Embedding of research into decision-making processes

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1. Introduction

1.1 Overview

As health systems have become more complex and public demands for accountability have increased, the salience of overall health system performance for better services and health outcomes has grown. The current international emphasis on evaluating performance has positioned health systems research as an important vehicle for promoting evidence-based policy making. In turn, this emphasis has also encouraged health systems research to become relevant to policy making.

The divide between research and policy is substantial in many low and middle-income countries (LMIC). Both supply and demand factors are responsible for this. On the supply side, the limited local pool of human and financial resources has constrained the production of quality research. The result is that many LMICs are characterized by limited institutional capacity to generate research to aid policy making. On the other hand, avenues for research to influence policy are severely limited. One reason for this is the bureaucratization of policy making, in which, researchers and research institutions have only a minor role. Other common obstacles in this regard are centralized decision making and a policy making culture that gives little importance to evidence based research.

1.2 Objectives

This study is concerned with the uptake of research evidence in policy decisions for health and the factors which are conducive for this. Specifically, this study seeks to:

(a) Present a conceptual understanding of institutional embeddedness and apply it to the context of research in policy making in health. Further, through a review of the literature, document the institutional arrangements that facilitate the embedding of research use in the policy-making domain.

(b) Present country case studies to illustrate the embeddedness of research use in policy-making and the contextual and institutional factors that create enabling conditions for it.

We examine these questions from the perspective of the six WHO building blocks – service delivery, health workforce, information, medical products, financing and governance. Information is sourced from the existing literature and from country case studies.

2. Methods

2.1 Literature Review

Literature from various disciplines was sourced to develop the idea of embeddedness of research institutions in policy-making for health. We conducted a thorough review of the literature pertaining to the decision making process in health policy, processes of knowledge translation, the generation of research for practical applications in health, and the institutional arrangements that affect these processes. There is also a substantial literature around barriers and facilitators to research utilization in health policy (1-6). The following electronic databases were searched in December 2011: PubMed-Medline (up to December 2011); EBSCO Global Health and Global Health Archive (up to December 2011). Additionally, Google and Google Scholar search engines were used to identify sources not included in the electronic databases. We also attempted to harness evidence from reports, book chapters, and government documents in addition to the peer-reviewed literature. Search terms included a combination of "policy-makers", "decision makers", "evidence-based policy", "evidence-based policy-making", "policy process", "research to policy", "data sources", "embeddedness", "embedded research", "social embeddedness", "developing countries", and "Low and Middle Income Countries". Lastly, we relied on references cited in relevant studies.

2.2 Key-informant Interviews

The idea of embeddedness of research was further explored through key informant interviews drawing on decision makers and researchers from India, Mexico, Thailand, Iran, Lebanon, Nigeria, and Cameroon. This data allowed us to empirically reflect upon our conceptual model of embeddedness and examine how research operates in country-specific contexts. Potential key informants were identified and contacted by collaborators at the Alliance for Health Policy and Systems Research at the World Health Organisation. The criteria for selection were purposive: informants were to be either high-ranking researchers or national level policymakers or were both, they were to be from countries that are recognized in the literature as having linkages between decision making and evidence (as in Iran, Mexico or Thailand), or where such systems have been created in certain domains of health (as in India and Nigeria). Appendix 2 is a listing of informants contacted and interviewed.

Questionnaire development

Interview questions were developed initially based on a conceptual model of institutional embeddedness that drew from an extensive review of the literature. They were further refined on the basis of discussions and consultations with experts in health policy and systems research in India and abroad to establish credibility. Two iterative versions of the interview guide were piloted with health decision makers in India to arrive at a revised instrument focusing on five major questions (apart from some information on the designation and duration of informants' work in health). The guide was structured around four *a priori* themes used as anchor-points for country case studies on characteristics or processes typifying institutional embeddedness of evidence in decision making: quantity of relationships, the quality of relationships, the capacity to generate quality health systems research, and the reputation of evidence-generating institutions.

Data collection

Once key informants were selected and initial contact was made, phone or in-person interviews were scheduled by researchers from the Public Health Foundation of India. In most cases (N=10), interviews were conducted on the phone. While some personal informant details (such as designation and institution) were recorded, no names were recorded. Instead, codes were used for informants, designating country, whether health researcher, policymaker or both, and the date. The interviews began with a verbal informed consent process and request to record the interview lasting no less than 40 minutes and no more than 1 hour, depending on the level of detail offered by informants. Within 48 hours of each interview, interview notes were transcribed with consultation of recordings when available and uploaded onto a secure site. Twelve key informant interviews were conducted between February 14th and March 15th 2012 (Figure 1).

Figure 1 | Data collection and sampling
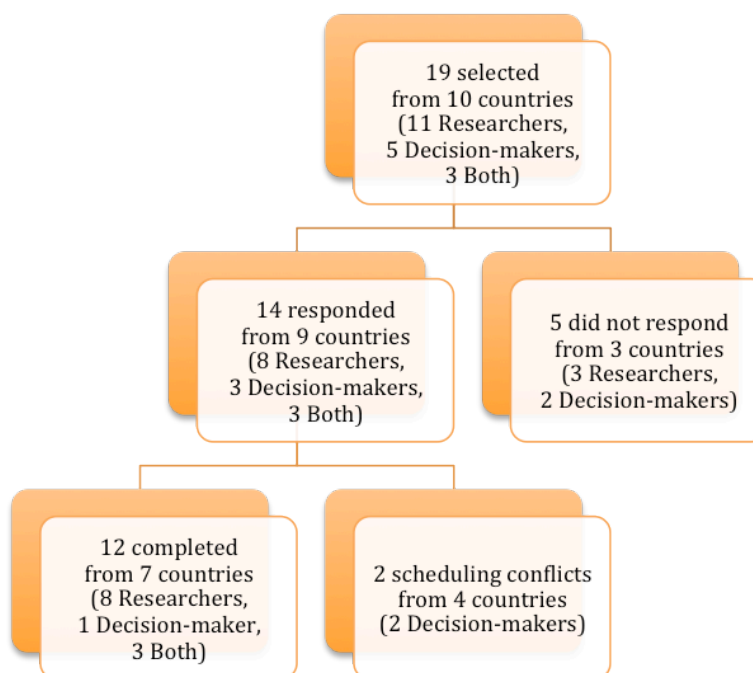
Qualitative analysis

Ritchie and Spencer's (60) framework approach for analysis was used. In this methodology, a number of *a priori* themes were generated based on prior research and the literature. Interviews perused repeatedly by two researchers and coded with these themes in mind, and also with attention to data that did not relate to these themes, on the basis of which, *de novo* themes were also added. For the most part, each research question corresponded to dimension of analysis; however, the third research question, pertaining to examples of health policy-making, was used to elucidate examples of enablers of embeddedness and challenges to it.

Ethical approval for human subjects research

IRB approval was sought from the Public Health Foundation of India Institutional Ethical Review Board.

3. Embeddedness & Health Research

The term "embeddedness" has a long history in the social sciences. The origins of the concept can be traced to the work of Karl Polanyi, who, in 1957, wrote that "the human economy...is embedded and enmeshed in institutions, economic and non-economic. The inclusion of the non-economic is vital."(7) This idea of embeddedness, or "social embeddedness", as it is often referred to, represents an organization's/individual's connection, relationship, and/or position, within a social network (8). The term is also associated with the idea of social capital that gained credence in the early 1990's (9). Nevertheless, embeddedness assumes many forms, as manifest by its assorted use in sociology, anthropology, political science, public administration, and economics. It has been used to describe electronic social networks (10), engagement of immigrants in politics (11), consumption trends in the agricultural sector (12), as well as the performance of various health agencies in the public sector (13, 14).
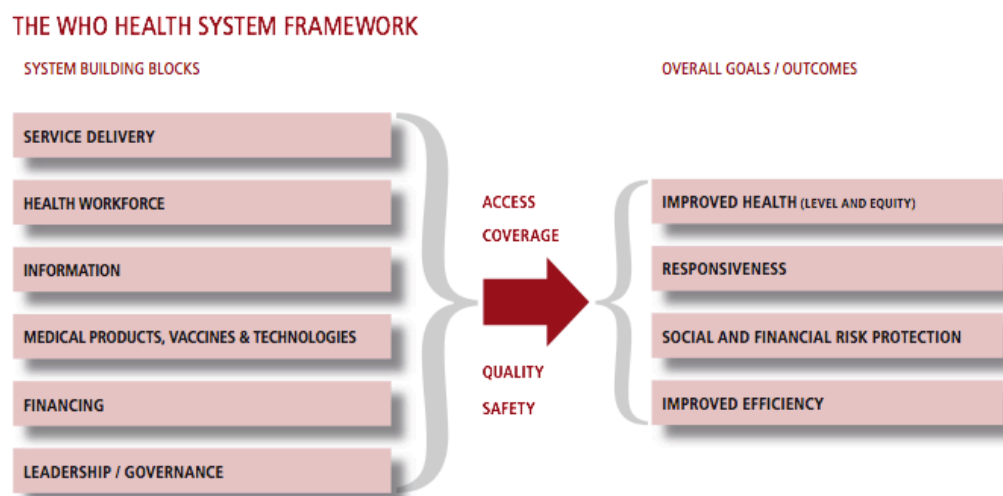
According to Provan et al., the degree of embeddedness of an organization refers to its structural position in an organizational network (15). The greater its embeddedness or centrality in an organizational network, the greater is its connectivity with other organizations in the network and more immersed the organization is in the flow of information and resources than non-central organizations. The authors found that embedded organizations have several desirable qualities. For one they are more influential. Influence, in this case, has to do with an embedded organization's stance, recommendations, or actions being taken into consideration when other organizations within the network make important decisions. Embedded organizations also have greater trustworthiness and reputation. Organizations that reliably deliver on their commitments to other actors in the web of exchanges are said to be trustworthy. Similarly, organizations that are perceived to be performing at a high level and producing quality outputs for others within its domain are said to have a strong reputation. These qualities may in part account for an embedded organization's ability to wield power within and outside the network (16). Another important characteristic is that embedded organizations also increase the performance of the network as a whole. Further, through empirical research, they found that these five qualities of organizational embeddedness tend to strengthen as the network matures.

Similar network analytical methods to those used by Provan et al. have been used to assess a variety of topics, including the embeddedness of political top executives (17), two mental health networks (18), the effects of informal collaboration (19), urban governance (20), and as a platform to call for more research into networks funded by the public sector (21). Recently, this type of research was also identified in a systematic review of public administration research applicable to the public health domain (22). To the best of our knowledge, this methodology has not been used in assessing the embeddedness of health research institutions or any type of institutional arrangement in LMICs.

3.1. Research Embeddedness through the lens of health systems building blocks

In this section we examine the idea of embeddedness of research use in decision making in the health sector. Because health systems are characterized by a diversity of institutions and activities, the information collated from the literature is organized according to the six building blocks described in the World Health Organization's Health Systems Framework (Figure 1) (23). Through a global survey of the literature we have identified various knowledge-translation pathways and institutional embeddedness with respect to service delivery, health workforce, information, medical products (drugs, vaccines, and devices), financing, and leadership/governance. While we feel that there is sufficient evidence to warrant this type of classification, there is some degree of overlap with several studies. For example, adoption of a certain course of treatment for malaria could be included in the medical products, service delivery, or even the governance realm depending on how one approaches the issue. We have, therefore, used our best judgment with the disclaimer that this categorization is by no means absolute. It is also important to note that we are working with a presumption that policy makers use research for making decisions. While this may be true of some countries or some health system building blocks within countries, it is unlikely to be true of all contexts.

Figure 1 | The WHO Health Systems Framework

Source: WHO. *Everybody's business: strengthening health systems to improve health outcomes: WHO's framework for action*. Geneva; 2007.

Service Delivery

Several studies have examined the diverse group of actors involved in decision making around service delivery. These studies indicate important differences in who informs the process by which health services are delivered. The influence of lobby groups, champions and the roles of national, regional and international research and policy networks were paramount in inserting research into the policy process for health care delivery in Mozambique, South Africa, and Zimbabwe (24). Research to inform planning of various service delivery mechanisms can also come from outside the MoH. For example, this happened at the district level in Kenya and at the federal level in Mexico (25, 26). Within the service delivery block, a great deal of research-informed policy

> **Box 1: Malaria Drug Policy in Peru**
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> One of the strongest examples of high-quality research flowing into policy is Peru's anti-malarial treatment plan. In this example, district health officials became concerned by the rising incidence of malaria as observed in hospital records. The (Peruvian) National Institute of Health, within MoH, conducted efficacy trials with technical assistance from the U.S. Centers for Disease Control and Prevention (CDC). Meanwhile department level MoH officials conducted cohort studies and presented their findings to the (Peruvian) National Malaria Control Program. These were synthesized and presented by the (Peruvian) National Institute of Health to a task force composed of individuals from USAID, CDC and academia, and eventually effectively implemented (28).

focuses on vertical programs. This particular type of research tends to draw from a number of different sources, each representing their own degree of embeddedness. In Uganda, for example, international advisory groups, academics, NGOs, and other peripheral organizations generated disease-specific research which policy-makers used to base their decisions about malaria treatment, antiretroviral therapy, prevention of mother to child transmission of AIDS (PMTCT), integrated management of childhood illnesses (IMCI), tuberculosis treatment, and safe male circumcision (27). The arrangement of these actors in Uganda will be depicted later in Figure 2. Unlike Uganda, Peru used a very small set of external actors to evaluate research generated from highly embedded federal research bodies in reforming malaria treatment policy (see box 1) (28). The role of health organizations within the health system is also not restricted to and can sometimes conflict with, research. Consider Thailand where, despite the fact that research from a highly embedded organization indicated that scaling-up antiretroviral therapy was not a wise course of action, a powerful policy network of non-state (NGO and civil society) actors emerged and successfully lobbied for the program to be implemented (29). Several other important factors were responsible for launching this policy; however, this example illustrates some of the complexities encountered during the process of crafting health policy in low and middle income countries.

Medical Products (Vaccines, drugs, medical devices, etc.)

Of the six building blocks, the medical products block is probably the best representation of the different pathways through which research can flow directly into policy. It is also populated by an interesting set of moderate to highly embedded research organizations. Box 2 further illustrates this idea for health technology in Asia (30, 31). Similarly, vaccine policy is interesting for several reasons. First, several different types of evidence, in addition to burden of disease, are frequently used to inform the debate. Se cond, many countries have Immunization Technical Advisory Groups for vaccine policy. These vary in composition but usually consist of MoH staff, scientists, and other experts in the field (32). Third, donors and technical agencies (such as WHO, GAVI, and UNICEF) have a strong influence over LMIC country decision in particular. In fact, in some countries, policy-makers have indicated that some of the principal sources of evidence are often WHO guidelines or position papers (33).

The literature on Essential Medicines or National Drug Policies suggests that the pathway from research to policy is similar to that of vaccines. Like vaccine policy, in Mali and Laos, national commissions, composed of an intersectoral set of experts, inform drug policy. In Mali, researchers used evidence from the peer-reviewed literature, technical reports

Box 2: Health Technology in Asia

Two studies from Asia describe the sources as well as the users of evidence in crafting policy around drugs, medical devices, and diagnostics (30, 31). In India, Pakistan, Malaysia, Philippines, Thailand, South Korea, and Taiwan, researchers have described large federal bodies responsible for the production of evidence to support policy decisions. This may or may not fall under the purview of the Ministry of Health. According to the authors, one institution may govern the entire research production and utilization process in some countries. In others, this is not the case. For example, Taiwan produces evidence to inform market approval of drugs and medical devices from 7 different government bodies, only three of which actually use the information. In all 7 countries mentioned above, legal frameworks are in place to regulate the flow of information from research to policy for medical technology.

from international organizations, and other country experiences (34). In Laos, it appears as though little research has historically been used by policy-makers, despite the efforts of highly embedded health research bodies within the country (35). In fact, in both Mali and Laos, policy-makers indicated that other concerns were given equal, and sometimes more, weight than scientific evidence.

Information

Of the six health system building blocks that guided our analytical framework, Information, or health information systems, appears to be one of the most underdeveloped in LMICs. There is very little evidence on the pathways by which other country experiences, technical assistance, or research within the MoH influences the policy process. In Sri Lanka, Hornby and Perera described the challenge of developing process indicators and installing performance management strategies without health information systems or research from other countries to aid their efforts (36). In Tanzania, the government has benefitted from costing analyses generated by external international researchers in order to inform their experimentation with health information system technology (37). Gething et al. draw attention to Kenyan efforts to develop an effective health information system and the authors present statistical techniques to compensate for imperfect national data, which is a major barrier to evidence-based decision making in Kenya (38). One positive sign of ways in which peripheral international actors can assist with building up information infrastructure is the Integrated Disease Surveillance and Response program initiated by WHO (39). Some countries, have even used certain aspects of this to form their own Integrated Disease Surveillance Units within the Ministry of Health (40). In summary, the literature suggests that for many low income countries, there exists a greater need to develop basic data collection facilities and workforce so as to lay the foundation for a comprehensive and embedded health management information system.

Health Workforce

In general, there is scant evidence of the pathways through which policy-makers typically source research to inform health workforce policy. This may be due to the fact that the health workforce was, until recently, seen largely as an administrative issue of recruitment, cadre establishment and training, transfers and postings. This inward and bureaucratic approach to human resource issues precluded research and international experience from permeating policy making. Secondly, till recently, this area did not receive much attention by researchers. Actually, contemporary research into human resources for health is quite recent. The Joint Learning Initiative's 2004 report on "Human Resources for Health: Overcoming the Crisis " and WHO's 2006 World Health Report "Working Together for Health," drew attention to the global crisis (41, 42). Systematic reviews have given policy-makers a clearer idea of what policy options exist, but we are just beginning to understand how various practices influence health worker retention in rural areas, curb the flow of qualified health personnel across borders and sectors, harness the potential of task shifting, and improve health worker performance (43). Not only are the results of basic strategies poorly understood across countries, but policy-makers often lack basic statistics about the size, composition, and distribution of health workers within their own countries (44). This highlights the need for stronger Health Management Information Systems in country health systems as well as identifying strategic entry points for external technical assistance in the interim. The WHO has also

attempted to facilitate this process through publication of guidelines such as those issued in the 2010 report, "Increasing Access to Health Workers in Remote and Rural Areas Through Retension." (45) While there is increasingly an acknowledgement by the international community to develop an urgent response to the health workforce crisis, there are very few examples, at the country level of evidence-based health workforce policy. Two notable exceptions to this are represented by Mali and Ghana who have both relied on the technical advice of external international actors to incite health workforce planning initiatives (46, 47).

Financing

In the financing realm, policy is often guided by evidence in the form of technical advisory groups, assistance from research institutions, or high-level task forces. For example, in the mid-90's, South Africa and Zambia, both embarked on ambitious financing reform in the health sector (48). To guide the process of reform, several working groups were created. Though they provided consistent input, the extent to which both reform efforts centered around research was largely a result of the interaction of the working groups with several other, in some cases, more powerful actors in the political realm (49). Similarly, in Ghana the government's national healthcare insurance scheme was nearly derailed by the presence of political elites forcing out technical experts. Though the scheme was eventually rolled out, technical experts were only brought back in to inform the process after political transition in which the political elites were replaced (50). In contrast, a highly embedded research institute in Thailand was the guiding force behind an ambitious national health insurance scheme during national elections in 2001. This publicly-funded, autonomous research institution was created in 1991 with the mandate of providing policy-relevant health systems research. Though it operates largely outside of the ministry of health, the health minister chairs the institute's governing board. Thus, Thailand's successful insurance scheme can be attributable to an investment in human resources for health research, which started 10 years prior to the actual reform measure, was maintained by regular input with key policy-makers in the ministry of health, and involved several other external actors to force the issue onto the policy agenda during a key time of political transition (51). As we can see from the examples above, the complicated nature of financing in healthcare necessitates the technical input of various experts. This may take the form of an intersectoral working group, technical advisory committee, or embedded research institution. The very structure of this technical assistance and the way it interacts with larger socio-political forces often plays a substantial role in the execution of successful policy initiatives.

> **Box 3: Mexico and Thailand Lead**
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> In the early 2000's, Mexican policy-makers drew from multiple sources, namely international academic institutions, free-standing publicly-funded institutions, and evidence generated from within the Ministry of Health to guide the process of comprehensive healthcare reform (25, 52). Similar to Thailand, Mexico installed a national health insurance scheme to curb regressive out-of-pocket expenditures in healthcare. Also, both Mexico and Thailand relied heavily on research institutions that were created with a public mandate nearly 20s prior to embarking on reform (51,52). Furthermore, both institutions enjoy direct contact with the Ministers of Health on a regular basis (53). Thus, two of the most widely cited examples of effective healthcare reform initiatives have utilized research generated from highly embedded research organizations. In addition to this, both examples explicitly relied on legislative frameworks to direct the process (51,52).

Governance / Leadership

With the exception of Mexico and Thailand (51-53) (see box 3), there are few examples of strong linkages between evidence and policy to inform health sector governance. Between 2001 and 2006 a government program in the Indian state of Karnataka was established for the sole purpose of fighting generalized poor governance and systemic corruption (54). While this is a specific example of an evidence-gathering mechanism aimed directly at improving governance, other research into drafting and launching national health plans describes less direct pathways by which research informs governance/leadership practices. In Vietnam, peripheral actors helped to facilitate the creation of national mental health

policy (55). This was also true in adopting a mental health plan in Solomon Islands; however, there the process seems to have been more enthusiastically supported by key policy-makers and buttressed with embedded research (56). In another conflict-affected fragile state, East Timor, the fledgling government began an arduous process of reconstructing the national health system. This involved commissioning research from peripheral actors and transferring stewardship responsibility from humanitarian aid organizations to the expanding national government (57). This underscores the unique circumstances some countries find themselves in prior to the development of functional institutional arrangements. Until more research is conducted in the governance/stewardship block, it remains unclear what role embedded research organizations can play in establishing knowledge streams for policy.

3.2 Conceptual framework for embeddedness in health research

The available evidence from the literature presented in the previous section indicates that, when evidence is used for decision making, policy-makers rely on evidence from a variety of sources. Several historical, sociological, and political forces have converged to create the context-specific pathways through which research enters into the policymaking environment. These pathways are mediated by institutional arrangements that influence the interaction between policy-makers and producers of research - research divisions or expert committees within the MoH, publicly-funded external institutions, and/or an increasingly complex array of privately-financed external institutions. Depending upon the policy under consideration, MoHs may call upon an intricate combination of actors within this configuration. For example, in some countries policy-makers convene a task force composed of researchers prior to undertaking a major policy endeavor, like formulating a national drug policy. Indeed, the institutional arrangements through which health research can be sourced for policy making can be very complex, as in Tanzania's case depicted in Figure 2 (58).

Figure 2 | Health Research Architecture in Tanzania
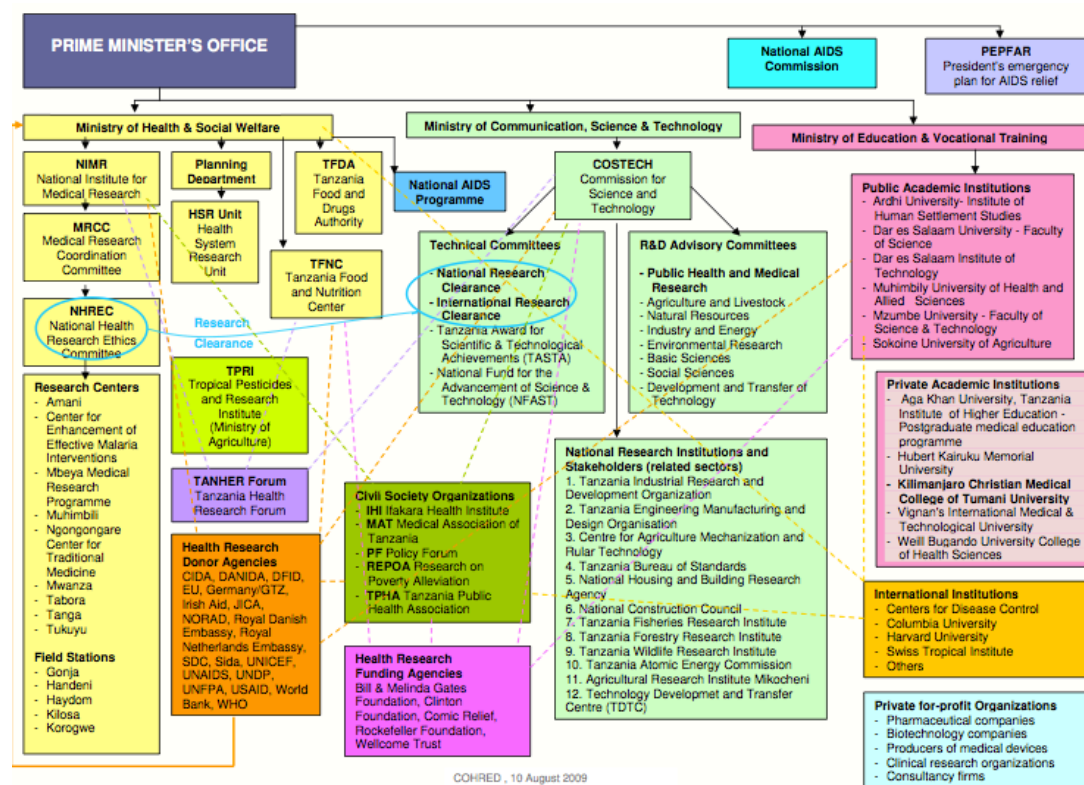
Source:COHRED. *Tanzania: An Assessment of the Health Research System*: Council on Health Research for Development; 2009

The institutional arrangements for producing research across countries can be conceptualized through a generic framework as depicted in Figure 3. Here, the different agents that produce research have been placed in concentric circles with 'Decision makers' at the core. The idea is to situate research-producing institutions in relative proximity to those making health policy decisions. So the innermost ring consists of government organizations such as special committees, research units, regulatory bodies. The next circle consists of government-supported research institutions such as agencies, universities, think-tanks and individuals who are funded by government but not directly part of it. The outer most circle consists of independent research institutions which are privately funded and managed like those belonging to multi-lateral and bi-lateral agencies, private universities, NGOs, and research consortia.

Figure 3 | Conceptual framework for institutional embeddedness of research in the health sector
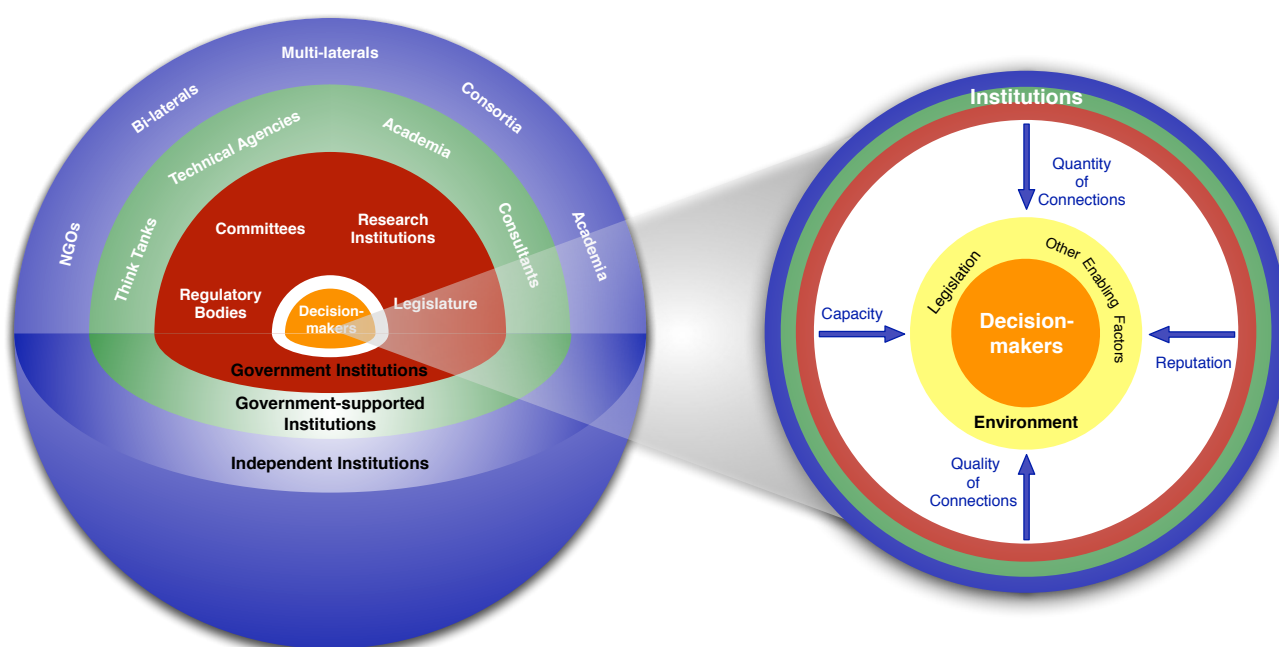
While proximity to decision makers or government could increase the embeddedness of research institutions, it is not necessarily the case. Through the diagram on the right in Figure 3 we attempt to marry the dimensions or attributes of embedded institutions in a network (discussed earlier) with the generic framework of research institutions (shown on the left of Figure 3). The first two dimensions describe the quantity and quality of institutional connections. If a given organization has several strong linkages to policy-makers then it is more likely to have greater centrality and embeddedness in the network. The 'quality' of these connections also matter - an institution that has links with other institutions that have high centrality in the network is also going to possess at least as high a degree of embeddedness (15). We discussed the third enabling factor earlier, when we defined "reputation" as the perception that an organization is producing quality outputs for others within its domain. Reputable organizations and their products, therefore, are much more likely to be embedded and, as such, command the attention of policy-makers. Reputable organization may, however, produce reliable and relevant evidence in only select domains (building blocks). For this reason, we introduce

the fourth dimension of capacity. We hypothesize that institutions that produce policy-relevant evidence within a few given health system building block(s) tend to posses a lower degree of embeddedness than institutions that produce evidence across more or all domains.

We present the environment surrounding decision makers as another important mediator in the flow of evidence to policy, irrespective of the institutional arrangement. For example, legislation can be an effective way of ensuring that research institutions and what they produce, if relevant, is considered by decision makers (like in the case of Mexico). Other enabling factors specific to the policy environment might include, historical precedence of relying on evidence to inform policy, research background of decision makers, a forum for consistently placing decision makers in contact with evidence generators, well-established modes of communicating clearly between actors (policy-briefs, updates, emails, digestible reports, etc.), responsive channels for quickly sourcing evidence, and access to centrally-located evidence generated by embedded institutions, but shared by all actors (4). Thus, in each of these ways, the environment can act as an important mediator, either by hindering or facilitating the uptake of evidence by decision makers.

From Figure 3, the picture that emerges is that there are several dimensions – quantity and quality of connections, reputation and capacity - that cause research institutions and the evidence they produce to be embedded in networks of decision makers or institutions in government. These dimensions can be combined to form an 'embeddedness continuum' and institutions can possess high, medium or low embeddedness. A research institution possessing all of these dimensions will have high levels of embeddedness in decision making networks. Similarly, an institution that has none of these dimensions will have no embeddedness. Institutions possessing only a large number of connections or even good quality connections or both or only possessing a good reputation with decision makers can be thought of having low embeddedness. If institutions possess either numerous connections and/or good quality connections together with good reputation, then they could be considered to have medium embeddedness. Finally, the presence of capacity to generate evidence to be used in decision making together with the other three factors can give institutions high embeddedness.

To illustrate the application of such an embeddedness scale, a research unit within the MoH would likely have good quantity and quality of connections to decision makers – however, because of poor reputation for its research products, it might have low embeddedness overall. On the other hand, an NGO that operates on the periphery as an independent international institution, but produces high quality, policy-relevant evidence and has numerous and/or good quality connections with policy makers could be said to exhibit a high degree of embeddedness. Nevertheless, proximity to a decision making core does lend certain advantages to institutions, which allow them to become more embedded. Also, the presence of legislation requiring research to be used in decision making or other environmental factors can serve as facilitators or barriers in the process of research being absorbed by decision makers. In this way, we can see that the mix of actors and environment affects the uptake of research in decision making in a highly contextual manner.

3.3 Empirical examples of embeddedness in health research

We explored the notion of institutional embeddedness through interviews with high-level national researchers. These individuals were asked a series of questions related to embeddedness and institutional arrangements within their countries (Appendix 1 and 2). All questions were open-ended and study participants were encouraged to talk freely and openly about their experience. A great deal of information was generated from this interview; the findings reported here reflect analyses specifically concerning the conceptual model presented earlier (Figure 3).

a) Institutionalizing the use of evidence for policy making

All key informants acknowledged the need for evidence to inform decision making and that the overall trend was in the direction of greater institutional embeddedness of research in this process. In Mexico and Thailand, the turn towards the use of evidence in decision making took place between two to three decades ago, crafted through **deliberate institution-building** by what our Thai informant (ThaHR011702) dubbed "key champions." Informants reported that it was not the Ministry of Health that identified research priorities, but rather, autonomous research institutions perform this function (as in Thailand), or that these are contingent on the processes health researchers use to set research priorities (as in Mexico).

In the cases of Lebanon and Iran, the institutionalizing of evidence use for policy making occurred contemporaneous to countries like Mexico and Thailand, but more importantly, as **part of post-conflict or post-revolution health systems building**. These efforts have been characterized by our Lebanese informant (LebHB012702) as involving "strategic" evidence-generation, accompanied later by "operational" evidence-generation. In these cases, the Ministry of Health played a major role in deciding the health research priorities and in budget topics.

Elsewhere, as in Nigeria and India, policy making for certain **vertical programmes** has typically relied on the institution-alised use of evidence. For example, in India, there is a National Technical Advisory Group on Immunization is headed by the health secretary and comprises a wide range of outside experts; and, for the country's HIV response, a parastatal National AIDS Control Organisation exists that has played a critical role in HIV surveillance and intervention research.

b) Linkages between research institutions and decision making: how evidence is sourced

Sourcing of evidence was situational. In some cases it related to "burning policy questions," and in other cases emanating from routine data collection. However, a key aspect of sourcing research was that it should be **relevant to decision makers' needs**. For research to cater to this relevancy, it is important to create opportunities for the development of personal relationships between researchers, research institutions and decision makers to improve information flow.

Evidence published in **journals** was also a source of information, although it was acknowledged that time constraints on the part of decision makers make this a rarer source of information. As such, the practice of using peer-reviewed literature has not been universally adopted across policy making institutions. More recently in Mexico, the practice of developing policy briefs has emerged to make evidence more relevant to decision makers.

Linkages with **national statistics agencies** were also common, typically for both the generation and dissemination of population-based data over long periods of time. In the case of Lebanon and India, population-level data is made publicly accessible (i.e. online) and could also be accessed by decision makers. While in most cases statistics agencies made this information available, in some cases, research institutions undertook the task of making information available as well.

Academic and/or research institutions were key sources emphasized by several participants. Iran has a unique sourcing model attributable to the fact that the Ministry of Health is also the Ministry of Medical Education. As such, apart from teaching and research, each Iranian university is responsible for the health and health surveillance of a catchment area. Therefore, "if they need data on maternal mortality, for instance, the Ministry [of Health and Medical Education] will approve the requirement of checking data and each university is responsible for its catchment area" (IraHR011202).

Apart from academic institutions, it was common also for **expert committees** to be convened on a routine or special basis. In some cases, like the National Technical Advisory Group on Immunisation (NTAGI) in India, comprising "outside experts but headed by the health secretary" which "changed [immunization] policy based on evidence" (IndHB012702). Thailand, too, has a Health Policy Advisory Committee that has been created for this purpose across domains. Our Nigerian informant (NiaHR011702) stressed the general need to create a government advisory consortium, of which nascent efforts are underway in the field of immunization.

c) Characteristics of embedded institutions

Quantity and quality of linkages

In our conceptual model, both the quality and quality of linkages between research institutions and decision makers determined the degree of institutional embeddedness (Figure 3). None of the key informants explicitly spoke about the number of linkages as being important for embedding research institutions and their products (i.e. research) in the policy making environment. This could be due to the limited perspective of the network of linkages that our informants had, given that there were few decision makers among them.

Several key informants highlighted the importance of the quality of linkages between research institutions and decision makers for institutional embeddedness. Better quality linkages connects research institutions more directly to decision makers giving the former more centrality in the policy making. According to the key informants, this appears to be determined by research institutions being part of, or closely working with, decision making bodies.

Several informants mentioned that **connections** made through personal contacts between decision makers and local and international NGOs (involved in research), facilitated the embeddedness of research institutions. Further, possessing **multiple memberships** facilitated the embeddedness of research institutions**.** At the individual level, we noted that some of our key informants play the role of both researcher and decision maker in the health arena. For example, in Mexico, "all of the last five ministers of health…were previously researchers…we can say the decision making field is very friendly towards researchers because of this…. and it became common to consider researchers candidates for MoH" (MexHB012002).   Therefore, the ability of researchers to enter the political realm of decision making allows for greater embeddedness. However, this appears more of an exception as our Thai informant reported "researchers have no desire to enter into policy-making because it's not an exciting or rewarding job…but, they have been invited…"(ThaHR011702).

Embeddedness of research institutions in policy making also increased when research institutions played **multiple roles**. In Iran, for instance, health universities are also responsible for care delivery and routine health monitoring of various areas. This has enabled a recursive feedback loop of policy-relevant data generation, translation into policy decisions, and implementation of policy through service delivery.   In India, the National Health Systems Resource Center plays a very active role in designing as well as evaluating national programs. Their unique position in government has made them want to expand this role - "we want to partner university capacity with decision making processes in the Ministry of Health to create a cordial working relationship" (IndHR012102).   In many other country settings, research institutions

played the dual role of capacity building (by providing higher education) and acted as technical secretariats or agencies for health decision making. In Lebanon, for example, university students were responsible for the field component of large survey projects and actually had practicum opportunities in the health ministry.

Several key informants highlighted the importance of **collaborative planning** to increase the embeddedness of research institutions. For instance, a very elaborate process of research agenda setting exists in Thailand; every January there is a deliberative process across health departments and research institutes of identifying and prioritizing research needs. Thailand's nodal Health Policy Research Institute consolidates research priorities from health and civil society agencies and through a day-long discussion examines the state of evidence generation on the topics. It then prioritizes ten top questions, which are subsequently taken up by other research institutes over the course of the following year. Such models are being considered as part of in India's Twelfth Five year Plan for health.

The quality of linkages is also facilitated by linking key policy-making and research institutions through **strategic networks.** Apart from linkages to national statistics offices, many ministries of health have developed strategic alliances with other research entities. For example in Lebanon, the Ministry of Public Health does not collect data; rather it engages the Society of the Order of Physicians to gather information on maternal mortality. The goal here is to "do it in a professional way with confidentiality. To improve, not to punish" (LebHR012702). As mentioned previously, the Iranian Ministry of Health and Medical Education integrates policy making with academia. In Thailand, researchers work closely with civil society and the media, ensuring that they have the evidence to help hold politicians accountable. These researchers actually comprise an informal policy network called the Rose Garden Group, which includes many of Thailand's first wave of rural doctors, and has over the years, propagated several of the country's major health reforms (ThaHB010803).

Reputation of embedded institutions

In our conceptutal model (Figure 3), the reputation of the research institution is a factor in determining its level of embeddedness in the decision making environment. Findings from key informants appear to confirm this – the reputation of the research institution gives its work credibility as does having reputable researchers on committees. For these reasons, decision makers are inclined to associate their work with reputed research institutions and individuals, conferring greater embeddedness on the latter.

In Nigeria "academic institutions are looked at as the citadel of knowledge...that's where we have trained manpower, people who are experts in this knowledge generation and dissemination" (NiaHR012102). A Mexican informant noted how partnership with international academic institutions "who was going to do very scientific work," bolstered the legitimacy of the ministry's work (MexHB012002).   Reputable national academic institutions are also seen as an important grounding force.   Another informant from Mexico stated that, "Universities offer ministers a power base because they know that knowledge is power.   They are able to mobilize support for the design, evaluation, and implementation for policies.This generates an ethos for evidence-based policy-making" (MexHB022202).

Even at the individual level, reputation mattered: having **"known experts"** consult on committees and councils was deemed important. In Thailand, "policy-makers appreciate quality of research because we publish in international journals of high impact. Policy-makers see that with the publications, they are at the forefront of evidence-based decision making" (ThaHR011702). Members of research institutions were aware that even if policymakers didn't read their papers, they would nonetheless duly consider their findings (IndHP012002).

Capacity of embedded institutions

The fourth factor in our conceptual model (Figure 3) that increases embeddedness of research institutions is their capacity for producing research. According to our key informants this factor also appears to be important as evidenced by the substantial investments were made to bolster the capacity of research institutions in countries like Mexico and Thailand where they enjoy a high degree of embeddedness in policy making. In Mexico, the view was that "ideally you have to guarantee independence and technical capacity" (MexHB012002). While initially, health researchers trained abroad, upon the formulation of the National Institute of Public Health (NIPH), capacity began to be generated in-country. In Thailand, research institutions focused on the building three capacities – t**he capacity of the health workforce, the capacity to generate evidence** through this human resource, and **the capacity to use channels** – both formal and informal – to translate evidence into policy-making.   In his view "human capacity and commitment are the strongest factor for success" (ThaHR011702).   In Cameroon, for instance, external consultants were undertaking a lot of the research until enough capacity was built for local health units to take up research. This suggests, again, that academic institutions are uniquely positioned to be embedded institutions.

Informants also reported an increased emphasis in research institutions on **capacity building for knowledge translation**. In Nigeria, for example capacity-building activities are underway through mentorship by senior researchers of decision makers in various WHO building block domain areas. In Iran, an institute has been created with the specific mandate of developing tools for the link between evidence and decision making.   Similarly Mexican leaders are considering different institutional models for housing knowledge brokering functions.   "…(It) would have to be carefully designed as a social intervention that makes use of networks, that makes use of influence, and so forth as opposed to just being an agency" (MexHB022202).

The sustainability of institutional embeddedness is contingent on continued capacity building. Even in a country like Thailand, where multiple institutions inform health decision making, our Thai informant reflected that "its still a very thin group of people…and mechanisms…and possibilities…many of these are not institutionalized…so it still creates a sustainability and continuity challenge" (ThaBH010803).

Other themes

In our conceptual model, we had also looked at dimensions of the environment and legislation as key elements affecting institutional embeddedness. In many cases, a **culture of evidence** created a conducive environment for institutional embeddedness. As regards legislation, we found that this was not always a necessary or sufficient factor in embeddedness, but in some countries it had played an important role.

The role of culture was deemed salient by informants. In Mexico, one informant described how the ministry "created an environment, a culture that privileged the use of research results…initially it was arbitrary probably, but turned out that ministers created a culture in which evidence was important" (MexHB012002). In India, a policymaker observed that "overall there is little appreciation of research. People think research is theoretical, that it is used to blame and that what is happening on the ground is more important"(IndHB012702). A mentorship program in Ebony state, Nigeria focused on establishing strong relationships between researchers and decision makers in an attempt to create a culture of evidence (NiaHR012102).

Participants had mixed views about the utility of **legislation**, beyond serving as a mechanism to create new institutions. In several countries, health policy and systems research institutes were created through an act of legislation. As this amounted to official government support of the institution, this was seen as a critical step towards establishing

institutional legitimacy.   In Mexico, legislators carried this a step further by forming the National Council of Evaluation, whereby every national program was required by law to be formally evaluated.   According to one informant, "Legislation in Mexico has been able to make policy-makers much more willing to use research also because in many ways they have to commission research or evaluations by law" (MexHB022202).   On the other hand, a Thai informant stated, "Legislation without human resource, without committed researchers is nothing"(ThaHR011702).   In his thinking, the wielding of soft power generated through relationships is much more effective.   He argues that: "…the power of evidence, and the process that evolves naturally is more powerful… Continuous relationship building is important part of the process and legislation might interfere with that" (ThaHR011702).   In India, an informant reported that legislation is a barometer of success for knowledge-translation.   According to him, "…the Supreme Court converts your study to a ruling or parliamentary standing committee decides that your (study) should be used as the basis (for implementation)…then you know you (researcher) have been to decision making [sic.]" (IndHR012102).

Limitations

This analysis has several limitations.   Decision makers were under-represented in the study.   Though the study protocol was designed to explore perspectives from both the research and policy domains, we were only able to interview two decision makers.   We found that decision makers were very difficult to contact for interviews due to their busy schedules, prior commitments, and divided attention.   Also, we suspect that a certain degree of caution may prevent them from engaging in interviews in which their particular view could be seen as courting controversy.   Overall, the relatively few number of study participants also limits the degree to which we can capture the experience of a particular country.   We were able to interview 12 individuals from 7 countries, with no more than two individuals interviewed in any single country. This was due in large part to the short time in which this study was completed.

4. Conclusion

This study represents a nascent attempt to understand the issue of research use in decision making from the perspective of embeddedness of research institutions in policy making. According to the network analysis literature, the degree of embeddedness of an organization refers to its structural position in an organizational network (15). The greater its embededness or centrality in an organizational network, the greater an institution's connectivity with other organizations in the network. This enables embedded organizations to be more immersed in the flow of information and resources than non-central organizations. In this study, we applied this idea of embeddedness to the context of research institutions (and their research) and the uptake of evidence in decision making for health.

Our findings suggest that multiple forces converge to create context-specific pathways through which research enters into the policymaking environment. Depending on the policy under consideration, Ministries of Health may call upon an intricate combination of actors for sourcing evidence. While proximity to a decision making core does have advantages, it is not the position of the institution within the network, but rather, the qualities that institution possesses that enable it to be embedded. Four factors were hypothesized to influence embeddedness - reputation, capacity, quality, and quantity of connections to decision makers. In addition to this, the policy environment was also expected to influence the uptake of research.

In the second phase of this study, we attempted to validate our conceptual model through qualitative research conducted with decision makers and researchers in seven countries. Through this process we garnered key insights about the creation of embedded research institutions, the processes by which ministries of health source research, qualities of embedded institutions, and features of the policy environment. Decision Makers sourced evidence from research institutions in a variety of ways - leveraging personal networks, accessing peer-reviewed publications, developing formal linkages with national statistics agencies, academic, or independent research institutions, or by assembling expert committees for a well-defined task. Key informants also shed light on the validity of our conceptual model. They did not confirm that the quantity of connections were important for embedding research institutions in policy making. However, the quality of linkages appeared important. High quality linkages included those where researchers were involved in policy making like in Thailand or Mexico; or where research institutions were part of the decision making body like medical universities under the Iranian Health Ministry; or where collaborative planning occurred, as in Thailand, where members of health departments and research agencies jointly identify and prioritize research needs. Reputation of the research institute was also important in increasing its embeddedness. The engagement of decision makers with academic institutions of repute conferred greater legitimacy upon the former's work. Similarly, having known experts on decision making committees gives their work importance and legitimacy. Finally, research capacity was also important for increasing embeddedness as evidenced by the investments made by

several countries to strengthen in-house research capacity. Further, emphasis was placed on capacity building for knowledge translation.

Among the other factors that appeared to increase embeddedness of research institutions was creating a culture of evidence among policy makers. This typically occurred because of the close ties between policy makers and research institutions. As regards legislation, key informants had mixed views about the utility of legislation for embedding research institutions beyond serving as a mechanism to create new institutions.

Our findings indicate that this embeddedness of research institutions occurs in a variety of ways and in many of the component areas of health systems. In some, particularly relating to medical technologies, research institutions and research enjoy a high degree of embeddedness in policy making. In other areas, like governance or human resources, research institutions have low embeddedness. Of the four factors hypothesized to influence the degree of embeddeness of research institutions in policy making – quality of connections, quantity of connections, capacity, and reputation – only quantity was found to be unimportant in our key informant interviews. Further, creating a culture for research among decision makers also emerged as a critical requirement. This suggests important ways in which research institutions can be encouraged to achieve greater embeddedness. Indeed, there is a clear need for more research to better understand these issues for furthering knowledge translation in LMICs.

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Appendix 1: Interview Guide

A. Introduction

Hello, my name is [name of interviewer] from [name of institution]. I'm grateful to you for taking the time to talk to me (and my colleague).

We are conducting a multi-country consultation with the support of the WHO on the relationship between health evidence and policymaking. We want to develop case studies of how evidence is used or not used in policymaking, and what factors shape the chances of evidence influencing policymaking.

We are hoping to talk with you for about 30 minutes to one hour. Please talk to us freely and frankly and let us know if there are any issues we bring up that you do not want to discuss. We will be attributing your statements to your official designation and type of institution (eg. Bureaucrat, Directorate of Health; Senior Researcher, National Health Research Institute). You can also let us know if there is another way we should cite your statements, in our reports and publications.

Please let us know if you have any questions. Once we address those, we'll get started.

B. Participant Information Could you tell us/me about your work experience?

1. Sex   _____   2. Country   _____

3. Designation_____   4. Department   _____

5. No of years in current position_____   6. No of years in health   _____

C. Embeddedness of Evidence in Health Decision Making
6. In your opinion, does evidence play a role in decision making in the ministry of health?
a. Why is this the case? Has it always been like this? Recent changes, etc.
b. (What) are the(re) relationships between institutions that produce evidence and the Ministry of Health? Between researchers and decision makers?

7. In your experience, when evidence is required by the Ministry of Health, how is it sourced?
a. Role of interpersonal networks
b. Role of institutional networks
c. Role of informational networks (portals, public information)
d. Other

8. Give an example of a recent MAJOR health policy implemented in the last 2-3 years
a. Who was involved
b. Who was consulted, what were the processes of deliberation
c. What was the decision (services offered, new initiatives, legislation etc.)
d. Were there any linkages to ongoing or prior evidence? If yes, describe? If not, why do you think not?

9. In your opinion, what has increased the chances of evidence being used in the decision making process? Please think of the aforementioned example:
a. Types of relationships between policymakers and researchers

    b.   Numbers of relationships between policymakers and researchers
    c.   Institutional relationships, if applicable
    d.   Specific areas of capacity/expertise/kinds of evidence?
    e.   Reputation of organisations or individuals?
    f.   Role of legislation
    g.   What are the challenges of your setup?
    h.   Other?

10. Is there anything that you would like to add that I have not asked you about regarding the topic that we have been discussing?

Those are all my questions for now. Thank you so much for taking the time to talk and sharing your experience. In case we have any clarifications regarding what you have shared with us, would it be alright to get in touch with you later on telephonically or in person depending on your convenience?

Appendix 2: Key Informants

Country	Type	Affiliation	Interview Date	Years in current Position	Years working in health sector
Lebanon	Both	Ministry of Health/American University of Beirut	27/2/2012	19 years	28 years
Iran	Researcher	National Institute of Health Research	14/2/2012	2.5 years	10-15 years
Nigeria	Researcher	Ebony State, Nigeria	17/2/2012	5 years	9 years
India	Researcher	National Health System Resource Center	21/2/2012	5 years	10 years
Mexico	Researcher	Center for HS Research - NIPH	22/2/2012	7 years	35 years
Mexico	Both	Ministry of Health	20/2/2012	20 years	30 years
Thailand	Researcher	International Health Policy Programme. MOH	17/2/2012	15 years	32 years
India	Decision Maker	Ministry of Health & Family Welfare	28/2/2012	4 years	10-15 years
Cameroon	Researcher	Medical Imagining Unity, Univ. Yaounde	3/2/2012	4 years	14 years
Lebanon	Researcher	American University of Beirut	3/5/2012	7 years	15 years
Iran	Decision Maker	Ministry of Health and Medical Education	8/3/2012	40 years	46 years
Thailand	Both	National Health Foundation	8/3/2012	10 years	32 years