To address challenges in moving Integration forward, in 2004, the U.S. Agency for International Development (USAID) established a working group—the Family Planning and HIV/AIDS Integration Partners Working Group—with representatives from over 30 organizations, including private foundations, USAID and its partners and contractors, United Nations Population Fund, International Planned Parenthood Federation, U.S. Centers for Disease Control, and other key organizations involved in family planning and HIV/AIDS programming and research sought to explore ways to promote integration of family planning and HIV/AIDS services. The group initially met twice a year and early in discussions began identifying knowledge management needs, particularly regarding sharing information on key research and programming gaps. In 2005, the group tasked the Johns Hopkins Bloomberg School of Public Health Center for Communication Programs (CCP) with developing a knowledge management solution for the international development organizations that participated in the USAID working group. The first knowledge management tool developed was an on-line database and portal Web site: Resources for HIV/AIDS and Sexual and Reproductive Health Integration (<http://www.hivandsrh.org>). This initial tool was later supplemented by on-line collaboration tools, on-line forums, videoconferences, and an e-newsletter.

Helping People Locate Key Sources of Knowledge

As mentioned in an earlier section, KM approaches seek to facilitate sharing knowledge. Forming the FP/HIV Integration Working Group provided a social network and valuable source for knowledge sharing. CCP then needed a way to capture both tacit and explicit knowledge of group members and make that knowledge easy to locate.

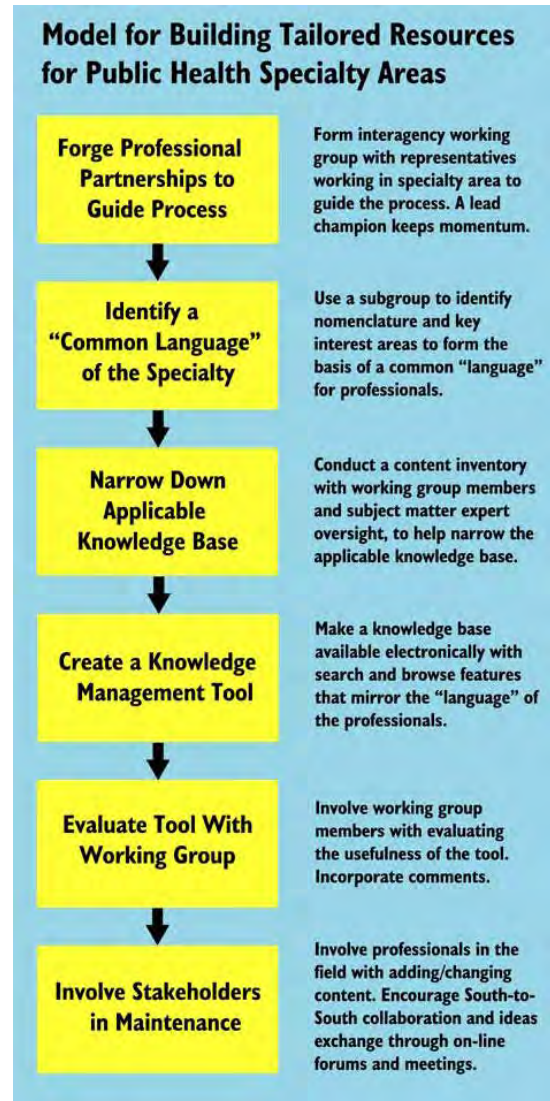
Once the working group decided on a need for a knowledge management solution, a development process began in which a subcommittee of the working group screened Integration content and advised on the information architecture for the database tool, while CCP leveraged its existing resources including over 350,000 citations in six databases that included scientific articles, communication materials, programmatic documents, photographs, and news items. A champion from the funder, USAID, was instrumental in keeping momentum in the process.

To jumpstart the effort to identify content, the working group members agreed to contribute to an inventory of known Integration resources that could be candidates for the tool. Most of the resources came from the working group member organizations. This process tapped into the tacit knowledge of group members, many of whom knew of Integration programs being conducted in the field, but about which information would be difficult to find because the programs were in

early stages and had yet to be documented in scientific journals. In fact, early on, the group agreed to include program documents in the inventory as well as research articles to reflect the state of Integration and document institutional knowledge. As the subcommittee reviewed and organized the inventory, familiarity with the body of knowledge grew, adding to the sense of commonality of the social network.

Mapping Knowledge

Creating a uniquely useable tool for the specialty area of Integration involved identifying the nomenclature that health professionals used when thinking about and discussing Integration. The subgroup members, USAID champion, and CCP jointly identified the Integration nomenclature. This terminology—consisting of a list of key topics, client groups, interest areas, and keywords—became part



of the resources tool as one-click searches or browse features of the database. For example, clicking on the key topic, “Contraception for HIV-Positive Women,” automatically searches the resources by a string of terms including HIV-positive, Persons living with HIV/AIDS, contraception, family planning, girl, women, and female.

Avoiding Too Much Information

CCP worked with an information technology partner to create a custom search interface for the tool—termed an “integrated user experience” because the tool needed to be more than just a search engine. The tool needed to give the user ways to filter through resources in a broad range of ways, such as by resource subtypes (e.g., communication materials, scientific articles), regions, keywords, and availability of full-text for downloading. By tying the database to CCP’s existing large-scale document delivery service, developing country users would also have the option to order free hard copy or electronic copy of many documents.

Helping Members Learn from Experience

An important avenue for diffusion of innovations is sharing of recommendations from opinion leaders or change agents throughout a social system. With this in mind, CCP facilitated multiple ways for network members to gain access to the views of opinion leaders. In an emerging public health subspecialty, the first important information may surface in professional presentations at meetings and conferences. CCP actively sought to archive and index presentations from significant conferences and meetings and make them searchable in the database tool. Further, CCP hosted multiple videoconferences and Webcasts, in which participants could view presentations by experts—thus addressing the geographic challenges in diffusion. These videoconferences were followed by on-line forums to discuss issues raised during the videoconferences. CCP also developed conference web pages with links to resources recommended by the experts. An on-line collaboration site allowed other members of the working group to upload documents to share, and a submission form on the website allowed members to submit documents for inclusion in the database. Finally, CCP interviewed program managers from successful Integration programs about their best practices and lessons learned, and posted the interview transcripts on the website in a “Voices from the Field” section, to give the sense of interpersonal communication with an expert.

How Has the Knowledge Management Tool Been Used?

In approximately two years, the on-line tool showed evidence of much information seeking behavior: it received over 64,000 visits from over 44,000 visitors in over 170 countries. Of the 1000 organizations accessing the site, the World Health Organization and USAID—opinion leaders in Integration—feature in the top forty active organizations (where the other 37 were unidentified organizations, Internet Service Providers, and one university in Germany). From 2007-2008, over 22,000 searches were performed on the database, with three search phrases appearing high on the list: “youth” (1899), “PMTCT” and “counselling” (1052), and “VCT” and “counselling” (454). These top search phrases correspond with high interest areas of innovation in Integration:

- Offering integrated services to youth, who are at the forefront of the HIV epidemic;
- Preventing mother-to-child transmission (PMTCT) of HIV by counselling pregnant and postpartum women on family planning; and
- Incorporating family planning counselling in HIV voluntary counselling and testing (VCT) services.

CCP conducted a voluntary on-line survey to solicit feedback from users of the Integration site. The survey was launched in May 2007 and completed by a total of 137 users from 42 countries.

Overall, 74% of respondents reported that the Integration site positively influenced their daily work. Repeatedly, respondents indicated that the site was a great resource because it provided them with convenient access to the latest information and tools selected by subject matter experts, and it saved them considerable time in researching relevant and evidence-based resources on the Internet.

In addition, survey respondents indicated that they incorporated the information they obtained from the Integration site and database into policy, programs, research practice as well as training or education efforts. Specific examples are presented below.

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Policy: Respondents whose primary job responsibility is in the area of policymaking and advocacy reported that they used the Integration resources to develop or improve policy or national service delivery guidelines.: Respondents whose primary job responsibility is in the area of policymaking and advocacy reported that they used the Integration resources to develop or improve policy or national service delivery guidelines.

“UNFPA Country Office is developing guidelines on HIV/AIDS and SRH Integration in Pakistan. We reviewed various resource documents.” – Program Officer working for UNFPA in Pakistan

“We have used the information in the design of HIV/AIDS and SRH Integration guidelines.” – Policymaker working for USAID in Nigeria

Program: Respondents whose primary job responsibility is in the area of program development and management reported that they used the Integration resources to design or improve projects or programs.

“It has been very useful in the implementation of two HIV/AIDS projects that I am currently coordinating, particularly in the training of nurses and midwives on PMTCT activities.” – Educator/program manager working for an academic institution in Ghana

“I am writing a position paper on integration of HIV and SRH services in our country program and information from integration website has been very the key to make our paper strong, professional and evidence informed.” – Program manager working for an NGO in Myanmar

“We have used the research studies as the basis of public awareness campaigns on sexual health issues.” – Health service provider working for an NGO in Australia

Research: Respondents whose primary job responsibility is in the area of research and evaluation reported that they used the Integration resources to guide research agenda or methods, and to put research findings into practice.

“We are conducting a review of the evidence that exists for HIV-SRH linkages at the service delivery and policy levels. The review is meant to summarize experiences to date, identify promising practices and potential for scale-up and identify research gaps.” – Researcher working for an academic institution in the U.S.A.

“Our organization produces different research on areas of SRH; we use to refer to the HIV/SRH integration web-site for this.” – Program director working for an NGO in Ethiopia

Training: Respondents whose primary job responsibility is in the area of teaching and training reported that they used the Integration resources to develop training programs or workshops, and to assist in designing educational materials.

“I am currently using it for training of church leaders to create an enabling environment for increased uptake of reproductive health services among Presbyterian Church of Nigeria members.”

– Program manager/trainer working in a religious/faith-based organization in Nigeria

“The information available was used in the training programs organized for various stakeholders. This also helped our staff for updating their knowledge and skills.” – Program manager/trainer working for an NGO in India

“The information was used in developing a training program known as PEER EDUCATOR for rural areas in Abia State, Nigeria. Some of the materials used in the training were taken directly from the web site.” – Educator working for an NGO in Nigeria

Case Summary

Along the process of working with the FP/HIV Integration Working Group, CCP conceived of knowledge management approaches using information technology to foster innovation in Integration. These approaches related to factors in innovation adoption as follows (JHU/CCP 2006):

- Demonstrate the benefits of certain approaches to Integration by highlighting best practices and evaluation results of pilot programs (relative advantage),
- Relate emerging Integration policy, program and research practices to current HIV/AIDS and family planning practice (compatibility),
- Provide clear steps for application through sample program documents, job aids, and training materials (complexity),
- Provide examples and exchange among policy makers, program managers, and researchers of the experience with different approaches to Integration through on-line forums, videoconferences, and documented interviews (observability), and
- Suggest easy ways to try these methods through descriptions of pilot programs (trialability).

By addressing some of these key predictors of adoption and diffusion of innovations, the project increased the use (adoption) of Integration information by key decision-makers, thus informing and enhancing policy, programs, and research. In turn, the Integration resource contributed to better,

integrated healthcare programs through which HIV-positive and –negative clients can efficiently access needed sexual and reproductive health and HIV services and make informed choices about their health care.

In addition, by systematically finding sound innovations and pulling content on Integration from non-USAID and Southern (e.g., Africa) partners and disseminating that information through the website, on-line forums, and e-newsletter, CCP provided greater access to innovations through a variety of means of communication, one of the environmental factors stated previously.

Conclusion

Emerging public health subspecialties are often characterized by lack of a readily identifiable and useable body of knowledge. Innovative ideas may be diffused slowly through interpersonal contact or unpublished literature until traditional means of scientific communication catch up, such as scientific publishing and conferences. Accelerating diffusion of innovations within an emerging public health subspecialty can be aided by using approaches that leverage the intersections of diffusion of innovations theory, knowledge management principles, and information and communication technology.

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Reviewed by Heather Johnson, Johns Hopkins Bloomberg School of Public Health Center for Communication Programs.

4.3 Paper 3. Exploratory study of the role of knowledge brokers in translating knowledge to action following global maternal and newborn health technical meetings

Exploratory study of the role of knowledge brokers in translating knowledge to action following global maternal and newborn health technical meetings

Citation:

Norton, T.C., Rodriguez, D. C., Howell, C., Reynolds, C., & Willems, S. (in press) “Maybe we can turn the tide.” An explanatory mixed methods study to understand how knowledge brokers mobilize health evidence in low- and middle-income countries. *Evidence & Policy*.

Research Aim:

To identify common attributes and activities of knowledge brokers working in LMICs

Abstract

Objectives: There have been increasing calls for more research on interventions to successfully translate evidence-based knowledge into improved health policy and practices. This paper reports on an exploratory study of knowledge translation interventions conducted with participants of global health meetings held in Bangladesh in 2012 and in South Africa in 2013. We measured stakeholders’ uptake of evidence-based knowledge in terms of their translation of this knowledge into actions around public health policy and practice. The research sought to determine whether participants shared and used knowledge from the meetings to improve health policy and practices in their settings and the factors influencing sharing and use.

Study Design: An exploratory study employed quantitative and qualitative methods of online surveys and in-depth interviews to collect data from all meeting participants.

Methods: All participants in the Bangladesh and South Africa meetings were invited to complete an online survey during the meetings and over the following six weeks. Of 411 participants in the 2012 Bangladesh meeting, 148 participants from 22 countries completed the survey. Eleven of these respondents (from eight countries) were interviewed. Of the 436 participants in the 2013 South Africa meeting, 126 respondents from 33 countries completed an online survey; none of these respondents were interviewed.

Results: The analysis revealed that most respondents used new knowledge to advocate for policy change (2012: 65.5%; 2013: 67.5%) or improve service quality (2012: 60.1%; 2013: 70.6%). The type of

knowledge that respondents most commonly shared was clinical or scientific information (2012: 79.1%; 2013: 66.7%) and country-specific information (2012: 73.0%; 2013: 71.4%). Most 2012 respondents shared knowledge because they thought it would be useful to a co-worker or colleague (79.7%).

Discussion: Findings on knowledge use and sharing suggest that most respondents saw themselves as knowledge brokers or intermediaries in a position to influence the translation of knowledge into action in health policy and practices in their countries. Results suggest that supporting knowledge brokers working in a local and regional context to spur change, as described in the paper, has the potential to improve health outcomes. Further research is needed to isolate specific interventions and their knowledge translation outcomes.

Keywords: Knowledge management; Global health; Knowledge broker; Knowledge translation; Maternal health; Newborn health

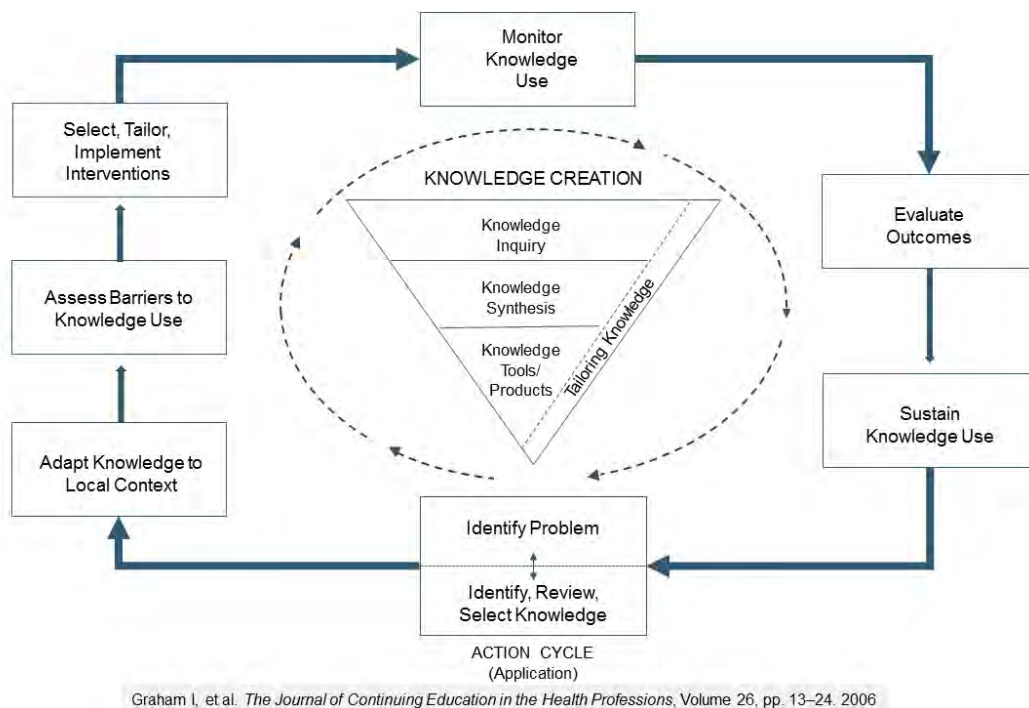
Introduction

Taking advantage of opportunities to increase the uptake of knowledge of “what works” in health policy and practice—reducing what is sometimes called the “know-do” gap—is an urgent need in public health and one of growing interest. (Dobbins, Hanna, et al., 2009; Graham et al., 2006a; Mitton, Adair, McKenzie, Sb, & Pb, 2007; Pablos-Mendez & Shademani, 2006; Ward, House, & Hamer, 2009; World Health Organization, 2005) Applying research evidence leads to high-quality and cost-effective health care and optimal health outcomes, but the “know-do” gap often results in that research evidence not being translated into action. (Dobbins, Hanna, et al., 2009; Graham et al., 2006a; Ward et al., 2009) Consequences of the know-do gap are most evident in avoidable deaths among the poor and marginalized and failure to reduce health inequalities. (Pablos-Mendez & Shademani, 2006; Welch et al., 2009) Among the relevant terms mentioned in know-do theories and models, and one growing in use is “knowledge translation.”

Knowledge translation refers to the synthesis, dissemination, exchange, and application of knowledge among research providers and users to improve health outcomes through evidence-based policy and practice. (Canadian Institutes of Health Research, 2015; Landry, Amara, Pablos-Mendes, Shademani, & Gold, 2006; World Health Organization, 2005) The World Health Organization’s (WHO’s) World Report

on Knowledge for Better Health: Strengthening Health Systems (World Health Organization, 2004) identified translation of knowledge from science to practice as a priority action for reaching Millennium Development Goals by 2015.

A number of models and frameworks have been proposed to explain successful approaches to knowledge translation, such as Graham et al.'s Knowledge-to-Action (KTA) Framework (Graham et al., 2006a) (Figure 1). This framework provides a useful conceptual basis for analyzing evaluation data on knowledge translation interventions in global health programs, as is discussed later in this paper. The KTA Framework portrays the movement of knowledge to application in two main processes, Knowledge Creation and Knowledge Action, which overlap and interact in a cycle of evaluation and refinement over the course of a health program. Important aspects of knowledge translation frameworks such as this one include interrelated processes for creating and synthesizing knowledge, distributing knowledge tools and products, and adapting knowledge to local interventions that successfully address barriers to implementation. A role often mentioned in these KTA processes is that of knowledge broker.



Graham I, et al. *The Journal of Continuing Education in the Health Professions*, Volume 26, pp. 13–24. 2006

Figure 1. Graham's Knowledge-to-Action Framework

Knowledge brokers: facilitators of knowledge translation

In knowledge translation processes, knowledge brokers facilitate interactions between researchers and users who apply research findings to policies and practice. (Dobbins, Hanna, et al., 2009; Dobbins,

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Robeson, et al., 2009; Pablos-Mendez & Shademani, 2006) Knowledge brokers help research users adapt findings to a local context. Individuals, as well as organizations,(Dobbins, Robeson, et al., 2009; Lomas, 2007) fill the role of knowledge brokers.(Mitton et al., 2007)

Both organizational and individual knowledge brokers play a part in global health development. Many organizations work across geographic and financial boundaries to create and act on knowledge, which leads to improved evidence-based health policies and practices.(Sullivan, Limaye, Mitchell, D'Adamo, & Baquet, 2015) These knowledge brokering organizations include nongovernmental organizations (NGOs) and international health organizations such as the WHO and United States Agency for International Development (USAID) and its implementing partners—such as partners of the Knowledge for Health Project (Sullivan et al., 2015) and the Maternal and Child Health Integrated Program (MCHIP).(J. M. Smith, de Graft-Johnson, Zyaee, Ricca, & Fullerton, 2015),(Brien & Richey, 2010) Within these organizations, individual brokers act as catalysts to bring together stakeholders and move knowledge creation to action. The data examined in this paper illustrate the role of knowledge brokers in knowledge translation.

Background

This paper focuses on knowledge translation efforts of global health programs such as USAID's MCHIP (led by Jhpiego), Save the Children's Saving Newborn Lives (SNL) Program, and programs supported by UNICEF and other major donors. These programs aimed to scale up evidence-based, high-impact maternal, newborn, and child health interventions in low-resource countries to reduce mortality and improve service quality.(J. M. Smith et al., 2015) To this end, MCHIP, SNL and other similar organizations integrated knowledge translation into implementation of its programs. These organizations and programs served as knowledge brokers between global leaders, such as the WHO, and country stakeholders and also cultivated individual knowledge brokers in the countries where they worked to foster change.

One knowledge brokering approach utilized by these maternal and newborn health programs was to periodically hold technical meetings with stakeholders in Africa, Asia, and worldwide. The format of the maternal and newborn health technical meetings, as shown in Figure 2, included knowledge creation and knowledge action activities that coincided with Graham et al.'s KTA Framework.(Graham et al.,

2006a) Meeting planners carefully selected and grouped participants according to country, forming country teams composed of health professionals in roles needed to galvanize action on the conference topic. Roles included policy advocates, health care practitioners, and health program managers. Before the meetings, planners and country teams created a synthesized list of priority technical problem areas (e.g., postpartum hemorrhage) to address during the meetings, which provided a focus for later action. Based on meeting priorities, country teams analysed their local or regional situation regarding the technical problems and created a synthesized view of the analysis (a knowledge product in the form of a poster) to share with other country teams at the meetings. In addition to providing a knowledge product, the synthesis process helped country teams prepare their thinking for acquiring new technical knowledge during the meetings and tailoring the knowledge to local needs after the meetings. Meeting planners also created knowledge products, such as key message briefs linking evidence to the technical problem, to use during and after the meetings as an aid for action.

During the meeting, participants worked together to prepare for action after the meetings. Preparation included discussing barriers to implementation with global experts (e.g., the WHO) and other country teams and drafting action plans. Interactive, skill-building sessions (such as practicing the Helping Babies Breathe® newborn resuscitation technique) also helped participants prepare for acting on the knowledge after the meetings.

The work of the meeting planners and country teams as knowledge brokers led to successful knowledge creation and transition to knowledge action as shown by data collected from participants after the meetings and external reports and communications.

The actions of the Pakistan team before, during, and after the 2012 Bangladesh conference offer a good example of how the process worked. In 2012 the team from Pakistan was composed of members working for UN agencies, government, NGOs, and academic institutions in the areas of program development and management, health service delivery, advocacy, and teaching and training. In preparing their country situational poster, the Pakistan team identified priority interventions for their country related to preventing postpartum hemorrhage and pre-eclampsia/eclampsia. This preliminary action plan was refined during the conference. The Pakistan poster also identified planned advocacy activities, including forming a Maternal, Newborn, and Child Health (MNCH) Pakistan Advocacy Group. Other plans included knowledge brokering activities with stakeholders, such as organizing seminars and

technical update sessions about evidence-based interventions.(Currie, Graft-Johnson, Galloway, & Sheehan, 2012)

According to interviews and survey responses, one of the areas in which the Pakistan team gained knowledge during the conference was on the use of misoprostol to prevent postpartum hemorrhage. After the conference, the team worked with provincial departments of health, professional bodies, academic institutions, civil society organizations, and development partners to advance the introduction and scale-up of evidence-based interventions to prevent postpartum hemorrhage. (Maternal and Child Health Integrated Program, 2013b) These interventions, called out in the Lahore Declaration of 30 May 2012, included adding misoprostol to the essential drug list.(Maternal and Child Health Integrated Program, 2013b) While not directly related to the work of the MNCH Pakistan Advocacy Group, a media report in The [Pakistan] Express Tribune on 11 January 2013 noted inclusion of misoprostol on the Peshawar provincial essential drug list.

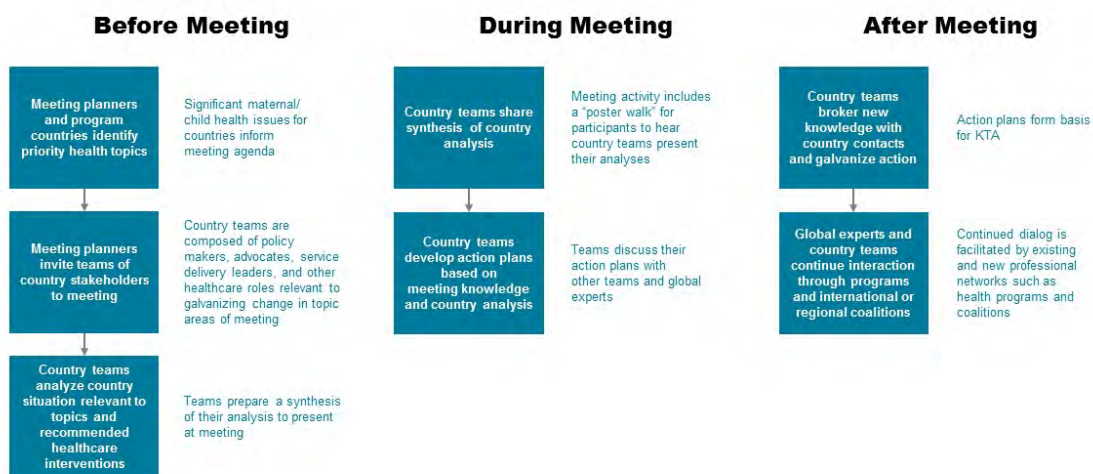


Figure 2. Before, During, and After Steps of the Meeting Process

Research purpose

This paper assesses the effectiveness of two maternal and newborn health technical meetings as knowledge translation interventions. The purpose of the research was to: (1) evaluate whether knowledge gained from the meetings was used by participants to address global health policy and practice and was shared with other global health practitioners, and (2) identify factors influencing participant knowledge sharing and use.

Methods

Study design, settings, and response rates

This exploratory study employed quantitative and qualitative methods for data collection. The methods consisted of online surveys offered to participants of a maternal and newborn health meeting in 2012 in Bangladesh and a newborn health meeting in 2013 in South Africa and individual interviews with participants of the 2012 Bangladesh meeting.

Everyone who attended the two maternal and newborn technical meetings was invited to participate in the study. The first meeting studied was held in Dhaka, Bangladesh, in May 2012 with 411 participants from 30 countries.(Currie et al., 2012) The second meeting was held in Johannesburg, South Africa, in April 2013 with 436 participants from 50 countries.(Maternal and Child Health Integrated Program, 2013a)

At the meetings, organizers invited all attendees to complete a survey at a computer kiosk. Responses rates during the meetings were 8% for the 2012 Bangladesh meeting and 25% for the 2013 South Africa meeting. Researchers sent email reminders within six weeks after the meeting to all attendees asking them to complete the survey online. A total of 148 respondents completed the 2012 Bangladesh survey (a response rate of 36%), 11 respondents agreed to an interview in 2012 (a response rate of 3%), and 126 respondents completed the 2013 South Africa survey (a response rate of 29%). Interviews with 2012 Bangladesh participants were conducted five to six months after the meeting.

Data collection and ethics approval

The surveys were created using SurveyMonkey®, a web-based service (www.surveymonkey.com). Questions asked about respondents' characteristics (such as country, type of work, and type of organization), knowledge-use behaviors (such as how they applied or intended to apply knowledge they gained at the meeting to their work), and knowledge-sharing behaviors (such as with whom they shared or intended to share knowledge from the meeting and motivation for sharing). Some of the survey questions were open-ended (e.g., examples of knowledge use). For the 2012 Bangladesh survey, respondents could also agree to be contacted for an interview. No other personally identifiable information was collected. Respondents were not paid for participating, but they could elect to enter their email address for a prize drawing as a thank-you for participating in the survey.

For the 2012 interviews, a student intern was engaged by the research team to contact respondents who agreed to be interviewed. She scheduled and conducted the interviews. The intern was a candidate for a master's degree in public health and also held a Doctor of Medicine degree. She did not have a prior relationship with the participants. Of the 62 respondents providing contact information for a follow-up interview, 11 responded to an email message and agreed to a date and time for an interview. The interviewer began by reading the oral consent script and getting the respondent's verbal agreement to be interviewed and recorded. Then the interviewer asked a series of open-ended questions, followed by probes to expand on answers. Following the interviews, the intern transcribed the recordings, omitting any personally-identifiable information other than country, type of work, and type of organization.

The 2012 Bangladesh research was approved by the Johns Hopkins Bloomberg School of Public Health Institutional Review Board (IRB). The IRB excluded the 2013 South Africa research from the human subject research approval process because the authors performed a secondary analysis of de-identified data collected by another team among the meeting planners.

Data analysis

Independent variables in the quantitative analysis were participant's type of work, type of organization, and location. Two knowledge translation outcomes were analysed: extent of meeting knowledge use in health policy and practice and extent of sharing of meeting knowledge.

Redacted transcriptions (without identifiers) from the 2012 interviews were analysed by manually identifying common themes related to the study questions, documenting unusual responses, and compiling illustrative quotes. These themes were then used to characterize open-ended responses to the surveys. Open-ended survey questions captured examples of knowledge use. Examples were collected in the 2012 Bangladesh survey (n=55), 2013 South Africa survey (n=71), and 2012 interviews (n=11). Team members analysing qualitative responses were different from those analysing quantitative responses.

Results

Characteristics of respondents

Respondents to the 2012 Bangladesh and 2013 South Africa surveys represented a wide range of regions and experience. Respondents from both surveys (n=148 in 2012; n=126 in 2013) reported being based in Africa, Europe, North America, and Southeast Asia (22 countries in 2012; 33 countries in 2013). The largest proportion of 2012 Bangladesh respondents reported being based in Southeast Asia, while most 2013 South Africa respondents reported being based in Africa. Program developers/managers represented the largest percentage of respondents (45.9% in 2012; 54.8% in 2013), followed by health/medical service delivery personnel (25.7% in 2012; 15.1% in 2013). Most respondents worked with local and international NGOs (43.9% in 2012; 34.1% in 2013).

Table 1 presents survey responses for type of organization and type of work for the 2012 Bangladesh maternal and newborn health meeting and 2013 South Africa newborn health meeting.

Table 1. Type of organization and type of work for 2012 and 2013 survey respondents

Demographic Attribute		Percentage of Respondents		
		2012 Survey (n=148)*	2013 Survey (n=126)	Total (n=274)
Type of Organization	Academic/Research Institution	12.2%	10.3%	11.3%
	Donor	11.5%	12.7%	12.0%
	Government/Ministry	8.1%	20.6%	13.9%
	Medical/Health Organization	7.4%	4.0%	5.8%
	NGO/PVO (local and international)	43.9%	34.1%	39.4%
	Private Sector (for profit)	0.7%	2.4%	1.5%
	United Nations System	11.5%	14.3%	12.8%
	Other	4.7%	1.6%	3.3%
Type of Work	Advocacy	3.4%	2.4%	2.9%
	Health Communication	0.7%	2.4%	1.5%
	Health/Medical Service Delivery	25.7%	15.1%	20.8%
	Policymaking	1.4%	10.3%	5.5%
	Program Development/Management	45.9%	54.8%	50.0%
	Research/Evaluation	10.1%	7.9%	9.1%
	Teaching/Training	6.8%	4.8%	5.8%
	Other	6.1%	2.4%	4.4%

Use of knowledge from the meetings

Figure 3 shows the types of use (or intended use of) of knowledge from predefined categories. Advocacy for policy change (65.5% in 2012) and service quality improvement (70.6% in 2013) were the two uses most commonly cited. Examples of use reported through open-ended responses and interviews provided additional details about use. Respondents frequently mentioned taking an active role in sharing by packaging the knowledge into new products, though they categorized this as a type of use and included words such as “disseminate,” “forward,” and “tell.” Respondents in all reported types of work gave examples of knowledge use.

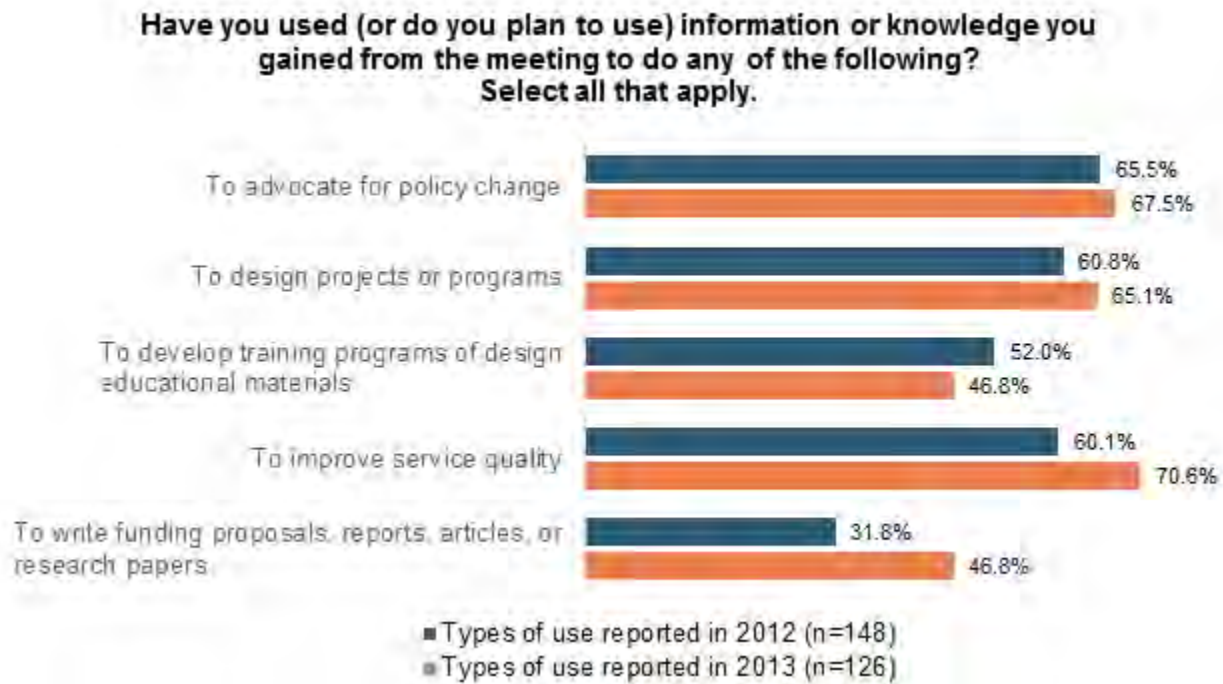


Figure 3. Types of use (or planned use) of knowledge by 2012 and 2013 respondents

Advocating for policy change

Interview respondents gave multiple examples of using knowledge gained from the meetings to advocate for policy change, such as adding drugs that were part of interventions described at the meetings to the essential medicines lists.

We have changed. Misoprostol was not part of the essential drug list, and due to the group following the conference...[it] has been incorporated in provincial essential drug list. (Advocate/trainer, Pakistan; 2012 interview).

Other advocacy examples involved adapting meeting knowledge for use in a local context and sharing with those in a position to change policies.

My country team is developing a post-conference plan that will include general information on the newborn, lessons learnt from the conference, and recommendations on what lessons we can adapt or replicate as well how these will align with our national policy on child health. The plan will be shared with the host country health leadership for adaption. As the focal point for the Agency, I will follow up with the Ministry. (Program developer/manager, Ghana; 2013 survey).

Improving healthcare service quality

Examples of knowledge use for improving health care included changes in service delivery at the hospital or community level, modifications to training, and practice of new techniques with provincial staff.

I met with the KMC [Kangaroo Mother Care] committee of the national maternity hospital where the largest KMC program in the country is being implemented, shared the information, and planned on a follow-up workshop in “next steps” to further improve the program, in particular documentation and ambulatory KMC. (NGO/PVO worker, Philippines; 2013 survey).

Designing projects or programs

Respondents who gave examples of use of new knowledge to design programs reported that they shared the information with groups involved in program or project design in order to gain acceptance of an intervention that was discussed at the meetings.

New preventive interventions in PPH [postpartum hemorrhage] and PE/E [pre-eclampsia/eclampsia]...going to discuss it with the technical working group of RH [reproductive health] and we will have a plan to mainstream them in essential obstetric care for midwives and doctors. (Policymaker, Yemen; 2012 survey).

Developing training or educational materials

Several examples of use mentioned conducting training of health care providers on the newborn resuscitation technique covered in the skills sessions of the meetings.

Helping Babies Breathe (HBB): in July 2012... [we] added a skills test for HBB to the clinical standardized service training for the clinical staff of the medical college [in the state of Jharkhand in India]. (Program developer/manager, India; 2012 interview).

Using clinical information for writing/sharing

Other examples respondents gave included using information for health care-related procurement and guidelines.

Disseminate the clinical updates of misoprostol and give inputs to [name of NGO in a country]'s international procurement department for how to procure misoprostol. (Program developer/manager, Myanmar; 2012 survey).

Integration of HBB [Helping Babies Breathe] in the BEmOC [basic and emergency obstetric care] and ENC [essential newborn care] guidelines. (Program developer/manager, Senegal; 2013 survey).

Sharing information or knowledge from the meetings

Respondents to both surveys reported being more likely to share information with people they knew than with others outside of their close contacts, such as members of online discussion groups (Figure 4).



Figure 4. Types of recipients of knowledge sharing by 2012 and 2013 respondents

Meeting respondents also reported sharing most types of information (Figure 5). Clinical or scientific information (79.1% in 2012) and country-specific information (71.4% in 2013) had the highest percentage of responses, which were similar to percentages for other types of information, with the exception of information about journal articles or publications (45.3% 2012; 32.5% 2013).

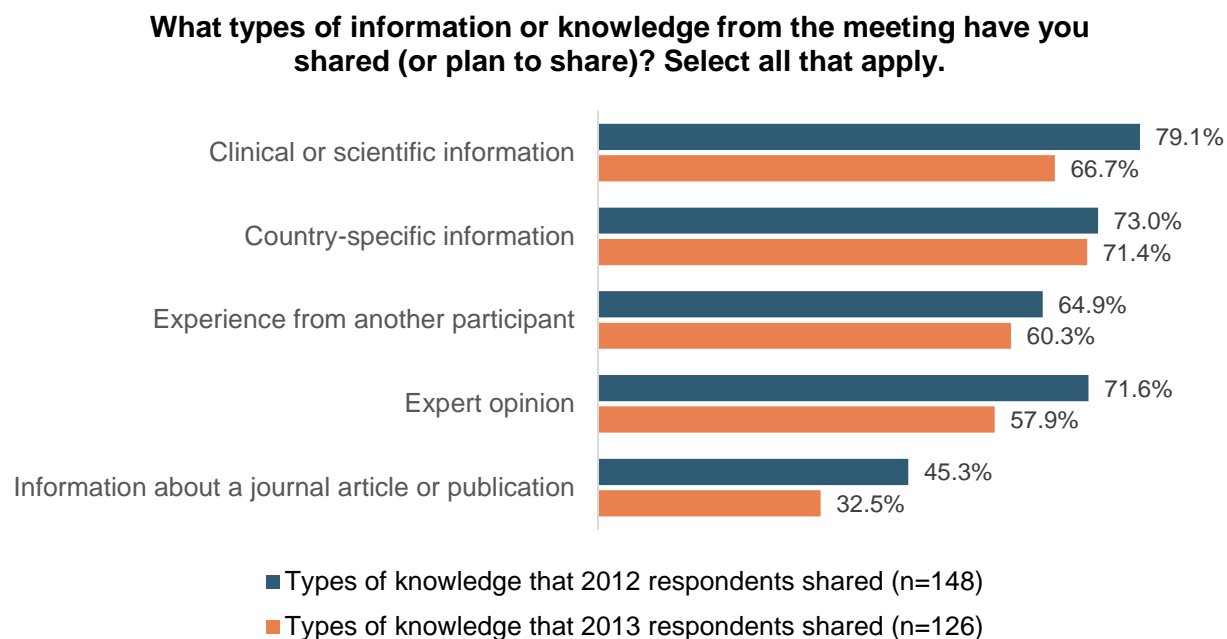


Figure 5. Types of knowledge shared (or planned to share) by 2012 and 2013 respondents

Reasons for sharing or not sharing knowledge

When asked why they shared information gained from past or current meetings, respondents to the 2012 Bangladesh survey most often said they thought it would be useful for a co-worker or colleague (79.7%) or others in their field (75.0%). Over half also cited their desire to improve service delivery (59.5%), and that reasoning was confirmed in interviews.

Among the small number of respondents who gave a reason why they did not share knowledge from the meeting (8.8% in 2012; 7.1% in 2013), not enough time to share (4.1% in 2012; 6.3% in 2013) and language as a barrier (3.4% in 2012; 0.0% in 2013) were the leading reasons.

Discussion

The purpose of this research was to evaluate the effectiveness of maternal and newborn health technical meetings that were designed to promote knowledge creation and knowledge brokering in moving evidence-based knowledge to action to improve health policy and practice. Specifically, the

research sought to determine if meeting knowledge was used and shared by participants and the factors influencing use and sharing.

Anecdotal evidence suggests that the technical meetings described in this paper—which incorporated knowledge creation and action processes similar to Graham et al.'s KTA Framework⁴—yielded intended outcomes in the form of scaled-up interventions. For example, follow-up communications with country teams after the 2012 Bangladesh meeting suggested that engagements at the meeting contributed to calls for action in Asia and sub-Saharan Africa to scale up the use of misoprostol as an intervention to prevent postpartum hemorrhage, now recognized globally as an essential commodity. (Karanj, Muganyizi, Rwamushaija, Hodoglugil, & Holm, 2013; Maternal and Child Health Integrated Program, 2013b; J. Smith, Graft-Johnson, Stolarsky, & Taylor, 2012) Following the 2013 South Africa meeting, India's health ministry announced significant policy changes relating to scaling-up key interventions related to newborn health. (Khurmi, Karpe, & Kaur, 2015)

Study results show that meeting participants did use and share the knowledge in order to improve health policy and practice and that a desire to share useful information with colleagues was a motivating factor. Open-ended responses and interviews mentioned aspects of the meetings that literature shows are facilitators for KTA. (Mitton et al., 2007; Scott et al., 2012) For example, the importance of human interaction came across in comments about country teams working together prior to, during the meetings and continuing efforts after the meetings, as did mentions of redistributing knowledge to colleagues. Another KTA facilitator—interactive learning activities for decision-makers—was referenced multiple times by participants who trained others after the meeting on the Helping Babies Breathe technique they learned during the skills sessions. The meetings' approach of engaging participants from multiple health care roles and at multiple stages—before, during, and after a technical meeting—is a promising practice for moving participants from knowledge to action.

According to the responses, many respondents see themselves as knowledge brokers. Multiple examples of use described repackaging and sharing evidence-based knowledge to influence uptake in policy and practice, a typical role for a knowledge broker. Evidence suggests that knowledge brokers can be most effective when facilitating uptake of knowledge in the form of key messages with an audience predisposed to act on evidence. (Dobbins, Hanna, et al., 2009) The meetings' design reflected this promising practice by focusing on a few technical problems with associated technical briefs and other

knowledge products that participants could take back to their countries for use. Multiple open-ended responses and interviews mentioned the content of the key messages, which suggests that they resonated with participants. The combination of focused key messages with knowledge products that can be adapted for local use by knowledge brokers is another promising practice for translating knowledge into action.

Limitations

A limitation of the 2012 Bangladesh survey and 2013 South Africa survey were the low response rates (36% 2012; 29% 2013) and self-selection of respondents. Those who chose to respond may have been exceptionally motivated to act on knowledge. In addition, unlike in 2012, no in-depth interviews were conducted in 2013.

Conclusions

An interactive meeting format alone does not ensure knowledge translation afterwards. (R. K. Rushmer et al., 2014) Engagement of country teams and meeting planners in a process involving actions before, during, and after meetings—as described in this paper—are needed to facilitate KTA in a local context to improve health policy and practice. Supporting knowledge brokers at technical meetings in ways that incorporate knowledge creation and action processes (as described by Graham et. al(Graham et al., 2006a)) before, during, and after the meeting is a promising practice for knowledge translation to improve health policy and practice. While the findings described in this paper do not clearly associate specific meeting design and participant attributes with intended knowledge translation outcomes, respondents' comments about the meetings' elements suggest that promising practices for planning meetings include knowledge translation interventions such as those described in this paper. Further research is needed to isolate the effects of KTA interventions on intended outcomes in global health policy and practice.

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Authors’ Contributions

TN was involved in designing the study, analyzing data, and drafting the manuscript. CH helped draft the manuscript, analyze data, and design the survey for the 2013 South Africa meeting. CR reviewed and helped revise the manuscript, helped plan the 2012 Bangladesh meeting, and provided input on the survey for the 2012 Bangladesh meeting.

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4.4 Paper 4. “Maybe we can turn the tide:” An explanatory mixed methods study to understand how knowledge brokers mobilize health evidence in low- and middle-income countries

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Research Aim:

To identify common attributes and activities of knowledge brokers working in LMICs

ABSTRACT

Background: Little is known about how knowledge brokers (KBs) operate in low- and middle-income countries (LMICs) to translate evidence for health policy and practice. These intermediaries facilitate relationships between evidence producers and users to address public health issues.

Aims and objectives: To increase understanding, a mixed methods study collected data from KBs who had acted on evidence from the 2015 Global Maternal Newborn Health Conference in Mexico.

Methods: Of the 1000 in-person participants, 252 plus 72 online participants (n=324) from 56 countries completed an online survey, and 20 participants from 15 countries were interviewed. Thematic analysis and application of knowledge translation (KT) theory explored factors influencing KB actions leading to evidence uptake. Descriptive statistics of respondent characteristics were used for cross-case comparison.

Findings: Results suggest factors supporting the KB role in evidence uptake, which include active relationships with evidence users through embedded KB roles, targeted and tailored evidence communication to fit the context, user receptiveness to evidence from a similar country setting, adaptability in the KB role, and action orientation of KBs.

Discussion and conclusions: Initiatives to increase evidence uptake in LMICs should work to establish supportive structures for embedded KT, identify processes for ongoing cross-country learning, and strengthen KBs already showing effectiveness in their roles.

Key words:

Knowledge brokers; Knowledge translation; Evidence-informed decision making; Low- and middle-income countries

KEY MESSAGES

- Little is known about how knowledge brokers mobilize evidence in low- and middle-income countries
- A multi-country study of knowledge brokers identified promising practices for evidence uptake
- Embedded brokers who adapted messaging and evidence to context in active relationships worked well
- Capacity building should use KB promising practices and facilitate multi-country evidence exchange

BACKGROUND

Insufficient use of research evidence for health policy and practice poses a global challenge that affects the quality of care and ultimately health outcomes (Bornbaum et al., 2015; Dagenais et al. 2015; Wong, 2017) . The health burden of insufficient evidence use in health care is particularly felt in low- and middle-income countries (LMICs): there were an estimated 303,000 maternal deaths worldwide in 2015, most of which were in LMICs and preventable (Alkema et al., 2016). While there is widespread agreement that contextually relevant research has the potential to address health challenges for the world’s most disadvantaged, opinions vary on who can best galvanize evidence use and how (Commission on Health Research for Development, 1990; Conalogue, Kinn, Mulligan, & McNeil, 2017; Global Forum for Health Research & Nuyens, 2005; Paudel, 2015).

Because uptake of health research evidence takes place in complex health systems, one mechanism that has emerged in evidence advocacy is linkage agents or intermediaries between evidence producers and users who help navigate the complexities of evidence-to-action. Organizations or individuals in these linkage roles are often referred to as knowledge brokers (KBs). They facilitate the translation of knowledge into evidence-informed decision making (EIDM) in health policy and practice (Dobbins et al. 2009; Lomas 2007; Jessani et al. 2016; Van Kammen et al. 2006; Kim et al. 2018; Dagenais et al. 2015; Pennell et al. 2013; Canadian Health Services Research Foundation 2003; Norton et al. 2016). A key

value of KBs is their ability to raise awareness of relevant evidence, which might not otherwise occur with passive dissemination (e.g., publishing alone).

How the KB role exists varies. KBs may be embedded in organizations, such as in Knowledge Translation (KT) units, or function as consultants for the duration of a project. Individuals with a primary professional role to which KB duties are added may work as policy advocates, health program implementers, faculty members, or ministry of health staff. KB activities often include building relationships and professional networks among research users and producers to foster the flow and use of evidence (Van Kammen et al., 2006; Dobbins et al., 2009), critically appraising evidence (Weiss and Bucuvalas, 1980; Lind and Persborn, 2000; Jessani et al., 2016; Van Eerd et al., 2016), and mobilizing change based on evidence (Van Eerd et al., 2016). In filling their role, KBs operating in LMICs may face more challenges than in higher-income settings, such as greater resource and infrastructure limitations and international pressures (Malla et al., 2018). The extent and nature of challenges influencing KBs and their ability to function in their role vary with the country’s level of development, organizational contexts, access to resources, and political agendas (Orem et al., 2014). Moving evidence to action in a low-resource country such as Ethiopia may require different strategies for overcoming challenges than in a country with more resources such as India, in addition to addressing other contextual issues. Decisions on evidence uptake in LMICs often lie at the intersection of science, politics, environment, and beliefs. Political stakeholders may drive priorities in healthcare, populations may exert pressure on decision-makers, and political approval processes may slow progress (Datta et al., 2016; Parkhurst & Abeysinghe, 2016). Examining a traditional scientific hierarchy of evidence may influence decisions less than a decision-maker’s own values, knowledge gained from experience, or locally derived knowledge (Datta et al., 2018; Nugroho et al., 2018; Rushmer et al., 2019).

Even when evidence informs decisions in health policy and practice, operationalization may stall due to factors such as workforce capacity, resource allocation, natural disasters, and political changes (Datta et al., 2018; Dobbins et al., 2018). Policy research organizations and units may need strengthening to ensure regular engagement with policymakers and assessments of research use (Datta et al., 2016). Leadership support for research generation and use presents a need shared by both higher-income and LMIC settings (Datta et al., 2016; Dobbins et al., 2018).

The literature paints an uneven picture of the approaches, circumstances, and individual attributes leading to knowledge brokering positive outcomes and impact on healthcare. Systematic reviews have been divided, with some saying that leveraging KBs is a useful KT strategy for EIDM and others saying that—though promising overall—more research is needed to determine the circumstances under which KBs are effective (Bornbaum et al., 2015; Dobbins et al., 2018; Elueze, 2015).

Theories, models, and frameworks relevant to the field of Dissemination and Implementation Research help understanding of when and where knowledge brokering may foster evidence uptake in the complex, constantly evolving settings of health systems in LMICs (Nilsen, 2015b; Tabak, Khoong, Chambers, & Brownson, 2012a). These theories, models, and frameworks include ones that address how innovations spread and the influences on uptake, both from an individual and systems standpoint (Harvey & Kitson, 2016). The often-cited Diffusion of Innovations Theory (Rogers, 2003) contributes to understanding by depicting change agents as drivers of adoption and the importance of social networks as conduits for dissemination (Green et al., 2009a). The Knowledge-to-Action Framework, another frequently noted framework, depicts the crucial activities of synthesizing, tailoring, and adapting knowledge to inform decisions that are both evidence- and context-appropriate (Graham et al., 2006a). Behavior change theory such as the Theoretical Domains Framework provides insight into how beliefs and motivations may influence evidence uptake among individuals (Cane et al., 2012). Applying theories, models, and frameworks to predict a path of evidence to informed policy in LMICs resulting from knowledge brokering, however, needs to acknowledge that the path is seldom linear nor may it be exactly replicable.

While helpful in understanding evidence dissemination and uptake, most theories, models, and frameworks omit specific discussion of how KBs fill their role. One of the few theories addressing how KBs operate originates outside of health. It proposes that KB functions can be better understood by characterizing the modalities of their interactions: transactional in making connections, regulatory in addressing norms, or strategic in leveraging established social structures (Taylor, 2015). Even with this additional attempt to explain knowledge brokering, insufficient attention has been given to how KBs think about their roles, their contexts, and the possible abundance of relevant evidence, which may influence their decisions in brokering knowledge and positive outcomes.

Publications | Paper 4. “Maybe we can turn the tide:” An explanatory mixed methods study to understand how knowledge brokers mobilize health evidence in low- and middle-income countries

This paper describes the findings of a study on KBs in multiple countries aimed at filling a gap in understanding KB decisions in acting upon and effectively mobilizing evidence. The authors view their methodological orientation as pragmatic realism (Miles et al., 2014). They focused on useful applications of evidence for improving the health of populations and accepted the accounts provided by KBs as representing the complexity of their contexts and interactions.

Study Context

The authors used an international health conference—the Global Maternal Newborn Health Conference (GMNHC) 2015—as a way of accessing KBs in global health. The GMNHC was held in Mexico City on October 18-21, 2015. Mexico’s Secretariat of Health hosted the gathering, and organizers included the United States Agency for International Development’s flagship Maternal and Child Survival Program, the Maternal Health Task Force at the Harvard T. H. Chan School of Public Health, and Save the Children’s Saving Newborn Lives Program. More than 1000 participants from 75 countries attended in-person by invitation of the organizers to prioritize actions for addressing unrealized millennium development goals (Paudel, 2015). Health system actors present included policymakers, global health program implementers, technical experts, clinicians and other health workers, and health faculty and trainers. Key presenters advocated for reducing preventable deaths by increasing access to and use of evidence in health policy and practice (Paudel, 2015).

Two studies in 2012 and 2013 explored evidence use and sharing following participation in similar international conferences and found that many participants reported activities common to the KB role (Norton et al. 2016). The current study builds on methods and findings of those previous studies to increase understanding of the KB experience and how it leads to evidence uptake.

RESEARCH METHODOLOGY

Design

The research team used a mixed methods explanatory sequential study design (J. W. Creswell, 2015) first to quantitatively describe characteristics of the KBs and their evidence sharing and use behavior and then qualitatively develop insights into the quantitative data to explain the decisions made by KBs in their intermediary role.

Study implementation began with the collection of quantitative data and a limited amount of qualitative data using a self-administered online survey. The survey was followed by semi-structured interviews with a subset of survey respondents. Review of conference materials, such as the program and presentations, supported the triangulation of quantitative and qualitative data during collection and analysis. Throughout data collection and analysis, the lead author served as a focal point for documenting insights and decisions and maintaining logs of the process.

Instruments

The survey and interview instruments used most of the same questions as the 2012 and 2013 studies (published separately) (Norton et al. 2016), with minor changes to multiple choice options to include choices previously supplied as “Other” responses. The online survey, delivered through the SurveyMonkey web platform (www.surveymonkey.com), asked questions about participant demographics and characteristics and examples of post-conference knowledge (i.e., evidence) sharing and use. The semi-structured interviews collected additional qualitative data such as examples of sharing and using knowledge from the conference and reasons for not doing so.

Selection of Respondents

Researchers worked with conference organizers to reach conference participants by using an e-mail distribution list previously used by organizers to promote the conference. Because the list included recipients who did not attend the conference, the first survey question eliminated respondents who indicated that they did not participate in the conference either in-person or online. Organizers sent the e-mail with the survey invitation approximately nine months after the conference. Survey respondents could indicate that they would be willing to participate in a follow-up interview. Of the 1000 in-person conference participants, 252 plus 72 online participants (n=324) from 57 countries completed the survey (fully or partially), and 124 answered that they would be willing to be interviewed.

The lead author purposively selected 20 respondents to contact for 30-minute phone interviews based on diversity of demographics (e.g., country, type of work), conference experience (e.g., in-person versus online participation), and self-reported use or non-use of conference knowledge to capture broad perspectives. Practical considerations (study timeline and budget) limited the number of target interviews; however, data saturation appeared to have been reached. Interviewers (the study lead and interns trained for the purpose) used an interview guide and study guidelines for conducting the

interviews. The principal investigator conducting some of the interviews and training the interns on standard procedures was a senior professional working in global health with formal training in qualitative research and holding a master’s degree. The interns were bachelor- and master’s-level college students with professional or volunteer experience in global health programs. All interviewers were female and based in the United States. The lead author replenished the list of interview candidates, as ones were eliminated after not responding to three e-mail contacts for unknown reasons. A total of 64 contacts were needed to yield 20 interviews, which were completed between 10 and 14 months after the conference. Interviewers recorded and transcribed interviews, sharing the responsibility for quality checking transcriptions. Interviewers did not previously know the respondents and did not return transcripts to them.

Data Analysis

Researchers exported survey data from SurveyMonkey to a Microsoft Excel (.xls) file for further analysis. Transcripts and open-ended survey responses were imported into MAXQDA qualitative data analysis software, version 18, for coding and cross-tabulation of demographic characteristics.

Qualitative data coding took both a deductive and inductive approach (Miles et al., 2014). Because the study aimed to increase understanding of KB decisions and actions, researchers used theory and frameworks in the analysis that addressed internal and external factors. Deductive codes came from the Theoretical Domains Framework of psychological theory (Cane et al., 2012), the literature on barriers and facilitators to evidence use, and categories of knowledge use and sharing from the survey. Inductive codes came from qualitative data. At the beginning of the coding process, an experienced qualitative researcher also coded two transcripts selected by the lead author to compare coding approaches and refine a qualitative codebook (MacQueen, McLellan, Kay, & Milstein, 1998).

Thematic analysis (Fereday & Muir-Cochrane, 2006) was used to identify themes of KB actions on evidence from the conference. Two experienced qualitative researchers reviewed interim summary reports of findings and provided feedback and guidance during the analysis process. In analyzing data obtained both early and late in the study, researchers estimated that data saturation had been achieved as no new themes occurred later in data analysis. Participant checking of findings was invited, but no comments were received.

Limitations of the Study

Limitations of the study included the small sample of interview respondents and difficulty in reaching participants after the conference to complete interviews, even though, as with the survey, e-mail reminders were sent multiple times. A self-selecting respondent pool may have resulted in over-representation of some characteristics (e.g., motivation). Selection of one conference instead of multiple conferences may have missed mediating factors of the specific conference (e.g., satisfaction with conference logistics, content selection, feelings about conference organizers and sponsors). Studying participation in a conference rather than other knowledge sharing contexts posed a limitation in that findings may have varied if participants had been exposed to knowledge in other ways. Respondents may have been exhibiting social desirability bias by reporting knowledge use and sharing because they equated the interviewers with the conference organizers and feared that negative responses would jeopardize future conference participation. The use of student interns for interviewers may have affected the richness of data collected during some interviews as interns may not have felt comfortable in prompting respondents for additional details.

The wording of survey questions may have posed limitations, even though most questions had been used in the previous related studies. For example, the survey question restricting respondents to choosing one type of work may have hindered revealing factors that help explain the KB experience, an issue that did not surface with research questions from previous studies. With one of the questions that was new to the current study—rating knowledge use from specific conference activities—the wording of the question may have confused respondents and resulted in misleading data about preference for interpersonal sharing. In addition, the omission of a gender question may have led to missing dynamics involved in evidence sharing that were related to gender.

While methodological triangulation through multiple sources of data (survey and interviews) aimed to reach an adequate depth of data saturation (Fusch & Ness, 2015), the researchers’ assessment that no new information would have been elicited from additional interviews could not be verified.

RESEARCH FINDINGS

Quantitative Results

A total of 324 survey responses were received. Table 1 presents demographic data of the survey participants and the subset who were interviewed, showing a variety of regions, types of organizations, and types of work, among other characteristics.

Table 1. Demographics of Survey Participants and the Subset Interviewed

	Survey Respondents (n=324)	Subset Interviewed (n=20)
Demographics		
Mode of Attendance		
In-person	252 (77.8%)	17 (85.0%)
On-line	72 (22.2%)	3 (15.0%)
Region		
Africa	108 (33.3%)	6 (30.0%)
Americas	102 (31.5%)	3 (15.0%)
Asia	83 (25.6%)	9 (45.0%)
Europe	15 (4.6%)	2 (10.0%)
Oceania	5 (1.5%)	0 (0.0%)
Unknown	11 (3.5%)	0 (0.0%)
Type of Organization		
Academic/Research Institution	83 (25.6%)	4 (20.0%)
Consultant	4 (1.2%)	0 (0.0%)
Donor	14 (4.3%)	0 (0.0%)
FBO	2 (0.6%)	0 (0.0%)
Government/Ministry	39 (12.0%)	5 (25.0%)
Media	2 (0.6%)	1 (5.0%)
Medical/Health Organization	32 (9.9%)	2 (10.0%)
NGO/PVO (Local and International)	118 (36.4%)	7 (35.0%)
Private Sector (For-Profit)	4 (1.2%)	1 (5.0%)
UN System	15 (4.6%)	0 (0.0%)

Unknown	11 (3.6%)	0 (0.0%)
<hr/>		
Type of Work		
Advocacy	19 (5.9%)	2 (10.0%)
Combination	3 (0.9%)	0 (0.0%)
Health/Medical Service Delivery	36 (11.1%)	5 (25.0%)
Health Communication	14 (4.3%)	0 (0.0%)
Polycymaking	12 (3.7%)	1 (5.0%)
Program Development/Management/Implementation	131 (40.4%)	4 (20.0%)
Research/Evaluation	72 (22.2%)	6 (30.0%)
Student	5 (1.5%)	0 (0.0%)
Teaching/Training	20 (6.2%)	2 (10.0%)
Unknown	12 (3.8%)	0 (0.0%)
<hr/>		
Years in Profession		
0-5 years	72 (22.2%)	3 (15.0%)
6-10 years	86 (26.5%)	6 (30.0%)
11-15 years	70 (21.6%)	6 (30.0%)
16 or more years	85 (26.2%)	5 (25.0%)
Unknown	11 (3.6%)	0 (0.0%)
<hr/>		
Abstract Accepted to Conference		
Do not know	4 (1.2%)	1 (5.0%)
No	149 (46.0%)	8 (40.0%)
Yes	140 (43.2%)	11 (55.0%)
Unknown	31 (9.6%)	0 (0.0%)

The majority of respondents said they shared (92.8%; n=292) and used (93.6%; n=279) knowledge gained from the conference. When asked with whom they shared knowledge, respondents mostly selected recipients suggestive of personal association (e.g., members of their own organization), as opposed to recipients likely unknown to them (e.g., readers of their publications). Figure 1 presents the options selected and the wording of the question about sharing. Most ways in which knowledge was shared were also consistent with personal association, such as passing along conference materials to colleagues and sharing in communication with members of the same organization (73.0% and 71.9%,

respectively; n=267). In response to a question asking the ranking of the top three reasons for attending the conference, answers suggested an interest in both sharing knowledge (abstract/presentation accepted: 61.0%; n=293) and receiving knowledge of possible relevance to the participant’s country setting (learn about new evidence from global experts: 34.2%; learn best practices: 32.0%; n=293). Types of information that were shared were more often types associated with an individual, such as expert opinion and experience from another participant (62.2% and 60.3%, respectively; n=267), as opposed to information without personal context, such as information about a journal article or publication (36.3%; n=267).

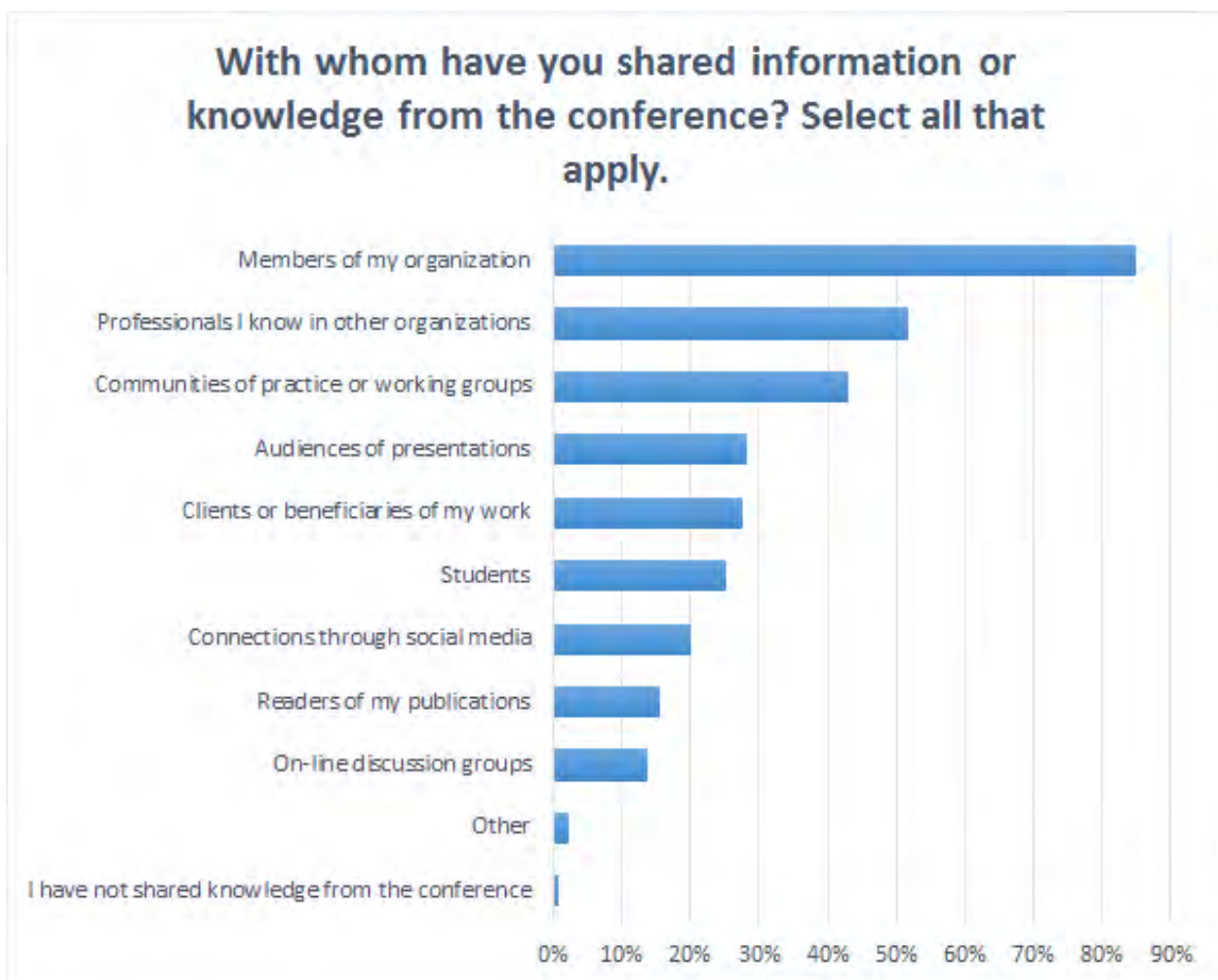


Figure 1. Types of recipients with whom KBs shared knowledge from the conference

How knowledge from the conference was used reflected various types of work and levels in the health system. A respondent’s primary type of work did not appear to limit knowledge use to a corresponding

type. For example, a respondent selecting a primary type of work as health care service delivery also selected types of knowledge use associated with other job roles such as advocacy and program development, in addition to service delivery. Figure 2 shows the survey question and responses about types of use.

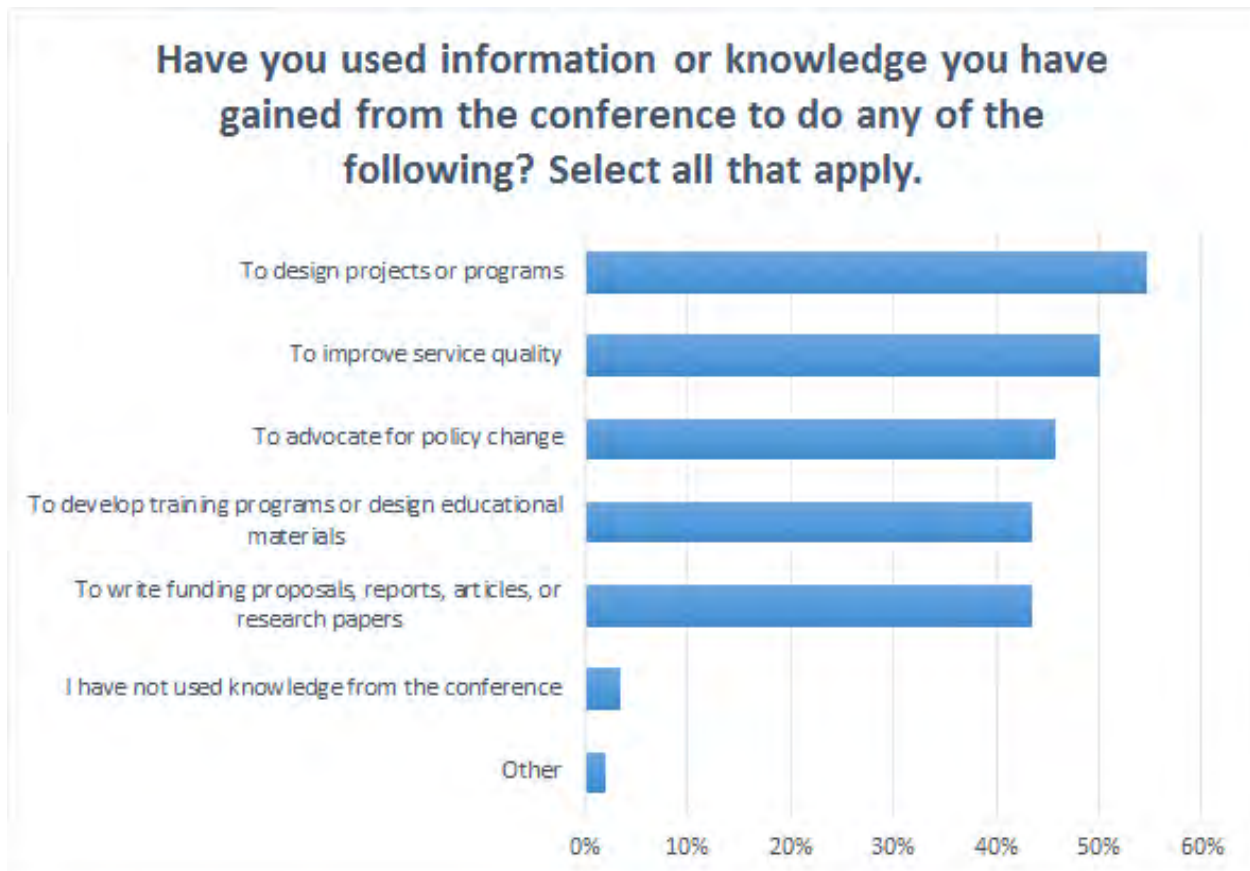


Figure 2. Uses of knowledge from the conference that KBs reported

In the few cases where respondents reported not sharing or using conference knowledge, most reasons given were “not enough time” and “nothing was new to me.”

Qualitative Results

Data analysis identified five themes of KB actions and decisions that they reported led to evidence uptake: (1) maintaining active relationships through embedded roles, (2) tailoring messages and communications to fit context, (3) leveraging user receptiveness to evidence from comparable settings, (4) adapting approaches in the KB role, and (5) exhibiting an action orientation. Across the themes, the

respondent's type of work appeared to be the most important personal characteristic explaining decisions and actions on evidence, as type of work was mentioned repeatedly during interviews (e.g., health workers describing changes to their service delivery practices).

Maintaining Active Relationships through Embedded Roles

KBs reported relying upon their existing roles embedded in organizations, health programs, and multi-organizational groups (e.g., Latin American and Caribbean Regional Task Force for the Reduction of Maternal Mortality) for providing opportunities to promote evidence uptake through active relationships. Multiple KBs expressed a feeling of responsibility in their professional role for both acquiring new knowledge to address health challenges in their settings and to mobilize its use to the extent of their authority. Respondents seemed to associate their capacity to access evidence, understand its implications for their setting, and ability to envision its application with driving adoption of changes in their networks. This theme could be seen across social or professional roles and demographics. Types of structures in which relationships developed included service delivery units in healthcare facilities, university departments, government-sponsored technical working groups, and local partnerships for health program implementation. Professional meetings with appropriate types of health system actors appeared to be crucial to respondents in gaining consensus on and sharing new evidence, as illustrated by the following example:

"We have what we call clinical meetings, and during those clinical meetings, we update each other on the latest practice which is research-based. And such information is like what was actually presented during the conference." [Health/Medical Service Delivery, Government/Ministry, Sub-Saharan Africa]

Professional roles involving interaction with multiple types of organizations and settings correspondingly widened the relationship network and potential reach of shared evidence. For example, a program manager who also worked in the community and made presentations at conferences mentioned multiple opportunities for sharing and promoting evidence:

"[I shared knowledge with the] community, the stakeholders here, and the local conferences back home." [Program Development, Academic/Research Institution, Sub-Saharan Africa]

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KBs in a position of authority or engaging those in authority as part of evidence discussions reported an easier time mobilizing evidence uptake, as mentioned in this example of a country team attending the conference:

"At the conference... family health division director and policy people in the ministry were there, and they realized the importance of the integration. So, it is easy for me to advocate the importance of integration of these newborn health activities at the division level." [Program Development, NGO/PVO, Southern Asia]

Tailoring Messages and Communications to Fit Context

KBs emphasized the importance of tailoring messages and communications about evidence to maximize acceptability by users. KBs seemed to assess drivers of acceptability based on the type of health system actor most needing to be influenced. For example, several KBs mentioned the importance to families of cultural norms for applying substances to newborn cord stumps and the need to reframe chlorhexidine (used on cords to avoid infection) so that it was acceptable to families:

"Because it is a cultural practice that people apply something on the umbilical cord of a newborn child. And if you provide them with something which is safe and which will prevent sepsis, so that's why it was a decision that instead of one day it should be a seven-day application." [Policymaking, Government/Ministry, Southern Asia]

KBs also mentioned tailoring evidence to fit actors by their health system level, such as community health workers. For example, one KB described sharing in the community only locally applicable evidence (versus global trends) that could be implemented with available tools and supplies. In another case, a KB reworded an evidence topic—using “respectful maternity care” instead of “preventing obstetric violence”—to avoid offending physicians, whose acceptance was crucial in setting standards of care.

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Leveraging User Receptiveness to Evidence from Comparable Settings

KBs described the value that they and decision-makers placed on evidence generated in a comparable setting (such as a similar LMIC) and how KBs used this perception as a bargaining aid. Their accounts suggest a view that adapting the successful implementation of evidence from a similar context might yield equally successful outcomes in the user’s own context. One such account came from a community advocate and healthcare provider who was suggesting solar-powered lighting in healthcare facilities:

“Public health officials...ask us...have you any good success stories, where from you collected this kind of idea? So, we suggest to them that...we come to know about such kind of practices being used in other countries, and their economic situation and their electricity situation is the same as ours.” [Health/Medical Service Delivery, Local NGO, Southern Asia]

The comparable setting-comparable success viewpoint surfaced in both narrow descriptions of specific healthcare practices and with broad comparisons among LMICs overall, as with this passionate expression from a faculty member and researcher for whom the comparison was a motivator to act:

“Because most of them were like success stories from other countries... since our maternal mortality and morbidity is related... I assume maybe we can turn the tide if we try maybe to do what other people have done in other parts of the world.” [Teaching/Training, Academic/Research Institution, Sub-Saharan Africa]

Most KB accounts implied measures of comparability related to resource availability, infrastructure status, and cultural norms. Comparisons did not mention geographic proximity as a factor.

In one atypical example, the respondent noted a common public health issue even though the settings were economically non-comparable and explained his thinking about the underlying implementation problem that needed to be addressed in his country:

“So it is quite comparative that I have the problem of newborn screening [as with other African or Asian countries] because it is not democratically distributed in the whole country, for the wealthy countries as well.” [Health/medical service delivery, Private Sector, Western Asia]

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He noted that while much of the conference was focused on lower-resource settings, the maternal and newborn issues presented were comparable to those in his higher-resource country (where “lack of money” was not an issue), and so he selected the information because it was “coming from different countries all over the world.” The KB gave the specific example of learning about simple approaches using little equipment to ensure safe delivery, which he said he practiced himself and then taught to his residents in Obstetrics and Gynecology in his country. He noted that he was able to make use of materials and visuals from the conference in training residents. He also expressed that he expected the number of cesarean sections and obstructed labors to decrease as a result of applying these delivery approaches, which prompted him to “push people to know it and to practice it.” The interviewer and transcriber identified in their notes the KB’s excitement about taking time while on vacation to share the knowledge from the conference by teaching midwives at the same university from which he graduated.

Adapting Approaches in the KB Role

KBs described facilitating evidence-to-action in ways that adapted to the realities of their limit of authority and the political and economic environment. Accounts of evidence uptake often referred to adjustments in practice that were achieved within the KBs sphere of influence, as noted in this quote:

“I’ve actually gotten a few points from the conference that we’ve actually included in our practice. Like the change of the postnatal visits: instead... the way we used to do it previously that after 6 hours or on discharge we do a postnatal visit and the next time to actually see a woman it would be after 6 days. But instead now, this time around we are able to actually see the woman back within 24 hours, again for a postnatal re-visit.” [Health/Medical Service Delivery, Government/Ministry, Sub-Saharan Africa]

In another example, the KB applied knowledge of budgetary processes in local healthcare facilities to advocate for acquiring resources for implementing improvements:

“They have some special budgets and they have some dispensary... some authority powers there. And they can purchase, just like the health contingency bill finds them such kind of funds, they are available. So, they can purchase these things. So, we meet hospital administration to look at the administrative budget.” [Health/Medical Service Delivery, Local NGO, Southern Asia]

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Other reported adaptations included re-purposing supplies to implement service delivery improvements and modifying advocacy approaches to overcome resistance to evidence.

Exhibiting an Action Orientation

Most KBs in the study did not limit their brokering to sharing evidence but actively sought opportunities to mobilize evidence for changes in health policy and practice. In describing their actions on evidence, KBs alluded to their motivations to act, such as passion for helping their country and alleviate suffering. Accounts from respondents based in LMICs expressed enthusiasm for learning about new evidence and the opportunity it presented to bring about change, as with this KB concerned about maternal and newborn mortality rates in her country:

“I felt like I can do something with this for my country and contribute to improve the maternal and newborn care. I felt like I could make this...from what I saw at the conference... if you have the will and the good attitude you can change something.” [Teaching/Training, Academic/Research Institution, Sub-Saharan Africa]

Discussion and conclusions

The study findings present a view of KBs working in a variety of health system roles through which they share and mobilize evidence for improved health policy and practice. The label of KB arose from researchers recognizing typical KB activities among the accounts, rather than from respondents using the term to describe themselves. This view of a KB differs from ones in the literature that depict knowledge brokering as a library service or convening function, separate from acting on evidence to bringing about change. Since all conference participants were invited to complete the survey and made their own decision about responding, the study team anticipated having a respondent pool that was motivated and action-oriented regarding evidence from the conference—and findings suggest that was the case. By collecting data from KBs with these characteristics, the study was able to capture a view of KB outcomes by examining successful approaches through their eyes and accepting their accounts of evidence uptake.

The approaches used by KBs in the study illustrate a creative variety of modalities in advancing evidence uptake (Taylor, 2015), ranging from faculty member-to-student interactions, to adaptations of healthcare practice to fit cultural norms, to making strategic use of health system administrative

processes. Also, the flow of knowledge through the KBs and how they chose to fill their intermediary role coincides with the popular KT theories, models, and frameworks mentioned earlier in this paper (Rogers, 2003; Graham et al., 2006; Cane et al., 2012). The crucial aspect of interpersonal sharing in the KB role also agrees with literature about knowledge flow through intermediaries in LMICs (Datta et al., 2016).

As suggested by the literature and supported by this study, the ability to function as a KB can be attributed to a combination of individual characteristics, promising KT practices, and supportive (or at least adaptable) structures in which KBs operate. The analysis of the responses we received for this study highlights the following characteristics, which are also confirmed by the literature. For example, findings suggest that KBs must have the professional expertise to access and appraise evidence for a given use and context, soft skills in relationship building and networking, and commitment to improving public health by brokering the use of evidence. Making use of promising KT practices such as tailoring messages and communications to fit the users and context also contributes to functioning as a KB. Structures that support KBs operating in their roles, such as participation in professional meetings and conferences and time for evidence brokering activities also support the aims of knowledge brokering. Receptiveness to new evidence by decision-makers and other users also figures prominently.

Findings also provided insights into how KBs think about the multitude of evidence to which they may be exposed (by possibly conflicting sources), what they might do about it and with whom, and how they would do it—a process that distinguishes them from being one-directional disseminators of knowledge (i.e., distributors who do not interact with users). The ability to think through the various possibilities in their brokering approach and adapt to a variety of factors, leading to evidence uptake, may distinguish the KBs in this study as both connectors and mobilizers of change.

Figure 3 depicts a proposed framework derived from the findings of the interviews and survey of a reflective comparative decision process that KBs undergo in judging evidence for action. Internal influences and external influences broadly categorize the drivers for judgment, which the KBs consider in a non-linear and iterative process. Internal Influences appear as three dimensions: Characteristics of Self and Action Orientation, Mental State, and Reaction to/Reflection on Outside World. External Influences present as three dimensions: Environmental Context Characteristics and Action Orientation, International Influences, and Knowledge Characteristics and Suitability for Action. Each dimension's

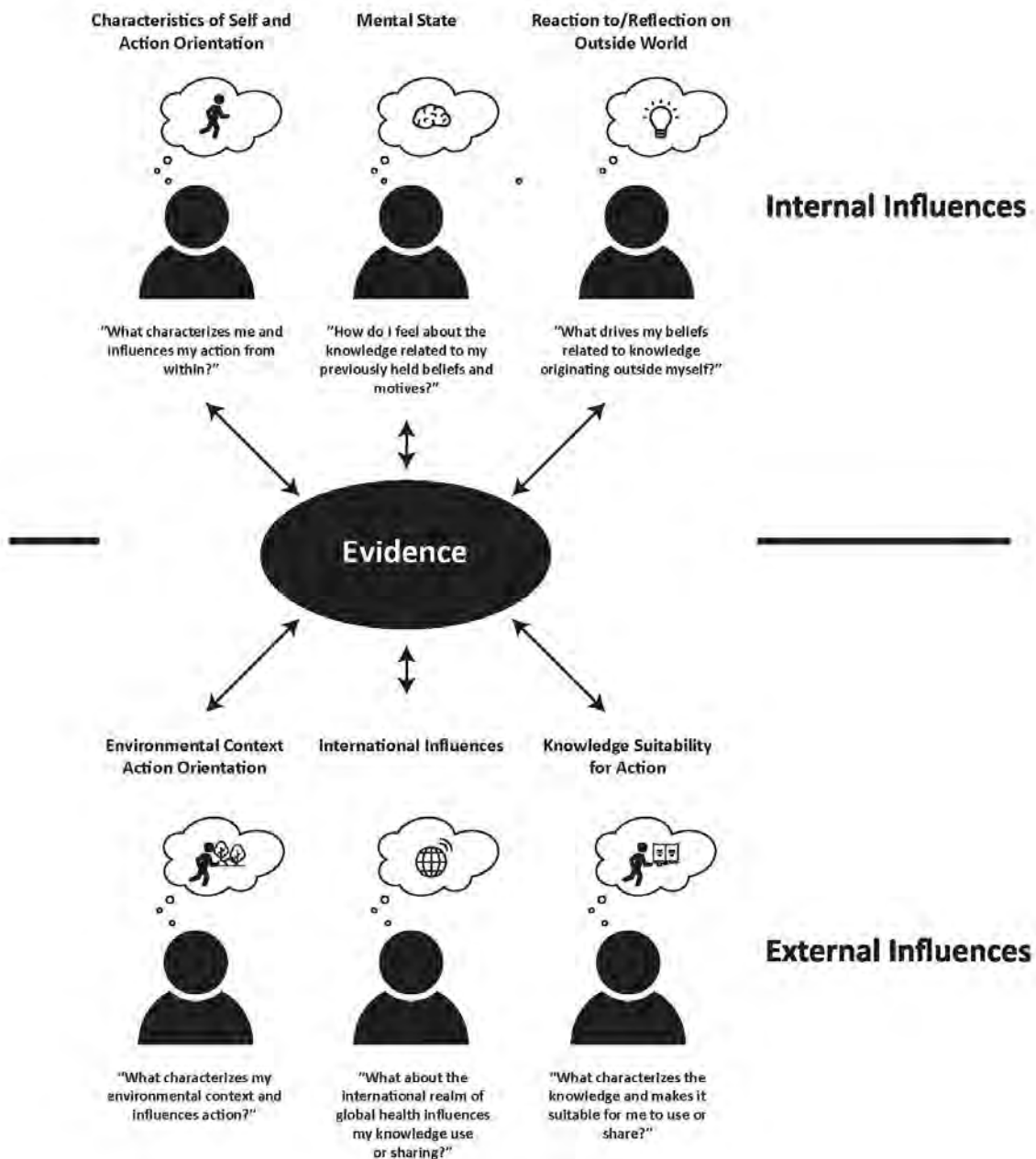


Figure 3. KB reflective comparative decision process in selecting evidence for sharing and use

characteristics are represented by a hypothetical question that KBs might ask themselves about new knowledge. The concept of comparing and judging evidence using a set of internal criteria appears elsewhere in the literature, notably in research describing the thought processes of decision-makers in assessing evidence by putting it through an intellectual truth test and utility test (Weiss & Bucuvalas,

1980). Such research has been found to be useful in understanding evidence uptake. The proposed framework will need further testing, research, and refinement to validate it and better understand the balance among influences.

The atypical example of the health/medical professional in Western Asia who compared public health problems in non-comparable economic settings illustrates how the reflective comparative decision process occurs with factors outside the norm. The KB was the only respondent to offer that “lack of money” was not the reason for newborn mortality challenges in his country but instead implementation was the issue, exhibiting consideration of Environmental Context Characteristics and Action Orientation. His view that information applicable to his country’s challenges was “coming from different countries all over the world” suggested the role of International Influences and Reaction to/Reflection on Outside World. In learning, practicing, teaching, and advocating approaches for safe delivery in his country, to the KB demonstrated his view on Characteristics of Self and Action Orientation. His use of conference materials to conduct training suggests a positive decision on Knowledge Characteristics and Suitability for Action. Finally, his excitement in sharing his new knowledge while visiting his former university exhibited a positive Mental State regarding the evidence.

Survey results suggested alignment with the internal influences and external influences dyad of the reflective comparative decision process. Overall, respondents shared and used knowledge from the conference in ways that aligned with their professional roles (e.g., program development in NGOs/PVOs), but allowing for the flexibility needed in LMIC settings. Reported interest in expert opinion from global experts and learning best practices illustrates the bridging between reaction to the outside world and international influences. The high levels of reported knowledge use from the conference and reported types of use suggest that respondents assessed the knowledge they encountered and decided that it was suitable for their uses.

Implications from the research findings

An understanding of KBs who mobilize evidence and their decisions and actions may provide a foundation for strategically targeting capacity building in knowledge brokering to KBs already successful in driving change (as suggested in the literature (Dobbins et al., 2018)). This type of effort may also serve to formalize the KB role and its boundaries, which was noticeably absent in the KB accounts in this study. The findings of this study suggest that we can recognize these mobilizers by their characteristics

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such as orientation to action, facility with networking and relationship building, and creativity in adapting evidence to a given context. A good practice in capacity building may be to promote the hiring of KBs with these characteristics in embedded KT units of government, universities, and professional associations—types of organizations which may be in a position to influence evidence uptake. Strategically inviting these KBs to evidence dissemination events such as conferences and meetings that also incorporate action planning may also support KT outcomes. As demonstrated by the current study context—a global conference focusing on high-impact maternal and newborn health care practices—gathering all the types of health system actors needed for scaling-up evidence uptake (e.g., healthcare service providers, policymakers) and equipping them to act as KBs is a promising practice.

Additional capacity building might focus on enhancing specific skills shown as critical to knowledge brokering, such as tailoring communications for audiences and contexts and appraising and adapting evidence. Skills development may be done through on-going, short learning opportunities accessed without leaving the workplace (e.g., webinars, tutorials) and through mentoring by KBs with specific expertise in aspects of the health system (e.g., commodity availability).

While these capacity building approaches can also be applied in higher-income countries, operationalizing them in LMICs may be particularly beneficial because of the contextual complexities that characterize LMICs. Focusing capacity building efforts on practical implementation of evidence to improve healthcare practice would help fill a gap in the KB research. A longitudinal research approach would help evaluate the sustainability of capacity building efforts and reported evidence uptake beyond what the current study was able to achieve with its point-in-time approach.

Finally, given the finding of how decisions on uptake are influenced by perceived success in a comparable setting, additional research on LMIC-to-LMIC exchange of implementation evidence may be beneficial, particularly in the area of advancing scale-up of key life-saving interventions. Such research could explore the types of organizations and work necessary to implement a practice widely in a country (e.g., supply chain, service delivery, workforce development) and how knowledge brokering in those areas between LMICs could promote scale-up and generate ideas to test in a country before scaling up. Exploring how opportunities for LMIC-to-LMIC support and sharing of implementation successes between regions in Africa and Asia will continue in an era of decreased international funding may also merit consideration.

To conclude, global and regional organizations working to disseminate evidence in LMICs rely on local actors to use and share the evidence to influence change in multiple levels of the health system.

Understanding KB decisions and actions in successfully driving change and using this understanding to strategically design capacity building in KT can help scale-up evidence-informed policy and practice.

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CORRESPONDING AUTHOR

Theresa C. Norton, Baltimore, Maryland USA, tnorton1@jhu.edu

ORCID

Theresa C. Norton <https://orcid.org/0000-0001-6716-9749>

Daniela C. Rodriguez <https://orcid.org/0000-0003-2523-1123>

Sara Willems <https://orcid.org/0000-0002-6349-7785>

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

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4.5 Paper 5. Applying the Theoretical Domains Framework to understand knowledge broker decisions in selecting evidence for knowledge translation in low- and middle-income countries

Applying the Theoretical Domains Framework to understand knowledge broker decisions in selecting evidence for knowledge translation in low- and middle-income countries

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Research Aim:

To understand what influences knowledge brokers in selecting evidence for sharing and use in health policy and practice in LMICs

ABSTRACT

Background

Health-related organisations disseminate an abundance of clinical and implementation evidence that has potential to improve health outcomes in low- and middle-income countries (LMICs), but little is known about what influences a user decision to select particular evidence for action. Knowledge brokers (KBs) play a part as intermediaries supporting evidence-informed health policy and practice by selecting and synthesising evidence for research users, and therefore understanding the basis for KB decisions, can help inform knowledge translation strategies. The Theoretical Domains Framework (TDF), a synthesis of psychological theories, was selected as a promising analysis approach because of its widespread use in identifying influences on decisions to act on evidence-based healthcare guidelines. This study explored its application in the context of KB decisions regarding evidence for use in LMICs.

Methods

The study analysed data collected from participants of a 2015 global maternal and newborn health conference in Mexico. A total of 324 conference participants from 56 countries completed an online survey and 20 from 15 countries were interviewed about evidence use and sharing after the conference. TDF domains and constructs were retrospectively applied and adapted during coding of qualitative data to enhance understanding of the KB decision process in selecting evidence for action.

Results

Application of the TDF involved challenges related to overlapping constructs, retrospective use, and complexities of global health settings and relevant knowledge. Codes needed to be added or adapted to account for how KBs' internal reflections on external factors influenced their actions in selecting evidence to share and use, and the decisions they made during the process. Four themes of the rationale for changing the TDF were identified during analysis, namely Influences from Beyond the Organisation, Knowledge Selection as a Process, Access and Packaging of Knowledge, and Fit for Use.

Conclusions

Theories of individual behaviour, such as those in the TDF, can enhance understanding of the decisions made by actors such as KBs along dissemination and knowledge translation pathways. Understanding how KBs reflect on evidence and interact with their environment has the potential for improving global dissemination efforts and LMIC-to-LMIC exchange of implementation evidence.

Keywords

Knowledge Brokers; Knowledge Translation; Theoretical Domains Framework; Barriers; Facilitators; Low- and Middle-Income Countries

BACKGROUND

Determining the factors that influence successful dissemination and uptake of evidence-based, context-appropriate health practices has critical importance for reducing maternal and newborn mortality in low- and-middle income countries (LMICs), which carry the greatest burden of preventable deaths [1, 2]. The how and why of research uptake – a topic labelled as knowledge translation (KT) in the literature – has been widely studied to address the long-standing gap between health research evidence and practice [3]. The methods associated with health KT include filtering and packaging evidence to suit the needs of health system audiences, disseminating the knowledge and advocating for its application in decision-making [3, 4, 5]. Global commitment in the form of actions and communications from organisations such as WHO and PAHO, and multi-region programmes such as the Evidence into Policy Networks [5], point to the importance of KT.

Despite keen interest by the health research community and global commitment, no one standard for KT emerges as widely accepted among the many proposed theories and frameworks [4, 5, 6, 7, 8]. Among the array of KT explanations and predictions, many focus broadly on systems, infrastructure and activities supporting KT, whilst others focus more narrowly on individual decisions to adhere to a specific evidence-based clinical care guideline [4, 6]. A common element among the perspectives on KT (whether explicitly stated or not) is the individual health system actor who makes decisions after learning about evidence within a larger context.

The way in which literature addresses critical elements of KT suggests the importance of individual perspective and choices about evidence. While dissemination of knowledge is a crucial aspect of KT, publication alone without interpersonal communication has been shown to be less effective in promoting evidence-informed decision-making [7, 9]. Individual behaviour comes into play during KT when choosing knowledge to package for audiences [5], cultivating relationships between researchers and decision-makers to influence research agendas and uptake [7], and interacting with patients to provide high-quality, evidence-based care [10]. Understanding how individuals perceive their context and settings can reveal barriers and facilitators to changing behaviour regarding evidence use [11]. Despite the importance of individual actors in KT, current KT theories and frameworks focus less on their decision processes and influences of internal and external factors in making choices when faced with an abundance of evidence.

In the context of public health, individual or organisation knowledge brokers (KBs) serve as intermediaries between research producers and consumers to facilitate KT—production and context-appropriate use of evidence to inform decision-making in health policy and practice [12, 13, 14]. KBs synthesise and disseminate evidence to support health policy, practice or clinical reasoning when and where the knowledge is needed. Through active relationships, KBs address the near-term needs of decision-makers by curating knowledge that is most applicable and communicating it in terms understandable to the decision-maker or other knowledge users.

Understanding KB thought processes about selection and sharing of evidence has relevance, therefore, to strengthening evidence-informed decision-making. Use of psychological theory to understand individual decisions about evidence—such as those facing KBs—has origins in studies on internal and external factors influencing use of social science research in the 1970s [15] and applies to current KT interventions [10]. As calls have increased for the use of theory in designing KT interventions as a way to improve results, implementation researchers have increasingly adopted a consolidated theoretical approach called the Theoretical Domains Framework (TDF). Recognising that no one theory is sufficient to address the complexities of behaviour in healthcare settings, the TDF consolidates aspects of 33 theories into a framework of 14 theoretical domains with component constructs in the validated version used in this study [16]. The domains, which are listed in Box 1, include internally reflecting concepts, such as Beliefs about Capabilities, and externally oriented concepts, such as Environmental Context and Resources. Constructs provide details about the topics included within each domain (e.g., Fear and Anxiety within the domain Emotion). The TDF has been used extensively to identify barriers and facilitators for individual uptake of evidence-based practices, and more broadly for implementation design and research such as that embedded in the comprehensive Tailored Implementation for Chronic Diseases Checklist [17].

Box 1. TDF Domains (Cane et al., 2012)

1. Knowledge
 2. Skills
 3. Social/professional role and identity
 4. Beliefs about capabilities
 5. Optimism
 6. Beliefs about consequences
-

7. Reinforcement
 8. Intentions
 9. Goals
 10. Memory, attention and decision processes
 11. Environmental context and resources
 12. Social influences
 13. Emotion
 14. Behavioral regulation
-

Whether used alone or with other frameworks, the TDF has been shown to be useful by offering a broad range of constructs that may influence individual decisions to make use of evidence [3, 18].

While the complexity of healthcare settings and associated decision-making is widely accepted, such complexity is more significant in global health, where wide variations in provider roles, culture and socioeconomic factors [19] provide challenges to understanding behaviour. Surprisingly, despite the pressing need for evidence-informed decision-making in health policy and practice in LMICs, few studies in those contexts have used the TDF. Where studies in LMICs have used the TDF, they have mostly focused on clinical behaviour such as guidelines implementation in Kenyan hospitals [20] and medication safety in Ethiopian hospitals [21]. Researchers have made little, if any, use of the TDF to understand the behaviour of health system actors in various roles related to uptake of research evidence. This paper describes application and adaptation of the TDF to explore KT in LMICs by better understanding internal and external barriers and facilitators facing KBs.

Study context

The context of the study was the Global Maternal Newborn Health 2015 Conference held in Mexico City, October 18–21, 2015. Multiple organisations and programmes working globally to improve maternal and newborn health (e.g. Saving Newborn Lives at Save the Children) collaborated in convening the conference.

Conference organisers designed the event for sharing evidence and planning future action in health research, policy and practice to improve health outcomes, particularly in LMICs [22]. To meet these goals, the conveners invited participants in a range of health system roles, such as researchers, policy-

makers, funders and healthcare faculty members and providers. The outreach aimed to bring together health system actors who were anticipated to take later action, such as disseminating and discussing evidence with stakeholders to work towards better- informed health policy and practice. The invitation strategy suggests that organisers were targeting participants expected to act as KBs. Studies by the same researchers and also aiming to explore knowledge use and sharing after global maternal and newborn health conferences convened by some of the same organisers were conducted in 2012 and 2013 [23].

METHODS

Target population

The target population for the study was participants in the 2015 Global Maternal Newborn Health Conference held in Mexico City in 2015.

Study design

Authors used a mixed methods explanatory sequential design [24]. Quantitative survey data were collected to capture conference participant demographics and characteristics of post-conference knowledge sharing and use (e.g. with whom they shared). Quantitative measures were first used to determine whether or not knowledge sharing and use had occurred after the conference and their parameters. Qualitative interview data were collected to explain and understand the quantitative data, that is, why or why not and how knowledge sharing and use occurred. Authors triangulated data sources (i.e. surveys, interviews and conference documents) to inform further data collection and analysis and provide richer insights into knowledge sharing and use. For example, researchers would compare examples of evidence use provided in an open-text field of the survey with comparable examples given during interviews and descriptions of the evidence in the conference documentation. The TDF provided a framework for identifying influences on decisions to use and share knowledge. Figure 1 illustrates the data collection and analysis process.

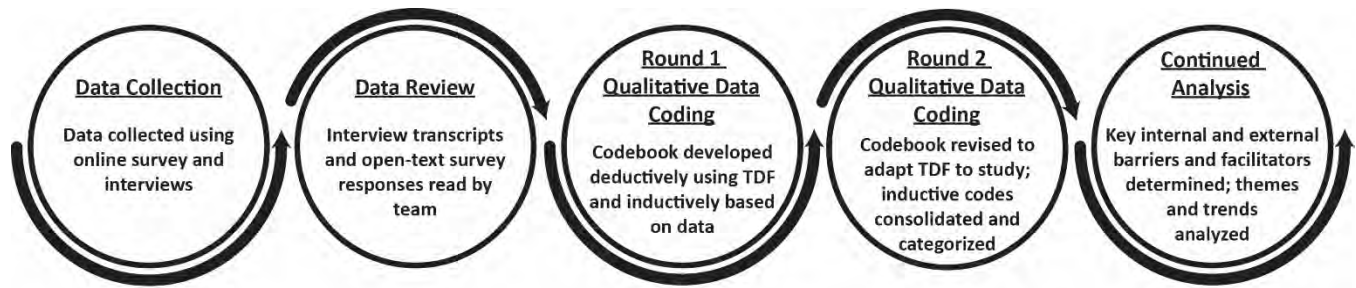


Figure 1. Overview of data collection and analysis process. Interview and survey data were iteratively analysed using TDF-derived codes, other codes from the literature and inductively derived codes

Study procedures

Quantitative data were collected using a self-administered online survey. Qualitative data were collected using three methods, namely (1) including open-ended questions in the survey (“Q18. Please give an example of how you have used information or knowledge from this conference, if applicable”); (2) conducting semi-structured interviews with selected survey respondents; and (3) reviewing documents related to the conference (e.g. session descriptions in the programme) to understand the context of respondents’ comments about particular knowledge they shared and used. Both the survey and interviews were conducted in English. Verbal translation was provided for one interview respondent who communicated through an interpreter.

Instruments

The 22-question survey was intended to determine if respondents shared knowledge from the conference and with whom, and if they used it and how they used it, among other subjects. The 15 interview questions were intended to obtain additional details about respondent experiences sharing and using knowledge from the conference and influences on their decisions regarding sharing and use (see Additional files 1 and 2 for data collection instruments).

Both the survey instrument and interview script were developed and validated during studies conducted by the researchers in 2012 and 2013 also aiming to explore knowledge use and sharing after global maternal and newborn health conferences [23]. For the 2015 study, minor refinements consisted of adding multiple choice options that previous respondents entered as ‘Other’ responses. Expert review by researchers and conference organisers validated the changes.

Recruitment

Respondents were recruited through an e-mail invitation to complete a survey that was sent to a communications distribution list used by conference organisers to reach potential attendees. A subset of the list had attended the conference (n = 1000 in-person participants; number of online participants unknown). The distribution list was used as a convenient way of reaching the target population since conference organisers did not maintain a database of contact information for actual conference attendees. The team sent the initial e-mail message 9 months after the conference with reminders sent 2 and 3 weeks later. The survey closed after 1 month.

The interview candidates were purposively selected from the pool of survey respondents. Among survey respondents, 124 (38.3%) answered 'Yes' to a question asking if they would be willing to participate in a 30-min interview about their knowledge sharing and use experience following the conference. From the pool, TN purposively selected a sample of 20 survey respondents to contact for semi-structured interviews based on maximum diversity of country, type of work, type of organisation, mode of participation (online versus in-person), abstract acceptance (Y/N), and use or sharing of knowledge from the conference (Y/N). The study budget and timeline determined the target number of interviews. The variables for participant diversity were selected with the rationale—based on the researchers' 2012 and 2013 similar studies [23]—that they would result in capturing perspectives with a variety of motivations to share and use evidence and multiple contexts. After three attempts to contact a potential respondent with no response, the protocol called for ruling out the candidate. TN continued to replenish the pool whilst maintaining diversity. Each 30-min interview was conducted using Skype (www.skype.com) or phone and audio recorded with permission, then transcribed. The lead author and trained interns conducted the interviews in English. One interview respondent used an interpreter. Interviews were completed between 10 and 14 months after the conference.

Inclusion and exclusion criteria

Inclusion/exclusion criteria for survey respondents was based on their confirmation of attending the 2015 Global Maternal and Newborn Health Conference either in person or online. Inclusion/exclusion criteria for participation in the semi-structured interviews was entering a valid e-mail address in response to the survey question, “May we contact you for a 30-minute interview to hear more about your experience using and sharing information and knowledge from the conference?” Potential participants that supplied an e-mail address that bounced back as undeliverable or failure to respond to follow-up e-mails from the researchers also resulted in exclusion.

Consent

The study protocol was reviewed by the lead author’s institutional review board and was determined to be exempt from further review. Nevertheless, interviewers obtained and recorded verbal consent by signing and dating consent forms, which was done during study as an ethical practice. Consent was not obtained from respondents who answered the survey as responses were not stored with personally identifiable information. The e-mail invitation to complete the survey said that respondents to the survey could be entered into a prize drawing for a Kindle Fire. There was no incentive to participate in the interviews.

Sample characteristics

The online survey received responses to some or all questions from 324 of 1000 in- person conference participants (a 32.4% response rate) and additional online participants. Respondents represented 57 countries. A total of 64 candidates were contacted to be interviewed, of which 20 respondents from 15 countries were successfully interviewed. Participant countries consisted of both LMICs and higher-income countries as organisers invited participants based on the relevance of their evidence or work to global issues of maternal and newborn health, not on the country in which they were based. The study participants, as with the conference invitees, included a variety of health system roles relevant to facilitating understanding, sharing and use of the evidence presented at the conference. These roles included researchers, policy-makers, funders, programme implementers and healthcare professionals.

Table 1 presents characteristics of survey respondents and the subset interviewed.

Table 1. Characteristics of Survey Participants and the Subset Interviewed

Characteristics	Survey Respondents (n=324)	Subset Interviewed (n=20)
Mode of Attendance		
In-person	252 (77.8%)	17 (85.0%)
On-line	72 (22.2%)	3 (15.0%)
Region		
Africa	108 (33.3%)	6 (30.0%)
Americas	102 (31.5%)	3 (15.0%)
Asia	83 (25.6%)	9 (45.0%)
Europe	15 (4.6%)	2 (10.0%)
Oceania	5 (1.5%)	0 (0.0%)
Unknown	11 (3.5%)	0 (0.0%)
Type of Organization		
Academic/Research Institution	83 (25.6%)	4 (20.0%)
Consultant	4 (1.2%)	0 (0.0%)
Donor	14 (4.3%)	0 (0.0%)
FBO	2 (0.6%)	0 (0.0%)
Government/Ministry	39 (12.0%)	5 (25.0%)
Media	2 (0.6%)	1 (5.0%)
Medical/Health Organization	32 (9.9%)	2 (10.0%)
NGO/PVO (Local and International)	118 (36.4%)	7 (35.0%)
Private Sector (For-Profit)	4 (1.2%)	1 (5.0%)
UN System	15 (4.6%)	0 (0.0%)
Unknown	11 (3.6%)	0 (0.0%)

Type of Work		
Advocacy	19 (5.9%)	2 (10.0%)
Combination	3 (0.9%)	0 (0.0%)
Health/Medical Service Delivery	36 (11.1%)	5 (25.0%)
Health Communication	14 (4.3%)	0 (0.0%)
Policymaking	12 (3.7%)	1 (5.0%)
Program Development/Management/Implementation	131 (40.4%)	4 (20.0%)
Research/Evaluation	72 (22.2%)	6 (30.0%)
Student	5 (1.5%)	0 (0.0%)
Teaching/Training	20 (6.2%)	2 (10.0%)
Unknown	12 (3.8%)	0 (0.0%)
Years in Profession		
0-5 years	72 (22.2%)	3 (15.0%)
6-10 years	86 (26.5%)	6 (30.0%)
11-15 years	70 (21.6%)	6 (30.0%)
16 or more years	85 (26.2%)	5 (25.0%)
Unknown	11 (3.6%)	0 (0.0%)
Abstract Accepted to Conference		
Do not know	4 (1.2%)	1 (5.0%)
No	149 (46.0%)	8 (40.0%)
Yes	140 (43.2%)	11 (55.0%)
Unknown	31 (9.6%)	0 (0.0%)

Data analysis

The team analysed survey responses of conference participants using Microsoft Excel. Analysts imported interview transcripts and survey data into MAXQDA qualitative data analysis software (version 18) to facilitate coding open-ended questions and transcripts. Descriptive statistics (frequencies) were generated for demographic variables (e.g. country, type of work, years of experience) and variables of knowledge use and sharing (e.g. with whom knowledge was shared, types of use) to explore trends in characteristics among the study participants.

The study team applied qualitative data coding techniques [25] in analysing the transcripts and open-ended question data from the survey, using both deductive and inductive approaches [25]. Deductive coding primarily used a priori-defined domains from the validated TDF [16], ones identified in the literature concerning barriers and facilitators to evidence use, and concepts about evidence use and sharing behaviour from the survey. Researchers added a priori codes above those derived from the TDF in order to better capture the influence of factors relevant to the KB role but not explicit in the TDF such as evidence characteristics (e.g. Timely Relevance) and KB activities (e.g. Interpersonal Sharing). As coding progressed, researchers found that the added codes helped capture the relation between internal and external factors in the KB thought processes. Subsequent cycles of coding resulted in additional inductive codes. The team created a reference codebook of codes, definitions and examples to aid consistency in coding. TN served as the primary coder throughout the study. To assess coding reliability, two authors (TN and DR) coded two transcripts purposively selected to have exceptionally deep content (i.e. extensive details in answers) and representing multiple types of respondent work and organisations. After provisional coding, points of disagreement were discussed and changes were made to the codebook.

Coding of the remaining interview transcripts took place in two cycles [25]. In the first cycle, all transcripts were coded using the amended codebook. The second cycle included revising the codebook as needed to reflect identified patterns, including further clustering and categorisation of codes into internal and external influences. Memo writing supported tracking rationales for code changes.

Analysis of coded segments included identifying the most relevant influences on the KB decision process. The criteria for relevance included rich descriptions (suggesting the importance of the topic to the respondent as an influential factor) and frequency across respondents. Similar tests for estimating relevance have been used in other TDF studies [11, 26]. Researchers used MAXQDA features in multiple ways to categorise and relatively rank influences. The codes 'Barrier' and 'Facilitator' were created and applied in tandem with construct codes to enable comparisons of which constructs appeared more as barriers or facilitators. Grouping codes as internal versus external influences similarly enabled comparisons. Finally, the MAXQDA feature of displaying the number of coded segment per code contributed to a relative ranking of codes and groupings, in combination with review of rich descriptions.

Continued analysis consisted of grouping and comparing the importance of internal facilitators, internal barriers, external facilitators and external barriers across data sources and respondent characteristics. Thematic analysis [27] yielded two types of insights, namely (1) themes of influences on the KB decision process, from the respondent perspective, and (2) themes of rationales for changing and supplementing TDF codes, from the researcher perspective, which are discussed in this paper.

Rigor and validity methods

The study design addressed rigor through multiple methods documented in the literature [28]. For quantitative data, researchers used validated survey and interview instruments. The interview sample was selected from the pool of survey respondents in line with a sequential study design. For qualitative data, multiple data sources—survey text responses, interviews and conference documents—were triangulated to assess consistency in findings and gain a deeper understanding of the study context. In addition to exploring themes of knowledge use and sharing, researchers also explored disconfirming evidence, i.e. accounts of not using or sharing knowledge from the conference. The study procedures also aimed for validity and included training interviewers according to developed standard operating procedures to ensure consistency, maintaining an audit trail of documentation such as interview logs, transcription verification records, researcher memos to record and interim analysis reports for expert reviewers.

Results

Most respondents in the study (92.8%; n = 292) indicated that they shared knowledge that they gained from the conference. When asked to identify with whom sharing took place, the majority of responses indicated recipients the respondents knew, such as members of their organisation (85.0%; n = 267) or their professional network (51.7%; n = 267). Most responses about what they shared focused on sharing expert opinion (62.2%; n = 267) or experience from another participant (60.3%; n = 267). Respondents shared mostly by passing along conference materials (73.0%; n = 267) or mentioning knowledge in communications done in-person, by phone or through e-mail (71.2%; n = 267). The most common types of use were designing health projects or programmes (54.7%; n = 256) or improving healthcare service quality (50.0%; n = 256).

Qualitative data also indicated that conference participants did not act on evidence from the conference in isolation, but instead were sharing evidence with other health system actors to facilitate understanding and inform policy and practice, in line with characteristics of the KB role. The ways the facilitation occurred reflected the KB's characteristics, context and thought processes about the evidence. For example, a researcher respondent described applying evidence about newborns to advocate with decision-makers to change how stillbirths are measured, whilst a healthcare provider respondent worked with colleagues to improve skills for newborn resuscitation.

Adequately exploring thoughts about evidence that KBs expressed required iteratively refining codes and definitions during analysis to address the scope of influences beyond those in the TDF. In particular, codes needed to be added or adapted to account for how KBs' internal reflections on external factors influenced their actions in selecting knowledge to share and use and the decisions they made during the process.

Changes to the TDF

All TDF domains were applied during interview transcript coding, whilst most were applied during coding of survey open-text responses. Most TDF domains represented internal influences such as beliefs and motives, whilst non-TDF codes represented a mixture of internal and external factors. The iterative coding process led to modification of the labels or definitions of four TDF domains—Knowledge, Skills, Intentions, and Environmental Context and Resources. Multiple reasons for modifying TDF domains surfaced during the coding process. In assessing the relevance of codes to the KB accounts based on rich descriptions and frequency across respondents, researchers decided that some relevant codes represented concepts that were important enough to respondents to merit adapting the TDF for the current study. For example, nuanced differences in how the domain Environmental Context and Resources was relevant to KBs appeared across accounts. In some cases, the environmental context referred to the KB's own organisation and how it operated, with implications for brokering use of evidence with local partners, as with this example:

“We [my organisation] are working with six hospitals, and we are applying social accountability tools to improve newborn health and also we include on what kind of facilities and equipment they are using, and how they are managing the equipment in their hospitals.” (Health/Medical Service Delivery, Local non-governmental organisation (NGO), Southern Asia)

Environmental context also appeared as important to KBs regarding the structure of the health system in their country and how it related to implementation of evidence-based practices, as shown in this quote:

“We are struggling in [our country] to establish the midwifery-led care, so midwife can link the community and the health facilities, and if the babies and mothers need the high quality or entrance care they can divert the mothers and the newborns in the tertiary health facilities level.” (Teaching/Training, Government/Ministry, Southern Asia)

Other modifications were based on researcher reflection that several of the definitions seemed better suited to exploring behaviour related to one practice in a specific setting, rather than a broad array of knowledge applied in diverse settings that was characteristic of the current study. The rationale for the TDF changes aligns with published guidance to focus application of a given framework to the scope of a study [29] and to propose hypothetical domains and constructs as part of a validity process [30]. See Table 2 for TDF domains and definitions, and how they were changed in this study. The table also notes for each domain whether it was determined to be an internal or external influence and a key barrier or facilitator based on analysis.

Table 2. Changes to TDF Domains and Definitions during Coding

Original TDF Label	Original TDF Definition (Cane et al., 2012)	Revised TDF Label	Revised TDF Definition	Internal or External Influence	Key Facilitator (+) or Barrier (-)
1. Knowledge	An awareness of the existence of something	Knowledge and Learning	An awareness of the existence of something. Process of acquiring knowledge.	Internal	+ -
2. Skills	An ability or proficiency acquired through practice	Unchanged	An ability or proficiency acquired through practice. Includes individual capability for critically appraising research evidence and determining implications for action and costs. Includes capability for adapting evidence for use or sharing in a local context or for current purposes.	Internal	N/A
3. Social / professional role and identity	A coherent set of behaviors and displayed personal	Unchanged	Unchanged	Internal	+ -

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		qualities of an individual in a social or work setting				
4.	Beliefs about capabilities	Acceptance of the truth, reality or validity about an ability, talent or facility that a person can put to constructive use	Unchanged	Unchanged	Internal	N/A
5.	Optimism	The confidence that things will happen for the best or that desired goals will be attained	Unchanged	Unchanged	Internal	N/A
6.	Belief about consequences	Acceptance of the truth, reality, or validity about outcomes of a behavior in a given situation	Unchanged	Unchanged	Internal	+
7.	Reinforcement	Increasing the probability of a response by arranging a dependent relationship, or contingency, between	Unchanged	Unchanged	Internal	N/A

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		the response and a given stimulus				
8.	Intentions	A conscious decision to perform a behavior or a resolve to act in a certain way	Unchanged	A conscious decision or plan to use or share knowledge. Displaying initiative in evidence use or sharing.	Internal	+
9.	Goals	Mental representation of outcomes or end states that an individual wants to achieve	Unchanged	Unchanged	Internal	N/A
10.	Memory, attention and decision processes	The ability to retain information, focus selectively on aspects of the environment and choose between two or more alternatives	Unchanged	Unchanged	Internal	-

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11. Environmental context and resources	Any circumstances of a person’s situation or environment that discourages or encourages the development of skills and abilities, independence, social competence and adaptive behavior	<ul style="list-style-type: none"> a. Environmental context—Own Organization and Setting b. Environmental context—Country or Health System c. Resource Availability 	<p>The domain was split into three sub-domains, as follows:</p> <ul style="list-style-type: none"> a. Aspects of a person’s organization or setting that influence behavior or actions regarding evidence use or sharing. b. Country or health system characteristics that influence behavior related to evidence use or sharing c. Availability of financial and other types of resources (e.g., human, supplies) for using or sharing evidence. Includes the financial resources needed to incorporate the evidence in health practice. 	External	-
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12. Social influences	Those interpersonal processes that can cause individuals to change their thoughts, feelings, or behaviors	Unchanged	Unchanged	External	N/A
13. Emotion	A complex reaction pattern, involving experiential, behavioral, and physiological elements, by which the individual attempts to deal with a personally significant matter or event	Unchanged	Unchanged	Internal	N/A
14. Behavior Regulation	Anything aimed at managing or changing objectively observed or measured actions	Unchanged	Unchanged	Internal	N/A

Supplemental codes

Table 3 presents the most used non-TDF codes that were added deductively and inductively to capture a range of internal and external barriers and facilitators. Most supplemental codes aided in identifying influences relevant to complex environments, such as those of LMICs, and the unique nature of the KB experience. For example, the supplemental code Multi-Country Importance was useful across KB accounts in different ways from TDF constructs and was possibly more relevant to complex settings. The code relates to the view that critical health issues and implementation evidence are more important when relevant to multiple countries.

This view expressed by multiple KBs appeared more often in mention of low-resource settings; however, one interesting exception stressed a common healthcare issue across countries with dissimilar economic characteristics, as shown in this quote:

“It is quite comparative, that I have, for example, the newborn screening program which is not available for other African or Asian countries, and in spite of that I have the problem of newborn screening because it is not democratically distributed in the whole country, for the wealthy countries as well.” (Health/Medical Service Delivery, Private Sector, Western Asia)

The table includes a short name and definition, and notes of whether the code represented an internal or external influence and was determined to be a key facilitator or barrier.

Table 3. Most used supplemental codes

Code Label	Definition	Internal or External Influence	Key Facilitator (+) or Barrier (-)
Accessibility	Ease or difficulty of obtaining evidence when and where it is desired and in the format desired	External	-
Decision-Making Culture	Collective characteristics and knowledge of a group of people that influence individual decision making	External	-
Interpersonal Sharing	Interpersonal communication among research producers and consumers or stakeholders as part of a relationship that includes discussion of research evidence	Internal	+ -
Knowledge Presentation	Suitability of presentation of evidence, language for intended audience, synthesized evidence, and knowledge products	External	+ -
Local Applicability	Belief about the relevance of evidence from a global source or other country to a local setting, whether now, in the past, or in the future	External	+
Multi-Country Importance	Public health problems, evidence, or interventions that are important to multiple countries or globally	External	+
Opportunity Availability	Availability of time or opportunity in the course of professional duties to use or share knowledge	Internal	-

Timely Relevance	Belief that research topic is relevant to current or near-term work or organizational objectives	External	+
Usefulness	Extent to which knowledge can be used for a practical purpose or in several ways	External	+

Themes of code changes

The issues with adequately capturing influences on KBs that led to code changes can be seen as falling within four major themes.

Influences from beyond the organisation

The most essential change needed to the TDF—and requiring addition of non-TDF codes—concerned influences originating beyond the respondent’s organisation or immediate environment. In the complex arena of global health, these influences included ones within the country (such as policy environment, culture and health system), from other countries, and from global organisations such as WHO.

The abundance and breadth of data applicable to the TDF domain Environmental Context and Resources led the team to subdivide the domain into three areas of influence, namely (1) aspects of the organisation or setting, (2) characteristics of a country or health system, and (3) availability of financial, human or other resources. Each distinction aided understanding of the data and has implications for possible interventions to aid evidence use and sharing. For example, the ability to note country or health system contextual factors surfaced issues with the governing environment that impeded evidence use.

“There is a focus on integrations of maternal and newborn health in that conference [but] in our...country at a central level there is no proper coordination between two divisions, maternal health and child health.” (Programme Development/ Management/ Implementation, NGO/ Private Voluntary Organisation (PVO), Asia)

As the conference knowledge was intended for use in resource-limited environments, the study team also found it useful to be able to determine the extent to which the availability of resources influenced evidence use.

“So you pass the information to a lower cadre that should do the work, but very often they don’t have the stethoscope and...to check the blood pressure, or they don’t have the urine dipstick to check for the proteinuria.” (Research/Evaluation, NGO/PVO, Africa)

The significance of international influences became evident during the coding process and led to the addition of several non-TDF codes, namely Multi-Country Importance, Comparable Setting and Success, and International Relationships. These codes helped fill a gap in capturing the value that KBs placed on evidence generated or applied in other LMICs that had similar characteristics (e.g. economic, cultural).

“...whenever we propose some kind of suggestion...public health officials...ask us...have you any good success stories, where from you collected this kind of idea. So we suggest to them that... we come to know about such kind of practices being used in other countries, and their economic situation and their electricity situation is the same as ours. So we can do such kind of [idea] easily and these are easily applicable...” (Health/Medical Service Delivery, NGO/PVO, Asia)

Knowledge selection as a process

In other studies using the TDF, the knowledge linked to behaviour has already been selected and a specific action identified (i.e. a ‘best practice’, such as washing hands to prevent infection). Individuals apart from those targeted in the studies have decided that the knowledge is relevant to address a timely problem relevant to a local context. For this study, labels and definitions needed to be adapted to reflect the process KBs undergo in identifying and deciding what to do (if anything) about knowledge to which they had been exposed. For example, the domain Knowledge relates to whether someone has awareness of information to the extent that they could take a proscribed action. With KBs, however, perceiving that they had learned something new appeared to be a facilitating precursor to focusing attention on and acting upon the knowledge.

“It was my first time to attend the...international conference. To me it was like I didn’t know that maybe what I was looking at... I didn’t know that it was very, very important, and it’s not only in [my country]” (Teaching/Training, Academic/Research Institution, Africa)

For this reason, the team expanded the domain and definition to include the process of acquiring knowledge (Knowledge and Learning).

Similarly, the domain Skills was clearly relevant to KB descriptions of learning a specific clinical skill such as newborn resuscitation; however, it omitted a crucial aspect of the knowledge selection process, namely the ability to critically appraise knowledge as scientifically or otherwise valid and contextually relevant.

“Okay, one of the major reasons [I shared the knowledge about newborn resuscitation technique] is that... if you go on a deep analysis of some of the causes [of high] neonatal mortality rates, most of these, they are somehow preventable deaths if we apply correct skills.”
(Health/Medical Service Delivery, Government/Ministry, Sub-Saharan Africa)

Expanding the definition of Skills enabled the study team to capture both narrowly defined clinical skills (e.g. resuscitation technique) and broader reasoning skills (e.g. suitability for addressing newborn mortality) involved in the KB process.

Another need for extending domain definitions related to the later stages of the knowledge selection process, during which KBs considered the possibilities of future action based on knowledge. Given that the KBs in this study also mentioned seeing themselves as responsible for applying knowledge, the team wanted to capture KB traits of initiative and action-orientation as facilitators in the process. To address this need, the team expanded the definition of the domain Intentions from planning on adhering to specific guidelines to a broader willingness to take the initiative on knowledge action.

“Working with the nurses, we tried to share with them the importance of making sure that they provide quality services to the antenatal clinic. This is one of the lessons I learned at the conference. I try to make sure that at any time I speak to nurses and midwives, I emphasize the issue of the content of care they give to their client.” (Research/Evaluation, NGO/PVO, Africa)

Access and packaging of knowledge

With many of the studies using the TDF or relating to KBs taking place in higher- income countries, access to knowledge in a needed format and language is seldom depicted as a significant issue. With the conference knowledge being intended for use in resource-limited settings, the study team identified the need to capture external influences related to knowledge access in LMICs. These influences included access to knowledge synthesis products and electronic resources (in lieu of print resources). To capture these concepts, the team added the codes Accessibility and Knowledge Presentation, which appeared relevant as both a facilitator and barrier. In one example, the respondent mentioned the challenge in arranging for a flow of information from urban to rural settings for local use.

“I often have information for me because most of the time I live in the state capital. I don’t go to villages or rural area, where people that need the information live. So when you come back [from a conference] you have to identify people to actually go to those villages or rural areas who will be able to pass this information down the line...to people that need the information to change their life.” (Research/Evaluation, NGO/PVO, Africa)

KBs also mentioned the need for them to filter information from the conference that had been packaged for an audience working globally rather than locally.

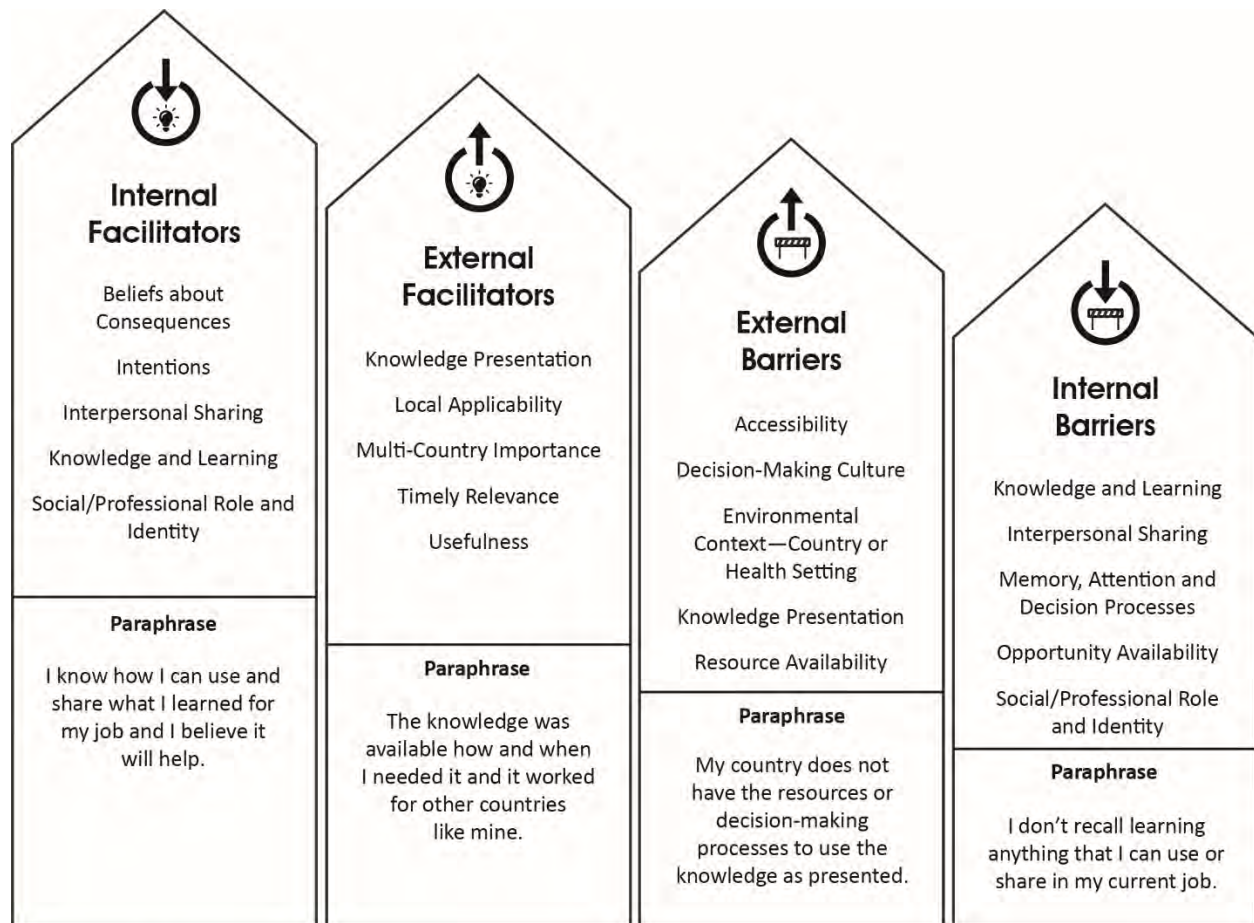
Fit for use

In many studies using the TDF, the evidence in question has been previously determined to be a good fit for the context. With the global nature of the conference, the evidence presented could potentially be shared and used in settings worldwide. KBs described their thought processes in identifying potentially actionable evidence and assessing whether and how it could be adapted for local use. In order to capture this reasoning, the study team added codes for Adaptability of Evidence and Local Applicability.

“Because it is a cultural practice [in our country] that people apply something on the umbilical cord of a newborn child. And if you provide them with the something which is safe [chlorhexidine] and which will prevent sepsis... so that’s why it was a decision that instead of one day it should be a seven-day application. So we adapted it to our cultural practices.” (Policy-making, Government/Ministry, Asia)

Relevance of TDF versus non-TDF codes

Overall, codes categorised as internal facilitators appeared most influential on respondents, followed by external facilitators, external barriers and, finally, internal barriers. Figure 2 shows the most relevant codes by category. Researchers arrived at relative rankings through a review of frequencies of coded segments and code groupings in MAXQDA and review of rich descriptions to assess KB views of importance. Using this combination of approaches, researchers relatively ranked the top five codes in each category pair (barrier/facilitator, internal/external).



Relevance criteria: richness of descriptions + frequency across respondents

Figure 2. Most relevant facilitators and barriers to knowledge sharing and use, in order of declining importance (left to right). Internal facilitators appeared most influential on knowledge brokers.*

TDF-based codes and inductively derived codes were equally useful in identifying relevant internal facilitators and barriers. Inductively and deductively derived non- TDF codes were most helpful in identifying relevant external facilitators and barriers, although Environmental Context and Resources is a concept that appears both in the TDF and other literature.

The top relevant domains and relative importance of internal versus external influences appeared to be mostly consistent across respondent characteristics such as type of work, type of organisation and region. Slight differences in internal versus external influences appeared when comparing respondents by type of work. For example, for respondents working in Health/Service Delivery, external barriers were more influential than for respondents working in other types of work. One nuanced difference among the rich descriptions, though not affecting estimations of relevance, concerned the Emotion domain. Expressions of passion for improving health outcomes in an LMIC appeared almost exclusively with respondents who both worked and lived in an LMIC country. Respondents based in one country, but working on activities in other countries, did not express passion to the same extent.

DISCUSSION

Using the TDF provided a starting point in this study to identify the internal barriers and facilitators to evidence sharing and use described by KBs; however, its use was somewhat challenging and required adaptation to address broad external factors and adequately explain knowledge brokering behaviour.

Using TDF to explore the interpersonal communication aspect of knowledge brokering

Analysis of qualitative data using TDF-derived codes helped identify factors that relate to effective knowledge brokering, which may be because of the TDF focus on human behaviour and its underpinnings in psychological theory. Interpersonal communication has been identified in the literature as an essential element in knowledge brokering and in advocating use of evidence in public health decision- making [13, 31, 32, 33, 34]. The need for KBs to build relationships of trust with health decision-makers [33] requires a strong foundation of interpersonal skills. Use of the TDF may have helped authors identify internal factors influencing evidence sharing and use more so than using an inductive approach alone.

The TDF was useful in exploring KB characteristics as well. Studies have examined individual aspects of KBs, and there have been calls for additional research on desirable KB personal attributes [31]. Positive traits for KBs identified in the literature include professional competencies [13, 35, 36], experiential knowledge [13], interactive skills [32] and personal disposition (e.g. a strong commitment to improving health outcomes in their country, action orientation) [13]. These attributes exhibited themselves in the current study through the KB descriptions of how they shared and used evidence in their professional roles, demonstrating confidence in their professional competence, experience, interpersonal skills and vision for improved health outcomes. The findings suggest that KBs in the study may fit the profile of a type of KB referred to in the literature as a 'knowledge mobiliser' [37] who can drive change and operationalise evidence. Further research based on the findings may contribute to development of an assessment tool to identify KBs who are also mobilisers.

Most findings of influences on evidence use surfaced by the TDF agree with ones mentioned in the literature, whilst a few disagreed. The high relevance of Belief About Consequences coincides with findings showing that healthcare professionals tend to act on knowledge if they believe it will have positive consequences for the care of patients (or not act upon it in the case of anticipated negative outcomes) [11, 38, 39, 40]. The strong influence on KBs of the anticipated health outcomes resulting from evidence use may link to the fact that many KBs in the study had hybrid professional roles, including responsibility for applying knowledge (such as through healthcare service delivery) as well as knowledge brokering. Social and Professional Role [11] and Environmental Context [39] also appear as highly relevant TDF domains in other studies, as in the current research, suggesting influences that may be generalisable across types of roles and settings in the health field. On the other hand, Social Influence appears highly relevant in multiple studies [39, 40], but not in the current study. The difference in relevance may be because the diversity of evidence, job roles and settings in the present research did not surface reflections on social influence the same way that a study focusing on one clinical behaviour and one or few healthcare cadres might. An alternative explanation may be that KBs in the study did not mention social influences on their professional decisions out of a social desirability bias.

Challenges with applying the TDF

The authors experienced several difficulties with applying the TDF, some of which the literature also reports. The time-consuming aspect of utilising the TDF posed a problem that has been mentioned in other research [10, 29, 41], though the extent to which using the TDF added to the time that qualitative data analysis typically takes is not known. Identifying distinctions between domains also posed a challenge noted in other studies [26]. The presence of the same constructs in multiple TDF domains added to the challenge. For example, Professional Confidence is a construct included in two TDF domains—Social/Professional Role and Identity and Beliefs about Capabilities. The authors in this study addressed the challenge by iteratively revising their qualitative codebook, adding to the exemplars and inclusion and exclusion criteria, which added to the analysis time.

Other challenges concerned how the study design incorporates use of the TDF. The current study used the TDF retrospectively on existing data, instead of prospectively for instrument design and analysis. While the TDF has been successfully used retrospectively (e.g. systematic review of implementation interventions [39]), such an approach has a risk of missing barriers and other factors that might surface during instrument design [26, 41]. Retrospective use in this study also involved applying the TDF to a broadly defined behaviour (knowledge sharing and use), as opposed to one specific practice, which may have been why some TDF domains were underrepresented (e.g. Reinforcement). If the study had prospectively focused on one behavior and professional role within the realm of knowledge brokering, such as academic KBs interacting with policy-makers, these underrepresented domains might have surfaced. Issues also arose from applying TDF to the topic of global health. Contextual factors are so complex in LMICs that the TDF domain Environmental Context and Resources needed to be expanded and adapted to capture the critical implications of knowledge exchange between countries.

Finally, the authors experienced challenges in distinguishing between internal and external factors and, similarly, between barriers and facilitators. For example, the way that respondents reflect on external factors could be said to be determined by their internal attributes. In one case, a public health decision-maker displayed an internal skill in crafting messaging about a health practice in response to an external factor, that is, resistance of local healthcare providers. Similarly, a respondent's view of whether an external factor was a barrier or facilitator may have been determined by internal factors. For example, in a case of a healthcare service provider describing cultural practices for newborn cord stump care, the provider described the practices as an opportunity to substitute an evidence-based approach in a culturally acceptable way rather than a barrier.

Use of the TDF offered a starting point for exploring KB decision processes, but might not be as useful if study aims focus on implementation of a particular intervention, for which there are other frameworks. Notable among these implementation frameworks are the Tailored Implementation for Chronic Diseases—Determinants of Practice Checklist [17], Promoting Action on Research Implementation in Health Services [42], and the Consolidated Framework for Implementation Research [43]; however, these frameworks do not share the same focus as the TDF. They are primarily concerned about implementation of interventions rather than the earlier steps of engaging with evidence to prioritise and adopt interventions, and they focus on organisational aspects rather than individual ones. Further research would be needed to determine if the supplemental codes created for the current study, and particularly Multi-Country Importance, would provide a useful addition to these popular merged frameworks.

Limitations of the study

The study had limitations related to sampling, respondent bias, study timeline and TDF use. First, self-selection of study participants may have led to over-reporting of facilitators and under-reporting of barriers due to social desirability bias—volunteers for the study may have wanted to show appreciation for being included in the conference, particularly those who received sponsorship to attend. In turn, over-reporting and under-reporting may have influenced estimations of which TDF domains were most relevant to KBs. Insufficient samples of respondents for key demographic characteristics such as region and type of work limited the ability of the authors to identify how domain relevance may have varied by strata. Second, the length of time between the conference and interviews (10–14 months) may have introduced a recall bias. The extended timeline also made it infeasible to obtain comments from study participants about the findings. Finally, the authors' adaptation of the TDF meant that they were no longer working with a validated version of the TDF, and the changes were not validated.

Implications and next steps

Additional research should be conducted to build on the theoretical contributions of the TDF to explore internal and external factors influencing evidence sharing and use in LMICs. Additionally, integration of TDF with commonly used implementation frameworks should be explored for interventions in LMICs that have knowledge brokering or dissemination as a critical component. Use of the TDF in building KB capacity in key influential areas, such as the interpersonal skills involved in knowledge brokering, should also be explored.

CONCLUSIONS

Theories of individual behaviour such as those in the TDF can help understand when, where and for whom knowledge brokering is effective in increasing evidence-informed health policy and practice in LMICs. Understanding how KBs in LMICs reflect on evidence and interact with their environment has potential for improving global dissemination efforts and LMIC-to-LMIC exchange of evidence and implementation approaches.

Additional files

Additional file 1: Survey questions. (PDF 90 kb)

Additional file 2: Interview script. (PDF 69 kb)

Abbreviations

KB: knowledge broker; KT: knowledge translation; LMICs: low- and middle-income countries; NGO: non-governmental organisation; PVO: private voluntary organisation; TDF: Theoretical Domains Framework

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Authors' contributions

TN conceived the study, collected data, analysed data and drafted the manuscript. DR coded transcripts, contributed to writing the manuscript and participated in coordination of the study. SW participated in coordination of the study and critically reviewed the manuscript and contributed to its intellectual content. All authors read and approved the final manuscript.

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Availability of data and materials

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

Ethics approval and consent to participate

The study protocol was reviewed by the Johns Hopkins Bloomberg School of Public Health Institutional Review Board (IRB 00007142) and determined to be not human subject research as personal information was not collected, and therefore the study did not require IRB oversight. The protocol reviewed by the IRB provided for interviewers obtaining and recording verbal consent by signing and dating consent forms, which was done during the study as an ethical practice.

Consent for publication

Not applicable.

Competing interests

The authors declare that they have no competing interests.

Author details

¹Jhpiego, 1615 Thames Street, Baltimore, MD 21231, United States of America. ²Department of International Health, Johns Hopkins Bloomberg School of Public Health, 615 N. Wolfe Street, Baltimore, MD 21205, United States of America. ³Department of Public Health and Primary Care, Ghent University, Campus UZ, K3, 6de verdieping, Corneel Heymanslaan 10, 9000 Ghent, Belgium.

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Limitations

5.1 Overview of Limitations

Several issues with how this PhD research was conducted may have limited the findings and their future usefulness. Limitations included those related to methods used or omitted, analysis approaches, and choices made in the research designs, including choice and definition of context for the research.

5.2 Biases

Several types of bias likely occurred as a result of research decisions. Foremost of these was selection bias associated with survey respondents' self-selection to participate and lack of random sampling. With survey invitations distributed only through e-mail and the survey delivery limited to the web, results were biased toward respondents likely to use e-mail frequently and have access to reliable Internet connectivity. In turn, bias toward Internet users may have led to a bias toward respondents in urban areas versus rural areas, especially in Africa, Asia, and Latin America and the Caribbean. This may have limited information obtained about how evidence informs community healthcare, except for respondents with professional roles in both urban and rural settings.

The selection bias also may have affected results in other ways. The survey and interviews were biased toward respondents comfortable with communicating in English, as both were conducted only in English, with one interview exception that provided the respondent with an opportunity to respond (through a translator) not given to other non-English speakers. There also may have been a bias in interviews toward respondents who managed their own schedules and appointments as all scheduling was done through e-mail, which may have reduced representation of respondents in higher-level professional roles.

Another bias may have been related to the respondent motivation for volunteering. There may have been a bias toward respondents expecting political or financial benefit from participating (beyond the prize drawing), such as receiving international funding for health programs and sponsorship for future travel to conferences. Comments from some interview participants suggested they equated the interviewers with the conference sponsors and organizers. It would have been better to have invitations sent by an organization or group not associated with the conference (to avoid association with funders)

and with endorsement by respected health system actors in multiple regions to raise the response rate, which was less than a third in 2015.

The population of all conference participants was subject to bias introduced by the conference organizers to the extent that organizers may have invited or sponsored participants for political reasons. Non-invited conference participants may have had more opportunities to learn about the conference than other health system actors because of the global program's communication channels (such as the e-mail distribution list), which may have influenced data obtained.

Because of possible influences related to politics and perceived power differentials with conference organizers, the apparently positive and highly motivated viewpoints of study participants may be associated with social desirability bias instead of being indicative of attributes shared by the study participants.

Non-response bias was also an issue as the lack of access to conference registration information made it impossible to estimate non-response errors or use alternative methods of contacting non-respondents, such as by phone to aid response rates and possibly reach respondents with different characteristics. Researchers had no access to demographic and contact information for all conference participants in 2013 and 2015, and only limited information in 2012.

Also related to non-response bias, not all conference participants may have received the e-mailed survey invitation because the e-mail distribution list was not a conference registration list, but rather a broader announcement list about the global program. Last minute substitutes for planned attendees may not have received the survey invitation. Other reasons the invitation may not have been received included recipients spending extended time working in a location without e-mail access or the e-mail invitation ended up in a spam filter.

Other types of bias may have occurred as well. The 6-month gap between the conference and the survey in 2015 may have introduced recall bias for questions such as "how many times did you share knowledge from the conference?" Researcher bias and reflexivity may also have influenced the research. Having the research team working for one of the organizations sponsoring the conferences may have influenced respondents to over-report knowledge sharing and use. Reflexivity may have been

associated with two-way influence (Yin, 2018). The candidate may also have been influenced by subtle agendas of respondents during interviews, such as with one respondent who began the interview by expressing his view on the role of local NGOs in global health programs.

The candidate's strategies for adapting to biases included triangulating methods (surveys, interviews, document reviews), repeating the methodology for three conferences in different contexts, selecting interview candidates for maximum diversity, and comparing findings with the literature on knowledge brokers.

5.3 Limited Quantitative Analysis

Producing only descriptive statistics such as frequencies and cross-tabulations during quantitative analysis may have missed opportunities to explore relationships between variables to suggest avenues for future research, such as regional differences in knowledge use and sharing.

5.4 Saturation Issues

Inconsistent consideration of qualitative data saturation may have affected results. This PhD project treated three types of saturation (Saunders et al., 2018) in different ways, as follows:

- Inductive thematic saturation during analysis was judged by seeing the same types of responses over and over while coding and re-coding the interview transcripts and open-ended survey questions.
- Data saturation was not judged to drive data collection. Challenges with reaching respondents (non-response) led to stopping data collection to adhere to a study timeline; therefore, it is unknown if future interview respondents would have had new types of responses.
- Theoretical saturation associated with the a priori domains and constructs of the Theoretical Domains Framework was judged and mostly, but not entirely, met. The domain, Reinforcement, and its constructs did not appear in the data.

The question of whether saturation was reached and how it was judged produced different answers depending on the type of saturation being addressed. A preferable approach to data saturation would have been to assess saturation during a parallel analysis and data collection process with a random

sample of participants. The lack of theoretical saturation with the Reinforcement domain should have been explored and rival explanations developed, including the effect of selection bias.

5.5 Survey Instrument Limitations

Several limitations existed with the development, testing, and implementation of the survey instrument used in the conference studies.

Wording of questions and timing of changes posed challenges. Intention to act wording should have been omitted from questions such as “do you intend to use/share the knowledge?” to avoid confusion between actual and intended action. This change was made for the 2015 conference. Modifying questions between conferences created challenges in comparing results between 2012, 2013, and 2015.

Questions on gender, years of education, and years working in the current country should have been included to provide additional avenues to explore relationships with knowledge sharing and use behavior. Theory-based questions should have been included to help identify knowledge brokers. For example, including questions based on the Knowledge-to-Action Framework (Graham et al., 2006a) or Knowledge Broker Role Domains (Glegg & Hoens, 2016) would have aided in identifying respondents as knowledge brokers. Including questions based on the Theoretical Domains Framework (Cane et al., 2012) would have improved the ability to prospectively identify influences on the knowledge brokers by domain.

Restriction of data to nominal variables limited analysis options. For example, allowing respondents to enter unique numbers to numeric questions instead of selecting from numeric ranges would have provided different analysis options.

In developing and testing the survey, additional steps should have been taken to strengthen validity and reliability of the survey instrument. Staff of US-headquartered organizations developed, reviewed, and tested the survey and interview questions, which may have resulted in a bias toward wording preferred by the US donor and implementing partners (such as the term “client and beneficiaries”), leading to different interpretations by participants. Including definitions or examples of terms may have helped participants. A better process would have been to incorporate the following steps in development and testing:

- Conduct focus groups in Africa, Asia, and Latin America and the Caribbean to inform design. Discuss with members their perceptions and experiences in evidence access, sharing, and uptake.
- Perform cognitive testing (Fowler, 2014) to explore how participants understood the questions.
- Conduct preliminary mock interviews to do behavior coding (Fowler, 2014) of the interview process, such as noting which questions required prompting or elicited respondent requests for clarification.

Lack of independence among some question categories also may have introduced error in analysis. For example, for the question asking with whom the respondents shared knowledge, the option of sharing knowledge with communities of practice and working groups may not be independent of the option for sharing knowledge with discussion groups.

5.6 Limitations of Researcher Interaction with Participants, Organizations, and Settings

The research would have benefitted from alternative methods of interacting with study participants, organizations, and settings.

Observation of interactions and activities (such as conferences and meetings), prolonged engagement of the researcher with the study participants in their settings, and approaches such as participant journaling would have aided in appreciating the nuances of knowledge exchange as social phenomena.

The IRB protocol would have been improved by providing for interacting with participants multiple times during the course of the study to enable activities such as follow-up questions, member checking, and other participant involvement in the study process.

The interviewing process had weaknesses. Some interviewers used different wording of questions from that appearing in the interview script, which may have provided an inconsistent interview experience for participants and affected the answers provided. Conducting all interviews remotely may have missed nuances in responses such as cues from body language. Also, the interviewers were all from the US, which may have contributed to a social desirability bias and perceptions by the participants of a power imbalance with the interviewers associated with the source of program funding being in the US.

The candidate's review of interview recordings and transcripts during the interviewing stage of the research was for quality control purposes. It would have been better to conduct analysis in parallel to data collection to inform the interviewing and to have the research team discuss analysis during the weekly meetings.

The conferences as research settings posed challenges. Inadequate information about the conference organizing process and actors may have led to gaps in insights about how knowledge brokers learned about evidence and shared it as conference presenters. Also, there may have been power imbalances among the conference organizers that was different for each of the three conferences (such as which organization took the lead role). These power differences may have influenced how the conferences were designed and the level of input from participants in Africa, Asia, and LAC in determining the agenda and selecting knowledge to feature during the conference. Participants who were interviewed during the research may have had a role in knowledge selection before the conference which was not explored during the interviews. Participation in knowledge selection may have merited further exploration to gain insight into the role of trust or judgement of evidence related to uptake decisions.

For the 2012 conference, the candidate was able to be a participant-observer in conference planning meetings, which provided richer insights into the conference process. It would have been beneficial to also have this role for the 2013 and 2015 conferences and also interview key informants among the planners in the US and Africa, Asia, and LAC.

Use of research methods such as observation, ethnography, and focus groups was limited by the candidate's self-funding of the PhD project. In-person contact with participants, organizations, and settings would have strengthened the research. Adapting to this limitation in the project included training the interviewers and audio transcriptionists to note nuances during the interviews (such as enthusiasm or hesitancy in answers), comparing findings to the literature, and conducting peer debriefs (Creswell & Miller, 2000) with the global program staff to gather more insights.

5.7 Case Study Limitations

The case studies described in the two book chapters had limitations in design and implementation. The candidate as researcher and employee of the lead global health organization may have experienced

insider bias (Trowler, 2011), relying on local knowledge extensively and perceiving pressure to limit negative reporting.

Restricting the case studies to secondary data collection may have missed insights and opportunities for diverse viewpoints provided by primary methods such as ethnography and interviews. The research also could have benefitted from greater diversity in study contexts. Limiting the case studies to one international funder (USAID) may have missed opportunities to explore differences in knowledge exchange approaches related to funder preferences. The knowledge exchange platforms described in the case studies were initiated by program headquarters staff in the US. Diverse perspectives should have been sought by also including platforms initiated in Africa, Asia, or LAC and by different types of organizations, such local NGOs and academic institutions

The case studies lacked proposed rival explanations for findings (Yin, 2018). Possible rival explanations for promising results of knowledge exchange platforms include power and organizational hierarchy effects on participation and possible roles of charismatic actors in the global health program environment.

Finally, the research aims of the case studies may have lacked clarity for readers as the writing style was part descriptive, part explanatory, and part evaluative, possibly associated with insider bias. While the descriptive and explanatory elements of the studies added to the evidence base, the chapters should have made clear that their lack of role in formally evaluating the knowledge exchange approaches or the global health programs.

5.8 Evaluative Language in Papers

While the published paper about the 2012 and 2013 conference studies referred to evaluating the effectiveness of the conferences as knowledge translation approaches, the wording should have instead been restricted to the knowledge brokers' views of outcomes instead of suggesting that an evaluation or assessment was conducted. As the PhD project progressed, the candidate increasingly reviewed documents from the global programs to gain a fuller understanding of evidence uptake, and they did include statements about outcomes of knowledge brokering following the conferences (Maternal and Child Health Integrated Program, 2013); however, verification was beyond the scope of this PhD project.

Findings from the current project could provide a foundation for future research that evaluates knowledge broker roles according to specific success criteria, which could help answer calls in the literature for better approaches to incorporating knowledge brokers in organizations' workforces.

5.9 Summary of Limitations

Limitations in implementation of the research project and unknown effect of external factors provided challenges in determining findings that best contribute to the body of knowledge. Methodological limitations and the researcher role in the global health programs inhibited generalizability of findings to all conference participants or all global health programs. Limitations also prevented determining which knowledge broker activities and decision factors were associated exclusively with countries classified as having a low or middle income, as opposed to settings categorized in other ways. Finally, power differentials inherent to global health program funding and implementation may have influenced which study participants could be reached and the content of their responses.

6 General Discussion and Critical Interpretation

6.1 Main Findings

The following discussion presents a critical interpretation of the main findings as themes across studies. The narrative includes selected examples from the studies and comparison to findings in the literature.

6.1.1 Study of Knowledge Brokers Versus Knowledge Brokering

The research project's main contribution is as a study of knowledge brokers: how they describe their activities and make decisions about acting on evidence based on internal and external influences. The data were strongest in providing insights into individual knowledge broker behavior and decisions, rather than how knowledge brokering processes worked in the contexts of the participants. Additional data on the contexts in which knowledge sharing and mobilization took place (such as organizational settings) would have provided more insights. While the case studies addressed brokering by describing knowledge exchange processes, they were not sufficient as studies of brokering because their designs did not reflect an aim of exploring diverse knowledge brokering processes in detail. The main contributions of the case studies were in providing a snapshot of organizations, groups, and individuals acting as knowledge brokers in order to illustrate how the concept might be operationalized.

6.1.2 Knowledge Broker Activities that Support Evidence Uptake

Knowledge broker activities described by study participants as being supportive of evidence uptake aligned with those identified in the literature. As noted in the literature, an individual knowledge broker may perform only some of the larger superset of possible knowledge broker activities, depending on the needs of the organization or setting. For this reason, a review of both the project findings and the literature is needed to compile a broader list of knowledge broker activities that support evidence uptake. The list below presents a compilation of key broker activities and cites illustrative sources in the literature. Bolded activities in the list derive from the literature alone and were not represented in project data, so it is unknown if study participants were engaged in those activities.

Key supportive knowledge broker activities are:

- Building active, sustained, and collaborative relationships across different types of evidence producers and users (Bornbaum et al., 2015; Dobbins et al., 2018; Lam, 2018; Phipps, Brien, Echt, Kyei-Mensah, & Weyrauch, 2017)
- Addressing contextual factors, including the political environment, influencing evidence access and uptake (Bornbaum et al., 2015; Haynes et al., 2018; Mallidou et al., 2018; Phipps et al., 2017; R. Rushmer et al., 2019)
- Critically appraising different types of evidence (for example, biomedical and implementation) (Bornbaum et al., 2015; Glegg & Hoens, 2016; R. Rushmer et al., 2019)
- Communicating evidence and tailoring knowledge broker interventions to be meaningful to audiences (Dobbins, Hanna, et al., 2009; Dobbins et al., 2018; Glegg & Hoens, 2016; Murthy et al., 2012)
- Using a variety of modalities in outreach to evidence producers and users, both face-to-face and virtual (such as webinars) (Bornbaum et al., 2015; Elueze, 2015; Glegg & Hoens, 2016; Mallidou et al., 2018; Phipps et al., 2017)
- Incorporating mentoring or coaching over a sustained period in approaches to build the capacity of users to access, appraise, and apply evidence (Dobbins et al., 2019; Haynes et al., 2018; Padek et al., 2018; Phipps et al., 2017)
- **Using a variety of ways to keep informed of changes in evidence-based practice (Mallidou et al., 2018; Salter & Kothari, 2016)**
- **Advocating for dissemination and knowledge translation planning as part of the research planning process (Canada Institutes of Research, 2012; Glegg & Hoens, 2016)**
- **Facilitating organizational change to support a culture of using evidence in decision-making (Bornbaum et al., 2015; Dobbins et al., 2019; Phipps et al., 2017)**

6.1.3 Knowledge Exchange Approaches in a Series of Global Health Programs

The global health programs in the case studies worked toward multiple ambitious aims, including scaling up high-impact health practices in multiple contexts and facilitating the spread of evidence globally to inform health practice and policy and address emerging health issues. The partners on the programs used a variety of approaches to promote exchange of knowledge and co-creation of new knowledge (e.g., implementation evidence) in line with the mission of the programs. The programs incorporated

the following blend of online and face-to-face approaches to connect participants across regions and organizations:

- **Technical consultation meetings** of public health experts collaborating on the review of evidence and recommending future research
- **Communities of practice**, which hosted online events and face-to-face meetings to engage members
- **Online forums and collaboration space** on a portal website with e-mail interaction for moderated discussions and collaboration to develop products
- **Synthesized knowledge products**, including electronic toolkits of “how-to” information
- **Electronic learning courses** on multiple public health topics on a portal website

A review of program documents and communications suggest that program implementing partners designed knowledge exchange approaches to respond to several drivers inherent to the characteristics of global health programs. Figure 10 summarizes key drivers that influenced selection of knowledge exchange approaches.

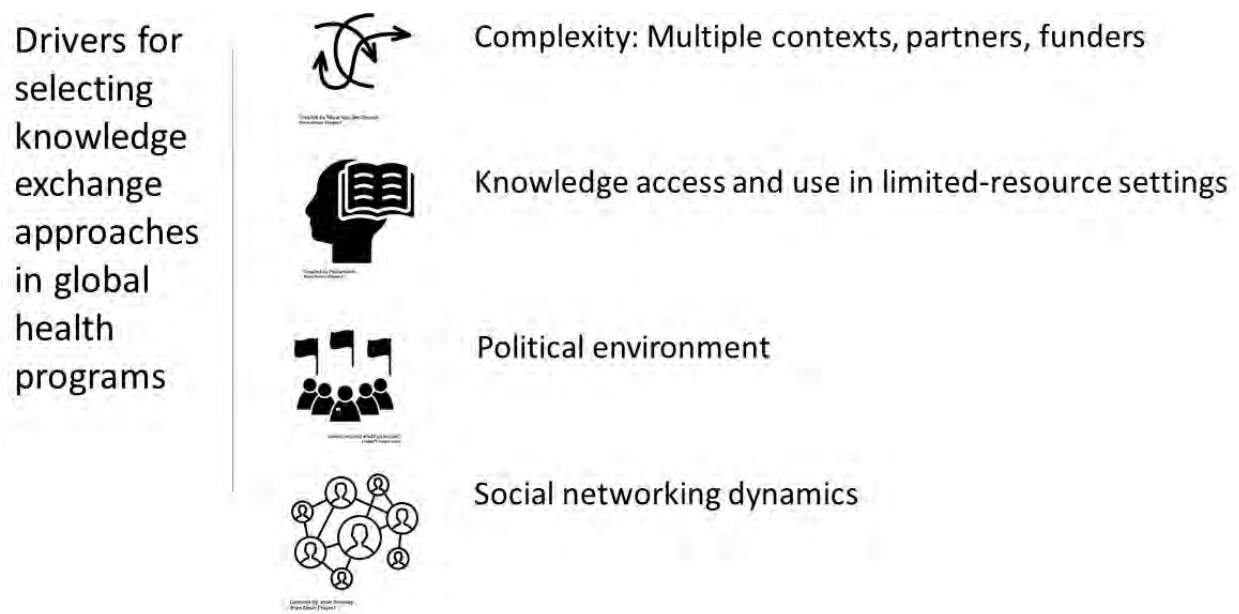


Figure 10. Key drivers for selecting knowledge exchange approaches for global health programs relate to context and social factors.

The approaches needed to address the complexities of enabling knowledge exchange among individuals and organizations who were geographically dispersed, with different cultures and learning styles and

motivations. Access to knowledge needed to incorporate both explicit or documented knowledge such as journal articles and tacit or experiential knowledge that may only reside in people's minds. Synthesizing knowledge and facilitating engagement needed to consider the political environment in ways such as healthcare restrictions in a country (e.g., contraceptive method options). Social networking dynamics refer to how people share knowledge within an organizational hierarchy, governmental levels of authority, and between global organizations and funders and local organizations. The dynamics also related to comfort with online versus face-to-face communication, and capacity for timely communication. Addressing these drivers led to selecting a mixture of approaches that would enable participation with the following aims:

- Engage participants globally
- Overcome cost and technology barriers in limited-resource settings
- Give opportunity for sharing to different types of stakeholders and experts

Figure 11 illustrates how the approaches, grouped into categories, map to the knowledge exchange drivers in the program, and served as engagement points for knowledge brokers. Communities of practice provided a collaborative structure for engagement of members in different program roles, organizations, and levels of health systems, to work toward common goals. They also provided a mechanism for multi-directional dissemination of evidence and interaction. Online discussion forums (paired with the communities of practice) similarly supported engagement globally, provided a way to interact without incurring travel costs, and allowed input from participants from different levels and types of organizations. Finally, activities and communications suggest that individual and organizational knowledge brokers functioned in all knowledge exchange approaches. Knowledge brokers facilitated linkages among health system actors, helped appraise and disseminate evidence, participated in co-creation of new knowledge and research-agenda setting, and built trusted relationships through networks.

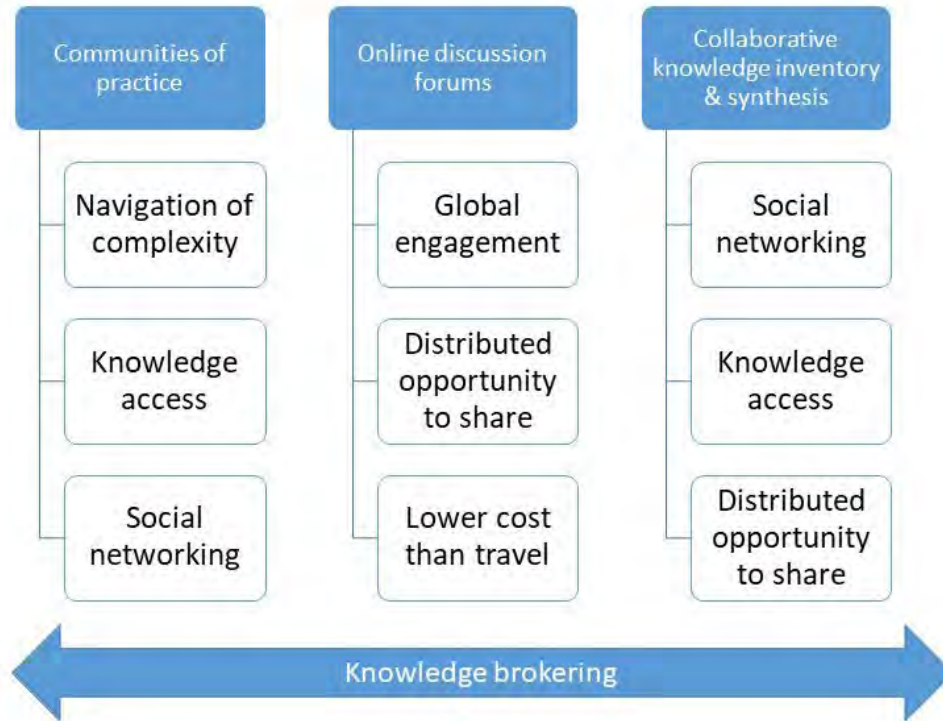


Figure 11. Knowledge exchange approaches mapped to drivers in the global health programs and provided space in which individual and organizational knowledge brokers acted.

6.1.4 Common Attributes and Activities of Knowledge Brokers in the Studies

6.1.4.1 Summary of Knowledge Broker Demographics and Activities in the Studies

The participants in the studies engaged in activities associated with knowledge brokers as individuals, groups, and organizations and functioned in a variety of roles and levels in healthcare systems. Figure 12 describes the individual knowledge brokers in the conference studies by summarizing the top three responses to key demographic and knowledge sharing and use questions combined from the 2012, 2013, and 2015 conference studies.

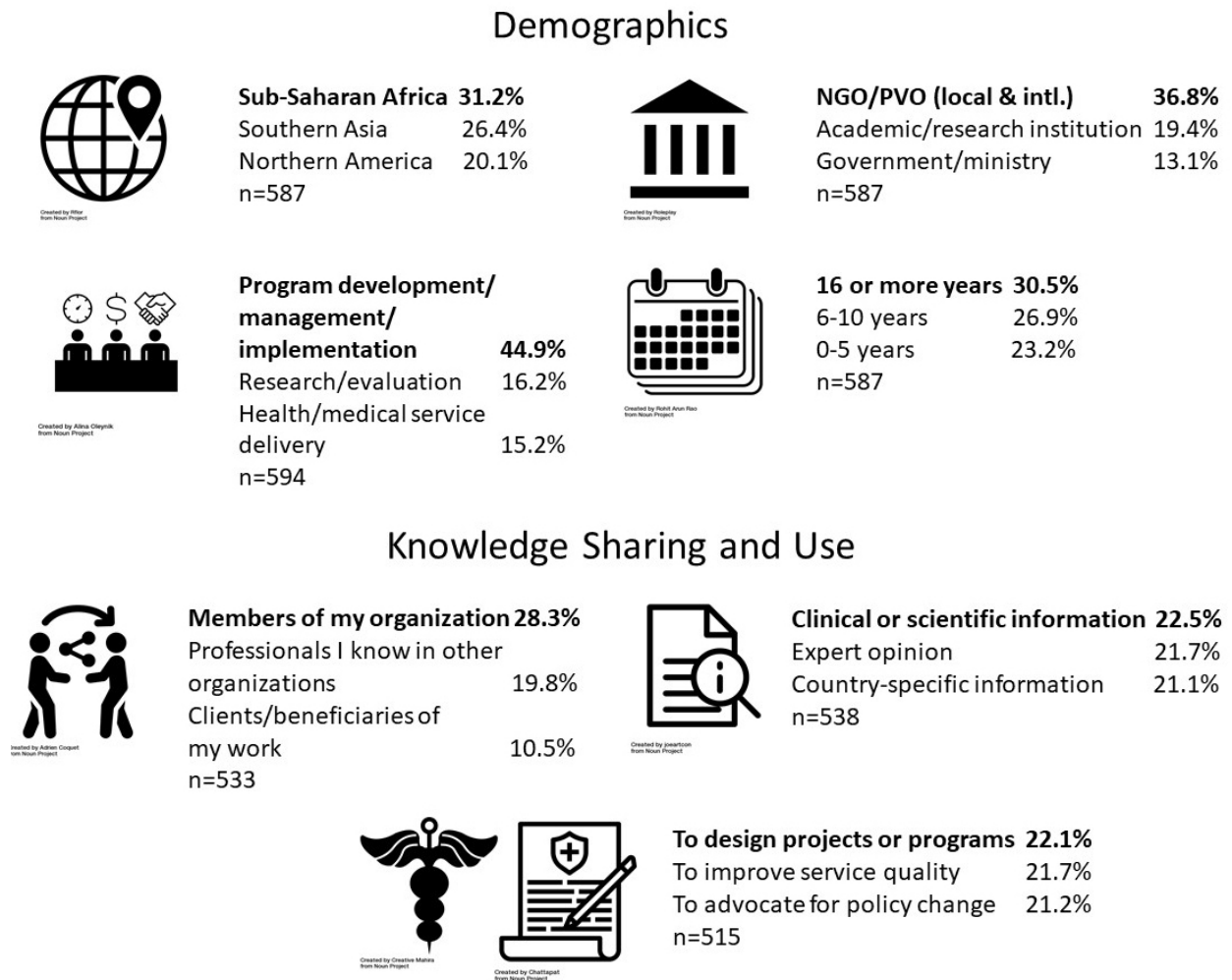


Figure 12. The combined top three responses to core questions in the 2012, 2013, and 2015 conference studies summarize key demographics and knowledge sharing and use activities of the knowledge brokers in the studies.

Collectively, most knowledge brokers responding to the surveys in the conference studies were based in Sub-Saharan Africa, though the top countries reported were United States (18.4%), Bangladesh (8.2%), and India (7.5%) (n=587). The brokers worked mostly for either international or local non-governmental or private voluntary organizations in the capacity of developing, managing, or implementing health programs. Most had 16 or more years of professional experience in their field. Knowledge brokers reported sharing knowledge from the conference primarily through professional relationships, such as in their organizations or networks, versus communication not based on relationships, such as publications or presentations. Clinical or scientific information was most often shared, though tacit knowledge such as opinions and context-specific knowledge also were shared. Knowledge brokers in the studies most often mobilized evidence to action through the design of healthcare projects or programs, though improvement of healthcare service delivery and policy advocacy were also reported as key actions.

The case study and interview data suggest that actors in the studies performed activities and filled roles typical for knowledge brokers as part of their professional roles in health systems. Professional roles included health program implementing partners (such as non-governmental organizations assisting government entities), healthcare providers, faculty members and trainers, community advocates, and global organizations who tap into expertise worldwide, such as the World Health Organization. In these roles, they connected actors, filtered and communicated evidence, persuaded adoption, and built capacity for implementation through education and training. The study data suggests that knowledge brokering performed within the professional roles commonly aligns with concepts in the literature on knowledge broker role domains (Glegg & Hoens, 2016), knowledge-to-action framework activities (Graham et al., 2006b), and diffusion of innovations (Rogers, 2003), as illustrated in Table 2. As shown in an example in the table, a knowledge broker functioning in the role of Capacity Builder helped sustain knowledge use (an activity identified in the Knowledge-to-Action Framework) for implementation (a concept from Rogers' diffusion theory) by training faculty members on an evidence-based approach to newborn resuscitation, so they in turn could train others.

Table 2. Examples of knowledge brokering from the studies align with the literature on knowledge broker role domains, knowledge-to-action activities, and diffusion of innovations.

Knowledge Broker Domains	Knowledge-to-Action Activities	Diffusion Concepts	Examples from Studies
Linking Agent	---	Opinion leading Social networking	Building consensus among health providers on national guidelines for cesarean sections
Facilitator	Identify problem Adapt knowledge to local context	Persuasion to adopt Creating awareness	Convincing local hospitals to adopt implementation evidence from another context to address local problem of facility births
Capacity Builder	Sustain knowledge use	Implementation	Training faculty members on evidence-based approach to newborn resuscitation
Information Manager	Knowledge creation, synthesis, and tailoring	Communication channels	Incorporating evidence in funding proposals for health projects
Evaluator	Monitor and evaluate knowledge use and outcomes	Persuasion (i.e., data for decision-making)	Advocating with administration to monitor stillbirths as part of newborn mortality rates in healthcare facility

The literature suggests that the diversity of knowledge brokers’ professional roles in which they learned of evidence through dissemination and collaboration mechanisms may support uptake and scaling-up of high-impact practices (Coffey, Hodgins, & Bishop, 2018). For example, the 2015 Global Maternal Newborn Health Conference organizers invited a variety of stakeholders, including those working in policymaking, service delivery, training and education, and monitoring and data analysis, to hear messages about the life-saving potential of chlorhexidine use on newborn cord stumps. Collectively, these roles are relevant to the range of needs in ensuring widespread chlorhexidine use, such as developing service delivery guidelines, monitoring service and mortality data in health facilities, ensuring commodity availability, and developing necessary health worker knowledge and skills.

Figure 13 illustrates the variety of stakeholders who may need to be involved in discussions and planning for scale-up of an evidence-based practice such as chlorhexidine use. Along with the literature about engaging diverse stakeholders, the findings of this project suggest that building capacity of knowledge brokers who are skilled at operationalizing evidence and are active in the relevant stakeholder groups may support scale-up of high-impact practices.



Figure 13. Brokering evidence to all the types of health system actors and levels needed for uptake may help in scaling-up evidence-based practices.

6.1.4.2 Common Attributes of Knowledge Brokers in the Studies

Results also suggest that the knowledge brokers in the studies shared attributes commonly associated with “mobilizer” knowledge brokers described in the literature. This type of knowledge broker goes beyond sharing evidence to working out solutions for implementation. Analysis of the interview transcripts and comparisons to frameworks in the literature contributed to identifying the attributes. Figure 14 depicts the common attributes of knowledge brokers in the studies.

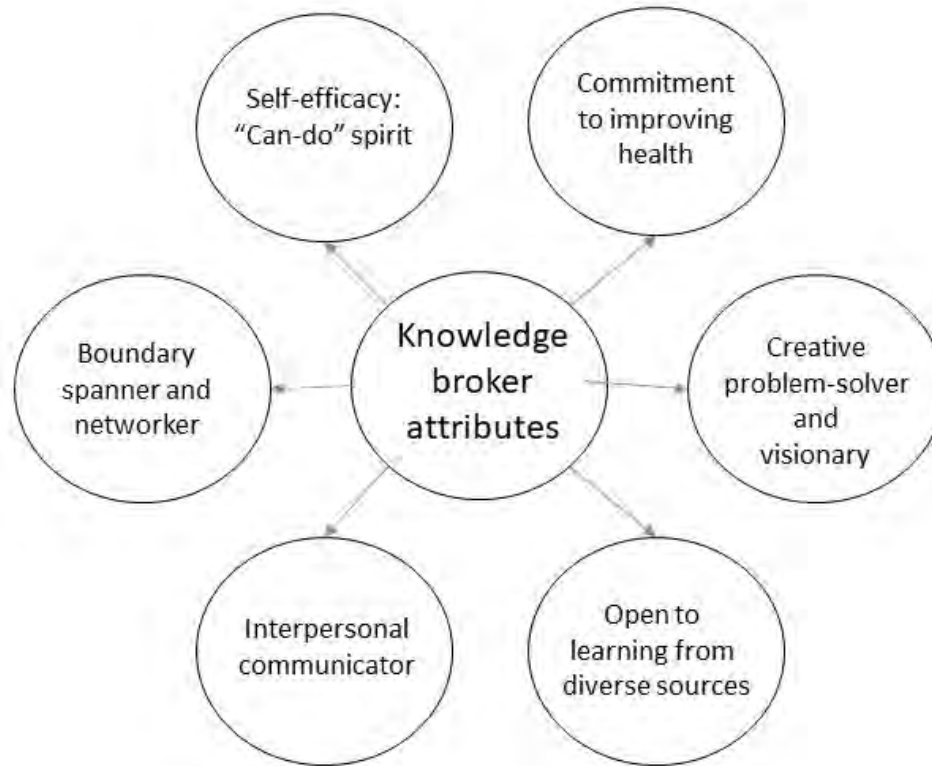


Figure 14. Knowledge brokers in the studies shared attributes associated with mobilizer knowledge brokers who work out solutions for implementing evidence.

Participants exhibited multiple attributes during the interviews that were supportive of moving evidence to action. Belief in their ability to make changes in their professional role based on evidence, while recognizing environmental challenges, came out in the interviews, as well as commitment to improving the well-being of populations in their countries, especially for participants in Africa and Asia. Participants discussed problem-solving that they accomplished as individuals, teams, and nations, such as gaining access to commodities and performing research to demonstrate local feasibility of implementing evidence from sources external to their country. Openness to learning from a variety of sources, including online resources and practitioners in other countries and regions, also came across in participant accounts. Finally, participants expressed the value they placed on relationships as a means to sharing evidence with their colleagues, students, and stakeholders, and to implementing solutions within their organizations and across organizational boundaries.

A small number of participants exhibited attributes seemingly counter to those of mobilizer knowledge brokers, such as:

- Negativity about learning through knowledge exchange opportunities such as conferences

- Tendency to think that constraints will prevent implementing evidence, such as boundaries of a professional role or organization or limited resource availability, especially at the community level

The section in this thesis entitled, “Why Evidence Was Not Shared or Used,” discusses possible reasons these counter attributes surfaced in the interviews.

6.1.5 Influences on Knowledge Brokers in Selecting Evidence for Action

Examples from study respondents about their actions following the conferences suggest that internal and external barriers and facilitators influence knowledge brokers in their selection of evidence for action. Figure 15 illustrates four categories and internal and external factors that may serve as either barriers or facilitators to action, depended on the presence or absence of the factor. The quotes from interview transcripts or open-ended survey questions that are shown connected to each category represents a typical example of the factor. It should be noted that the distinction between barrier and facilitator in some cases was unclear. In the example below for Category 4, Fit of Knowledge, the decision-making culture of the country could be considered a barrier and the ability to work around the culture using easily implemented solutions may be a facilitator.

Category 3, Comparable Settings and Success, emerged as a factor that was the most different from the sources that the candidate used for analysis; that is, the Theoretical Domains Framework, and literature on barriers and facilitators to evidence uptake and related decision processes. Knowledge brokers and their stakeholders in the studies appeared to particularly value implementation evidence generated in a comparable setting, even if from a different region. In making comparisons, knowledge brokers mentioned similar infrastructure and resource availability, political climate, and health issues, among other setting characteristics.

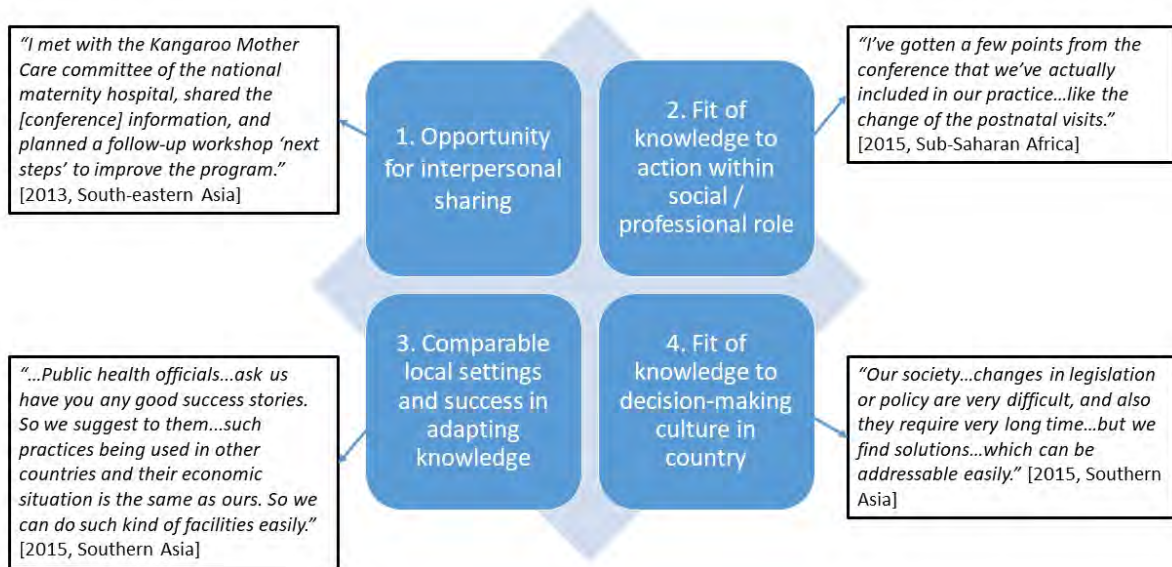


Figure 15. Knowledge brokers are influenced by internal and external factors as either barriers or facilitators in their selection of evidence for action.

Multiple knowledge broker accounts mentioned the positive influence of LMIC-to-LMIC sharing of evidence, which was associated with the desirable characteristics of the evidence. For example, evidence from another LMIC was perceived to be adaptable and feasible for local application and likely to be accepted by a local target population (e.g., healthcare clients, decision-makers). The importance to knowledge brokers of international evidence sharing also showed in their many enthusiastic references to learning how health problems are being addressed “around the world” by countries that are “like us” or having the “same problems that we have.” In the case studies, conveners of expert groups strove to provide opportunities for LMIC-to-LMIC exchange in online forums, communities of practice, and technical working groups.

Knowledge brokers and decision-makers particularly valued evidence generated in a comparable setting—even if from a different country and region.

International influence in the examples showed similarities among types of evidence, decision processes, and reporting outcomes. All three examples represent types of implementation evidence

(though the chlorhexidine example also has a biomedical aspect), which may explain the emphasis on comparable settings. The knowledge broker decision processes leading to evidence selection commonly involved reflecting on settings, the feasibility of adopting the evidence, and an anticipated near-term outcome.

The examples also illustrate points of alignment and departure from the literature. Action orientation in the examples differentiates them from cases in the literature in which the user selects evidence for purposes of general enlightenment (Weiss & Bucuvalas, 1980). Most factors considered by the knowledge brokers in selecting evidence align with theories, models, and frameworks that seek to explain how individual behavior influences evidence uptake (Cane et al., 2012). A factor that surfaced in the studies but not in the literature on individual behavior is LMIC-to-LMIC influence on decisions.

Analysis of influences on the knowledge brokers led to modifying existing and proposing new knowledge translation frameworks to fill in gaps, and ultimately to creating a merged model with borrowed and new constructs aimed at a deeper understanding of both the LMIC context and knowledge brokers as individuals, particularly their decision processes.

The literature supports the adaptation of frameworks. Researchers use altered versions of frameworks to enhance their applicability to a study in terms of actors or audiences involved, context, and interventions, or to prioritize certain aspects of implementation (Strauss & Smith, 2009; Tabak et al., 2012). In operationalizing frameworks, researchers assess if the models' constructs are reliable and valid through the use of measurements (Strauss & Smith, 2009; Tabak et al., 2012) and comparisons between frameworks (Strauss & Smith, 2009).

In applying the Theoretical Domains Framework to the analysis of qualitative data from surveys and interviews, its usefulness became apparent and the need for adaptation to better fit the knowledge broker experience in LMICs. Paper 5 documents how it was applied and the challenges. Since the Theoretical Domains Framework is a behavior determinant framework, the Theoretical Domains Framework's greatest usefulness was in capturing knowledge brokers' views of their personal characteristics in relation to use of specific evidence. However, two aspects of use led the candidate to decide to make changes. First, crucial aspects of the knowledge broker experience, such as the complexity of working in LMICs and the diversity of knowledge broker settings and types of evidence,

indicated the need to subdivide the domain, Environmental Context and Resource, and add constructs in order to capture external factors influencing evidence selection adequately. Second, the ways that knowledge brokers described their decisions in selecting evidence suggested a process of judging both internal and external factors. Simply using frequencies of constructs to determine a hierarchy of significance to knowledge brokers was insufficient in capturing how they compared factors, which seemed to occur newly for each instance of evidence.

Based on reflections during Theoretical Domains Framework application, the candidate produced an adapted framework called the knowledge broker Reflective Comparative Decision Process for Evidence Selection, which is described in Paper 5 of this thesis. The framework presents hypothetical domains and associated constructs based on multiple frameworks (primarily the Theoretical Domains Framework) and emerging data from the project, a practice described in the literature on construct validity (Strauss & Smith, 2009). The framework depicted in Paper 5 suggests a knowledge broker thought process that moves among the domains as knowledge brokers judge strengths and weaknesses in a non-linear fashion and determine if the evidence merits future action.

Testing a new framework was outside the scope of this project; however, the author took an interim step of preparing a matrix comparing the proposed hypothetical domains and constructs with frameworks used in this thesis to assess which domains were most and least homogeneous with other published frameworks. The matrix appears below as Table 3 and contains construct labels replaced with designations of their presence (P) or absence (N) within the hypothetical domains.

The results of the comparison suggest aspects of the knowledge brokers' evidence selection process aligned with the literature and also an under-explored area. The hypothetical domain, View of Self and Action Orientation, aligned most across the selected frameworks. The comparison suggests that individual factors such as perceptions of roles and capacity for action in relation to evidence play a part in selection.

Being able to identify knowledge brokers with characteristics that are a good fit may help mobilize evidence in strategic positions in the health system. For example, if assessment of scale-up of an evidence-practice reveals that commodities are a significant challenge, positioning and supporting knowledge brokers with knowledge and influence in that area may help overcome barrier

General Discussion and Critical Interpretation | Main Findings

Table 3. Comparison of Knowledge Broker Reflective Comparative Decision Framework domains versus frameworks used in the thesis

Legend: P=Constructs present; N=No constructs present

Model/Framework & Description	Internal Influence Domains			External Influence Domains		
	View of Self & Action Orientation	Mental State	Reaction to/Reflection on Outside World	Environmental Context – Characteristics & Action Orientation (Organization or Country)	International Influences	Evidence Characteristics
Reflective Comparative Decision Process for Evidence Selection Framework (Norton)	P	P	P	P	P	P
Model of Stages in the Innovation-Decision Process (Rogers, 4 th edition, 1995, p. 163)	P	P	N	P	N	P
Truth Tests and Utility Tests (Weiss and Bucuvalas, 1980)	P	N	N	P	N	P
Theoretical Domains Framework, v2 (Cane et al., 2012)	P	P	P	P	N	N
Knowledge-to-Action Framework (Graham et al., 2006)	N	N	N	P	N	P

Evidence Characteristics appeared to be the next most homogeneous domain. The alignment across frameworks suggests that packaging and framing of evidence and modes of dissemination (e.g., free websites with materials) influence how knowledge brokers can make use of the evidence in their roles. Strengthening knowledge broker capacity to access evidence regularly in formats conducive to their role may help knowledge brokers make effective use of their time and efforts in supporting stakeholders. Project findings point to the importance of access to both formal and informal sources of knowledge: a combination of subscriptions to relevant discussion forums, regular webinar participation, and e-mail alerts for publications (peer-reviewed and grey literature) can provide the diversity of knowledge needed by knowledge brokers.

Perhaps most noteworthy, the hypothetical domain, International Influences, could be found in no other framework compared in the matrix. While the benefits of LMIC-to-LMIC knowledge exchange and mutual support appear in the literature, representing the concept as an influence on evidence action does not appear explicitly in frameworks. The candidate considered whether knowledge brokers' judging of evidence from another LMIC constituted a Truth Test (Weiss & Bucuvalas, 1980), but concluded that the concepts were not aligned because the knowledge brokers seemed to have confidence in the setting generating the evidence, not the evidence qualities themselves.

Practical application of the International Influences concept can be accomplished, even while it is being tested. For example, disseminating evidence in formats that enhance the ability to locate implementation evidence in countries with comparable characteristics, such as in searchable databases, may enhance exchange. Examples of multi-country comparison reports include ones about national programs for postpartum hemorrhage and pre-eclampsia/eclampsia (Fujioka & Smith, 2011). A similar approach can be taken with conference and meeting programs, proceedings, and websites, and journal special issues.

6.1.6 Why Evidence Was Not Shared or Used

The research design of the mixed methods studies of conference participants (2012, 2013, and 2015) allowed collecting counterfactual data about the extent to which evidence use and sharing did not occur after the conferences, for which types of respondents, and for what stated reasons. While limited

counterfactual data was obtained (possibly because of the high motivation levels of the respondents, as discussed in the individual papers), some interpretation of the lack of evidence action is possible.

Among more than 500 survey respondents across three studies, fewer than 20 indicated that they did not share or use knowledge from the conference. These few respondents represented a diversity of countries, types of organizations, and types of work. When asked the reason for not sharing or using knowledge, most indicated that they did not have enough time. While conclusions cannot be drawn based on so few responses, possible reasons surfaced through the interviews.

Re-disseminating evidence may have been viewed as too time-consuming with competing priorities. Knowledge brokers mentioned during interviews that they valued knowledge in formats easy to access and share, such as brochures, key message briefs, and online versions of presentations and proceedings. Preparing a synthesis for a target audience, such as members of a technical working group, may have been perceived as taking more time than some knowledge brokers could spare from other professional responsibilities. Providing ready-to-use PowerPoint files synthesizing evidence on key topics for different types of audiences may have helped knowledge brokers with sharing.

Some conference participants may have been the wrong target audience, despite organizer efforts in inviting specific health system actors in enabling roles. Respondents who were not presenting or were not participating because of an expectation of changing practice or policy seemed to fall in a gap. This gap was characterized by a lack of learning and lack of opportunity to share knowledge during and after the conferences, two facilitating constructs in the hypothetical framework domain, Views of Self and Action Orientation. Developing checklists to help assess the suitability of invited conference and meeting participants, according to their professional roles, health system level, and type of participation (e.g., presenter), may help in disseminating evidence to the right actors to support scale-up.

Finally, a few knowledge brokers indicated that they shared knowledge from the conference without expectation of specific near-term changes in health practice or policy, either through their action or that of others. Most of these knowledge brokers were based in higher-income settings and working on projects in LMICs. Further research may help to determine if demographic factors were associated with evidence action or if these respondents represented a type of knowledge broker that was more a disseminator and less a mobilizer of evidence.

6.2 Implications of Country Categorization in this PhD Project

Presenting findings of this PhD project as being relevant exclusively to LMICs would be misleading. Use of the terms “low-income” and “middle-income” is not intended to imply homogeneity within an economic status, nor to imply that country economy is a sole driver of health systems and country mortality rates. In fact, study participants mentioned other possible categorizing factors, such as similar culture and how health systems were governed.

LMIC was a term adopted from the global health programs that were context to this PhD project. The term identified the pool of countries from which ones were prioritized by the funder for participation in the programs. As such, LMIC could be viewed as an artificial construct that loosely grouped settings sharing characteristics such as severe resource limitations, political instability, and mid-to-high levels of mortality and morbidity in comparison to other geographic areas. Over the course of the PhD project, this construct fell short in accounting for external influences on the mobilizer knowledge broker decisions in the studies or for developing typologies of the brokers. For example, knowledge brokers in high-income countries may operate in pockets of severe poverty or work in health systems with challenges shared by lower-income countries, both of which influence their decisions about evidence. Similar factors transcending country categories surfaced during the conference study interviews with a respondent not working in an LMIC who noted his country’s high income, but also recognized internal challenges with availability of maternal and newborn health services that would typically be associated with lower-income countries. This outlier case illustrated that limiting the studies to participants working in LMICs missed opportunities to capture knowledge broker experiences in other settings that should have been considered with the universal aspects of knowledge broker behavior and decisions presented in this thesis. The LMIC focus also limited identifying trends in challenges and promising practices across contexts that may be categorized in other ways than country income. Identifying cross-cutting trends may help strengthen learning about overcoming challenges in evidence uptake globally and advance the practice of knowledge brokers.

Future studies on knowledge brokers may use other approaches for categorizing contexts. Among the options for country categorization, use of region might aid exploring similarities and differences in knowledge brokers and their impact based on factors such as culture. Alternatively, countries might be

categorized by magnitude and severity of morbidity and mortality in population groups (such as newborns) or by disease, status of national scale-up of high-impact healthcare practices (such as chlorhexidine use on newborn cord stumps), or former colonization. Context categorization might also be useful on a sub-national level based on characteristics such as urban or rural setting or local resource limitations. These other options for categorizing the context of knowledge brokers may be worth exploring in future research.

6.3 Implications of Limitations to Conclusions Based on the Findings

Iterative learning and limitations during the span of the research project influenced conclusions based on the findings, which were different than those expected at the beginning of the project.

The research project originally aimed to describe knowledge exchange approaches that were used to share and mobilize evidence and their theoretical underpinnings in the context of a series of global health programs. Analysis of the description and theory led to proposing that a knowledge broker role was evident in the programs and was critical to meeting the programs' knowledge translation goals. With this proposal, a decision was made to shift the research focus from processes to individuals. The research project next sought to increase understanding of the knowledge brokers who were functioning within the programs by collecting data from them through a series of conferences on evidence-based practices sponsored by the global health programs. As the designation of LMIC formed part of the scope of the global health programs and data was being collected through the programs, the research project continued this focus on LMICs. Learning about knowledge brokers that was gained through the first two conference studies led to the aim of the third study to better understand the decision processes of brokers in LMICs regarding evidence. Methodological limitations across studies (such as lack of randomized recruitment), however, hindered drawing conclusions that were specific to LMICs overall or associated with specific countries or health system roles in LMICs. Limitations also prevented generalizing findings to all conference participants based on quantitative data.

Conclusions based on the findings and limitations ultimately had a narrower scope than originally envisioned in the research project, which was to develop an understanding of how evidence was shared and mobilized through global health programs in LMICs. Implicit to this aim was a focus on differences from high-income country settings. By the end of the research project, however, learning had not

emerged about what was different with knowledge brokers or the knowledge exchange platforms they used in LMICs.

What did emerge were insights into how mobilizer knowledge brokers thought about evidence and the possibility of acting upon it. These insights appeared to be universal in that they applied to diverse settings and health system actor roles. They included thought processes in comparing new evidence to expected implementation challenges such as slow-changing national policy and counter-viewpoints in the health workforce. Qualitative data in the form of rich accounts from knowledge brokers in diverse settings and health system roles who were motivated to participate in the studies contributed most to the conclusions. Comparing the findings with underlying theories in knowledge translation and behavior change helped develop these insights into new understanding of existing theory.

6.4 Summary of Findings

The research presented in this thesis helps fill a gap in understanding knowledge brokers who are active in dissemination and uptake of evidence for healthcare policy and practice in diverse settings. Overall, findings across studies in this thesis present a view of healthcare evidence sharing and use across contexts, levels in health systems, health system actor roles, and public health topics, with the knowledge broker role being evident throughout. The findings can be summarized as the following:

- **The role of knowledge broker was evident in a series of global health programs:** Organizations, groups, and individuals acted as knowledge brokers in the global health programs studied in the research project. A mixture of knowledge exchange approaches was used in which knowledge brokers participated on-line and face-to-face through activities characterized by social networking, collaboration, evidence appraisal and synthesis, and capacity building through learning opportunities.
- **Promising practices to promote evidence uptake were used by knowledge brokers in diverse settings:** Knowledge brokers in the three conference studies served in a variety of roles and levels in health systems, brokered as part of their professional duties, and conducted activities that fall across the spectrum of knowledge broker domains. These activities align with the literature about promising practices of knowledge brokers in supporting evidence uptake. They included the use of sustained relationships for facilitating evidence use, exhibiting deep understanding of context and the political environment in adapting evidence, building capacity to use evidence in a variety of ways, and communicating evidence in ways meaningful to audiences.
- **Attributes of study participants aligned with those of mobilizer knowledge brokers:** Common attributes of the knowledge brokers in the studies aligned with those of mobilizer knowledge brokers described in the literature, a type of knowledge broker who goes beyond sharing evidence to aid implementation.
- **Decisions to select evidence for action by knowledge brokers involved weighing internal and external factors:** Knowledge brokers overall were influenced in selecting evidence for action by having an opportunity to share, the fit of the evidence to action within a professional role, favorable comparisons of successful implementation in similar settings, and the fit of the evidence to decision-making culture in the country.

6.5 Further Research Needed

Multiple avenues for further research would enhance this project's contribution to the field of knowledge translation. Some avenues would provide insights into evidence uptake in any setting and build on previous research in higher-income contexts, while other lines of inquiry would help fill the gaps in the body of knowledge specific to limited-resource health systems.

Implementers of knowledge brokering initiatives would benefit from insights into the timing of evidence uptake in relation to intervention timelines and how increases in evidence-informed decision making behavior are sustained (Green et al., 2009b; Park et al., 2018; R. K. Rushmer et al., 2014).

For strengthening knowledge broker staffing, more needs to be learned about the contributions of individual knowledge brokers to impact (Maag, Alexander, Kase, & Hoffmann, 2018), priorities of individual attributes (Bornbaum et al., 2015; Elledge et al., 2018; Elueze, 2015), and incentive schemes for taking on the knowledge broker role in the face of competing priorities (such as pressures to publish) (N. Jessani et al., 2016).

Gaining a greater understanding of knowledge brokers who function as mobilizers of evidence to effect change in healthcare practice and policy could provide knowledge useful in building knowledge translation capacity. Aspects of mobilizers to investigate include the personal attributes that contribute most to effectiveness (Dobbins et al., 2018; Elueze, 2015) and whether different knowledge translation competencies are needed to operate within different contexts, professional roles, and stakeholder groups (Bornbaum et al., 2015; Mallidou et al., 2018).

Investigating differences in how knowledge brokers are positioned in organizations and work with others would also provide needed insights; for example, how they operate as sole knowledge brokers, knowledge brokering units, or knowledge broker teams (P. A. Estabrooks et al., 2018; R. Rushmer et al., 2019), particularly in LMIC settings.

Testing the hypothetical evidence selection framework across knowledge broker contexts, public health topics, and professional roles—particularly the concept of international influence—could provide practical support for dissemination efforts globally. For any further research, use of rigorous methods

will be needed to address past criticisms of the quality of knowledge broker research, perhaps even going so far as to attempt randomized controlled trials as was done with one early knowledge broker study (Dobbins, Hanna, et al., 2009).

Piloting and evaluating knowledge translation interventions in limited-resource settings that worked well in higher-resource settings may serve as the most promising research to directly benefit health systems and address some of the challenges mentioned by knowledge brokers in this project. Aspects of this type of intervention include organizational strengthening to make use of evidence (including stakeholder self-assessment using tools adapted from other research), staff training on evidence use in health ministries, and regular mentoring by knowledge brokers over multiple years (Dobbins et al., 2018). Interventions that strengthen organizational capacity while also building skills of mobilizer knowledge brokers may provide long-term benefits and cost-effective approaches (Dobbins et al., 2018). Building on knowledge translation work already started in limited-resource settings, such as with embedded knowledge translation units in ministries of health who have participated in activities with WHO's EVIPNet (The World Health Organization, 2016) also offers an opportunity to build on past interventions.

Finally, exploring opportunities to increase linkages between regional evidence networks (such as ones between Africa and Asia) should be explored to strengthen global coverage of knowledge brokering and dissemination of evidence.

7 Relevance of Work and Future Outlook

7.1 Relevance of Knowledge Brokering to the Sustainable Development Goals

Reviews of the progress on the Sustainable Development Goals reveal both uneven progress on specific goals—such as health and well-being—and gaps in using evidence-based approaches in working towards goals (e.g., benchmarking) (Allen, Metternicht, & Wiedmann, 2018). There have been increasing calls for integrated approaches to addressing these challenges, including forming partnerships across different levels and actors in health systems, supporting improved policy, and removing barriers to the spread of evidence-based solutions (United Nations Development Programme, 2017). The linking role of knowledge brokers among multiple levels and functions throughout health systems, as described in this project, can play a crucial part in an integrated approach to supporting the achievement of the Sustainable Development Goals. Also, strengthening the knowledge translation capacity of local organizations as knowledge brokers may help lessen dependence on international organizations to lead knowledge translation efforts and contribute to the self-reliance of LMICs, a goal stated by international donors (USAID, 2018).

The following sections propose approaches to building on the findings of this project to strengthen country, organization, and individual capacity to disseminate and translate evidence for improved health policy and practice and better health outcomes.

7.2 Future Directions

7.2.1 Forging Knowledge Translation Partnerships

A key dynamic surfaced by this doctoral project was the role of international organizations as facilitators of evidence dissemination across geographic boundaries. Given the current emphasis by international donors on developing LMIC self-reliance, new approaches are needed within LMICs to engage local organizations in disseminating and mobilizing evidence (El-Jardali & Fadlallah, 2015). A question that will need to be answered is whether and how incentives will need to be provided to local organizations to take on a more robust knowledge brokering role, especially crossing geographic boundaries (N. Jessani et al., 2016). With international NGOs and global health programs, incentives have been provided through funding to connect evidence producers and users across countries and regions. Strengthening of local knowledge brokers is less likely to be achieved with ad hoc efforts or those limited by time-bound projects than with on-going initiatives bringing together stakeholders (R. K. Rushmer et al., 2014).

Positioning academic research institutions as trusted knowledge broker partners with ministries of health, professional associations, local NGOs, and other stakeholders has the potential for aiding sustained use of evidence (El-Jardali, Ataya, & Fadlallah, 2018). A university-as-knowledge-broker approach has been successfully used in the United States with a Family Impact Series initiative spanning more than 20 years (Bogenschneider, 2018), in Lebanon through the Knowledge to Policy Center (a WHO collaborator) (American University of Beirut, n.d.), and at Ghent University through the International Centre for Reproductive Health (Ogbe et al., 2018), among other examples. With this type of approach, university teams regularly meet with policymakers to ask about decisions they face for which evidence may be useful. Universities then convene meetings bringing together decision-makers and experts for reviews of evidence and deliberative dialogs. Including experts from other LMICs in these dialogues could provide access to implementation evidence from comparable settings. Involving participants from ministries of health, professional associations, local NGOs, healthcare service delivery, and communities can provide a cross-section that addresses near-term healthcare needs and implementation challenges and informs longer-term health workforce development. Leading webinar series, CoP forums, and social media discussions would also be part of the universities' roles.

Adopting the university-as-knowledge-broker approach would require commitment, vision, and resources from university leadership, assessment of organizational readiness to take on the role, and establishment of a team comprising the knowledge broker skills needed for relationship-building, evidence synthesis, communications, political awareness, and knowledge of implementation realities. Regarding use of resources to fund such as approach, the institution would need to determine which source of funding may be used (e.g., internal versus external sponsorship). In terms of vision, a university may need to articulate during establishment of the knowledge broker initiative to what extent they want to be issue advocates versus issue neutral (Oliver & Cairney, 2019).

Strengthening linkages between regional evidence networks to broker implementation evidence can also help bridge gaps in global dissemination.

7.2.2 Building Knowledge Broker Competencies and Networks

The knowledge brokers in this project displayed brokering competencies that could serve as benchmarks for building networks of knowledge brokers throughout health systems, supported by the partners

previously mentioned. University curricula could be supplemented to better prepare researchers and future health care workers to broker evidence by addressing the skills they require to identify research needs, communicate findings in ways meaningful to decision-makers, and appreciate political implications of research (Haynes et al., 2018; Lairumbi et al., 2008; Mallidou et al., 2018). Professional associations have been shown to have a role in disseminating scientific findings to society (Delicado, Rego, Conceição, Pereira, & Junqueira, 2014) and could provide similar learning opportunities and messages on the importance of brokering to their members. Local NGOs are uniquely positioned to support knowledge translation at multiple health system levels, including communities (Malla et al., 2018), and so would benefit from efforts to enhance their brokering competencies. Advanced knowledge brokers—those particularly adept at mobilizing evidence—could mentor those newer to brokering (perhaps in return for professional recognition). Knowledge brokers in a mentoring role would also benefit from building their competencies as mentors.

7.2.3 Embedding Knowledge Translation Units Focused on Operationalizing Evidence

The knowledge brokers in this project exhibited a deep understanding of contexts and health issues that helped them act on the evidence and may have been associated with their embedded roles in organizations. Formalizing the embedded knowledge broker role in multiple types of organizations in LMICs may help advance evidence use (Orem et al., 2014). Strengthening knowledge broker capacity in ministries of health also collaborating with WHO's EVIPNet (The World Health Organization, 2016) may provide an entry point. Multiple approaches might support the establishment of additional knowledge translation units. Successfully adapting processes and tools used in higher-income settings to assess organizational readiness (Dobbins et al., 2018) may provide a starting point. Involving ministries in the design of the services provided by the knowledge translation units would be crucial (Haynes et al., 2018). Arranging for peer-assist exchanges with existing knowledge translation units having demonstrated successes, such as ones in Moldova and Ethiopia (The World Health Organization, 2016), would provide LMIC-to-LMIC sharing of lessons learned in implementation. The positioning of mobilizing knowledge brokers in embedded units, or arranging for such knowledge brokers as mentors, would be desirable.

7.2.4 Creating and Adapting Knowledge Broker Assessment Tools

One aspect of advancing capacity for EIDM in LMICs through knowledge brokering is use of tools to assess individual and organizational capacity (Dobbins et al., 2018; Rodríguez et al., 2017). Making effective use of mobilizer knowledge brokers would benefit from use of an assessment tool to identify this type of knowledge broker leader, including knowledge, skills, and attitudes that contribute to brokering success. Assessment tools also are useful for organizations. Tools have been developed to assess capacity for EIDM of organizations such as public health departments in Canada (Canadian Foundation for Healthcare Improvement, 2014) and ministries of health in LMICs (Rodríguez et al., 2017).

7.3 Contribution of PhD Project to Knowledge Translation and Knowledge Brokering Practice

This PhD project contributes to the field of knowledge translation and knowledge broker practice and addresses calls in the literature for further research. The project contributes to filling gaps in the knowledge base in the following key areas:

- Insights into knowledge brokering experiences and complexities in resource-constrained settings (Cummings et al., 2018; McSween-Cadieux et al., 2019; Yapa & Bärnighausen, 2018),
- Common elements of knowledge broker roles and activities found in multiple contexts (G. Moore et al., 2018)
- Internal and external influences on knowledge brokers and the evidence-to-action process (Elledge et al., 2018; N. Jessani et al., 2016; Oliver et al., 2014; Reid et al., 2017; Ward, 2009)
- Frameworks to inform dissemination (Harris et al., 2012)

Increased understanding of how evidence is shared and action influenced through linkages of organizations and individuals in turn helps understanding contributing factors to preventable deaths. In looking at evidence pathways, the research uniquely presents a diverse view of knowledge brokers across many geographic boundaries, types of professional roles, and types of organizations that provides insights into how widespread knowledge translation occurs for a single high-impact practice based on

internal and external factors. Incorporating this understanding in dissemination plans that target mobilizer knowledge brokers in strategic positions in health systems can advance goals for evidence use.

The finding of the importance to evidence users of international sharing, particularly LMIC-to-LMIC, adds a seemingly new dimension to frameworks about determinants for evidence uptake, which, when validated, may be used to advocate for building health system capacity for LMIC-to-LMIC support in developing health solutions.

The proposed capacity building approaches and possible avenues for further research previously described can lead to further building the evidence base of an under-represented area of knowledge translation: brokering in LMICs as a strategy for moving toward scale-up of high-impact, evidence-based practices to improve health outcomes.

Finally, in the spirit of this PhD project and its emphasis on knowledge sharing, Appendix C presents a dissemination plan for project findings—to continue the dialog and work into the future.

Final Conclusion

The SDGs and their timelines create an urgency to accelerate implementation of evidence-informed policy and practice to help prevent needless deaths and improve the health and well-being of populations. Inherent to the SDGs and their aim of widespread commitment is the recognition that bridges need to be built across geographic, political, and scientific boundaries to address globally relevant public health issues such as maternal and newborn mortality. Knowledge brokers—as individuals, groups, organizations, or other entities—act as crucial partners in building these bridges to accelerate feasible and appropriate evidence-informed solutions that tap into the best of local and global thinking. Much can be done to build the capacity of mobilizer knowledge brokers and their organizations, based on promising practices from this research project and the literature. A critical first step, however, in supporting their role is acknowledging the challenge they face in filtering a potentially overwhelming amount of evidence of myriad types and sources—both locally and internationally generated. Understanding the decision processes of knowledge brokers after learning of evidence and how they weigh internal and external factors influencing implementation can point to ways to aid the filtering process and contribute to advances in dissemination and implementation science.

Final Conclusion

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Appendices

10.1 Appendix A. 2012 and 2013 Conference Studies Research Plans

JHSPH INSTITUTIONAL REVIEW BOARD

RESEARCH PLAN

PI: Linda Fogarty

Study Title: Maternal and Child Health Integrated Program (MCHIP) Regional Conference Information Use and Sharing Survey

IRB No.: 00004383

PI Version Number/Date: Version 1: April 16, 2012

- 1. Aims/objectives/research question/hypotheses:** The primary objective of the study is to determine whether information gained through regional maternal health conferences is used to improve global health practices and is shared by participants with other members of the global health community. The secondary objective of the study is to identify factors influencing use of the information and sharing.

NOTE: This research project is modeled after IRB#: 4220, as the objectives and methodology are similar.

- 2. Background and rationale:** USAID's Maternal and Child Health Integrated Program (MCHIP), led by Jhpiego (an affiliate of the Johns Hopkins University), aims to scale up evidence-based, high-impact maternal, newborn, and children health interventions in 30 low-resource countries to reduce maternal and child mortality. To support advocacy for these interventions in countries, MCHIP and its predecessor project, ACCESS, have periodically held regional conferences in Africa and Asia. The next conference will be held in Dhaka, Bangladesh, May 4-8, 2012. MCHIP plans to invite conference participants to complete a survey that will ask how they plan to use and share information from the conference to improve global health practices. The survey will also ask about past participation in the regional conferences and use and sharing of the information. Similarly, an invitation will be sent by e-mail to participants of the last regional conference, held in April 2011 in Addis, Ethiopia, with the same questions. As MCHIP is scheduled to end in 2013 and the frequency of future regional conferences is unknown, the survey will also ask questions about preferences for alternative

methods of information and knowledge access.

3. Participants:

- a. Participants of the May 2012 conference in Bangladesh, and participants of the April 2011 conference in Ethiopia will have access to the announcement of the on-line survey.

- b. Sample size: Approximately 350 participants are registered for the May 2012 conference and approximately 350 participants attended the April 2011 conference. With a population size of 700 and a confidence interval of 95%, with $\pm 5\%$ margin of error, we need at least 249 participants to expect to have representative responses. In addition we need from 35-40 follow-up qualitative interviews, which would be 14-16% volunteer rate, which may be optimistic. To ensure that we have sufficient follow-up qualitative interviews we will therefore increase our survey sample size target to 350, which assumes a 10% volunteer rate to achieve a target of 35 follow-up interviews, which we believe is more realistic.

4. Study procedures:

- a. Data collection steps:
 - i. Post the on-line survey instrument in Survey Monkey.
 - ii. MCHIP communications specialist sends e-mail with invitation to April 2011 conference participants.
 - iii. MCHIP communications specialist sets up computer kiosk at location of May 2012 conference with a sign inviting people to complete the survey at the kiosk.
 - iv. Interested conference participants will complete survey (approximately 10 minutes). On-line survey will remain open for two weeks.
 - v. Respondents who agree to an in-depth follow-up interview will be consented and interviewed by phone or Skype (approximately 30 minutes). Interviews will be audio-taped if the interviewee agrees, transcribed and stored electronically. If the interviewee declines to be audio taped, the interviewer will take notes, but not audio tape the interview. Transcriptions and notes will be redacted to remove all

identifying information.

b. Data analysis

- i. Use analysis features of Survey Monkey to cross-tabulate respondent characteristics (e.g., type of organization, frequency of participation) with information use and sharing patterns.
- ii. Analyze redacted transcriptions (without identifiers) from phone interviews by identifying common themes related to the study questions, documenting unusual responses, and compiling illustrative quotes.

5. Data Security and Protection of Subject Confidentiality (NOTE: LOSS OR THEFT OF COMPUTER OR HARD COPIES OF DATA COLLECTION SHEETS DURING TRANSPORT IS GREATEST THREAT TO SUBJECT CONFIDENTIALITY – BE SURE TO TRAIN YOUR STAFF ABOUT THIS PROBLEM.)

- a. Will the study data stored in the United States be protected by a Certificate of Confidentiality?

If yes, explain who will apply for and maintain the Certificate.

(http://grants.nih.gov/grants/policy/coc/appl_extramural.htm) NO

- b. Identify the data security plan below that best describes how you will minimize the risk of a breach of confidentiality by typing an X in the appropriate box on the left side of each section (A, B, C) of this chart. If your study includes sequential phases that require different procedures, or does not fit these categories, explain in “Other”. These categories reflect minimal standards; you may impose more stringent protections. See the JHSPH Data Security Guidance at http://www.jhsph.edu/irb/Guidance_and_Policies.html.

Note: Identifiers include direct identifiers such as name, address, SSN, hospital record number, etc., and other indirect identifiers (e.g., date of birth, tribe) that, when combined with other variables, may make a subject identifiable. It is possible that a unique, randomly-assigned, study identifier may remain within a dataset, but the dataset could be considered sufficiently ‘deidentified’ for the purposes of the JHSPH IRB. This may be the case if the person in possession of the data cannot use the unique identifiers to locate or identify a specific individual without additional codes or identity table linkages.

A. Hard copies of data collection forms:	
	The study collects data that are anonymous; no personal identifiers are recorded or retained from any study participants in either direct or coded form.
	Hard copies of data collection materials <u>have identifiers</u> and are locked in a secure cabinet or room with limited access by specified individuals. COPIES WILL BE KEPT IN INVESTIGATOR'S POSSESSION DURING TRANSPORT. When possible, redacted (de-identified) versions of the data collection sheets will be used for coding and analysis.
	Hard copies of data collection materials include an ID code but <u>do not have personal identifiers</u> . However, a code linking the data to the subject's personal information is stored separately from the data collection sheets, and is either stored in a secure electronic database, and/or locked in a secure cabinet or room with limited access by authorized individuals. CODE WILL BE KEPT IN INVESTIGATOR'S POSSESSION DURING TRANSPORT.
X	Data are not collected on paper.
	Other (describe):
B. Electronic Databases:	
<i>Note: This refers to the initial database into which study data is entered and stored. If this "Study Database" includes personal identifiers from participants, only de-identified analytic datasets should be used for data analysis except in instances in which identifying information is required. Databases that retain identifying information require a higher degree of electronic security.</i>	
	The study collects data that are anonymous; no personal identifiers will be recorded or retained from any study participants in either direct or coded form.
X	<u>Personal identifiers</u> are included in the database (for some surveys). If breach of confidentiality poses more than minimal risk to participants because data are personally sensitive in nature (for example, involve substance abuse, mental health, genetic propensities, sexual practices or activities), access to identifiers will be restricted. These data are stored on a secure server protected by strong password, and will be only accessible by authorized study personnel. Data will be coded when possible. Identifiable data transferred or stored via portable electronic devices (e.g., laptops, flashdrives) will be encrypted. The devices on which this information is stored are accessible only to individuals who need access to these data.
X	Other (describe): Audio tapes of qualitative interviews will be stored in locked cabinets.

C. Analytic Datasets:	
<i>Note: This refers to the use, for analysis, of either discrete subsets or the entirety of the database into which study data is entered and stored. To the extent possible, analytic datasets should be de-identified, except in instances in which identifying information is required. Analytic datasets that retain identifying information require a higher degree of electronic security.</i>	
	The study collects data that is anonymous; no personal identifiers will be recorded or retained from any study participants.
X	Electronic database will be managed by a specific data administrator (PI or other designated person) who will track and log issuance of analytic datasets, and return/removal when approved use ends. Access to analytic datasets will be subject to conditions established by the PI. Electronic analytic datasets will be provided to authorized study personnel, or approved investigators outside the study, with the same data protection requirements established for the study database.
	Other (describe):

c. Survey respondents can elect to provide e-mail addresses for (1) prize drawing and (2) follow-up interviews. For winners of prize drawings, the e-mail messages with name and address will be deleted after the prize has been delivered. For follow-up interviews, names and other contact information will be kept separately from the transcribed interviews.

6. Recruitment process:

The survey announcement will be e-mailed to the participants of the April 2011 conference, and will be on display at a computer kiosk at the May 2012 conference.

7. Consent process and documentation:

Survey respondents who volunteer to be interviewed by phone or Skype will receive the e-mail and hear the study consent form read over the phone or Skype. Theresa Norton will conduct the interviews. Minors will not be interviewed.

All interviews will be conducted in English, which is also the language in which the conferences are held. It is unknown at this time which countries will be represented by the interview participants.

8. Risks:

There is a risk that participant responses would be associated with the respondent. However, we judge the harm from this risk as very minimal, and the chance of this risk as slight. We will minimize the chance of risk by storing all files securely and interviewing the respondent at a time convenient for them and conducive to their own privacy.

9. Benefits:

Responses to the survey will be used to improve future conferences or alternative information and knowledge sharing events. For example, if barriers to information sharing are language of conference materials, the conference organizers may explore producing briefs of key information in multiple languages.

10. Payment:

Participants will not be paid. They may elect to be entered into a drawing for a prize.

JHSPH Institutional Review Board
RESEARCH PLAN

PI: Dr. Linda Fogarty, Director, Monitoring, Evaluation and Research

Co-Investigators: Theresa Norton, Director, Knowledge Management

Study Title: MCHIP Newborn Conference Participant Survey Analysis

IRB No.: 00005366

PI Version Number/Date: v1, September 13, 2013

Aims/objectives:

5. The objective of this study is to perform secondary data analyses on the results of an on-line survey of newborn health conference participants. The objective of the data analysis is to determine whether information gained through a regional newborn health conference is used to improve global health practices and is shared by participants with other members of the global health community. The secondary objective is to identify factors influencing use of the information and sharing.

NOTE: This research project is related to IRB#: 4220 and 4383, as the objectives are similar.

6. **Background and rationale:** USAID's Maternal and Child Health Integrated Program (MCHIP), led by Jhpiego (an affiliate of the Johns Hopkins University), aims to scale up evidence-based, high-impact maternal, newborn, and children health interventions in 30 low-resource countries to reduce maternal and child mortality. To support advocacy for these interventions in countries, MCHIP and its predecessor project, ACCESS, have periodically held regional conferences in Africa and Asia. The most recent conference was held in Johannesburg, South Africa in April 2013. One of Jhpiego's partners on MCHIP, Save the Children, conducted an on-line survey of participants. Jhpiego staff suggested using a survey instrument similar to ones used for a previous conference (see IRB# 4383 and the appendix). Jhpiego staff did not post the survey on-line and did not do the data collection.

7. Participants:

Almost 500 participants participated in the 2013 MCHIP newborn conference. All conference participants were invited to complete the on-line survey and 126 completed the survey. The conference participants came from 33 countries in Africa, Southeast Asia, Asia, North America, and Europe. Most participants work for a non-governmental organization, in the capacity of program development or management, service delivery, or policy making.

4. Study procedures:

4.1 Existing Data

a. Analysis of existing data:

- 1) For this application, a research dataset has been extracted from the Survey Monkey on-line survey that Save the Children implemented. Jhpiego does not have access to Save the Children's Survey Monkey account, so Save the Children staff exported the results to an Excel spreadsheet and Adobe Acrobat pdf file for Jhpiego's use. To date, the data has been used internally to inform MCHIP program activities. This IRB application is being submitted so that secondary data analysis may be shared outside of MCHIP in publications and presentations.

5. **Data Security and Protection of Subject Confidentiality (NOTE: LOSS OR THEFT OF COMPUTER OR HARD COPIES OF DATA COLLECTION SHEETS DURING TRANSPORT IS GREATEST THREAT TO SUBJECT CONFIDENTIALITY – BE SURE TO TRAIN YOUR STAFF ABOUT THIS PROBLEM.)**

- c. Will the study data stored in the United States be protected by a Certificate of Confidentiality? If yes, explain who will apply for and maintain the Certificate.

(http://grants.nih.gov/grants/policy/coc/appl_extramural.htm) NO

- d. Identify the data security plan below that best describes how you will minimize the risk of a breach of confidentiality by typing an X in the appropriate box on the left side of each section (A, B, C) of this chart. If your study includes sequential phases that require different

procedures, or does not fit these categories, explain in “Other”. These categories reflect minimal standards; you may impose more stringent protections. See the JHSPH Data Security Guidance at http://www.jhsph.edu/irb/Guidance_and_Policies.html.

Note: Identifiers include direct identifiers such as name, address, SSN, hospital record number, etc., and other indirect identifiers (e.g., date of birth, tribe) that, when combined with other variables, may make a subject identifiable. It is possible that a unique, randomly-assigned, study identifier may remain within a dataset, but the dataset could be considered sufficiently ‘deidentified’ for the purposes of the JHSPH IRB. This may be the case if the person in possession of the data cannot use the unique identifiers to locate or identify a specific individual without additional codes or identity table linkages.

D. Hard copies of data collection forms:	
	The study collects data that are anonymous; no personal identifiers are recorded or retained from any study participants in either direct or coded form.
	Hard copies of data collection materials <u>have identifiers</u> and are locked in a secure cabinet or room with limited access by specified individuals. COPIES WILL BE KEPT IN INVESTIGATOR’S POSSESSION DURING TRANSPORT. When possible, redacted (de-identified) versions of the data collection sheets will be used for coding and analysis.
	Hard copies of data collection materials include an ID code but <u>do not have personal identifiers</u> . However, a code linking the data to the subject’s personal information is stored separately from the data collection sheets, and is either stored in a secure electronic database, and/or locked in a secure cabinet or room with limited access by authorized individuals. CODE WILL BE KEPT IN INVESTIGATOR’S POSSESSION DURING TRANSPORT.
X	Data are not collected on paper.
	Other (describe):

<p>Electronic Databases: Indicate your choice by typing an X in the appropriate box on the left: :</p> <p>Note: <u>A de-identified version of the database should be used for data analysis</u> except in instances in which identifying information is prerequisite for coding or analysis. Databases that retain identifying information require a higher degree of electronic security.</p>	
	<p>The study is minimal risk and data collected are not sensitive in nature. <u>No personal identifiers</u> are included in the electronic database. Any electronic documents that link IDs to identifying information are stored on a computer in accordance with JHSPH Data Security guidance.</p>
	<p><u>Personal identifiers</u> are included in the database. The data are stored on a computer that is password protected with a secure server. Transfer or storage on portable devices (e.g., laptops, flashdrives) is encrypted. The devices on which this information is stored are accessible only to individuals who need access to these data.</p>
	<p><u>No personal</u> identifiers are included in the database but linkable identifiers exist separately and the data are sensitive in nature (e.g., substance use, mental health, genetic propensities, sexual practices or activities) such that disclosure could provide a risk to the individual. The codes are stored on a computer that is password protected with a secure server. Transfer or storage on portable devices (e.g., laptops, flashdrives) is encrypted. The devices on which this information is stored are accessible only to individuals who need access to these data.</p>
X	<p>Other (describe): The original data collectors exported the survey results to Excel and Adobe Acrobat pdf file, which will be analyzed for this study. Any identifiers such as e-mail addresses that some participants may have contributed will be deleted by Save the Children prior to sharing with us. Participant names are not included in the pdf file. There is minimal risk to the participants.</p>

A. Analytic Datasets:

*Note: This refers to the use, for analysis, of either discrete subsets or the entirety of the database into which study data is entered and stored. To the extent possible, analytic datasets should be de-identified, except in instances in which identifying information is required. **Analytic datasets that retain identifying information require a higher degree of electronic security.***

	<p>The study collects data that is anonymous; no personal identifiers will be recorded or retained from any study participants.</p>
X	<p>Electronic database will be managed by a specific data administrator (PI or other designated person) who will track and log issuance of analytic datasets, and return/removal when approved use ends. Access to</p>

	analytic datasets will be subject to conditions established by the PI. Electronic analytic datasets will be provided to authorized study personnel, or approved investigators outside the study, with the same data protection requirements established for the study database.
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e. If you are using participants' personal identifiers, describe any plans for disposing of identifiers including if, when and how that will be done.

d. Describe any plans for destroying data including if, when and how that will be done.

There will not be any identifiers.

6. Risks:

There are no identifiers or names in with the Excel or Adobe files of the secondary data. We judge that the harm from this risk of identifying participants is very minimal, and the chance of this risk as slight. We will minimize the chance of risk by storing all files securely.

7. Benefits:

There is no direct benefit to participants of the survey. There may be community-level benefits. Analysis of the survey responses will be used to inform other global health programs through publication of the analysis.

8. Payment:

N/A

Appendix. MCHIP Newborn Conference Participant Survey

MCHIP Newborn Conference 2013 Post-Conference Questions:

ABOUT YOU

1. What country are you based in?

2. Please select the category that best describes your organization type:
 - Academic Institution
 - Government/Ministry
 - Jhpiego
 - Medical/Health Organization
 - News Media
 - NGO/PVO (local and international)
 - Private Sector (for profit)
 - Religious/Faith-Based Organization
 - Research Institution
 - U.S. Agency for International Development
 - UN Agencies
 - Other (please specify):

3. Please select the category that best describes your work:
 - Advocacy
 - Health Communication
 - Health/Medical Service Delivery
 - Journalism
 - Policymaking
 - Program Development/Management
 - Research/Evaluation
 - Teaching/Training
 - Other (please specify):

4. Please select the number of years employed in your current field:

- 0-5 years
- 6-10 years
- 11-15 years
- 16 or more years

5. Are you a member of any professional associations or groups? Please select or specify as many as apply:

- International Federation of Gynecology and Obstetrics
- International Confederation of Midwives
- Public Health Association of South Africa
- Other [e.g., multi-organization working groups, communities of practice (please specify)]

6. Are you or your organization/institution a member of the Healthy Newborn Network?

- Yes
- No
- Don't know

7. Has your organization ever collaborated with MCHIP on a project or program?

- Yes
- No
- Don't know

8. Would your organization/institution be interested in working with MCHIP on future projects or programs related to newborn health?

- a. Yes
- b. No
- c. Don't know

If yes, please provide us your email address so that we may contact you:

9. How did you learn about this conference?

- a. E-mail from MCHIP
- b. Communication from colleague
- c. MCHIP Website
- d. MCHIP Newsletter
- e. Other (e.g., e-mail lists, newsletters)(please specify)

USE OF TECHNOLOGY

10. How often do you access the Internet?

- Daily
- Weekly
- Monthly
- Never

11. Which of the following types of social media do you use? Please select all that apply.

- Facebook
- Twitter
- Blogs
- LinkedIn
- None
- Other (please specify):

KNOWLEDGE GAINED AT THE CONFERENCE

12. About which of the following programs and interventions did you gain knowledge from the conference? Please select all that apply.

- Causes of newborn mortality
- Newborn resuscitation/ Helping Babies Breathe
- Kangaroo Mother Care
- Antenatal Corticosteroids

- Newborn sepsis management
- Maternal interventions to reduce newborn mortality
- Policy/global recommendations
- I did not learn about any programs or interventions at the conference
- Other (please specify):

13. In what areas did you learn from experiences of your colleagues from other countries? Please select all that apply.

- Advocacy
- Community-based approaches/community mobilization
- Documentation & dissemination of results
- Human Resources
- Logistics/Commodities
- Monitoring & Evaluation
- Quality of Care
- Scale up
- Supervision
- Training
- I did not learn from experiences of my colleagues

SHARING INFORMATION OR KNOWLEDGE FROM THE CONFERENCE

14. How have you shared information or knowledge gained from the conference?

- Shared information, knowledge and conference materials (e.g., handouts, PowerPoint files) with others
- Shared information, knowledge and conference materials with communities of practice of which I am a member
- Mentioned in communication (in-person, phone, e-mail)
- Shared information, knowledge and conference materials through social media outlets (Facebook, Twitter, etc.)

- Included or cited information in a publication, presentation, or proposal
- I have not shared information, knowledge or materials from the conference
- Other (please specify)

15. How many times do you estimate you have shared information or knowledge gained from the conference?

- 0
- 1-3 times
- 4-6 times
- 7-9 times
- 10 or more times

16. With whom have you shared information or knowledge gained from the conference? Check all that apply:

- Members of my organization
- Clients or beneficiaries of my work
- Professionals I know in other organizations
- On-line discussion groups
- Audiences of presentations
- Readers of my publications or other writings
- Students
- Connections through social media
- I have not shared information or knowledge
- Other (please specify):

17. What influenced your decision to share information or knowledge from the conference? Please select all that apply:

- Wanted to share information that I thought would be useful to a co-worker or colleague
- Wanted to share information that I thought would be useful to others in my field
- Wanted to share information that was previously unknown to me
- Hoped it would help improve a global health program
- Thought it would lead to improved service delivery

- I have not shared information or knowledge
- Other (please specify)

18. Which types of information or knowledge from the conference have you shared? Please select all that apply:

- Expert opinion
- Experience from another participant
- Country-specific information
- Clinical or scientific information
- Information about a journal article or other publication
- I have not shared information or knowledge from this conference
- Other (please specify):

BARRIERS TO SHARING INFORMATION OR KNOWLEDGE FROM THE CONFERENCE

19. If you have not shared information from the conference, why not? Please select all that apply:

- Not enough time to share
- Not likely to identify need to share information or knowledge
- Language of information or knowledge was a barrier
- Other (please specify):

USING INFORMATION OR KNOWLEDGE FROM THE CONFERENCE

20. Have you used information or knowledge you have gained from the conference to do any of the following? Please select all that apply:

- To design projects or programs
- To advocate for policy change
- To develop training programs or design educational materials
- To improve service quality
- To write funding proposals, reports, articles, or research papers
- I have not used information or knowledge gained from the conference

- Other (please specify):

21. Please give an example of how you have used information from the conference, if applicable:

FINAL COMMENTS

22. Which of the following free information and knowledge exchange events would you be likely to participate in if MCHIP offered them to continue discussion on the conference themes? Check as many as apply.

- Community of practice on-line discussions
- Webinars (Web-based seminars)
- Virtual Meetings between countries in a region
- Social Media Communities (i.e. Facebook, Twitter)
- In-person assistance or consultations
- None
- Other (please specify):

23. Please feel free to add any additional comments you have about using and sharing information and knowledge from the conference:

24. How would you rate the interactivity of the conference?

- Too interactive
- Just the right amount of interactivity
- Not enough interactivity
- No opinion

25. Based on the knowledge gained from the conference, do you intend to modify your practices in addressing the leading causes of newborn mortality in your organization/country?

- Yes
- No

26. If you intend to modify your practices, may we contact you to discuss further?

- a. Yes

b. No

27. If we may contact you for more information, please provide your contact information below:

- E-mail address
 - Re-enter e-mail address
 - Phone number (including country code)
-

10.2 Appendix B. 2015 Conference Study Research Plan

JHSPH INSTITUTIONAL REVIEW BOARD

RESEARCH PLAN

PI: Theresa Norton

Study Title: Global Maternal Newborn Health Conference 2015 Knowledge Use and Sharing Study

IRB No.: IRB00007142

PI Version Number/Date: Version 1: April 15, 2016

- 8. Aims/objectives/research question/hypotheses:** The primary objective of the study is to determine whether knowledge gained through the 2015 Global Maternal Newborn Health Conference held in Mexico is used to improve global health practices and policy and is shared by participants with other members of the global health community. The secondary objective of the study is to identify factors influencing use of the knowledge and sharing.

NOTE: This research project is modeled after IRB#: 4383, as the objectives and methodology are similar.

- 9. Background and rationale:** USAID's Maternal and Child Survival Program (MCSP), led by Jhpiego (an affiliate of the Johns Hopkins University), aims to scale up evidence-based, high-impact maternal, newborn, and children health interventions in more than 30 low-resource countries to reduce maternal and child mortality. To support advocacy for these interventions in countries, MCSP and its predecessor project, the Maternal and Child Health Integrated Program, periodically worked with partner organizations to hold global and regional technical conferences on maternal and newborn health. One of these conferences—the Global Maternal Newborn Health Conference—was held in October 2015 in Mexico City, Mexico. Conference host partners plan to invite conference participants to complete an online survey—and volunteer for follow-up interviews—that will ask how participants have used and shared information and knowledge from the conference to improve global health practice and policy.

10. Participants:

- a. Participants of the October 2015 Global Maternal Newborn Health conference in Mexico City, Mexico.
- b. Sample size: Approximately 1000 participants attended the conference. With a population size of 1000 and a confidence interval of 95%, with +-5% margin of error, we need at least 278 participants to expect to have representative responses. All conference participants will be invited to complete an online survey about knowledge use and sharing following the conference. The online survey will include a question asking if the respondent is willing to participate in an interview. Approximately 30 survey respondents will be selected to be interviewed, based on their responses to the online survey. Interviews will continue up to the maximum of 30 or until the study question has been sufficiently answered and saturation is reached with the respondents.

11. Study procedures:

- a. Data collection steps:
 - i. Post the on-line survey instrument in Survey Monkey.
 - ii. MCSP communications specialist sends e-mail with invitation to October 2015 conference participants.
 - iii. Interested conference participants will complete survey (approximately 10 minutes). On-line survey will remain open for six weeks.
 - iv. Respondents who agree to an in-depth follow-up interview will be consented and interviewed by phone or Skype (approximately 30 minutes). Interviews will be audio-recorded if the interviewee agrees, transcribed and stored electronically. If the interviewee declines to be audio-recorded, the interviewer will take notes, but not audio-record the interview. Transcriptions and notes will be redacted to remove all identifying information.

b. Data analysis

- i. Use analysis features of Survey Monkey to cross-tabulate respondent characteristics (e.g., type of organization) with information use and sharing patterns.
- ii. Analyze redacted transcriptions (without identifiers except index number) from phone interviews by identifying common themes related to the study questions, documenting unusual responses, and compiling illustrative quotes.

5. Data Security and Protection of Subject Confidentiality (NOTE: LOSS OR THEFT OF COMPUTER OR HARD COPIES OF DATA COLLECTION SHEETS DURING TRANSPORT IS GREATEST THREAT TO SUBJECT CONFIDENTIALITY – BE SURE TO TRAIN YOUR STAFF ABOUT THIS PROBLEM.)

- f. Will the study data stored in the United States be protected by a Certificate of Confidentiality? If yes, explain who will apply for and maintain the Certificate.
(http://grants.nih.gov/grants/policy/coc/appl_extramural.htm) NO
- g. Identify the data security plan below that best describes how you will minimize the risk of a breach of confidentiality by typing an X in the appropriate box on the left side of each section (A, B, C) of this chart. If your study includes sequential phases that require different procedures, or does not fit these categories, explain in “Other”. These categories reflect minimal standards; you may impose more stringent protections. See the JHSPH Data Security Guidance at http://www.jhsph.edu/irb/Guidance_and_Policies.html.

Note: Identifiers include direct identifiers such as name, address, SSN, hospital record number, etc., and other indirect identifiers (e.g., date of birth, tribe) that, when combined with other variables, may make a subject identifiable. It is possible that a unique, randomly-assigned, study identifier may remain within a dataset, but the dataset could be considered sufficiently ‘deidentified’ for the purposes of the JHSPH IRB. This may be the case if the person in possession of the data cannot use the unique identifiers to locate or identify a specific individual without additional codes or identity table linkages.

E. Hard copies of data collection forms:	
	The study collects data that are anonymous; no personal identifiers are recorded or retained from any study participants in either direct or coded form.
	Hard copies of data collection materials <u>have identifiers</u> and are locked in a secure cabinet or room with limited access by specified individuals. COPIES WILL BE KEPT IN INVESTIGATOR'S POSSESSION DURING TRANSPORT. When possible, redacted (de-identified) versions of the data collection sheets will be used for coding and analysis.
	Hard copies of data collection materials include an ID code but <u>do not have personal identifiers</u> . However, a code linking the data to the subject's personal information is stored separately from the data collection sheets, and is either stored in a secure electronic database, and/or locked in a secure cabinet or room with limited access by authorized individuals. CODE WILL BE KEPT IN INVESTIGATOR'S POSSESSION DURING TRANSPORT.
X	Data are not collected on paper.
	Other (describe):
F. Electronic Databases:	
<i>Note: This refers to the initial database into which study data is entered and stored. If this "Study Database" includes personal identifiers from participants, only de-identified analytic datasets should be used for data analysis except in instances in which identifying information is required. Databases that retain identifying information require a higher degree of electronic security.</i>	
	The study collects data that are anonymous; no personal identifiers will be recorded or retained from any study participants in either direct or coded form.
X	<u>Personal identifiers</u> are included in the database (for some surveys). If breach of confidentiality poses more than minimal risk to participants because data are personally sensitive in nature (for example, involve substance abuse, mental health, genetic propensities, sexual practices or activities), access to identifiers will be restricted. These data are stored on a secure server protected by strong password, and will be only accessible by authorized study personnel. Data will be coded when possible. Identifiable data transferred or stored via portable electronic devices (e.g., laptops, flashdrives) will be encrypted. The devices on which this information is stored are accessible only to individuals who need access to these data.
X	Other (describe): Audio tapes of qualitative interviews will be stored in locked cabinets.

G. Analytic Datasets:	
<i>Note: This refers to the use, for analysis, of either discrete subsets or the entirety of the database into which study data is entered and stored. To the extent possible, analytic datasets should be de-identified, except in instances in which identifying information is required. Analytic datasets that retain identifying information require a higher degree of electronic security.</i>	
	The study collects data that is anonymous; no personal identifiers will be recorded or retained from any study participants.
X	Electronic database will be managed by a specific data administrator (PI or other designated person) who will track and log issuance of analytic datasets, and return/removal when approved use ends. Access to analytic datasets will be subject to conditions established by the PI. Electronic analytic datasets will be provided to authorized study personnel, or approved investigators outside the study, with the same data protection requirements established for the study database.
	Other (describe):

c. Survey respondents can elect to provide e-mail addresses for follow-up interviews. For follow-up interviews, names and other contact information will be kept separately from the transcribed interviews.

6. Recruitment process:

The survey announcement will be e-mailed to the participants of the October 2015 conference.

7. Consent process and documentation:

Survey respondents who volunteer to be interviewed by phone or Skype will receive the e-mail and hear the study consent form read over the phone or Skype. The PI, co-PI, or trained study team member will conduct the interviews. Minors will not be interviewed.

All interviews will be conducted in English, which is also the language in which the conference was held. It is unknown at this time which countries will be represented by the interview participants.

8. Risks:

There is a risk that participant responses would be associated with the respondent. However, we judge the harm from this risk as very minimal, and the chance of this risk as slight. We will minimize the chance of risk by storing all files securely and interviewing the respondent at a time convenient for them and conducive to their own privacy.

9. Benefits:

Responses to the survey will be used to improve future conferences or alternative information and knowledge sharing events. For example, if barriers to information sharing are language of conference materials, the conference organizers may explore producing briefs of key information in multiple languages.

11. Payment:

Participants will not be paid.

10.3 Appendix C. Dissemination Plan for Doctoral Project

Ensuring that this doctoral project contributes to improved healthcare systems—which was the author’s goal—requires actively disseminating key findings and lessons learned using multiple approaches to reach the audiences equipped to either apply the findings or re-distribute them to the right audiences. Because of the importance of providing users with timely access to research findings, dissemination began with the early publications in the project. Publishing journal articles as open access has aided this effort. This plan builds on those previous dissemination activities.

Audiences

The dissemination approaches in this plan target the following audiences to continue to build the research knowledge base and apply findings in global health programs and country strategies for improving healthcare. Audiences include:

- Researchers in the areas of knowledge brokering, knowledge translation, evidence-informed decision making, and scale-up of high-impact healthcare practices in LMICs
- Global health program implementers and funders
- Knowledge management for development practitioners
- Academic research institutions, professional associations, and ministries of health in LMICs

Dissemination Approaches and Knowledge Products

Use of multiple dissemination approaches and products supports “push and pull” access to the findings and development of linkages between the author and groups and organizations for possible future collaboration and learning.

The author will package findings and lessons learned from the project in the following types of knowledge products:

- Postings to online discussion forums (listservs)
- Blogs and blogspots (mini-blogs)
- Tweets
- Conference presentations and posters
- Seminars and webinars

- Electronic repositories of thesis and individual papers
- Video and audio recordings summarizing key points (similar to the “3-Minute Thesis” approach)
- Briefs

The following avenues for dissemination will be explored for use:

- **Electronic repositories:** Examples: Ghent University electronic repository for theses, journal publisher websites, website for the Maternal and Child Survival Program (mcsprogram.org)
- **Online discussion forums with international audiences:** Examples: Health Information for All, KM4Dev
- **Conferences:** Examples: Annual Conference on the Science of Dissemination and Implementation in Health, Global Symposium on Health Systems Research
- **Multi-organization professional groups:** Examples: Health Systems Global, Global Health Knowledge Collaborative, Implementing Best Practices Consortium, Health Information and Publications Network
- **Researcher and other professional networking websites:** Examples: researchgate.net, LinkedIn
- **Video repositories:** Examples: YouTube, Jhpiego/Johns Hopkins University’s internal “Spark” podcast series.
- **Guest seminar and webinar hosts:** Examples: Johns Hopkins Bloomberg School of Public Health Summer Institutes, Translating Evidence into Action thematic working group of Health Systems Global

10.4 Appendix D. Curriculum Vitae

THERESA C. NORTON, MBA

www.linkedin.com/in/theresanorton/

www.researchgate.net/profile/Theresa_Norton @km_health

orcid.org/0000-0001-6716-9749

Implementation science, behavioral science, and qualitative researcher with more than 20 years of experience in global public health implementation programs. More than a decade of developing and implementing one of the first electronic platforms in multiple languages for healthcare providers in limited-resource settings. Have continued to advance the exchange and uptake of evidence-based practices. Most recently, as a division director, led 3 international research studies (both quantitative and qualitative). Research results provided the evidence base for sustainable knowledge translation to improve health policy and practice in low- and middle-income countries. Also managed a \$750,000 project portfolio overseeing technical and financial components of 5 implementation science electronic platforms which have helped professionals worldwide to transform evidence-based maternal and newborn healthcare. Increased the capacity for exchange of implementation evidence among more than 3500 public health professionals in Africa and Southeast Asia both indirectly and directly through technical assistance. Have produced multiple journal articles and book chapters, published blogs, written technical and other program reports, and made conference presentations on implementation science and knowledge translation in the past 2 decades.

EXPERIENCE

Knowledge Management Director, November 2010–August 2019

Jhpiego (Johns Hopkin University Affiliate)

Led implementation science and qualitative research initiatives in a large global public health program implementation organization. Advanced the exchange and uptake of evidence-based practices, through more than a decade of experience developing and implementing one of the first electronic platforms in multiple languages for healthcare providers in limited resource settings. Led three international quantitative and qualitative research studies building the evidence base for

sustainable knowledge translation to improve health policy and practice in low- and middle-income countries. Managed project portfolios including overseeing technical and financial components of five implementation science electronic platforms with budgets up to \$750,000 which have helped public health professionals worldwide to transform evidence-based healthcare. Provided technical assistance in Africa and Southeast Asia up to three times per year, including conducting workshops, developing implementation guidance, and mentoring, which has led to increased capacity for exchange of implementation evidence among more than 3500 public health professionals worldwide.

Knowledge Management Advisor, August 2009–November 2010

Jhpiego (Johns Hopkins University Affiliate)

Managed projects for two electronic repositories containing more than 800 implementation science and global health practice documents and other resources downloaded more than 24,000 times annually from users worldwide. Provided content discovery and acquisition, content and usage reporting, and reference desk services for over 25 field office and headquarters locations to advance implementation of evidence-based healthcare practices. Exhibited technical thought leadership through active participation in multi-organization working groups to advance knowledge transfer for global health and international development, including development of a guide for monitoring and evaluating knowledge management in global health.

Communications and Marketing Manager, June 2008 – August 2009

Johns Hopkins University School of Education, Center for Data-Driven Reform in Education

Managed an implementation evidence website, the Best Evidence Encyclopedia. Served as U.S. editor of a related magazine distributed to over 6,000 education professionals about education implementation research to promote evidence-based education. Used early social media (blogs, Twitter, and iTunes University) to promote awareness of website, resulting in a 582% increase in web page views in 1 year.

Associate Editor, Info Project, April 2004 – June 2008

Johns Hopkins Bloomberg School of Public Health, Center for Communication Programs

As editor-in-chief of a weekly electronic magazine, managed global public health print and electronic publications to disseminate news and research findings with a budget of over \$750,000.

Disseminated content to over 80 countries using state-of-the-art web technology, which enabled global access by health professionals. Wrote successful grant proposals for \$300,000 from private foundations and created awareness and improved a global public health database and knowledge transfer tool (hivandsrh.org), increasing visits 152% in a year.

Senior Information Resource Developer/Information Specialist, January 1995- April 2004

Jhpiego (Johns Hopkins University Affiliate)

Developed one of the first Internet-based implementation science dissemination platforms to provide open-access materials and asynchronous learning in five languages to low- and middle-income countries (reproline.org). Topics included reproductive health, HIV services, maternal and newborn health, and competency-based training for health professionals. Managed and promoted awareness of the platform to build traffic to over 115,000 visits per month from over 125 countries.

EDUCATION

PhD, Health Sciences, expected December 2019, Ghent University

MBA, 1992, University of Baltimore

BA, Sociology & Anthropology, 1981, Towson University

PUBLICATIONS, REPORTS, AND PRESENTATIONS

Publications

Norton, T.C., Rodriguez, D. C., Howell, C., Reynolds, C., & Willems, S. (2019) “Maybe we can turn the tide.” An explanatory mixed methods study to understand how knowledge brokers mobilize health evidence in low- and middle-income countries. *Evidence & Policy*.
<https://doi.org/10.1332/174426419X15679622689515>

Norton, T.C., Rodriguez, D. C., & Willems, S. (2019). Applying the Theoretical Domains Framework to understand knowledge broker decisions in selecting evidence for knowledge translation in low- and middle-income countries. *Health Research Policy and Systems*, 17(1), 60.
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Norton, T.C., Howell, C., & Reynolds, C. (2016). Exploratory study of the role of knowledge brokers in translating knowledge to action following global maternal and newborn health technical meetings. *Public Health*, 140, 235–243. <https://doi.org/10.1016/j.puhe.2016.04.012>

Norton, T.C. (2012). Enabling knowledge exchange to improve health outcomes through a multipartner global health program. In J. Liebowitz (Ed.), *Knowledge management handbook: Collaboration and social networking, second edition* (pp. 63–88). Boca Raton: CRC Press.

Norton, T.C. (2009). Knowledge management for public health subspecialties using diffusion of innovations theory and information and communication technology. In T. K. Gokah (Ed.), *Contemporary discourses on IE&C theory and practice* (pp. 87–100). New York: Nova Science Publishers, Inc.

Norton, T.C., & Sullivan, R. L. (2004). Performance support. In A. Kovalchick & K. Dawson (Eds.), *Education and technology: An encyclopedia, Volume two J-Z* (pp. 468–473). Santa Barbara: ABC-CLIO.

Norton, T.C. (2004). Usability. In A. Kovalchick & K. Dawson (Eds.), *Education and technology: An encyclopedia, Volume two J-Z* (pp. 579–584). Santa Barbara: ABC-CLIO.

Norton, T.C. (2004). Web-based surveys. In A. Kovalchick & K. Dawson (Eds.), *Education and technology: An encyclopedia, Volume two J-Z* (pp. 644–650). Santa Barbara: ABC-CLIO.

Curran, K., Maier, N., & **Norton, T.C.** (2001). Realizing the possibilities: A technology-assisted learning center at Universidad Mayor de San Adres, La Paz, Bolivia. *TechKnowLogia: International Journal of Technologies for the Advancement of Knowledge and Learning*, 36–38. Retrieved from <https://www.scribd.com/document/55410330/Techknowlogia-Journal-2001-Mac-April>

Technical and Other Reports and Resources

Maternal and Child Survival Program. (2018). Conducting Competency-Based Clinical Exams: Guide for Implementation. (**T.C. Norton** key writer as part of the Knowledge Management technical assistance team). September.

Maternal and Child Survival Program. (2018). Guide for Strengthening Targeted Capacities of Health Councils and Associations through Organization Capacity Workshops: Guide for Implementation. (**T.C. Norton** key writer as part of the Knowledge Management technical assistance team). September.

Maternal and Child Survival Program. (2018). Learning and Performance Improvement Center In-Service Capacity-Building Model: Guide for Implementation. (**T.C. Norton** key writer as part of the Knowledge Management technical assistance team). August.

Jhpiego. ReproLinePlus website (resources.jhpiego.org). (2012-2019). Manager and developer of platform containing freely available implementation materials for global health practice. Impact example: Website materials were used to train providers and implement cervical cancer screening at hospitals in Nigeria, Kenya, and Malawi serving more than 10,000 HIV patients 2012-2017. (**T.C. Norton**, project and content manager).

Marwiro, A., **Norton, T.C.**, Togarasei, L. (2018). Knowledge Management and Organizational Learning Practice at ABC Corporation : An Exploratory Study on Cultural Determinants of Knowledge Sharing (Draft journal manuscript).

Norton, T.C. (2013). Knowledge Sharing: The Power of the Trusted Source in Changing Healthcare Practice. [Blog post]. June 17. Retrieved from <https://www.globalhealthknowledge.org/blog/knowledge-sharing-power-trusted-source-changing-healthcare-practice>

Ohkubo, S. et al. (2013). Guide to monitoring and evaluating knowledge management in global health programs. Baltimore, Maryland: Center for Communication Programs, Johns Hopkins Bloomberg School of Public Health. (**T.C. Norton** contributor, as part of the Health Information and Publications Network)

University of York, Institute for Effective Education and Johns Hopkins University School of Education, Center for Data-Driven Reform in Education. (2009). *Better: Evidence-Based Education* magazine. (**T.C. Norton** U.S. editor). Spring. Retrieved from: <http://www.betterevidence.org/>

Johns Hopkins University School of Education, Center for Data-Driven Reform in Education. (2008-2009). Best Evidence Encyclopedia (www.bestevidence.org). (**T.C. Norton** project manager).

Norton, T.C. (2006). Expanding and Promoting Resources for HIV/AIDS and Sexual and Reproductive Health Integration. Proposal for Grant 2006-29833 from The David and Lucile Packard Foundation.

Schenck-Yglesias, C., **Norton, T.C.**, Sacknoff, D., Sánchez, M., & Brechin, S. J. (2002). Increasing Access to Reproductive Health Information in Low-Resource Settings: Evaluation of a Technology-Assisted Learning Center in La Paz, Bolivia. JHP-19. Baltimore. Retrieved from <https://www.ponline.org/node/234091>

Canova [Norton], T. (1981). Ethnography of a Teenage-Girls' Dormitory at a School for the Blind: "What Radio Station Do You Listen To?" Submitted for requirements of a Bachelor of Arts degree in Sociology and Anthropology, Towson University.

Presentations Made and Workshops Conducted

Norton, T.C. (2019). How to Write an Abstract for a Conference Presentation. Workshop presented to staff of the Jhpiego India office. April.

Norton, T.C., Wijanarko, D., Devharsh, J., Gomes, C., Arora, P. (2019). Facilitating an Internal Culture of Learning, Collaboration, and Knowledge Sharing. Workshop presented to staff of the Jhpiego India office. April.

Norton, T.C. (2019). Mapping the Knowledge Landscape to Address Business Challenges. Workshop conducted for Jhpiego Leadership Development Program. April 18.

Norton, T.C., Howell, C., & Reynolds, C. (2018). Following the knowledge trail: How is health knowledge used in low-income countries after participant exposure to global conferences? Poster presented at the Fifth Global Symposium on Health Systems Research, Liverpool, England. October.

Norton, T.C. (2018). Making Linkages to Improve Global Health. Presented for students and faculty of the Health Promotion and Education Unit, Department of Public Health and Primary Care, Ghent University, Ghent, Belgium. October 4.

Norton, T.C. (2017). Challenges and opportunities in global knowledge translation: Role of knowledge intermediaries in improving maternal and newborn health. Panel: Knowledge Translation in Health Sciences. Presented at the Association for Information Science and Technology 2017 Annual Meeting, Washington, D.C. October.

Norton, T.C. (2017). Case Example: Evolution of Knowledge Management at a Global Health Non-Profit Organization. Presented for Technology in Knowledge Management course, TechChange.org. July 10.

Ricca, J., **Norton, T.C.,** Reynolds, C. (2015). Translating Knowledge to Action: Lessons from MCHIP. Seminar presented at Jhpiego Mini-University, Bangkok, Thailand. March.

Norton, T.C. (2013). Knowledge Management. Workshop presented to the Ministry of Health in Ethiopia under the Strengthening Human Resources for Health program. April.

Norton, T.C., Lukobo-Durrell, M., & Raney, L. (2012). Use of Online Community of Practice Forums to Support Global Program Staff in Improving Service Delivery. Panel: Best Practices in Creating and Sustaining Communities of Practice for Global Health. Presented at the 62nd Annual International Communication Association Conference, Phoenix, Arizona. May.

Norton, T.C. and Lasser, E. (2011). Operationalizing Knowledge Management in Global Health Programs. Presented at the 2011 Public Health Informatics Conference, Centers for Disease Control, Atlanta, Georgia. August.

Norton, T.C. (2011). Social Support and Networks - Communities of Practice in Global Health. Presented for Social and Behavioral Foundations online course, Johns Hopkins Bloomberg School of Public Health, 2011 Summer Institute. July 19.

Norton, T.C. (2007). Developing an Online Toolkit for Revitalizing the Intrauterine Device. Presented at the 34th Annual International Conference on Global Health, Washington, D.C. May.

Norton, T.C. (2006). Building Tailored Resources to Serve Information Needs of Emerging Public Health Specialties. Presented at the 33rd Annual International Conference on Global Health, Washington, D.C. May.

PROFESSIONAL DEVELOPMENT COURSES

- Improving Public Health through Innovative Social and Behavioral Tools and Approaches. 2019. Johns Hopkins Bloomberg School of Public Health Summer Institute
- Social and Behavioral Responsible Conduct of Research Refresher Course. 2019. Collaborative Institutional Training Initiative.
- Mixed Methods for Research in Public Health. 2017. Johns Hopkins Bloomberg School of Public Health Summer Institute.
- Implementation Research Study Design Challenge. 2017. Jhpiego/Johns Hopkins University.
- Qualitative Data Analysis for Public Health. 2016. Johns Hopkins Bloomberg School of Public Health Summer Institute

Of the estimated 15000 children who died each day in 2017, most could have been saved by making evidence-based, life-saving interventions more widely available and ensuring the quality of care (UNICEF et al., 2018). Insufficient use of evidence in health policy and practice contributes to preventable deaths among vulnerable populations—who bear the greatest burden—and delays achievement of the Sustainable Development Goals, a global call to action to improve lives by 2030 (United Nations, 2018). Public health experts widely acknowledge the urgent need to close the gap between knowledge of evidence and its context-appropriate application in health policy and practice—commonly called the “know-do” gap (World Health Organization, 2005).

Little is known about how evidence is disseminated and translated into action by health system actors (e.g., policymakers, healthcare providers) in multiple contexts of low- and middle-income countries (LMICs). The overall purpose of the doctoral research project is to advance understanding of dissemination and knowledge translation facilitated by knowledge intermediaries (called knowledge brokers) in the context of global health programs. The specific research aims were to: (1) Describe knowledge exchange approaches used in global health programs in multiple contexts of LMICs for health policy and practice; (2) develop common profiles of knowledge brokers working in LMICs, and (3) understand what influences knowledge brokers in selecting evidence for sharing and use in health policy and practice in LMICs. The research objectives were to: (1) Develop case studies of global health programs to describe their knowledge exchange approaches using secondary data; (2) conduct online surveys, semi-structured interviews, and document reviews to develop knowledge brokering profiles of participants of three maternal and newborn health conferences; and (3) analyze the decision processes of knowledge brokers in selecting evidence using psychological theory.

The PhD project employed multiple research methods and data sources, which are described in more detail in the individual papers and chapters. The book chapters describe knowledge exchange approaches for disseminating evidence and influencing evidence uptake through global health programs, used a case study approach with a discourse on the theoretical underpinnings of the approaches, and depended on secondary data sources. These sources included program reports and online discussion activity logs. The refereed papers present findings from studies of knowledge use and sharing following global health conferences held in 2012, 2013, and 2015. Collectively, data were collected by surveys and interviews from 598 participants in 68 countries in Africa, Asia, Europe, and the

Americas. One refereed paper is a methodological article describing how the Theoretical Domains Framework was adapted to analyze the decision processes of knowledge brokers in selecting evidence, using data from the 2015 conference study. The process of using the framework in this way generated new knowledge, which the candidate deemed would merit its own paper apart from the study findings. The idea of using the Theoretical Domains Framework evolved later based on earlier learning in the project.

Ethical approval for the human subjects research was obtained from the Johns Hopkins Bloomberg School of Public Health Institutional Review Board in the United States (IRB00004383, IRB00005366, and IRB00007142).

Findings across studies in this thesis present a broad view of healthcare evidence sharing and use in LMICs regarding contexts, levels in health systems, actor roles, and content topics. The research suggests that a mixture of knowledge exchange approaches is used in global health programs in which knowledge brokers participate on-line and face-to-face through activities characterized by social networking, collaboration, evidence appraisal and synthesis, and capacity building by providing learning opportunities. A common profile of knowledge brokers working in Africa, Asia, and the Americas includes professionals in a variety of roles and levels in health systems who broker as part of their professional duties. They link health system actors, facilitate adaptation of evidence to local contexts, build capacity to use evidence, communicate evidence, and monitor and evaluate evidence use and outcomes. Knowledge brokers are influenced in selecting evidence for action by having an opportunity to share, fit of evidence to action within a professional role, successful implementation of evidence in a setting similar to that of the knowledge broker, and fit of evidence to the decision-making culture in the country. In selecting evidence for action, knowledge brokers undergo a reflective decision process during which they weigh internal and external factors that may be barriers or facilitators.

There are several opportunities to conduct further research and to advance the field of knowledge brokering. A combination of research and interventions could focus on organizational strengthening approaches to build practice-oriented knowledge brokering. These approaches could include development of competency checklists for hiring individuals and teams for knowledge brokering, strategic identification and engagement of mobilizer knowledge brokers in hybrid professional roles, and incentivizing knowledge brokering as part of professional reward systems. Another potential focus area

Summary

is building capacity to appraise and communicate evidence in LMICs by adapting promising initiatives being used in higher-income countries. Global dissemination of evidence could be strengthening through increased linkages between regional evidence networks to build global coverage of dissemination and knowledge brokering. Finally, future research could investigate factors influencing sustainment of increases in evidence-informed decision making after knowledge brokering interventions.

Samenvatting

In 2017 zijn naar schatting elke dag 15000 kinderen gestorven. Echter, het merendeel ervan kan worden voorkomen mits een wijdverspreide beschikbaarheid van 'evidence-based' levensreddende interventies en het waarborgen van kwaliteitsvolle zorg (UNICEF et al., 2018). Wanneer het gezondheidsbeleid en de praktijkvoering onvoldoende 'evidence-based' worden uitgebouwd, leidt dit tot vermijdbare sterfgevallen onder de bevolkingsgroepen die reeds kwetsbaar zijn en belemmert het de verwezenlijking van de Duurzame Ontwikkelingsdoelstellingen, een mondiale oproep tot het verbeteren van leven tegen 2030 (Verenigde Naties, 2018). Deskundigen inzake volksgezondheid erkennen de noodzaak om de kloof tussen 'evidence-based' kennis en contextgeschikte toepassingen ervan in het gezondheidsbeleid en de praktijkvoering te dichten, de zogenaamde 'know-do' -kloof (Wereldgezondheidsorganisatie, 2005).

Er is weinig bekend over hoe evidentie wordt verspreid en omgezet door actoren in het gezondheidszorgsysteem (bijv. beleidsmakers, zorgaanbieders) naar concrete acties in diverse contexten in lage- en middeninkomenslanden (LMIC's). Dit doctoraatsonderzoek heeft als doelstelling om diepgaand inzicht te verwerven in de verspreiding en de vertaling van kennis, gefaciliteerd door kennis intermediairs (i.e. de zogenaamde 'knowledge brokers') in kader van 'global health' interventies. Meer concreet omvat dit als volgt: (1) het beschrijven van benaderingen voor kennisuitwisseling die worden gehanteerd in 'global health' interventies in diverse contexten in LMIC's voor het gezondheidsbeleid en de praktijkvoering; (2) het ontwikkelen van gemeenschappelijke profielen van 'knowledge brokers' die werkzaam zijn in LMIC's; en tot slot (3) inzicht bekomen in de factoren die 'knowledge brokers' beïnvloeden bij hun selectie van evidentie die wordt gedeeld en gebruikt in het gezondheidsbeleid en de praktijkvoering in LMIC's. De volgende studiedoelstellingen zijn geformuleerd: (1) het opzetten van een gevalsstudie van 'global health' interventie om de benaderingen van kennisuitwisseling te beschrijven, gebaseerd op secundaire data-analyse; (2) het uitvoeren van online vragenlijsten, semigestructureerde interviews en documentanalyse om de 'knowledge brokering' profielen van deelnemers uit drie gezondheidsconferenties met betrekking tot moeders en pasgeborenen samen te stellen; en (3) het analyseren van de beslissingsprocessen van 'knowledge brokers' bij het selecteren van evidentie, gebaseerd op psychologische theorie.

Dit doctoraatsonderzoek hanteert verschillende onderzoeksmethoden en databronnen die uitvoerig worden besproken in afzonderlijke artikels en hoofdstukken. De hoofdstukken uit boeken beschrijven benaderingen om aan kennisuitwisseling te doen met oog op het verspreiden van evidentie en het

beïnvloeden van opname van evidentie doorheen ‘global health’ interventies. Hiervoor is gekozen voor een gevalstudie als benadering met een discours over de theoretische onderbouwing van de benaderingen, gebaseerd op secundaire databanken. Dit impliceert rapporten van interventies en activiteitenlogboeken van online discussies. De artikels waarnaar wordt verwezen, stellen de bevindingen voor van studies omtrent het gebruik en het delen van kennis volgend op ‘global health’ conferenties in 2012, 2013 en 2015. In totaal, hebben 598 personen uit 68 verschillende landen in Afrika, Azië, Europa en Noord- en Zuid-Amerika deelgenomen aan de dataverzameling gebruikmakend van vragenlijsten en interviews. Een geïncludeerd artikel betreft een methodologisch artikel die een beschrijving geeft over hoe het ‘Theoretical Domains Framework’ is aangepast om het beslissingsproces van ‘knowledge brokers’ bij het selecteren van evidentie te analyseren, op basis van onderzoeksdata van de conferentie in 2015. Dergelijke werkwijze biedt de mogelijkheid om nieuwe kennis op te doen, wat volgens de kandidaat zou kunnen worden neergeschreven in een eigen artikel, afgezien van de bevindingen uit de studie. Het idee om het ‘Theoretical Domains Framework’ te gebruiken, is gegroeid uit eerdere bevindingen in het project.

De ‘Institutional Review Board’ van de ‘Johns Hopkins Bloomberg School of Public Health’ (Verenigde Staten) heeft ethische goedkeuring verleend voor de studie (IRB00004383, IRB00005366 en IRB00007142).

De bevindingen doorheen dit doctoraatsonderzoek geven een globaal beeld weer over het delen van evidentie in de gezondheidszorg en het gebruik ervan in LMIC’s met betrekking tot de context, de niveaus in het gezondheidszorgsysteem, de rol van actoren en de inhoud. Het onderzoek suggereert dat een mix van benaderingen om kennis uit te wisselen gebruikt wordt in ‘global health’ interventies waarin ‘knowledge brokers’ online of ‘face-to-face’ deelnemen doorheen activiteiten die gekenmerkt worden door sociale netwerken, samenwerking, beoordeling en synthese van evidentie en opbouw van capaciteiten door het voorzien van leermogelijkheden. ‘Knowledge brokers’ die werkzaam zijn in Afrika, Azië en Amerika kennen een gemeenschappelijk profiel, namelijk professionals werkzaam in diverse rollen en actief op verschillende niveaus van het gezondheidszorgsysteem die fungeren als tussenpersoon in kader van hun professionele taken. Zo verbinden ze actoren van het gezondheidszorgsysteem, faciliteren ze de aanpassing van evidentie naar de lokale contexten, bouwen ze capaciteiten op om evidentie te gebruiken, communiceren ze evidentie en zorgen ze voor de opvolging en de beoordeling van het gebruik van evidentie en de uitkomsten ervan. ‘Knowledge brokers’

worden beïnvloed in het selecteren van evidentie voor de praktijk door de mogelijkheid van het delen, maar ook het aanpassen van evidentie voor de praktijk vanuit een professionele rol, het succesvol implementeren van evidentie in een gelijkaardige setting dan die van de 'knowledge broker' en het passen van evidentie naar de cultuur van beslissingsmaking in het land. Bij de selectie van evidentie voor de praktijk, ondergaan de 'knowledge brokers' een reflectief beslissingsproces waarin ze een afweging maken van de interne en de externe factoren die fungeren als mogelijke barrière of facilitator.

Er zijn diverse mogelijkheden om verder onderzoek uit te voeren en om het domein van 'knowledge brokering' te versterken. Een combinatie van onderzoek en interventies kan zich toeleggen op benaderingen van het organisatorisch versterken om praktijkgerichte 'knowledge brokering' op te zetten. Die benaderingen kunnen de ontwikkeling van een checklist met betrekking tot competenties bevatten om individuen en teams in dienst te nemen voor 'knowledge brokering', de strategische identificatie en het betrekken van 'knowledge brokers' in hybride professionele rollen en het stimuleren van 'knowledge brokering' als deel van professionele beloningssystemen. Daarnaast kan men zich verder toeleggen op het opbouwen van capaciteiten om evidentie te beoordelen en communiceren in LMIC's door aanpassing van beloftevolle initiatieven uit hogerinkomenslanden. Een mondiale verspreiding van evidentie kan mogelijk toenemen door versterkte relaties tussen regionale netwerken van evidentie om een mondiale dekking van verspreiding en 'knowledge brokering' uit te bouwen. Tenslotte, toekomstig onderzoek kan zich verdiepen in de factoren die een invloed uitoefenen op een duurzame toename van 'evidence-informed' beslissingsmaking na 'knowledge brokering' interventies.