MICRO, MESO AND MACRO LEVEL FACTORS AND INTERACTIONS THAT SHAPE KNOWLEDGE TRANSLATION CAPACITY AND PRACTICE WITHIN AFRICA-LED RESEARCH CONSORTIA: THREE CASE STUDIES

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by **Violet Ibukayo Murunga**

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ABSTRACT

Micro, meso and macro level factors and interactions that shape knowledge translation capacity and practice within Africa-led research consortia: Three case studies

Violet Murunga

Background. Translation of research into policy and practice, referred to as knowledge translation (KT), remains sub-optimal, which has raised concerns about the value of investments in research. Researchers are one of the many actors with a critical role in facilitating KT but what influences their KT practice is not well understood. This thesis aimed to explore this from the perspective of health research consortia; a model widely used to strengthen health research and KT capacity.

Methodology. I used a case study approach. I purposively selected three diverse research consortia out of 11 from the Developing Excellence in Leadership, Training and Science (DELTAS) Africa initiative. From these three cases, I gathered data from 27 participants including 23 researchers representing different disciplines and career stages using in-depth interviews. I also reviewed relevant documents obtained from nine academic and research institutions where participants were based. A systems perspective analytical framework and the thematic framework method were used for data analysis.

Results. I found that multiple interactions of factors at the micro, meso and macro levels shaped the KT capacity and practice of the health research consortia explored in this study. Research consortia KT capacity and practice and their potential to stimulate the institutionalisation of KT capacity and practice in partner institutions was greatly influenced by their research discipline, the KT capacity and experience of consortia leaders and specialist support staff and the KT support provided by funders. Research consortia developed KT plans that addressed their research discipline KT interests and that were informed by their KT capacity and experience. Funders' KT reporting requirements and their use of the reports to refine their support was crucial in motivating research consortia to pay more attention to KT. The funders' interest in certain KT activities and budget ceiling for the activities restricted research consortia KT capacity and practice in as much as it enhanced it in research consortia with narrowly focused KT capacity and experience.

Conclusions and recommendations. KT capacity strengthening targeting research consortia and their researchers should consider research discipline KT needs. Research consortia funders have an important role to play in providing early and ongoing technical support to research consortia in the development and implementation of their KT plans. Research consortia funders can also harness support from research consortia with greater KT capacity and experience for peer-to-peer learning. Funders will better support research consortia KT capacity and practice if they allow a wide range of activities that accommodate different research disciplines and have budget envelopes that are more flexible. To maximise the potential for research consortia to stimulate institutionalisation of KT capacity and practice in partner institutions long-term investments by funders is crucial. Future research could focus on exploring the multilevel interactions of factors that influence research consortia KT capacity and practice identified in this study in other settings and research fields in Africa and beyond. In addition, more research is needed on how best to integrate KT modules and activities in PhD degree programmes administered through research consortia within institutional contexts that insufficiently emphasise KT. The field would also benefit from research that develops and tests KT modules and activities relevant for training and mentorship of basic researchers doing discovery research.

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DECLARATION

This thesis is the result of my work. The material contained in the thesis has not been presented nor is it currently being presented, either wholly or as part of any other degree or other qualification.

Signature:

Date: November 2022

LIST OF ACRONYMS

AAS	African Academy of Sciences
AEN	Africa Evidence Network
AESA	Accelerating Excellence in Science in Africa
AFIDEP	African Institute for Development Policy
CCR	Centre for Capacity Research
CSOs	Civil society organisations
CPE	Community and public engagement
DELTAS	Developing Excellence in Leadership, Training and Science in Africa
DFID	Department for International Development
FCDO	Foreign, Commonwealth & Development Office
HIC	High-income country
HRCS	Health research capacity strengthening
KT	Knowledge translation
LMIC	Low- and middle-income country
LRP	Learning Research Programme
LSTM	Liverpool School of Tropical Medicine
REC	Research Ethics Committee
M&E	Monitoring and Evaluation
MoH	Ministry of Health
NACOSTI	National Commission for Science, Technology and Innovation
NGO	Non-governmental organisation
PhD	Doctor of Philosophy or Doctoral
R&D	Research and Development
RAPID	Research and Policy in Development
SUIRB	Strathmore University Institutional Review Board
Wellcome Trust	Wellcome Trust Foundation
WHO	World Health Organization

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DEDICATION

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CHAPTER 1: INTRODUCTION

1.1. OVERVIEW OF CHAPTER

This chapter introduces my dissertation, including the background, followed by the research problem, the research aim and objectives, a summary of the research approach and methodology, its significance and finally, an outline of the thesis report structure.

This dissertation is concerned with a process known as 'knowledge translation' (KT) and the role of researchers in it. Simply expressed, KT involves getting the right information, to the right people, at the right time, and in formats they can use to respond to societal needs and challenges. The KT process involves complex interactions between knowledge producers and knowledge users, which are facilitated by knowledge intermediaries (actors that serve as a link between knowledge producers and users). Researchers are one of many groups central to KT and a primary (but not the only) knowledge producer in the KT process. Some evidence on researchers' KT capacity (i.e., knowledge, attitudes, and skills) and practice exists including barriers and facilitators but an in-depth understanding of the topic is lacking. Some scholars have characterised researchers as critical KT stakeholder that are understudied (1). A better understanding of researchers' role in promoting KT is needed because of their importance in optimising translation and the impact of research in response to societal needs and challenges.

This dissertation seeks to generate evidence that will help fill this gap by exploring the factors that shape the KT capacity and practice of health researchers based in low- and middle-income country (LMIC) settings, to consider the unique influences they face. The dissertation also distinguishes between two research disciplines: 1) basic research (also referred to as discovery research, pure research, fundamental research, or natural sciences such as biological sciences, chemistry, and physics); and 2) applied research including epidemiology, clinical and implementation research, and action and operational research.

The dissertation is underpinned by the principle that researchers are heterogenous and their involvement in KT practice will vary. Some researchers may have a keen interest in KT and have explicit KT goals (e.g., to develop a better product or service to address a societal problem). Some researchers may not think they should be involved in KT or may not view it as their role while some researchers may fall somewhere in between. KT activities are more or less relevant for researchers depending on their research discipline and stage in the research process. Therefore, this dissertation does not seek to promote KT practice as a

homogenous expectation for all researchers. Rather, it seeks to deepen understanding of the factors that shape or influence researchers' KT capacity and practice to generate evidence on how the situation can be improved.

The dissertation explores researchers' KT capacity and practice in research consortia settings (a commonly used approach for strengthening research and KT capacity) and using a systems perspective that considers multi-level complexities and interactions at micro (the individual), meso (team, units, organizations, networks) and macro levels (national systems, regulation, cultures) (2, 3). Using the systems perspective approach to addressing challenges or strengthening capacities is theorised as the best way to achieve sustainable improvement.

Key terms I will be using in this dissertation are presented in Table 1.

Table 1. Key terms used in this dissertation

Knowledge translation (KT) defined as the "synthesis, dissemination, exchange, and ethically-sound application of knowledge –within a complex system of interactions among researchers and users – to accelerate the capture of the benefits of research" (4, 5).
KT capacity. The dissertation adopts Mallidou (2) categorisation of KT core competencies into knowledge, skills, and attitudes.
KT practice. This dissertation adopts Sibley (6) definition of KT practice as engaging in or conducting the four broad activities in the KT definition used in this dissertation: synthesis of results from individual research studies and interpreting them within the context of global evidence; dissemination i.e., communicating or sharing research findings preferably using targeted and non-traditional dissemination strategies; exchange i.e., establishment of partnerships between knowledge producers and users that facilitates shared understanding of issues and potential for research uptake; and application i.e., the process of putting research into practice.
Micro level factors referring to individual level attributes that influence researchers' KT capacity and practice (3)
Meso level factors refers to strategic, financial, and operational support for KT among research institutions and their networks that influence researchers' KT capacity and practice (3)
Macro level factors refers to systems level support for KT including government policy and funder investments that influence researchers' KT capacity and practice (3)
Basic research (also referred to as discover research, pure research, fundamental research, or natural sciences) is experimental or theoretical research done primarily to acquire new knowledge of the underlying foundation of phenomena and observable facts, without any particular application or use in mind (7).
Applied research generates evidence with a specific purpose to solve practical problems including epidemiology, clinical and implementation research, and action and operational research. Some basic researchers may also be involved in applied research e.g., those that support infectious disease surveillance studies (7).
Basic researcher undertakes basic research
Applied researcher undertakes applied research
Senior researcher is an established researcher who has developed a level of independence and is renowned in their research area or field (8).

Mid-career researcher is a recognised researcher who holds a PhD or equivalent and is not yet fully independent (8).
Junior researcher has training up to the point of PhD (8).
Non-academic audiences include policymakers, practitioners and managers within the public, private, or community sectors, and beneficiaries e.g., communities and the public (9, 10).
Policymakers are individuals at some level of government or decision-making institution, including but not limited to international organizations, non-governmental agencies or professional associations, who have responsibility for making recommendations to others (11)
Industry (alternatively referred to as private sector). The dissertation adopts the International Development Innovation Alliance (IDIA) definition that uses the alternative term 'private sector'. Their investments in research and development partnerships, knowledge-sharing platforms, technology and skills transfer, and infrastructure investment are motivated primarily by considerations of profit (12).
Funders. The dissertation adopts Viergever (13) definition that funders are public and philanthropic funding organizations that invest in the development of new knowledge and products, particularly in areas that are not sufficiently profitable. The authors group public and philanthropic funders into four types: (1) public national or regional funders (excluding funders of official development assistance (ODA) and multilateral funders), (2) philanthropic funders, (3) ODA funders, and (4) multilateral funders.
Engagement refers to a two-way process involving interaction and listening to generate mutual benefit (14).
Community engagement may be used to sensitise the community about the study and obtain insights from them into the issues that would inform refinements (15, 16).
Public engagement involves giving the wider public the opportunity to understand research, shape research agendas, be involved in decisions about how research findings are used and increase interest in research careers among young people (17).
Media engagement is considered a sub-set of public engagement targeting print, radio and TV media (18).
Policy engagement activities targeting policymakers to inform the design and implementation of public policy and people whose perspectives influence public policy decisions including practitioners and members of the public (19, 20).
Industry engagement involves a wide range of activities, depending on the industries and disciplines concerned, aimed at forging mutually beneficial partnerships between private sector companies and academia usually aimed at stimulating innovations of commercial interest
Policy. This dissertation adopts Jones et al. (21) definition that policy is a plan of action, typically based on certain principles and decided on by an entity or individual, designed to administer, manage and control access to resources. In evidence-informed policy processes, policy typically refers to the explicit (and sometimes implicit) plan of action prepared by international, regional, national, or sub-national inter-governmental or governmental organisations. The focus is on public rules and regulations. Non-governmental organisations (NGOs) or private sector organisations are excluded in this definition.
Practice refers to real-world delivery of programmes and services (22)

When referring to a particular group of researchers, I will use the prefix basic or applied or LMIC or HIC. When I use 'researcher' without a prefix, I will be referring to both applied and basic researchers based in LMIC and HIC contexts or reflect the ambiguousness of the issue in the source used (e.g., a source may refer to researchers without explicitly noting their disciplinary alignment). I will acknowledge this uncertainty when the literature is not clear.

1.2. BACKGROUND

Knowledge translation and its importance

It has been argued that policy and practice decisions informed by research evidence can result in improved health and development outcomes, reduced inequities, efficient use of limited resources, and accountability (23-27). Resource constrained contexts such as low- and middle- income countries (LMICs) including Africa would accrue the most benefits if their policy and practice decisions were informed by research evidence (28-30). However, translation of research into policy and practice remains sub-optimal, which has raised concerns about the value of investing in research (23, 27, 31-35). This concern has increased global attention and investments towards improving research uptake in policy and practice decision-making processes (26, 32, 33).

Consequently, a specialised field concerned with understanding, promoting and enabling the movement of research evidence from where it is produced to groups that can use it to inform their decisions has emerged, variously described as knowledge translation, knowledge exchange and research uptake (23, 26, 31, 33, 35, 36). This thesis adopts the term knowledge translation (KT) defined by the Canadian Institutes of Health Research as the **"** synthesis, dissemination, exchange and ethically-sound application of knowledge –within a complex system of interactions among researchers and users – to accelerate the capture of the benefits of research **"** (4 p.1). Synthesis refers to the contextualisation and integration of findings of individual research studies within the larger body of knowledge on the topic using reproducible and transparent quantitative and/or qualitative methods e.g., a systematic review or result from a consensus conference or expert panel (4, 6). Dissemination activities identify the appropriate audience (i.e., knowledge user) and tailor the message and transmission medium to the audience (4, 6). Dissemination activities can include summaries for / briefings to stakeholders, educational sessions with patients, practitioners and/or policymakers, working with knowledge users in developing and executing dissemination/implementation plan, creating tools to facilitate use of research knowledge, and media engagement (6). Exchange refers to the interaction between the knowledge user and the researcher, resulting in mutual learning through the process of planning, producing, disseminating, and applying existing or new research in decision-making (4, 6). Ethically-sound application of knowledge refers to the iterative process of putting knowledge into practice and is consistent with ethical principles and norms, social values and legal and other regulatory frameworks (4). Although implicit in the CIHR definition of KT, evaluation and monitoring of KT initiatives, processes, and activities are key components of the KT process (5). KT occurs within a system of interactions between knowledge producers and

knowledge users that may vary in intensity, complexity and level of engagement depending on the nature of research and needs of the knowledge user (37).

The following sections describes how KT and the KT process is conceptualized in this thesis and researchers' roles in it, and the KT approaches and activities they can use. This section also summarises the current evidence on researchers' KT capacity and practice, identifies knowledge gaps, and situates the study presented in this dissertation.

The KT process and researchers' roles

The KT process is often described in relation to research discipline, sector (public versus private) and even geographies (38). Some recent efforts have sought to consolidate these fragmented descriptions into unifying (38) or expanded concepts (39). This section describes the KT framing adopted in this dissertation, which takes into account basic and applied research disciplines.

The KT process

Most conceptualisations of KT have identified three interacting spheres in the KT process. The first sphere is *knowledge production* or generation, which refers to the source of research-based knowledge from knowledge producers including researchers (39, 40). The second sphere is *knowledge exchange* or transfer including technology transfer, which involves processing knowledge into an understandable and useable format (e.g., development of a product, policy recommendations or practice guidelines), sharing it with relevant knowledge users, and their consideration of the knowledge in their decisions, practice and/or behaviour (39, 40). This sphere is where actors (e.g., knowledge brokers/intermediaries and innovation brokers), functions and processes that facilitate knowledge exchange are located. The third sphere is *knowledge adoption*, application, or absorption, where research-based knowledge informs a policy or practice change or is commercialised in industry (39, 40).

There is lack of agreement among KT scholars on whether technology transfer and commercialisation of research are part of the KT process (1). However, this dissertation considers technology transfer and commercialisation to be part of the KT process because it is an important stage in the basic research process.

Earlier conceptualisations of the KT process depicted it as linear and interventions focused on strengthening links and communication between the knowledge production and the knowledge adoption spheres (also referred to as the two-communities theory) (41-46). In this

simple linear model, the knowledge exchange activities merely serve as a bridge between the two spheres that do not typically communicate.

However, later conceptualisations of the KT process acknowledged that the simple linear model insufficiently described what was going on. The KT process is now understood to be a complex process involving the interaction of many actors with varying interests, incentives and capacities at micro, meso and macro levels (24, 38, 46-52).

To address the multiple competing terms and processes in the KT space, Shaxson et al. (38) have suggested a model that captures all the different permutations using the symbol K* including Knowledge Management, Transfer, Translation, Exchange, Brokering, and Mobilization to name a few most widely used (Figure 1).

The figure illustrates four groups of actors representing - Science (S), Policy (P), Industry (I) and Civil Society (CS) - and how they interact and the contribution of K*. The processes that comprise K* can facilitate the communication between the four groups of actors and work to improve the external environment. The idea behind improving the external environment is to enable the four groups of actors to continue to interact and sustain the flow of knowledge without the presence of a dedicated intermediary or broker. Therefore, K* can ensure that the incentives for knowledge sharing exist and that they do not privilege any group of actors over another.

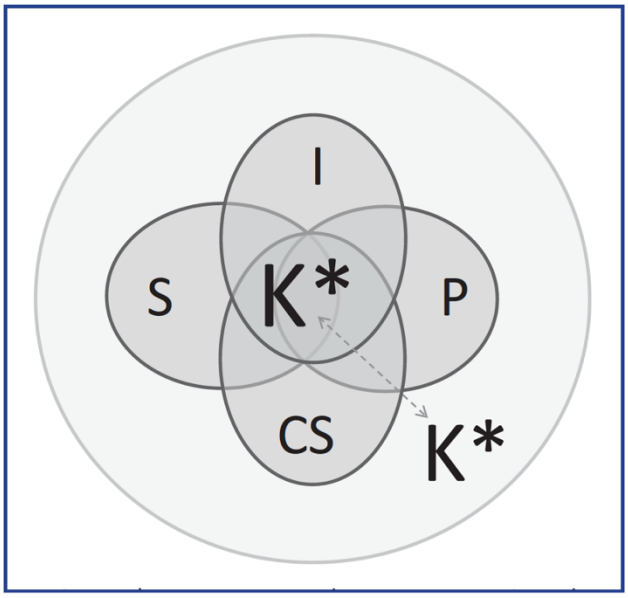

Figure 1. Role of K* in interaction between Science, Policy, Industry and Civil Society

Source: Shaxson et al. (38)

Box 1. presents loose definitions of the most widely used K* terms and illustrate fuzzy boundaries between the definitions; for instance, Knowledge Translation and Knowledge Brokering emphasise two-way sharing of knowledge and are both part of the definition of Knowledge Mobilization (38).

Box 1. **Some (loose) definitions of a few of the terms that make up K*:**

Knowledge Management (KM): the process of ensuring that knowledge is available. It is sometimes used to describe the suite of activities from the storage of information through to its dissemination. However, with the emergence of other terms and greater differentiation between roles, it is beginning to refer more to the collection and storage of different types of knowledge so that they can be accessed when needed.

Knowledge Transfer: a one-way process of sharing knowledge which can be construed as more of a teacher-student relationship than other knowledge-related activities and perhaps associated with mutual exploration of an issue.

Knowledge Translation (KT): the process of translating knowledge from one format to another so that the receiver can understand it; often from specialists to non-specialists. KT is sometimes represented as a one-way, and sometimes a two-way, process.

Knowledge Exchange (KE) or ***Knowledge Translation and Exchange*** (KTE): a more two-way process of sharing knowledge between different groups of people.

Knowledge Brokering (KB): a two-way exchange of knowledge about an issue, which fosters collective learning and usually involves knowledge brokers or 'intermediaries'.

Knowledge Mobilization (KMb): a two-way process that makes use of the existing stock of knowledge and co-creates new knowledge to help foster change. The term KMb is most used by the Canadian network Research Impact, which helps translate/transfer university-based knowledge to help citizen groups.

Source: Adapted from Shaxson et al. (38 p. 2)

The role of researchers in the KT process

Researchers' varied interests in KT practice

This dissertation acknowledges that researchers have varied interests in KT, which may influence the extent of their involvement in the KT process (1, 53-57). It has been argued that some types of research, particularly curiosity-driven research, do not generate evidence that is of practical societal use and as such basic researchers have no role in the KT process (1, 55, 58, 59). In contrast applied researchers are viewed as generating knowledge that can be used by non-academic audiences and thus, they do have a role in the KT process. Some authors believe that basic researchers also have a role in the KT process and that basic research and applied research are interdependent rather than being in

competition (1, 9, 58-62). For example, Lane and Flagg (61) emphasises that basic researchers interested in promoting translation of their research to address societal challenges should seek input from potential research users at the different stages of generating and transforming their research findings into products and services. These stages are: *discovery* (the creation of new knowledge); *invention* (a proof of the concept's viability); and *innovation* (a functional device or service, capable of mass production, distribution, and support).

Some basic researchers worry that an overemphasis of research funders and governments on demand-driven research and promoting its translation may lead to curiosity-driven basic research being undermined (1, 55, 63). Yet, curiosity-driven research has a critical role to play in the KT process as it may lead to serendipitous discoveries of great benefit to society (55). Basic researchers' perception of KT may be more positive if its conceptualisation also includes commercialisation of research (53, 57).

Interest in KT among researchers has been clustered into five groups: researchers who view KT as someone else's responsibility (predominantly basic researchers); researchers who view it as their moral obligation (predominantly applied researchers); researchers who will integrate KT activities in their research projects if it is incentivised by funders and their institutions; researchers who play an activist role in the KT process (e.g., pushing for the adoption of a specific intervention); and researchers who believe their role should be neutral (honest broker) i.e., ensuring that the research is accessed and considered by decisionmakers (54, 56, 64).

The interests in KT among researchers can be influenced by a range of factors including their disciplinary (basic versus applied research) and sub-disciplinary alignment (chemistry versus mathematics), epistemological perspectives (e.g., whether their definition of knowledge privileges research over other sources of knowledge), seniority (senior versus junior researcher), professional orientation (current or past experience working in a practice setting e.g., industry or government versus a university) and intrinsic personal interest in KT (53-59, 65-67). However, more research is needed to explore within-discipline differences in interest in KT and what factors influence this.

Roles researchers can play in the KT process

Researchers and their institutions primarily fall in the knowledge production sphere of the KT process. However, in some instances, they could also function as intermediaries. For instance, many universities include societal impact as one of their mandates and operate

technology transfer offices or Think Tanks to meet this goal (i.e., structures and processes that fall in the knowledge exchange sphere). These support researchers to disseminate their research and to promote its use by non-academic audiences. Some researchers may be involved in the implementation of policy or practice recommendations and commercialisation of products (activities that fall in the knowledge adoption sphere) or they may champion system-wide improvements that facilitate KT: for example, advocating for more investments for KT and thus operating as knowledge or innovation brokers.

Consequently, some scholars have suggested a spectrum of functions that could be undertaken by anyone interested in promoting KT including researchers (38). It is referred to as the K* spectrum (see Figure 2) where K* denotes the various functions including:

- An *informing* function defined as "creating, collecting, codifying, storing, and communicating ideas and information over time and across different geographies – to make it more accessible and usable";
- A *relational* function defined as "improving relationships between the various actors around an issue; to enable co-production of knowledge and genuine dialogue, taking into account the power dynamics between all those involved"; and
- A *systems* function defined as "working across a whole system to enable change (possibly working on multiple functions simultaneously) to ensure that there is a good institutional environment for sustainable innovation" (38 p.12).

Each of the three functions can be associated with a series of roles:

- Information intermediaries or "infomediaries" who enable access to information from multiple sources and engage in informing, aggregating, compiling and signalling information;
- Knowledge translators or knowledge intermediaries who help make sense of and apply information, and who engage in disseminating, translating and communicating knowledge and ideas (e.g., production of policy briefs);
- Knowledge brokers who improve knowledge use in decision-making and engage in bridging, matching, connecting, convening, linking, boundary spanning, networking and facilitating (such as knowledge exchange events);
- Innovation brokers who focus on changing contexts to enable innovation and engage in negotiation, building, collaborating, and managing relationships and processes

Figure 2 presents the functions on the K* spectrum nested within each other to emphasise their common purpose i.e., enabling access to information from multiple sources (38).

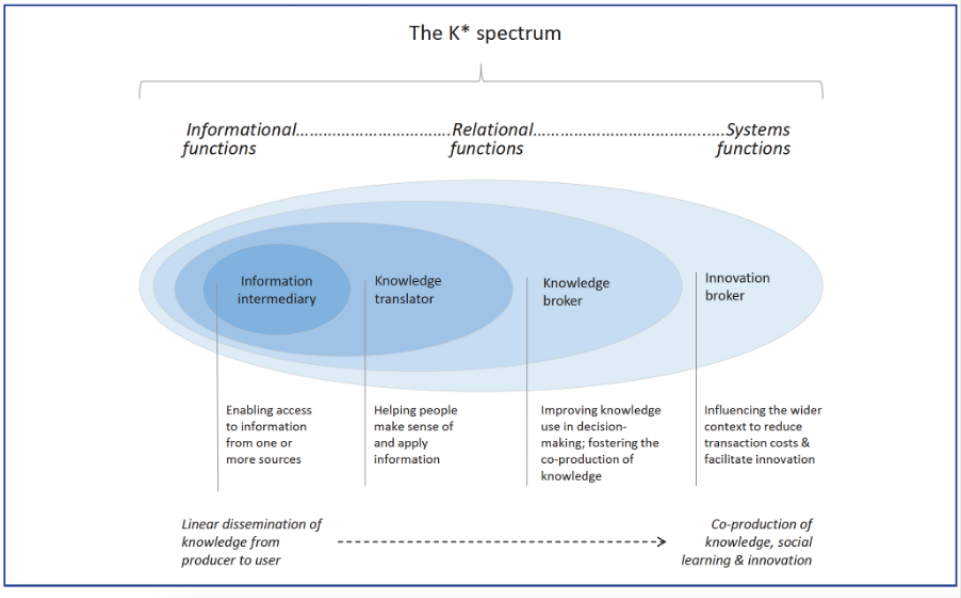

Figure 2. The K* spectrum

Source: Shaxson et al. (38 p. 13)

Based on studies assessing researchers' KT practice, basic researchers predominantly play the informational function and applied researchers usually play both the informational and relational functions. More research is needed to understand what drives researchers who play more substantive roles in KT compared to their counterparts.

Shaxson et al. (38) explain that the most appropriate K* function adopted in a given context depends on the relationships between supply and demand for knowledge. The authors suggest four scenarios of how the context for K* can vary noting that it is not as direct and linear as represented. Supply and demand for knowledge can be fragmented or focused. It can result in confusion when there are multiple knowledge producers and users, which can be compounded by uncertain or conflicting evidence. Shaxson et al. (38) note that analysing the context in this way could help K* practitioners understand how to tailor their activities, or inform investments in the knowledge systems they work within. Table 2 presents a helpful framework that could be used by K* practitioners to characterise the supply and demand for knowledge and what K* activities/ functions may be most relevant.

Table 2. Characterising the supply and demand for knowledge and K* process.

		Demand for knowledge:	
		Fragmented	Focused
Supply of knowledge:	Fragmented	**Scenario 4.** The issue is contested; there are competing understandings over what is important and the basis for decisions is vague or ambiguous The full spectrum of K* activities will be needed, but at different times and with different emphases, depending on need.	**Scenario 2.** The issue is narrowly focused; there is good agreement on what is important and the basis for decisions is clear, though the evidence needs to be brought together from diverse sources While there will be a clear need for the infomediary function, K* practitioners can act more as brokers here focusing on the relational element, sourcing and translating different types of knowledge, making connections, helping articulate demand more clearly and ensuring that weaker voices are heard.
	Focused	**Scenario 3.** Because the demand is fragmented, the issues will vary widely and there is likely to be little agreement on what is important. The current sources of knowledge will probably not be sufficient. If K* functions work well they can help broaden this supply by increasing the legitimacy of different knowledge types around an issue (e.g., by supporting weaker voices and collecting knowledge from different sources). They can also help articulate demand to clarify what knowledge is needed. While there will be a need for both the infomediary and relational elements of K*, the focus will need to be on fostering an environment that stimulates innovation.	Scenario 1. There is a high degree of certainty in the knowledge base and because the demand is focused there is good agreement over how to interpret it K* can help ensure that the knowledge gap is clearly identified and that the needed knowledge gets to the right people at the right time. Because there is no disagreement either in what is required or what is supplied, it is enough simply to ensure that knowledge is communicated well to the target audience (i.e., knowledge translation).

Source: Adapted from Shaxson et al. (38 p. 20). The boundaries are much fuzzier than are represented here.

KT approaches and activities

The current evidence on recommended KT approaches and activities focuses predominantly on promoting uptake of applied research with little or no consideration of basic researchers' potential contributions to KT, especially those involved in discovery research (1, 58, 60, 63, 68). This may be partly attributed to the predominant view that KT is not relevant in

discovery research exacerbated by the varied and conflicting conceptualisations of KT. As noted earlier, some scholars view technology transfer and commercialisation as part of the KT process while others do not (1, 60). Furthermore, a separate body of knowledge dedicated to exploring technology transfer and commercialisation exists, which is often not considered in KT studies and practice. Consequently, the KT target audiences, approaches, and activities relevant for researchers described in the following sections may reflect this bias towards applied research. Similarly, the importance of the policy issue and/or context in informing KT activities is a common issue raised in the KT evidence base but I did not find guidance for KT approaches and activities that is nuanced in this way.

The rest of the section is organised using a framework of questions proposed by Lavis et al (69) that knowledge producers (including researchers) should consider when planning KT activities. The questions are: 1) What should be transferred? (single study versus synthesis, key message, language and format); To whom should research knowledge be transferred? By whom should research knowledge be transferred? (i.e., credible messengers); How should research knowledge be transferred? What is the desired effect of transferring research knowledge?

What should be transferred?

KT experts recommend that researchers should transmit synthesised knowledge rather than findings of a single study with the exception of when the target audience is other researchers and research funders (32, 69). Pooled data are preferred for supporting the decisions of non-academic audiences because this improves the quality of the evidence by balancing contradictory findings of single studies (69). Therefore, researchers need to interpret the results of single studies within the context of the existing evidence before deciding whether the evidence is ready for knowledge translation, particularly when targeting consumers, practitioners, and/or policymakers (32). This includes basic researchers who are interested in developing their discoveries into innovations that will be of benefit to society (61).

Evidence from multidisciplinary applied and basic research across and within disciplines (e.g., biology, chemistry and physics) is also encouraged by some scholars because of its potential to facilitate translation of basic research discoveries as solutions for the most pressing global issues (70). However, multidisciplinary research is more common among applied researchers than among basic researchers and can occur in informal and tacit ways (56, 59).

Lavis et al. (69) offers two caveats on what research should be transferred. They note that not all research can or should have an impact. In addition, some bodies of research knowledge will not generate “take-home” messages, because they may have no apparent application for target audiences, or the findings are not conclusive.

To whom should research knowledge be transferred?

Target audiences will depend on the relevance of the research evidence to them in terms of the decisions they face and their decision-making environments (69). For example, policymakers use research findings primarily for agenda setting and policy formulation, whereas managers need it more to inform their programme implementation (21). Therefore, the message communicated from a body of evidence on a particular issue should be tailored to the target audience (i.e., one standard message would not work for the public, service providers, managers, and public policymakers) (69). Lavis et al. (69) suggest that when researchers are deciding whom the research knowledge should be transferred to and with what messages, they should map those who can act on the information and/or influence people who can act, and the relative level of success achievable by targeting each group.

Researchers can target a wide range of knowledge users depending on the intended outcome they seek. Target audiences for KT activities can fall into four main groups: 1) other knowledge producers (i.e., researchers) to promote more research either to refine or test a concept e.g., biological scientists engaging clinical researchers; 2) Industry (or business) such as pharmaceuticals to invest in product research and development (R&D) and commercialisation; 3) Government to inform policy and practice decisions; 4) Civil society organisations (including media) to inform their work with communities, the public, practitioners and policymakers in government (71).

Some scholars have attempted to identify KT target audiences by research discipline (32). Those identified as most relevant for basic researchers are industry, research funders and other researchers, although, a need for more research to clarify and refine relevant target audiences for basic researchers has been noted (63, 72). Basic researchers interested in KT may need to engage the public and practitioners to identify gaps in existing products or services that would inform their research (61). A wider range of target audiences have been identified as relevant for applied researchers including: consumers (i.e., patients, family members, and informal carers), providers, local administrators, national policymakers, industry, research funders and other researchers (32).

By whom should research knowledge be transferred?

Researchers can relay the research findings to target audiences directly. This works well when they have credibility among their target audience, have the interest in and skills for KT, and time and resources to do so (32, 69). Alternatively, researchers can work with other individuals, groups or organisations that have credibility with the target audience (credible messengers) e.g., a respected physician to influence adoption of clinical practice guidelines (32, 69).

Researchers could also collaborate with trusted intermediaries (often referred to as knowledge brokers), which may address their time constraints and the minimal interest in and skills for KT among some researchers (32, 59, 69, 73-76). Knowledge brokers can support researchers to identify knowledge needs of research users, synthesise and package evidence to respond to the knowledge needs, and facilitate interactions between knowledge producers and users. They can also strengthen the KT capacity of researchers and research users. In discovery research, the equivalent may be innovation brokers (73). However, collaborations between researchers and knowledge brokers have been found to be an uncommon practice (77).

Researchers, particularly in LMIC contexts, can work with and through mass media and non-governmental organisations (NGOs) to promote uptake of research evidence by the public, communities, practitioners and policymakers (27). Use of mass media by researchers to communicate research has been found to be minimal due to researchers distrusting journalists for their tendency to misinterpret and sensationalise information including (research findings) in their reporting (78-80). The comparable effectiveness of using researchers rather than knowledge brokers, media and/or NGOs to communicate and promote the use of research evidence is not yet known (81, 82).

How should research knowledge be transferred?

There are a wide range of KT approaches and activities that researchers can use depending on the type of research evidence they generate, the policy issue the evidence addresses, their KT goal and the resources they have.

KT approaches

Four typologies of KT approaches have been identified: producer-push, facilitate user-pull, exchange, and integrated (23, 62, 74, 75, 83-85). Systems model is a fifth type of KT approach that has been defined by some scholars that focuses on addressing meso and

macro level barriers and facilitators of KT (84). These approaches are discussed in more detail below.

Producer-push

Producer-push involves researchers disseminating results of their studies to perceived and actual users typically undertaken at the end of the research project (also called end of grant KT). This approach is researcher driven in that they are the source of ideas for directing research, and the users are viewed as receptacles of research results – this is KT conceptualised as a linear process. Two factors have been identified that influence the use of research 'pushed' by researchers: *content attributes* including efficiency, compatibility, complexity, observability, trialability, validity, reliability, divisibility, applicability, and radicalness; and the *type of research* (basic or applied, general or abstract, quantitative, or qualitative, particular, or concrete and research domains and disciplines). The producer-push approach has been criticised for its assumption that potential users of the research would receive and apply it without contesting it. Linked to this is an acknowledgement that research published in scientific journals needs made easier for potential research users to understand and use. This can be partly addressed if researchers identify what knowledge is useful and transfer this to potential research users. However, this falls short because it does not involve potential research users in the selection of the transferable information or in the process of production of the research results.

Some examples of formats that researchers can use to package and facilitate use of research evidence include: decision aids for patients; clinical practice guidelines or best practice advice for healthcare professionals; consumer-oriented materials; policy briefs, actionable messages, evidence synthesis, evidence briefings for policymakers; and project summaries or "technology disclosures" for R&D professionals (indicating the technology's stage of development, potential application, cost-benefit and market analysis) (32, 59, 74, 75). Evaluations of the producer-push KT approach have found that it has minimal effect in promoting use of research by target users (26, 59, 74, 75, 82, 86).

Facilitate user-pull

The 'user-pull' approach partly addresses the criticisms raised against producer-push KT approach by supporting decisionmakers to actively seek and use evidence. Activities could include storing appropriately packaged research findings on a centralised, searchable repository, providing rapid response services to target audiences, and strengthening the research use capacity of target audiences. The 'user-pull' approach also conceptualises KT as a linear process because it assumes that research use is increased when researchers

focus their projects on the needs of research users instead of focusing them only on the advancement of scholarly knowledge. Criticisms of this approach are that it does not promote interaction between producers and potential research users, it fails to consider the influence of target audiences' organisational interests on their use of research, and it emphasises instrumental research use. Research repositories have minimal effects on use of research findings (26). There has been little evaluation of rapid response mechanisms.

Exchange

Exchange approaches (also referred to as relational or interaction model) try to address the gaps noted in the producer-push and facilitate user-pull KT approaches by emphasising meaningful partnerships between researchers and users to jointly ask and answer relevant questions. However, their effectiveness has not been robustly evaluated (74). Exchange approaches conceptualise KT as various disorderly interactions occurring between researchers and research users rather than a linear process beginning with the needs of the researchers or the needs of the research users. The supporters of this approach fall into two groups: those who emphasise a communication breakdown between researchers and research users attributing it to differences in their cultures, which leads to low levels of research use; and those who believe that more sustained and intense interaction between researchers and research users would improve research use. Therefore, this approach emphasises relationships between researchers and research users at different stages of knowledge production, dissemination, and utilisation. In this approach, research use is influenced by type of research and research disciplines, needs and organizational interests of research users, dissemination, and linkage mechanisms.

Exchange activities include: researchers jointly designing and implementing research projects with target audiences, which may involve them being embedded in the practice or policy setting, shared governance arrangements and matched funding (32, 75); establishing and/or participating in networks that include target audiences such as formal advisory committees (59, 87); establishing and/or participating in deliberately constructed communities of practice, which facilitate consideration of both tacit and research knowledge (75); and organising or participating in deliberative dialogues with decisionmakers and citizens (which are structured and typically face-to-face) that aim to discuss, contextualise and interpret research, tacit and other evidence about issues of mutual interest (3, 32, 75, 88). Similar interactive activities have been recommended among basic and applied researchers for whom industry are an important target audience, to forge partnerships for developing innovations (e.g., engineering, and physical sciences). Suggested activities that could be undertaken to promote partnerships between researchers and industry include:

informal interactions at industry sponsored meetings and conferences; and formal agreements such consultancy and contract research, establishment of new companies and new physical facilities and joint research (89).

Some research fields, disciplines, sectors (e.g., higher education) or funders use the term "engagement" to refer to exchange KT activities. Such activities are often described in terms of the target audience (e.g., community engagement, public engagement, media engagement, policy engagement and industry engagement). "Community engagement" is common in action research and related methods collectively known as 'engaged scholarship'. Community engagement involves collaboration between community members and researchers to democratize knowledge, promote use of multiple research methods and dissemination and ensure social justice (15, 16). Community engagement may be used to sensitise about the study and obtain insights into issues to inform refinements.

"Public engagement" has gained popularity in the UK higher education sector. It involves giving the wider public the opportunity to understand research, shape research agendas, be involved in decisions about how research findings are used and increase interest in research careers among young people (17). "Media engagement" is considered a sub-set of public engagement targeting print, radio and TV media (18). Also common in the UK higher education sector, "policy engagement" refers to activities targeting policymakers to inform the design and implementation of public policy and people whose perspectives influence public policy decisions including practitioners and members of the public.

"Industry engagement" involves a wide range of activities, depending on the industries and disciplines concerned, aimed at forging mutually beneficial partnerships between private sector companies and academia usually aimed at stimulating innovations of commercial interest (90). This dissertation will use these terminologies when discussing these activities interchangeably with engaging communities, the public, media, policymakers, and industry.

Integrated

Integrated approaches apply different components of push, user-pull and exchange through a large-scale knowledge translation platform (e.g., at country level). A knowledge translation platform (KTP) can operate as a stand-alone, an independent organisation (e.g., think tank), within an existing organisation (e.g., government ministry or agency, university), or as a network of existing organisations involved in evidence-informed policy-making (75). A KTP can consist of: 1) information technology tools such as electronic databases and search engines; 2) staff who manage the platform (documentation specialists, data analysts,

knowledge brokers); 3) and training programs for enhancing the capacities of knowledge producers, brokers and users to promote translation of research and its use. Integrated approaches are recommended over other KT approaches although this is yet to be backed with robust evidence (3, 37, 61, 75, 91).

Systems model

Best and Holmes (84) created another cluster of KT activities that address micro, meso and macro level barriers and facilitators of KT called *systems model*. The systems model provides support for KT in complex policymaking environments including: strengthening the ecosystem of relationships between the researchers, funders and policymakers involved in the production and use of evidence and their KT capacity; fostering leadership for KT; rewarding and incentivising KT; and creating and embedding infrastructure for KT.

What is the desired result of transferring research knowledge?

Evaluating KT activities and their outcomes is an integral part of the KT process, and can strengthen the KT evidence base and practice. It should be planned at the start of the research or KT project (3, 62, 69, 85, 92). El-Jardali et al. (3) emphasises the importance of researchers' KT activities being impact-oriented i.e., driven by the desired result. Therefore, when planning KT activities, researchers are encouraged to set a clear KT goal and implement activities that would help them achieve it. They should also include monitoring and evaluation activities for assessing their KT plan and to understand what activities worked (and what didn't work) and with what effect (3).

KT outcomes can progress through five stages of change including: awareness, persuasion, decision, implementation, and adoption (93). These stages of changes are often grouped into three broad types of research use (94-96):

1. *Instrumental use* refers to the direct use of research knowledge in making a decision or defining a solution to a problem such as a change in a policy or practice, that is clearly identifiable.
2. *Conceptual use* is a broader type of research use encompassing complex and often indirect uses of research, resulting in changes in how people think about issues, problems, or potential solutions. Target audiences' opinions about something may change but not their action. This type of research use is difficult to measure.
3. *Strategic use* of research (inclusive of tactical, political, and symbolic uses) involves use of research to support a political stance, to challenge others or to legitimatize a decision or course of action. This type of use is more common than instrumental use in policy contexts e.g., among highly politicised actors (95, 96). This type of research

use is difficult to measure empirically because research participants tend to conceal it (96).

Pattern of KT practice among researchers

Numerous studies have found that researchers in LMIC and HIC contexts more commonly employ producer-push KT activities (including peer reviewed journal publications and conference presentations) rather than other types of KT approaches (1, 26, 53, 56, 66, 71, 75, 86, 89, 97-101). Some researchers employ interactive KT networking activities including organising deliberative meetings and undertaking collaborative research with non-academic target audiences including policymakers, non-government organisations, community organisations and industry (1, 56, 66, 71, 89, 97-102).

Some studies have found that researchers who undertake KT activities rarely evaluate their KT practice and lack awareness of evaluation strategies for KT activities (1, 66, 101). Among researchers who have evaluated their KT activities in both LMIC and HIC contexts, conceptual and strategic uses of research are more commonly reported than instrumental use because of lack the time and resources for long term evaluation of their KT strategies (46, 96, 103).

Some studies have also found that senior researchers and applied researchers implement KT activities to a greater extent than junior researchers and basic researchers (53, 57). However, the majority of these studies used a narrow conceptualisation of KT that did not consider target audiences and activities relevant for basic researchers i.e., industry, technology transfer and commercialisation (53, 57). One study that used an inclusive conceptualisation of KT reported more KT practice among social sciences, humanities and arts researchers than among those involved in science, technology, engineering and mathematics (56). Differences in KT practice at the sub-discipline levels have also been reported, such as other health science researchers engaging in KT more than medical researchers (53, 56, 57, 66, 89).

More studies are needed to explore within-discipline variations in researchers' KT practice and influencing factors i.e., differences in the range of KT activities implemented among basic or applied researchers and their sub-disciplines and what drives the differences.

Frameworks and factors influencing researchers' KT capacity and practice

The previous sections provided a background of KT process, the role of researchers within the process and recommended approaches and activities. This section discusses existing frameworks and evidence identifying the factors that influence researchers' KT capacity and practice including barriers and facilitators.

Frameworks for researchers' KT capacity and practice and gaps

Over the past two decades there has been a gradual increase in studies exploring the factors (i.e., barriers and facilitators) that shape researchers' KT capacity and practice and some frameworks for guiding, assessing and strengthening KT capacity and practice have been proposed (1, 3, 9, 21, 27, 55, 59, 62, 63, 68, 75, 83, 86, 101, 102, 104-106). A few of the frameworks provide guidance from the 'systems' perspective (i.e., they consider the micro, meso and macro levels) to varying degrees (3, 62, 86). These frameworks are emphasised in this section as the most appropriate for informing the one for this thesis. The frameworks comprise: the *Framework for Assessing Country Efforts to Link Research to Action* by Lavis et al. (62); *Knowledge Translation Model* by Majzadeh et al. (86); and a *Conceptual Framework for a Backward Design in Knowledge Translation* by El-Jardali and Fadlallah (3).

However, none of the three frameworks fully met the needs of this thesis's focus on the researchers' perspective of KT, falling short on three issues. Firstly, they consider some factors that shape researchers' KT capacity and practice but not in sufficient detail to inform a robust analysis. Secondly, the extent to which they are informed by evidence from LMIC and African contexts is either unclear or minimal. For example, the Lavis et al. (62) framework is based partially on research evidence but has not been evaluated or refined. The Majzadeh et al. (86) model was informed by published literature and primary data but only from one institution in Iran. The framework developed by El-Jardali and Fadlallah (3) did not describe the extent of LMIC evidence used to construct the framework. Kalbarczyk et al. (83) have also reported that existing frameworks for assessing KT capacity of institutions in LMICs are underdeveloped with few empirical studies to show which constructs are most relevant for LMICs and should be prioritised.

Thirdly the frameworks have an applied research focus and offer little guidance for basic researchers. None of the frameworks explicitly identify industry as a target audience even though it is particularly important for basic researchers involved in discovery research and seeking R&D partnerships. Lavis et al. (62) acknowledge that their framework does not

consider actions for commercialisation because they felt that its profit motive orientation warrants different considerations.

Despite these issues, all three frameworks provide useful insights on researchers' KT capacity and practice needs at micro, meso and macro levels, which I discuss below using the systems perspective framework to structure the section. I also draw on other commonly used KT frameworks and evidence from other studies on barriers and facilitators of researchers' KT capacity and practice to clarify or add to the factors identified in the frameworks.

Micro level factors

El-Jardali and Fadlallah (3) suggest that researchers' KT capacity development should target the micro, meso and macro levels (using the alternative terms individual, team, institutional and systems levels). At the micro level (individual), researchers need skills for: i) conducting policy-relevant research and systematic reviews, ii) preparing evidence briefs for policy and other evidence synthesis products, iii) engaging research users and other stakeholders (including policymakers, practitioners, civil society organisations and the public) in priority setting meetings and deliberative dialogues, and iv) conducting ongoing monitoring and evaluations (3).

In addition, researchers having strong research skills has been noted as an attribute that strengthens their credibility and that of their research among target audiences (27, 62, 83, 86, 104). Other noted key attributes and personality traits that facilitate researchers' KT capacity and practice including: their research and publising track records; their interest in KT (drive, passion and enthusiasm for KT and openness to sharing their research knowledge and potential related risks); their familiarity with the target audience or KT experience; and having an entrepreneurial nature (1, 62, 69, 86, 104, 105).

Meso level factors

At the meso level (teams, units and organizations), El-Jardali and Fadlallah (3) identify a number of critical ways that research teams, units and institutions can support researchers' KT capacity and practice. At the team level, El-Jardali and Fadlallah (3) suggest that researchers should form groups with the right mix of skills and expertise to undertake systematic reviews and other evidence synthesis products. In addition, research team, units and institutions can: provide technical support (e.g., a department with staff who have KT expertise for supporting researchers' KT efforts); protected KT time for faculty members and researchers (e.g., academic appointments with KT responsibilities); integrate KT courses

within curricula; and establish demand-driven rapid response units and online clearinghouses for timely response to research users' and other stakeholders' needs.

Lavis et al. (62, 69) also recommend universities and other research institutions to assess KT in tenure and promotion processes, and research ethics committees to mandate researchers to demonstrate that their research is addressing a priority issue identified by non-academic target audiences. Majzadeh et al. (86) add that tenure and promotion processes should value and score research done in collaboration with target audiences (i.e., co-production of research) and KT activities. The criteria for researchers' promotion or tenure could also be expanded to include research synthesis and application activities (107).

Majzadeh et al. (86) also propose that researchers should be trained in defining research topics and questions that address target audience needs, communication skills, and KT approaches. Researchers' KT training should also encourage interdisciplinary networking and collaboration, promote a shared understanding of KT among all researchers and be tailored to their interests and context (55, 83). In addition, they should be provided with platforms that facilitate networking and collaboration between researchers and target audiences and be involved in activities and events that promote awareness and discussion of KT (1).

Research institutions can further support KT efforts of researchers and staff by having guidelines for KT; mandating inclusion of KT in research proposals; providing training on KT to journal review committees; conducting institutional monitoring and evaluation (M&E) of KT efforts; providing robust online tools and platforms for data sharing and translation, including researchers' profiles and expertise; and providing supplies, infrastructure, equipment, and logistics for carrying out KT activities (86). Lavis et al. (69) highlight the importance of research institutions training their KT staff and researchers on KT approaches and activities and target audiences on the value of using research and how to do so. Lavis et al. (69) also note that the size of the budget the institution allocates for researchers' KT activities is important. Jacobson (107) suggest that universities could adapt existing tools to inform their institutional KT M&E frameworks including Holland's matrix of institutional commitment to service and the 'Gelmon Assessment Approach'. Beyond provision of guidelines, infrastructure, equipment and resources for KT, research institutions having leaders who champion KT and their involvement alongside senior researchers in mentoring the next generation of scientists has been identified as a critical enabler of researchers' KT capacity and practice (1).

The credibility of the research institution among target audiences could be enhanced by establishing mechanisms for enhancing community awareness and understanding of their research and access to it including structures such as information centers and extension agents (107). University grants and contracts offices could also play a role in strengthening links between researchers and target audiences by brokering non-traditional partnerships e.g., with NGOs (107). Jones et al. (21) also highlight the important role of intermediaries including networks, the media, NGOs and communication teams within research institutes as resources with requisite capacity to researchers' KT capacity and practice. Malla et al. (27) reported that such partnerships in LMIC could enhance local NGOs' research and KT capacity given their influence among communities and policymakers. Lavis also notes the influential role of research networks in diffusion of KT approaches, particularly among those with strong interconnectedness.

Macro level factors

At the macro level, El-Jardali and Fadlallah (3) recommend institutionalised mechanisms for researcher-policymaker interactions (e.g., KT platforms). Such a platform works best with strong leadership for KT among funders and government (through legislation) (69). Such a platform is beneficial on a number of issues including: offsetting the consequences of the high staff turnover and changing priorities in government; nurturing trust between researchers and decisionmakers; facilitating information sharing, interactions and collaboration between knowledge producers and knowledge users in research and policymaking processes; supporting research priority setting activities; and assessing the validity of a particular message from research findings and its appropriateness for a particular context (3, 69, 86, 105). WHO (105) suggests that such platforms should be supported by long-term investments. Funders can also play a critical role in supporting researchers' KT efforts by mandating KT in their funding policies, providing grants and fellowships for KT and considering KT in research-assessment exercises and when reviewing grant applications (e.g., providing individualized feedback on how they could strengthen their KT plans) (1, 62, 69, 86, 104, 105). To address KT funding constraints, funders can encourage researchers working on similar issues to pool together and maximise KT funding (69).

Lavis et al. (69) also theorised that if research funders introduce KT requirements, they can indirectly impact research institutions' incentives systems because academic tenure and promotion decisions are based on peer-reviewed grants as much as peer-reviewed publications. WHO (105) emphasises the need for continued investments in primary research by funders because future KT processes depend on current and future flows of

basic, theoretical and methodological innovations, individual studies, articles and reports, and syntheses of research knowledge. Lavis et al. (69) add that the funding should support evidence synthesis and knowledge transfer. WHO (105) acknowledges the importance of professional knowledge brokers or practitioners who often fill the gap in KT capacity and practice among researchers and highlights the need for developing countries to invest resources to build up this cadre.

1.3. THE RESEARCH PROBLEM

Despite studies on researchers' KT capacity and practice increasingly focusing on LMIC contexts (1, 3, 27, 83), most of the studies address the micro level (66, 108-111) and high-income country (HIC) contexts (83, 105). Existing frameworks need to be enriched by a) a comprehensive review of evidence from LMIC settings, given their dependence on external funding and international partnerships and b) insights from studies that incorporate the perspective of basic researchers.

Researchers who integrate KT in their research predominantly undertake producer-push activities involving unidirectional communication and dissemination of their studies to target audiences (1, 26, 53, 56, 66, 74, 75, 86, 98, 101). Global studies on researchers' KT practice do not exist but some studies in LMIC and HIC contexts have found that researchers do not plan for KT early in their research process or evaluate their KT efforts (1, 66, 69, 101, 112).

Minimal KT practice among researchers has been attributed to lack of incentives including tenure and promotion processes that reward scientific journal publications and obtaining large-scale research grants (1, 9, 55, 59, 75, 83, 86). The practicality or relevance of KT among some basic researchers has been questioned and there has been little focus on identifying relevant KT approaches and activities by research discipline (1, 63, 68). Lack of KT knowledge and skills and exposure to researchers' training and development has also been cited as a key barrier to researchers' KT practice (1, 27, 74, 83, 86). Among researchers involved in discovery research major barriers include lack of interest in R&D in their local industry and intellectual property concerns (1, 86).

Some studies in LMIC or HIC contexts, have found varied but largely minimal KT capacity at micro, meso and macro levels (1, 66, 69, 101, 105, 108, 111, 113-118). However, published studies have mainly used quantitative and mixed methods designs with a proportionally fewer studies using qualitative designs (1, 56, 66, 69, 71, 89, 97, 98, 100-102, 108, 111,

113-115, 117-120). More in-depth qualitative studies are needed to identify and explain the micro, meso and macro factors that influence variations in researchers' KT capacity and practice including how they manifest and interact in different contexts (e.g., geography/ institution) and conditions (e.g., a project that mandates KT versus one that does not). To my knowledge, no study has sought to understand the factors that shape researchers' KT capacity and practice from this systems perspective.

Research funders are increasingly expecting researchers to integrate KT activities in their research to address growing pressure to illustrate value for money (53, 55). This has resulted in researchers with varied attitudes about KT practice and KT knowledge, skills and experience having to integrate it in their research irrespective of their stance. This situation presents an opportunity to explore differences in how researchers' KT capacity and practice are influenced under such conditions. The evidence generated from such studies could inform the design of more nuanced interventions for strengthening researchers' KT capacity and practice.

1.4. STUDY AIM AND OBJECTIVES

This dissertation aimed to contribute to filling this knowledge gap by exploring the factors (micro, meso, macro) that shape the KT capacity and practice of three diverse research consortia that are part of the "Developing Excellence in Leadership, Training and Science (DELTAS) Africa" programme. DELTAS was a large donor funded health research capacity strengthening (HRCS) programme involving research consortia led by African researchers and partner institutions and requiring them to integrate KT activities in their research (121). The ultimate goal of the dissertation was to generate evidence that would inform KT capacity strengthening initiatives involving Africa-led research consortia similar to DELTAS Africa.

The specific research objectives were to:

1. Develop an analytical framework to support a systems perspective comparative analysis of Africa-led research consortia KT capacity and practice
2. Apply the framework to compare and contrast KT capacity and practice in three DELTAS research consortia
3. Refine the analytical framework based on the study findings for application in understanding KT capacity and practice in Africa-led research consortia
4. Identify lessons and strategies for strengthening the KT capacity and practice of Africa-led research consortia

1.5. RESEARCH APPROACH AND METHODOLOGY

I used a case study approach involving three purposively selected consortia with varied characteristics that were part of the DELTAS programme. DELTAS was designed as a long-term programme from 2015 to 2035 (121). Over the initial five-year phase (2015-2020), DELTAS supported 11 consortia from 54 research institutions across Africa to invest in research infrastructure, offer training at Masters, PhD and post-doctoral level, and provide mentorship. My PhD programme was embedded within the Learning Research Programme of DELTAS (121). This was a cross-DELTAS research programme (i.e., not affiliated to any consortium), implemented by the Centre for Capacity Research (CCR) at the Liverpool School of Tropical Medicine (LSTM) (122).

I used two data sources: 1) semi-structured interviews with a purposive sample of researchers and staff having KT and M&E responsibilities who were affiliated with the programme, and; 2) review of documents from the consortia and home research institutions of the participants. I used the framework thematic approach to analyse the interview data and triangulated it with the document review data. I organised my study findings using an analytical framework for the factors that shape LMIC researchers' KT capacity and practice at the micro, meso and macro levels that I constructed based on a literature review (see chapter 2). I presented my study findings in the form of a narrative of the key emerging themes supported with illustrative quotes.

This study contributes to the KT knowledge base and informs its practice in three ways: Firstly, the study provides new insights on the factors that shape the KT capacity and practice of diverse Africa-led health research consortia at micro, meso and macro levels including how manifest and interact. Secondly, the findings of the study were used to develop an analytical framework for the factors that shape the KT capacity and practice of Africa-led health research consortia and their interactions at the micro, meso and macro levels. Finally, the study recommends strategies for strengthening the KT capacity and practice of Africa-led research consortia focusing on health research that may also be applicable in other research fields.

1.6. PLACE OF THE RESEARCHER IN THE STUDY

My positionality in the research is that of a KT practitioner over the past ten years. Therefore, my stance on researcher's role in promoting KT is supportive. However, at the same time I acknowledge that researchers are not all the same and that their roles in the KT process vary depending on their research discipline and personal and professional interests. My PhD being embedded within the DELTAS programme may have made some participants

uncomfortable if they viewed me as an 'evaluator' of their activities, thus, potentially resulting in the withholding of information or social desirability bias. I reflected on my positionality at every stage of my research process and sought to mitigate its influence in my data collection and analysis as described in the methodology chapter.

1.7. STRUCTURE OF THE THESIS

This thesis is organised into seven chapters. This first chapter has introduced the rationale for conducting the research, identified the research aim and objectives, and briefly described the research approach, methodology, and thesis structure. Chapter two presents a systematised review of literature on LMIC researchers' KT capacity and practice, which informed the study's analytical framework and addresses the study's objective one.

Chapter three provides a detailed description of the research approach and methodology, including the conceptual framework, study design, sampling strategy, ethical considerations, data collection methods and process, and data management and analysis. The chapter concludes by describing the steps taken to ensure the reliability and credibility of the study findings.

Chapters four, five, and six present the study results addressing the study's objective two. Each chapter reports the findings from one of the three case studies concluding with a summary of the key findings.

Chapter seven discusses the study's key findings in relation to the existing evidence base, future research directions and acknowledges the study's strengths and limitations. The refined study analytical framework based on the study findings, which addresses the study's research objective three is also presented. The chapter concludes with recommended strategies for strengthening the KT capacity and practice of Africa-led research consortia focusing on health research and of potential relevance in other research fields.

CHAPTER 2: LITERATURE REVIEW AND FRAMEWORK DEVELOPMENT

2.1 OVERVIEW OF CHAPTER

This Chapter presents a systematised review of English-language literature that summarised the scope, quality, and primary outcomes of published articles on LMIC researchers' KT capacity and practice to:

- Understand how and what aspects of LMIC researchers' KT capacity and practice have been explored in the literature;
- Synthesise the factors that shape LMIC researchers' KT capacity and practice at micro, meso and macro levels reported in the literature;
- Inform development of an analytical framework for the factors that shape LMIC researchers' KT capacity and practice at micro, meso and macro levels

The chapter first describes the review's methodology and then presents the review's findings followed by a summary and discussion of the findings in the context of the wider KT evidence base (existing KT frameworks and evidence from high-income country (HIC) settings). The discussion also identifies gaps in the reviewed literature. The final section of the chapter presents an analytical framework for the factors that shape LMIC researchers' KT capacity and practice at micro, meso and macro levels drawn from the review findings and the referenced wider KT evidence base.

2.2 METHODOLOGY

I led the review process with guidance and support from my three PhD supervisors. I conducted a systematised review of published studies using the process described by Grant and Booth (123). The review modelled the 'systematic review' process, except that we included all types of peer-reviewed literature without limitation to publication type and quality. This review sought to answer the broad question: what is known about the KT capacity and practice of LMIC researchers and research institutions? In the remainder of this section, the steps undertaken to complete the review are outlined.

2.2.1 Search strategy

We agreed upon a list of initial search terms, which I tested and refined following a preliminary search of the literature. I undertook an electronic search of studies published in English in the PubMed and Scopus databases using the query string presented in Box 2. The search included literature from the earliest records available in the databases up to February 2019. I identified additional articles through checking reference lists of articles

selected from the electronic search. During the revision of my dissertation, I identified and included additional new or relevant publications.

Box 2. Search query string

(TITLE-ABS-KEY ("knowledge translation") OR TITLE-ABS-KEY ("knowledge utilisation") OR TITLE-ABS-KEY ("knowledge utilization") OR TITLE-ABS-KEY ("research uptake") OR TITLE-ABS-KEY ("research utilisation") OR TITLE-ABS-KEY ("research utilization") OR TITLE-ABS-KEY ("evidence uptake") OR TITLE-ABS-KEY ("knowledge transfer")) AND (TITLE-ABS-KEY (researchers) OR TITLE-ABS-KEY (academics) OR TITLE-ABS-KEY ("post graduate") OR TITLE-ABS-KEY (faculty)) OR (TITLE-ABS-KEY ("research centers") OR TITLE-ABS-KEY ("research organisations") OR TITLE-ABS-KEY ("research organizations") OR TITLE-ABS-KEY ("research institutions") OR TITLE-ABS-KEY (universities)) AND (TITLE-ABS-KEY (africa) OR TITLE-ABS-KEY ("developing country") OR TITLE-ABS-KEY ("low income") OR TITLE-ABS-KEY ("low and middle income") OR TITLE-ABS-KEY (asia) OR TITLE-ABS-KEY ("Middle East") OR TITLE-ABS-KEY (latin) OR TITLE-ABS-KEY (caribbean) OR TITLE-ABS-KEY (pacific) OR TITLE-ABS-KEY (mediterranean) OR TITLE-ABS-KEY (eastern AND europe)) AND (LIMIT-

2.2.2 Inclusion and exclusion criteria

Articles were considered eligible for inclusion if they reported studies focusing on:

1) LMIC settings (countries and/or academic/research institutions) as the main or one of the main study settings
2) Perspectives of LMIC researchers as the main or one of the main study populations, irrespective of the researcher's nationality
3) Any research field (health, education, climate change, etc.)
4) LMIC researchers' KT capacity (attitudes, knowledge and skills) and practice (implementation of KT activities) and the (i.e., knowledge producer side) micro, meso and macro level factors that shape their KT capacity and practice
5) Interventions for enhancing LMIC researchers' KT capacity and practice

Multiple articles reporting on the same study were included if they focused on different findings. Articles reporting researchers' KT practice with study samples consisting of a mix of researchers and other professions (e.g., policymakers) that did not disaggregate findings by participant's profession were excluded. Articles were not excluded based on publication type (commentary, review, original research).

2.2.3 Screening

After removing duplicates, I screened the title, abstracts, and keywords of the retrieved articles against the inclusion criteria and excluded studies that were not relevant. I read in full and screened the remaining articles using the stated inclusion criteria. The selected articles were independently reviewed by one of my supervisors (JP). We discussed disagreement regarding eligibility until consensus was reached. A PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) flow chart of the identification, screening, and selection process is presented below (Figure 3).

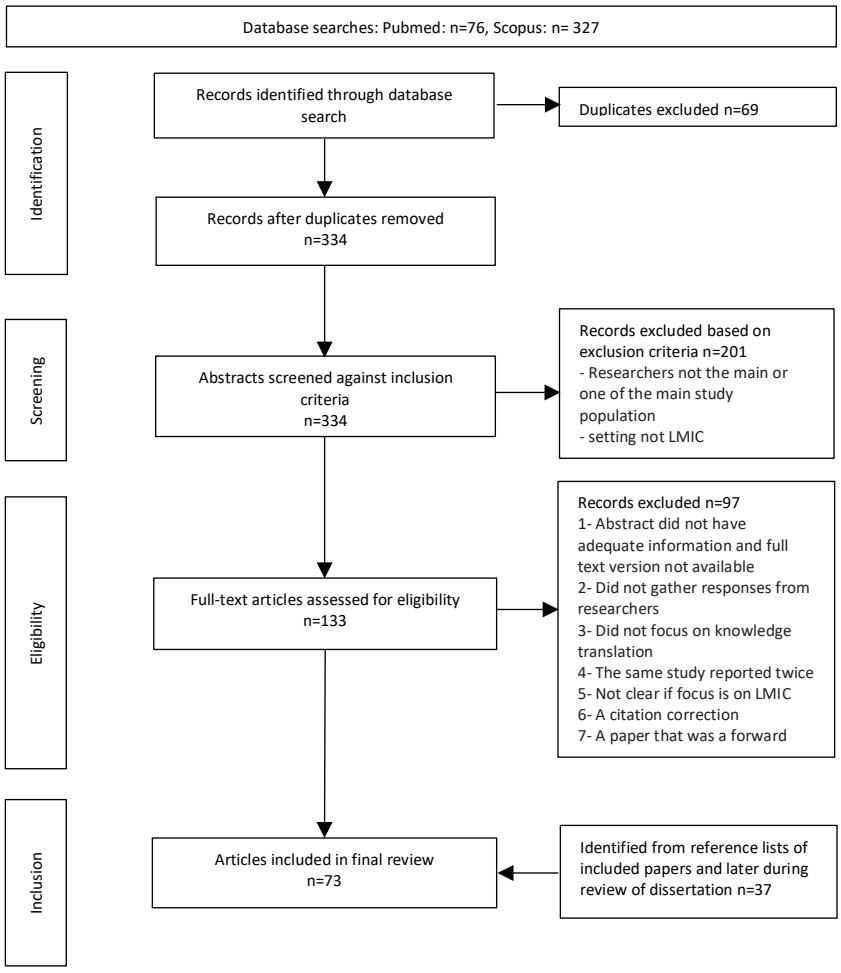

Figure 3. Flow chart of the identification, screening and included articles

Note: Figure illustrates the process used to search for studies that were included in the review. Studies were searched in the PubMed and Scopus databases. 'Identification' shows the number of articles retrieved using the search terms (403) and after removal of duplicates (334). 'Screening' indicates the number of articles whose titles, abstracts, and keywords were screened against the study inclusion and exclusion criteria (334) and the number of articles that were excluded at this stage (201). 'Eligibility' denotes the number of full-text articles screened against the inclusions and exclusion criteria (133) and the number of articles excluded at this stage (97). 'Inclusion' shows the number of articles included in the review (73), including those that met the inclusion criteria (36) and 37 additional articles identified from searching the reference lists of the 36 included articles and during the revision of the dissertation.

2.2.4 Data extraction and analysis

I first extracted the following data from each included article using Microsoft Excel: author, year, objective, study country and region, study population, setting, study design and methods including the theoretical framework used, and the main findings. I then read the articles and assigned each to one or more of the following three predetermined categories:

- M**icro level factors** i.e., recommended, and documented KT capacity and practice among researchers
- M**eso level factors** i.e., recommended, and documented KT capacity and practice of research institutions, teams or groups (e.g., consortia) and other institutions, networks and professionals in the evidence ecosystem that researchers and their institutions align, work or compete with
- M**acro level factors** i.e., recommended, and documented KT capacity and practice of national research systems including regulation, funding mechanisms, and culture

I re-read the main findings of each article and coded them to identify and allocate subthemes, which were verified by one of my supervisors (JP). We discussed disagreements until a consensus was reached. I then summarised the themes and sub-themes descriptively. The literature review focused on identifying factors in each of the systems perspective levels separately not how they interact and emerging properties. The latter part is the focus of my research.

2.3 RESULTS

2.3.1 Search results

The search identified 334 potentially relevant references. Following a review of the titles and abstracts,133 articles were retrieved for full-text review. From these, 36 articles that met the inclusion criteria were selected. I identified an additional 37 articles through reference checks of included papers (30) and during revision of the dissertation (7), bringing the total number of papers included for review to 73. The search results are illustrated in Figure 1, the PRISMA flow chart.

2.3.2 Characteristics of included studies

Of the 73 articles included in the review, 46 (63%) presented original research findings, 24 (33%) were commentaries, and three (3%) were structured reviews. Most (n=54; 74%) of the articles focused on the researcher and/or research institution or their KT strategy as the unit

of analysis. The rest of the articles (26%) explored policymaking processes including researchers' role, activities and the factors that shape their KT capacity and practice.

All the articles discussed micro level factors that shape LMIC researchers' KT capacity and practice (n=73; 100%). Most (n=61; 84%) articles further discussed meso level factors that shape LMIC researchers' KT capacity and practice with most (87%) focusing on LMIC research institution and fewer (56%) on institutions, professionals, or networks that LMIC research institutions align, work or compete with. Three quarters (n=54; 74%) of the articles discussed macro level factors that shape LMIC researchers' KT capacity and practice. A majority (n=68; 93%) of the articles discussed the factors that shape LMIC researchers' KT capacity and practice at two or all three levels; the rest of the articles (n=5; 7%) discussed it at just one of the three levels. None of the articles explored the interaction of the factors at the three levels in different LMIC research settings and how this shapes LMIC researchers' KT capacity and practice.

A majority (n=56; 77%) of the articles explored KT capacity and practice among applied researchers. The researchers' disciplinary focus was not explicitly stated in some articles (n=10; 14%). Only two (3%) of the five articles that included both basic and applied researchers in the study population analysed and presented their findings by discipline. Two-thirds (n = 49; 67%) of the articles focused on sub-Saharan Africa as the primary study setting or as one of several study settings, and a majority (n = 69; 95%) focused on health research.

The most common study design was some form of a qualitative study (n = 31; 42%) followed by cross-sectional surveys (n=8; 11%) and mixed-methods studies (n=7; 10%). A wide range of theoretical frameworks were applied. The Majdzadeh et al. KT cycle was the most frequently one used singly or in combination with other frameworks (n=7; 11%) (109-111, 114, 120, 124). Other frameworks used in multiple studies included the Overseas Development Initiative RAPID framework (n=3) (54, 125, 126), Lavis et al. 'How can research organizations more effectively transfer research knowledge to decisionmakers?' (n=3) (66, 111, 120); WHO World Report on Knowledge for Better Health (n=3) (66, 111, 120); Landry et al. 'Climbing the ladder of research utilization' (n=3) (66, 111, 120); and Lavis et al. framework assessing country-level efforts to link research to action (n=2) (23, 127). Appendix 1 presents a detailed list of included primary studies, including study design, methods, sampling, setting, and population.

2.3.3 Micro level factors

As noted earlier, all the 73 articles (100%) reported micro level factors that shape LMIC researchers' KT capacity and practice. A review of these articles identified six themes discussed below. The most cited factor was LMIC researchers' KT activities and underpinning factors.

Attributes among LMIC researchers that facilitate their KT capacity and practice

More than a quarter (n=21; 29%) of the articles on micro level factors identified attributes among LMIC researchers that foster their KT capacity and practice. Credibility of the researcher among target audiences was the most cited attribute (n=19; 90%) that underpinned their KT capacity and practice; more credible researchers had more opportunities for KT practice, which strengthened their KT capacity in the long run (n=19; 90%). Researchers were held in high regard when judged by target audiences to have an established track record in research, scientific publishing and KT including established relationships with them, holding a senior position in their institution (e.g., Professorial position), and based at a prestigious institution (23, 27, 54, 110, 126, 128-139). To a lesser extent but relatedly, whether the researcher was renowned in their field (e.g., famous), obtained international education, was considered a global researcher (e.g., based at an international organisation) or had a PhD degree were cited as characteristics that target audiences considered when judging the credibility of a researcher (27, 65, 130, 137, 139). One study also mentioned that in Mexico, the reputation of the journal the researcher had published the research was an important factor considered (139). Another study reported that, in Kenya, the tribe and gender of the researcher was important (65).

Besides credibility several other attributes that foster LMIC researchers' KT capacity and practice were cited, but to a lesser extent. The most cited among these was patience including understanding that policymakers face competing priorities and being persistent with them (128, 130, 138, 140, 141); and being proactive as a policy entrepreneur and seeking KT funding (65, 110, 130, 132, 137, 139). The other attributes were: being a practitioner e.g., physician (130, 142); being flexible and adaptable (129, 130); being an applied researcher conducting policy relevant research (130, 132); and being charismatic and having gone through policy training (130).

LMIC researchers' attitudes about KT

More than a quarter (n=21; 29%) of the articles on micro level factors discussed LMIC researchers' attitudes about KT (i.e., their views on researchers' role in the KT process and interest in KT practice) and their influence on researchers' KT capacity and practice. Some

studies found that many LMIC researchers did not view KT practice as one of their core responsibilities (23, 108, 110, 114, 127, 132, 143). Rather, researchers viewed their primary roles as producing high-quality research, publishing it in scientific journals, presenting it at seminars and conferences, training individuals to ensure a supply of researchers, and interacting with a larger network of researchers (108, 127, 132, 139, 144). This view was attributed to their institutional incentive systems that reward them based on peer-reviewed scientific publications (27, 54, 108, 110, 114, 128, 138, 145-147).

Some studies presented a more nuanced analysis noting that researchers held diverse views about their role in promoting KT and interest in KT practice shaped by their disciplinary alignment, professional identity, and personal outlook (54, 111, 128, 130, 140, 143, 148). Researchers' perceptions fell into two groups: those who believed the role of researchers is to produce knowledge for other stakeholders to take up and use (a common view among basic researchers); and those who saw KT practice as central to their role, i.e., their moral obligation (a common view among applied researchers) (54, 65, 128, 130, 140, 143).

Crichton and Theobald (54) identified two additional sub-groups of researchers interested in KT among researchers from four consortia working on SRH, HIV and AIDS and working in nine countries in sub-Saharan Africa and Asia. One sub-group consisted of researchers who believed that researchers should limit their activities to informing policy and practice, while the other were keen on engaging in advocacy or activist activities. Another study involving academics from six schools of public health in sub-Saharan Africa identified motivations behind these two sub-groups of researchers (130). Researchers who play an advocacy role in the KT process tended to be driven by their view of KT as their moral obligation, while those opposed to this alignment were concerned about not being viewed as influenced by others' interests, i.e., maintaining their independence.

LMIC researchers' KT knowledge

Nearly a third (n=22; 30%) of the articles on micro level factors identified LMIC researchers' KT knowledge as critical for their KT capacity and practice. Inadequate understanding of KT and KT techniques was cited as a barrier to researchers' KT practice in some studies (27, 108, 109, 114, 128, 132). For example, Maleki et al. (114) reported that more than half of medical and health researchers (n≈75) based in eight universities based in eight countries in the Eastern Mediterranean Region believed that researchers were not familiar with KT.

Having an understanding of the policy process and local context was the most cited KT knowledge considered important for researchers' KT practice (n=18; 82%) (23, 54, 65, 127-130, 133, 136, 143-145, 149-153). For example, Corluka et al. (132) found that biomedical researchers in Argentina's rural northwest and the capital of Buenos Aires lacked understanding of the policymaking context, which inhibited their KT practice and attributed this to their disciplinary alignment. Another study cited lack of understanding of research use concepts (i.e., instrumental, conceptual, and symbolic uses of research) among researchers based at an international health research institution in Bangladesh, which limited their research uptake evaluation activities (154).

LMIC researchers' KT skills

About half (n=35; 48%) of the articles on micro level factors identified LMIC researchers' KT skills as important for their KT capacity and practice. Insufficient KT skills among researchers was the most cited barrier to researchers' KT practice (23, 54, 78, 126, 127, 131, 132, 136, 138, 139, 143, 153, 155-160). Not only was insufficient KT skills identified as a primary barrier to KT practice, in some cases inadequate research skills more generally were impeding researchers' KT practice because it led to little or poor-quality research studies and scientific publications and consequently diminished their credibility (23, 27, 128, 132, 136, 156, 161). Research skills were also found to be undermined by unsupportive research environments (e.g., not being part of a network of researchers where they could get some mentorship) (27, 132).

Whilst a key finding of the review was that many LMIC researchers lack essential skills to engage in the wide variety of KT activities, several studies identified the essential skills needed for effective KT practice. The most cited of these was being able to communicate research to non-academic audiences (n=20; 57%): including summarising, simplifying, packaging it in user-friendly formats and using communication information technology (3, 27, 54, 65, 111, 126, 128, 130, 132, 138, 139, 149, 155, 158) However, studies recorded poor or varied communication skills among LMIC researchers (23, 108, 114, 115, 120).

There were other skills noted as essential for researchers' KT practice, but cited to a lesser extent. Among these, research and evidence synthesis skills were the most cited including: production of policy-relevant, operational or implementation research and economic evaluations (3, 27, 86, 116, 130, 136, 144, 156, 161); conducting systematic reviews and other evidence synthesis products (3, 86, 144, 156); scientific writing to ensure a supply of quality publications (132, 149, 156); policy analysis (149); and conducting monitoring and evaluations (3, 27).

The remaining skills identified were all related to interacting and collaborating with target audiences including: engaging research users including communities, policymakers and stakeholders (3, 144, 145), and relatedly possessing social skills including active listening and lateral thinking (27, 128, 130, 149); and having business, entrepreneurial (i.e., story-teller, networker, engineer and fixer) or negotiation skills (130, 138, 160), advocacy skills (54, 130, 140), and political, diplomatic or public relations skills (130, 160).

Strategies used to develop LMIC researchers' KT capacity

More than a quarter (21; 29%) of the articles on micro level factors reported strategies they used or recommended to develop researchers' KT capacity including skills for designing and implementing high quality policy relevant research.

The strategies cited clustered into two types of approaches: 1) education and training, which was the most cited; and 2) support networks and collaborations. Learning by doing, two-way learning and peer-to-peer learning were commonly cited features of these two approaches. Most studies did not present evaluations of the strategies used to enhance researchers' KT capacity and the results.

The reported researchers' KT capacity development strategies focused on areas that are consistent with the KT knowledge and skills recommended earlier in this section including: understanding the policymaking processes; conducting high quality implementation or operations research; producing systematic reviews; mapping and developing stakeholder KT, engagement or communications strategies; communicating research including contextualising evidence, distilling actionable messages and packaging them; media engagement; facilitating dialogues; research grant writing; and KT monitoring and evaluation. The reported researchers' KT capacity development strategies are described in more detail below.

Education and training

Of the 21 articles reporting on strategies for researchers' KT capacity development, majority (n=17; 81%) reported use of education and training through stand-alone KT courses and fellowships, integration in research degree training and mentorship to strengthen researchers' KT capacity and practice (111, 128, 130, 136, 144, 147, 153, 155, 156, 161-167). For example, Bennett et al. (153) described fellowships and training workshops used to enhance the capacity of researchers in Jamaica in systematic reviews emphasising knowledge synthesis methodology, statistical analysis, search strategy development,

information retrieval, and collaborating with health care professionals and policymakers. Jessani et al. (130) found that some researchers involved in KT activities transferred knowledge about KT and how to do it to academia through teaching. Theobald and Nhlema-Simwaka (161) described a mentoring strategy used by applied social researchers based in Malawi that involves coupling more experienced and more junior staff in operations research so that there is a process of skill sharing and exchange including interacting with and presenting findings to policymakers.

Support networks and collaborations

Of the 21 articles reporting on strategies for researchers' KT capacity development, half (n=11; 52%) reported use of support networks and collaborations to improve researchers' KT capacity and practice including researchers forging networks to support each other, and researchers and target audiences working together (54, 128, 129, 132, 136, 147, 153, 155, 158, 165, 167). For example, Young et al. (129) described a researcher support network among researchers in South Africa that met monthly to share and troubleshoot their experiences and challenges in an intervention that matched them with policymakers to support them with evidence on demand. Oronje et al. (155) described a media training of researchers based at a health and population research institution in Kenya that was co-facilitated by seasoned journalists who served as both experts and target audiences of those being trained. Zahiruddin et al. (136) reported that young health researchers in India were placed in policy institutions to gain an understanding of the policymaking environment.

Learning by doing, two-way learning and peer-to-peer learning

Learning by doing, two-way learning and peer-to-peer learning were embedded features of some interventions that were used to strengthen researchers' KT capacity and practice (n=9; 43%) (128, 129, 132, 147, 153, 155, 158, 162, 165). For example, some of the training workshops reported entailed researchers producing tangible outputs at the end e.g., a communications strategy (165), a systematic review (153), and a KT proposal (164). Oronje et al. (155) reported that researchers who worked with producers of a TV drama to integrate and communicate research-based sexual and reproductive health and rights messages acquired skills for simplifying and framing messages for the general public during the collaborative process.

Evaluation of capacity development interventions

Among the 21 articles discussing strategies for researchers' KT capacity development, a few reported evaluating the strategies they used to strengthen researchers' KT capacity and practice mainly retrospectively, immediately following the intervention, and using qualitative

study designs (n=5; 28%) (129, 147, 155, 158, 162, 164, 165). Two studies used a survey pre-post-test design. All the evaluations found positive short-term results and provided lessons for improvements in the design of the interventions. For example, Mbuagbaw et al. (164) reported a statistical increase in the mean scores of the pre-test and post-test KT knowledge among academic researchers in Cameroon. Oronje et al. (155) reported that their evaluation of a training of researchers in Kenya on media engagement recorded an improvement in some researchers' confidence to work with media and actual use of media to communicate their research. Interventions that involved production of an output at the end (mentioned earlier) usually measured the outputs as one of the metrices to assess their success.

LMIC researchers' KT practice

Majority (n=70; 96%) of the articles reporting micro level factors identified KT activities implemented by LMIC researchers or recommended KT activities that are important in LMIC researchers' KT practice. Several studies found that researchers' KT practice is uncommon and varies by research discipline and resources allocated for it (e.g., time and money) (54, 66, 78, 108-111, 114, 117, 118, 120, 127, 132, 139, 140, 146, 168, 169). Researchers mainly communicate and disseminate their research using scientific journals and conferences and rarely plan and evaluate KT activities targeted and tailored for non-academic audiences. For example, Lavis et al. (66) reported that about half of 308 surveyed health researchers from ten LMIC countries were actively involved in KT activities, and that health policy and systems researchers, or population and public health researchers were more likely to undertake KT activities than biomedical and clinical researchers. Crichton and Theobald (54) found that the intensity and frequency of interactions between researchers working on SRH, HIV and AIDS and policy actors varied depending on the time and resources (money and KT staff) they had.

Researchers' KT activities that were discussed fell into nine groups: 1) planning for KT; 2) generating relevant research; 3) synthesising and packaging research findings; 4) producer push KT activities; 5) facilitate pull KT activities; 6) exchange KT activities; 7) integrated KT activities; 8) evaluating KT activities; and 9) conducting research studies in the KT field. Generating relevant research was the most discussed KT activity undertaken by researchers followed by exchange KT activities and synthesising and packaging research findings. The least discussed activities were evaluating KT activities and conducting research studies in the KT field, which were supported by little or no empirical evidence.

Two thirds (n=46; 66%) of the articles cited some common factors underpinning researchers' KT activities including: relationship and trust building; targeted and tailored communication; timely delivery of research evidence; and long-term investment of time and money. The researchers' KT activities and underpinning factors reported are described in more detail below sequentially.

Researchers' KT activities

Planning for KT

More than a third (25; 36%) of the 70 articles reporting on LMIC researchers' KT activities identified planning for KT from the initiation of research projects and throughout implementation rather than at their completion as important, but not commonly done (3, 23, 54, 65, 110, 125, 127, 130, 131, 133, 135, 137, 138, 140, 142, 144, 148, 150, 154, 158, 161, 163, 165-167). Key aspects of planning for KT that were emphasised included: budgeting for KT in research proposals and proactively applying for KT grants; integrating research capacity development opportunities within research project plans; undertaking stakeholder and policy analysis; developing a communications strategy; identifying and seizing windows of opportunity or adapting to changing policy environment; developing an advocacy strategy for topics that are politically charged with conflicting stakeholders' interests; and having a long-term view that goes beyond one piece of research.

For example, Crichton and Theobald (54) reported that researchers developed a communication strategy based on a careful analysis of the scope and limitations of the research findings (typically related to the type of research evidence), and the influence it could have on policy. Trostle et al. (139) found that in Mexico different types of research (operations research, biomedical, clinical, epidemiological and demographic research) played varied and complementary roles in policymaking processes depending on the health policy issues being tackled. Delaney-Moretlwe et al. (166) reported that clinical researchers working on HIV interventions in South Africa iteratively modified and refined their KT strategies based on ongoing reflections as they implemented them. Bramblia et al. (167) reported that researchers were more successful in influencing reproductive health policy and practice in Guatemala when their KT efforts were based on a sequence of operations research projects that built on each other rather than from one piece of research.

Generating high quality relevant research

Most (56; 80%) of the 70 articles reporting on LMIC researchers' KT activities identified the generation of high-quality research that meets target audiences' information needs as a strategy that improved credibility and uptake of research findings (23, 27, 54, 65, 66, 78,

108, 110, 111, 114, 116-118, 120, 125, 127, 131-133, 135-140, 142-145, 147, 148, 150, 152, 154, 156, 157, 159-161, 163, 165-168, 170-177). Several strategies were found to facilitate the production of high-quality relevant research by LMIC researchers including: collaborating with target audiences to plan, undertake and disseminate research; involving a wide range of stakeholders to ensure diverse perspectives are taken into consideration in the research process; aligning their research to the national research or target audiences' priorities; undertaking operations or implementation research and/or analysing local and routine service data. For example, Tulloch et al (135) reported that research recommendations from a SRH/HIV research programme in Ghana were easily incorporated into policy because they directly addressed the mandate of the target parliamentarians. Based on an evaluation of 30 case studies from a Ghanaian-Dutch research program, Kok et al. (140) found that operational research often results in continued implementation of the practice at the research site beyond the study.

Synthesising and packaging research findings

More than half (36; 51%) of the 70 articles reporting on LMIC researchers' KT activities identified synthesis and packaging of research findings as an important approach for improving access and use of research findings (3, 23, 27, 54, 65, 66, 108-111, 114, 118, 125, 130, 131, 133-140, 143, 144, 147, 148, 150, 154, 155, 157, 158, 161, 172, 173, 178). Specific synthesis and packaging products and strategies cited included: producing policy briefs, plain language summaries, newspaper articles, presentations, reports, systematic reviews, bulletins and practice guides or tools; contextualising research findings e.g., framing messages according to target audiences' values; indicating solutions, benefits, harms and cost; indicating actionable messages; using charts, cross country comparisons; complementing quantitative data with qualitative data; using local language and graphics to present research to local communities whose native language is not English; and integrating local and global evidence in synthesis.

For example, Kok et al. (140) found that target audiences in Ghana were inclined to implement research findings when researchers used action-oriented recommendations that identified how change should happen and assigned roles and responsibilities to a variety of actors. Gilson and McIntyre (138) found research recommendations on health financing reforms in South Africa had limited impact because they overlooked some key groups and developed communication products that were too long and used complex language.

Push KT activities

Nearly half (29; 41%) of the 70 articles reporting on LMIC researchers' KT activities identified push KT activities as one of the main approaches used by LMIC researchers to disseminate their research to target audiences (3, 65, 66, 108, 111, 117, 118, 125, 133-135, 137, 138, 143, 144, 147, 148, 150, 154, 155, 158, 160, 161, 165, 171, 174-176, 178, 179). The range of identified activities included: national and/or international conferences; research dissemination workshops including some that aimed to change understanding and views and stimulate action; short message service on cellular phones, email and telephone communication to policymakers; social media e.g., 'Facebook'; wind banners and posters; and media releases and the use of mass media. For example, Rashid et al. (125) reported an initiative in Bangladesh that involved researchers organising a conference and inviting a diverse group of policy actors and practitioners to expose them to different ideas and constructs of sexuality and rights, and to challenge and change their traditional understandings, views, discourse, and practices. Delaney-Moretlwe et al. (166) reported researchers in South Africa organising workshops with community members where they presented the research results in local languages and used drawings or images to illustrate important HIV concepts.

Facilitate Pull KT activities

More than a third (26; 37%) of the 70 articles reporting on LMIC researchers' KT activities identified KT activities involving LMIC researchers making their research easily accessible to target audiences (3, 66, 118, 125, 127, 130, 133, 134, 137, 138, 141, 142, 146, 148-150, 154, 159, 160, 163, 167, 175, 176). Among these, education and training of target audiences to expose them to research evidence and how to apply it in their work or novel evidence-based practices was the most common approach and done through training workshops, academic degree training and mentorship. Activities reported to a lesser extent were: researchers providing technical assistance to target audiences to support implementation of research findings or innovations; offering a rapid response service that produces and supplies evidence synthesis requested by target audiences; developing a research implementation strategy for target audiences that considers barriers, facilitators and context (institutional and political) and ways to overcome barriers.

For example, Ssengooba et al. (127) reported researchers in Uganda using mathematical modelling of the future impacts and benefits of various HIV prevention intervention options to help policymakers decide. Cornick et al. (175) reported researchers supporting governments in Botswana, Brazil, Nigeria, and Ethiopia to scale up an innovative intervention using a mentorship model. Lehmann and Gilson (148) reported efforts by researchers in South

Africa to improve demand-side KT capacity and practice by integrating their implementation research and KT experiences in postgraduate training programmes for public health and health management practitioners. El Jardali and Fadlallah (3) demonstrated that positive KT outcomes (e.g., a revised policy) of researchers' KT activities can fail to have lasting effects if an implementation plan that ensures their success and sustainability is not developed.

Exchange KT activities

Two-thirds (44; 63%) of the 70 articles reporting on LMIC researchers' KT activities identified exchange KT activities implemented by LMIC researchers or recommended as a KT approach that improves relevance, credibility and uptake of their research (3, 23, 27, 54, 65, 66, 78, 108-111, 114, 116-118, 124, 125, 127, 129, 131-135, 137-139, 142-150, 154, 156, 157, 159, 160, 163, 166, 167, 169-173, 175-177, 179). A range of exchange KT activities implemented by researchers or recommended were reported. The most cited of these were: researchers nurturing and using personal relationships, policy champions, credible individuals (either from the target audience or researchers) to communicate their research findings; and establishing and/or participating in national and regional networks, coalitions or partnerships involving a wide range of actors (researchers, policymakers, practitioners or implementing actors, professional organisations, CSOs and the public or consumers) in research priority setting, implementation and uptake activities.

Activities reported to a lesser extent were: researchers organising deliberative dialogues with a diverse range of audiences or public dialogues for citizens to share their views and experiences; communicating through and building relations and working with media; using 'immersion' (target audiences taken to a research site to encourage them to react to the issues on an emotional and experiential level); and collaborating with civil society and community representatives particularly on sensitive issues that need advocacy.

For example, Tulloch et al (135) reported using well-respected legal advocates and researchers to communicate research to parliamentarians. Lashari et al. (117) found that, in the environment sector in Pakistan, some champions of research use in government were previously researchers, and this improved the chance of research uptake. Delaney-Moretlwe et al. (166) reported that researchers in South Africa worked with two local community radio stations to develop a weekly one-hour phone-in radio show aiming to educate the public on sexual and reproductive health topics. Young et al. (129) evaluated an intervention in South Africa that aimed to nurture relationships between researchers and policymakers to increase the use of evidence in provincial health policy decisions and found that although it improved KT capacity and practice, it was time-consuming.

Integrated KT activities

Five articles (7%) of the 70 articles reporting on LMIC researchers' KT activities identified LMIC researchers' involvement in integrated KT activities including establishing or being involved in national KT platforms as important for advancing their KT capacity and practice (3, 27, 66, 155, 179). Lavis et al. (66) recommended LMIC researchers to participate in a range of partnerships involving policymakers that support KT efforts (e.g., the WHO-sponsored Evidence-Informed Policy Networks).

Evaluating KT activities

More than a third (25; 36%) of the 70 articles reporting on LMIC researchers' KT activities identified evaluation of KT activities including the process, outcomes and impacts as important, but uncommon (3, 23, 66, 108-110, 114, 125, 129, 131, 134, 138, 140, 141, 146, 149, 154, 158, 159, 162, 164, 167, 169, 171, 178, 179). Based on a review of literature in African countries, Edwards et al. (23) found that instrumental and conceptual use of research were the main outcome indicators evaluated by researchers, but that instrumental use was reported less commonly than conceptual use. Articles that reported evaluation of researchers' KT interventions used varied study designs including quantitative pre- and/or post-tests of training of target audiences (146, 164); qualitative case studies (129, 131, 134, 138, 140, 149, 154, 167, 171); and mixed methods approaches (125, 141, 158, 162).

Noted challenges researchers faced with evaluating their KT activities included: lack of know-how and guidance; the complexity of assessing KT outcomes (for instance, dealing with high staff turnover in government, attributing impact to KT interventions and identifying subtle changes like conceptual use of evidence); time and financial constraints; and use of varied approaches and indicators. Recommendations for improving researchers' evaluation of their KT activities included: planning and integrating KT monitoring and evaluation (M&E) at the start of research projects; use of policy tracing in the absence of a clear M&E plan; and use of realist-type approaches for better consideration of contextual factors.

Conducting research studies in the KT field

Only two (3%) out of the 70 articles reporting on LMIC researchers' KT activities identified the conduct of research studies in the KT field as important for advancing researchers' KT capacity and practice (3, 128). For example, El Jardali and Fadlallah (3) encouraged LMIC

researchers to undertake studies that can contribute to a better understanding of the various elements that drive the KT process.

Factors underpinning researchers' KT practice

Relationship and trust building

More than a third (28; 40%) of the 70 articles reporting on LMIC researchers' KT activities identified relationship and trust building as a facilitator of researchers' KT capacity and practice (23, 27, 54, 65, 116, 128-132, 135, 137, 139, 142, 147, 148, 149, 152, 154, 161, 167, 171, 174-176, 179, 180). Relationship and trust building was cited as important for various interrelated reasons including: to build the credibility of researchers among target audiences; improve researchers' understanding of the policy making processes; improve target users' access to needed evidence; and clarify expectations and motivations of each group.

However, high turnover of target audiences, particularly government officials, and researchers moving on to other activities with no succession plan were cited as factors that disrupt relationships and trust between researchers and target audiences (23, 66, 114, 126, 132, 138, 143, 149, 160, 167, 174, 179). Forging partnerships at institutional level rather than at individual level was suggested as one approach for overcoming this challenge. Researchers' concerns about intellectual property rights (i.e., ownership of an idea or innovation if not yet patented) and maintaining their independence were identified as factors that resulted in their mistrust of and reluctance to nurture and maintain close relationships with target audiences, particularly policymakers (65, 114, 124, 126, 128, 131, 146).

For example, Oronje et al. (155) found that when trust was built between researchers in Kenya and journalists, journalists became proactive in consulting researchers for evidence and technical advice on various issues that they were working on. Tulloch et al (135) reported that policymakers in Ghana were more receptive to research findings collected by facility level health staff and trusted evidence presented by researchers with whom they had existing relationships. Majdzadeh et al. (124) found that in some instances policymakers in Iran insisted that they appear as co-investigators on research projects before approving the research, which deterred researchers from collaborating with them.

Targeted and tailored communication and dissemination

About a third (22; 31%) of the 70 articles reporting on LMIC researchers' KT activities identified targeted and tailored research communication and dissemination as a facilitator of uptake of LMIC researchers' findings (23, 65, 111, 116, 130, 133-140, 142, 143, 147, 150,

160, 167, 175, 176, 178). Target audiences' preferred information sources and their values on issues were noted as important factors to consider. For example, Kok et al. (140) reported that their programme in Ghana adapted research products and dissemination channels according to their target audiences' preferences.

Timeliness of delivery of research findings to target audience

Nearly a quarter (15; 21%) of the 70 articles reporting on LMIC researchers' KT activities cited researchers' delivery of research findings to target audience at the time they need it as important for improving uptake of their research findings (23, 65, 111, 116, 126, 131-133, 135, 138-140, 143, 144, 146, 150, 172). Use of communication information technology was cited as a strategy for improving timely access to research findings by target audiences. For example, Stringer 2013 suggested that researchers could use modern technology such as web-based tools and databases. Kok et al. (140) reported that some research findings from a programme in Ghana were used by policymakers with no efforts made by researchers to promote their uptake because the timing of their release concided with the information needs of the policymakers.

Long-term investment of time and money

More than a third (24; 34%) of the 70 articles reporting on LMIC researchers' KT activities identified long-term investment of time and money by researchers as essential for improving improving research uptake (23, 54, 65, 110, 114, 126, 128-130, 132, 133, 135, 136, 138, 141, 146, 147-149, 155, 161, 165, 167, 175, 178). KT was cited as a time consuming and expensive exercise, which was exacerbated by the increasing diversity and complexity of actors involved in policy and practice spaces (54, 126, 133, 135). Yet LMIC researchers were found to lack or have little time to implement KT activities due to their high teaching loads and lack of budgets for KT activities due in part to their poor budgeting practices.

For example, Jessani et al. (65) reported that researchers did not have proper facilitation mechanisms for organising forums for interacting with target audiences such as transport, accommodation, venues, materials, equipment and a moderator. Consequently, they often placed the responsibility for organising such activities on the target audience, which may not occur or are limited in scope. Stringer et al. (133) demonstrated and recommended use of modern technology such as web-based tools and databases by researchers in environmental research to make research accessible to policymakers in a timely manner.

2.3.4 Meso level factors

Of the 61 articles that discussed meso level factors, most (n=53; 87%) discussed the KT capacity and practice of research institutions and half (n=34; 56%) noted the influence of research and KT institutions, networks, and professionals that research institutions align, work, or compete with. These are discussed in more detail below sequentially.

KT capacity and practice of LMIC research institutions, teams or groups

The 53 articles that discussed meso level factors at the research institution level (i.e., KT capacity and practice of research institutions) identified five important factors namely: 1) leadership for KT; 2) support for KT in strategic and operational policies; 3) resources for KT including financial, technical and infrastructure; 4) KT capacity development; and 5) promotion and evaluation of KT. Some articles reported low levels of institutional KT capacity and practice (66, 108-110, 114-116, 120, 169).

The articles focused more on mechanisms in research institutions that facilitate researchers' KT practice (credibility, partnerships, and demand for research), and less on more structural issues such as KT policies, resources, and capacity development. Furthermore, none of the articles described institutional KT capacity development interventions. Indeed, Malla et al. (27) noted that existing KT capacity strengthening efforts targeting researchers mainly focused on the individual (micro) level not the institutional (meso) level. Kalbarczyk et al (128) also noted little evidence on how to conduct institutional KT capacity building. Important KT capacity and practice factors identified at research institutions are discussed in more detail below.

Leadership for KT

Only one article (1; 2%) of the 53 articles reporting KT capacity and practice of research institutions, teams or groups identified leadership for KT as important for facilitating researchers' KT capacity and practice (128). Leadership for KT refers to leaders at all levels of research institutions championing KT including modelling and encouraging research staff and students to engage in the practice and ensuring it is prioritised and well-resourced However, the study did not present empirical evidence on this.

Support for KT in institutional strategic and operational policies

Nearly half (24; 45%) of the 53 articles reporting KT capacity and practice of research institutions, teams or groups identified institutional strategic and operational policies emphasising KT as important for facilitating researchers' KT capacity and practice.

Missions and strategic plans of research institutions were the main institutional strategic policies discussed (66, 124, 128, 132, 153, 169). For example, Crichton and Theobald (54) reported that researchers' KT approaches were influenced by whether their institutions had mandates in academia, policy analysis, advocacy, or service delivery. Kalbarczyk et al. (128) found a misalignment between university missions and strategic plans (having KT objectives) and incentive systems (not rewarding KT).

Three groups of institutional operational policies were also identified as important in fostering researchers' KT capacity and practice. The most cited of these were tenure and promotion policies emphasising assessment of researchers' KT practice and time for KT (27, 108-111, 114, 116, 118, 124, 147, 156, 157, 159, 169). For example, Maleki et al. (114) reported that criteria for evaluating researchers' KT practice were absent in most of the institutes studied. Kalbarczyk et al. (128) found that LMIC university incentive systems rewarded researchers for securing large scale, long-term funding from external sources, and publishing in high impact scientific journals and recommended their adjustments to include co-production of research and KT.

To a lesser extent, the existence of KT guidelines including for research proposals, research reports and target audience tailored products were identified as important for supporting researchers' KT practice (108-110, 114, 115, 124, 150). Intellectual property rights, which safeguard ownership of ideas and innovations by the researcher when disseminated to the public also emerged as critical (108-110, 114, 115, 117, 124, 143, 150, 161). For example, Ayah et al. (115) 2014 reported that only one out of seven schools of public health that they surveyed in Eastern Africa had a clear KT strategy. The more common approaches for disseminating research articulated by research institutions were scientific conferences and workshops. Syed et al. (150) reported the development and testing of a framework for assessing and strengthening the KT components of research proposals with researchers from research consortia based in Bangladesh, India, China, Afghanistan, Uganda, and Nigeria, and recommended its wide application.

Resources for KT (financial, technical and infrastructure)

Nearly half (25; 47%) of the 53 articles reporting KT capacity and practice of research institutions, teams or groups identified the allocation or presence of financial, technical and infrastructure for KT as essential for facilitating researchers' KT capacity and practice. The most discussed institutional resource for KT was the existence of KT offices and staff with KT expertise.

A few articles discussed institutional funding for KT (23, 66, 108-110, 114, 115, 128, 155, 159). Inclusion of a section in grant proposals for KT and their evaluation during the grants review process was suggested as one way that research institutions could ensure that researchers had budgets for KT activities. Allocating funding for hiring and retaining KT staff and champions was also recommended. For example, Maleki et al. (114) reported that almost half of the eight medical and health research institutions based in eight countries in Eastern Mediterranean Region did not allocate a budget for KT activities. Gholami et al. (110) found that while costs for publishing an article in a scientific journal or attending conferences were included in project budgets of nine medical science universities in Iran, no costs for KT activities were included.

Several articles discussed research institutions having KT offices and staff with KT expertise including KT champions and academics holding posts with KT responsibilities (27, 54, 65, 66, 108-111, 114, 128, 130, 147, 153, 155, 156, 165, 167). For example, Gholami et al. (110) found that the nine medical science universities they assessed in Iran did not have a knowledge or technology translation office. Yousefi et al. (156) survey of 131 participants in Iranian research institutions including academics and their administrative and technical support staff identified inadequate capacity among information specialists for supporting researchers to produce systematic reviews. On the other hand, Oronje et al. (155) demonstrated the range of media engagement support that KT staff of a Kenyan research institution provided to its researchers.

A few articles examined the existence of scientific journal and grey literature databases at research institutions responsibilities (66, 128, 141, 153, 156). For example, Bennett et al. (153) reported that lack of access to scientific journal and grey literature databases was a barrier to the production of systematic reviews by researchers in Jamaica. On the other hand, Lavis et al. (66) found that more than 80% of the 308 health researchers from ten LMIC countries they surveyed had access to national, regional and international scientific journals.

Several articles identified research institutions having an up-to-date website and electronic research repository that profiles their faculty areas of specialty and skills and publish theirs and/or other organisations' research priorities as important for supporting researchers' KT capacity and practice (27, 65, 66, 108-111, 114, 128). For example, Maleki et al. (114) found that most institutions had websites, but they lacked databases that published their own or other organizations' priorities and in cases where these existed, they were not up to date. On the other hand, Gholami et al. (110) reported that a majority of the nine medical science

universities they assessed in Iran published their research priorities on the institutions' websites.

A few articles identified research institutions having infrastructure including for preparing and displaying KT contents as important for supporting researchers' KT capacity and practice (108-110, 114); having a personal computer (PC) and internet connectivity (23, 66, 169) and research analysis software (27). For example, Maleki et al. (114) found that almost half of the eight medical and research institutions in eight countries in Eastern Mediterranean Region lacked infrastructure for preparing and displaying KT content and among the institutions that had it, the extent to which it was used was unclear. Block and Mills (169) reported that a greater proportion of research institutions in Africa report having insufficient personal computers and internet connectivity compared to other LMIC regions. Lavis et al. (66) found that, among the 308 health researchers from ten LMIC countries they surveyed, having a personal computer with reliable internet connectivity facilitated researchers' KT practice.

KT capacity development

More than a third (19; 36%) of the 53 articles reporting KT capacity and practice of research institutions, teams or groups identified three institutional approaches used or recommended for strengthening researchers KT capacity and practice. The most cited of the approaches was integrating KT modules in research degree training including KT techniques, conducting systematic reviews and operations research, and aligning content to government needs and priorities (3, 27, 65, 108-110, 114, 128, 130, 144, 153, 156, 159, 161-163, 165).

The other approaches discussed were: mentorship programmes for strengthening operations research and KT capacity (65, 128, 130, 136, 153, 161); and institutional KT training and support of KT staff and other technical staff such as knowledge brokers, reviewers of journal articles and research project proposals (including ethics committees), and information scientists (specialists who support systematic review teams) (27, 65, 128, 130, 153, 156, 161).

For example, Maleki et al. (114) found that only one of the eight medical and health research institutions they assessed in Eastern Mediterranean Region countries had included KT among the topics taught in research methodology courses. Bennett et al. (153) reported introducing structured university courses and public lectures on systematic reviews to address the challenge of lacking formal training of researchers on this topic in Jamaica. Theobald and Nhlema-Simwaka (161) described a mentoring strategy they used in Malawi

that involved coupling more experienced and more junior staff in operations research so that there was a process of skill sharing and exchange including interacting with and presenting findings to policymakers. Yousefi et al. (156) recommended that systematic review training courses should be provided not only to researchers, but also journal editors and information specialists based on their survey of academics and their administrative and technical staff in Iran.

Promotion and evaluation of KT

Majority (49; 92%) of the 53 articles reporting KT capacity and practice of research institutions, teams or groups identified the presence of institutional mechanisms for promoting and evaluating KT practice as important for supporting researchers' KT capacity and practice. As noted in the summary of this section, research institutions having in place mechanisms for interaction between researchers and target audiences (KT exchange mechanisms) was the most discussed issue.

Credibility of the research institution

Nearly half (23; 47%) of the 49 articles discussing institutional mechanisms for promoting and evaluating KT practice cited credibility of the research institution as an important attribute that facilitates researchers' KT practice (23, 27, 54, 66, 108-110, 114, 124, 125, 128, 129, 132, 134-136, 144, 149, 155, 159, 161, 169, 176, 177, 179). Long-standing well-respected universities that have long-term relationships with government, funders, non-profit organizations, or other academic institutions were noted to stand a better chance of being taken seriously by target audience institutions (usually in reference to government institutions). The level of embeddedness of a research institution (e.g., whether it is housed in government or independent) was also noted as an important characteristic with those most embedded having an advantage. However, a tension between embeddedness of the research institution and maintaining autonomy was noted. Institutions with alumni in government positions and key global positions were cited as advantageous.

For example, based on a review of literature on LMIC health policy systems research institutions, Koon et al. (177) found that policy institutions were more likely to use research evidence supplied by an embedded research institution than those less connected to them. Corluka et al. (132) reported that health researchers in a rural part of Argentina questioned the quality of research (in terms of bias) produced by an embedded research institution involved in defining national research priorities and translating research to policy and identified other institutions they felt produced rigorous unbiased research.

Partnerships between research institutions and/or departments

Nearly half (n=22; 45%) of the 49 articles discussing institutional mechanisms for promoting and evaluating KT practice identified partnerships between research institutions and/or departments from varied disciplines to strengthen LMIC research capacity and generate high quality multidisciplinary research as important for supporting researchers' KT capacity and practice (3, 27, 54, 65, 109, 117, 127, 128, 142, 144, 147-149, 151, 153, 155, 159, 160, 163, 165, 167, 175, 176). Partnerships between LMIC and HIC research institutions were noted as a common practice, but susceptible to power imbalance, which sometimes failed to achieve the intended purpose of strengthening LMIC researchers' research capacity. Developing mutually beneficial partnerships between LMIC and HIC research institutions and between LMIC-based research institutions (i.e., South-South collaboration) were recommended.

For example, Bennett et al. (153) reported that a Jamaican research institution collaborated with the Cochrane Centre to provide access to more resourced libraries, and support and guidance for systematic reviews. Ssengooba et al. (127) reported a collaboration between an African research institution based in Uganda and a HIC research institution to generate high quality operations research. Li et al. (144) found that research partnerships tended to be between African and HIC institutions and recommended partnerships between local and regional institutions, noting that South Africa was well placed to catalyse this given its strong research institutions.

Facilitate pull KT mechanisms

About half (n=24; 49%) of the 49 articles discussing institutional mechanisms for promoting and evaluating KT practice identified research institutions having structures and programmes that enable target audiences to access and use research (facilitate pull KT) as important for supporting researchers' KT capacity and practice (3, 65, 66, 108-111, 114, 116, 126, 128, 129, 136, 138, 141, 149, 153, 159, 160, 163, 167, 175, 176, 178). The most cited institutional pull mechanism or programme was training target audiences (including media) to improve their capacity to use research evidence. Operating a rapid response service that addressed urgent evidence needs of target audiences and 'pairing' of policymakers with academics were cited to a lesser extent.

For example, Maleki et al. (114) found that researchers predominantly conducted primary research and were much less involved in producing products that facilitate evidence-informed decision-making such as systematic reviews and guidelines because they perceived them to be time-consuming. Valinejadi et al. (108) reported that a few of the 14

diabetes research centres they assessed in Iran offered regular education programmes on research use to target audiences from outside. Mijumbi-Deve (149) evaluated a rapid response service based at a university in Uganda, which responds to urgent requests for evidence from health policy and practice decisions makers and identified several key success factors including: getting buy-in from the Ministry of Health and their input into its design and implementation; ongoing marketing of the service; follow-up interviews with users of the service; sustainable funding to run the service including full-time staff salaries; and staff maintaining a balance between institutional and personal relationships.

Exchange KT mechanisms

More than three-quarters (37; 76%) of the 49 articles discussing institutional mechanisms for promoting and evaluating KT practice identified research institutions having exchange KT mechanisms as important for supporting researchers' KT capacity and practice (23, 27, 54, 65, 66, 108-111, 114-117, 120, 124, 127, 129, 131, 134-136, 142-144, 147-149, 151, 155, 159-161, 175-177, 179). A range of institutional exchange activities were cited including: having formal institutional research and KT partnership, collaborations or networks with target audience institutions including media, CSOs and knowledge brokering institutions (e.g., signing memorandum of agreement and commissioned research); having dedicated placements for research users in academic governing bodies; involving policymakers with academic qualifications as guest lecturers; and rotating researchers through government departments including student placements and secondments. For example, Majdzadeh et al. (124) found that integration of medical research institutions into the Iran health ministry to promote evidence-informed decision-making had an impact only at the individual level (among those with an interest) because the partnerships lacked a well-defined governance mechanism.

Evaluating KT efforts at the institutional level

A quarter (n=13; 25%) of the 49 articles discussing institutional mechanisms for promoting and evaluating KT practice identified research institutions evaluating KT efforts at the institutional level as important for fostering researchers' KT practice but occurring minimally due to lack of investments by funders and institutions on this (66, 108-110, 114, 120, 128, 155, 159, 160, 167, 169).

KT capacity and practice of research and KT networks, professionals and institutions in the evidence ecosystem

The 34 articles that discussed networks, professionals and institutions in the evidence ecosystem that align, work, or compete with research institutions and shape researchers' KT

capacity and practice identified four groups including: national and international research networks; knowledge brokers; other knowledge producers; and institutions that determine and regulate discipline norms and research practice. These are described in more detail below.

National and international research networks

Nearly half (n=14; 41%) of the 34 articles discussing the role of networks, professionals and institutions in the evidence ecosystem reported that national and international research networks facilitate researchers' KT capacity and practice by implementing and/or funding various KT activities ranging from disseminating research outputs of their affiliates to helping spearhead the establishment of national KT platforms in partnership with governments and international organisations (108, 114, 120, 131, 132, 134, 135, 137, 139, 142, 160, 171, 177, 179). For example, Valinejadi et al. (108) reported that the 14 diabetes research institutions they assessed in Iran did not have a clear priority setting process, but in some instances their researchers referred to the priorities set by a diabetes research network to inform their research. Sriram et al. (179) reported the active role of a health policy systems research network in India in the formation of the national KT platform in India. El Jardali et al. (120) reported that a third of the 575 research institutions they assessed in 22 Eastern Mediterranean Region countries frequently used research networks to disseminate research and one third never used the approach.

Knowledge brokers

Half (n=18; 53%) of the 34 articles discussing the role of networks, professionals and institutions in the evidence ecosystem identified the importance of researchers working with knowledge brokers (KBs) (e.g., institutions like Cochrane Collaboration and individuals specialising in KT) to link them to target audiences, support them with tools and guidelines, strengthen their KT capacity and work with them to set-up KT platforms (e.g., KT and systematic review training) (3, 27, 54, 65, 136, 137, 142, 144, 150, 153, 157, 160, 164, 172, 173, 175, 176, 178).

However, some capacity constraints and needs among KBs that were hindering researchers' KT capacity and practice were also cited. One was the jargon used by KT scholars to describe KT, which alienates some researchers to think it is a practice outside their professional role. Yet some activities that are core parts of their research constitute KT Crichton and Theobald (54). The lack of awareness, knowledge, and clarity of KT techniques for LMIC contexts was raised as a gap in the KT field and attributed to lack of systems for monitoring and evaluating KT processes in these contexts (3, 27). A need for continuous

development of theories to understand and improve the science of KT including research on the effectiveness of different KT strategies and tools and the role of context was acknowledged (3). Similarly, a need for capacity development of KT practitioners to strengthen the support they provide to researchers and at research institutions was emphasised (144).

Other knowledge producers

A few (n=6; 18%) of the 34 articles discussing the role of networks, professionals and institutions in the evidence ecosystem found that the type of relationship between one research institution and policy institution compared to that of other research institutions influenced their power to influence uptake of research in policymaking processes (27, 111, 139, 144, 150, 177). In other words, a research institution with a formal memorandum of understanding or housed in a policy institution has more power to influence uptake of research in decision of the policy institutions than others that do not have such arrangements. For example, Koon et al. (177) found that LMIC decisionmakers' use of research depended on the reputation of research institutions based on their relative embeddedness compared to other institutions, and the relevance and quality of research they produced. Trostle et al. (139) found that the small size of the research community in Mexico enhanced their KT practice by increasing the interconnectedness between researchers and policymakers.

Institutions that determine and regulate discipline norms and research practice

A quarter (n=9; 26%) of the 34 articles discussing the role of networks, professionals and institutions in the evidence ecosystem identified several research practice and discipline norms as barriers to researchers' KT capacity and practice including: journal intellectual property regulations that limit when researchers can disseminate their work to the wider public; undervaluing of qualitative research among some research disciplines and governance entities (e.g., research ethics committees); and use of different terms to describe research findings (e.g., correlation versus influence) across research disciplines, which was noted to be confusing to target audiences (54, 120, 131, 132, 139, 144, 148, 156, 161). For example, Goyet et al. (131) reported that health researchers in Cambodia could not release preliminary and incomplete findings to inform a policy review process because this did not align to their scientific methodology and ethics. Theobald and Nhlema-Simwaka (161) reported strategies that qualitative researchers in Malawi used to address negative perceptions about the rigour and generalisability of qualitative research among both researchers from other disciplines and policymakers to improve its uptake. The study also

recommended strengthening the capacity of research ethics committees for appraising qualitative studies by requiring them to have social science experts.

2.3.5 Macro level factors

Three quarters (55; 75%) of the articles reported three macro level factors that are important for supporting researchers' KT capacity and practice, the most cited one being research and KT funders. These are described in more detail below.

Research and KT funders

Majority (52; 95%) of the 55 articles that discussed research and KT funders identified research and KT funders as critical for supporting researchers' KT capacity and practice. Two key points were reported; that, LMIC researchers rely on funding for research and KT from international funders, and that the funding allocated for KT by both international funders and LMIC governments is inadequate. These issues are discussed in more detail below.

Over-reliance on funding for research and KT from international funders

About two-thirds (34; 65%) of the 55 articles that discussed research and KT funders reported that LMIC researchers were over-reliant on international funding for research because LMIC governments allocate little often negligible amounts to research. This, in turn, facilitated and hindered their KT capacity and practice (23, 54, 66, 78, 111, 116, 126, 127, 131-140, 142, 144, 145, 151, 157, 159, 160, 166, 167, 169, 174-177, 179).

International funders were found to have both a positive and negative influence on LMIC researchers' KT capacity and practice. International funders positively influenced LMIC researchers' KT capacity and practice by mandating and funding KT activities, developing global norms to guide KT activities and/or implementing KT activities, including research priority setting, defining and performing research and evidence synthesis, packaging and dissemination of research, and providing technical support for policy development. For example, El-Jardali et al. (157) described WHO's global programme, which supports the setting up of KT platforms at regional and country levels in Africa, the Americas, and Asia, to facilitate the process of translating research evidence into policy and action.

On the other hand, international funders were noted to negatively affect LMIC researchers' KT capacity and practice in various ways including by: funding and promoting uptake of research on issues of interest to them, which may not align with the research needs of LMIC target audiences (e.g., institutional research capacity strengthening to address the shortage of local academics or low research capacity, operations or health systems research or

feasibility studies); and disproportionately funding northern researchers to undertake LMIC research at the expense of local researchers, which undermines the relevance of the research and the building of the LMIC research capacity. In addition, international funders that influence transnational policy diffusion such as the Global Fund, PEPFAR and WHO were noted to sometimes undermine local researchers' KT efforts inadvertently by diminishing the value of local evidence (not endorsed by WHO) and LMIC target audiences' perspectives and needs. For example, Tesfazghi et al. (151) reported that locally generated malaria prevention research in Burkina Faso was perceived to have limited impact on policy and donors would not fund its implementation until it was approved by the WHO.

Funders allocate inadequate or no funding for KT and research capacity development

Half (29; 56%) of the 55 articles that discussed research and KT funders found that government and international funders allocate inadequate or no funding for KT including multidisciplinary research, which hindered researchers' KT capacity and practice (3, 54, 65, 110, 111, 114, 116, 118, 125, 126, 132, 136, 138, 144, 145, 147, 153, 155, 156, 159, 160, 163, 165, 167, 179). Several ways through which funders can support researchers' KT capacity and practice were suggested including long-term funding as opposed to *ad hoc* short-term funding focused on individual projects, increasing investments for strengthening the research capacity of LMIC academic institutions, and scaling up innovations proven to be effective. Beyond their investments, looking inward, the studies recommended that funders incorporate criteria in their grants mandating researchers' KT practice and strengthen the capacity of their staff to commission, access, interpret, and use research to inform their investment decisions as well as the global standards and norms that they influence.

Nabyonga-Orem et al. (145) offered an alternative perspective about the inadequate funding challenge based on their experience in Uganda. They reported that international funders may be hindered from effectively supporting LMIC researchers' KT capacity and practice when their countries lack institutionalised platforms for setting research agendas and engaging in KT steered by strong government leadership.

Government funding for research and KT

Among the 55 articles that discussed research and KT funders, a few studies (11; 21%) reported that LMIC governments facilitated researchers' KT capacity and practice by funding their research and KT efforts because the evidence generated is better aligned to local or national priorities (66, 108, 114, 124, 136, 138, 143, 144, 150, 153, 174, 175, 179). Little or no investments in research and KT by LMIC governments was attributed to resource

constraints (150, 153, 175). In cases where some LMIC governments had research and KT grant schemes, a few implementation challenges were identified including: the complicated government grants system cited as a barrier to researchers accessing it (114); lack of researchers' capacity to apply for the funding (169); and lack of follow-up to hold researchers that receive national research funding accountable to addressing national research priorities (132).

KT capacity and practice in the national policy environment

About half (n=29; 53%) of the articles on macro level factors that shape researchers' KT capacity and practice cited the importance of a supportive national policy environment. Two ways in which the national policy environment is important were identified, the most cited being the national laws, policies, mechanisms and incentives that promote and facilitate KT. The factors are discussed in more detail below.

National KT laws, policies and mechanisms

Majority (n=26; 90%) of the 29 articles discussing the influence of the national policy environment identified national laws, policies, and mechanisms for promoting KT and adherence to them as important for researchers' KT capacity and practice (3, 23, 27, 54, 65, 66, 78, 110, 111, 114, 116, 120, 124, 126-128, 131-140, 142-145, 151, 156, 157, 159-161, 166, 167, 169, 174-177, 179). The range of laws, policies, and mechanisms included laws integrating research and policy institutions, and knowledge translation platforms (KTPs) for facilitating interaction between research and policy institutions. One benefit of having national KT laws, policies, and mechanisms was their protection of relations between researchers and policymakers from the effect of high staff turnover in government. Having national KT laws and policies, and mechanisms alone was found not to guarantee increased interaction of researchers and target audiences, and KT practice. The effectiveness of KT laws and policies, and mechanisms could be enhanced in various ways including: providing incentives to researchers such as national prizes and awards; having well-established modes of communicating clearly between actors (e.g., policy briefs, updates, emails, digestible reports, etc.); providing access to government's central research repositories; and demand-side KT capacity and practice.

A few studies found that researchers did not think or know that their governments had laws, policies and mechanisms for promoting researchers' KT practice. Furthermore, where the KT laws, policies and mechanisms existed, they were said to be ineffective (66, 110, 118, 124). For example, Majdzadeh et al. (124) found that the Iranian government's integration of medical schools into the Ministry of Health failed to achieve institutional culture change due

to insufficient policy and regulatory guidance and incentives. Maleki et al. (114) found that only one of eight countries presented prizes to research projects, which generated applicable results as an incentive to motivate KT practice.

Intellectual freedom

Among the 29 articles discussing the influence of the national policy environment, a few articles (n=5; 17%) highlighted the importance of LMICs having regulations and practices that promote intellectual freedom for researchers' KT capacity and practice (132, 137, 138, 142, 144). For example, Li et al. (144) found that regulations that promote transparency, accountability, citizen engagement, openness, deliberation, and contestability improved the quality and credibility of evidence-informed decisions. Corluka et al. (132) reported that government laws and dictatorships in Argentina had limited the development of research institutions and their intellectual engagement with policymakers.

Industry interests and investments in R&D

Similarly, among the 29 articles discussing the influence of the national policy environment, a few (n=6; 21%) articles cited the profit driven interest of industry as a barrier to researchers' KT practice because the situation made it difficult for researchers to secure partnerships for the development of innovations. In events where researchers work with industry, they risk being bound to lobby for industry interests (117, 124, 131, 139, 142, 143). For example, Goyet 2014 reported that pharmaceutical companies in Cambodia potentially pressured researchers and experts that they worked with to support a product that they developed without consideration of competing options in the market.

2.4 DISCUSSION AND IMPLICATIONS OF THE FINDINGS

I conducted a systematised review of English-language published literature on LMIC researchers' KT capacity and practice to: understand how and what aspects of LMIC researchers' KT capacity and practice have been explored in the literature; synthesise the factors that shape LMIC researchers' KT capacity and practice at micro, meso and macro levels reported in the literature; and inform development of an analytical framework for the factors that shape LMIC researchers' KT capacity and practice at micro, meso and macro levels. A discussion of the review findings in the context of the wider KT evidence base, and presentation of the analytical frameworks follows.

2.4.1 How and what aspects of LMIC researchers' KT capacity and practice have been explored in the literature

The review identified 73 articles, most (63%) primary research studies exploring the KT capacity and practice of health researchers (94%) involved in applied research (77%) in sub-Sahara Africa (65%). Most (n=54; 74%) of the articles focused on the researcher and/or research institution or their KT strategy as the unit of analysis. The rest of the articles (26%) explored policymaking processes including researchers' role, activities and the factors that shape their KT capacity and practice. A majority of the articles discussed the factors that shape LMIC researchers' KT capacity and practice at either two or all three levels of the systems perspective framework (micro, meso, macro). However, none of the articles explored how the interaction of the factors at the three levels in different contexts shapes researchers' KT capacity and practice. The most common study design was some form of a qualitative study (42%) applying a wide range of theoretical frameworks with the Majdzadeh KT cycle being the most referenced one (n=7; 11%). A majority (93%) of the articles had a quality rating of 50% and higher.

2.4.2 The factors that shape LMIC researchers' KT capacity and practice at micro, meso and macro levels reported in the literature

The review found that LMIC researchers' KT capacity and practice at micro and/or meso and/or macro levels varied and was reported as insufficient.

The review identified numerous factors that shape LMIC researchers' KT capacity and practice at micro, meso and macro levels. At the micro level, certain attributes among LMIC researchers foster their KT capacity and practice most notably their credibility, which is judged by their research, publishing, and KT practice track record. Researchers who establish credibility among target audiences also tend to be high ranking within their institutions, renowned among their peers, and hold a PhD degree. Credibility of a researcher is bolstered if they received their training abroad and have global recognition. LMIC researchers were found to possess divergent attitudes about KT due to incentive systems that prioritise research and scientific publications, disciplinary alignment, professional identity and personal outlook. Knowledge and skills for navigating policymaking processes and communication research were the most cited as essential for researchers' KT capacity and practice, but deficient among them. There was minimal evidence on strategies for improving researchers' KT capacity and practice and their effectiveness. Researchers' KT practice is reported as sub-optimal and varies by discipline and sub-discipline (e.g., health systems versus medical research) and research context (e.g., different institutions or countries).

At the meso level, the review generated little evidence on essential structural capacity and practice at research institutions such as leadership, policies, and financial and technical resources. Most of the evidence identified mechanisms by which research institutions foster researchers' KT capacity and practice including by establishing their credibility and partnerships, and increasing demand for research among target audiences. Research networks and knowledge brokers were identified as critical for strengthening links between researchers and target audiences and their KT capacity.

Finally, at the macro level, funding has the greatest influence on researchers' KT capacity and practice both positively when substantive, long-term and aligned to national research priorities or supported by government funding, and negatively when inadequate or focused on donor interests. A great need for increased investments in LMICs academic institutions to increase the national research workforce and improve their credibility among target audience and ultimately their KT capacity and practice. To a lesser extent, supportive national policy contexts including structures for collating, synthesising and effectively communicating research and demand-side KT capacity strengthening were also identified as important for facilitating researchers' KT capacity and practice but often lacking or poorly executed.

2.4.3 Comparison with the wider evidence base

There is great alignment between the evidence presented in this review with that in the wider evidence with some few differences. Consistent with the findings of this review, the wider evidence base has found little focus of studies on KT capacity and practice among basic researchers (63, 68). Since I did not systematically review the wider literature, I am unable to comment on the balance of types of study designs used and how they compare to the LMIC evidence-base. Nevertheless, among the papers I found on this topic, scholars used both cross-sectional quantitative surveys and qualitative studies (typically case studies). Studies in the wider evidence base have also found variations in researchers' KT capacity and practice at micro and/or meso and/or macro levels (57, 89, 101, 180). Similarly, at the micro level, variations by discipline and sub-discipline and also by national context have been noted (57, 89, 101).

Majority of the micro, meso and macro level factors that shape researchers' KT capacity and practice identified in this review feature in the wider KT evidence base (1, 9, 55, 59, 62, 63, 68, 75, 101, 102, 106). In this review, inadequate research capacity (i.e., poor research, publishing and grant writing skills) were identified as an important barrier to LMIC researchers' KT capacity and practice because they diminished the credibility of the

researchers. This challenge was attributed to lack of access to quality academic degree training of researchers in the region and likely explains why being trained overseas and a global researcher was found to foster the credibility of researchers and thus their KT capacity and practice. This was not identified as a challenge in the existing literature.

Indeed, inadequate investment in research and KT, and in research capacity development by national governments and international funders was cited as a major constraint to LMIC researchers' KT capacity and practice. Accessing research funding may be a challenge in HIC settings, but the problem is much more serious in LMIC settings (136). Consequently, LMIC researchers rely on international funders for research and KT funding and compete with their HIC counterparts for it. However, international funding is typically product or disease focused and rarely institutional focused. Furthermore, one study found that international funders have tended to award grants to HIC researchers to lead LMIC research, which contributes to LMIC underdeveloped research capacity. This was attributed to LMIC researchers' inadequate research capacity (27). Even in projects that have deliberately tried to promote equal partnerships between local and global researchers, an imbalance in the roles allocated to local versus international researchers can persist resulting in little improvement, if any, on LMIC researchers' capacity (27, 181).

Another finding in this review that may be unique to the LMIC context was the need for LMIC researchers to forge more formal research and KT partnerships with NGOs because of their strong relationships with communities and policymakers (27). Also, while the size of the national research workforce was cited as challenging, it was simultaneously noted to increase access to government decisionmakers (132).

2.4.4 Gaps in the LMIC KT evidence base

One of the main gaps in the evidence base is minimal focus on basic researchers' KT capacity and practice particularly at meso and macro levels, but also at micro levels as it pertains to relevant KT knowledge and skills. The evidence from the review is strongest for the micro level factors (researchers KT capacity and practice) given that most of the studies explored the KT capacity and practice of individuals. The evidence is weakest on the role of networks, professionals, and institutions in the ecosystem that researchers and their institutions may align, work, or compete with. The evidence on institutions and the macro level is mixed in terms of strength but is weakest on factors that may have a more sustainable effect on researchers' KT capacity and practice if addressed e.g., integrating KT in tenure and promotion policies, researchers' degree training and national policy environments.

More relevant to this dissertation, none of the studies reviewed explored researchers' KT capacity and practice using a systems perspective i.e., exploring the interaction of KT capacity and practice factors at the three levels – micro, meso and macro. For instance, the review found that KT capacity and practice at micro, macro and meso levels varies and is sub-optimal. The factors at each of the three levels that facilitate or inhibit researchers' KT capacity and practice are well established e.g., researchers' discipline at the micro level, the need for tenure and promotion policies that promote KT and more sustainable funding for KT etc. However, documented variations in KT capacity and practice among similar types of researchers based in different research contexts (e.g., as demonstrated in Lavis et al. (66) and Valinejadi et al. (108) suggests that micro, meso and macro level factors may manifest and interact in varied ways. Yet none of the studies in this review explored how the range of micro, meso and macro level factors manifest and interact in different research contexts resulting in variations in researchers' KT capacity and practice. I also did not find studies in the wider KT evidence base that analysed researchers' KT capacity and practice from this perspective.

Such an analysis would provide deeper insights into why and how researchers' KT capacity and practice is facilitated or inhibited in different research contexts including common and unique issues. Jessani (65) similarly noted that KT capacity and practice is complex and unique and there is a need for "more context-specific studies that might reveal parallel sets of necessary and/or sufficient conditions that are more universal in nature" (65 p. 246).

2.5 AN ANALYTICAL FRAMEWORK FOR THE FACTORS THAT SHAPE LMIC RESEARCHERS' KT CAPACITY AND PRACTICE AT MICRO, MESO AND MACRO LEVELS

This review identified important micro, meso and macro levels factors that I used to construct an analytical framework for exploring how these manifest and interact across and within different research contexts (institution and/or country and/or region) resulting in variations in researchers' KT capacity and practice. Therefore, the framework takes into consideration evidence from both the LMIC (drawn from the review) and HIC (from the discussion) contexts. As noted in the review methodology section, the review identified factors in each of the systems perspective levels separately not how they interact and emerging properties. The latter part is the focus of my research. The analytical framework is presented as Table 3.

The analytical framework presents the main factors identified as important for researchers' KT capacity and practice in this review of LMIC evidence. The factors are organised using the systems perspective framework, i.e., micro (the individual level), meso (the research institution and other knowledge producing or governance institutions), and macro levels (the national research and KT regulation, structures, mechanisms and funding). As noted in the literature review methodology section, the literature review focused on identifying factors in each of the systems perspective levels separately not how they interact and emerging properties. The latter part is the focus of my research.

The framework will be used to analyse the primary data for this dissertation that seeks to explore variations in how the factors that influence researchers' KT capacity and practice manifest and interact in different research contexts. The framework will be refined based on the dissertation findings and made available for use by other scholars to explore or assess the KT capacity and practice of researchers based in similar or other contexts and refine further.

Table 3. Analytical framework for the factors that shape LMIC researchers' KT capacity and practice at micro, meso and macro levels

I. Micro level factors

1. Attributes of LMIC researchers

- Discipline
  - Basic
  - Applied
  - Sub-discipline
- Career stage
- Education
- Research and publishing experience/expertise
- Status at institution/in society/of institution

2. LMIC researchers' attitudes about KT

- Moral obligation
  - Advocacy for specific issue
  - Neutral
- Not relevant or responsibility of researcher

3. LMIC researchers' KT knowledge

- Policymaking process

4. LMIC researchers' KT skills

- Communicating research
- Research and evidence synthesis
- Interacting and collaborating with target audiences

5. Strategies used to develop LMIC researchers' KT capacity

- Education (including fellowships) and training workshops
- Support networks
- Learning by doing
- Strategic partnerships
- Other capacity development approaches

6. LMIC researchers' KT activities

- Planning for KT
- Generating relevant research
- Synthesising and packaging research findings
- Push KT activities
- Facilitate Pull KT activities
- Exchange KT activities
- Integrated KT activities
- Evaluating KT activities including process and outcome and impact
- Conducting research studies in the KT field

II. Meso level factors

1. Research institution KT capacity and practice

Leadership for KT

Institutional strategic and operational policies

- Missions and strategic plans
- KT guidelines
- Intellectual property rights
- Tenure and promotion policies

Resources

- Financial
- Technical (KT staff, academics with KT expertise)
- Infrastructure (KT office, databases, repository, equipment, internet and software, etc.)

KT capacity development

- Integrate KT in research degree training
- Mentorship programmes
- Institutional KT capacity development

Promotion and evaluation of KT

- Credibility of the research institution
- Partnerships between research institutions and/or departments from varied disciplines
- Facilitating pull activities
- Exchange activities
- Evaluation of institutional KT efforts

2. KT capacity and practice of networks and institutions in the evidence ecosystem

- National and international research networks
- Knowledge brokers (KBs)
- Other knowledge producers
- Institutions that determine and regulate research practice and discipline norms

III. Macro level factors

1. Research and KT funders

- Over-reliance on funding for research and KT from international funders
- Funders allocate inadequate or no funding for KT and research capacity development
- LMIC government funding for research and KT

2. KT capacity and practice in the national policy environment

- National KT laws and mechanisms
- Intellectual freedom

3. Industry interests and investments in R&D

CHAPTER 3: METHODOLOGY

3.1 OVERVIEW OF CHAPTER

This chapter presents the methodological framework for this study. First, I describe the study's research paradigm. I follow this with a description of the overall research design and sampling strategy. Then I provide details of the data collection methods used to achieve the study aim and objectives. I follow this with an explanation of the data analysis approach. Finally, I describe the strategies undertaken to improve validity and reliability.

3.2 STUDY ANALYTICAL FRAMEWORK

Chapter One described some systems perspective KT frameworks that identified factors that influence or shape researchers' KT capacity and practice (46, 52, 62, 86). However, none of the frameworks offered a sufficient analytical framework to apply to my research predominantly because they did not comprehensively consider LMIC evidence on researchers' KT capacity and practice. In addition, the frameworks included factors relevant for the KT or evidence-informed decision-making capacity of knowledge users, but few factors relevant for knowledge producers who are the focus of this study. By focusing on factors that shape LMIC researchers' KT capacity and practice, the aim was to deepen understanding of the factors that shape researchers' capacity for and involvement in the complex KT process including their KT knowledge and skills, attitudes, and practices and how to strengthen this.

In the absence of a suitable existing analytical framework, I constructed a new framework primarily based on the systematised review of published literature on LMIC researchers' KT capacity, practice, and support presented in Chapter Two supplemented with evidence from the wider literature presented in Chapter One. The methodology for development of the framework is described at the end of Chapter Two.

Figure 4 is a graphical presentation of my study analytical framework. A detailed description of the analytical framework follows.

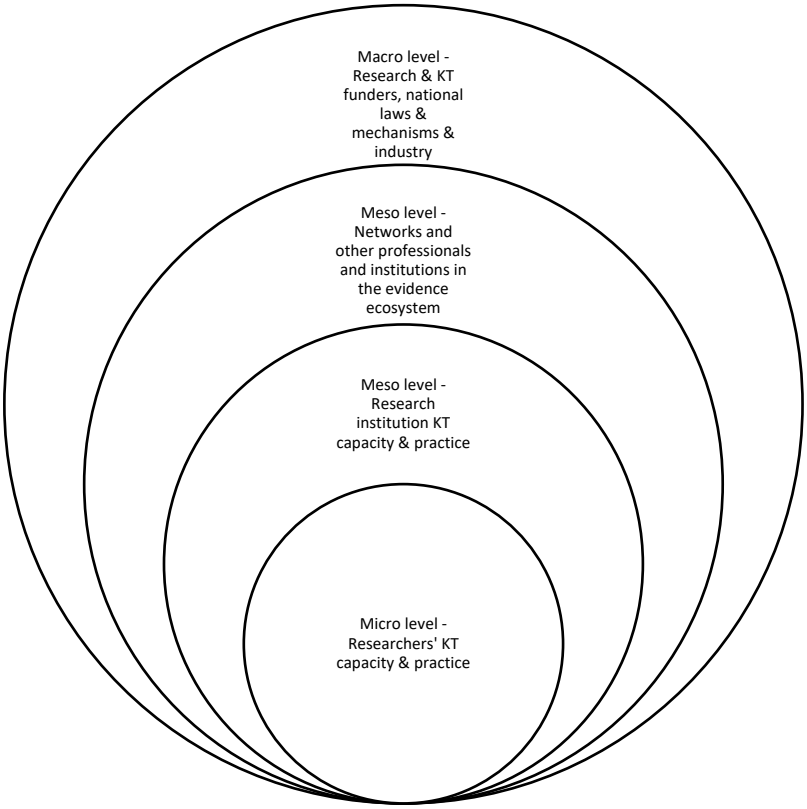

Figure 4. Study analytical framework for the factors that shape researchers' KT capacity and practice at micro, meso and macro levels

My study analytical framework is organised using the systems perspective, which consists of micro, meso and macro level factors. Micro, meso, and macro levels are represented as nested circles to depict the multiple interactions between many of the factors. In this study, the micro level factors relate to the underlying driving factors in individual researcher's KT capacity and practice. The meso level addresses the researcher's institution and interactions and partnerships with other entities (networks) and their support for researchers' KT capacity and practice. The macro level relates to the national context where the researcher is based, and the support for researchers' KT capacity and practice including culture, regulations, structures and funding.

Refinement of my study conceptual framework

I applied this analytical framework to analyse my empirical data and refined it based on the key themes and patterns that emerged. The refined analytical framework is described in Chapter Seven including how it changed based on my empirical data.

3.3 STUDY DESIGN

I used a comparative case study design. A comparative case study is a research approach to formulate or assess generalisations across multiple cases (182). Three diverse cases were included in the study, all of which were consortia belonging to the DELTAS health research capacity strengthening (HRCS) initiative. The ccomparative case study approach was selected as the most appropriate to compare and contrast KT capacity and practice in the three selected DELTAS research consortia, applying the systems perspective (183).

A case study has been defined variously, the central tenet being the in-depth exploration of an event or phenomenon in its natural context (184-187). The case and its context are often described as a system or a bounded phenomenon. Therefore, the investigated unit of analysis (organisation, a group, person, process, or social relationships) is defined together with its numerous aspects and within a broad network of social, political, institutional, ethical, and aesthetic phenomena and meanings (184, 186, 187).

Creswell's (186) description of a case study has been noted as the best. Creswell describes a case study as “a qualitative approach in which the investigator explores a bounded system (a case) or multiple bounded systems (cases) over time, through detailed, in-depth data collection involving multiple sources of information (e.g., observation, interviews, audiovisual material, documents, and reports), and reports a case description and case-based themes” (186 p.245).

3.3.1 Rational for comparative case study of contrasting cases involved in DELTAS

Analysing three contrasting cases of consortia involved in DELTAS is important for capturing a wide range of KT capacities and practices at micro, meso and macro levels, which would generate lessons that consider different contexts.

HRCS consortia such as those that are part of DELTAS involve partnerships between multiple research departments, groups, or institutions (varied in size, ranging from 2 to 20 institutional partners), from both high- and low- and middle-income countries, pooling their varying levels of resources, expertise and experience and working together towards collective gains in health research capacity (181, 188). HRCS consortia activities and partners (individual and institutional) are typically led by researchers and embedded in additional structures and systems e.g., of national and donor agencies supporting them (181). Therefore, consortia have the potential to influence (and be influenced by) capacities and practices of partner institutions and the additional structures and systems. This is

important in this study that includes an analysis of the meso and macro level factors that influence the KT capacity and practice of consortia and their researchers.

3.3.2 Study setting

My research study was nested within the context of the health research capacity strengthening programme, DELTAS, implemented in partnership with the Learning Research Programme (LRP) (122). Since the inception of DELTAS, the LRP, led by the Centre for Capacity Research, Liverpool School of Tropical Medicine, has been working alongside the programme beneficiaries to produce research-based learning addressing four thematic areas (122). One of the four thematic areas is KT, which is the focus of my research. Therefore, I was granted written permission by the DELTAS Programme Manager to access DELTAS data for this research (Appendix 2).

Reason for selecting the DELTAS programme

Research consortia are a widely used model for strengthening health research capacity and have been found to result in significant and moderate improvement in individual research skills and institutional capacity, respectively (181, 188). However, their minimal focus on KT has been noted as a weakness and an area needing strengthening (188-190). Locally owned and led (as opposed to HIC-led) research capacity strengthening initiatives are being promoted to enhance the likelihood of research being better aligned with national agendas and addressing implementation challenges they are grappling with (181, 188). DELTAS addresses these two interrelated gaps; the programme supports African-led consortia and emphasises KT capacity strengthening and practice including provision of some support for this. Thus, DELTAS offers an opportunity for exploring and generating lessons about use of consortia as a model for enhancing researchers' KT capacity and practice and the influence of their diverse characteristics i.e., research discipline and focus, and pre-existing KT capacity and experience of their leaders. Moreover, DELTAS is one of the largest HRCS programme with access to a diverse cohort of researchers and potential for shared learning on how best to support researchers' KT capacity and practice within research capacity strengthening programmes and African academic and research settings.

Description of DELTAS

DELTAS was a five-year programme (2015-2020) that supported the African-led development of world-class researchers and research leaders in Africa (121). The programme aimed to train and mentor researchers and research leaders who would "play a major role in shaping and driving a locally relevant health research agenda in Africa, contributing to improved health and development in the continent" (121). DELTAS was

funded by the Welcome Trust and DFID and managed by the Alliance for Accelerating Excellence in Science in Africa (AESA), an initiative of the African Academy of Sciences (AAS).

To achieve the programme goal, DELTAS was founded on the following four strategic areas of which the third one (in bold) is of relevance to this study:

1. Scientific quality: To produce world-class scientific research that addresses African health and research priorities through scientific discourse and collaborative supervision, DELTAS promotes collaborations with well-resourced universities, research institutions, and think tanks to strengthen capacity.
2. Research training: To strengthen scientific research training and build career pathways for scientific researchers, DELTAS focuses on the tertiary and postgraduate training of science students and professionals along a defined career pathway.
3. **Scientific citizenship: Foster mentorship, leadership and equitable collaboration in science, and engagement with public and policy stakeholders.**
4. Research management and environment: To cultivate professional environments to manage and support scientific research

DELTAS supported 11 African-led research consortia (collaborative teams) based in 54 institutions across 21 African countries in East, South, and West Africa and 24 European institutions. Figure 5 shows the DELTAS-funded programmes and their beneficiaries' geographical location in Africa.

Each of the 11 DELTAS consortia consisted of a lead institution and several partner or collaborating institutions, ranging from two to ten in number. The 11 consortia were undertaking a range of health-related research spanning various disciplines (applied and basic research) and health issues (HIV, Malaria, Mental Health, Reproductive, Maternal, Newborn, Child, and Adolescent Health). Some consortia also collaborated among themselves on shared research interests and capacity building. Therefore, DELTAS provided access to a diverse cohort of researchers and potential for shared learning on how best to support researchers' KT practice within research capacity strengthening programmes and African academic and research settings.

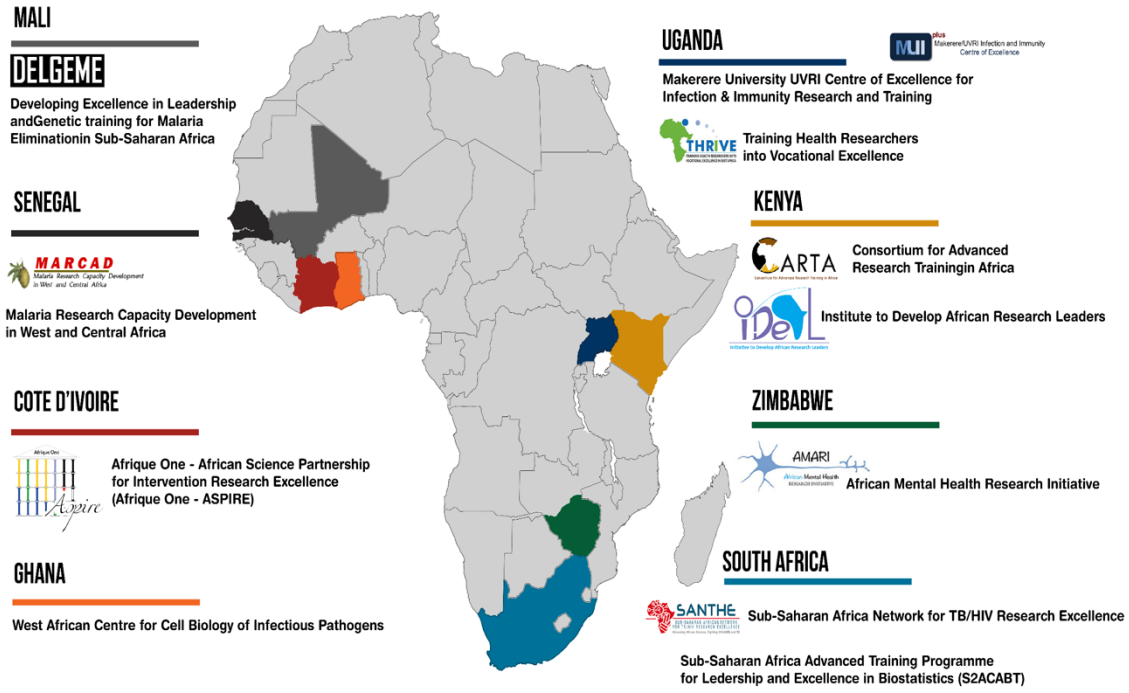

Figure 5. Developing Excellence in Leadership Training and Science (DELTAS) Africa funded consortia

Source: AAS (122)

Deltas KT support and role

The specific DELTAS support and role in support consortia KT capacity and practice included its prioritisation in programme design, provision of some funding for it and supporting implementation, further detailed below.

Programme design

As noted earlier, KT capacity and practice was defined as an explicit outcome of the DELTAS programme within the Scientific Citizenship strategic area, which was reflected in its theory of change. Grant applicants applying for funding from the DELTAS grant scheme were also expected to define how they would achieve the programme's KT outcomes, and this was facilitated by the grant proposal application form having a dedicated section for policy, public, and media engagement and other research dissemination activities.

Funding

The DELTAS grant scheme included an allocation of 1-2% of total grant for policy, public, and media engagement and other research dissemination activities and also encouraged grant applicants to seek additional public engagement funding from Wellcome Trust Foundation.

Implementation

Mid-way implementation of the DELTAS programme, in 2017, the funder hired a staff to provide leadership and capacity strengthening for grantees specifically for community and public engagement (CPE). CPE was the preferred terminology for referring to KT activities, adopted by DELTAS programme funders. The CPE staff led the development of a CPE capacity strengthening strategy and supported its implementation among the 11 DELTAS consortia. The strategy provided broad guidelines on target groups and activities, which could be interpreted widely depending on the consortia preferences, capacity and experience. Consortia were expected to report their KT activities on annual basis and the reporting tool had a section for these reports grouped into policy, public, media and other research dissemination. Consortia were expected to report the presence of consortium level CPE strategy, budget, and training. The CPE staff supported implementation of the strategy by organising and co-organising training and sensitisation workshops with each of the 11 consortia.

3.3.3 Sampling strategy

I used a three-tier purposive sampling technique to select three out of 11 DELTAS consortia as my cases, nine institutions affiliated with the selected consortia (three from each consortium), and 29 interview participants (27 based at each of the selected institutions and two from AAS, i.e., DELTAS programme administrators). This sampling strategy is summarised in Figure 6 and elaborated in the following sub-sections.

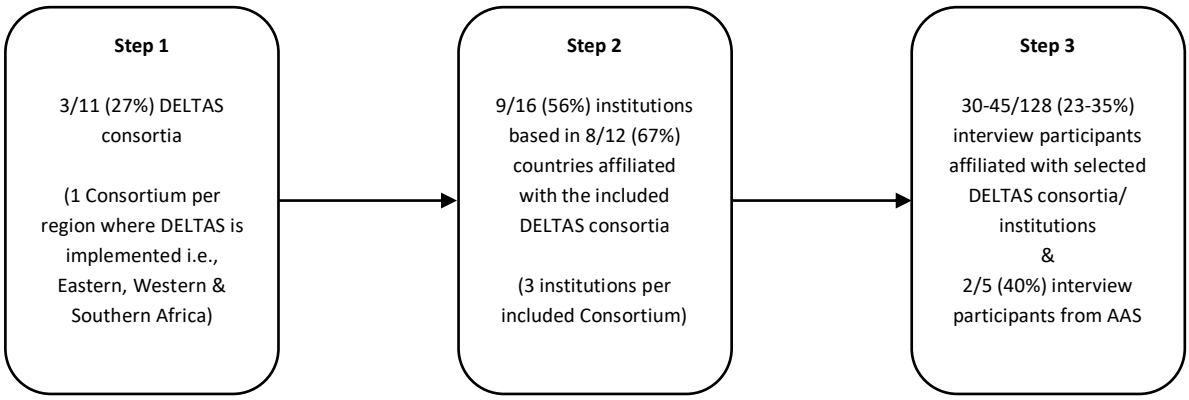

Figure 6. Study sampling strategy

Selection of cases

Mapping the 11 DELTAS consortia

I first gathered information and documents describing DELTAS to map the characteristics of each of the 11 consortia, including:

- the partner institutions within each consortium
- where they are located (African region and country)
- what research they are involved in, i.e., topics and research discipline (applied or basic)
- KT strategies and outputs indicated in their award documents and annual progress reports (2016-2017).

I used two approaches to gather the information. In July 2017, I attended the 2017 DELTAS Annual meeting to learn more about each of the 11 consortia from their programme progress updates and interaction with key staff and consortia members. Later in February 2018, I met with the DELTAS programme staff based at the AAS headquarters in Nairobi, Kenya. I presented and discussed my research proposal. The DELTAS programme staff then shared DELTAS information and documents, including documents describing the scheme, grantees' proposals, award letters and budgets (2015), and 2016 annual progress reports. I obtained additional DELTAS documents such as the 2017 annual progress reports, Monitoring and Evaluation (M&E) framework, and theory of change.

Selection of three consortia as cases

After completing the mapping, I purposively selected three out of the 11 DELTAS consortia as cases using maximum variation sampling to provide an opportunity for comparing and contrasting, and for drawing parallel lessons from different contexts (184, 185).

The three consortia (Case A, Case B and Case C) were selected as case studies based on the following criteria that they demonstrated diversity in and that have been identified in the literature as important factors that influence researchers' KT capacity and practice:

- *Health focus*

Case A focused on a marginally health issues that is globally acknowledge as critical to address, while Case B and C focused on health issues that have received enormous global attention and investments for decades.

- *Research discipline*

Case A researchers were mainly applied researchers (only one was a basic researcher), while Case B had a balanced mix of applied and basic researchers and Case C consisted of basic researchers.

- *KT strategies and outputs indicated in their award documents and annual progress reports (2015-2017)*

Case B exhibited the widest range of KT activities among all the 11 DELTAS consortia based on the range of KT strategies and outputs they described/reported in their award documents (2015) and annual progress reports for 2016 and 2017 (timeline preceding the study inception in 2018). Case C was among the consortia that described/reported minimal and narrowest range of KT strategies and outputs in their award documents and annual progress reports. Case A was among the consortia that described/reported a range of KT strategies and outputs in their award documents and annual progress reports that fell between that describing/reporting the higher range (Case B) and those describing/reporting minimal and narrowest range.

- *Geographical location*

The cases each represented one of four regions of Africa based on the location of the African partner institutions and their home countries including Southern Africa (Case A), Eastern Africa (Case B) and Western Africa (Case C). Case A consortia membership includes one Eastern Africa partner institution, but the selected partner institutions were those in Southern Africa.

- *Type of Africa based partner institutions*

Case A was a partnership of two departments and an autonomous research institute within three large well established public universities. Similarly, Case C had a mix of two departments and an autonomous research institute within two large well established public universities (one department and the autonomous research institute were based in the same university). Case B had a mix of a departments within a large well establish public university, a department within a small recently established public university and a department within a large well established private research institution.

- *Maturity*

Case A was a newly created consortium in response to DELTAS. Cases B and C were consortia that existed for a few years before DELTAS as part of different Established before DELTAS as part of a different HRCS programmes.

I limited the number of consortia to three based on an assessment of what was achievable within the PhD project's timeframe and resources. The three consortia that were selected are presented in Table 4.

Table 4. Selected research consortia from DELTAS as cases

Consortium	Health focus	Research discipline	Described/reported KT strategies and outputs (2015-2017)	Geographical location	Type of Africa based partner institutions	Maturity
A		Applied	Some KT strategies but narrow in terms of strategies and target audiences	Southern Africa	Two departments and an autonomous research institute within three large well established public universities	Newly established to respond to DELTAS (September 2015)
B		Mix of applied & basic	Widest range of KT strategies and target audiences	Eastern Africa	Mix of a department within a large well establish public university, a department within a small recently established public university and a department within a large well established private research institution	Established before DELTAS as part of a different HRCS programme (2009)
C		Primarily basic	Did not define specific KT strategies beyond the training of researchers & hiring media consultant	Western Africa	Mix of two departments and an autonomous research institute within two large well established public universities (one department and the autonomous research institute were based in the same university)	Established before DELTAS as part of a different HRCS programme (November 2013)

Selection of institutions within the consortia

From the three consortiaa that I selected, I purposively sampled nine out of 16 African institutions affiliated with the three consortia (i.e., three institutions per consortium), from which I would select the interview participants and documents for review. Nine institutions were deemed sufficient to generate a wide range of perspectives from across the consortia. Among the nine Africa institutions that I selected, three were the lead institutions of each consortium, and the rest were partner institutions, i.e., two from each consortium. The partner institutions were selected based on the responsiveness of individuals invited to be research participants (described in the following section). Therefore, the institution where an individual who accepted to participate is based was included in the study. For the consortium with partner institutions based in both anglophone and francophone countries, I ensured that each language was represented by at least one institution.

Selection of interview participants

Permission to include consortia in the study

Before moving on to sample interview participants, I sought permission to include the three selected consortia in the study from their directors. I obtained contacts of the Directors of the three consortia from the DELTAS Programme Manager. I emailed the consortia directors copying the DELTAS Programme Manager and explained the study in detail. I also provided them with the study participant information sheet. The DELTAS Programme Manager was copied so that the consortia directors understood that AAS had approved the study. I informed them that I wished to include their consortium in my study and request their permission. My email explicitly stated that their decision to participate was voluntary, and they would face no consequence for choosing not to participate. I followed up unanswered emails with phone calls to the directors' offices to seek advice on how to access the directors more effectively. Phone calls were followed up with emails, usually copying the personal or programme assistant as directed.

I managed to secure permission from the directors of all three consortia. The consortia directors then linked me to their respective programme administrators. The programme administrators facilitated my access to the information that would help with participant sample selection (database of partner institutions, staff, and fellows), scheduling interview dates, and organising logistics for the fieldwork.

Selection criteria for interview participants

I used maximum variation sampling to select the interview participants from within each of the nine selected institutions to generate a wide range of perspectives and experiences for comparison and contrasting (185). The selection of the interview participants was based on the following criteria:

1. individuals affiliated with DELTAS
2. individuals based at the institutions included in the study
3. individuals who manage and implement research
4. individuals who provide M&E, communications, and KT support (including training) to researchers

In DELTAS, criteria 2 and 3 are not mutually exclusive, meaning that an individual who manages and implements research can also have a programme administration, M&E, or communications responsibility in the consortium. When selecting the researchers, efforts were made to ensure equitable representation at every stage of the research career pathway (junior, mid-career, and senior researchers), and research discipline (applied and basic).

Within DELTAS, the roles that meet these criteria are identified variously as follows:

1. Consortium Director or Principal Investigator overseeing the implementation of DELTAS.
2. Country Lead or Co-applicant responsible for leading implementation of DELTAS activities at the consortium's partner institutions.
3. Other technical leads or heads, e.g., Head of Research and Training.
4. Fellows who are students undertaking Masters and PhD degrees and postdoctoral fellowships.
5. Knowledge Translation Officer or Communication/Community and Public Engagement Manager or Officer responsible for working with researchers to interact with, and communicate and disseminate their research findings to, target audiences.
6. M&E Head or Officer responsible for tracking implementation of programme activities.
7. Programme manager, coordinator, or administrator responsible for providing administrative support to researchers, including logistics for events, M&E, and training.

Collectively, the participants would provide a range of perspectives, including: understanding and appreciation of KT among themselves and researchers in general; researchers' integration and assessment of KT activities in their research; support of KT by research institutions and their assessment of KT in postgraduate training, research and performance assessments (individual and institutional); and support for KT from funders and the DELTAS central management team.

Where appropriate, participants were classified by research career stage and type of research using the European Framework for Research Careers (8) and the OECD 2015 Frascati Manual (7), respectively. This was done so that results could be analysed by these sub-groups to explore their influence.

Sampling frame and study sample size

Based on programme information provided by the administrative staff of each of the three selected consortia, 128 individuals across the three consortia were eligible to participate in the study, i.e., they met the participant selection criteria (Table 5). I initially targeted between 10 and 15 interviews per consortium for a total of between 30 and 45 interviews. I felt that this number of participants would be sufficient to reach saturation, i.e., when no new insights are forthcoming (185, 191). This estimate was not intended to be fixed, and additional participants would be recruited and interviewed for further exploration of emergent issues as needed.

Table 5. Sampling frame by selection criteria

	Sample size			
	Consortium A	**Consortium B**	**Consortium C**	**Total**
Total ssampling frame	**40**	**48**	**40**	**128**
The institution where the participant is based				
Lead institutions of the consortia	15	26	31	**72**
Other consortia partner institutions	25	22	19	**66**
Position in Consortium				
Director or Primary Investigator overseeing the implementation of the Consortium's DELTAS programme	1	1	1	**3**
Country Lead or Co-applicant responsible for leading implementation of DELTAS activities at the Consortium's partner institution	3	2	4	**9**
Other technical leads or heads, e.g., Head of Research and Training	1	0	2	**3**
Master's fellows	10	8	0	**18**
PhD fellows	15	9	12	**36**
Postdoctorate fellows	1	6	10	**17**
Knowledge Translation Officer or Communication/Community and Public Engagement Manager or	1	2	2	**5**

	Sample size			
	Consortium A	**Consortium B**	**Consortium C**	**Total**
Officer responsible for helping researchers to interact with research target audiences and communicate and disseminate their research findings				
M&E Head or Officer responsible for tracking implementation of programme activities	1	3	1	**5**
Programme Manager, Coordinator, or Administrator responsible for providing administrative support to researchers, including logistics for events	5	4	1	**10**
Research career stage				
Senior researcher	5	3	4	**12**
Mid-career researcher	1	6	3	**10**
Junior researchers	26	39	22	**87**

Initially, I planned to include Master level students in my sample. However, dduring the interviewing process, I learnt that Master's degree students are not involved in activities beyond their coursework and research dissertation project. Therefore, they were unable to provide information relating to the research objectives. This informed a review of my sampling strategy to focus on interviewing fellows at PhD and postdoctoral levels.

Insights from interview participants also informed the need to include AAS staff to glean more information about the DELTAS grant award process and guidance for the KT component. I purposively selected two out of five AAS staff based on the criteria that they oversee DELTAS implementation.

3.4 ETHICAL CONSIDERATIONS

Before starting my data collection, I submitted my research protocol for ethics approval simultaneously to the Liverpool School of Tropical Medicine Research Ethics Committee (LSTM REC), UK, and the Strathmore University Institutional Review Board (SUIRB), Kenya. The study protocol was approved by the LSTM REC (Reference number 18-011; Appendix 3) and SUIRB (Reference number 0174/18; Appendix 4), subsequently renewed (Reference number 374/19; Appendix 5). A research permit was also obtained from the National Commission for Science, Technology, and Innovation (NACOSTI) in Kenya as the

jurisdiction governing AAS, the organisation that manages DELTAS (Reference number NACPSTI/P/18/97821/22355; Appendix 6), subsequently renewed (Reference number 693015; Appendix 7).

In addition, I obtained written informed consent explaining the study's benefits and risks and seeking permission to conduct and record the interviews from all the participants before interviewing them. A copy of the participant information sheet and consent form used are appended (Appendix 8 and 9). Participants' identifiers were anonymised with pseudonyms to protect their privacy and maintain confidentiality. Interview data were also stored on a secure drive, which was password protected.

3.5 DATA COLLECTION

I selected semi-structured iinterviews and document review as the most appropriate data collection techniques and sources to address the research objectives. I used interviews to gather the participants' perspectives on KT, including: their understanding and appreciation of KT; the extent that they (and researchers in general) undertake KT activities; barriers and facilitators of researchers' KT practice; the extent that their institutions and DELTAS support KT; and recommendations.

I used the document review for two purposes. Firstly, to understand DELTAS and selected consortia KT objectives, activities, and support and contextualise interview questions (192), and secondly as a means of triangulation to validate the interview data and generate additional insights (192). Figure 7 illustrates the data collection methods used to address each research objective.

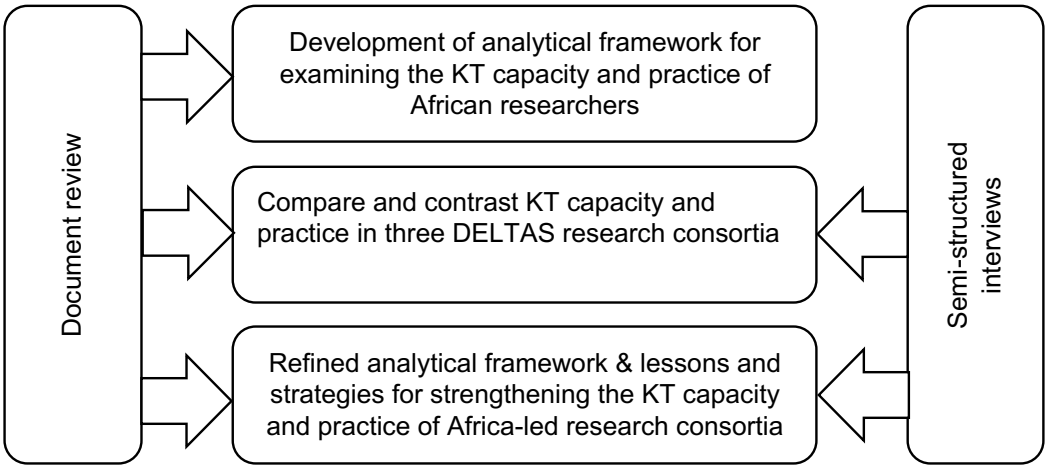

Figure 7. Relationship between data collection method and research objectives

3.5.1 Interviews

I chose the semi-structured interview format, which consists of several key questions that help define the research areas being explored and allow the researcher to add or omit pre-planned questions depending on the interviewee's responses (185, 193). Therefore, this type of interview allows the researcher to respond based on their worldview and bring in new ideas on the topic (185).

Development of the interview guide

I adopted the theoretical semi-structured interview approach in which theory informs the interview questions (194). My research study objectives formed the skeleton frame of my interview guide. Then I generated questions and probes within the frame informed by a review of KT frameworks and data collection tools that focus on the researcher and research institution perspective (52, 62, 69, 76, 195-198). In constructing the interview questions, I used a mix of primarily open- and some closed-ended questions (mainly as background questions and probes), which is characteristic of a semi-structured interview (185).

The interview guide (presented in Appendix 10) consisted of questions that gathered information on the following broad issues:

1. Research participants background information, e.g., discipline and research topic, responsibilities
    - In general
    - In DELTAS
2. Research participants' understanding of KT
    - In general
    - The concepts evidence-based decision- or policy-making and evidence-informed policy- or decision-making
    - What KT entails in terms of target audiences, activities, and approaches
3. Research participants' views about the role of researchers in promoting KT and what they observe relative to their views
4. Consideration of KT in research ethics processes
5. Funders' support for KT
    - In general
    - To DELTAS
6. Researchers' KT practice experience

- In general
- In DELTAS

7. Research participants' institutions support for KT
8. Researchers KT capacity development experience and recommendations

I amended the draft interview guide to improve clarity after discussions with my supervisors. I then piloted the guide in June 2018 with a convenience sample of six researchers representing all the research career pathway stages (junior, mid-career, and senior researcher). These researchers were based at the Africa Institute for Development Policy (AFIDEP) Nairobi, Kenya and were therefore not involved in DELTAS and not included in my study. Minor revisions were applied to the interview guide after that and further minor adjustments were made during the main study interview process, which is acceptable in qualitative studies (185).

Participant recruitment

Interview participants were recruited by email, which was sent a month in advance of the proposed interview period. The email described the study and explicitly noted that participants' decision to participate was voluntary and they would face no consequence if they chose not to. The programme administrator of each consortium was copied to signal that the consortium management had approved the study. The consent form and study participant information sheet were attached in the email, which the participants were urged to read before making their decision. In cases where there was no response, follow-up phone calls were attempted once before recruiting another candidate that met the participant selection criteria. These instances were rare, occurring just twice. One person declined participation because they had gone on maternity leave. Another interview participant was dropped because of scheduling conflicts that could not be resolved.

Interviewing timeline

Most of the interviews were conducted between June and July 2018. Three interviews were conducted in September 2018, one in July 2019, and one in June 2020 to clarify emergent issues.

Interview setting

I conducted the interviews at six locations to optimise my time and resources. The locations included: the lead institutions of each of the three consortia where the consortia directors and communications and/or community and public engagement, M&E and programme administration staff are based; the KEMRI 10-year review meeting held in Nairobi in June

2018; and two DELTAS annual meetings held in July 2018 and July 2019. Most (23) of the interviews were face-to-face. Four participants who were either unavailable or not present at the interview locations or were sought later on during the study (i.e., AAS staff) were interviewed via Skype. Most interviews lasted one to one and a half hours; two interviews were about two hours long.

The interviews were conducted with single individuals except in two instances. In one instance, a participant asked that their research assistant be part of the interview. The other instance involved the two AAS staff that I recruited as key informants to clarify study findings on funding and expectations related to the KT component of DELTAS. I chose to do a joint interview because each individual would contribute to different aspects of the programme – one on the overarching programme and the granting process and the other specifically on the KT component.

I had planned to interview three people based at the francophone institution in Consortium C, but I experienced some challenges that resulted in only one person being interviewed. Initially, I planned to conduct Skype interviews with the three participants because they were not available at any of the other locations where face-to-face interviews were held. However, poor internet connectivity necessitated the decision to plan and conduct face-to-face interviews with them at their institution. I successfully scheduled the interviews in early December 2018, but a family emergency resulted in its postponement. I followed up to reschedule the interviews in 2019, but this proved difficult, particularly with two of the three selected participants. The reason for this is unclear because there were no responses to my emails. Ultimately, I managed to secure an interview with just one francophone participant, which occurred at the 2019 DELTAS annual meeting.

Interviewing process

Before starting each interview, I introduced myself and went through the information sheet and consent form point by point, which highlighted the aims and benefits of the study, potential adverse effects, what is expected from the participant, their rights as voluntary participants, and how the interview will be documented and stored. I asked each participant whether they had any questions and responded to any queries. I then asked them if they were still willing to participate in the interview or needed more time to think about it. All of them agreed to participate. After this, I asked them if I could record the interview to aid accurate documentation of the discussion and allow for a free-flowing conversation, not interrupted by me taking detailed notes, which would also save on time. All except one

participant accepted for the interview to be recorded. I then invited each participant to sign the consent form, and I co-signed my section.

For interviews done remotely using Skype, I requested the participant to email the signed consent form to me before the interview commenced. Due to my alignment to the DELTAS LRP programme, I made it clear that I was not an evaluator. Rather, I sought to generate evidence that would improve understanding of the factors influencing researchers' KT practice in the DELTAS scheme and potentially applicable to other similar research capacity strengthening programmes.

I used a conversational style of interviewing. The interview guide was used to ensure that I addressed all the issues for which I sought information. I adapted the wording and changed the order of the questions in the interview guide to each participant's experience and responses. For instance, I sought views about funding for KT activities from all senior and mid-career researchers but not from junior researchers and non-academics except among those who demonstrated having some knowledge based on the interview discussions. I listened more and took few notes of things I found interesting to note, e.g., a new idea or a named document that I should review.

All interviews for which participants gave permission were audio-recorded using a voice recorder after obtaining written consent to do so. I did not name the participant in the recordings to protect their identity. Arrangements had been made to involve a research assistant with the ability to speak both English and French to facilitate and translate French interviews if it was required. However, the one French-speaking participant that was interviewed had a good command of English and was interviewed in English.

Participants interviewed

I conducted a total of 27 interviews with 29 participants (two interviews were with groups of two participants). Table 6 presents a breakdown of the interview participants' demographics.

Table 6. Demographics of interview participants

	Number of participants				
	Consortium A	**Consortium B**	**Consortium C**	**AAS staff**	**Total**
The institution where the participant is based					
Lead institution of each study consortium	5	7	9	N/A	**20**
Selected two institutions of each study consortium	2	3	2	N/A	**7**
AAS headquarters				2	**2**
Research career stage					
Senior researcher	2	4	2	N/A	**8**
Mid-career researcher	1	1	3	N/A	**5**
Junior researchers	2	2	4	N/A	**8**
DELTAS Programme staff					
Directors	2	3	1	N/A	**6**
KT or Communications or CPE staff	1	1	2	N/A	**4**
M&E staff	1	1	1	N/A	**3**
Programme administration staff	1	2	0	N/A	**3**
Other technical staff	0	0	3	N/A	**3**
DELTAS Programme fellows					
PhD fellows	2	1	1	N/A	**4**
Postdoctoral fellows	0	0	3	N/A	**3**
Career development grant awardee	0	1	0	N/A	**1**
Total	**7**	**9**	**11**	**2**	**27**

3.5.2 Document review

I sourced institutional documents at four levels:

- the DELTAS funder and scheme administrator including the Wellcome Trust KT policy and funding and AAS KT policy and description of the DELTAS scheme
- the selected consortia including documents or information describing the programme approved budgets and annual progress reports for 2016 and 2017
- the selected institutions including documents or information on: their vision and mission statements; strategic plans and/or objectives; research and KT policies; intellectual property policies; research ethics application documents; tenure and promotion documents; Master and PhD research degree training curricula; M&E frameworks; the existence of structures including Communications and KT

departments and staff information and research repository within the academic/research; and research funding

- government institutions responsible for formulating national research and KT policies and funding national research priorities in the selected institutions' host countries (typically the responsibility of Ministries of Science, Technology, and Innovation or equivalent institutions).

As my understanding of the key issues about researchers' KT capacity, practice and support evolved during the interview process, more documents than initially conceptualised became relevant. Consequently, retrieval of institutional documents started before and continued during and after primary data collection (April 2018 - August 2019). I sourced the documents and information from the institutions' websites and directly from interview participants. The extent that I was able to obtain the range of documents that I was sourcing varied depending on how developed the institutions' websites were and the participants' responsiveness when I sought their help. The full list of types of documents/websites retrieved/reviewed is presented in Appendix 11. A summary of the documents obtained per institution is also provided in Chapter five, which discusses the document review findings.

3.6 DATA MANAGEMENT AND ANALYSIS

Data from my interview transcripts and document review were analysed using the thematic framework method. The following sections describe the data management and analysis in more detail.

3.6.1 Transcription of semi-structured interviews

I recruited three research assistants based in Kenya as transcribers after reviewing CVs and holding short interviews with each to determine whether they possessed the requisite experience. I had each transcriber sign a contract that contained a confidentiality agreement not to disclose the contents of the recordings to other parties or use them for other purposes. I provided each research assistant with a transcriptions template and had a session with them on how I expected the transcriptions to be done. The research assistants transcribed 27 out of the 29 audio recordings of the interviews. I transcribed the other two. All the audio recordings were transcribed verbatim to ensure the reliability and validity of the data. I verified each of the interview transcripts done by the research assistants by picking random sections of each transcript and listening to the audio recording of it. When reading through the transcripts the first time, I made any necessary corrections related to

misinterpretations due to the participant's accent or programme related acronyms, e.g., DELTAS.

Each interview transcript was assigned a unique alpha-numeric code-identifier which I used in the presentation of the results. Table 7 presents the participant code-identifiers and their characteristics.

Table 7. Participant identification and characteristics

Participant identification (P#)	**Researcher career stage**	**Researcher discipline**	**Non-academic support staff/role*/ other**
Consortium C			
P01	Senior	Basic	
P02	Mid-career	Basic research	
P03	Non-academic support staff		CPE
P04	Senior	Basic research	
P05	Junior	Basic research	
P06	Mid-career	Basic	
P07	Junior		Research Assistant
P08	Mid-career	Basic research	M&E
P09	Junior	Basic research	
P10	Non-academic support staff		CPE
P11	Junior	Basic	
Consortium B			
P12	Senior	Applied research	
P13	Senior	Applied research	
P14	Senior	Basic research	
P15	Junior	Applied research	CPE
P16	Non-academic support staff		Programme administrator
P17	Non-academic support staff		Programme administrator
P18	Senior	Applied research	M&E
P19	Junior	Basic research	
P20	Mid-career	Basic research	
Consortium A			
P21	Senior	Applied research	
P22	Senior	Applied research	

Participant identification (P#)	Researcher career stage	Researcher discipline	Non-academic support staff/role*/ other
P23	Non-academic support staff		CPE
P24	Junior	Applied research	
P25	Non-academic support staff		M&E
P26	Mid-career	Applied research	Programme administrator
P27	Junior	Basic research	
DELTAS programme			
P28	Other		AAS staff
P29	Other		AAS staff

Note: P denotes participant, and # is the number assigned to them starting from 01-29; some individuals are researchers with non-research support roles on the project.

3.6.2 Data analysis

I used the thematic framework method to manage and analyse my data (199, 200). The flexibility of the approach and inductive reasoning allowed new themes and concepts (aside from the a priori ones) to emerge from the interview data (200). The following sections explain this process in more detail.

Familiarisation

I read and reread all interview transcripts to become familiar with the key issues and recurrent concepts, and themes relative to the research questions and note them. Likewise, I repeatedly read the documentary sources to identify the extent that they mentioned or addressed KT.

Documents from the funder and scheme administrator were reviewed to obtain information on how KT is conceptualised and the funding allocated for this component. Documents from the consortia represented in the study were reviewed to obtain information on how they had conceptualised and budgeted their KT activities and the anticipated and/or reported outputs. Documents from the study institutions were reviewed to obtain information on how KT is addressed in their policies, processes, structures, and research funding. Finally, documents from government institutions were reviewed to obtain information on whether KT is mandated and how it is conceptualised in national research and KT regulatory and policy frameworks relevant to academic and research institutions and the extent it is funded.

Development of the analytical framework

The study analytical framework described in Chapter Two was used to filter and classify the interview data. The analytical framework was discussed with my supervisors, and revisions were incorporated. Thereafter, I made modifications during coding to better fit the study interview data. Therefore, the framework comprised both concept- and data-driven sub-categories (201, 202). As noted earlier, the refined analytical framework is described in Chapter Seven.

Coding interview and documentary sources

Coding interview data

I used the Computer Assisted Qualitative Data Analysis Software NVivo 12 to manage and code the data. I entered the analytical framework into NVivo and used it for indexing and sorting the data. Some units of data were relevant to more than one code and were allocated multiple codes (203). I started with one of my three case study sites, which had the smallest sample but was also broadly representative of my entire study sample. To make the coding process manageable, I divided the coding process into sections starting with coding data related to the first category (Individual level factors) and then moving on to the next main category (Institutional level factors).

I tagged units of data from each transcript into the relevant categories and sub-categories. I created new sub-categories when the data did not fit the existing ones. I then read the coded data within each sub-category, and, where relevant, I created additional codes within these, i.e., grandchild codes resulting in three to five levels of codes. The first set of interview transcripts that I coded served as my trial phase to test and further refine the analytical framework. I then coded the rest of the interview transcripts following the same format (i.e., selecting a case study site and coding data related to each category sequentially).

The analytical framework was constantly refined throughout the process of data analysis as new insights emerged and by reviewing the data tagged in each code for congruence. Since I coded all the data myself, any changes to the analytical framework were consistently applied.

Coding the documentary sources

NVivo 12 was also used to manage the documentary sources and chart relevant information extracted from them. I created codes for each type of document. Within each code, I created categories indicating whether KT is mentioned, not mentioned, unclear, e.g., a vague

statement. I tagged information from each document into the relevant code and category. As I coded the information, I created sub-categories within the 'KT mentioned' category for the characteristics of the statements (e.g., broad or narrow) and types of strategies indicated, e.g., push activities such as a newsletter. I then summarised the coded information for each document narratively and using tables.

Each document was assigned a unique alpha-numeric code-identifier to facilitate cross-referencing during data triangulation.

Development of descriptive and explanatory accounts

Following coding, I charted the data to summarise it by type of participant and consortium while retaining their original meanings. I then analysed the findings collectively to identify important concepts and processes and the overarching patterns by which those concepts and processes manifested. Patterns of commonality (repeated themes) among all participants and across the three consortia were identified. The contextual aspects of the phenomenon that account for differences among participants and consortia were also considered. Findings that corresponded or conflicted with the documentary sources and theoretical lenses were noted.

I presented the study findings per case in three results chapters and highlighted the main emergent themes aligned with the study analytical framework. I used extracts from the interview transcripts and documentary evidence to support the descriptions of the themes. I noted modifications to the analytical framework and presented these in the discussion chapter. Finally, I derived recommendations for improving researchers' KT capacity and practice from the study findings, which I also present in the discussion chapter.

Three supervisors reviewed drafts of my thesis report to provide recommendations and raised concerns, when necessary, which I addressed.

3.7 RELIABILITY AND VALIDITY

The following approaches were used to ensure the reliability and validity of the research findings.

3.7.1 Data triangulation

To improve the internal validity, reliability, and transferability (generalisability) of my study findings, I used two approaches: maximum variation sampling both at the level of the consortia and the participants to identify common patterns from a wide range of perspectives

and alternative explanations; and use of multiple data sources and techniques, i.e., interviews and document review, to verify the data.

3.7.2 Validation of study findings

The findings' internal validity and reliability were also addressed by sharing the study findings' preliminary analysis with participants and inviting their feedback. This was done using the DELTAS newsletters in October 2019 and October 2020, the learning report in March 2020, and briefs of the findings that I prepared and shared with each of the three consortia in January 2020.

3.7.3 Transparency

I described the steps involved in case selection, data collection and analysis, the reasons for the methods chosen, and my background and bias. I also used recommended approaches to develop and refine the study interview guide and analytical framework, and to analyse the data to ensure rigour and trustworthiness of the research findings.

3.7.4 Reflexivity

As a practitioner in the KT field with about ten years promoting KT practice among relevant stakeholders, including researchers, I come with a bias favouring KT. I considered the influence of my positionality throughout the research process, including in data collection and analysis (204, 205). I sought to remain open to alternative perspectives that challenge my beliefs or provide explanatory insights into the researchers' KT capacity and practice (204, 205). My data collection and analysis tools and research findings were also reviewed several times by my three supervisors who had different disciplinary backgrounds and ideological perspectives from myself. Their diverse perspectives helped strengthen the study design and interpretation of the findings (204, 205).

My project being embedded within DELTAS LRP might have made some participants wary and view me as an 'evaluator' of their activities (204). This may have, in turn, resulted in some participants withholding information or portraying more favourable insights (204). During recruitment and interviewing, I explained to the participants that my study was a learning exercise that would generate evidence to enhance the design and implementation of DELTAS and other similar research capacity strengthening projects. Despite this effort, there might still have been some self-censorship of responses by the participants.

CHAPTER 4: CASE A

4.1 OVERVIEW OF RESULTS CHAPTERS

This and the next two chapters (Chapters Five and Six) present the results from the three case studies (Cases A, B and C), purposively selected from the Developing Excellence in Leadership, Training and Science (DELTAS) programme. The three case studies were selected for their varied characteristics including their health research focus, research discipline, geography, type of partner institutions, maturity (when established) and KT strategies and outputs indicated in DELTAS award documents and annual progress reports (2015-2017), as noted in the methodology chapter. Each results chapter focuses on one of the three case studies (i.e., this chapter on Case A, Chapter Five on Case B and Chapter Six on Case C). The results chapters address the following research objective:

- Apply the framework to compare and contrast KT capacity and practice in three DELTAS research consortia

All three results chapters are structured using the analytical framework generated in the literature review (Chapter Two) that identified factors that influence LMIC researchers' KT capacity and practice at the micro, meso, and macro levels. The last section of each chapter examines interactions between the key issues identified at the micro, meso and macro level and also serves as each chapter's conclusion.

4.2 OVERVIEW OF THIS CHAPTER

This chapter first begins by summarising the KT situation (KT capacity and practice) in each of the three cases and then discusses the Case A KT situation to identify the contributing factors at micro, meso and macro levels and their interactions.

KT SITUATION IN THE THREE CASES

Before proceeding to a detailed analysis of Case A findings, Table 8 presents a summary of key findings from across the three levels (micro, meso and macro) for each of the three cases (Case A, B and C). This summary is intended to provide a brief orientation to the commonalities and differences in KT capacity and practice identified in this study before analysing each case in detail.

Ticks (✓) indicate the KT situation reported in interviews and documents at the micro, meso, and macro levels. Superscript stars (*) show how common the situation is reported across the sample i.e., strength of the evidence. At micro, meso consortium and macro levels, one

star (*) depicts a report from one source hence little evidence; two stars (**) is evidence from two sources, also categorised as some evidence; and three stars (***) is evidence from more than two sources (symbolising strong evidence). At meso level relating to the wider research institution level (e.g., university) and macro level relating to national KT laws and mechanisms, one star (*) depicts consistent (rather than contradictory) evidence from two or more sources (at least one of the sources being a documentary source) for one institution or country (also categorised as little evidence). For the same levels, two stars (**) depicts evidence consistent evidence from two or more sources (at least one of the sources being a documentary source) for two institutions or countries (some evidence) and three stars (***) is consistent evidence from two or more sources (at least one of the sources being a documentary source) for three institutions or countries (strong evidence).

At the meso level relating to research institutions, the different levels of research institutions are colour coded. Orange arrows and stars represent research consortia, green represents the department level where the consortium is housed e.g., College of Health Sciences, and blue represents the wider research institution level (e.g., university). At the meso research institution level and macro national KT policies and mechanism levels, when only one type of data source (interview or documentary) was available, ticks are replaced with the letters ‘i’ (representing interview data) or ‘d’ (symbolising documentary data) with superscripted stars denoting the number of institutions, departments or countries (e.g., d* or int*). The data source could be either an interview participant with no documents supporting the claim (‘int’) or documentary data with no support from interview data (‘d’). Also, at these meso and macro levels, where the letter ‘m’ replaces a tick with stars denoting the number of institutions or countries (e.g., m*), this symbolises missing information either because the information could not be found or is not relevant e.g., only one institution in Case B was analysed for policies and structures at the department level because the other two institutions were smaller in size and had a flatter structure. In Case C, one institution is an autonomous research institution within one of the two larger universities and is therefore smaller in size, has a flatter structure and shares some of the resources of the wider institution such as the department and staff in charge of KT. The letter ‘m’ is used when at least one of the cases provide data on a certain item. Otherwise, where the items are missing across all case, it has been left blank.

As shown in Table 8, there are subtle differences in the reported KT capacity and practice of researchers in Cases A, B and C at the micro level. The Cases differed with respect to how researchers view their role in KT but in general exhibited a similar patterns of inadequate KT knowledge and skills and narrow understanding of KT in their descriptions of what it is.

Nevertheless, Case B reported greater understanding of KT and KT activities beyond co-production of research with policymakers and practitioners among its researchers who participated in this study compared to Cases A and C i.e., activities falling under the 'synthesis and packaging research findings', 'push KT activities', 'facilitate Pull KT activities', 'exchange KT activities', 'evaluating KT activities' and 'conducting research studies in the KT field' sub-domains. On the other hand, Case C exhibited lesser involvement in KT activities among the researchers who participated in this study aligning to its stronger view that KT is not relevant for basic researchers and the responsibility of other professionals.

At the meso and macro levels, all three Cases illustrated similar challenges in terms of having in place policies, structures and processes that support researchers' KT capacity and practice. However, Case B reported more support at these levels than Cases A and C. The rest of this chapter and next two chapters discuss the KT situation of each case in more detail including the underlying factors at the micro, meso and macro levels and interactions within and across the levels.

Table 8. KT situation by Case at micro, meso, and macro levels

	Case A	Case B	Case C
I. Micro level			
1. Attributes of LMIC researchers			
• *Senior researcher*	✓***	✓***	✓**
• *Early career researcher*	✓**	✓*	✓*
• *Applied researchers including basic researchers involved in applied research e.g., disease surveillance*	✓***	✓***	✓***
• *Basic researcher*			✓*
• *Clinician*	✓***	✓***	✓*
• *Public health practice and advocacy*	✓**	✓**	
• *Credibility*	✓**	✓*	✓**
2. LMIC researchers' attitudes about KT			
• *Moral obligation*	✓***	✓***	✓**
• *Not relevant for basic researchers*		✓*	✓***
• *Role for KT practitioners or research users*		✓**	✓***
• *Lack of knowledge and skills*	✓**	✓***	✓**
• *Lack of time*	✓***	✓***	✓***
• *Not thought of as researchers' core responsibility*	✓***	✓***	✓***
• *Not considered in researchers' performance assessment*	✓**	✓***	✓*
• *Not an expectation of research funders*	✓**	✓***	✓*
3. LMIC researchers' KT knowledge			
• *Self-reported lack of* KT *knowledge*	✓**	✓***	✓**
• *Narrow understanding*	✓***	✓***	✓***
• *Comprehensive understanding*	✓*	✓**	✓***
4. LMIC researchers' KT skills			
• *Self-reported lack of* KT *skills*	✓***	✓***	✓***
• *Self-reported lack of skills for engaging with industry*			✓***
5. Strategies used to develop LMIC researchers' KT capacity			
• *Learn-by doing*	✓***	✓***	✓***
• *One year training and mentorship fellowships*	✓***		

	Case A	Case B	Case C
• *Training workshops* • *Sensitisation workshops*	✓*** ✓***	✓*** ✓***	✓***
6. LMIC researchers' KT activities			
• ***Planning for KT*** ○ *DELTAS programme KT (i.e., community and public engagement) planning for each research project*	✓***	✓***	✓***
• ***Generating relevant research*** ○ *Topic informed by target audience* ○ *Implementation research* ○ *Epidemiology and surveillance* ○ *Develop and test diagnostic and treatment tools* ○ *Co-design and implement research with target audiences*	 ✓*** ✓*** ✓* ✓*** ✓***	 ✓*** ✓*** ✓* ✓*** ✓**	 ✓* ✓* ✓* ✓*** ✓***
• ***Synthesis and packaging research findings*** ○ *Policy briefs/advice/recommendations* ○ *Rapid evidence reviews for policy and practice decision-making* ○ *Practice tools and guidelines* ○ *Research brief*	 ✓* ✓* ✓*	 ✓*** ✓* ✓*	 ✓* ✓*
• ***Push KT activities*** ○ *Media (TV, radio, newspaper articles and Op-Eds)* ○ *Public/community education events e.g., world health days, road shows* ○ *Short videos* ○ *Social media* ○ *Conferences and seminars* ○ *Web stories* ○ *Newsletter* ○ *Documentaries* ○ *Dissemination workshops* ○ *Other formats e.g., blogging, community theatre etc.*	 ✓*** ✓*** ✓* ✓*** ✓* ✓** ✓*** ✓* ✓*	 ✓*** ✓** ✓** ✓*** ✓*** ✓** ✓* ✓* ✓*	 ✓* ✓*** ✓** ✓* ✓*** ✓*** ✓** ✓*
• ***Facilitate Pull KT activities*** ○ *Train practitioners and communities* ○ *Train media*	 ✓***	 ✓** ✓**	 ✓***
• ***Exchange KT activities*** ○ *Co-design and implement research with target audiences* ○ *Participate in government policymaking forums* ○ *Invite policymakers to project events e.g., project meetings, conferences etc.* ○ *Organise policy dialogues* ○ *Network and collaborate with media* ○ *Meetings with industry*	 ✓*** ✓*** ✓*** ✓***	 ✓*** ✓*** ✓*** ✓*** ✓**	 ✓*** ✓* ✓*** ✓***
• ***Integrated KT activities*** ○ *Co-design, implement and disseminate research with target audiences*		 ✓**	 ✓*
• ***Evaluating KT activities***		✓*	
• ***Conducting research studies in the KT field***		✓***	
II. Meso level			
1. Research institution KT capacity and practice			
• ***Leadership KT capacity and experience*** ○ KT capacity and practice ○ Media and advocacy capacity and practice ○ Experience advocating for investment in R&D	 ✓*** 	✓*** 	 ✓***
• ***Institutional strategic and operational policies*** ○ Vision	d**d***	d*m**d ***	d**m**

	Case A	Case B	Case C
○ *Missions* ○ *Strategic plans* ○ *KT policy* • *Part of research policy* • *Stand-alone* ○ *KT strategy* ○ *KT guideline* ○ *Intellectual property rights policy* ○ *Tenure and promotion policies*	d**d*** d*m*d*** d***✓**m* ✓*m* ✓*** d*m** d*m** ✓*d*m*	d*m**d *** m***✓*d** d*m**✓**m* m* ✓* m***d**m* d**m*	d**d*** d*m**d*** d*m** d*m** ✓*m** ✓* ✓*m*** m***✓*m*** m***
• ***Resources*** ▪ *Financial* • *Inadequate* ▪ *Technical (KT staff, academics with KT expertise)* • *insufficient capacity (technical and number)* ▪ *Infrastructure - inadequate* • *KT Unit - insufficient capacity* • *Technology Transfer Unit - insufficient capacity* • *Research repository*	 ✓*** ✓***✓*✓* ✓* ✓* d***	 ✓*** ✓***✓*✓* ✓*✓** ✓** ✓**	 ✓*** ✓***✓* ✓* ✓*✓* d**
• ***KT capacity development*** ▪ *Integrate KT in research degree training* • *Discipline focused e.g., public health degrees* ▪ *Mentorship programmes* ▪ *Institutional KT capacity development* • *Training KT staff* ▪ *Continuous professional development*	 ✓*** ✓*** ✓* int*	 ✓*** ✓* ✓*** int*	 ✓*** Int*
• ***Initiatives/platforms promoting and evaluating KT*** ○ *Initiatives for improving credibility of research institution among target audience* ▪ *Public relations office/ publications* ▪ *Formal partnership with government* ○ *Initiatives facilitating multidisciplinary research* ○ *Facilitating pull activities* ▪ *Training programme for practitioners* ▪ *Rapid evidence services* ▪ *Secondment* ○ *Exchange platforms* ○ *Evaluation of institutional KT efforts*	 ✓*** ✓** ✓* ✓*✓* ✓*	 ✓** ✓** ✓** ✓* ✓* ✓**	 ✓*** ✓* ✓* ✓*** ✓*
2. KT capacity and practice of networks and institutions in the evidence ecosystem			
• ***Support from national and international networks*** ○ *Media and advocacy* ○ *KT capacity building*	 ✓**	 ✓**	
• ***Support from knowledge brokers (KBs) or other intermediary e.g., media consultants*** ○ *KT capacity building* ○ *Collaboration*	 ✓***	 ✓*** ✓***	
• ***Relative credibility among target audience of competing/peer research/policy institutions***			
• ***Norms of institutions that determine and regulate research practice and discipline norms*** ○ *Research ethics committees*	 ✓***	 ✓***	 ✓***
III. Macro level factors			
1. Research and KT funders			
• *Over-reliance on funding for research and KT from international funders*	✓***	✓***	✓***

	Case A	Case B	Case C
• *Funders allocate inadequate or no funding for KT and research capacity development including R&D*	✓***	✓***	✓***
• *Inadequate LMIC government funding for research and KT*	✓***	✓***	✓***
• *Difficult national research fund grant system*		✓*	
2. KT capacity and practice in the national policy environment			
• ***National KT laws and mechanisms*** ○ *KT law and mechanism exists challenging to implement due to insufficient/no funding* ○ *Law mandating industry investment in R&D exists but challenging to implement due to insufficient/no funding/ technical capacity*		✓*	✓*
• ***Intellectual freedom*** ○ *KT hindered by sensitivity/controversial nature of evidence*		✓*	✓*
3. Industry interests and investments in R&D - *Lack of local capacity; minimal interest and investment by multinational corporations*	✓*	✓*	✓***

No arrow/stars = not reported; At micro, meso consortium and other institutions/networks levels, and macro levels relating to intellectual freedom and industry interests and investments in R&D ✓*= one interview data source (little evidence); ✓**= two interview data sources (some evidence); ✓***= more than two interview data sources (strong evidence). At meso wider research institution level and national KT laws and mechanisms, ✓*= consistent evidence from one institution based on two or more sources, at least one source being documentary (little evidence); ✓**= consistent evidence from two institutions or countries based on two or more sources, one source being documentary (some evidence); ✓***= consistent evidence from three institutions based on two or more sources, one source being documentary (strong evidence). At the meso research institution level, orange arrows and stars (✓*) = the Consortium level, green (✓*) = the department level e.g., College of Health Sciences, where the consortium is housed, and blue (✓*) = the wider research institution (e.g., university) level. At the meso research institution and macro national KT laws and mechanisms levels, 'd' or 'int' = only one type of data source was available; either from an interview with no documentary support ('int') or documentary source with no support from the interview data ('d'). Also, at the meso and macro levels, 'm' = missing information either because the information could not be found or is not relevant e.g., only one institution in Case B was analysed for policies and structures at the department level because the other two institutions were smaller in size and had a flatter structure. In Case C, one institution is an autonomous research institution within one of the two larger universities and is therefore smaller in size, has a flatter structure and shares some of the resources of the wider institution such as the department and staff in charge of KT. The subscript 'm' is used on items where one or two other cases have reported their existence. Otherwise, where the items are missing across all case, it has been left blank.

4.3 CASE A DESCRIPTION

Case A was selected as an example of a consortium undertaking applied research focusing on a marginalised health issue, representing consortia mid-way between one that planned/reported the widest range of KT activities and those that planned/reported the narrowest KT activities, consisting of partner institutions in countries in the Southern Africa region, and established in response to DELTAS i.e., the consortium did not previously exist as part of a different programme.

The next section describes the micro, meso, and macro level factors that influenced the Case A KT capacity and practice and their interactions within and across the levels.

4.4 RESULTS

4.4.1 Characteristics of Case A participants

The data used to characterise and explain the Case A KT situation were drawn from interviews with nine participants consisting of seven individuals from Case A and two representing AAS (not included on the table) and a review of KT information in relevant documents from three out of the four African member institutions and the AAS. Among the seven Case A participants, five were researchers and two were support staff not engaged in research. Among the researchers, four were applied researchers and one was a basic researcher. Three researchers had one or more other responsibilities outside doing research - two were clinicians (including the basic researcher) and all three were DELTAS project staff (Directors and administrative staff). There were two senior researchers and three junior researchers. Among the junior researchers, two were DELTAS PhD students (typically referred to as fellows). Across the whole sample and among the researchers there was gender balance with slightly more women.

Collectively, the participants represented three academic and research institutions (all referred to as partner institutions with one designated as the lead institution responsible for coordinating and overseeing implementation of the consortium's activities). All three institutions were based in anglophone countries in Southern Africa.

Table 9 summarises the demographic characteristics of Case A participants.

Table 9. Demographic characteristics of Case A participants (n=7)

Participants characteristics	**# of participants**
Research discipline	
Applied researcher	4
Basic researcher	1
Research career stage	
Senior researcher	2
Mid-career researcher	0
Junior researchers	3
Other professional (not researcher)	2
The institution where the participant is based	
Lead institution of each study consortium	5
Selected two institutions of each study consortium	2
DELTAS Programme staff	

Directors (Principal and Co- Investigators)	2
KT or Communications or CPE staff	1
M&E staff	1
Programme administration staff	1
Other technical staff	0
DELTAS Programme fellows	
PhD fellows	2
Postdoctoral fellows	0
Career development grant awardee	0
Total	**7**

KT=Knowledge Translation; CPE = Community and Public Engagement; M&E=Monitoring and Evaluation

Documents of AAS, and the three institutions, and three countries included in the study were reviewed for the KT support they mentioned to triangulate with the participants' insights. The documents reviewed included:

- the DELTAS funder and scheme administrator including the Wellcome Trust KT policy and funding and AAS KT policy and description of the DELTAS scheme
- the selected consortia including documents or information describing the programme approved budgets and annual progress reports for 2016 and 2017
- the selected institutions including documents or information on: their vision and mission statements; strategic plans and/or objectives; research and KT policies; intellectual property policies; research ethics application documents; tenure and promotion documents; Master and PhD research degree training curricula; M&E frameworks; the existence of structures including Communications and KT departments and staff information and research repository within the academic/research; and research funding
- government institutions responsible for formulating national research and KT policies and funding national research priorities in the selected institutions' host countries (typically the responsibility of Ministries of Science, Technology, and Innovation or equivalent institutions).

4.4.2 Micro level themes

Researchers' discipline, career stage, training and professional background greatly influence their KT capacity and practice

Case A demonstrated the influence of researchers' disciplinary alignment, training and practice setting on their KT capacity and practice. Participants' understanding of, and attitudes towards KT were shaped by the expectations of their applied research discipline. Their KT practice was shaped by their career stage, professional setting and KT training in

addition to their applied research discipline. However, all the participants, irrespective of their level of KT capacity and practice, struggled with inadequate KT competency (knowledge and skills) and expressed their interest in further KT training and support.

Positive attitudes towards KT as a moral obligation

All participants considered KT a core responsibility or moral obligation of researchers to ensure that the society benefited from their scientific work (P21, P22, P24, P26, P27). The participants attributed their support for KT to: their clinical practice contexts, which provided opportunities to identify and address problems their patients presented with (P21, P27); KT being a core objective of applied research specifically referring to health services research (P22); personal interest in useful research findings being used rather than going to waste (P26); and/or personal interest in addressing specific health challenges through research (P21, P24, P26). For example, one participant described their personal interest in generating research that has practical use, which emerged from their clinical practice experience:

> "In the beginning we had a purely scientific approach, … do our science [and] publishing ... It's fulfilling if you are just a researcher but for me because I am also a clinician and I interact with people on the ground and see them coming to me with problems … I realized that doing research without actually engaging people is meaningless" (P21).

The following statement illustrates another participant's personal interest in generating research that can help address a specific issue they are passionate about exhibiting an advocacy undercurrent. The participant also perceived themselves as different from the typical researcher suggesting that their interest in KT is not the norm:

> "What good is … research if it just stays with the researchers? How is it going to help the world? How is it going to save a life in the community? For me research is meaningless without the advocacy component … I think that puts me in a different category from the academic researcher who sees themselves as a pure researcher, whether it a basic scientist or [other researchers who] see their work as conducting research and that's where the buck ends" (P24).

Researcher discipline influence may be shaped by their professional practice

Insights from participants suggest that the extent that researchers' discipline influences their interest in KT practice may depend on their professional practice i.e., whether they are a clinician-researcher, public health or advocacy professional or laboratory technician. Some

participants contrasted their support for KT practice with that of basic researchers, whom they perceived to be less interested in it or that not relevant in basic research processes (P21, P22, P24). This perspective seemed to align closely to their understanding of KT as involving co-production of research, which they did not view as relevant in basic research (P21, P22). For example, the following statement by one participant illustrates a lack of their clarity of the relevance of KT for basic research as compared to applied research:

> "It might be different if you were doing lab-based research … I think because we are offering services and we are developing interventions you have to engage users from the beginning to the end. I think it is also important for lab based [researchers] but it might not be pronounced" (P22).

However, the idea that KT is either not an interest of or relevant for basic researchers was challenged by one participant who was a basic researcher yet shared the same support for KT as the applied researchers (P27). The participants' parallel profession as a clinical practitioner and thus involvement in clinical research that uses molecular techniques likely influenced their thinking about KT. This finding suggests that basic researchers support for KT may vary depending on their professional settings and backgrounds, but more evidence would be needed to ascertain this.

More research on the interaction between researchers' discipline and their professional practice and how this shapes researchers' KT capacity and practice would be useful to strengthen these findings.

Inadequate understanding of KT shaped by practical experience and formal training

Participants' understanding of KT principles and techniques was shaped by and varied depending on their training and experience. Some participants had exposure to formal KT training though narrow in focus on media and advocacy principles and techniques (P21, P24) and/or were based at institutions with an advocacy mandate (P22, P24, P27). Only one participant had learned broader KT principles and techniques in their role as an academic supervisor of a PhD student (not affiliated with DELTAS) and through that process had theoretical but not practical knowledge (P26). In addition, at the time of data collection, the participants had been sensitised or trained on some KT principles and techniques (emphasising community and public engagement) through their involvement in the DELTAS programme (P21, P22, P23, P24, P25, P26, P27, P28, P29). Three participants reported that the DELTAS programme had defined three clusters of KT activities that grantees could implement including policy engagement, media and research communication, and

community and public engagement (P26, P28, P29). However, the programme placed more emphasis on the latter in the training and support they provided (P26). One participant described their DELTAS community and public engagement activities as follows:

> "Through the funding we get for our PhDs ultimately, we are expected to do a lot of public engagement so that our findings …doesn't end with publishing but then there's also a lot of community awareness on the research that we conduct and ultimately there has to be some impact in peoples' lives. For example, when we have 'World … Health Day' there are commemorations we do, we have a way of making communities have knowledge about the … health issues that affect people in the community so we are trying to do that" (P24).

Despite some training and practice-based exposure, a recurrent theme among participants was inadequate understanding of KT principles and techniques and a perception of minimal or insufficient KT practice by researchers more broadly. This was attributed to researchers' training and development lacking a specific focus on KT, rather prioritising research and scientific publishing (P21, P24, P25, P26, P27). Consequently, some participants lacked an interest in KT practice (P25, P26) or struggled to create time for it (P21, P24, P25, P26) and, among those interested, generally did not know how to do it (P21, P26). One participant explained it like this:

> "Researchers are not taught to do this [i.e., KT activities], so the skill is not there, the knowledge is not there, so they don't know how to do it" (P26).

The participants' uncertainty about KT was often signalled in their use of the following phrases before or after explaining how they understood KT (P21, P22, P27):

> "That's how I understand [knowledge translation] but I don't know if that is what it is" (P21).

> "I'm not sure that is answering your question" (P22)

> "My understanding is that, I think what I am trying to say …" (P27).

When asked to describe KT, many participants drew wholly or in part on their research practice experience illustrating their limited exposure to KT in their formal training and development (P21, P22, P24, P26, P27). For example, one participant who was both a junior

researcher and clinician in a public health facility drew from his experience to explain how KT could be facilitated by researchers:

> "As a practitioner and also somebody who has witnessed [decisions] the government [makes] for us as clinicians, what I think would have helped is if … [they want] to make sure that a certain evidence-based intervention … is being used, it should be accepted on the ground … But [what] I've seen is that projects … done, for example, in the university … are not … concerned [with that] … you are not even told that there is this [issue being explored] and then over the years [you] receive a memo to say, … Ministry of health in liaison with the World Health Organization … are saying we should adopt a, b, c, d and then you are like in a shock … as somebody who is working on the ground, if I was told initially … it will be much easier for me [to implement it]" (P27).

Emphasis on co-production of research and packaging and communication of research findings in KT knowledge and practice

When asked to describe KT and their KT experience, participants emphasised two principles and techniques: co-production of primary research studies with target audiences to ensure their relevance including defining the research question, designing the study, data collection, analysis and dissemination (P21, P22, P24, P26, P27); and packaging and communicating research findings using formats that are easily accessible and understandable to non-academic target audiences (P21, P22, P24, P26, P27). The participants' existing capacities in media and advocacy and involvement in DELTAS trainings on community and public engagement likely influenced their understanding of KT. For example, one participant reported their experience training media to improve their reporting of a sensitive health issue:

> "I was part of the team which was reviewing the [national] standard treatment guidelines, it was being updated … I was part of the authors of the section on the … how to address the common conditions … the main ministry …, whenever they want to engage other people my name … comes up because one of the officers in the ministry … knows the capacity that I have … … I have stayed long in the system … they know that there is this clinician that is at the hospital … whenever they are trying to do something around [that health issues] they say … 'give him an opportunity to be part and parcel of the process'…" (P27).

Greater understanding of KT among researchers with formal or academic KT training

Among participants with formal or academic training, the influence of training was most notable on their understanding of KT principles and techniques. For example, the participants interchangeable use of the terms community and/or public engagement to refer to KT demonstrates the influence of the DELTAS programme. Furthermore, two participants including one of the two participants with training in media and advocacy and another with academic exposure to KT exhibited more confidence in their descriptions of KT compared to the other participants (P24, P26). For example, the participant with media and advocacy training consistently referenced it when explaining their understanding of KT.

> "I went through a year of advocacy training [on] how to translate research into advocacy and also how to translate it into like layman's terms so that communities can understand what research is … how I understand knowledge translation is we have evidence that is generated either through … clinical trials … and evidence can also be generated by communities by what they see happening whether it's actually in the community or in the health facility. So, taking that evidence and making it useful so that it informs policy [and] future implementation … from the [advocacy] fellowship that I participated in we were encourage to use community advisory boards where researchers … communicate with the advisory board … so that the advisory board can further cascade that information to communities so that … we move beyond communities being used as guinea pigs by researchers but then they appreciate that this is their contribution to communities and generations to come. [Also] engaging with policymakers even from the get go when formulating your research questions so that policymakers have a buy-in and they have a clear understanding of the rationale behind doing this research so that when the findings come they find a place within [their decisions] … I got to know through my advocacy fellowship … policymakers don't find academic publications … useful because most [of them] do not read those but [we should make] sure that when we do our research and get our findings we try and package our information in different ways so that we target different audiences" (P24).

Similarly, the participant exposed to KT as an academic supervisor demonstrated their greater knowledge of the KT being more than just dissemination of research as follows:

> "I have been trying to explain to [my student] the concept of knowledge translation. He's a journalist so he seems to [think] if you put up billboards and distribute pamphlets that's 'knowledge translation'. And am like no, you've only done a … small

> part … that's dissemination and there is a very big difference between [that and KT], and we had this huge argument. So, his primary supervisor said let's send the paper to the journal, this is enough, and I am like, you've missed the point. You have all the data, but you have missed the point and it just came back and one of the reviewers just flagged that definition of knowledge translation [saying] 'you are talking about information dissemination which is one of the little specs on the whole spectrum of knowledge translation'" (P26).

However, the extent that this participant's greater KT capacity had been harnessed by the consortium to improve their collective KT capacity was not apparent suggesting a missed opportunity.

The potential for formal training to improve KT practice in certain conditions was also observed. Only one of the participants with formal training in media and advocacy exhibited notable improvement in their KT practice after their training, which may have been facilitated by the type of researcher their training targeted (senior researchers/practitioners) and approach of the training (hands on training of researchers to deliver public talks about the importance of their research and publish articles on the same in authoritative news outlets) (P21; DR416). This can be contrasted with the other participant who shortly after their media and advocacy training was enrolled into the consortium's DELTAS PhD programme and was focusing on laying the groundwork for their research and thus not yet having a chance to apply the skills they acquired from their training (P24; DR417).

Researcher career stage influence may vary based on their professional practice

Insights from some participants suggest that the extent of researchers' career stage influence on their interest in and KT practice may differ depending on their practice setting. Junior researchers were perceived as primarily concerned with and focused on activities that would get them awarded their PhD degree and career advancement after that (P25, P26). One participant explained it as follows:

> "The main challenge the fellows have been facing is a lot of work [in addition to] community and public engagement … Probably they thought what they were supposed to do was just … their PhD research publications." P25

However, the junior researchers among the participants did not mention this competing interest as a constraint they faced (P24, P27). One participant was already implementing some activities, which aligned with their professional responsibilities suggesting that junior

researchers are not homogenous and may be variously influenced. The other participant cited the early stage of their research as a reason for having not yet implemented the downstream KT activities that would happen when they have research findings (P24, P27).

> "When we had our … training we talked about the dissemination, how are we going to reach policymakers so that they know these are our findings? are we going to do policy briefs? are we going to do Op-eds? … so we've talked about that. I think it's the implementation of it, some of us are still in the early stages of our research" (P24).

Another participant reported that in their experience senior researchers at the pinnacle of their research career were the ones they had observed shifting their primary focus from research to KT practice involving evidence synthesis and promoting evidence-informed decision-making processes (P26). The participant said:

> "We do have one of the big people in [name of research field] health … he is a very good example of someone who has shifted his mindset saying 'we need to engage policy' … His papers are now moving more towards [saying] all these evidence we have collected can lead to a policy decision on this issue ... So he has been writing, I think 3 or 4 vey big and controversial papers … saying these are the authorities in this area and this is where we should move … as a country… He's got a lot of influence now and he does TED talks and all these things. So, he's shifted towards … policy type issues … from grassroots type of issues" (P26).

More research on the interaction between researchers' career stage and their professional practice and how this shapes researchers' KT capacity and practice is needed to strengthen these findings.

Expressed need for, and interest in, KT capacity development beyond co-production of research

Irrespective of their level of KT knowledge and practice, a recurrent theme among participants was inadequate competency for KT practice and a need for and interest in KT training and support (P21, P22, P23, P24, P25, P26, P27). The KT competency gaps cited by the participants were those for packaging and communication of research and interacting in policy making processes (i.e., going beyond co-production of research), specifically: navigating policy processes (P24, P26); packaging and communicating evidence to policymakers (P26); producing evidence synthesis to inform policy processes (P24, P26,

P27); using social media (P21, P23, P26); and interacting with mass media (P23, P24, P26). These KT competency gaps also align to the types of KT activities cited the least by the participants. For example, one participant said:

> " We … write policy briefs but I know that we can do better … I know sometimes when we put these policy briefs together the policymakers don't even read them and I think it's because … maybe we need to learn to make it … attractive, short and straight to the point so that the policymaker actually finds it interesting to read" (P21).

As noted earlier, lack of exposure of researchers to KT principles and techniques in their training and development was identified as one of the main reasons why their KT practice is minimal (P21, P22, P24, P26, P27). It is likely that most of the researchers who were part of the consortium's DELTAS programme were learning some KT principles and techniques for the first time through its training and support. For example, one participant expressed their interest in additional training similar to those provided in the DELTAS programme:

> "I think we would need more of those kind of trainings on public engagement, because it's a new area for a lot of researchers" (P21).

The participants also expressed an interest in KT courses being integrated into researchers' training and development including their degree training (P21, P22, P24, P26, P27). Mentorship and peer to peer education were recommended approaches for researchers' KT training and support (P24, P26, P27):

> "The research landscape is changing and we should all start playing a role because relying on communication officers is one thing. A lot of us should … engage ourselves. I think it would be a good idea to incorporate [KT modules in research degree training]" (P22).

> "I think … direct mentorship is a good approach … to have people who have actually done it explain how they did it such as a journalist training on use of digital media rather than a scientist … Peer to peer mentorship is also … a very good approach … Like [among] the [consortium's] cohort one's … the few who have done different things op-eds, radio and so on, … will then form … the training team or coaches" (P26).

4.4.3 Meso level themes

Consortia leaders greatly influence KT capacity and practice

Case A shows that consortia leadership for KT manifested in various ways that positively and negatively influenced their KT activities.

Past experience of consortia leaders informs current practice

Insights from some participants and documentary sources suggest that the consortium's DELTAS KT strategies were informed by its leaders' training and practice experience in clinical practice, health services research and media engagement and advocacy, specifically: co-producing research with policymakers and communities; disseminating evidence using public forums such as TED talks, TV and radio and non-academic print formats like Op-Eds; and participating in policymaking processes and advocacy groups (P21, P22, P25, P26, DR17). However, the consortium leaders overlooked budgeting for the DELTAS KT strategies in their grant proposal suggesting that they did not prioritise KT (DR17, DR20).

Flexibility/adaptiveness of consortia leaders in programme planning

When DELTAS launched in September 2015, the project administration role was a joint effort between Wellcome Trust Foundation, DFID and AAS. In November 2016, the project administration role was transferred fully to AAS (DR13). Based on insights from participants' knowledge about the management of DELTAS and documentary sources when the changeover occurred, AAS disseminated more specific DELTAS KT guidance and reporting expectations to their 11 grantees (P21, P26, P28, P29, DR15). AAS refined the DELTAS public and policy engagement into three clusters of KT activities namely: public engagement targeting research participants and groups of the public (interchangeably referred to as community and public engagement or CPE); policy engagement targeting policymakers; and media and research communication activities including attending conferences (P21, P26, P28, DR2, DR3, DR15). AAS concurrently placed more emphasise on the CPE cluster of activities and required each grantee to report the existence of a CPE strategy, budget, staff and training for researchers (P26, P28, P29, DR15).

Following AAS refinement of the DELTAS KT requirements, the consortium leaders realised they would not be able to meet the AAS expectations. Keen on addressing the identified gap, the consortium leaders acted swiftly to seek guidance for how to salvage the situation, which resulted in their application for the Wellcome Trust Public Engagement grant (P21,

P26, P23, P25). One participant serving as the consortium Director explained the situation like this:

> "When I realised that we needed a public engagement [component] for [DELTAS] … I went to Wellcome Trust [Foundation] and I [asked] them if we could use … a component in [our] DELTAS grant … called 'flexible funding' … to focus on public engagement… They [advised me to] apply for [the Wellcome Trust] public engagement grant [scheme instead]. So, I applied for [it]" (P21).

The same participant reported that at the time of data collection their consortium was among few DELTAS grantees that had applied for and been awarded the Wellcome Trust Public Engagement grant. Therefore, the consortium leaders demonstrated their flexibility or adaptiveness in their efforts to seek additional support for aligning their DELTAS KT plans with AAS expectations and in fact were used as an example by the funder to encourage other consortia to strengthen the KT component of their DELTAS programmes.

> "There are other DELTAS programmes, maybe one or two that [may] also have the [Wellcome Trust public engagement grant] … [one of the fund directors] kept giving our examples on several occasions … I remember emphasising that it was … easier if you have a Wellcome Trust grant to get their public engagement grant. But am … surprised that not many have applied for it" (P21).

However, as earlier noted, the Wellcome Trust Public Engagement grant did not fully address the gap in the consortium's DELTAS KT plans as it emphasised community and public engagement. To address this challenge, the consortium leaders tried to balance its KT activities by piggybacking on their involvement in ongoing non-DELTAS KT activities (P21, P23, P26). One participant explained it this way:

> "We are privileged to have [the consortium Director]. Wherever [he] goes, people listen to him … If he is going to do an op-ed, people will read it, so …certain parts we can leverage on the money that we have" (P26).

The consortium leaders may also have been inspired by DELTAS to adopt KT as part of their institutional strategic priority through their decision to pool funding for KT activities from all their projects and implement the activities at department level rather than DELTAS project level (P21, P26, P23). One participant serving as the consortium Director explained it as follows (using the DELTAS preferred terminology for KT, 'public engagement'):

> "Initially [the Wellcome Trust public engagement grant] was targeting DELTAS but now it's a different programme all together, because I have funding from other programmes and … from all my other grants we are taking a small proportion which goes towards public engagement" (P21).

Potential for consortia leaders to be role models

During the DELTAS programme implementation, the consortium Director served as a role model and was involved in training and mentoring DELTAS PhD and postdoctoral fellows (P26, DR26). One participant involved in the management the consortium's DELTAS activities including training gave the following example of how their leadership was involved:

> "[The consortium Director] can explain what it is like to be on TV, to be on radio, to do a TED talk, what goes into the preparation, how to write an Op-Ed … We are now trying to get our fellows to write [Op-Eds], I think they will take them more seriously because they know they are part of [the consortium Director's] group … We've … had one [fellow] write op-eds. She's … done two and she [asked], 'who picked me' and I was like, 'it was [the Director]', … [but] it was me who said let's pick [her]" (P26).

Inadequate engagement of consortia partner institutions

After being awarded the Wellcome Trust Foundation Public Engagement grant, each of the consortium's partner institutions identified an individual to tailor KT activities and champion and coordinate their implementation (P23, DR24). One participant responsible for overseeing implementation of the consortium's KT activities described it this way:

> "We have … institutional leads who are responsible for each institution … We worked closely with [them] to identify the fellows [who would be featured in the documentary and their] topics [in] a number of meetings … We had to agree on the areas that we were going to focus on … [and] the ways that we would communicate the message" (P23).

However, despite efforts to involve all partner institutions in defining their KT activities, getting them to implement them was a challenge (P21, P22, P26). Insights from two participants point to two issues that may have resulted in minimal interest in implementing the KT activities at the partner institutions (P22, P26). One was their lack of involvement in writing the Wellcome Trust Foundation public engagement grant proposal, which would have

made them more aware that it was a key DELTAS deliverable. This was alluded in the following explanation by a participant involved in management of the consortium's DELTAS programme activities:

> "I get the feeling that when [the consortium's Director] applied for [the Wellcome Trust Foundation grant], he [understood] the idea but the rest of the … PIs were not at the same level. So, they're only starting to understand … When I joined … last year, each time I talked about [the Wellcome Trust Foundation public engagement grant] they would say oh [the Director's] thing … they were like can you give us money [for] computers in our lab and I'm like 'that is not what the money is for.' … At the last annual meeting I got the sense that now they get it, they sort of have an idea of what we want to do with [the Wellcome Trust Foundation public engagement grant] … It's something … I had to force down their throats … we are slowly getting there" (P26).

The other issue may have been ineffective communication of their DELTAS KT activities within the consortium, which was cited by one participant who was a leader based at one of the partner institutions.

> "I haven't really been involved in it. I'm not sure … there is a bit of communication on it but I think it's probably better to get information from the fellows themselves participating in that program … Although, we only have two PhD students who just started … so they probably don't know what is going on" (P22).

Specialist staff capacity and support greatly influenced by consortia leaders' experience

Case A also demonstrates that consortia level of KT expertise particularly among the leaders influenced hiring of specialist staff and the training and support they provided to the consortium's researchers. The training and support provided to specialist staff in combination with their existing capacity in turn shaped the range of consortium KT activities they implemented.

Specialist staff skills in media and advocacy aligned to consortium main KT activities

Case A had two staff (one part time manager and one full-time officer) responsible for championing, coordinating, and supporting implementation of their KT capacity development and activities commonly referred to as community and public engagement (CPE) staff (P23, P21, P24, P26, DR24). As noted earlier, the CPE staff were hired mid-way implementation

of the project following AAS refinement of DELTAS KT expectations suggesting that they initially did not prioritise human resources for supporting this component. Both CPE staff were based at the consortium's lead institution.

The full-time CPE staff was hired during the second year of implementation of DELTAS using the additional funding from the Wellcome Trust Foundation grant in response to AAS refined expectations (P21, P26, DR24). The part-time CPE role was also defined for an existing staff at the time the full-time staff was employed (P26, DR24). Both CPE staff had no prior formal KT training or experience implementing KT projects and as a result had minimal understanding of KT (P23, P26). However, both CPE staff could draw on some experiential knowledge from their training and prior or current practice experience. For instance, the full-time staff had training and experience in advocacy, which they drew on to implement and support their DELTAS CPE that included media engagement and advocacy activities. We could draw parallels between the consortium leaders' greater capacity in media and advocacy and their hiring of a full time CPE staff possessing similar expertise. The part-time CPE staff had a good theoretical understanding of KT obtained from their role as a supervisor of a PhD student focusing on the topic, however, as earlier noted, the extent of diffusion of their greater KT knowledge into the support provided to the consortium was not apparent (P26).

Limited influence of specialist staff training and support on policy engagement capacity

As earlier noted, the CPE staff attended a training facilitated by AAS to improve their understanding of community and public engagement and follow-up trainings were planned (P21, P23, P25, P26, DR26). The full-time CPE staff expressed strong interest in participating in future AAS training to continue to improve their CPE capacity, which they believed was inadequate:

> "There is a great need for continued capacity building of public engagement officers and AAS … promised to have more of these workshops … My recommendation would just be for them to stick to their promise. Continue having them because they are really useful … and also … now there is need for training of trainers because we deal with fellows. We need to be confident when we speak to them. We need to know what we will be talking about … There are certain skills that I have but … other skills that I don't have that I must acquire that can make AMARI public engagement more effective and that can make the fellows appreciate public engagements … better" (P23).

However, given that the participants identified a need for training on policy engagement (reported in the micro level section), the training for CPE staff may not have sufficiently equipped them with these skills limiting their support to their consortium.

Potential for insufficiently skilled specialist staff to support consortia KT capacity and practice

Despite being insufficiently skilled in KT, the CPE staff managed to enhance their consortium KT capacity and practice. Most of the participants reported KT training and support provided by the CPE staff at three levels (consortium, institutional, and individual levels). The KT training and support activities reflected the DELTAS emphasis on CPE and the consortium's greater capacity in media and advocacy (reported in the micro level section) (P21, P23, P24, P26, P27). The consortium and partner institution activities were conceptualised and implemented by the CPE staff while individual level KT activities were typically organised by the PhD and postdoctoral fellows but also included their involvement in the implementation of consortium and partner institution activities.

The consortium's KT training programme stood out because of the structured approach used to deliver and evaluate it, which could serve as an example for other consortia to adopt or adapt. The training programme adapted a UK based curriculum for the African setting with modules on presentation skills, digital media, engaging policymakers and adult learning pedagogy skills (P23, P24, P25, P26, P27, DR26, DR27). The training programme used a mix of webinars, in-person, half-day and full-day workshops and was delivered collaboratively with experts from partner institutions including the curriculum developers who were also the consortium's UK-based partner institution (P24, P26, P27, DR27). One participant gave the following description of the training:

> "[We have a training on] the soft skills that you need for a PhD. The first one was about presentation skills. How do you deliver an effective presentation how do you make your presentation less wordy? … some of the … courses were delivered through webinars because we can't always be in the same place … One of the webinars … looked at dissemination of information through OPEDs, journals, policy briefs …. writing an article on like reproductive health matters" (P24).

A formal assessment of the acceptability of the training programme published in 2020 found that it was perceived as having improved research communication and policy engagement skills of PhD and post-doc fellows involved in it and their application of the skills (DR27).

Therefore, the CPE staff were able to strengthen their consortium policy engagement capacity by leveraging their partner institution's expertise. However, the extent of bidirectional transfer of capacity between the CPE staff and experts was not mentioned and may have been a missed opportunity for Peer-to-Peer and South-North learning among them.

Partner institutions minimally influence consortia KT capacity and practice

Case A illustrates that consortia partner institutions' policies, structures and processes have minimal influence on their KT capacity and practice due to insufficient focus on KT. However, opportunities for consortia and partner institutions to mutually benefit from each other's KT capacity and practice were identified.

Minimal opportunities for leveraging support for consortia KT activities from partner institutions

Participants had mixed views about the extent their home institutions value KT (including those based at the same institution). One participant did not think KT was valued at their institution noting that any KT efforts implemented by their institution were fragmented, not institutionalised and usually donor driven (P26). The participant said:

> "No, … I haven't seen where [the University is] making an effort to do [KT]. I haven't seen. It might be because it's here and there … What I've noticed is that … these [KT] type of courses are always sponsored from outside" (P26).

Yet, another participant based at the same institution reported that KT was valued because they often hosted events that facilitate interactions between researchers and non-academic target audiences to promote KT (P23). Another participant from a different institution felt that their institution supports KT because they expected their staff and students to generate evidence responding to their country's research agenda (P27).

Only one participant reported that recently their institution had strengthened KT within their policies, structures and processes including having a department and staff responsible for steering and monitoring institutional KT efforts, a KT strategy, and assessing KT in their researchers' tenure and promotion process (P22). The participant said:

> "We have a research office that assists with these kinds of things, and they are trying to look at more communications, like for example there is a communications officer in

> the health science faculty liaising with all the other communications officers to try and come up with a strategy. I think maybe last year or so … we are seeing a difference, some changes in policy … Our promotion … focuses on four areas - research, teaching, management, and leadership, and … social responsibility, which I think covers … things like community engagement, radio TV …, engaging with NGO's. So, I think it's pretty strong … there is a … committee that … keep tabs on all the activities done by all the researchers" (P22).

The same participant also reported that they had a donor funded project KT staff within their department but expressed concern about the sustainability of that arrangement suggesting that their institution's efforts to strengthen KT support fell short.

> '… we are very lucky … we have a communications officer which has been very … helpful for us. ... I think it's very unique to our set up because it's funded by external research funders. So, it's hopefully something we can sustain other than to rely on …. getting some funds" (P22).

Majority of participants were unaware of any existing KT policies in their institutions and cited a range of gaps in support for KT at their institutions suggesting that KT may not have been receiving notable attention. The gaps cited included: lack of KT units or KT capacity among support staff (P21, P24, P26, P27); KT not considered in tenure and promotion processes (P21, P26, P27); and KT not covered in their academic degree training programmes (P21, P22, P26). Documentary sources on support KT among consortium's partner institutions that were accessible corroborated participants' insights on the existence of KT departments and policies (I1L1, I1L2, I2L1 & I2L2), tenure and promotion processes (I1L1, I1L2) and academic degree training (I2L1, I3L1).

Opportunities for consortia and partner institutions to mutually benefit from each other's KT capacity and practice

Two participants, both CPE staff based at the lead partner institution, noted some opportunities for the consortium and partner institutions to mutually benefit from each other's KT capacity and practice (P23, P26). One participant reported a positive and potentially more mutually beneficial relationship with their institution's public relations office based on an encounter with them when seeking clearance for one of their DELTAS KT activities during which they encouraged closer interaction with journalists and gave them tips on how to do it (P26). The interview process may also have prompted the participant to reflect on an

opportunity to explore a more meaningful collaborative relationship that goes beyond just seeking their permission to hold events (P26).

> "[the public relations office] were actually saying 'why didn't you take the journalists to the … hospital part of the … unit' and [we were saying] 'this is our first time to engage the journalists so we're not so sure if we wanted to do that. People take weird selfies' … and they said, 'no we have done it before… all you need to do is have a hat by the door, 'put all your phones and cameras into the hat and if you need a selfie or a picture taken, we will have the camera and we will take the picture and tell you what's appropriate and what's not.' … So, the communications person … for the Medical School or they call them the PR people, [attended the event] and he was enjoying himself and saying 'this is a good thing' … But we didn't s…reach out and say … 'you could … be part of this …when we do our [events] because that would also be … building capacity. Exposing them to these things … They probably know more people and researchers …than we do" (P26).

As earlier noted, the consortium CPE staff integrated a structured soft skills course inclusive of some KT modules into their PhD and postdoc training. Interview and documentary data reported that the consortium planned to strengthen the capacity of partner institutions to deliver the soft skills training as part of their degree training, which they had started implementing (P26, DR26, DR28).

> "The next step for us is … we've started to train the trainer … [we] want […] it out there as a package … instead of having people to gather let's say in Johannesburg and do the training for fellows, do a training of trainers to … cohort 1 fellows, [then] they should start … training the cohort 3 fellows, and then the cohort two train the next, … in any case, they're becoming academics so teaching is going to be part of their skill set... I would think they would need to develop skills and talking about their work. In layman's terms, not to dumb it down no, but to talk about the application and the importance of their work to society" (P26).

As noted in the section on leadership, the DELTAS stimulated the institutionalisation of CPE activities within the lead institution department housing the programme by expanding it to all their projects (P21).

4.4.4 Macro level themes

Funders exert considerable influence on consortia KT capacity and practice

Case A shows that the donor and government funders have a disproportionately large influence on consortia KT capacity and practice via a variety of means (both carrot and stick) that is simultaneously facilitative and inhibitive.

Initially broad guidance for KT activities pivoted towards CPE

The DELTAS programme guidance for the KT component was initially not defined in terms of the expected activities allowing for wide interpretation by grant applicants. However, as noted earlier, a year into implementation of the DELTAS programme, the funders refined the guidance for the KT component into three clusters, namely: CPE, policy engagement, and media and research communication. The funder grouped the DELTAS KT activities along with networking and collaboration (e.g., conferences) and leadership development activities as 'Scientific Citizenship' (DR2, DR3).

As reported earlier, mid-way implementation of DELTAS, the funders through AAS emphasised the community and public engagement cluster of activities (referring to them as CPE) and required, from each grantee, an annual progress report on the existence of a CPE strategy, budget, staff and training for researchers (P21, P26, DR15). AAS also hired a staff to guide and strengthen capacity for CPE among the DELTAS grantees including developing and implementing a CPE Strategy (P26, P28, P29). AAS staff said their decision to emphasis CPE was informed by an assessment of the first-year project reports, which demonstrated that this component was receiving the least attention among the grantees (P28, P29). One AAS staff explained the idea behind AAS heavy focus on CPE as follows:

> "We realised that [on the aspects of] communications, media engagement, results dissemination was really being implemented well, researchers are very good around engaging with policymakers. However, the component on community and public engagement was largely deficient. And that is [why AAS hired a Community and Public Engagement (CPE) Manager] to lay the foundation on how the community and public engagement component could be strengthened to bridge that gap so that all the strands of scientific citizenship move at the same pace" (P28).

However, whilst the consortium had some existing policy engagement experience, a recurrent issue among the participants was the need for more resources and capacity strengthening focused on this (P21, P22, P24, P23, P26).

> "An area we are lacking, and I think we would need support in … we write policy briefs, but I know that we can do better … Sometimes when we put this policy briefs together the policymakers don't even read them and I think it's because … we need to learn to make it … attractive, short and straight to the point so that the policymaker actually finds it interesting to read" (P26).

KT budget restrictions including size and focus

The DELTAS scheme guidance asked grant applicants to allocate only 1-2% of their total proposed budget for policy and public engagement (DR1). However, as noted earlier, DELTAS grant applications were initially not provided with clear guidance for the types of activities appropriate for the policy and public engagement and thus they would have used their own discretion to define and budget for relevant activities. Documentary data showed that the consortium did not budget for policy and public engagement activities.

As noted earlier, the DELTAS programme funders consistently encouraged their grantees to apply for additional funding from their Wellcome Trust Foundation Public Engagement grant scheme including at the grant award stage. The following statement taken from the Wellcome Trust Foundation Public Engagement guidelines illustrates the kinds of activities that they defined as public engagement, which prioritises activities targeting communities and the public:

> "Although your ultimate aims in your research might be to influence policy, the activities paid for by [Wellcome Trust Foundation public engagement grant] need to involve the public. We believe that community or public voices can add to your argument so you might, as a result of your public engagement, create interest or evidence that could then be used to inform policy, but you should not be aiming to engage only policymakers in your activities" (DR7).

As noted earlier, the consortium applied for and was awarded a Wellcome Trust Foundation Public Engagement grant worth about £100,000 as a strategy for salvaging the gap in their programme for DELTAS KT activities. The grant would support organisational, institutional and individual level capacity development and activities but focusing specifically on CPE (P21, P22, P23, P25, P26, DR23, DR24, DR23). However, some participants reported that

while the additional Wellcome Trust Foundation grant helped to partly fill the gaps in the consortium DELTAS KT plans, the funder's restrictions on the range of activities (i.e., focusing on CPE) and budget size constrained their KT capacity and practice (P21, P23, P26). For example, one participant described how the funder approved a smaller budget than what they requested, which reduced their CPE activities:

> "When we applied for [the Wellcome Trust Foundation Public Engagement grant], … we had … planned that the documentary would be … 30 minutes [long] for each country or one hour … We did not receive the money that we had applied for…, so we had to cut down [the activities] to go with the budget that we received" (P23).

As noted earlier, the consortium tried to address their budget constraints by pooling funding from their portfolio of projects including DELTAS to support joint KT activities.

Missed opportunity for early-stage support to grantees for development of robust KT plans

As noted in the previous section, interview and documentary data showed that the consortium's proposal initially lacked a budget for KT activities. Participants involved in the grant application process attributed this to an oversight in the grant review process, which was corroborated by insights from AAS staff and documentary data (P21, P26, P29, DR17). For example, one participant felt that the DELTAS KT component was not subjected to much scrutiny:

> "I think if they put that as one of the scoring categories for the next round of Deltas, people can budget for it, and they can take it more seriously" (P26).

However, the consortium's grant reviewer's notes revealed that they had noted that the proposal did not define knowledge dissemination strategies and raised this as an issue to be addressed (DR17). This challenges the notion that the DELTAS grant reviewers failed to critically evaluate the KT component of grant proposals but rather suggests that the funders did not effectively execute their due diligence to ensure that the concerns raised were addressed. Indeed, one AAS staff alluded to the DELTAS grant review process focusing more on ensuring that proposals did not exceed budget ceilings for each of the broad budget lines defined, which resulted in them overlooking specific budget lines within. As noted earlier, the DELTAS KT budget line was within the broader 'Scientific Citizenship' budget line.

> "The [DELTAS grant review] committee was looking at budget lines for Scientific Citizenship in the global sense. So, … they didn't look at the budgets for individual activities under Scientific Citizenship. I think that's what informed the decisions… when budgets were challenged and scrutinised, they were looking at broad project headings like Scientific Citizenship" (P29).

One participant believed that the DELTAS KT budget challenges they faced was a reflection of the funder simply prioritising the research component of the grant over the KT component:

> "There are very few of DELTAS grantees using the scientific citizenship component of the grant .... But even if they were, if you look at the component it's a small fraction of the budget for most of the programmes, which goes back again to what I said earlier …, Wellcome Trust [Foundation] is interested in science" (P21).

Indeed, if there was a keen interest in ensuring the DELTAS KT component was reasonably reflected in the consortium's grant proposal and budget, the funder might have done more to ensure this.

Training and support during project implementation

AAS and Wellcome Trust implemented a capacity strengthening strategy that also emphasised CPE and used a multi-pronged approach to deliver it that included: advocating to DELTAS grantees' leaders (e.g., Directors) to prioritise integration of CPE activities in their research projects (P21, P26, P28, DR11); organising training workshops for their CPE staff (P23, P26, P28, DR11); and administering a grant scheme for supporting junior researchers to integrate CPE activities in their research projects (P28). The training and support were largely appreciated and helped clarify the funders' expectations on KT among the participants involved in them i.e., CPE staff and a desire for continuous training and support expressed (P21, P23, P26). One AAS staff described their capacity strengthening strategy as follows:

> "We have a strategy that guides our work … Even within the AAS we do some form of capacity strengthening in terms of bridging the gap around engagement for our ST&I programmes. We strengthen the capacity of the DELTAS institutional leadership … [encouraging them] to embed engagement in the institutional systems to be able to plan for [it] right at proposal development level, grant proposal level and budgeting for engagement initiatives and then … the … guys who actually do the implementation at … DELTAS institutions, building that capacity because we

> appreciate that there is no particular degree, or … training tailored at universities, to … do community and public engagement. Some of the people who you will find who are … mandated to implement engagement at institutions will basically be communicators, people trained as journalists. Their skillset could have some components that would support engagement, but … [need strengthening]. The next level [is] to empower or build capacity among researchers, these are the DELTAS fellows. Where we provide technical support as well as funding support" (P28).

The AAS staff added that the reason for creating the grant scheme for junior researchers was in response to their progress assessment, which revealed little KT capacity and financial support for KT practice among junior researchers who had an interest in it.

> "The DELTAS Africa CPE fund was an initiative that was informed by a quick assessment that [was] conducted among CPE implementers at DELTAS Consortia to try and understand … the needs and gaps that are existent … in order to support capacity strengthening for CPE within the DELTAS Consortia and across the board. One thing that kept coming up from CPE implementers was that whereas we are encouraging embedding of engagement at institutional level … within the grantees' scientific projects, some of them did not have sufficient knowledge and even funding support to undertake these initiatives even when they felt that they were really important" (P28).

Documentary data corroborated that AAS, Wellcome Trust and DFID created a special competitive grant scheme targeting 20 DELTAS junior researchers (PhD and postdoctoral fellows) called the 'Community and Public Engagement Seed Fund'. The grant scheme was launched in the 4th year (2019) of DELTAS and provided each of the 20 junior researchers that were successful £30,000 (DR16). However, at the time of data collection from Case A participants, the grant scheme was still being designed and had not been launched.

Potential for institutionalisation of KT practice at funder level

The AAS staff reported that the DELTAS programme also influenced AAS by inspiring its leaders to adopt CPE as one of the institution's strategic objectives i.e., AAS would promote CPE in in all their programmes, not only DELTAS (P28, P29, DR418). One AAS staff explained it as follows:

> "We started realising that there needed to be … more emphasis on … community and public engagement and then … it also … emerged as an area of strategic importance for the AAS" (P29).

However, while this was a positive development, it might have resulted in little focus/ attention on other (non-CPE) aspects of KT at the wider AAS institution level.

Potential for funders to support development and use of national research agendas

A recurrent theme among the participants was the influential role of national research agendas or priorities in facilitating (by signposting policymakers information needs) or hindering (when some issues are marginalised) researchers' KT practice (P21, P22, P24, P26, P27). At the same time, a recurrent challenge among the participants was the low priority given to the issues they focus on in national research agendas compared to HIV and Maternal, Newborn, Child, and Adolescent Health (MNCAH) (P22, P23, P24, P26, P27). One participant attributed this to over-reliance of their government on donor funding, which prioritised HIV and MNCAH (P24).

Nevertheless, recent positive shifts in support of the issues they focus on were noted by two participants due to an increase in evidence on the societal impact (P22, P27). For example, one participant explained how the extent of prioritisation of issues on their country's national research agenda influenced their KT practice:

> "There is a new boom in terms of [the health issue I work on] because there are a number of issues reported in the media which lead to [it] … In the past decade, [the health issue] has … been put as part of essential health coverage in [my country]. Recently … there was even a parliamentary committee recommending that our standards … need to be updated … they were … say[ing] that … limited resources in terms of funding [are being invested into the health issue]. So that's … pushing [the issue] onto the national research agenda that we need more … studies to understand the phenomenon" (P27).

At the same time, the consortium designs and implements research projects that integrate the issue with HIV and MNCAH as a strategy for increasing attention to the issue among policymakers, practitioners, the public and funders (P23, DR26).

A few participants demonstrated the potential for researchers to be involved in shaping national agendas or priorities, which would likely be of great benefit to researchers investigating marginalised issues to ensure they are not left out (P24, P27):

> "we review [the research agenda] and if there are further questions to be asked or further research questions to be added to [it] they're added there and … there's a systematic process of doing this and it happens mainly through various technical working groups that are within ministry of health" (P24).

Therefore, opportunities exist for consortium funders to support researchers to work with their governments and other national actors to define and use national research agendas/ priorities.

4.4.5 Interaction between micro, meso and macro level factors influencing KT capacity and practice in Case A

Having presented the micro, meso and macro level factors influencing Case A KT capacity and practice separately, this section considers their interaction.

The data reveals that the KT capacity and practice of the consortium in Case A was shaped by multi-directional interactions between the micro, meso and macro level factors. The consortium's applied research orientation, stronger capacity in media and advocacy and lack of experience designing and implementing formal KT programmes (including among their leadership) greatly influenced the consortium's DELTAS KT plans, budget, hiring of specialist staff and capacity strengthening approach. For example, lack of experience designing and implementing formal KT programmes may have resulted in lack of knowledge of the need to allocate resources for such activities including specialist staff, which were left out of their initial DELTAS proposal. At the same time, the existing KT capacity and experience of the consortium leader (even though narrowly focused on media and advocacy) was harnessed for training and mentorship of DELTAS PhD and post-doctoral fellows to build their KT capacity. The consortium's partner institutions and their national research policy and funding contexts also provided insufficient support for KT from which the consortium could draw on.

Nevertheless, the study data illustrated the potential for the consortium and partner institutions to mutually benefit from each other's KT capacity and experience, which could positively influence micro level KT capacity and practice beyond the DELTAS project. For

example, the consortium's CPE staff received some guidance and tips from their wider institution's public relations office staff presumably aligning to the institution's policy framework for engaging with non-academic target audiences. The consortium's CPE staff also invited their wider institution's public relations staff to their DELTAS KT activities providing them with an opportunity to understand and learn from the programme. Notwithstanding the limitations of existing capacities, it could be assumed that if effectively harnessed, the knowledge exchange and learning between DELTAS CPE staff and their institution's public relations staff had the potential for strengthening KT support to individual researchers being served by the two structures (DELTAS CPE staff and their institution's public relations office) and ultimately improving their KT capacity and practice. However, at the time of the data collection, there was no evidence to support this link between the meso level (the consortium and research institutions) and micro level.

The efforts by the consortium to integrate their KT modules into their partner institutions' postgraduate training programmes could also be assumed to potentially have a positive influence in the long-term on micro level KT capacity and practice beyond the DELTAS project. However, at the time of the data collection, there was no evidence to support this link between the meso level (the consortium and research institutions) and micro level. Insights from some participants suggest that the meso level networks and groups that researchers worked with or through greatly influence micro level KT capacity and practice (e.g., the participants that underwent media and advocacy training prior to DELTAS). Similarly, some insights from the participants suggest that research networks and groups also influenced the consortium KT capacity and practice through e.g., engaging experts to conduct trainings and support implementation of some activities and collaborating in some activities. The influence of either the consortium or micro-level on meso networks or groups in was unclear. Although, there is a potential for it to be strong if for instance trained researchers are absorbed by the networks to serve as mentors. Likewise, research networks or groups collaborating or training the research consortium research and staff could be simultaneously meeting their own professional goals and this way are influenced by the consortium.

Due to the narrow KT capacity and practice among the consortium's researchers, leaders, and partner institutions (represented in the study), the DELTAS funders had a disproportionately large influence on the consortium's KT capacity and practice at all levels including: how individual researchers and the consortium conceptualised KT; the technical and financial support available to them; and the scope of KT activities they could implement. By requiring the consortium to define, budget for and report KT activities (albeit placing more

emphasis on CPE), the funder had a positive influence on the consortium and its wider institution. For example, the consortium wrote a successful proposal for the Wellcome Trust public engagement grant in response to their lack of a budget for KT activities in their initial proposal, which the funder later required them to report on. Then CPE was adopted as an institutional strategy in the department housing the consortium and funding from their portfolio of projects including DELTAS were pooled to support implementation of the strategy. However, at the time of data collection, the data did not demonstrate the potential for uptake of CPE as an institutional strategy at department level to stimulate its adoption at the wider institution, which could positively influence micro level KT capacity and practice beyond the DELTAS project. The consortium leader emerged as a champion of CPE, which was motivated by the DELTAS programme emphasising it and in turn was crucial in the institutionalisation of the CPE at department level.

However, the funders' influence was not all positive as they missed an opportunity to support the consortium to develop better KT plans at the grant review stage, the result of which was a lack of a budget in the consortium's initially approved grant. The funders also placed more emphasis and investments on the CPE cluster of KT activities and in the process undermined opportunities to strengthen the consortium's capacity for policy engagement, which participants identified as a need.

Case A identifies key intervention opportunities for strengthening the KT capacity and practice of research consortia that are similar to Case A: improving applied researchers' understanding of KT and KT practice addressing all relevant target audiences; strengthening the capacity of consortium leaders, funders, policymakers and dedicated KT staff to better champion KT and support researchers; and strengthening support for institutionalisation of KT in consortium partner institutions.

CHAPTER 5: CASE B

5.1 OVERVIEW OF CHAPTER

This chapter discusses the Case B KT capacity and practice to identify the contributing factors and their interactions.

5.2 CASE B DESCRIPTION

Case B was selected as an example of a consortium undertaking a mix of applied and basic research on a high priority global health issue, planned/reported the widest range of KT activities among the consortia in the DELTAS programme, consisting of partner institutions in countries in the East Africa region, and established before DELTAS as part of a different donor funded health research capacity strengthening programme.

Refer to Chapter Four Table 8 for the summary of Case B KT capacity and practice across the three levels (micro, meso and macro) in relation to Cases A and C.

The next section describes the micro, meso and macro factors that influenced the Case B KT capacity and practice and interactions within and across the levels.

5.3 RESULTS

5.3.1 Demographic characteristics of Case B participants

The findings were drawn from interviews with eleven participants consisting of nine from Case B and two representing AAS (not included on the table), and review of their institutions' documents. Case B participants consisted of seven researchers and two support staff not engaged in research. Among the researchers, four were applied researchers and three were basic researchers. Three researchers were clinicians (including one of the basic researchers) and four were DELTAS programme staff (Directors and administrative staff). Four of the researchers were established (i.e., senior) and three were junior. All the junior researchers were DELTAS fellows – two were PhD students and one a Master level career development grant recipient. Similar to Case A, Case B participants had a balanced representation of gender with slightly more men, represented three partner institutions, all academic or research institutions based in anglophone countries in East Africa.

Table 10 summarises the demographic characteristics of Case B participants.

Table 10. Demographic characteristics of Case B participants (n=9)

Participants characteristics	# of participants
Research discipline	
Applied researcher	4
Basic researcher	3
Research career stage	
Senior researcher	4
Mid-career researcher	0
Junior researchers	3
Other professional (not researcher)	2
The institution where the participant is based	
Lead institution of each study consortium	7
Selected two institutions of each study consortium	3
DELTAS Programme staff	
Directors (Principal and Co- Investigators)	3
KT or Communications or CPE staff	1
M&E staff	1
Programme administration staff	2
Other technical staff	0
DELTAS Programme fellows	
PhD fellows	1
Postdoctoral fellows	0
Career development grant awardee	1
Total	**9**

KT=Knowledge Translation; CPE = Community and Public Engagement; M&E=Monitoring and Evaluation

The types of institutional documents reviewed for KT support in the partner institutions were the same as those summarised in Case A.

5.3.2 Micro level themes

KT training, mentorship and experience results in better KT capacity and practice

Case B demonstrates that research consortia implementing a wider range of KT activities have greater KT capacity and experience at the individual and team level, irrespective of disciplinary alignment. However, consortia with greater KT capacity and experience among them face the same challenge of lacking formal KT training and need this support identified in Case A.

Potential for diffusion of greater individual level KT capacity and experience at team level

Most participants exhibited an understanding of KT and KT practice that mirrored that of Case A participants. Participants expressed uncertainty about KT attributing this to prioritisation of research and scientific publications in their training and development and emphasised co-production of primary research and its packaging and communication in non-academic formats in their descriptions of it (P13, P14, P18, P19, P20). Also, similar to Case A, the DELTAS programme influenced participants' understanding of KT and KT practice, which reflected a bias to CPE and media engagement (P12, P13, P15, P16, P17, P18, P19, DR32).

Just as in Case A, a few participants (two in this Case) exhibited better understanding of KT than their counterparts but more refined and sophisticated likely because of their more extensive experience learning and implementing a wider range of KT approaches (P12, P15). The two participants cited KT principles and techniques beyond co-production of primary research and its packaging and communication including: carrying out and promoting uptake of evidence synthesis rather than findings from single studies; organising forums with target audiences specifically aiming to discuss evidence in relation to identified policy gaps; and strengthening individual and institutional capacity of target audiences and researchers to promote evidence-informed decision-making. The two participants also self-identified as not just researchers but researchers doubling as KT practitioners (i.e., investing a significant part of their time to formally designing and implementing activities that strengthen KT capacity and practice). For example, one of them said:

> "We … have a program on knowledge translation which has been running for … about seven years and our program is about building capacity for knowledge translation and we have five PhD students right now … some will be completing this year and some will be completing next year. But I am also involved in a number of knowledge translation initiatives along with that" (P12).

The greater KT practice experience of the two participants visibly influenced their consortium's DELTAS wider range of KT activities in comparison to Cases A and B, which was likely because they both held governance and management roles on the programme. For example, Case B included policy dialogues in their DELTAS KT plans, which they would use to discuss the evidence they generate in relation to public policy gaps and potential solutions. One participant explained it as follows:

> "We haven't done any [policy dialogues] since the program started but we are … anticipating doing them at some point with the grant. Right now what we are doing is … media engagement, which is relevant … when the research is just starting" (P15).

In addition, having colleagues with greater KT expertise may have enhanced the participants' collective understanding of KT in comparison to that in Case A. Even though the pattern of understanding of KT among most Case B participants mirrored that in Case A, their descriptions were richer in comparison, which could be attributed to their proximity to colleagues with greater KT expertise. However, it is also possible that the participants in Case B were just better at expressing themselves than their counterparts in Case A. For example, one participant who was a junior researcher with no knowledge of KT before joining the DELTAS programme summarised it quite well:

> "I think my understanding is that we do a lot of research that generates a lot of information and we would like to see this information translate into … clinical practice, … policy formulations that can change practice … What would happen before was that a lot of information is generated and it is locked up in publications, which many policymakers …, … many organizations or other service providers may never read and if there is a deliberate effort to take that knowledge to them, I think that should work better and translate into better clinical care and whichever interventions we're looking into" (P19).

Considering that Case A missed an opportunity to similarly harness the greater understanding of KT concepts and principles among them, Case B findings demonstrate that extensive KT practice experience may have a role to play. It was likely very easy for the two participants in this Case with extensive KT practice experience to impart their knowledge and skills compared to the Case A participant who lacked any practice experience. More research would help clarify the role of level of KT practice experience in the influence of individual level KT capacity and practice at the team level.

Potential for informal exposure to KT to stimulate researchers' KT capacity and practice

Insights from the two participants with advanced KT knowledge and practice reinforced one of the cited barriers to researchers KT practice by demonstrating that researchers are usually not introduced to KT principles and techniques in their formal education and development but rather in informal serendipitous ways. The senior of the two participants reported that their interest in KT emerged following an invitation to a project dissemination

workshop as they were an expert on the health issue that the project was focusing on (P12). This initial exposure stimulated an interest in promoting KT not just within their own research projects but as a broader agenda that should be adopted regionally in Africa and globally. The participant then proceeded to actively lead the process and seek funding to do so. The following is an excerpt from the participant explaining how they got introduced to KT practice:

> "I got [interested] through a project … a ten-year study … I think they were three experimental districts and three control districts … In three districts they were [asked] to collect data, analyse it and let it be used to inform policy decisions including budget allocation while the other districts it was business as usual … they put in place a mechanism to show them (i.e., the experimental districts) how to analyse the data and how to make use of it and included a budget for this. The whole idea was to see, … for example, 'What does it do to the health indicators in the districts where people are using data to inform budget allocations?' … When the study was over and they wanted to disseminate those results. They called … a number of people, I was lucky to be called to that meeting as … an expert … the results were intriguing … at the end of the meeting we were like this seems a good thing for the whole of East Africa, why don't we advocate for the whole of East Africa. We asked the East African Community to do that and … they agreed but they were not doing it. So, I said … I will write to the same [funder] that funded [that ten-year project] and request them for money … to go around East Africa advocating for setting in place a mechanism, which will support the use of evidence" (P12).

The other participant (i.e., the junior among the two) became exposed to KT principles and techniques as a protégé of the senior participant illustrating the potential for mentorship to enhance researchers' KT capacity and practice.

More research is needed to understand the interacting role if personal interest given that other researchers may be exposed to a research project focusing on KT but may not be influenced to the level was described in this Case.

Mixed support for KT influenced more by professional background than disciplinary alignment

Similar to Case A findings, participants perceived disciplinary differences in researchers' support for their role in promoting KT i.e., applied researchers viewing it as their core responsibility and basic researchers having less interest in it or viewing it as irrelevant in the

work they do (P12, P13, P14, P19, P20). This perspective was validated by some participants who are basic researchers unlike in Case A where this was refuted (P14, P19). For example, one of the participants who was a basic researcher said:

> "We [researchers] have an obligation to make sure that the things we do actually have meaning and it's not … abstract ... We might do basic science [but] ultimately when it is applied, we may not be able to see what the implications might be … I think our obligation then is that we engage with the stakeholders that can enable that translation. It also will mean we engage stakeholders to define the priorities … That could be government, or it could be private foundations … We should in some way influence the things they fund not just by writing good proposals, but also highlighting what the real priorities are … Where we have some challenges is where do we … stop and let those who are better qualified to take whatever technology it is out … I think our role then needs to stops at generating the evidence and then we get somebody else who is better suited to do the marketing and distribution" (P14).

This difference in support for researchers' KT practice among basic researchers in Case B compared to Case A suggests that basic researchers are not homogenous and may be influenced variously resulting in differences in perception of their role in promoting KT. The difference between Case A and B appears to be influenced by their professional responsibilities and relatedly the type of research they conduct. The Case A basic researcher was a clinician and involved in clinical trials exploring drug interactions and their effect on a certain health issue while the Case B basic researchers were involved in exploratory lab-based research on molecular tools for diagnosing, monitoring and controlling infectious diseases (discovery research).

The idea that researchers' KT practice may be influenced by other factors beyond disciplinary alignment was reinforced by one participant's view that researchers' professional setting shapes their KT capacity and practice:

> "There are islands in countries where researchers have much better appreciation based on who else they are working with and so you might say, for example, … researchers working with AFIDEP by the very nature … they emphasis knowledge translation, … use of research to inform policy and practice … those [researchers] understand it much better than … other general researchers" (P12).

Researchers' career stage is important irrespective of research discipline and KT capacity and experience

In Case B, the influence of researchers' career stage on their KT practice, irrespective of disciplinary alignment, was stronger than in Case A. This may be because, unlike in Case A where the early career researchers (PhD students) had held and continued to hold positions that involved clinical practice and/or advocacy. Nevertheless, Case B, demonstrates that researcher career stage is still a crucial factor that influences their KT capacity and practice.

Nevertheless, in Case B, the range of KT activities reported by participants who had advanced further in their career went beyond co-production of research (P12, P14, P15, P18, P20). For instance, among the two basic researchers involved in applied research, the senior researcher exhibited a wider range of KT activities (P14) than the junior researcher who reported having only been involved in one-off dissemination workshops (P19). For example, the senior basic researcher described some of their KT activities as follows:

> "For one of the technologies that our department has worked on for years, we recently got registration by the relevant authority … so it can be commercialised. Now … we're … in discussion with private sector under a licensing agreement but also working with county governments especially … in our target areas so that dissemination can happen and … With the work that we are doing in [the county] … at any one time we have three technicians from the county government that work with us and they are seconded to us, seconded quote and quote … just because we pay them but the first three that we had were then employed by the county government [i.e.,] they got absorbed … We now have another three that we understand have been interviewed and may be absorbed. So … they are now very competent to do the things we do and can then support the county. We hope that some of our technologies [that we trained them to use]… will at least become a governmental health policy" (P14).

Of note, the participant alluded that their involvement in promoting KT ended after testing and evaluating the effectiveness of their intervention in collaboration with the target audience, which aligned with their view that researchers' role in promoting KT should be limited to producing the evidence or in this case an innovation.

Among the two participants with greatest experience designing and implementing KT programmes, the senior researcher implemented a wider range of KT initiatives and more complex and large scale than the junior researcher (some of it described earlier). The junior

researcher had been involved in designing and implementing smaller KT projects and activities mainly to operationalise the large-scale initiatives designed by the senior researcher. For example, the junior researcher summarised the KT activities he was coordinating at their institution as follows:

> "I am looking at researchers, students and other faculty and PhD [and] masters fellows … along those three domains … trying to liaise with the media to pick up research being done by [the university] and highlight it in the news. And then on the other hand … working with researchers and faculty to look for and identify opportunities for them to actually interface with the media. Then doing similar work for policy and policymakers [i.e.,] research done by [the university] on a topical matter, we synthesis it and contextualise it and we write evidence briefs for policy and we use those as discussion papers for the … policy dialogues" (P15)

Expressed need for and interest in formal KT training irrespective of disciplinary alignment and KT expertise

Similar to Case A, lack of or insufficient competency for KT practice was a recurrent theme among the participants irrespective of the greater KT experience among them, disciplinary alignment and views on researchers' KT practice (P13, P15, P16, P18, P19). One of the participants with advanced KT knowledge and practice noted that despite their greater exposure to KT through their practice experience, they believed they could benefit from some formal training:

> "for me it's been on the job training … formal training is extremely important. In my case I haven't had that but … it's important to iron out some of the issues that I might have wanted to ask during whatever training I attended but perhaps which were not answered. So a formal training might actually allow me to do just that." P15

Reinforcing Case A findings, the need for researchers to be trained in KT principles and techniques including in researchers' academic degree training was a common theme among the participants, irrespective of the greater KT experience among them, disciplinary alignment and views on KT practice, (P12, P13, P14, P15, P19). One participant offered this recommendation for strengthening basic researchers' KT capacity and practice through their degree training:

> "One parallel … I draw between natural sciences and computer sciences is that computer scientists are trained to make products and those products could be

> software and some other computer algorithms ... Natural scientists, especially in our sectors, are trained to follow protocols and to follow processes, “this is how you do this experiment and if you do it this way this is the outcome”. Very rarely is it, ‘this is the problem, how do we find the solution’” (P14).

Another participant recommended a training strategy that involved ongoing multiple sessions that allow for incremental learning rather that one-off trainings workshops (P12). Two participants emphasised experiential training rather than the didactic kind (P12, P13). One participant said:

> “I would like something practical not theoretical. I want a person to come and give us case studies … I am always very slow; I need somebody to really link it to everyday life. How they have carried it out and what the effects were … That’s when it will sink in” (P13).

5.3.3 Meso level themes

Better capacitated leaders exert greater influence on consortia KT capacity and practice

Case B shows that greater KT expertise (capacity and experience) among consortium leadership positively influences KT capacity and practice but they also faced common challenges related to budget constraints and engagement of partner institutions as identified in Case A.

Greater KT practice experience among consortia leaders informs stronger KT plans

Interview and documentary data suggests that the consortium Director’s legacy of spearheading, designing, implementing and institutionalising KT initiatives nationally in their country, regionally in Africa and globally informed the design and implementation of a well thought out KT plan.

Some participants knowledgeable about the consortium Director’s efforts cited a number of actions taken by them to demonstrate their strong leadership for KT including: having established a KT unit within the department housing the consortium’s secretariat (P12, P15, P17, DR18); and led other KT initiatives (P15, P20). For example, one participant talked about another initiative they were involved with that was established by the Consortium Director:

> "[An institution I worked with] … used to train us on community engagement and we used to have stakeholder meetings with media … and … make sure we work together and design projects with these media houses … [Case B director] is one of the founders [of the institution]" (P20).

The influence of the consortium Directors KT experience was also apparent in their DELTAS plans in which KT was positioned as one of the governance and management pillars, consideration for a dedicated KT staff at project proposal stage and defining a wide range of KT activities targeting the public, policymakers, civil society organisations and media (P12, P14, P15, P16, P17, P18, P19, P20, DR18).

Furthermore, during implementation of DELTAS, the consortium Director expanded their KT staff from one to three (P12, P14, P15); and supported their DELTAS KT activities including facilitating training sessions and also bringing experts to facilitate KT training and sensitisation workshops (P14, P16, P19). For example, one participant described the KT governance and management pillar notably adopting the DELTAS funders' terminology 'public engagement', but illustrating that their objective was to engage a wider range of non-academic audiences than alluded in 'public engagement':

> "We have a public engagement committee at the program governance level, the secretariat level, it's among the other committees … and I head that committee for the … consortium … we are looking for innovative ways of engaging the public with research coming out of [the consortium], that's partly what the committee is about … most of my work entails finding ways of creating opportunities for interaction between the fellows and the public to enrich the fellows understanding of the research context or the public perspectives. But I do have other roles. I also do media engagement as well as policy engagement within [the consortium] … I work with fellows to look for opportunities for them to interface with the media and we also work with fellows to … identify and utilise opportunities for them to interface with policymakers on a topical issue that we think might need to be discussed" (P15).

The individual appointed to lead the public engagement committee had been coordinating the consortium's KT activities since 2014, before the inception of DELTAS programme further demonstrating that KT had been a priority in Case B pre-DELTAS (P15, P16, DR32).

Flexibility/adaptiveness of consortia leaders in programme planning

The consortium leadership in Case B similarly had to navigate the mid-way programme implementation refinement of the DELTAS KT expectations and emphasis on CPE. The consortium leadership adopted school engagement activities to be undertaken by PhD students that were suggested by the funder as one-way consortia could get around achieving the added emphasis on CPE with the small budgets they had. Like Case A, they sought additional funding from Wellcome Trust Foundation particularly to increase their CPE activities to meet the DELTAS reporting requirements on this. As noted earlier, the consortium leadership also increased the number of staff responsible for championing, coordinating, and supporting its DELTAS KT activities from one to three to manage the increased workload. One participant (also serving as the consortium KT lead) described it like this but also alluded to a need for additional support staff stationed at the other partner institutions:

> "[the consortium's Director] is enthusiastic about citizen engagement, public engagement and media engagement, so he's provided support over the last one year … previously at least at the secretariat level I was alone but he added two more people so we are able to move things even faster. So at the secretariat we have some capacity, within … partner institutions, I don't know" (P15).

Like in Case A, the Wellcome Trust Public Engagement grant resulted in the consortium having a lopsided programme with disproportionately more CPE activities than other DELTAS KT strands but to a lesser extent due to the countering effect the greater KT capacity among its leaders and the resultant initial KT plan that included a wide range of activities (P14, P15, P18, DR21).

Inadequate engagement of consortia partner institutions

Also similar to Case A, the consortium in Case B struggled to effectively engage the partner institutions to implement the DELTAS KT activities because of various factors including: lack of dedicated support staff (P12); little if any interest among designated KT champions at partner institutions (P12, P13, P15, P16); and inadequate knowledge of the DELTAS KT component among leaders based at partner institutions likely due to its ineffective communication (P13, P15).

Influence of mentors on junior researchers' KT capacity and practice

Insights from three participants demonstrated how academic supervisors played an important role as mentors in shaping PhD and postdoctoral students' interest in KT and KT

practice and the effect on implementing the DELTAS KT activities (P13, P15, P20). One participant who is a leader based at a partner institution described how their failure to communicate the DELTAS KT requirements to PhD and postdoctoral fellows resulted in their research plans and budgets lacking this component:

> "I think it was not inbuilt and it was not talked about at the beginning, it was not part and parcel of the development of their proposals, and it's something they have to report on, so I think they feel a bit stressed" (P13).

Another participant described how views among some academic supervisors about the relevance of KT practice in PhD and postdoctoral training influenced their PhD and postdoctoral students' interest in the consortium's DELTAS KT activities:

> "Supervisors … might say …the grant [has] so many expectations and this public engagement work should not be another PhD on top of the fellows PhD. So you hear comments like that sometimes coming from supervisors" (P15).

Having better capacitated specialist staff is strongly influenced by greater KT expertise among consortia leaders

Case B illustrates that greater KT capacity and experience among consortia leaders informs hiring of support staff with stronger capacity for supporting a wider range of KT activities, but their efforts can also be restricted by budget constraints.

Specialist staff expertise and roles reflect consortium's greater KT capacity

Unlike Case A, the consortium in Case B hired a staff responsible for championing, coordinating and supporting the implementation of its DELTAS KT activities at the project inception and then added two more staff after AAS refined their expectations to manage the increased workload (P12, P13, P14, P15, P16, P17, P18, P19, DR18, DR21, DR29, DR30). Therefore, Case B demonstrated the consortium's better understanding and consideration of staffing needs for this component, which may have been influenced by their extensive KT practice experience. Also, unlike Case A, which referred to the staff using the pre-fix CPE, Case B participants interchangeably referred to the support staff as knowledge translation, community and public engagement, CPE or public engagement officers reflecting the interacting influences of the consortium's greater experience in the KT space and the terms used therein, and the funders' emphasis on CPE.

The support staff engaged at the project Inception was full-time and had a broader mandate of overseeing all the DELTAS KT activities including community and public engagement and other activities targeting policymakers, civil society organisations and media (P15, DR32). The full-time staff possessed substantial knowledge of KT obtained from their experience designing and implementing KT activities and projects including grant writing since at least 2014 and, their ongoing PhD training which was focusing on the topic (P13, P15, P17, DR32). The other two staff engaged mid-stream DELTAS implementation to support the additional CPE activities were part time employees and had no prior KT or CPE expertise or training (P12, P15, P17, P18, DR32). One participant described the support staff as follows:

> "We have a knowledge translation officer … then we also have someone who is supporting that position who actually came in as an intern, but he appeared to be very interested and doing well in that area … he is currently … supporting the [knowledge translation officer] to do that and recently, because of the need of the knowledge translation that is there, our research administrator is also providing some time to that" (P18).

As noted earlier, similar to Case A, all the three staff were based at the consortium's lead institution, which meant that researchers based at partner institutions likely benefited the least from the support. Nevertheless, this did not emerge strongly as a challenge. Rather, a recurrent theme among the participants was the consortium's strategy for overcome this challenge, which entailed using events (such as annual conferences) that brought all the researchers from partner institutions together to deploy face-to-face KT training and mentorship sessions alongside other research methods courses.

The rest of the section will refer to the support staff using the prefix KT/CPE.

Specialist staff with KT expertise still need capacity development

The KT/CPE staff had also participated in AAS trainings focusing specifically on CPE reported in Case A and expressed their desire for additional training to fully grasp and better support implementation of the DELTAS KT expectations (P15, P17, P18, DR32). In addition, the full-time KT/CPE staff attended a training organised by Wellcome Trust Foundation but it also focused on public engagement (P18, P20, DR32). However, the greater KT expertise among Case B KT/CPE staff likely balanced the over-emphasis on CPE in the AAS and Wellcome Trust Foundation trainings rather than skew their KT capacity towards CPE as it may have in Case A. Nevertheless, the staff with KT expertise expressed a desire for

additional formal KT training since much of their knowledge and skills was from on-the-job learning (P15).

> "Formal training is extremely important. In my case I haven't had that but I would imagine it's important to iron out some of the issues that I might have wanted to ask during whatever training I attended but perhaps which were not answered" (P15).

Specialist staff with strong KT expertise support a wide range of KT activities

KT/CPE staff in Case B similarly reported coordinating, supporting and implementing consortium, institutional, and individual level activities as in Case A (P12, P14, P15, P16, P17, P18, P19, P20). However, Case B KT activities and target audiences were wider in range than those of Case A reflecting their stronger KT capacity and experience.

Two approaches stood out in the support provided by Case B KT/CPE staff. One was encouraging their fellows to publish their KT/CPE activities in scientific and non-academic formats (e.g., blogs), which demonstrated their recognition of the value of going beyond implementing activities by systematically documenting and contributing to building the KT/CPE knowledge base. One participant captured it this way:

> "We are telling [fellows] to take [CPE] seriously [and] even come up with a publication" (P17).

The other was one-on-one mentorship, which was cited numerously as a preferred approach among the PhD and postdoctoral fellows because it helped them understand what target audiences and activities were most appropriate for their CPE and school engagement activities. For example, one participant who is a PhD fellow described it as:

> "The [public engagement] department has had one on one interactions with the fellows to guide them on how they can do public engagement, particularly for their different projects … they have been quite useful, because as I said public and community engagement concept is a bit new to us … it was important to … understand the importance of it and then … help us on how to do it. I think it was quite useful … other than my project, [they have] assisted … every fellow to adapt a school … to interest young people … in science and research" (P19).

Despite Case B having KT expertise within, they did not yet have a KT curriculum but were in the process of developing one. However, the curriculum was not made available or

published. Therefore, it was not possible to compare it with the Case A one, which may have provided some interesting insights. Nevertheless, participants and documentary data reported that modules on CPE, media engagement and science communication were integrated in PhD and postdoctoral fellows' research methods trainings and were facilitated by a mix of experts including the KT/CPE staff, AAS staff (as earlier noted) and external individuals (P12, P13, P15, P16, P17, P18, P19, P20, DR32). As was demonstrated in Case A, leveraging on expertise from outside the consortium (e.g., other professionals/ institutions they interact with) was a key strategy used to deliver the KT modules. The full-time KT/CPE staff described the modules they planned to include in their training curriculum like this:

> "We organise these trainings and in fact we are looking towards having these as standard modules which one can actually take up and train. So, we are developing an actual curriculum for these trainings to happen, media engagement, the policy engagement. We are designing an actual course one can deliver" (P15).

One of the part-time KT/CPE staff explained how they integrated the KT modules in the PhD and postdoctoral fellows' training:

> "When we have those cross-cutting courses, for example, … bio statistics, epidemiology [for] three days, we put in a day for CPE … at some trainings AAS staff have even been involved … For example, recently we had a pre-conference training before the AGM, we had a one day and AAS public engagement officer was present and gave a talk about public engagement" (P17).

Another participant explained the consortium's strategy of leveraging outside expertise for their trainings as follows:

> "I don't think I've had any other training from public engagement outside [this consortium], … [This consortium] has organized several meetings and I remember a lecture [by] a Research Communications Specialist … brought in by the [consortium] Director …. she is based in South Africa and that time she had come to give a research communications lecture at [another department] and then professor learned she was around [and] brought her to speak to [us]" (P19).

Partner institutions minimally influence consortia despite greater KT capacity and practice

Case B demonstrates that even consortia with greater KT capacity and practice have little opportunities to leverage support from partner institutions because they pay little attention to it in their policies, structures and processes. However, partner institutions can benefit from consortia with greater KT capacity and practice.

Minimal opportunities for leveraging support for KT capacity and practice from partner institutions

Varied but insufficient KT support in policies and structures

Unlike in Case A where views about the extent that their home institutions valued KT were mixed, most participants in Case B unanimously believed that their institutions valued KT (P12, P13, P14, P15, P16, P17, P18, P19, P20) based on range of factors including: the existence of institutional strategic or research policies that emphasise KT (P12, P13, P16); institutional KT structures (P14, P15); and institutional KT initiatives (P16, P18, P19, P20). For example, one participant said:

> "Two years ago [the institution] established a technology transfer unit and …the sole purpose of that unit is knowledge transfer … It was … funded … [with] a grant that was from a donor … we are working with [the technology transfer unit] to transfer some of the technologies that we developed … They provide the interactions with industry, … they will start the official part together with legal department, any licensing agreement and so on" (P14).

However, just like in Case A, some participants identified a number of gaps in support for KT at their home institutions that hindered their KT capacity and practice including: inadequate or lack of staff with KT expertise (P13, P14, P15, P17); reliance on donor funding for KT initiatives and activities (P14, P15, P17); existing KT departments focusing more on technology transfer than public policy influence (P13, P14, P15); or lack of a KT department (P13). One participant attributed their lack of a KT department to the small size of their institution:

> "We have a research policy … [KT is covered in] one of the sections … but I don't think we have critical mass of people or I think we can say lack of know how in how to go about … knowledge translation … We are lacking that capacity … as an institution. We'll need training, then we'll need people who have really tried to go out

there … In bigger universities, they have people who are doing that, Knowledge translation unit. We are [a] very small [institution]" (P13).

The main underlying issue may be the recent change of status of their institution from a college to a university in 2010, meaning that they were still in the infancy stage of setting up and strengthening key functions (DR419). Indeed, the participant noted that a major reason for not having a KT department was that they had only recently prioritised research generation in their strategy and partnerships such as this consortium were helping them start to achieve this goal (P13).

Also, similar to Case A, some participants reported that their institution did not impose any restrictions on the design and implementation of their DELTAS KT capacity development and activities and thus did not influence them (P12, P15, P16, P17, P19). One participant explained it this way:

> "[The university] haven't put any barriers in the way, they leave you to do what you said you are going to do in a project proposal. That was funded it may not be a pro-active support but it's an environment that leaves you to do what you want to do" (P12).

In addition, a recurrent them among the participants was that their home institutions focused on public relations activities and they had uneven and little interaction and coordination with them, which further buttressed the evidence of their minimal influence on Case B DELTAS KT capacity development and activities, (P13, P15, P16, P17, P19, P20). The Case B KT/CPE staff explained it best as follows:

> "At the lower level [i.e., the department housing the consortium] we … try to coordinate with the communications office ... At the higher level … the university has a PRO office … I … haven't been in touch with them … we inform [the department communications office] of what we are doing. We are supposed to work together but they also have capacity gaps so … in some projects we do but in others sometimes we don't … For example, if there is something that we need to communicate out there about a study about we usually go through the communications office and they communicate it either through the listserv" (P15).

Documentary sources corroborated the participants' insights showing that the three partner institutions included in Case B to varying extents had KT policies or strategic objectives.

Also, two of the three institutions had KT and Intellectual Property (IP) departments (I4L1, I4L2, I6L1) while the other one lacked a KT and/or IP departments (I5L1) but noted plans to establish them.

Tenure and promotion processes focus more on research and teaching than KT
Like Case A, the predominant view was that the focus of tenure and promotion processes was on assessing research and scientific publications (P12, P15, P18, P19). Among the three institutions represented by Case B participants, two had accessible tenure and promotion documents, which corroborated that they allocate higher weightings to research and scientific publications than KT (I4L1, I5L1).

Minimal focus on KT in their researchers' training and development
Participants views about whether their institutions' academic degree training includes a KT course were inconsistent. Some participants representing two institutions reported that their institutions offered a KT course as part of public health and epidemiology degrees, which was corroborated in degree training documents of the institutions (P12, P13, P18, P19, I4L2, I5L1). However, some participants referred to the course as implementation science, which is different from KT that covers a broader range of activities beyond what is covered in implementation science, further demonstrating their narrow understanding of KT (P12, P18, P19). Nevertheless, the course was being offered to the consortium's Masters and PhD fellows (P18). Additionally, the participant who also served as the consortium's CPE staff was reported to be completing a public health degree programme specialising evidence-informed policy making at the lead partner institution (P12, P15).

Some participants, all based at the lead partner institution, also reported that their institution had a graduation expectation for students to complete a policy brief or abstract with policy recommendations based on their research findings that would be published on their institution's website, which was corroborated by documentary sources, specifically their research policy (P12, P16, P17, I4L1). However, there were conflicting perspectives about the extent to which this policy was operationalised in graduation requirements for degree programmes. One participant, a senior academic at the institution, said that completion of the policy briefs by post graduate research degree students was a graduation requirement:

> "In one of [the university's] strategic pillars it talks about advancing … use of research for national development. That's the pillar that really relates to knowledge translation and they have as a university decided all PhDs, you cannot graduate if in your thesis …, … book, has no page on...they call it a policy brief, there must be a

> page on policy brief [explaining] how your results … you've done for the last four or five years [is relevant] … to policymakers. A one-page policy brief. If it is not there, you are not going to graduate" (P12).

Another participant, that supports students' administrative requirements, reported that students unmotivated to implement the DELTAS KT requirements because their institutions' graduation requirements did not consider such activities (P17): Therefore, they viewed the CPE activities as time consuming and a distraction to achieving the deliverables they were expected to for their graduation.

> "Remember as PhD fellows they are not going to be evaluated on how much CPE … you've done. It is basically … you've done your research, how many publications have you done, … you are good to go and do your defence. But here we are imposing CPE on them. Even when we … held individual meetings with them to sensitize them about CPE some were telling us "You are asking too much about CPE, we are busy with our work and yet you are diverting us to take this up which does not count in … what [the] university expects of them… there is nothing like public engagement" (P17).

Nevertheless, requiring students to develop a policy brief and publish it on the institution's repository is a minimal expectation in terms of KT output (knowns as end-of-project KT), but the problem might lie in having to integrate KT activities in their research process, which needs considerably more time investments. The extent to which just writing a lay summary of research findings would meaningfully enhance PhD students' KT capacity and practice relative to the DELTAS CPE activities they were reluctant to undertake may need to be explored. At the same time, considering the challenges raised about the time constraints within the broader PhD programme requirements, there may be a need to explore how best to integrate KT training and mentorship in PhD programmes administered through research consortia under such conditions.

Notably, although raised as a general disincentive of researchers KT capacity and practice, a direct negative influence of partner institutions' degree graduation requirements on PhD students' motivation to implement DELTAS activities did not emerge in Case A. It is possible that the kinds of activities Case B PhD students were being encouraged to undertake were much more intense than in Case C given the greater KT experience among the leadership and support staff.

Finally, some participants based at the lead institution also cited the existence of continuous professional development courses focusing on KT but did not mention any systematic efforts by the consortium to draw on the opportunities (P12, P16, P20). One of the participants captured it this way:

> "I have seen several workshops about knowledge translation organised by the School of Graduate Studies … Again, in the college, there are several groups that are doing … knowledge translation" (P16).

Among the three institutions represented by Case B participants, only two had accessible degree training curricula, which corroborated participants' insights that researcher's' KT training was discipline focused i.e., in public health and epidemiology degrees (I4L2, I5L1). Documentary sources also confirmed participants' insights that all researchers at the lead institution were expected to develop a policy brief of their research after completion (I4L1).

Notably, collectively the partner institutions in Case B exhibited stronger capacity for KT in comparison to Case A albeit still insufficient suggesting that consortia with greater KT capacity are more likely to consist of institutions with strong support for KT, which may occur through uni- or bi-directional influences.

Potential for consortia to strengthen institutional KT capacity but not as a parallel initiative

Interview and documentary sources reported that the department in the lead partner institution where the consortium was housed had a KT unit that they established with donor funding from a previous HRCS programme. The KT unit was set up to support a wide range of activities to researchers within the department (P12, P15, P16, P17).

> "The KT office I mentioned … [Case A] set it up … even the officer for that, we pay him … he is supposed to support college of health science as a whole" (P12).

Some participants believed that the DELTAS grant was contributing to strengthening their institution's KT capacity because it was paying the salary of one staff of the unit (P15), had increased KT activities and outcomes at the institution (P16, P20), and could potentially contribute to uptake of the model as routine practice across the wider institution beyond the department housing it (P17, P19).

> "Since [Case B DELTAS programme] supports the university or the college knowledge translation officer, there is … a big impact … because the is person paid by [the project]" (P15).

However, as much as the initiative was created to serve the department, it remained reliant on donor funding to operate because it had not been integrated into the university system i.e., it started out as a project and remained so (P12, P15, P17). Lack of institutional or supplemental funding from other sources was noted to have resulted in resource constraints that caused the scaling down of its activities to focus predominantly on supporting activities aligning to the DELTAS KT interests i.e., CPE (P12, P15, P17). One participant explained this as follows:

> "The challenge has been funding for the office. That position, that office is not recognised in the main structure of [the] University or the college for that matter. So, it is largely dependent on projects … Because of funding [constraints] … they couldn't recruit many people … to [manage the demand for KT services]. So, maybe if … [the] university put in the structure, employees are recruited directly [and] paid by the university to do that work, maybe it … would have pushed it a bit further … because the position was … thought to be college wide but supported by [the DELTAS programme funding], at some point [a decision was made to] concentrate on the [consortium's] work [i.e.,] the work of the fellows to do the public engagement and … other than you know having it done for the entire college. So, it lost momentum a bit" (P17).

However, insights from two participants revealed that the KT unit was a parallel structure established to address the inadequate support provided by the university-wide KT department (P12, P15), which likely explains why it is not part of the formal university structure.

> "[the University] … opened a knowledge transfer office … but I think they are mainly concentrating on technology transfer, the patents … this other side of … translation of … research, I am not so sure but I don't think much is happening there" (P15).

Therefore, while the consortium contributed to strengthening the lead institution's KT capacity, its sustainability is questionable because it is not recognised as a university structure. Nevertheless, one participant alluded to the potential for institutionalisation of KT

units within university departments basing this on past influences the consortium had at the institution:

> "When most of the things are being started here at the college … eventually [the] university takes them up … maybe this is outside what we are doing but the grants office was first started at the college and eventually the whole idea … was taken up by the university. They put up a policy [that] all colleges should have grants offices. [Also], the post docs were [previously] not recognised in the system and this came out as [this consortium's] initiative and it was taken up by the entire [university]" (P17).

5.3.4 Macro level themes

Funders exert strong influence on consortia despite greater KT capacity

Case B shows that consortia with greater KT capacity also face similar issues related to donor and government funding that promote and constrain their KT capacity and practice as reported in Case A. However, their greater KT capacity helps them better navigate the issues but not sufficiently.

Better utilisation of funder support by consortia with greater KT capacity

Similar to Case A, the consortium in Case B took some steps to respond to the changes in the DELTAS KT requirements introduced by AAS that notably emphasised CPE. The consortium already had a KT/CPE but felt that the changes increased the workload and decided to hire two additional part-time staff (discussed earlier) (P12, P15, P18). In addition, the consortium in Case B did not only participate in trainings and sensitisation workshops on CPE organised by AAS staff but also invited AAS staff to be involved in training and sensitisation workshops that they organised to clarify the DELTAS KT requirements (P12, P13, P14, P15, P16, P17, P18, P19, P20, DR32). One participant described the consortium's efforts to maximise AAS technical support as follows:

> "A year ago [AAS] recruited a person who is in charge of … community and public engagement. [they are] … supportive, pointing us to where we need to … pay attention … When we had our AGM, we invited her and she came over and trained us [and] if you want to benchmark [your activities] you can get a hold of her [and] she would … get you the literature [the is] the kind of support [AAS is providing], a personnel … who supports us when we need help, capacity building [and] if we need …a reference" (P16).

The better utilisation of support provided by AAS by this consortium may have been influenced by their greater KT capacity compared to Case A and thus their proactive approach to ensure they understood and implemented the DELTAS KT activities.

Potential for funder to leverage support from consortia with greater KT capacity

The existence of greater KT capacity in the consortium made it a source of this expertise by the funder for their training and sensitisation illustrating the potential for funders to also leverage support from consortia with greater KT capacity (P12, DR33). One participant who is the consortium's Director explained their collaboration with AAS to facilitate a session on KT early in the DELTAS programme implementation targeting all DELTAS programme beneficiaries:

> "AAS needs to be more proactive in providing opportunities for fellows and mentors to get to know more about knowledge translation and emphasizing … its importance. Much as there was that workshop in Ghana, that … I was invited to … facilitate, that was a one off … I think they should put more resources in the knowledge translation" (P12).

However, the participant was involved this way only once, which might have been a missed opportunity to spread the capacity and lessons for researchers' KT practice within this consortium to others that lacked it.

Greater KT capacity within consortia facilitates budgeting for wider range of KT activities

As noted in Case A, the initial DELTAS KT guidance was vague and consortia used their discretion to define and budget for relevant KT activities. The greater KT capacity in Case B resulted in activities and a budget for a wide range of KT activities that cut across all three DELTAS clusters of KT activities defined by AAS (P12, P15, P16, P17, P18). The budget amounted to nearly £130,000 (P12, P15, DR21). Similar to Case A, a recurrent issue among the participants was that the DELTAS KT budget was inadequate (P12, P13, P14, P15, P16, P17, P18, P20). One participant who was involved in developing the consortium's DELTAS grant proposal captured as follows noting that they had to reduce their activities because of budget size restrictions imposed by the funder:

> "We did include some money for policy work … policy dialogues … because we were aware that … at the end of the day …, if you get good research, you can … be able

> to engage. So, we put in some money, it wasn't as much as we would have wanted to put … there are limitations to how much funding we would allocate to research uptake … when we wrote the [DELTAS] grant [proposal] we were asked to cut it almost to two thirds … of what we had initially" (P15).

A review of the consortium's initial DELTAS budget against what was eventually awarded to them corroborates a reduction, which coincidentally or not also skewed it towards a larger proportion for CPE activities (DR18, DR21). The initial proposed total grant amount had been reduced by about half and the KT budget by two-thirds. In addition, the initial budget for public engagement activities had been cut by less than half compared to three quarters or more for the activities targeting policymakers, media practitioners and industry (DR18, DR21). This resulted in nearly half of the approved KT budget covering CPE activities while the other half of the KT budget was spread across the other clusters of DELTAS KT activities (DR18, DR21). Consequently, the approved KT budget reduced from a proportion of 1.5% to 1% of the total project budget, which was within the 1-2% grant restriction for this component but on the low end (DR18, DR21). The fact that the consortium's KT budget was initially within the range allowed but further reduced to the low end of the range supports the notion that the funder prioritised other aspects of the grants over the KT component.

Budget restrictions influence choice of KT activities despite greater KT capacity within consortia

At the time of data collection for this dissertation, the consortium in Case B had not yet been successful in getting additional funding from the Wellcome Trust Foundation Public Engagement grant scheme as in Case A. There initial proposal was unsuccessful and they were attempting a second time. Furthermore, unlike in Case A, none of the participants reported the consortium leveraging on other sources of funding beyond Wellcome Trust Foundation to address their DELTAS KT budget constraints they were facing. Therefore, school engagement was adopted by the consortium as their main CPE activity because it was promoted by AAS as a low cost, easy to implement activity that DELTAS grantees could consider incorporating in their programmes (P13, P14, P17, P18, P19, P20, P28, P29). The following explanation from one participant alludes to meetings among DELTAS consortia (likely facilitated by AAS) where the idea for school engagement activities emerged:

> "I think in the beginning people didn't understand what community engagement was all about so … all the proposals of students didn't think about that … I think what has evolved over time when we were caught unaware people thought about how the situation could be salvaged, and then they came with different ideas, they said …

> ‘let’s introduce science to schools, how do we make the students get interested’. I think in most of the consortiums they equated [school engagement] with fellows going out and trying to communicate with the public … on what they are doing in order to get their interest” (P13).

The following explanation by a AAS staff corroborated their role in suggesting school engagement as a potential CPE activity requiring minimal resources to implement:

> “The school engagement … within the context of community and public engagement (CPE)… became popular because that’s more like a low hanging fruit … it is one of the easy to do things but which has a lot of impact as far as attracting a younger generation of kids to become scientists and as part of … improving science or creating awareness in schools on science and research … that became something that can be easily done, which was one step above getting researchers to organise a workshop where they are reporting back or seeking views on what they were doing … if you were to rank them in terms of complexity … you’ll find out that CPE programmes that are focused on schools … have a lesser degree of complexity compared to other programmes” (P29).

As noted by the AAS staff, school engagement was predominantly conceptualised to increase interest in science careers rather than influencing non-academic target audiences policy and practice or behaviour. Therefore, the activity fits more with a different objective of the DELTAS programme that was grouped in the same pillar as the KT activities, ‘Scientific Citizenship’. This means that the consortium’s decision to incorporate school engagement activities in the end reduced the focus on their programme on the KT objective.

The influence of the funder on the consortium’s KT activities can also partly be demonstrated in the notable shift in the terminology used by the consortium to communicate its KT activities in its quarterly newsletters across the period 2011 to 2018. The terminology changed from knowledge translation between 2011 and 2014 to public engagement or CPE from the year 2015 when the consortium started implementing its DELTAS programme (DR32).

Potential for consortia funders to support development and use of national research agendas

Similar challenges regarding use of national research agendas by researchers highlighted in Case A were also reported in Case B despite their greater KT capacity and practice.

Participants' views about the importance of national research agendas in researchers' KT practice were mixed but showed the potential of these policy instruments to have greater influence. Some participants reported not using national research agendas or that this was an uncommon mechanism for identifying priority policy issues they could explore (P12, P13, P19) while some participants said otherwise (P14, P18). Similar to Case A, some participants attributed use or non-use of research agendas to the extent that their governments funded it (P14, P13, P15, P18). For example, one participant had the following to say about how lack of government funding hinders use of national research agendas by researchers:

> "Ministry of health can or whichever you know national body could have as many lists of agenda priority items as they want, as long as they are not injecting money into the research process towards that agenda it is just a list a wish list … One of the things … that drives research questions is funders preferences. [For example] it could still be malaria and there is malaria on the research agenda but … the funder might be interested in releasing money for studying monoclonal antibodies and the ministry of health wants to study … how best to distribute say mosquito nets to prevent malaria. So funders priority, availability of funds and researchers' interest usually override the ministry of health or national body agendas" (P15).

Another participant demonstrated how the strong influence of government funding on use of national research agendas:

> "Sometimes we look at government … policies and … structure our proposals to respond to some of the gaps that are in those policies, so for example in [our country] we have strategic plans for middle and tropical diseases, so we look at that and see what are the gaps that are highlighted, and that is important if you are seeking government funding" (P14)

Finally, similar to Case A, a few participants highlighted or demonstrated the potential for researchers to participate in national research priority setting processes that produce national research agendas and the role they can play to get funders to support these instruments (P14, P18). For example, one participant said:

> "I think our obligation … is … we engage stakeholders and define the priorities … that could be government or it could be private foundations, so we should in some

way influence the things they fund not just by writing good proposals, but also highlighting what the real priorities are" (P14).

These insights reinforce findings in Case A supporting the potential for consortium funders to support researchers to work with their governments and other national actors in defining and using national research agendas/priorities.

5.3.5 Interaction between micro, meso and macro level factors influencing KT capacity and practice in Case B

As in Case A, this section considers the interaction of micro, meso and macro level factors that influenced the KT capacity and practice of the consortium in Case B. Similar to Case A, multi-directional interactions between the micro, meso and macro level factors shaped the consortium's KT capacity and practice.

The greater KT capacity among consortia leaders (relative to Case A) positively influenced the consortium KT capacity and practice in terms of the range of activities they defined and resources (budget and staff) they allocate for them. Despite the funder providing little guidance during the grant proposal stage to grantees on what they expected for the KT component, this consortium was able to articulate and implemented a KT plan that covered a wider range of KT activities (relative to Case A) i.e., KT activities ranging from co-production to those for public policy influence and even industry partnerships. This was facilitated by the greater KT capacity and experience of both the consortium leader and KT staff who had a combined two decades exposure to KT practice prior to DELTAS. Their greater KT capacity and practice also appears to have motivated them to seek out additional technical support from the DELTAS funders to better understand and implement the grant requirements.

However, limits on this influence remained, especially related to funding (low and restrictive) and partner institutions (insufficient capacity for the consortium could harness). Nevertheless, there were still actions taken by Case B leadership to overcome these challenges but maybe not as well executed as they could have been suggesting that even consortia leaders who have greater KT capacity and practice than their counterparts can benefit from additional support. For example, to overcome the tight budget, this consortium maximised the reach of their KT support to PhD and postdoctoral students (and saved on implementation costs) by deploying their trainings and mentorship during events where all partner institutions would be present. However, despite these efforts they struggled to

generate greater support for KT from partner institutions and this had a negative influence on the motivation of PhD and postdoctoral students based at partner institutions to integrate KT activities in their research. Furthermore, the consortium failed to harness support from existing structures in their partner institutions despite their greater KT capacity and experience and even having a long history of implemented KT initiatives at the lead institution. On the other hand, their wider institutions (particularly the lead institution), benefited greatly from the DELTAS programme funding, which supported the staff salaries and operational costs of the existing KT unit in the department housing the consortium. The KT unit was established 5 years before the start of DELTAS through a different donor funded project. Whilst the KT unit was viewed as a project at the institution, the potential for the model being adopted or adapted at the wider institution level was noted. This Case provided stronger evidence than Case A illustrating the potential for research consortia to be promoted as one approach for stimulating or strengthening institutionalisation of KT support at academic institutions.

As with Case A, an influence of the meso level research/professional networks and groups on the micro and research consortia KT capacity and practice was noted. The consortium drew on external KT professionals to serve as trainers in their training and mentorship of researchers and staff. Even the better capacitated staff in the consortium had received their training from meso level networks and groups championing researchers KT capacity and practice. In turn, the better capacitated KT staff and consortium leader were involved in supporting the implementation of the KT initiatives outside DELTAS.

The funders' role in narrowing the KT capacity and practice of an otherwise better capacitated research consortium was demonstrated. The funder also failed to more effectively harness the greater capacity within this consortium for peer-to-peer learning. Perhaps the most beneficial support to this consortium or others like it may be to provide a more flexible budget that accommodates a wide range of KT activities, which would also allow them to undertake activities that would strengthen the institutional KT support of their partner institutions and national research policy processes. Funders can also provide additional support to better capacitated research consortium to lead or support peer-to-peer learning efforts of programmes such as DELTAS. This would require greater and longer-term funding without which only modest outcomes are possible and mostly at the level of individual members.

CHAPTER 6: CASE C

6.1 OVERVIEW OF CHAPTER

This is the final of the three results chapters, which discusses the Case C KT capacity and practice to identify the contributing factors and their interactions. Refer to Chapter Four Table 8 for the summary of Case C KT capacity and practice across the three levels (micro, meso and macro) in relation to Cases A and B.

6.2 CASE C DESCRIPTION

Case C was selected as an example of a consortium undertaking basic research predominantly addressing high priority global health issues, representing DELTAS consortia that planned/reported the narrowest KT activities, consisting of partner institutions in countries in the Western Africa region, and established before DELTAS as part of a different donor funded health research capacity strengthening programme.

In the following section, the micro, meso and macro level factors that influenced Case C KT capacity and practice and interactions within and across the levels are discussed.

6.3 RESULTS

6.3.1 Demographic characteristics of Case C participants

The findings were drawn from interviews with thirteen participants consisting of eleven from Case C and two from AAS (not included on the table) and review of their institutions' documents. Case C participants consisted of eight researchers and three support staff not engaged in research. Among the researchers, all were basic researchers. Four researchers were also DELTAS project staff (Directors, technical and administrative staff). Two researchers were established, two were at mid-career stage and four were junior. All the junior researchers were DELTAS fellows including one PhD student and three post-doctoral fellows. Unlike Cases A and B, Case C had three times more men than women i.e., six men and two women. The participants represented three academic institutions – two based in anglophone countries and one in a francophone country, all in Western Africa.

The demographic characteristics of Case C participants are summarised in Table 11.

Table 11. Demographic characteristics of Case C participants (n=11)

Participants characteristics	# of participants
Research discipline	
Applied researcher	0
Basic researcher	8
Research career stage	
Senior researcher	2
Mid-career researcher	2
Junior researchers	4
Other professional (not researcher)	3
The institution where the participant is based	
Lead institution of each study consortium	9
Selected two institutions of each study consortium	2
DELTAS Programme staff	
Directors (Principal and Co- Investigators)	1
KT or Communications or CPE staff	2
M&E staff	1
Programme administration staff	0
Other technical staff	3
DELTAS Programme fellows	
PhD fellows	1
Postdoctoral fellows	3
Career development grant awardee	0
Total	**11**

KT=Knowledge Translation; CPE = Community and Public Engagement; M&E=Monitoring and Evaluation

The types of institutional documents reviewed for KT support in the partner institutions were the same as those summarised in Case A.

6.3.2 Micro level themes

Basic researchers' diverse KT capacity and practice is greatly influenced by the type of research they do

Case C demonstrates that basic researchers have diverse KT capacity and practice, which is influenced by the type of research they are involved in i.e., discovery versus applied research. Their interest in KT training and support varies based on their contrasting views about researchers' role in KT practice and the type of research they are involved in. Strengthened capacity and practice in industry partnership is of greater interest among basic researchers involved in discovery research.

Basic researchers have diverse KT capacity and practice

Participants' descriptions of KT, attitudes about KT and KT practice experience exhibited a mixed pattern, which did not consistently live up to the views expressed about basic researchers in Cases A and B, i.e. that KT practice is not relevant for basic researchers and they do not value it. Some participants were basic researchers involved or ever involved in applied research (e.g., molecular surveillance) and they exhibited a similar understanding, attitude and KT practice experience as applied researchers in Cases A and B (P01, P05, P06 & P11). Participants less supportive of KT were basic researchers involved in discovery research and tended to believe that early-stage basic research findings would serve no purpose among the public and policy and practice decisionmakers (P01, P02, P04, P05, P08, P09). For example, one participant used the following statement that highlighted basic researchers' contrasting views about their involvement in KT practice:

> "The role of researchers in promoting KT depends on the research you're doing … basic science where I've worked most of the time … researchers will do the research and publish the papers … unless you're in public health … doing surveillance, then we could work with the public health [officials] and if we see an outbreak that has not been detected just because routinely they're not testing for that disease or something, then we could communicate to [them] … Otherwise, most of the … research ends up just as publications" (P05).

Participants involved in discovery research most strongly emphasised unidirectional 'push' KT activities involving the researcher communicating research they already produced or an innovation they developed. Their articulation of push KT activities likely considers that co-production of research is not an approach that is relevant in the discovery research process since it usually begins as an exploratory exercise driven by the researchers' curiosity.

Participants involved in discovery research also held the strong view that they should not be expected to lead KT efforts but rather this role should be left to other groups with KT expertise and time for it or target audiences interested in using their research findings including social scientists (P01, P02, P08, P09). For example, one participant said:

> "The research … we are carrying out, is troublesome enough, so … translating it is actually adding more trouble to yourself. The other thing is we cannot be jacks of all trades … there has to be aspects that someone will have to do the molecular biology and somebody must have to do … translation … I could be good in molecular biology but am very poor in, for instance, … communicating to policy managers. But there is

> another person who is very poor in molecular biology but is very good in communicating research" (P09).

Only one participant involved in discovery research held a different view compared to their counterparts that researchers' KT is a moral obligation of researchers and demonstrated their own KT efforts demonstrating that even this group of researchers views on this are heterogenous. The participant said:

> "Most people are invited on to topics that they work on for their PhD and they continue [after that] … The temptation is that you begin to lose original reasons why those questions were raised in the first place then it becomes an intellectual exercise … You can see that in some of these vaccine development efforts. Where organisms have been kept in the labs for convenience and for practical reasons. And they've been preserved for many years to the extent that the organisms now cease to relate to what really cause disease in the real world … But if you're not cut off… you would understand that we're invited to research because we identify problems then your role is … knowledge translation … you want to affect change" (P04).

This suggests the role of other underlying extrinsic and/or intrinsic factors including personal interest and prior exposure to KT capacity development and initiatives. Indeed, the Case C basic researcher involved in discovery research illustrated their personal interest in promoting KT, which they attributed to exposure to a KT initiative that also included a capacity development component. The participant said:

> "In terms of career and training, I never saw myself going to enterprise but … the issue of translation is something that I took interest in much earlier because of my activities with the Grand Challenges [project] … I've talked to more people in industry than I'm sure the Dean of Science or Vice Chancellor for Research … in my small corner … I've gone … around … talking to people [asking] 'How do I go build this technology I want' … That is the 21st century answer to drug making … I was telling some guys from … the City Council … the other day … 'The same system can make molecules [that] can be used in electronics'" (P04).

Participants' KT practice experiences ranged from none to some minimal activity, which aligned to their diverse views on researchers' KT practice. Among the participants who reported having KT practice experience, the most cited activities (particularly by those in applied research) was working with target audiences to co-produce research including

defining research questions that address target audiences' challenges e.g., surveillance work (P01, P05, P06). Two participants (also involved in applied research) reported having experience participating on policymaking forums (e.g., Ministry of Health technical working groups) and presenting evidence to them that in some cases informed policy and programme design changes (P05, P06). Two participants involved in discovery research reported actively seeking and meeting with funders and industry to seek partnerships including pitching innovations for commercialisation (P01, P04). For example, one participant reported their efforts to bridge the gap between academic institutions and industry in their country:

> "Everywhere I went to give a speech whenever we had policymakers, I said that we have to insist that if you call yourself an industry or a manufacturing company anywhere in [this country] … you need to have an R&D unit. And you need to put in PhD holding scientists in charge so that they can do research about how to improve your product and how to use local materials to make your product and all that. … We have to compel them to do it otherwise they won't do it because the easier way is just to produce using a formula that has already been [developed] … So … I was very glad to hear that [the government has now put in place] requirements [for industry to] create research units" (P01).

The participants involvement in their consortium's DELTAS KT activities also mirrored the type of research they were involved in. Participants involved in discovery research were mainly involved in activities that disseminated the aims and importance of their research projects to increase public awareness and interest in the research using TV, radio and social media and high school talks (P02, P08, P09). Participants involved in applied research implemented a broader range of DELTAS KT activities including collaborating with policymakers and practitioners in their research and using their platforms to discuss their research and inform policy and practice decisions (P01, P06, P07, P11). One participant described the DELTAS activities as follows:

> "Because its basic science, most of the activities we do are public engagement, … some … communication … about what we do in a broader sense … We have activities where faculty engage the communities. Most of the activities we do in terms of research has to do with infectious diseases. We know the communities that are affected with [the] infectious diseases [we are investigating]. We … engage the communities and tell them about what is going on … We also do TV and radio sessions … As far as translating the information to policymakers to change them into

policies, in my opinion …, it is not done to [DELTAS] expectation not because we don't know what we are supposed to be doing and we are not doing it but [rather] the feasibility, … the state at which the projects are doesn't really encourage this" (P08).

Influence of research career stage and KT training

Reinforcing the findings in Cases A and B, research career stage (P01, P02, P04), prior involvement in a KT initiative and training (P04) and DELTAS KT training and support (P02, P05, P06, P08, P11) influenced the participants' KT capacity, attitude and practice. For example, one participant who was a senior researcher gave the following well-articulated description of KT as it relates to basic research findings as follows:

> "Knowledge translation will depend largely on… its complexity and its root will depend on the subject. If the evidence found from the research is cut and dry, translating it into policy is a little easier. The researcher writes a policy brief and that goes to policymakers, they review it, if they're not satisfied with the evidence, they want to reproduce it … They look for a way of doing same experiment in a different setting to see if the results will be the same. When that result comes and it's proving the previous result, then another policy brief is written … taking note of the previous evidence. And then it's passed on to probably a regulatory body or something and then they look at the whole thing holistically … Then … both in country policymakers and probably WHO or depending on the key question …, there's a round table meeting to consider the evidence … That then goes through a whole cascade of, how is this implementable? What is the easiest way to do this? Does it require doing another … pre-test? As a scientist I'm looking at … biological research, … e.g., … to see whether changing the sequence of a vaccine …has the same benefits in a broader context at population level … as it did in the lab … when that is done and the results are satisfactory and the policy is … adapted and then everyone has to change and align to it … if you [need to do] vaccine trials it takes even much longer to translate that because the evidence has to be confirmed, reconfirmed, there has to be talk, there has to be politics … depending on what [the issue] is" (P02).

Despite eloquently describing the KT process, this participant did not have any KT practice experience and was one of the strong supporters of KT being led by KT practitioners suggesting that their seniority may have played a role in their greater understanding of KT.

Varied interest in KT training consistent with diverse views on researchers' role in KT practice

Similar to Cases A and B, participants cited KT capacity constraints and a need for KT capacity development irrespective of their KT knowledge, attitude and practice but these varied depending on their views towards researchers' responsibility for KT practice.

Need for training and support for technology transfer and commercialisation in discovery research

Participants involved in discovery research reported inadequate knowledge and skills for navigating technology transfer and commercialisation processes and a need for their institutions to provide training and technical support for these activities. This aligned with their understanding of KT (i.e., the product development perspective) and how they viewed their role in promoting it (P01, P02, P04, P05, P09). For example, one participant described their inadequate capacity and need for technical support in forging partnerships with industry including patenting:

> "Basic research … could have huge Impact … in terms of generating income, for instance, in industry. However, … I don't know how to take it further … We have molecules and we don't know how to deal with patent issues, so we totally don't know where to start … you would expect … depending on the institution you are in and if they are supporting such a thing … we should have … departments that deal with all that" (P09).

Another participant recommended training and development of a cadre whose primary responsibility would be to support for researchers' KT activities:

> "In Africa … maybe what we need to address is that void where you are either in policy or … doing research … there are researchers, people who went for research degrees but they're not doing research. And they could be very good and a very good interface between researchers and policymakers and they could contribute their knowledge into helping us in translation. So probably I think that the approach would be to build a critical mass of people who understand science but … want to look at science within the translation context" (P02).

Interest in KT training in researchers' academic degree training

Participants interested in KT practice reported similar capacity constraints as those cited in Cases A and B i.e., inadequate or lack of capacity to package and communicate evidence in

formats appropriate for and understandable to non-academic target audiences and navigating policymaking processes (P01, P03, P04, P05, P11). From among them, three suggested KT training including its integration in researchers' academic degree training (P04, P05, P11). For example, one participant said:

> "Trainings would … be very good and … practical … engagements with these kind of stakeholders or policymakers because me and my lab experiments, I think I need to find a link at the end of it because not everyone will end up in academic. I might not end up in academia but I can have the training that can help me branch into 'policymaking'. I might be relevant in the policymaking because I've come from a research background … When they're doing the training and capacity building [of researchers], … my opinion is that it's good to do a wholesome kind of training that [is not limited to] … publication, I've attended a conference on how to present my findings. But other than that, how do I translate my findings for policy?" Or, "How do I get this pharmaceutical company to be a part of or to be interested in my findings? How do I change my findings to an entrepreneur…?" All those kinds of things, I think they all go to how we translate the information. So, for me that training should be incorporated in the current system, if there's a way to do that it would really help" (P05).

6.3.3 Meso level themes

Greater interest in industry partnerships among consortia leaders influences KT capacity and practice

As in Cases A and B, Case C demonstrates the critical role of consortia leaders in shaping their KT capacity and practice in terms of choice of activities and investments for them based on their interests and needs in relation to the type of research they are engaged in. In this case, consortia leaders were most interested in industry partnerships.

Greater focus on industry engagement

Consistent with the findings in Cases A and B, the past experience and capacity among the consortium leaders strongly influenced the kinds of DELTAS KT activities they defined. The consortium's director had been involved in setting up a research institution and overseeing the work of basic research groups focused on both discovery research and applied research (P01, P02). Therefore, the consortium director had experience leading a diverse group of basic researchers and may explain the range of CPE activities they were implementing at

the time of data collection, which included community engagement for some of their studies and industry engagement.

The consortium director was also a basic researcher involved primarily in discovery research and had a notable interest in and experience advocating for stronger capacity and support for research and development (R&D) among local industry (P01). This may explain the greater focus on industry partnerships in the consortium's DELTAS KT plans and the consortium's governance and management compared to the little or no focus on this in Cases A and B (P01, P02, P03, P04, P05, P08, P10, DR19). The following insight from the consortium director demonstrates their proactive advocacy for stronger links and partnerships between research institutions and industry:

> "Last week we had a meeting with the Pharmaceutical Society …, which is the umbrella group for all … medicine manufacturers. They … told me … the government …has … now mandated them to have … R&D units, which … I've been calling for a long time, I didn't know anybody was listening. Everywhere I went to give a speech whenever we had policymakers, I said that we have to insist that if you call yourself an industry or a manufacturing company …, you're producing anything, you need to have an R&D unit. And you need to put in PhD holding scientists in charge so that they can do research about how to improve your product and how to use local materials to make your product ... We have to force them to do it … I was very glad to hear [they are] starting requirements and they've … given … a deadline" (P01).

Inadequate engagement of partner institutions

The consortium in Case C faced similar challenges of inadequate engagement of partner institutions in the implementation of consortium DELTAS KT activities as those reported in Cases A and B (P03, P08, P09, P11). Therefore, there was little focus on the DELTAS KT component at partner institutions, which was a hindered implementation of the activities by PhD and post-doctoral fellows even among those interested (P09, P11). One participant explained it this way:

> "Last year they won a 10,000 US dollar grant for assistant and associate professors. I informed the director of the [consortium] that I have additional funds that I can use for public engagement most importantly training the health professionals. What the Dean said to me is 'Modibo, you are a scientist, you should be doing science but not politics'. They view public engagement as political activities but I don't care, I know

the benefit of what I am doing and I am convinced science is nothing if you cannot translate your data into something positive for your people" (P11).

This participant's experience also reinforces the finding in Case B that leaders at all levels (including consortia leaders, supervisors or mentors) exert great influence on the KT capacity and practice of their PhD and post-doctoral students.

A notable difference in Case C compared to Cases A and B was that the latter designated champions at their partner institutions to coordinate planning and implementation of DELTAS KT activities at that level. However, they all experienced the same challenge of inadequate engagement.

Flexibility/adaptiveness of consortia leaders in programme planning

Also similar to Cases A and B, consortium leaders in Case C took actions to address gaps in their DELTAS KT component (particularly the CPE cluster of activities) after AAS took over as programme administrator. The consortium leadership asked the funder to allow them to reallocate their DELTAS KT budget to be able to hire a staff to lead and coordinate their DELTAS KT activities (P01, P02). At the time of data collection, the consortium had also applied for the Wellcome Trust Foundation Public Engagement grant to further strengthen their CPE component (P03, P10). The consortium leadership also decided to maximise the impact of their DELTAS activities by pooling funding from other projects of the institution housing the consortium and implementing the activities at that level rather than project level.

Specialist staff capacity and support strongly influenced by consortia interest in industry engagement

Case C reinforces the findings in Cases A and B that the interests and experience of consortia influences their hiring of specialist staff and the support they provide. In this case, greater interest of consortia on industry engagement influenced the specialist staff support, which focused on this despite their inadequate capacity.

Industry engagement a key responsibility of specialist staff

Just like Case A, Case C hired two staff to champion, coordinate and support their DELTAS KT activities mid-way implementation of the project after AAS released the refined KT expectations suggesting that they initially did not prioritise human resources for supporting this component (P01, P02. P03. P04, P06, P07, P08, P09, P10). Also, similar to Cases A and B, Case C staff were all based at the lead institution.

Case C staff were typically referred to using their designated titles, one being a Communications Manager and the other a Public Engagement Officer (P01, P02, P03, P04, P08, P10). One staff was responsible for supporting communication of the consortium's activities via a range of media platforms including the consortium's website and social media accounts (twitter and Facebook) and mass media (print, TV and radio) (P01, P03). The other staff focused on community and public engagement activities, which included: industry engagement; community outreach in research processes; and educating high school students about the importance of science careers (P02, P04, P10). The roles of the staff overlapped in many instances e.g., the Communications Manager would organise media coverage for community outreaches coordinated by the Public Engagement Officer (P03, P04, P06, P07, P10). From here on both staff are referred to using the pre-fix CPE to mean Communications and Public Engagement as opposed to Community and Public Engagement.

Unlike Case B and similar to Case A, both CPE staff had no prior KT capacity development and practice experience. One had corporate communications training and experience and the other had a graduate level political science training and no other work experience before joining Case C but had supported their DELTAS CPE activities as an intern for a year prior to becoming staff (P02, P04, P10). Nevertheless, the Communications Manager was drawing on some of their communications approaches in their work such as simplifying messages for the lay public, developing and maintaining a website and using traditional and social media to communicate with the public (P03).

Limited influence of specialist staff training and support on industry engagement capacity

The CPE staff reported their participation in the AAS capacity development workshops that focused on CPE also mentioned in Cases A and B (P03, P10). In addition, one of the CPE staff had also attended another training organised by their funder (Wellcome Trust Foundation) that focused on a range of topics including public and media engagement (P03). The CPE staff found the training workshops useful but expressed the need for additional training and also longer, better structured and contextualised. One participant described some topics covered in the Wellcome Trust training as follows:

> "The training program that I went to I think has also worth two days; but I don't think two days is enough for you train people as well as they would need seriously … if their training programs are segregated better, so then if we're focussing today on public engagement, we take out the week to deal with public engagement … so that

> we are not doing a little bit of everything but we are doing one thing and then we go into detail, break it down and make it more practical … instead of one person sitting and telling us, "Okay, so this is how you do it." … That will be more beneficial for the communication professionals. Perhaps the programs could be more structured towards our reality in Africa … The one I went to was basically Euro-centric strategies that were supposed to be translated to fit African. [For example] we don't … have specific journalists in our media houses that [report] research" (P03)

None of the staff noted the lack of focus on industry engagement or their need for, which may have been useful given the consortium's strategic interest in this.

Potential for specialist staff to support KT activities including industry engagement despite inadequate capacity

Consistent with Cases A and B, participants reported they coordinated, supported and implemented the DELTAS KT activities at the consortium and individual levels despite their inadequate capacity (P01, P02, P03, P04, P05, P06, P07, P09, P08, P10, P11). However, unlike Cases A and B, some participants noted that they had no systematic process in place for coordinating and overseeing institutional level DELTAS KT activities at partner institutions (P01, P03, P08). Although, it is worth noting that, across all three cases, majority of the DELTAS PhD and postdoctoral fellows were based at the lead institutions. Thus, any negative impact of little focus on DELTAS KT activities at partner institutions may be small at the consortium level but large when considering missed opportunities for institutional strengthening.

While the CPE staff supported a wide range of CPE activities, which ensured that the diverse needs of their researchers were met, their focus on facilitating links and partnerships between researchers and industry was most prominent (P01, P02, P04, P08, DR35, DR36, DR37).

> "We constantly found that we needed to bridge the gap between ourselves and industry, our pharmaceutical companies. Our students were going around visiting them … we sent them to various pharmaceutical companies in the country [to] see what they're doing. Somebody started saying that "We produce PhD students, brilliant students, why can't you put them in R&D … We have a department where we're trying to isolate compounds for fungal disease. How do you work with these people?" So that they know we exist [and] can strengthen their R&D departments" (P02)

Compared to Cases A and B, the CPE staff in Case C provided lesser support to their PhD and postdoctoral fellows (i.e., at individual level). For example, They did not organise training workshops or integrate relevant modules within their PhD fellows' academic training programmes. One participant even reported that this was not one of the support strategies of the CPE staff even though their initial plans included this (P01). In addition, PhD and postdoctoral fellows received no support from their CPE staff in the designing the CPE or KT activities for their research projects as was exhibited in Case B (using one-on-one mentorship) and, to a lesser extent, Case A (within their training) (P01, P03, P06, P07, P10).

However, CPE staff were typically involved in the implementation phase of the PhD and postdoctoral fellows' CPE activities but only those based at the lead institution (P03, P10). Therefore, the PhD and post-doctoral fellows mostly acquired any KT or CPE knowledge and skills through learning-by-doing (P01, P02, P04, P06, P07, P11). It is at this stage that mentorship was sometimes used by the CPE staff to strengthen specific capacities usually media engagement (P03, P06, P07). One participant gave the following description of the working relationship between the CPE staff and PhD and post-doctoral fellows, which suggests a lack of understanding of the CPE staff role and may partly explain why their individual level support was minimal:

> "Most people think that I'm here to tweet. When they want to go to this community, they draw their budgets, they do everything and then they come and inform me. "So, we're going here." And you don't have a choice but you have to be there" (P03).

Partner institutions minimally influence consortia capacity for KT including industry engagement and partnerships

Case C also demonstrates consortia partner institutions may have a stronger focus on industry engagement in the policies and structures but little investments in their operationalisation.

Insufficient opportunities at partner institutions for leveraging support for KT including industry engagement and partnerships

Greater but insufficient support for industry engagement and partnerships in partner institutions' policies and structures

A recurrent theme among the participants was that their institutions valued KT (P01, P02, P04, P07, P09) mainly attributing this to existence of a department or initiative responsible

for KT and linking researchers to industry (P01, P02, P07, P09). However, a common view was that their institutions support was insufficient because they put more focus on production of high-quality research (P01, P02, P03, P04, P11), publications (P01, P03, P04, P11) and public relations (P01, P02, P03, P04, P10). Some participants felt their institution had a greater focus on industry partnerships e.g., commercialisation but had inadequate capacity to operationalise the activities (P01, P02, P04, P09). The following participant best captures these sentiments:

> "There's some department called 'The Research Innovation Department' or something like that … they have a technology transfer unit … they're supposed to do that [i.e., KT activities] but it's not something they're aggressively doing. They actually sit and wait for you to send somebody … it's not a very well-staffed office" (P01).

Nevertheless, only one participant definitively stated that their institution was unsupportive of KT attributing this to their experience being denied funding for their KT activities (P11).

Consistent with Cases A and B, participants involved in the implementation of the consortium's DELTAS KT activities reported that their efforts were in no way influenced by their institutional policies, structures and processes (P01, P02, P03, P04, P07, P10, P11).

> "The university is not … directly involved in our public engagement activities … We can decide where we go. There are no barriers ... The university has a public affairs directorate but it… mostly focus on crisis communication … There's the … research management body in the university … I don't know if they have knowledge translation … Perhaps they might have some facility … but I don't know if there's anything specific like a place where you can go and say, you want to … communicate your research" (P03).

Documentary sources corroborated the participants' insights that among the three institutions represented by the participants, two identified KT as one of their strategic objectives and had KT and intellectual property (IP) policies and departments (I7L1, I8L1) and one did not (I9L1).

Lesser consideration of KT in basic researchers' compared to applied researchers' tenure and promotion processes

Contrary to Cases A and B, Case C participants had contrasting views about assessment of KT in their institutions' tenure and promotion processes. Some Case C participants said that it was not assessed (P01, P04) while some Case C participants said that assessment of KT was discipline dependent i.e., it was assessed among applied researchers not basic researchers (P02, P09). For example, one participant explained it as follows:

> "I think it depends with individual departments … because, for instance, … you can't assess my … public engagement skills when I am doing my molecular biology … and the same case you cannot assess the molecular skills of a public health [researcher] …, so it is tailored depending on the department you are working in" (P09).

Only the lead institution had accessible tenure and promotion policy documents, which corroborated the participants' insights that KT was not among the promotion criteria assessed (I8L1).

KT including industry engagement and partnerships not covered in researchers' academic degree training

Similar to Cases A and B, some participants reported that KT including industry partnerships was not covered as a core course in researchers' degree training curricula and that these types of training were mostly offered as continuous professional development (P01, P02, P04, P05). One participant explained it as follows:

> "So, when they are doing the training and capacity building, I think … it's good to do a wholesome kind of training, so that we just don't … get … lab people who focus on … publication and attending conferences ... But other than that, how do I translate my findings into a policy?" Or, "How do I get this pharmaceutical company to be a part of or to be interested in my finding? How do I change my findings for an entrepreneur …?" All those kinds of things, I think they all go to how we translate the information. So for me that training should be incorporated in the current system. If there's a way to do that it would really help" (P05).

Documentary sources showed that the lead institution had a core course that touched on some KT principles and approaches including how to align research questions to national development priorities and communicate it to policymakers, the public and media (I8L1). However, none of the participants cited the existence of that course suggesting that it may

not have been taught as conceptualised or touched on these issues too briefly to notice. Documentary sources also corroborated the participants' insights that their institutions' degree training and development of researchers did not include a core course on communicating and partnering with industry (I7L1, I8L1, I9L1).

Potential for partner institutions to leverage consortia KT capacity and support including industry engagement

Similar to Cases A and B, whilst the data suggests that the consortium in Case C benefited from little support at partner institutions to implement their DELTAS KT activities, the reverse happened. As earlier noted, the work of the consortium's DELTAS CPE staff including their industry engagement activities was expanded across other projects of the institution housing the consortium (P01, P03, P04, P08, DOC CODE). Threrefore, the DELTAS KT activities were institutionalised at the lead partner level. One participant serving as one of the consortium's CPE staff described their role like this:

> "We [i.e., the institution housing the consortium] are semi-autonomous and we are directly under the university … I'm Communications Manager for [the institution]. So, I'm basically in charge of the Communications and Public Engagements Unit. I'm in charge of disseminating information about the centre, I handle the communications channels for [the centre] … I'm here because of the DELTAS Africa program. I … was hired because it was a requirement" (P03).

Just like in Case B, collectively the partner institutions in Case C exhibited stronger KT capacity than Case A but also insufficient for the consortium to leverage on. The KT capacity of partner institutions in Case C was comparable to Case B for its greater focus on IP, which was more aligned to their interests but also insufficient.

6.3.4 Macro level themes

Funders inadequate support for industry partnerships greatly influences consortia focusing on basic research

Case C reinforces the disproportionately large and simultaneously positive and negative influence of donor and government funding on consortia KT capacity and practice, which is compounded by the inadequate support for industry engagement and partnerships.

Inadequate emphasis on industry engagement

Similar to Case A, Case C paid minimal attention to the DELTAS KT component in their proposal but at least had a small budget allocation for some KT activities including industry engagement (0.6%) (P01, P02, DR20). The budget was later adjusted to support the hiring of specialist staff to lead the component when AAS made this a requirement in their refinement of the DELTAS KT component (P01, P02, DR36). The low proportion of the KT budget (i.e., 0.6%) against the funders allocation for this (1-2%) reinforces the views in Cases A and B suggesting that the DELTAS funders did not pay critical attention to the KT component. As noted earlier, at the time of data collection, the consortium was also in the process of applying for additional funding from Wellcome Trust Foundation (P10, DOC CODE). The consortium had also pooled funding from other projects to be able to support more activities (P02, P03, P07).

However, insights from some participants suggest that the DELTAS KT funders' support for industry engagement and partnerships may have been insufficient, which reinforces the high value placed on this particular activity in Case C. The participants' views about the extent of support for industry engagement and partnerships in the DELTAS programme were inconsistent (P01, P04, P08). One participant felt that DELTAS lacked a focus on the product development process or research and development (R&D) and was taking their own initiative to source funding for this (P04):

> "I think there is a strong interest in science as a society … trying to drive proper understanding in science in general … but the integrated innovation concept I don't think it is part of the outcomes. Maybe it's implied but it's not obviously designed to be a part of DELTAS. It might be something they want to consider" (P04).

Another participant said that industry partnerships was being emphasised in the programme but that it would be difficult to meet the funders' expectation on this due to wider challenges and bottlenecks in the national context, discussed in the next section (P08).

Similar inconsistent perceptions existed among AAS staff. One AAS staff interpreted the primary target audiences for DELTAS CPE activities as only communities and wider publics and acknowledged the limitation of this among basic researchers involved in discovery research and suggested that those interested could source this support from a different AAS initiative (P28). The other AAS staff viewed the private sector and industry as part of the public and thus a primary target audience of DELTAS CPE activities (P29). The varied

interpretations suggest that there was inadequate clarity about and communication of the DELTAS CPE strand.

Potential for funders to support development and use of national research agendas

Use of national research agendas to inform their work was cited as uncommon due to lack of government funding for it and reliance on donors for research funding mirroring the sentiments in Cases A and B (P01, P02, P04, P05, P06, P08, P09). Only one participant who was a basic researchers involved molecular surveillance research reported explicitly aligning their work to the national research agenda (P06). In addition, the World Health Organisation (WHO) was cited by three participants as an influential among researchers in identifying health priorities and informing policy decisions in Africa (P02, P04, P05). However, some participants mentioned that more recently funders had started to align their priorities to national research agendas and in this way supported their implementation (P01, P04).

Opportunity for funders to increase interest and investment in R&D within African local industry

A recurrent challenge unique to the consortium in Case C, was that basic researchers in Africa lacked access to investments for R&D, which hindered their potential to develop their research findings into products and services of practical use to society that they could then promote in public policy and practice settings (P01, P02, P04, P05, P08). This was attributed to local industries in Africa lacking capacity and support from government to fund R&D or operating as international subsidiaries and, consequently, having no interest in R&D or say in defining R&D priorities of their parent companies. The result was a culture of generating and publishing research just to contribute to the knowledge base among basic researchers involved in discovery research. One participant captured it best this way:

> “Running the R&D department in [local pharmaceutical companies] is expensive and is not necessarily going to lead to a cheaper drug … you can produce a drug all right but because of what you've spent, government doesn't subsidise, or it doesn't support you in any way in that production pipeline. You have to recover your cost and so your drug will be expensive, and it won't sell” (P02).

This identified challenge may have been an underlying reason for the inconsistent perspectives on the extent of DELTAS support for industry engagement and partnerships among the participants. Having meetings to explore mutual interests between researchers and industry is a critical part of the process but getting investors to take ideas forward is

essential for translation to be realised. The consortium's DELTAS programme supported meetings between researchers and industry but seemed not to have an allocation for projects to move to the development stage. Indeed, one participant highlighted this as a gap in their programme:

> "I've not seen a part of the DELTAS initiatives that looks like the Grand Challenges … they understand knowledge translation very well, so they package it as part of the application process ... they structured their grant to have two phases; phase one is proof of concept … like me I've done some work over the years and I have one interesting candidate and … I applied for 100,000. You have to demonstrate that this candidate can be of use in treatment options … that's phase one. When the phase one report is submitted and the technical team evaluates it and they're happy, then we can … go to phase two, which is already entitled … translation to scale or impact. … you can now be eligible for up to one million Canadian dollars. And then you are required to either set up a venture or university or a small company … in your own individual capacity or you collaborate with an existing business that can take up your idea and commercialise it. So the money is for that activity. So that's the experience I had" (P04).

The same participant also discussed their future plans to source funding from a private equity firm.

> "I have … my plan of going for translation or translating to scale from my activities .... To the extent that … I … found enough … drive to look out for private equity fund and to engage with them … They were going through a second fundraising cycle and they've told us that one will be like much bigger than the first one. So now that we've spoken to them, they will put us in their plans towards the end of the year. So then we have 2019 to prepare and then hopefully 2020 we can submit the actual application." P04

Another participant reported that the government in their country had introduced a requirement for local industry to strengthen their R&D function, which would partly address the challenge of no local capacity for R&D (P01). Government and donor funders would have to invest in R&D for such a policy to work. The participant explained it as follows:

> "If the government was well connected, this was an opportunity to put academia and industry together because now they need academia to set up those research units.

> They should have said ‘those who don't have the capacity to set up your own research unit, enter into a partnership with an academic unit so that they'll serve us your research unit and you give them some funding, … give them research questions or problems that you have and let them do research for you.’ … we're not well connected because we in academia we didn't … know that there was that policy” (P01).

Therefore, Case C demonstrates that there is an opportunity for consortia funders to support researchers to advocate for national policies promoting R&D and government and donor investments in it.

6.3.5 Interactions between micro, meso and macro level factors influencing KT capacity and practice in Case C

This section examines the interaction of micro, meso and macro level factors that influence researchers’ KT capacity and practice in Case C. As was demonstrated in Cases A and B, multi-directional interactions between the micro, meso and macro levels shaped the KT capacity and practice of the consortium in Case C.

The researchers in this consortium who were all basic researchers demonstrated lesser KT capacity and practice than their applied research counterparts but also diverse interests and needs depending on the type of research they are involved in. Some participants shared similar KT capacity and practice as applied researchers in Cases A and B e.g., basic researchers doing molecular surveillance or clinical research were involved in co-production of research with policymakers and practitioners. However, unique to Case C, there was a sub-group of basic researchers, mainly involved in discovery research, with a strong interest and need for capacity and support for industry engagement and partnerships. This interest and need were visible in their DELTAS project KT plans but emerged as insufficiently supported by the participants’ institutions, the DELTAS funders, governments and local industry.

Just like in Cases A and B, the micro level KT capacity and practice among the consortium leaders, i.e., their interest, capacity and experience, shaped their consortium’s KT plan (in this case their basic research disciplinary alignment and interest in strengthening links between researchers and industry). However, this meant that basic researchers involved in applied research such as molecular surveillance, which involved interactions with

communities, policymakers and practitioners, were not sufficiently considered in the consortium's initial KT plan. However, just like Cases A and B, Case C KT capacity and practice was greatly influenced by the DELTAS funders' emphasis on CPE, and this widen support to basic researchers involved in applied research but with the same challenge of insufficient funding noted in Cases A and B. Like in Cases A and B, the influence of the funders' interest in and support for CPE went beyond the consortium and also influenced the strategic priorities of the department institution housing it. The department housing the consortium was motivated to incorporate CPE as one of its strategic priorities and pooled funding from the range of projects in the department to support department level rather than project CPE activities.

It is noteworthy that similar to Case A, Case C only took the DELTAS KT component seriously when the funder issued refined guidelines requiring reporting of various activities/outputs related to this suggesting that this carrot and stick approach works. Also, worth noting and relevant across the three cases is that the funder exhibited a learning culture by using progress reports to identify gaps in implementation of the KT component and refined their guidance and support. This is another good practice that funders interested in motivating research consortia KT capacity and practice should adopt. At the same time, at the macro level, lack of opportunities to work with local industry due to their lack of interest and capacity also greatly influenced this consortium's KT capacity and practice and in particular their focus on advocating for strengthened support by government. This lack of lack of opportunities to work with local industry also played a role in the demonstrated minimal micro level KT capacity and experience.

However, like Cases A and B, despite partner institutions (at the wider institution level) exhibiting greater interest in industry links and partnerships, this consortium was unable to harness support from them due to insufficient capacity. Unlike Cases A and B, interactions between the consortium and/or their research and meso level research/professional networks and groups that implement similar work as Case C or have expertise of value to them was not reported. This may be a consequence of their much more limited KT practice experience due to the macro level challenge of lack of opportunities particularly among researchers involved in discovery research. It is likely that this was happening to some extent among basic researchers involved in applied research but because it was not explicitly probed, this interaction may have been missed.

This Case demonstrates that funder KT support must consider the range of research disciplines within research consortia and their KT capacity and practice needs. This Case

also reinforces the need for research funders to provide technical support to consortia during the grant proposal stage to help them develop their KT plans that address the range of KT capacity and practice needs within them.

CHAPTER 7: DISCUSSION

7.1. OVERVIEW OF CHAPTER

This study aimed to generate evidence that would inform interventions for strengthening African (and broadly LMIC) researchers' KT capacity (knowledge, attitudes, and skills) and practice. The study addressed four specific objectives:

1. Develop an analytical framework to support a systems perspective comparative analysis of Africa-led research consortia KT capacity and practice
2. Apply the framework to compare and contrast KT capacity and practice in three DELTAS consortia
3. Refine the analytical framework based on the study findings for application in understanding KT capacity and practice in Africa-led research consortia
4. Identify lessons and strategies for strengthening the KT capacity and practice of Africa-led research consortia

A qualitative case study approach was used. Three purposively selected Africa-led research consortia that were part of the health research capacity strengthening programme, DELTAS, served as the study cases. The three cases varied based on health research focus, research discipline, geography, type of partner institutions, maturity (when established) and KT strategies and outputs indicated in DELTAS award documents and annual progress reports (2015-2017). Interviews were completed with 29 participants among whom 27 were drawn from across the three research consortia based in nine universities or research institutions located in eight African countries. The remaining two participants were from AAS, serving in the capacity of the DELTAS fund administrator.

Interviews and relevant documents from institutions and countries represented by the participants were the primary sources of data for this study. The data were analysed using the thematic framework approach. The study analytical framework was iteratively developed and used the systems perspective (micro, meso and macro levels) as the overarching structure to organise themes that emerged in the systematised review of published literature on LMIC researchers' KT capacity and practice (presented in Chapter Two) and the primary data. Common themes and patterns across the three cases were identified and each case was presented as separate chapters.

The first objective was addressed by the systematised literature in Chapter Two, at the end of which an analytical framework for supporting a systems perspective comparative analysis

of Africa-led research consortia KT capacity and practice was presented. The second objective was addressed in the results chapters (Chapters Four to Six).

The third and fourth objectives are addressed in this chapter. Drawing on findings from across each of the three cases, the discussion will focus on the major interactions that emerged from across the three levels (micro, meso and macro) to glean insights from the data from a systems perspective.

I first present the refined study analytical framework based on a synthesis of the main study findings. I then discuss in detail the synthesis of the study findings and their contribution to the current KT evidence base and implications. I follow this with a discussion of the study limitations and areas for further research. Finally, I end the chapter with recommendations drawn from the study findings and an overall conclusion.

7.2. SYNTHESIS OF THE MAIN FINDINGS AND IMPLICATIONS

The study applied the systems perspective to identify the micro, meso and macro level factors that shaped the KT capacity and practice of three diverse Africa-led research consortia including how they manifested and interacted within and across the levels. To my knowledge, no other study has applied a systems perspective to explore the KT capacity and practice of research consortia and this is the main contribution of this research. The most compelling discovery in this research is the extent to which the micro, meso and macro levels influenced each other and how. The study identified two additional sub-levels at the meso level expanding them from two (research institution and research/professional networks) to four (with the addition of research consortium and research institution department e.g., College of Health Sciences at a university). In addition, three main groups of multi-level and -directional interactions (micro-meso, meso-meso, and macro-meso-micro) emerged.

Figure 8 is a graphic presentation of the micro, meso and macro level factors that shape researchers' KT capacity and practice and their interaction.

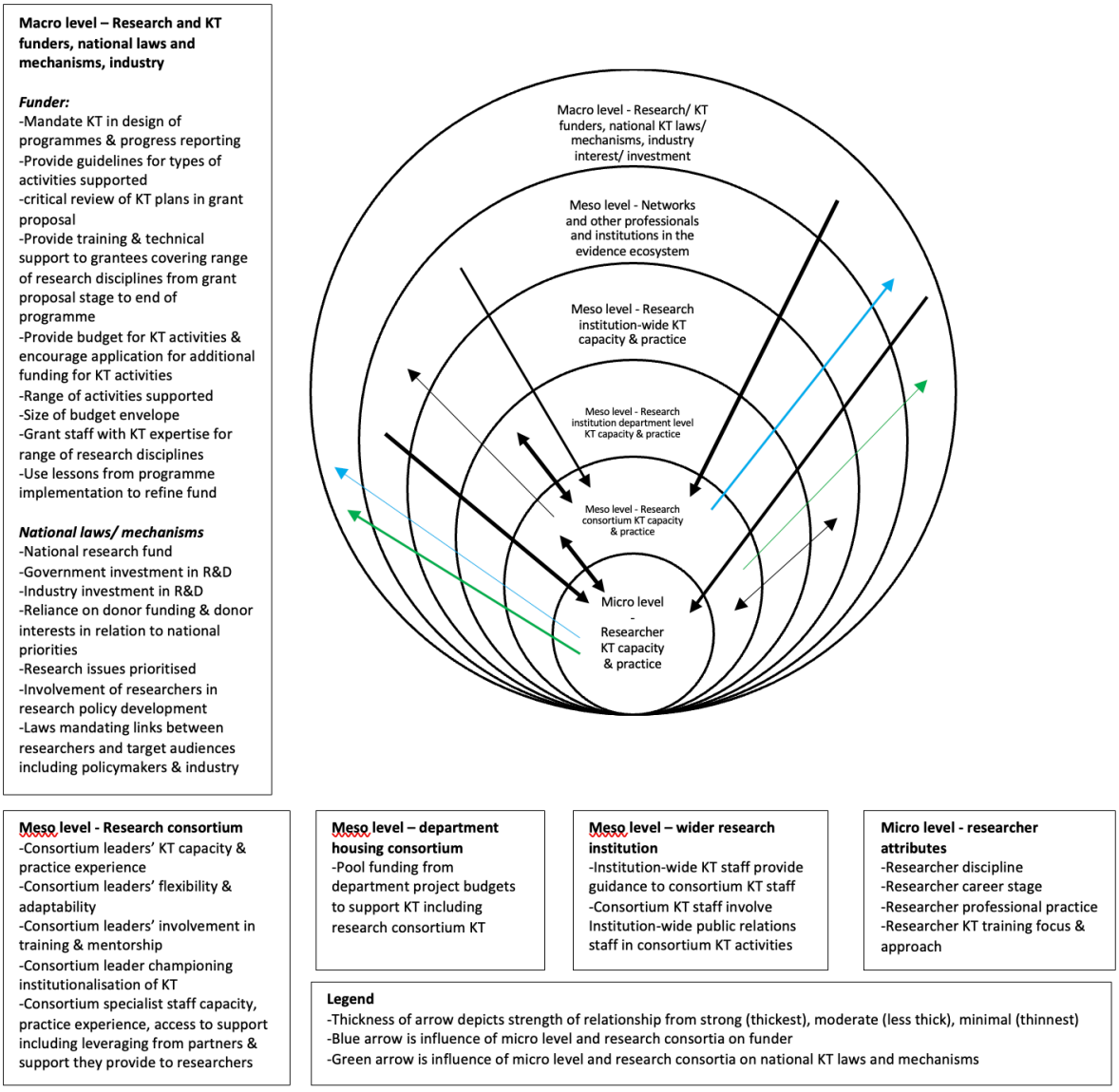

Figure 8. Analytical framework for the factors that shape researchers' KT capacity and practice and interactions

The micro-meso group of interactions identified a strong bidirectional influence between the micro level KT capacity and practice and meso level research consortium KT support. The influence of research/ KT/ professional networks was clearer and stronger on the micro level, moderate with potential to be stronger on research consortia but minimal in the opposite direction at both levels also with potential to be stronger. The meso-meso group of interactions found a strong bidirectional influence between the research consortia and the institutional departments housing them. By comparison, the influence of the research consortia on the wider research institutions was unequal across the research consortia and minimal in comparison to their influence on institutional departments but with potential for it to be stronger. Similarly, the influence of the wider research institutions on the research

consortia was minimal with potential for it to be stronger. The macro-meso-micro group of interactions identified a strong influence of the funder on micro and research consortia KT capacity and practice while the micro level and research consortia minimally and moderately influenced the funder, respectively, with potential to be stronger. There was also a strong influence of national KT and R&D laws and mechanisms on micro level and research consortia KT capacity and practice. In turn the influences of the micro level and research consortia KT capacity and practice on national KT and R&D laws and mechanisms were moderate and minimal, respectively, with potential to be stronger.

Unlike the meso-level which distinguishes each sub-level, the figure presents the macro level sub-factors together since the issues related to the two factors are interlinked e.g., over-reliance on donor research funding is a consequence of lack of or insufficient government funding for research. The figure distinguishes the varied interactions between the micro level and research consortia with the two sub-factors using different colours – blue for interactions with the funder and green for interactions with national KT laws and mechanisms.

A detailed discussion of the study findings, its contribution to the wider evidence base and future research directions follows.

Micro-Meso level interactions

To understand the bidirectional influences between the micro and meso (research consortium) levels and, later on, the macro-meso-micro levels, it is important to first highlight separately the micro level factors and interactions that shaped the KT capacity and practice of researchers in the research consortia explored in this study.

Strong influence of KT training and experience on researchers' KT capacity and practice

At the micro level, across the three research consortia, researchers' exposure to KT and their professional practice contributed to wide variations in the KT capacity and practice of study participants, irrespective of their research discipline and career stage. In other words, researchers who were clinicians and/or involved in advocacy work and/or had been exposed to KT through training, mentorship and/or implementing KT initiatives (learning by doing) were more likely to value and play a central role promoting KT than those not, irrespective of their discipline and career stage. The study also identified one other factor that may shape the extent of interest and involvement in KT practice among basic researchers – the type of

research they undertake. Basic researchers involved in discovery research (which has no defined or identifiable specific use) tended to have lesser interest in researchers playing a central role promoting KT than those involved in research with a defined or identifiable specific practical use i.e., applied research such as infectious disease surveillance.

The findings suggest that among these factors, researchers' exposure to KT may have the strongest influence on variations in their KT capacity and practice, irrespective of their discipline, in two broad ways. Firstly, the extent of researchers' exposure to KT principles and approaches (narrow or comprehensive) strongly influenced their understanding of KT and KT skills, and practice. For example, participants exposed to media and advocacy exhibited a narrower understanding of KT and KT practice influenced by this perspective compared to participants exposed to a wider range of KT concepts and approaches. Secondly, the study found that exposing researchers to KT principles and approaches through sensitisation, training, mentorship, and practical experience has the potential to nurture KT practitioners and champions among them.

Across the three cases and irrespective of their discipline, exposure of researchers to KT principles and approaches was often ad hoc and usually through some externally funded initiative they were involved in during their professional practice. The study found a high interest in KT training and mentorship being integrated into academic research degree programmes, irrespective of research discipline but with some variations in the focus. Applied researchers (including basic researchers involved in applied research) were more interested in training that would equip them with KT skills beyond co-production of research including: skills for packaging and communicating research in formats more understandable and accessible to non-academic audiences; and navigating policymaking processes and the media. Some basic researchers involved in discovery research were interested in training and mentorship focused on interacting and working with industry. This means that making KT more widely accessible e.g., through integrating KT modules into researchers' academic degree training, which is tailored for their disciplinary KT needs, may produce more researchers interested in and equipped for KT practice.

However, there were some basic researchers involved in discovery research who expressed more interest in their institutions hiring dedicated support staff who they felt would be better capacitated (in terms of expertise and time) to focus on identifying translatable research and creating and nurturing the necessary relationships and partnerships (including with industry) to promote KT. This means that in addition to introducing KT training in basic researchers' academic degree programmes that focuses on linking and working with industry,

encouraging basic researchers to opt for careers in the KT space (i.e., linking and facilitating partnerships between researchers and industry) is another approach that may strengthen KT practice among basic researchers.

Other scholars in LMIC and HIC settings have also found that researchers' KT capacity and practice is shaped by their career stage, professional practice and having KT training or experience, but from the perspective of applied researchers (23, 27, 54, 110, 126, 128-139) (54, 128, 155, 162). This study shows that these factors also shaped basic researchers' KT capacity and practice, albeit in a research consortium setting. At the same time, the study adds to the existing evidence base by shedding light on the factors and interactions that contribute to the variations in researchers' KT capacity and practice that have been documented by other scholars (56-58, 68, 100-102, 180, 207). Finally, the study provides some insights into how researchers could transition into KT practitioners and champions, which may be through the interaction of exposure to KT principles and approaches and untapped interest in KT practice that is ignited by the exposure. There are existing KT curricula for researchers, including the one used by one of the consortia in this study, which could be adapted to include modules relevant for basic researchers involved in discovery research i.e., focusing on interacting and working with industry (208-213). Outside of the KT evidence base, there are courses targeting basic researchers that research consortia and other KT curriculum developers could draw on such as patent drafting training for researchers, which have been documented as effective in improving the quality of patents written by researchers (214, 215). Furthermore, some scholars have documented experiences of HIC based basic researchers opting for careers as KT experts, which can provide some insights on how to develop a critical mass of a similar cadre in the African setting as recommended by some participants in this study (216).

Strong bidirectional influence between micro level KT capacity and practice and research consortia

The study identified a strong bidirectional relationship between the micro level KT capacity and practice and the meso research consortium level, specifically, the research consortia leaders, specialist staff, which shaped their research consortia KT priorities, plans, activities and resources including budgeting and staffing.

Strong micro level influence on research consortia leaders and specialist staff

The disciplinary alignment and KT capacity and experience of research consortia leaders (micro level) emerged as the most important factor influencing the prominence given to KT in consortia (meso level) DELTAS programme activities, the quality of their KT plans and

activities (in terms of range of activities) and the resources (budget and staff) they allocated for implementing their KT plans. For example, the participants with the greatest KT capacity and practice and who also self-identified as KT champions and practitioners were from the same consortium and served in leadership positions within it at different levels – one as the director and the other as the Chair of the community and public engagement committee within the consortium's governance structure and staff responsibility for championing, overseeing and supporting the research consortium's KT capacity and practice. The stronger focus on KT within the consortium's governance structure and KT plan that featured a wider range of budgeted activities compared to the other two consortia explored in this study reflected the greater KT capacity and experience of the consortium's leaders and staff.

The consortium focusing on basic research had stronger interest and experience advocating for industry engagement and partnerships among the leaders, which was visible in their governance structure, choice of activities, and support staff responsibilities. The consortium focusing on applied research initially defined a KT plan with no budget and staff for its implementation likely due to no experience formally planning and budgeting for KT but rather undertaking ad hoc activities. However, later when the funder provided more specific guidance and support to consortia to improve their DELTAS KT components, the consortium defined a stronger KT plan with resources allocated to it that was strongly influenced by both the leaders' training and experience in media engagement and advocacy and the funders' interests in community and public engagement (CPE).

The influence of consortia leaders' KT capacity and experience was also demonstrated in the extent of support for DELTAS KT activities among the consortia leaders based at the partner institutions, which was found to be inadequate and attributed to their lesser interest, capacity and engagement (e.g., in the conceptualisation of the consortia grant KT proposals). Furthermore, the KT capacity and experience of research consortia KT/CPE support staff and the range of KT activities they supported greatly aligned to their capacity and experience and interests of their consortia, particularly among the leaders (i.e., KT, media and advocacy, industry engagement etc.). For example, the research consortium with greater KT capacity and practice allocated a budget in its initial DELTAS proposal for hiring a specialist with substantial KT capacity and experience (also a protégé of the consortium leader) and increased the staff from one to three mid-way implementing their programme. In comparison, the other two consortia did not consider staff needs for the KT component of their projects in their initial DELTAS proposal and only added them mid-way implementing their programme in response to the funders' requirement for this. The capacity and experience of specialist staff hired by the two consortia mirrored those of the consortia

leaders; one having strengths in media and advocacy and the other experienced in branding and corporate communications.

Strong influence of research consortia leaders and specialist staff on the micro level KT capacity and practice

In turn, the research consortia leaders and KT/CPE specialist staff (meso level) greatly influenced the KT capacity and practice of the researchers (micro level) they supported. The study showed that better capacitated consortia leaders and specialist staff can influence and support researchers (through training, mentorship, and modelling) to undertake a wider range of KT activities including community, public, media, policy, and industry engagement. Similarly, the KT activities that consortia leaders and specialist staff with narrower KT capacity and experience can encourage and support is limited to their strengths. Consequently, a wider range of KT activities were reported by participants from the consortium with better capacitated specialist staff compared to the other two consortia. The activities reported by participants from the other two consortia were biased towards their leaders' and specialist staff disciplinary orientations and interests, capacity and experience in industry partnerships/ product developed and media and advocacy, respectively.

The findings reinforce the need for integrating KT training in research degree programmes (tailored by disciplinary needs) as one way that could nurture future African research leaders who are better capacitated to steer research programmes that emphasise KT such as DELTAS. Training curricula should as noted earlier consider African researchers' disciplinary KT needs. For current African research leaders and researchers already on the path to become research leaders, it may be beneficial to integrate KT training in their leadership development programmes and other forums they regularly attend (e.g., conferences) that could be used to showcase the work of African research leaders of varied research disciplines involved in KT activities. African academic and research institutions or programmes can also adapt existing research leadership training programmes within their institutions or offered by other institutions to feature KT more prominently (217-219). Integrating KT modules into researchers' degree training and development would likely accelerate the natural progression of some African research leaders into KT practice, which was identified in this study as one of the main pathways for researchers to get involved in KT practice. In addition, the study identified an opportunity for better involvement of all leaders within an African research consortium in developing KT grant proposals. This study findings also suggest the need for dedicated KT support staff to ideally possess a wide range of KT knowledge and skills that match the KT needs of the researchers they are supporting, which they could acquire through capacity strengthening programmes offered within the research

consortia setting, at their workplace or by other institutions and/or during their science communication degree training as recommended by the participants.

Strong unidirectional/ potentially bidirectional influence of research/KT/professional networks and institutions on the micro level KT capacity and practice

The study also suggests that research/KT/professional networks and institutions could have a strong influence on micro level KT capacity and practice when harnessed. Evidence from two consortia illustrated that professional networks played an important role in strengthening the KT capacity and practice of some researchers. However, the interests/ focus of the network in terms of KT concepts and approaches is critical as it affects how the researcher conceptualises KT and their KT approaches and the research consortia KT plans and activities more broadly, as noted earlier. This finding reinforces the need for KT training and mentorship that consider research discipline KT needs being integrated in PhD degree programmes, so that early career researchers are exposed to all the basic KT concepts and approaches that are relevant for them. Research/KT/professional networks and institutions can serve as a source of additional training and mentorship that may focus on specific KT approaches and activities and/or build on their existing KT knowledge and skills. Although not a strong finding in this study, there is also a potential for researchers who are beneficiaries of capacity strengthening or other support from research/KT/professional networks and institutions to have some kind of reciprocal influence e.g., becoming one of the pool of mentors for a training programme administered by these entities. Perhaps not surprising, the KT staff of the research consortium with greatest KT capacity and practice reported supporting other groups involved in KT practice at their university to deliver trainings and mentorship.

Other scholars have identified institutional and programme level leadership for KT as important for promoting LMIC and HIC researchers' KT capacity and practice in their capacity to allocate and provide resources (staff and funding), KT policies and tools, time, and mentorship opportunities (2, 62, 86, 128, 220). Likewise, the importance of research/KT/professional networks and institutions has also been cited as facilitative of researchers' KT capacity and practice (3, 27, 54, 65, 108, 114, 120, 131, 132, 134-137, 139, 142, 144, 150, 153, 157, 160, 164, 171-173, 175-179). However, none of the studies have illustrated how research leaders' micro level KT capacity and experience and research discipline shapes their leadership for KT like in this study. Similarly, none of the studies have illustrated the influence of research/KT/professional networks and institutions on how researchers' future KT plans and activities.

Other studies have also identified researchers having access to dedicated specialist staff as an enabler of LMIC and HIC researchers' KT capacity and practice (86, 128). However, previous studies have not explored the factors that may influence the calibre of dedicated specialist staff hired to support researchers (in terms of qualifications) and the variations in the support they could provide depending on their background, researchers' disciplinary KT support needs and access to capacity strengthening in their workplace as done in this study. Some scholars have analysed the competencies that dedicated support staff championing, coordinating, and supporting KT should have but did not consider the needs of basic researchers involved in discovery research, the importance of which was demonstrated in this study (2).

Meso-Meso level interactions

At the meso level, three kinds of influences were identified: strong bidirectional influence between the research consortia and their host departments within their lead research institutions (e.g., College of Health Sciences); minimal/ potentially strong bidirectional influence between the research consortia and at their wider home research institution level (e.g., university-wide); and moderate/ potentially strong bi-directional influence of research/ KT/ professional networks on research consortia.

Strong bidirectional influence between research consortia and host departments based in the lead research institutions

The study illustrated a strong bidirectional influence between research consortia and their host departments based in the lead research institutions.

Strong influence of research consortia on host departments

In all three research consortia, the consortia directors incorporated community and public engagement or KT as part of the mandates of the departments housing the consortia either pre- DELTAS grant as part of a different grant (the consortium with greater KT capacity and experience) or during the DELTAS grant (the other two consortia). Consequently, the responsibilities of the specialist staff hired to lead implementation of the DELTAS KT component were expanded to include supporting all projects in the host departments. However, this was reported to have resulted in the specialist staff being overstretched. The consortium with greater KT capacity and experience tried to address this by adding two more part time staff to support the work but still fell short on meeting the department level demand for KT support. Therefore, as much as research consortia can influence host

department strategic priorities to include KT, their influence at the implementation level can be hindered by technical capacity constraints.

Strong influence of departments hosting research consortia

A reciprocal consequence of community and public engagement or KT being introduced as strategic priorities of host departments demonstrated across the three research consortia was pooling of funding from the range of projects within the host departments to maximise the impact of the resources by designing activities that promote uptake of evidence from multiple similar research projects rather than many potentially duplicative KT activities. The study also illustrated the influence of research consortia conceptualisation of KT on that adopted by their host departments. For instance, the conceptualisation of KT at the host department of the research consortium with greater KT capacity and experience was more encompassing of the range of KT approaches beyond community and public engagement while the host departments of the other two consortia were more aligned to the DELTAS conceptualisation of community and public engagement and the interests and capacity of their leaders (media and advocacy and industry links and partnerships). This finding reinforces the central role of micro level KT capacity and practice in shaping KT capacity and practice at the meso level. Although not demonstrated in this study, there is a potential that the influence of research consortia on host departments KT capacity and practice could extend to inform their fundraising practices in which KT would be seriously considered to address its strategic prominence in the department.

No other study exists that has identified the influence of research consortia on support for KT at their home academic and research institutions at the department level and vice versa. The study findings suggest that one approach to strengthening KT support at academic and research institutions could be through supporting research consortia and encouraging their leaders to scale up or intensify the practice in their departments. In addition, as an incentive, research consortia that scale up KT as a strategic priority of their host departments could have access to supplemental funding for hiring more staff to support their departments and advocate for internal institutional funding for sustainability beyond the programme life.

Minimal/ potentially strong bidirectional influence between research consortia and wider research institutions on research consortia

Minimal/ potentially strong influence of wider home research institutions on research consortia

Across the three cases, the wider academic and research partner institutions housing the research consortia had minimal influence on research consortia KT capacity and practice due to lack of or insufficient focus on KT in their policies, structures, and processes. The study illustrated that research consortia implementing research projects that integrate KT activities such as DELTAS can be implemented without or with minimal support from their home research or academic institutions. However, support for KT in academic and research institutions is critical for sustainability of the gains made in strengthening the KT capacity and practice of research consortia by such projects beyond the project life. Departments at the consortia partner institutions responsible for steering KT efforts including industry engagement and partnerships were described as having insufficient staff (number and skills) and unstructured, minimal to no influence on the design and implementation of their DELTAS activities in terms of guidance and support that research consortia could leverage from them.

The study findings suggest that KT initiatives of academic and research institutions in this study are typically donor initiated and/or funded including in some case the establishment of their KT departments. However, the study also revealed that academic and research institutions in this study invest more resources (though still inadequate) on industry engagement and partnerships (i.e., patents and commercialisation) than activities aiming to influence public policy and practice suggesting that the relative value they placed on two types of activities may be playing a role. Industry engagement and partnership could be receiving more attention than public policy and practice influencing activities because of its income generating potential given the resource constraints that African academic and research institutions face. The same pattern has been noted in HIC based institutions suggesting that it is not an issue unique to the African setting (68).

Research degree programmes and researchers' performance assessments were also reported as paying minimal or no attention to KT, which contributed to the lack of interest in the DELTAS KT activities among some researchers. The study illustrated how minimal or no attention to KT in research degree programmes in research institutions could potentially hamper implementation of research projects that emphasis KT such as DELTAS. For example, academic supervisors who viewed integrating KT in their training as a distraction

and waste of time hampered implementation of the KT component by their PhD and post-doctoral fellows in one of the research consortia. This example also showed the potentially influential role of academic supervisors in shaping their students' views on KT practice, both positively and negatively. Therefore, support for KT offered to research consortia and researchers in general by African academic and research institutions could be strengthened if KT departments are better resourced and capacitated, and KT is made more prominent in tenure and promotion processes and research degree programmes.

Indeed, participants across the three cases suggested several strategies for strengthening institutional support for KT including links and partnerships with industry (i.e., technology transfer and commercialisation). One strategy suggested was for institutions to introduce incentives that will encourage researchers to integrate KT in their work e.g., revising publication requirements so that there is less emphasis on certain high impact journals and add scores for KT activities. There was also strong support for integrating KT training in all research degree programmes (noted earlier) rather than in certain degree programmes (e.g., public health degrees) or as continuous professional development as was found to be the case across the three consortia. However, a recurrent challenge mentioned across the three consortia was that PhD students already face considerable time constraints for achieving their degree graduation requirements making it difficult to integrate KT activities. Therefore, there is a need to explore how best to integrate KT training in research degree programmes. There are some examples of LMIC and HIC based universities offering KT training in their post graduate research degree programmes, a few having been evaluated and found to be well received by researchers (162, 221). Lessons could also be drawn from these efforts to inform the best approach of integrating KT training in research degree programmes in African academic institutions.

One suggestion, though from one participant, was computer science degree programmes could offer a blueprint from which to design basic research degree training programme because of their focus on product development. Other suggestions specifically for nurturing a critical mass of KT experts in Africa who could work in academic and research institutions to support researchers was the need to introduce a science communication degree programme or PhD degree programme focusing on KT theory and practice. Notably, the participant that suggested the introduction of a PhD degree programme with KT theory and practice specialisation was one of the two with greatest KT capacity and experience, reinforcing the influence of micro level KT capacity and practice on how KT is conceptualised at the meso level. Such courses exist in some HIC based academic institutions from which African academic institutions can model and adapt to the unique

African context (222, 223). However, academic and research institutions would also need to invest in hiring of staff with KT expertise, which, as noted earlier, emerged as a major bottleneck to research institutions supporting research consortia and researchers in general.

As noted earlier, among basic researchers involved in discovery research, there was greater interest in developing KT specialists from among researchers, suggesting that strong research knowledge and experience may be viewed by them as one of the critical competencies for this role. Nevertheless, as noted earlier, such a cadre could emerge naturally if KT training is a core part of their degree programmes and researchers are encouraged to think broader about their career options i.e., that some researchers could pursue KT practice as a viable career path. At least in HIC settings this is already occurring, as noted earlier, illustrating that this is a feasible strategy although also depended on academic and research institutions hiring such a cadre to make it an attractive option (216).

Given the increased attention to industry and commercialisation activities observed among African academic and research institutions in this study, this may be a “low-hanging fruit” for improving institutional support for basic researchers’ KT capacity and practice. At the same time, the existence of departments with KT/Intellectual Property (IP) mandates in majority of academic and research institutions in this study could also be viewed as a “low-hanging fruit” for advocating for their strengthening to better support researchers’ public policy influencing activities

This study illustrated the potential for academic and research institutions to provide greater guidance and support to research consortia and more broadly researchers’ KT practice through investing in more skilled staff and some core activities. Indeed, one institution had a well-defined KT strategy and KT criteria in their tenure and promotion policy although both insufficiently addressed KT for basic researchers. One participant described the guidance and support their institution KT staff offers for drafting patents and getting into partnerships with industry. However, these examples reveal that even academic and research institutions that demonstrate greater support for KT struggle to realise their aspirations and plans due to their lower investments in this area.

Minimal/ potentially strong research consortia influence on wider home research institutions
The study also demonstrated the potential influence of research consortia on KT support in their home academic and research institutions. Some participants from one research consortia believed that there was high potential for the KT Unit established in the department hosting their research consortium (though through a different funding scheme) to be scaled

up as an approach across the wider institution because they had witnessed this occurrence with other policies/ strategies that their projects had introduced in the past. Additionally, one of the research consortia noted that they had started to scale up the KT modules introduced in their consortium's PhD degree training programme at their partner academic and research institutions. However, as was noted earlier, the sustainability of such efforts is questionable if academic and research institutions hosting the research consortia insufficiently emphasise KT.

Moderate/ potentially strong bi-directional influence between research/ KT/ professional networks and institutions on research consortia

There was some evidence suggesting that research consortia sought support from or collaborated with research/KT/professional networks and institutions they are affiliated to strengthen KT capacity and practice or maximise the impact of their KT activities. One consortium (the one with greater media and advocacy capacity and experience) offered explicit examples on their collaboration with at least two professional networks to implement their KT activities. This pattern may reflect preference of this approach in advocacy efforts i.e., use of advocacy networks for policy influence (224). It is possible that this was happening in the other two cases given that forging partnerships with other programmes/ initiatives to meet mutual KT goals was also reported by them but may not have come out explicitly as it was not explicitly probed. Two research consortia also illustrated how they drew support for their capacity building of their PhD and post-doctoral fellows from professionals/ institutions they work with on other KT initiatives or engaged as consultants to leverage their expertise.

Other studies in LMIC and HIC settings have also found that it is uncommon for academic and research institutions to have a KT policy or guidelines (68, 99, 101, 108-110, 114), have sufficient KT staff support (66, 101, 108-110, 114, 115, 225), assess KT in tenure and promotion processes (1, 18, 56, 68, 108-110, 114, 180, 226, 227), cover KT in their research degree programmes (102, 108-110, 114), and that KT efforts at research institutions are often donor driven (100). However, the influence of support for KT in research and academic institutions on research consortia implementing projects emphasising KT and their researchers' KT capacity and practice and vice versa has not been explored. Other studies in both LMIC and HIC contexts have also recommended strengthening support for KT in tenure and promotion processes, resources (including staff and infrastructure), and research degree programmes at academic and research institutions (128, 227, 228). The need for institutions to tailor their KT assessment criteria in research institutions' tenure and

promotion processes by disciplinary alignment has similarly been recommended in HIC based studies (68, 227).

These findings highlight the potential for these challenges to reverse the gains in strengthened KT capacity and practice of donor funded research capacity strengthening programmes emphasising KT such as DELTAS after the programme life. These findings also reinforce the potential for research consortia to be used as one approach for strengthening support for KT at academic and research institutions, but this would require long-term investments beyond the typical 5-year period of such programmes. Lavis et al. (69) theorised that funders requiring researchers to integrate KT in their research could result in institutional tenure and promotion processes adopting the practice to align to that of the funder. Long-term investments would help assess the extent that such a change could be achieved including through using the research consortium approach.

Macro-Meso-Micro level factors

At the macro level, three influences were identified: a bidirectional influence between funders and research consortia on KT priorities, plans and budgets but the funders' influence on research consortia was strong and that of the research consortia on the funder was moderate and potentially strong; strong unidirectional influence of research consortia funders on researchers' KT capacity and practice; and a bidirectional influence between national KT laws and mechanisms including for research and development (R&D) and research consortia and their researchers but the influence of the national KT laws and mechanisms on research consortia and their researchers was strong and that of the research consortia and researchers on the national KT laws and mechanisms was moderate/ potentially strong.

Bidirectional influence between funders and research consortia

Strong influence of funders on research consortia KT priorities, plans, budgets, and capacity strengthening

The three cases in this study illustrated that funders can exert a disproportionately large influence on research consortia KT priorities, plans, budgets and capacity strengthening, irrespective of their KT capacity and experience through: requiring consortia to define KT plans, budgets for them and report on them; specifying the types of KT activities they are interested in; the extent they evaluate the KT components in grant applications; the guidance and technical support they provide at grant application and implementation

phases; the level of funding they provide; and extent of consideration of the relevant KT activities for grantees research disciplines.

The study showed that funders supporting projects emphasising KT can more effectively get this implemented if they require research consortia to report their KT plans, activities, and resources in their annual progress reports. In all three cases in this study more attention was placed on integrating community and public engagement plans and a budget and staff for them mid-way their programme implementation when the funders issued new annual progress reporting requirements capturing these aspects. As suggested earlier, research consortia could be encouraged to scale up KT capacity and practice at their research institutions and this could be done by including a section for capturing this in the annual reporting tool.

The study illustrated that the influence of funders on research consortia depends on the consortia KT capacity and experience but on some aspects this does not matter, such as the budget size. For example, the funders' influence on the KT plans defined by research consortia differed depending on their KT capacity and experience. Despite the DELTAS initial small allocation of 1-2% of the total grant for KT activities and leaving the interpretation of activities up to each research consortia, the research consortium with greater KT capacity and experience defined a KT plan that covered a wide range of activities with a budget and specialist staff for implementing them. In comparison, the research consortia with narrower KT interests, capacity and experience defined narrower KT plans and did not include KT staff in their proposals, and in one case, no budget as well.

However, the study findings demonstrated that funders' interests and budget constraints can greatly restrict the KT plans of research consortia, irrespective of KT capacity and experience. The DELTAS budget restrictions (1-2% of the total grant) and later the funders' emphasis on having budgets for community and public engagement limited the range or size of KT programmes of research consortia. For example, the consortium with greater KT capacity and practice was forced to drop some activities, which resulted in a smaller and lopsided KT plan favouring community and public engagement activities compared to their initial conceptualisation that reflected a more balanced range of activities. On the other hand, the funders' influence on the KT plans of the other two consortia with narrower KT interests, capacity and practice was more facilitative although still restrictive. The consortium involved in basic research initially defined industry engagement as their main KT activities before having to expand their activities later to include community and public engagement activities in line with additional guidance and support from the funder. However, lack of

support for product development emerged as a major bottleneck among researchers in the consortium involved in discovery research.

On the other hand, the consortium involved in applied research with narrower KT capacity and experience focusing on media and advocacy did not budget for the KT activities they defined in their initial proposal but later strengthened their KT plan in line with the funders' emphasis on budgeting for and reporting community and public engagement. The study identified a gap in the funders' grant review process that missed to pick up on lack of a budget for KT activities in the research consortium's initial grant proposal. This same gap in the funders' grant review process resulted in the KT budget for the research consortium with greater KT capacity and experience being reduced below the 1-2% allocation for KT activities.

The findings of this study suggest that research consortia funders of projects that emphasise KT may provide better support to research consortia if they support a wider range of activities that consider researchers' KT needs based on their research discipline. In addition, the findings demonstrate that funders with research grant schemes that emphasise KT should hire grants administration staff with KT expertise or train existing staff to better support research consortia during the grant proposal and implementation phases, which would address the challenges noted regarding the KT plans and budgets that were approved in relation to the budget provided (1-2% of the total grant).

Nevertheless, notwithstanding the funders' emphasis on community and public engagement, the grantees, particularly those with narrowest KT interests, capacity and experience, defined and implemented better plans after receiving more specific guidance and support from the funder. This demonstrates the great influence of funders in shaping the KT capacity and practice of research consortia and their researchers reinforcing the need for them to provide support (technical and financial) that considers research disciplinary KT needs and KT capacity and experience within research consortia.

Moderate/ potentially strong influence of research consortia on funders' KT priorities and capacity strengthening

The study also noted a reciprocal moderate influence of research consortia on funders' KT priorities and capacity strengthening. DELTAS funders' KT priorities and capacity strengthening were informed by the experiences of research consortia documented in their annual progress reports, which they assessed and noted a need to place more emphasis on

community and public engagement in their support. This suggests that funders' requiring grantees to report their KT activities and using the information to tailor their support is important.

In addition, to a small extent with potential for more leveraging, the study showed that research consortia funders can draw support from better capacitated grantees for their capacity strengthening activities. The DELTAS funders drew such support (though unstructured and ad hoc) from two research consortia in this study to sensitise researchers about the value of integrating KT activities in their research and encouraging other research consortia to strengthen their KT components including sourcing more funding. Better capacitated research consortia with notable KT champions and experts (as was the case in one of the research consortia in this study) could play a bigger role in supporting research funders to capacitate other grantees with no, lesser, or narrower KT capacity and experience and be compensated to do so e.g., defining within their proposals time and resources (staff and budget) for this.

Similarly, to a lesser extent with potent for more leveraging, the study illustrated that better capacitated research consortia can influence funders' capacity strengthening activities. The research consortium with greater KT capacity and experience maximised the guidance and support provided to them by inviting the DELTAS funders to their meetings and training workshops as co-facilitators to improve their understanding of the programme's KT component and what was expected of them rather than relying only on events and activities organised by the funder as done by the other two research consortia. Therefore, funders could, from the outset as part of their capacity strengthening approach, encourage research consortia to proactively seek guidance and support from their grants staff, which may translate into stronger KT capacity and practice.

Strong unidirectional influence of research consortia funders on researchers' KT capacity and practice

The study revealed the great influence funders have on individual researchers' KT capacity and practice in terms of preferred terms, concepts, and approaches. The DELTAS funders' capacity strengthening workshops had a great influence on how DELTAS PhD and postdoctoral fellows and support staff in the three consortia with little baseline understanding of KT conceptualised it, which was skewed towards community and public engagement activities. The DELTAS funders' interest in and provision of additional support for community and public engagement activities and reporting of such activities also greatly influenced the

kinds of KT activities researchers designed and implemented, irrespective of their initial KT knowledge.

The DELTAS programme funders are among research funders who are increasingly mandating researchers to integrate KT activities in their work and their great influence on researchers' KT capacity and practice has been acknowledged (59, 100, 207, 229-231). However, other studies in both LMIC and HIC settings have similarly reported that researchers' KT capacity and practice is limited by funders' small budget allocations for a narrow range of activities and the inadequate KT capacity of grants administration staff (1, 56, 59, 68, 102, 108-110, 114, 180, 207, 225, 230, 232, 233). Researchers can apply for additional funding from other sources to address gaps in their KT activities (as was also demonstrated in this study) but this puts undue pressure on researchers who already face considerable time constraints (59, 180). Consequently, only researchers with greater interest in KT (such as those identifying as KT practitioners) are likely to seek out funding for KT from multiple sources (59, 180). However, in this study, the funder was very influential in getting research consortia to write grant proposals for additional funding but only because the researchers sought to address gaps in their KT plans that they had to report on. However, this reinforces the great influence funders have on shaping researchers' KT capacity and practice, which could be better harnessed by increasing their financial and technical support to researchers.

Other scholars have also found that researchers' micro level KT capacity and experience shapes their KT proposals to funders reinforcing the importance of funders providing guidance and support to grantees for developing better and discipline relevant KT plans (68). Some funders have developed and tested models for supporting grant applicants including providing them with KT experts at the application stage and a planning framework among other supports, which was also a strategy used by the DELTAS funders (234). An audit framework for research teams and institutions to use to assess their grant applications to funders has been recommended as an additional approach (235). Research institutions and programmes could be encouraged by funders to adopt or adapt such a framework as part of their guidance and support to them.

This study illustrates that the influence between funders and research consortia as it relates to KT capacity and practice is bidirectional rather than unidirectional. As much as funders exert a strong influence on research consortia KT capacity and practice, research consortia can also influence funders' KT support if the funder uses progress reporting as a learning tool and consults with and leverages existing expertise from research consortia.

Bidirectional influence between national KT laws and mechanisms (including for R&D) and research consortia (meso level) and their researchers' (micro level)

Strong influence of national KT laws and mechanisms (including for R&D) on micro level and research consortia KT capacity and practice

Across the three cases, national research policy instruments (including national research agendas and laws promoting KT e.g., mandating industry to establish R&D departments) emerged as potentially beneficial in enhancing research consortia KT capacity and practice. However, the influence of national research policy instruments was diminished due to various factors. One factor was lack of formal national frameworks that facilitate interaction between researchers and policymakers, resulting in minimal involvement of researchers during formulation and enactment of the national research policy instruments and consequently minimal awareness of these among researchers. Two other interrelated factors that diminished the influence of national research policy instruments particularly where these existed were: lack of government funding to support their implementation or awareness of its existence; and reliance of researchers on donor funding to support their research, which meant that their research addressed donor interests that may or may not be aligned to national priorities.

Only one participant had experienced sourcing funding for research from their national research fund even though majority of the countries represented in this study had national research fund policies. The study findings suggest that governments may not be optimally publicising their national research fund schemes where these exist, which may be related to lack of national frameworks that link researchers to policymakers.

Similar challenges were cited by basic researchers involved in discovery research as it relates to research and development (R&D). Lack of local industry R&D capacity and consequently lack of interest in R&D partnerships with researchers was partly attributed to lack of government support such as provision of subsidies to reduce unsustainable manufacturing costs.

Moderate influence of micro level and minimal influence of research consortia on national KT laws and mechanisms (including R&D) with potential to be stronger

The study findings demonstrated an opportunity for funders of research consortia implementing projects emphasising KT to support researchers to work with governments to define national research agendas and align their funding priorities to them. The study offered some examples that showed that some researchers (across the three consortia) are involved in these processes, which are influenced by donor interests because of dependency on their funding. This study also showed that issues that are marginalised because of little or no focus on them among donors that fund African policy and programme initiatives could potentially become more visible in these processes if research consortia and researchers in general working on these issues are encouraged and supported by their funders to participate in national research agenda setting. The potential for donors to invest in R&D processes as one approach to alleviating the bottlenecks basic researchers involved discovery research face in translating their research findings was also demonstrated.

Governments having well-defined and -resourced national policy frameworks for facilitating interactions between researchers and policymakers and promoting KT has also been identified in the wider evidence base as important for researchers' KT capacity and practice but typically not well executed largely due to funding constraints (132, 145). This study found that governments should more proactively publicise their national research fund schemes, which could be one of the activities of their national policy frameworks for facilitating interactions between researchers and policymakers and promoting KT. Furthermore, it is well established in the wider evidence base that LMIC researchers are reliant on international donor funding for research, whose priorities may or may not align to those of their governments. The need for some research funders to be involved in processes that identify priority research and KT issues has been suggested as one way for addressing this bottleneck (66). However, this study emphasises the need for research consortia implementing projects emphasising KT to be supported by funders to be centrally involved in these processes particularly those working on marginalised issues.

Other studies in both LMIC and HIC contexts have similarly reported that basic researchers face difficulties getting into partnerships with industry including sourcing funding from for early phase clinical trials and patent issues (68, 236).Therefore, this is a global challenge shared by basic researchers in LMIC and HIC contexts. However, basic researchers in HIC contexts may be better able to overcome this bottleneck. For example, Deeming (68) reported that some Australian medical research institutes invested their internally generated funds to overcome this bottleneck. Given the resource constraints that African academic and

research institutions and governments face, this may not be an achievable strategy. Unfortunately, this means that African research teams would continue to be reliant on support from donors interested in product development. Nevertheless, there are international funders who support product development that interested researchers can explore including one identified in this study i.e., Grand Challenges Canada (237-239). However, there may be need for more funders to expand their grant schemes to include product development. In addition, other non-traditional funding sources such as local businesses in Africa could be encouraged to diversify their investments in product development, who tends to focus on Information Communication Technology (ICT) as far as product development is concerned (240, 241).

7.3. LIMITATIONS

The study has several limitations that should be considered when interpreting the study findings. Firstly, DELTAS is a health research capacity strengthening programme, and therefore, the research findings may not be applicable in non-health sectors, which may value and apply research differently. Secondly, the study findings may not be transferable across the whole DELTAS programme as they are drawn from a sub-set of beneficiaries. I tried to improve the transferability by using maximum variation sampling both when selecting consortia and the participants. Thirdly, the study findings may not fully represent the experience of researchers in typical academic/research institution settings who are not part of a research capacity strengthening programme with a KT objective, such as DELTAS. However, some of the findings such as the influence of research discipline factors and institutional KT support may be of wider relevance.

Despite efforts to ensure that a balance of perspectives was generated from across the sample in each consortium, this was not achievable for all consortia. For instance, I was unable to obtain interviews from any Co-PI from one consortium (Consortium C). Therefore, the findings on Consortium C's leadership for KT at partner institutions would require further exploration to strengthen them. Consortium A did not have representation of junior post doctorate researchers because this cadre had not yet been recruited at the time of the data collection. Therefore, this gap in perspective may affect the quality of the findings on the influence of individual level KT capacity on the implementation of the consortium's KT strategy.

The target population for this study were directors (PIs and Co-PIs), fellows (PhD and post docs) and staff responsible for communications and/or community and public engagement,

M&E, and programme administration of the three consortia. Other perspectives in the wider contexts (institutions and countries) of the consortia would have contributed to a more in-depth and holistic analysis, such as staff of KT/ technology transfer departments of research institutions, the academic/research institution's decisionmakers, national academies of sciences, KT practitioners/brokerage institutions, government agencies/ departments responsible for science, technology, and innovation, and funders. However, this study deliberately sought to focus on the researcher's perspective to fill the knowledge gap about the factors that shape Africa-led research consortia KT capacity and practice.

While I sought to maintain a neutral stance in the interviews to avoid imposing my understanding and influencing the participants' perspectives, this may not always have been achievable. Due to the conversational nature of the interviews, I sometimes engaged in a discussion that may have resulted in the co-construction of some of the insights. I consciously took steps to avoid this by looking for consistency in the participants' insights throughout the interviews, triangulating the interview data with documentary sources and using maximum variation sampling technique.

Finally, my systematised literature review and the multi-level conceptual framework used to analyse my primary data were based on English-language publications only and, therefore, I may have missed valuable information in non-English papers. In addition, a few of my interviews (four out of 26) were done using Skype, which in two cases were very unstable and reduced the opportunities for probing to clarify some issues. Therefore, the data from the two interviews were light on some issues. Furthermore, the topic addressed in this study was not familiar to many participants, which resulted in some being unable to respond in detail or getting 'off-topic.' However, when I noted that a participant was veering off-topic, I clarified the issue to have a shared understanding. For example, if the participant talked about knowledge translation from the perspective of teaching students, I probed them on interacting and communicating with people in non-academic settings such as the public, media, industry, and government.

7.4. RECOMMENDATIONS ON FUTURE RESEARCH

The study findings offer several implications for more research. One focus of additional research should be to explore whether the identified multilevel interactions (i.e., micro-meso, meso-meso and macro-meso-micro) hold true in another set of research consortia implementing a project emphasising KT such as the DELTAS programme. Such studies could include data sources that would strengthen the meso and macro level findings such as

decisionmakers and staff of departments at academic and research institutional responsible for championing, coordinating, and supporting KT, research consortia funders and government institutions responsible for regulating research institutions. The studies could also more explicitly probe the noted interactions (strong, moderate or minimal) within and across the levels.

There is need for research on how best to integrate KT training in research degree and leadership development programmes administered through research consortia as well as evaluate the effectiveness of the approaches. The research should address the time constraints noted as disincentive for integrating KT in research projects among PhD and postdoctoral fellows. The research should also further explore interest in KT training among larger samples of basic researchers involved in discovery research supported by research consortia and appropriate modules to integrate in their training. The extent to which promoting KT practice as an alternative career path for researchers during research degree training administered through research consortia results in research degree trained KT practitioners should also be investigated.

At the meso and macro levels, there is need to further explore the extent that research consortia can sustainably stimulate or strengthen institutionalisation of KT support at their host departments and wider research institution levels beyond the programme life. Furthermore, how best research consortia can strengthen leadership for KT among other leaders across the consortium partnership is another area needing further exploration.

7.5. RECOMMENDATIONS FOR PRACTICE

This section presents recommendations derived from the study findings, which addresses the fourth research objective, i.e., ‘4. Identify lessons and strategies for strengthening the KT capacity and practice of researchers and support staff in Africa-led research consortia’.

The recommendations are most relevant for Africa-led research consortia given the focus of the study. One major assumption for the recommendations is that all universities and research institutions want to provide the best KT support to research consortia and researchers in general including those implementing programmes emphasising KT such as DELTAS.

The study recommendations address the three systems perspective levels i.e., micro, meso and macro levels. Given the close interrelationship between micro and meso level factors, I

group the recommendations tackling them together. The macro level recommendations are presented separately.

Micro and meso level recommendations

Drawing from the study findings, I suggest the following recommendations for strengthening micro and meso level KT capacity and practice of African-led research consortia:

1. **Ensure KT courses that are integrated in PhD degree programmes offered through research consortia are tailored by researchers' discipline and interest in KT practice and consider the wider PhD programme requirements**. Explore how best to integrate KT training in PhD degree programmes offered through research consortia to ensure PhD students are not overburdened. Draw lessons from other research consortia (e.g., the cases in this study) and universities that have integrated KT training in their PhD degree programmes. Based on this study, experiential training and one-on-one mentorship worked well and could be tested in other research consortia settings and by other practitioners and scholars. Research consortia should map the KT capacity and practice of their researchers (capacity assessment) to identify researchers among them that could serve as trainers and/or mentors.
2. **Develop and/or adapt existing KT topics that are relevant to integrate into research degree programmes by discipline and researchers' interest in KT.** This study found differences in preferred KT knowledge and approaches between researchers involved in applied research and basic researchers involved in discovery research. Applied researchers (including basic researchers involved in applied research e.g., surveillance) were more interested in topics focusing on: packaging and communicating research evidence in formats that are understandable and accessible to various non-academic audiences; and how to navigate policymaking processes and the media. On the other hand, some basic researchers (those involved in discovery research) were more interested in topics that would help them interact and forge partnerships with industry e.g., entrepreneurship and how to apply for patents.
3. **Promote KT practice as an alternative career pathway for researchers.** This study showed that some researchers can naturally transition into KT experts when serendipitously exposed to KT concepts and approaches. The study also found a strong interest in such a cadre among basic researchers. Integrating KT training into research degree programmes and promoting KT practice as an alternative career

path for researchers could accelerate the emergence of more researchers with an interest in KT practice and some among them that pursue KT practice as a career path.

4. **Introduce Masters and PhD degree programmes focusing on KT theory and practice and Science Communications if not yet in place.** Existing communications degree programmes were noted as not adequately preparing communications specialists to support researchers' KT capacity development and practice. Communications staff at universities were described as typically strong in public relations and corporate communication but KT concepts and approaches. Future research capacity strengthening programmes such as DELTAS could develop and introduce Masters and PhD degree programmes focusing on KT theory and practice and Science Communications as part of their training. Lessons can be drawn from universities that have developed Masters and PhD degree programmes focusing on KT theory and practice and Science Communications. Such specialised programmes would require the existence of academic staff with expertise in KT and/or science communications or strategic partnerships with academics/ academic institutions that have the expertise and should be tailored to align to research discipline KT needs.
5. **Integrate KT modules/sessions in research leaders' training and development.** The findings revealed that research consortia leaders with a good understanding of KT and interest in it can stimulate policy and practice changes at their institutions in their departments and at the wider research institution level i.e., improved attention and resource allocation for KT. The study showed that academic supervisors had a great influence on PhD student's interest in and KT practice. Therefore, in addition to integrating KT modules in PhD degree programmes as a long-term strategy, research leaders (or those on track to be research leaders) can be exposed to KT principles and approaches in leadership development programmes. Research consortia can adapt existing research leadership programmes and integrate relevant KT content that is missing that address varying research discipline KT needs.
6. **Proactively seek collaboration with staff of KT departments at home universities and research institutions.** This would help address the challenge of lack of coordination between research consortia and their home institutions and increase opportunities for them to mutually benefit from each other's KT capacity and practice.

Macro level recommendations

I suggest the following recommendations for strengthening the support of funders of African-led research consortia:

1. **Fund a wider range of KT activities that consider research discipline KT needs**. The study demonstrated how DETLAS funders' emphasis on a narrow range of activities restricted the KT efforts of the research consortia. The study revealed that basic researchers interested in KT practice were least supported to achieve this goal because of lack of funding for product development. Some funders support product development but these are few and far between and often not the traditional sources of funding used by researchers. More funders should consider expanding their KT support to cover product development when basic researchers make promising discoveries.
2. **Increase the proportion of research grant funding allocated to KT activities**. This study demonstrated how insufficient funding for KT activities (1-2% of the total grant) limited the KT plans and outcomes of research consortia, particularly the one with greater KT capacity and experience.
3. **Require research consortia to report their KT plans including efforts to strengthen support for KT at their institutions**. This study demonstrated that having this requirement resulted in DELTAS research consortia that had initially overlooked the KT component placing more focus on it including raising additional funding and allocating specialist staff for it as advised by the funders.
4. **Use progress reports as a learning tool to adapt the programme's support but consult research consortia to validate the support**. This study demonstrated that the DELTAS funders used the data from progress reports to identify gaps in implementation of the KT component and tailor their support to address the gaps. However, the study also revealed that while the funders decided to concentrate their support on community and public engagement, research consortia in this study expressed additional support for policy and industry engagement. The funders' refined support may have been better informed if they had consulted the research consortia to validate it.
5. **Strengthen the KT capacity of grants staff to provide ongoing support to grantees**. This study's findings suggests that the funder missed an opportunity to support research consortia to develop better DELTAS programme KT plans during the grant application review process, which may have been partly due to insufficient KT capacity and experience among them. The importance of having staff with KT expertise was demonstrated mid-way the implementation of the programme when

someone was hired to support the research consortia to redesign and implement better KT plans albeit emphasising community and public engagement. Therefore, research consortia funders supporting programmes with a KT focus should hire staff knowledgeable in KT principles and approaches or train their staff to have this capacity so that they can better support research consortia to develop and implement KT plans. Research consortia funders should also encourage grantees to proactively seek their technical guidance and support.

6. **Contribute to strengthening national policy instruments that promote researchers' KT practice.** Support researchers to work with governments in national research priority setting processes and fund research that aligns to identified national research priorities. This study revealed that such support could facilitate the inclusion of research on marginalised issues that are often left out of research agendas, which are typically supported and funded by development partners with interests in specific global health priorities that may not be representative of the range of national priorities.

7.6. CONCLUSION

Research consortia are widely used to support sustainable health research capacity strengthening in LMICs. This includes strengthening researchers' KT capacity and practice in response to international policy and research attention on how to reduce the research to policy and practice gap (or 'Know-do' gap). While research consortia have been found to result in improvement in individual and institutional research capacity, their minimal focus on KT has been noted as a weakness and an area needing strengthening (181, 188-190). Using the systems perspective, this study generated evidence that Africa-led consortia focusing on health research, and potentially other research fields, can draw on to strengthen their KT capacity and practice including that of their researchers. The study findings are also relevant for funders and partner institutions of Africa-led research consortia to inform how they could better support research consortia KT capacity and practice towards more sustainable gains. To my knowledge, this study is the first of its kind to explore how to strengthen research consortia KT capacity and practice and using the systems perspective to do so.

I found that multiple interactions of factors at the micro, meso (research consortia, institutions and networks) and macro levels shape the KT capacity and practice of research consortia. The study findings suggest that research discipline, KT capacity and experience

of consortia leaders and specialist support staff and the KT support funders provide have the greatest influence on research consortia KT capacity and practice and the extent to which they can stimulate institutionalisation of KT capacity and practice in partner institutions, at least among the cases explored in this study. Therefore, improving research consortia KT capacity and practice requires multiple points of intervention.

A key lesson from this study is that research consortia expected to integrate KT in their research programmes do so by developing KT plans that address their research discipline KT interests and that are informed by their KT capacity and experience. Research consortia focusing on applied research such as implementation science and those focusing on discovery research generate different kinds of evidence and, thus, different activities for promoting uptake of their research findings would be relevant to each. For example, knowing what to do when basic researchers make a discovery worth pursuing further is important for research consortia focusing on discovery research. On the other hand, knowing how best to design, plan and conduct implementation research and tailor, package and communicate the findings is important for research consortia focusing on implementation science. More likely than not, research consortia will have a mix of disciplines and therefore mapping this and developing KT plans that meet the range of KT needs is necessary.

Therefore, research consortia funders have an important role to play in providing early and ongoing technical support to research consortia in the development and implementation of their KT plans. This support is especially critical for research consortia that have insufficient or narrow KT capacity and experience among its leaders and specialist staff. To provide such support, research consortia funders should have grants staff with KT capacity and experience that would enable them to support basic and applied research. However, I found that research consortia funders can also potentially harness support from research consortia with greater KT capacity and experience for peer-to-peer learning. In addition, funders can better support research consortia by not restricting their support (financial and technical) to certain activities but rather covering a wide range of activities to accommodate different research disciplines including R&D and national research policy processes. This means that the budget envelope of research consortia funders needs to be more flexible; certainly, larger than the 1-2% of the total grant that DELTAS was offering, which proved to be critically insufficient. However, there is no clear international consensus or standard yet on how much funding donors might allocate for KT (230).

Importantly, I found that research consortia can stimulate institutionalisation of KT capacity and practice at partner institutions but long-term investments by funders would be critical for

influence that research consortia have at this level to take hold. Notably, in the short-term, to combat the inadequate resources often allocated to KT practice, researchers can draw support from other departments they work with and networks they are part of to implement KT activities that are mutually beneficial as was demonstrated in this study, albeit to a small extent. Other scholars have suggested pooling of funding to support KT activities among groups of researchers working on the same issues and doing the same kind of research to benefit from the economies of scale (69). Funders also ought to undertake robust evaluations of research consortia KT capacity strengthening and practice outcomes to inform their future investments as has been recommended by other scholars (230).

Beyond informing research consortia practice and that of their funders, this study offers insights relevant for the KT field more generally. First the study illustrates research consortia as a promising model for strengthening KT capacity and practice and how best to do so by highlighting enablers and barriers. Second, the study findings suggest that there is need for KT curricula and capacity development in general to be tailored by research discipline. The KT field has been noted to be more advanced in offering guidance and direction for applied research than basic research (1, 58, 63, 68). This study suggests some basic researchers involved in discovery may be interested in going beyond publishing their research findings in scientific journals and developing them further in the R&D process. However, their involvement in R&D is partly hampered by their lack of knowledge and skills for engaging with industry because of limited training and mentorship that focuses on this. KT practitioners can draw from the insights in this study and develop and test modules that would be relevant for basic researchers involved in discovery research who are interested in interacting and working with actors in the R&D space. Research consortia and others implementing research programmes emphasising KT could then draw on these to inform their efforts.

The study also contributes to the wider knowledge base on capacity strengthening in which simultaneously targeting the individual or group (micro level), organisational (meso level) and system-wide (macro level) capacity and practice is emphasised for sustainable change because of the interdependence between the levels (242-244).

The study findings may not be widely generalisable because they are based on three out of 11 DELTAS research consortia and did not obtain insights from wider stakeholders who are not direct beneficiary of the DELTAS grant e.g., staff from KT departments of university where these exist to triangulate what emerged about these and government representatives from country ministries in charge of regulating and funding research institutions and

research in general. However, the study findings offer some valuable insights for informing research consortia KT capacity and practice and their funders' support and identifies areas for further research to strengthen the evidence base. Future research could further explore the multilevel interactions of factors that influence research consortia KT capacity and practice identified in this study in other settings in Africa and beyond and research fields, which would be beneficial in strengthening the knowledge base on this topic.

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APPENDICES

Appendix 1: List of included primary studies

List of included primary research studies in the review of published evidence on knowledge translation capacity, practice and support among researchers and research institutions in low- and middle- income countries

#	Author, year, study focus	Study design and methods	Study population (Participants, sample size, country, region)
1	El-Jardali et al., 2018 Explore KT activities with emphasis on institutional planning for research, national planning of health research and knowledge management, translation and dissemination	Study design: - Cross-sectional survey Sampling - Purposive Items/issues explored or measured - Four items scored using a five-point scale (1=low, 5=high): institutional characteristics; institutional planning for research; national planning of health research; and knowledge management, translation and dissemination Data analysis - Descriptive analysis by country income level, facility type and sector using SPSS - Thematic analysis of data from open-ended questions - Disaggregated findings presented only where differences in trends observed Study period: - August 2015 to July 2016	- 223 health research institutions - 22 Eastern Mediterranean Region Member States (5 high-income, 12 middle-income and 5 low-income countries) - 38.8% response rate
2	Sriram et al., 2018 Explore the policy-making process for establishing a health sector knowledge platform in India	Intervention: - Health sector knowledge platform Study design: - Qualitative case study - In-depth interviews and document review Sampling - Purposive Items/issues explored or measured - enabling contextual factors, the interests and actions of stakeholders, and the varying	- 11 researchers (6 involved in the process & 5 researchers with no prior or current involvement) - 5 policymakers - 42 Meeting minutes, communications & published material on the internet - India

#	Author, year, study focus	Study design and methods	Study population (Participants, sample size, country, region)
		institutional arrangements explored in the development of the NKP Data analysis - Thematic Analysis Study period: - October 2015 to January 2016	
3	Young et al., 2018 Evaluate intervention for building relationships between researchers and policymakers	Study design: - External mixed methods evaluation - document review, structured reflections, in-depth, semi-structured interviews & focus group discussion Sampling - Purposive Items/issues explored or measured - Implementation process, barriers & successes; strategies used and the short-term impact Data analysis - Framework thematic analysis Study period: - Implemented in 2014 for 6 months	- 5 Researchers & 7 Policymakers - Policy documents - Cape Town, South Africa
4	Conalogue et al., 2017 Identify future global health research priorities	Study design: - Cross-sectional survey - Health research expert panel - Internal DFID health adviser consultation, and - Delphi study with expert informants Sampling - Purposive/Convenient Items/issues explored or measured - Views on (1) the long-term future global health research priorities; (2) areas likely to be less important over time; (3) how to improve research uptake in low-income countries; and (4) how to build research capacity in low-income countries Data analysis - Thematic analysis Study period: - May to June 2015	- 421 researchers from academia (43%), non-governmental organisations (23%), international organisations (13%), national government (9%) and industry (3%), high-income countries (60%) & low- or middle-income countries (40%)

#	Author, year, study focus	Study design and methods	Study population (Participants, sample size, country, region)
5	Lashari et al., 2017 Assessment of KT practices of PhD faculty members of universities offering degrees in field of Environment in Sindh Pakistan	Study design: - Cross-sectional survey - 96% response rate Sampling - Purposive Items/issues explored or measured - 7 clusters of KT activities including publications, networking, mobility of researchers, joint research, intellectual property and co-operations including spinoff companies and sharing of equipment & 28 sub-factors Data analysis - Descriptive analysis using SPSS Study period: - July 2015 to December 2015	- 8 universities offering degrees in field of environment including environmental sciences (3) & environmental engineering (5). - 23 PhD faculty members (12 working in the universities offering degrees in environmental engineering and 12 in environmental sciences) - Sindh, Pakistan
6	Mijumbi-Deve and Sewankambo, 2017 Explore the contextual factors associated with the how and why a Rapid Response Service may be taken up by users in Uganda	Intervention: - RRS at the College of Health Sciences in Makerere University established in March 2010 Study design: - Case study employing process evaluation methods - in-depth interviews Sampling - Purposive Items/issues explored or measured - Views on the components that make up the RRS and contribute to the completion of its process including structures and activities Data analysis - Thematic analysis Study period: - March 2010 to May 2014	- 11 Researchers (7 affiliated with university) and KT specialists & 10 policymakers (6 based at the ministry of health) involved and/or conversant with programme operations - Uganda
7	Shroff et al., 2017 Analyse institutional capacity for the generation of health policy and systems research (HPSR) and the use of evidence (including HPSR) more broadly in LMICs	Study design: - Literature review - Two survey instruments Sampling - Purposive Items/issues explored or measured	- 101 institutions engaged in HPSR within the Alliance & represented at the Second Global Symposium on Health Systems Research

#	Author, year, study focus	Study design and methods	Study population (Participants, sample size, country, region)
		- Two thematic areas: 1) capacity of research institutions to generate HPSR; & 2) incorporation of research evidence into decision-making for health, including the capacity of decisionmakers to use research evidence Data analysis - Descriptive analysis Study period: - July to December 2014	- Based in 56 countries (25% represented sub-Saharan Africa & 63% low- & middle-income countries)
8	McSween-Cadieux et al., 2017 Evaluate the implementation of the dissemination workshop, the effects observed following it and the processes that facilitated, or did not facilitate, the use of the research results	Intervention: - 2-day dissemination workshop in November 2013 organised by researchers - Attended by 31 people Study design: - Mixed convergent qualitative–quantitative design - Survey & semi-structured interviews - Group discussions of 5 of 10 Policy Briefs (50%) several days after training - 81% response rate Sampling - Survey: Census - Interviews: Purposive, contrasted sampling technique Items/issues explored or measured - Survey o Four components: 1) participants' expectations; 2) their assessment of the workshop's objectives, content and organisation; 3) their opinions regarding the utility of the knowledge acquired and their intention to use it to improve their practices; and 4) their suggestions for improving future workshops o Statements scored on a 7-point Likert scale from 1 (strongly disagree) to 7 (strongly agree).	- Survey: 25 workshop participants - Interviews: 7 participants (involved in decision-making and public administration (n = 2), programme management (n = 1), NGOs (n = 2), health professions (n = 1), CSO (n = 1) - Groups discussion: 40 advisers and programme heads in several ministries, physicians and researchers - Burkina Faso

#	Author, year, study focus	Study design and methods	Study population (Participants, sample size, country, region)
		- semi-structured interviews, contrasted sampling technique o activity and the PBs, the knowledge they had acquired, their intention to use that knowledge and how the workshop might be improved Data analysis - Descriptive analysis of data from the questionnaires - Thematic analysis of data from interviews and group discussions Study period: - November 2013	
9	Kok et al., 2016 assess how 30 research projects evolved and the results were translated into action	Study design: - Contribution Mapping - Interviews and document review Sampling - purposive Items/issues explored or measured - Three phases examined: 1) formulation phase; 2) knowledge production phase; and 3) the knowledge. dissemination and utilisation. For each phase, the main actors, activities and interactions were mapped. Data analysis - Framework thematic analysis, within-case & cross-case analysis Study period: - March 2005 to 2008	- 113 Researchers (n=54) and potential key users from Ministry of Health, the Ghana Health Service or other health-related organisations (n=59) associated with 30 research projects that are part of Ghanaian Dutch Health Research for Development Programme funded between 2002 and 2004 - Ghana
10	Tesfazghi et al., 2016 To identify potential challenges and opportunities for accelerating access to new vector control tools in Burkina Faso	Study design: - Desk review to identify key actors (institutions and individuals) involved in national vector control for interview, to refine the research question and semi-structured interview guide, and to supplement findings from these - Semi-structured interviews - Informal discussion with representative of private sector Sampling - Purposive	- 13 people representing 13 institutions including 2 researchers, 4 staff of the MoH, 3 NGOs, 2UN technical agencies, 2 donors & 1 private sector - Ouagadougou, Burkina Faso

#	Author, year, study focus	Study design and methods	Study population (Participants, sample size, country, region)
		Items/issues explored or measured - Seven themes: actors, power, context, content and process, availability & affordability Data analysis - Framework thematic analysis Study period: - April 2014	
11	Valinejadi et al., 2016 Assess the status of diabetes KT in Iranian diabetes research centres to find out the strengths and weaknesses of principal institutes undertake producing and disseminating diabetes knowledge in Iran as a developing country	Study design: - Concurrent mixed methods approach - The self-assessment tool for research institutes (SATORI) - 24 Focus group discussions (FGDs) Sampling - Census - 75% response rate Items/issues explored or measured - 50 items in four KT domains scored using five-point Likert scale (1=low, 5=high): “The question of research” (12 items), “knowledge production” (9 items), “knowledge transfer” (25 items), and “promoting the use of evidence” (4 items). Every item of this tool evaluated at least one of the aspects affecting KT Data analysis - Descriptive analysis of data from survey using Excel software - Thematic analysis based on SATORI-extracted seven themes Study period: - 2015	- 65 diabetes researchers from 14 diabetes research centres in Iran
12	Nabyonga-Orem and Mijumbi, 2015 Explored policymakers’ attitudes of what evidence is and which types are important for decision-making and in which hierarchy, if any, in Uganda	Study design: - Exploratory qualitative method - In-depth interviews Sampling - Purposive - stakeholders in health policy development and KT in Uganda at national and sub-national (district) levels Items/issues explored or measured	- 51 people including 4 researchers (2 from public & 2 from private institutions), 18 MoH, 8 Service providers (4 from public & 4 from private sectors), 1 MoF, 1 journalist, 1 parliamentarian, 6 CSOs & 8 donors.

#	Author, year, study focus	Study design and methods	Study population (Participants, sample size, country, region)
		- Views regarding suitable evidence to guide policy development Data analysis - Content analysis Study period: - June 2012 to August, 2013	
14	Walugembe et al., 2015 Explore activities implemented by researchers to promote research utilisation in reproductive health policy-making processes in Bangladesh	Study design: - Exploratory case study design - Three case studies - Key informant interviews, focus group discussions & database and document reviews Sampling - Purposive Items/issues explored or measured - Used the World Health Organization/Turning Research into Practice (WHO/TRIP) framework to examine: the research process, stakeholder engagement, communication and dissemination, as well as macro contextual factors Data analysis - Thematic framework Study period: - September and December 2011	- 21 key informants, including 13 researchers, two policymakers, and six programme implementers involved with 19 reproductive health studies conducted and completed by International Centre for Diarrhoeal Disease Research Bangladesh researchers between 2001 and 2011.
15	Ayah et al., 2014 Analysing existing capacities for Health Systems Research (HSR); building consensus around HSR capacity development strategies for each SPH; and making an initial and rapid assessment of HSR priorities in the different countries involved in the HEALTH Alliance	Study design: - Context-adapted and modified self-assessment tool & document review - dissemination workshops to discuss and validate the results of their capacity assessments Sample - Purposive - Response rate varied from 9% in Jimma University College of Public Health and Medical Science, Ethiopia to 92% in Kinshasa School of Public Health, DRC Items/issues explored or measured - Indicators scored using a 5-point Likert scale (1 = strongly disagree, 5 = strongly agree):	- 123 respondents from all seven member institutions of the HEALTH Alliance Africa Hub, a consortium of seven schools of public health in East and Central Africa including Makerere School of Public Health, Uganda, Kinshasa School of Public Health, DRC, Muhimbili School of Public Health, Tanzania, Moi University School of Public Health, Kenya, National University of Rwanda School of Public Health, Rwanda, Jimma University College of Public Health and Medical Science, Ethiopia, University of Nairobi School of Public Health, Kenya.

#	Author, year, study focus	Study design and methods	Study population (Participants, sample size, country, region)
		the presence of a KT strategy, an organisational structure to support KT activities, KT skills, and institutional links with stakeholders and media Data analysis - Descriptive analysis using excel Study period: - 2011	
16	Corluka et al., 2014 Explores researchers' roles in evidence-informed decision-making and proposes a new framework for thinking about how researchers interact with (and can influence) their working environment	Study design - Qualitative, constructivist epistemological approach - Semi-structured, in-depth interviews Sampling - Purposive and snowball sampling Items/issues explored or measured - experiences in informing health policies or programmes with their research, working with policymakers in the Argentine public health sector, perceptions of policymakers and the policy-making process in Argentina & facilitators of or barriers to research use in policy-making Data analysis - Thematic analysis, grounded theory Study period: - May and August 2008	- 20 health research (biological and social science) in the Federal City of Buenos Aires and the provinces of Salta, Jujuy, Tucuman, Santiago del Estero and Catamarca. - University-based, in a combined research and decision-making capacity for provincial Ministries of Health, or within non-governmental organisations (NGOs), such as think tanks.
17	Goyet et al., 2014 Evaluation of a 'knowledge translation' (KT) intervention to identify the barriers to KT encountered in this LIC setting, and to suggest strategies to facilitate KT in similar settings	Intervention: - A multidisciplinary working group of national and international clinicians, biologists, health programme managers and epidemiologists involved in pneumonia management in Cambodia, dubbed the CALIBAN network formed to provide the MoH with locally relevant and evidence-based knowledge on pneumonia to inform the revision of the pneumonia national guidelines Study design - Retrospective evaluation - Review of document review, email correspondence & 1 key informant interview	- Project protocols, reports, published literature, and meeting minutes from CALIBAN, successive drafts of guidelines. - Researchers, the CALIBAN network and the Task force. - Representative of NGO who assisted the guidelines update.

#	Author, year, study focus	Study design and methods	Study population (Participants, sample size, country, region)
		Sampling - Purposive Items/issues explored or measured - Policy content analysis against CALIBAN key messages - AGREE-II online tool: three appraisers independently score six domains, i.e., scope and purpose, stakeholder involvement, rigour of development, clarity of presentation, applicability, and editorial independence. Scores of appraisers are then summed up and standardised domain scores computed (expressed on a scale of 0–100). - Unified Modeling Language graphical tools used to frame and analyse the dynamics of activities, the interactions between actors and the documents' exchanges during the adult guideline updating Data analysis - List & group barriers and facilitators to KT Study period: - 2013	
18	Maleki et al., 2014 Assess and compare the KT status of selected health research institutes in the Eastern Mediterranean Regions (EMR) countries, and to identify their strengths and weaknesses in the field	Study design - The 'Self-Assessment Tool for Research Institutes' (SATORI) tool - 15 FGD (A minimum of 6 and a maximum of 8 participants (mean number of participants = 7) - 40% response rate Sampling - Purposive Items/issues explored or measured - 50 items classified into 7 main domains scored using a five-point Likert scale (1=high, 5=high): 'priority setting', 'research quality and timeliness', 'researchers' KT capacities', 'facilities and prerequisites of KT', 'processes and regulations supporting KT', 'interaction with research users', and 'promoting and evaluating the use of knowledge'	- 8 medical universities & health research institutes in 8 EMR countries (high-income, low-income & middle-income countries). - 90-120 participants including Deputy and/or director of research affairs, two researchers (at least one professor, one associate professor, one of whom was a lady) and stakeholders from research utilising organisations, especially the Ministry of Health (MoH).

#	Author, year, study focus	Study design and methods	Study population (Participants, sample size, country, region)
		Data analysis - Descriptive analysis of quantitative data - Thematic analysis of qualitative data - Data dissagregated by income status (but not all reported) Study period: - 2011	
19	Mijumbi et al., 2014 The feasibility of a Rapid Response Service (RRS) to meet the urgent needs of policymakers for evidence about health systems	Intervention: - RRS at the College of Health Sciences in Makerere University established in March 2010 Study design - Case study - Document review - Key informant interviews Sample - Purposive Items/issues explored or measured - How service was used, immediate and delayed (after one month) & experiences of the users following receipt of the rapid response evidence briefs Data analysis - Descriptive analysis of quantitative data - Thematic analysis of qualitative data Study period: - March 2010 to July 2012	- Questionnaires & other resources used on the service and for the study - Policymakers
20	Orem et al., 2014 Examine the uptake of evidence in public health policy making in Uganda	Study design - cross-sectional qualitative study - In-depth interviews Sample - Purposive Items/issues explored or measured - Perceptions of the role of evidence in public health policy development, their understanding of KT and their views on the appropriateness of different KT activities that are currently implemented in Uganda Data analysis - - content analysis	- 17 participants including 5 from MoH, 4 CSOs, 1 private for-profit & 5 donors and 2 researchers - Members of the Health Policy Advisory Committee (HPAC), the policy advisory body for the health sector

#	Author, year, study focus	Study design and methods	Study population (Participants, sample size, country, region)
		Study period: - Not indicated	
21	Simba et al., 2014	Study design - Self-assessments, key informant interviews of internal & external stakeholders, and a review of documents - Plenary meeting to validate the findings Sample - Purposive - Response rate varied from 9% in Jimma University College of Public Health and Medical Science, Ethiopia to 92% in Kinshasa School of Public Health, DRC Items/issues explored or measured - Self-assessment tool: adequacy of academic members of the SPH to engage in HSR; availability and access to research funding for HSR; the external and internal organisational environment under which research is conducted & individual researchers' motivation to conduct research - Interviews: Contextual factors influencing the conduct of HSR within the country including, existing policies, available human and financial resources, and staff motivation for HSR Data analysis - Descriptive analysis of quantitative data - Thematic analysis of qualitative data Study period: - 2011	- 123 researchers from seven member institutions of the HEALTH Alliance Africa Hub (See Ayah 2014) - 73 Deans of the schools of public health, MoH, donors and non-governmental officials
22	Gholami et al., 2013 Assess the status of KT in Iranian medical science universities in order to assess the strengths and weaknesses	Study design - Cross-sectional study - The Self-Assessment Tool for Research Institutes (SATORI) - 16 FGDs Sampling - Stratified random sampling to select institutions - Purposive, maximum variance	- 9 Iranian medical universities, affiliated to the MoHME - University's vice chancellor or the director of research, the members of the research committee, and researchers (at least two faculty members who had published at least three articles relating to applied research) - Other stakeholders (one from the healthcare system and one from other

#	Author, year, study focus	Study design and methods	Study population (Participants, sample size, country, region)
		Items/issues explored or measured - 50 items categorised into 7 themes scored using a five-point Likert scale: "priority setting, researchers KT capacities, interaction with research users, the facilities and prerequisites of KT, processes and regulations supporting KT, and promoting and evaluating the use of evidence" Data analysis - Descriptive analysis of quantitative data - Thematic analysis of qualitative data Study period: - Not indicated	organisations such as pharmaceutical companies, the medical equipment industry and/or a public sector domain other than health)
23	Nabyonga-Orem et al., 2013 Examine the roles and links among various stakeholders in KT as related to public health policy	Study design - Qualitative study - document review & in-depth interviews Sampling - Purposive Items/issues explored or measured - Perceptions about the roles of various stakeholders in KT, the challenges faced by these stakeholders, and the availability of platforms for stakeholder engagement Data analysis - Deductive content analysis Study period: - November 2010 to January 2011	- 15 members of the Health Policy Advisory Committee (HPAC) including government officials at the central level (n = 4), service providers at the district level (n = 1), and representatives of CSOs including coordinators (n = 2) and service providers (n = 2) - Representatives from private for-profit (n = 1) organisations, multilateral donors (n = 3), bilateral donors (n = 2), researchers (n = 2), journalists/media (n = 2), and parliamentarians (n = 2) were interviewed.
24	Campbell et al., 2012 Case study of a "dissemination as intervention" methodology to report back research findings to study communities in ways that seek to facilitate community responses to pressing social problems	Study design - Case study - Structure discussions - Post-workshop evaluation reflections Sampling - Purposive Items/issues explored or measured - Effect of intervention on awareness of AIDS, critical understandings of the community's lacklustre response, ownership of the problem, a recognition of local resources for responding more effectively & awareness of	- Intervention targeted to 9 local groups involving 121 participants (78 women and 43 men).

#	Author, year, study focus	Study design and methods	Study population (Participants, sample size, country, region)
		potential support partners outside of the community Data analysis - Thematic content analysis Study period: - Not indicated	
25	El-Jardali et al., 2012 Explore how researchers view and experience the role of health systems research in health policy-making in the EMR, including the factors that influence health policy-making and the factors that increase researchers' engagement in KTE activities	Study design - Cross-sectional survey Sampling - Purposive – Corresponding authors who had published relevant articles between the years 2000 and 2008 in local or international journals indexed on Medline or EMBASE - 56% response rate Items/issues explored or measured - Four main quantitative scales, and seven open-ended questions scored using a five-point scale (1=high, 5=high) assessing: researchers' KT activities, skills and necessary KTE training and have undertaken KTE activities, investments/ resources available to researchers to support their KTE activities, policymakers' usage of evidence in addition to the factors the influence the use of evidence in policy-making, health policy-making context in the region, needs to ensure that research is transferred to health policymakers and stakeholders Data analysis - Descriptive analysis of quantitative data & Linear Regression Models - Thematic analysis of qualitative data Study period: - Not indicated	- 133 health systems and policy researchers
26	El-Jardali et al., 2012_2 Assess the climate for the use of evidence in policy & explore views and practices on the current processes and weaknesses of health policy-making	Study design - Multi-staged study - Questionnaires - Discussion of case study scenarios on health policy-making Sampling	- 27 participants including 15 Senior policymakers, 4 stakeholders and 8 researchers from Algeria, Bahrain, Egypt, Iran, Jordan, Lebanon, Oman, Sudan, Syria, Tunisia, and Yemen -

#	Author, year, study focus	Study design and methods	Study population (Participants, sample size, country, region)
		- Purposive - 64.3 % response rate Items/issues explored or measured - Three quantitative scales including seven items that assessed the availability of health research evidence about high-priority policy issues, five items that assessed the strength of relationships among policymakers & researchers & four items that assessed policymakers' capacity to support the use of health research evidence in health systems policy-making scored using a seven-point Likert scale (never, very rarely, rarely, occasionally, frequently, very frequently, always) Data analysis - Descriptive analysis of quantitative data & Linear Regression Models - Thematic analysis of qualitative data Study period: - December 2010	
27	Nixon et al., 2012 Describe use of KTE principles to inform the dissemination of survey results to adolescent study participants in an HIV research project based in South Africa	Intervention: - Two-way communication approach Study design - Researchers' critical reflections Sampling: - Purposive Items/issues explored or measured - Strengths, weaknesses and surprises in the dissemination processes Data analysis - Written reflection report after dissemination session in each school Study period: - October 2008	- Researchers' (intervention implementers) critical reflections.
28	Uneke et al., 2012 Describe workshop was used as a forum for the promotion of evidence-informed policy-making because of the many strategic benefits of a workshop	Intervention: - One-day evidence-to-policy forum (workshop) was held in Abakaliki, the capital of the Ebonyi State in south-eastern Nigeria Study design:	- Six senior academic researchers (Professors and Associate Professors) from the Ebonyi State University, Abakaliki, Nigeria

#	Author, year, study focus	Study design and methods	Study population (Participants, sample size, country, region)
		- Pre- & post-workshop surveys & FGDs - 79% response rate Sampling: - Purposive Items/issues explored or measured - health policy-making process and capacity to use evidence & level of involvement of researchers in the research-to-policy process scored using four-point Likert scale (1=low, 4=high) Data analysis - Descriptive analysis Study period: - December 2009	- 81 policymakers & representatives of NGOs, health worker association & police force
29	Crichton and Theobald, 2011 Collaborative analysis with researchers and communicators in four research programme consortia (RPC) working on sexual and reproductive health (SRH)	Study design: - Qualitative study, participant-observer approach - In-depth interviews, case studies and an interactive workshop Sampling: - Purposive & convenience Items/issues explored or measured - The role of research in policy, and experiences with policy engagement drawing on the RAPID analytical framework in ordering and presenting our results adapted by adding sphere on the characteristics and actions of researchers and their institutions Data analysis - Thematic analysis Study period: - August 2008 to May 2009	22 participants including 15 researchers and 7 communications specialists in the four RPCs (9 from northern and 13 from southern partners).
30	Delaney-Moretlwe et al., 2011 Interactions between researchers and society, and the role of researchers as agents of social change	Study design: - Case study - Accumulated experience, reflections and discussions of the authors over the life of these four trials conducted in Johannesburg, South Africa from 2004-2008. - Document review - Interactive workshop	- Study investigators - Research dissemination plans drafted prior to trial completion, as well as reports written by staff which recorded various aspects of the results communication process, including reactions to the process by stakeholders

#	Author, year, study focus	Study design and methods	Study population (Participants, sample size, country, region)
		Items/issues explored or measured - lessons learnt from communicating the results of four trials evaluating treatment for herpes simplex virus type 2 (HSV-2) as a new strategy for HIV prevention Sampling - Purposive Data analysis - Not indicated Study period: - May 2009	
31	Gholami et al., 2011 Designing & pilot a self-assessment tool for knowledge translation activities in research-producing institutes, Tehran University of Medical Sciences research centres and faculties, Iran	Study design: - The self-assessment tool for research institutes (SATORI) - FGDs Sampling - Purposive - 100% response rate Items/issues explored or measured - 50 statements in four main domains including: the question of research, knowledge production, knowledge transfer & promoting the use of evidence using a five-point Likert scale (1=low, 5=high) Data analysis - Descriptive analysis Study period: Not indicated	- 12 research centres and 8 departments (One department from each faculty; in the medical faculty, a clinical & a basic science department) at the Tehran University of Medical Sciences, Iran - 120 participants (6 members of the research council and the researchers from different centres and departments)
32	Ssengooba et al., 2011 Understand the process of translating research into policy in order to improve health outcomes related to national health priorities in Uganda & explore strategies for academic institutions like Makerere University College of Health Sciences to influence the translation of research into policy and practice	Study design - Case study - In-depth interviews Sampling - Purposive & snowball Items/issues explored or measured - lessons on how research influences policy developments in Uganda, informed by a number of frameworks linking the research-policy interface Data analysis	30 in-depth interviews including 8 researchers, 12 policymakers, and 10 media journalists involved in decision-making around or health reporting on the PMTCT and or SMC process at any time since the year 2000 in Uganda.

#	Author, year, study focus	Study design and methods	Study population (Participants, sample size, country, region)
		- Mixture of Manifest and Latent content analysis techniques Study period: - 2009	
33	Oronje et al., 2011 APHRC's experience in working with the media to promote reporting on health research in general, and its own research, in particular over the period 2004 and 2009	Study design: - Case study - Personal experiences and reflections of the authors (who played a central role in developing and implementing the Centre's communication and policy engagement strategies) - Survey of science journalists in Kenya conducted in 2007 by the Media for Environment, Science, Health and Agriculture in Kenya (MESHA) on behalf of APHRC - Literature review Sampling - Purposive Items/issues explored or measured - approaches used and highlight what worked well, the challenges we faced, and overall lessons learnt in order to provide a learning platform for institutions seeking to adopt similar strategies Data analysis - Not indicated Study period: - 2004 to 2009	- Study authors - 18 Kenyan science journalists
34	Tulloch et al., 2011 Explore SRH research to policy and practice interactions in Sub-Saharan Africa	Study design: - Case study - Reflections & interactive workshop - Used Sumner et al synthesis approach and Nutley et al research use continuum to identify lessons and the dominant types of research use Sampling - Purposive Items/issues explored or measured - Two criteria assessed: role of developing research-to-policy networks which act on new	- Study authors & other researchers, communication specialists and donors working with DFID-funded SRH and HIV Research Programme Consortia.

#	Author, year, study focus	Study design and methods	Study population (Participants, sample size, country, region)
		research evidence; & role of research, advocacy and engagement Data analysis - Not indicated Study period: - Not indicated	
35	Whiteside and Henry, 2011 Track & evaluate the Reviewing Emergencies report	Study design: - Qualitative Case study - Literature review of relevant policy documents, articles, op-eds and minutes of key meetings - Questionnaire on influence, potential influence and barriers to influence across sectors ranked using scale from 'no influence' to a 'very large influence' (including a 'don't know' option) & asked for examples or description of influence - Interviews with people who had significant involvement in the creation dissemination of the report. Sampling - Purposive - 40% response rate for survey Items/issues explored or measured - Document the creation and dissemination of the report; Identify and explain its impact; Identify any barriers and/or limitations to its impact; & Draw lessons for maximising the impact of future Data analysis - Descriptive analysis of quantitative data - Thematic analysis of qualitative data Study period: - mid-2008	- Survey completed by 20 individuals in the five sectors (donors; government; civil society and NGO; academia and the media) - 5 interviews
36	Lavis et al., 2010 Describe the findings from a survey of health care providers in these countries who were practising in one of these clinical	Study design: - Self-administered questionnaire Sampling - Purposive/census - 67.6% response rate Items/issues explored or measured	368 researchers in 10 LMICs (China, Ghana, India, Iran, Kazakhstan, Laos, Mexico, Pakistan, Senegal and Tanzania) who conducted research in.

#	Author, year, study focus	Study design and methods	Study population (Participants, sample size, country, region)
	areas about their awareness of, access to and use of research-based evidence in these clinical areas and the influence of such evidence on their professional practice	- Two main sets of questions scored using five-point Likert scale (1=low, 5=high): one set addressed researchers' activities in bridging the gaps between research, policy and practice grouped into three broad domains ("producer-push", efforts to facilitate "user-pull" & exchange efforts); The other addressed potential system-level, organisational and individual correlates of researchers' engagement in these bridging activities Data analysis - Descriptive analysis and logistic regression models Study period: - April 2004 to April 2005	one of four clinical areas (malaria prevention, contraception, childhood diarrhoea & tuberculosis (TB) treatment
37	Garnett et al., 2009 Illustrate that participatory research can be both empowering and transformative regularly leading to outcomes that extend beyond the life of individual research projects	Study design: - Case study Sampling - Purposive Items/issues explored or measured - Knowledge transfer evidence or benefits Data analysis - Not indicated Study period: - Not indicated	- 6 case studies in Natural Resource Management (NRM); 2 from Africa and 4 from remote northern and central Australia
38	Woelk et al., 2009 Understand the process of knowledge translation in LMICs by describing the factors affecting the use of research findings, particularly findings from RCTs, in national policy development & how actors in the policy process understand the notion of 'evidence' for decision-making	Study design: - Qualitative case study - key informant interviews, reviewed documents and developed timelines of key events Sampling - Purposive and snowball Items/issues explored or measured - Evidence uptake in the policy-making process at national level Data analysis - Thematic analysis, cross-country and cross-case study analysis	- 39 participants involved in MgSO4 policy process including 1 regionally-based researcher, 11 government health officials, 12 pharmaceutical policymakers & 3 representatives of pharmaceutical companies, 15 clinician researchers - 47 participants involved in Malaria policy process including 3 regionally-based researchers, 16 government health officials, 5 NGOs, 13 clinician/researchers & 10 international/ bilateral agencies - Regionally-based researchers based in three countries (Mozambique, South Africa and Zimbabwe) in PraCTiHC (Pragmatic

#	Author, year, study focus	Study design and methods	Study population (Participants, sample size, country, region)
		Study period: - April 2004 and March 2005	Randomized Controlled Trials in Health Care), a project funded by the European Commission
39	Yousefi-Nooraie et al., 2009 Assess the views of researchers, health policy and decisionmakers, and research policymakers and support staff on how the development and usage of evidence from systematic reviews can be promoted in a country with limited resources	Study design: - Questionnaire Sampling - Purposive - 87% response rate Items/issues explored or measured - Rank a list of 20 items that potentially influenced attitude and behaviour towards producing and using systematic reviews & strategies for addressing them Data analysis - Descriptive analysis & Multidimensional scaling (MDS) method - Content analysis for qualitative data Study period: - Not indicated	- 131 participants including clinical and health care researchers, research affairs of Iranian medical universities and their information and research managers, health managers and investigators from the MoH
40	Daniels and Lewin, 2008 Explores the actual and perceived utilisation of research information, in particular findings from RCTs, in policy-making and clinical guideline development for the treatment of eclampsia and pre-eclampsia in South Africa over the period of 1970 to 2005.	Study design - Qualitative case study - Literature review, policy document review, timeline of key events and interviews Sampling - Purposive Items/issues explored or measured - Policy document review: Establishing the extent to which research information had been implicitly and explicitly used - Interviews: the respondent's background; their knowledge of national policies; their knowledge of and involvement in the policy development process; their understanding of the various influences on the policy process and content including stakeholder involvement, prevailing values and research information Data analysis - Thematic content analysis Study period:	15 local researchers and policymakers.

#	Author, year, study focus	Study design and methods	Study population (Participants, sample size, country, region)
		- 1970 to 2005	
41	Nedjat et al., 2008 Determine the frequency of various knowledge transfer activities applied by researchers at TUMS & determine factors leading to the type of strategy ('active' or 'passive').	Study design - Document review using a checklist - Researcher's questionnaire (self-administered) Sampling - Purposive/census - 95.6% response rate for documents reviewed - 74% response rate for survey Items/issues explored or measured - List of KT passive and active activities to be selected by respondents & open-ended question for the activities that were not listed in the above-mentioned questions. A score of zero was given if the activity was not carried out; a score of one if it was performed once, and a score of two if it was done more than once. Estimates of percentage of time, or 'percent effort' allocated to each activity, including research, education, clinical service delivery, executive responsibilities, and others & estimate their percent effort in a way that the sum would be equal to 100 Data analysis - Descriptive analysis & multi-variable linear regression Study period: - 2004 to 2006	- 301 TUMS research projects that received grants from inside and outside the university in 2004 and were completed by the time this study was performed (the second half of 2006) were studied.
42	Gonzalez-Block, 2003 Analyse institutional structure and characteristics, engagement with stakeholders, institutional capacity, level of attainment of critical mass and the process of knowledge production by institutions in low- and middle- income countries.	Study design - Survey for assessment of capacity to produce, demand or support HPSR, including countries in both North and South Sampling - Purposive - 61% response rate Items/issues explored or measured - Six strategic and interrelated groups of variables: institutional/country context and characteristics, institutional capacity and engagement with stakeholders, attainment of	- 108 the Alliance partner institutions producing health policy and systems research in low- and middle- income countries (50 based in low-income, 36 in lower middle- income & 22 in upper middle-income countries) - LICs with most sampled institutions (in order) India, Bangladesh, Pakistan, Indonesia, Kenya, Uganda and Ghana. Those for LMICs are China, Colombia, Philippines, Thailand, Bolivia, Cuba and Sri Lanka; while those for UMICs are

#	Author, year, study focus	Study design and methods	Study population (Participants, sample size, country, region)
		critical mass of researchers to produce quality, sustainable research, and the process of knowledge production (project portfolio characteristics, including external research project funding). Data analysis - Descriptive analysis Study period: - 2000 to 2001	Argentina, Brazil, South Africa, Mexico, Korea, Rep., Uruguay and Chile
43	Trostle et al., 1999	Study design - Case study - In-depth interviews, document review of policies & validation meeting Sampling - Purposive Items/issues explored or measured - Analyse content, actors, process & context of each policy process Data analysis - Thematic analysis Study period: - November 1994 to June 1995	- 67 researchers & policymakers
44	Jessani 2016	Study design - Qualitative - Semi-structured interviews Sampling - Purposive Items/issues explored or measured - Questions of interest covered (1) opinions on individual characteristics that facilitate knowledge brokering; (2) ranking of the above on importance; (3) opinions on personal characteristics that hinder knowledge brokering; (4) factors that hinder KBs from being effective (for KBs) and which of the previously mentioned barriers should be a priority for alleviation (for policymakers). Data analysis - Inductive thematic analysis Study period:	- 12 academics and faculty leadership (including those who had previously been identified as KBs) from six SPHs in Kenya, and 11 national health policymakers with whom they interact

#	Author, year, study focus	Study design and methods	Study population (Participants, sample size, country, region)
		- March and May 2013	
45	Jessani 2017	Study design - Qualitative - Semi-structured interviews & document review of policies Sampling - Purposive Items/issues explored or measured - Interviews covered: 1) personal opinions on academic faculty engaging in policy decision-making; 2) personal experiences with such engagement; 3) For KBs: strategies to encourage policymakers' use of research evidence in decision making and policies. Data analysis - Inductive thematic analysis Study period: - March to May 2013	- 12 faculty (including identified Knowledge Brokers among them) from six SPHs in Kenya& 13 policymakers
46	Kalbarczyk 2021	Study design - Mixed methods - A literature review, stakeholder interviews & qualitative survey Sampling - Purposive o 200 eligible participants were identified via the STRIPE consortium and were invited to participate in the survey via Qualtrics, an online survey software Items/issues explored or measured - Identify and validate constructs for measuring individual and institutional readiness, health priorities in each country and develop a list of KT activities commonly conducted across the settings. Data analysis - Content & thematic analysis	- The 18 stakeholders including researchers based at six LMIC academic institutions, - policy makers who currently engaged or had been engaged with the academic institution in the past 2 years in efforts to conduct KT activities and - members of a global knowledge-to-action thematic working group - a multidisciplinary group that comprised approximately 220 researchers, decision-makers and implementers with a focus on the translation of health systems evidence into action (ie, KT) and supporting mechanisms to share best practices globally.

#	Author, year, study focus	Study design and methods	Study population (Participants, sample size, country, region)
		- Exploratory factor analysis (EFA) was used to identify underlying dimensions for assessing institutional readiness to conduct KT Study period: - 2019- 2020	

HPSR=Health policy and systems research HPSR; NGOs=non-government organisations; CSO = civil society organisations; MoH = Ministry of Health; UN=United; Nations; TUMS = Tehran University of Medical Sciences; LMICs = low- and middle-income countries; LICs = low- income countries; CALIBAN network = Community-Acquired Lung Infections, Bacteria and Antimicrobial Network; the Alliance = Alliance for Health Policy and Systems Research

Appendix 2: AAS study support letter

The African Academy of Sciences

Driving Scientific and Technological Development in Africa

Thursday, July 27, 2017

TO WHOM IT MAY CONCERN

Re: AESA approval for Learning Research Programme (LRP) data collection activities conducted in support of the DELTAS Africa initiative.

The Alliance for Accelerating Excellence in Science in Africa (AESA) is a funding platform established by the African Academy of Sciences and the New Partnership for Africa's Development (NEPAD) Agency with the aim of developing science strategies and funding research in Africa. The Developing Excellence in Leadership, Training and Science (DELTAS) Africa, a scheme initiated by the Wellcome Trust, is a flagship AESA programme. DELTAS Africa consists of eleven African-led health research consortia, spanning over 52 institutions from across 21 African countries, that collectively seek to: produce world-class scientific research that addresses African health and research priorities through scientific discourse and collaborative supervision; strengthen scientific research training and build career pathways for scientific researchers; foster mentorship, leadership and equitable collaboration in science, and engagement with public and policy stakeholders; and cultivate professional environments to manage and support scientific research.

The Capacity Research Unit (CRU), Liverpool School of Tropical Medicine (LSTM), has been funded by the Wellcome Trust and the UK Department for International Development to embed a 'Learning Research Programme' (LRP) within the DELTAS Africa initiative for the period 2016-2020. The LRP is designed to complement routine monitoring and evaluation activities and will inform programme implementation during the course of the DELTAS Africa initiative. In order to carry out the LRP, CRU research staff and PhD students (inclusive of Ms. Millicent Liani, Ms. Violet Murunga and Ms. Nadia Tagoe) will be required to occasionally collect programme-specific information from DELTAS staff, students and stakeholders in areas pertaining to research training, research careers, research uptake and consortia management. This information may be collected by questionnaire, interview, focus group discussion, observation or document review and, following appropriate analysis, will be reported to AESA and all relevant DELTAS consortia and stakeholders for the purpose of programme review.

As Director of AESA, I confirm our support for the LRP and associated activities as described above. AESA further supports the dissemination of LRP-derived DELTAS information through presentation at scientific conferences, technical reports, academic publication and (in the case of the PhD students) dissertations pending approval from a registered Kenyan medical ethics review board.

Sincerely,

Dr Thomas Kariuki
Director, AESA

President: Prof Felix D. Dakora; Secretary General: Prof Barthelemy Nyasse; Treasurer: Prof Dominic W. Makawiti;
Interim Executive Director: Dr Thomas Kariuki
The African Academy of Sciences
P.O. Box 24916 – 00502, Nairobi, Kenya | 8 Miotoni Lane, Karen, Nairobi
Tel: + 254 (20) 806 0674 | Mobile: +254 725 290 145
www.aasciences.ac.ke

Appendix 3: Liverpool School of Tropical Medicine research ethics approval

Ms Violet Murunga
6th Floor, Block A, Westcom Point Building
Mahiga Mairu Road off Waiyaki Way
Westlands
Nairobi
Kenya

LSTM
LIVERPOOL SCHOOL
OF TROPICAL MEDICINE

Pembroke Place,
Liverpool, L3 5QA, UK
Tel: +44(0)151 705 3100
Fax: +44(0)151 705 3370

www.lstmed.ac.uk

Friday, 8 June 2018

Dear Ms Murunga,

Research Protocol (18-011) Analysing African Researchers' capacity for promoting evidence-informed decision-making

Thank you for your letter of 7 June 2018 providing the necessary in-country approvals for this project. I can confirm that the protocol now has formal ethical approval from the LSTM Research Ethics Committee.

The approval is for a fixed period of three years and will therefore expire on 9 June 2021. The Committee may suspend or withdraw ethical approval at any time if appropriate.

Approval is conditional upon:

- Continued adherence to all in-country ethical requirements.
- Notification of all amendments to the protocol for approval before implementation.
- Notification of when the project actually starts.
- Provision of an annual update to the Committee.
  Failure to do so could result in suspension of the study without further notice.
- Reporting of new information relevant to patient safety to the Committee
- Provision of Data Monitoring Committee reports (if applicable) to the Committee

Failure to comply with these requirements is a breach of the LSTM Research Code of Conduct and will result in withdrawal of approval and may lead to disciplinary action. The Committee would also like to receive copies of the final report once the study is completed. Please quote your Ethics Reference number with all correspondence.

Yours sincerely

Dr Angela Obasi
Chair
LSTM Research Ethics Committee

Researching and educating to save lives
A Company Limited by Guarantee. Registered Number 83405, England and Wales. Registered Charity Number 222655.

RECTEM010 v1.0
Release date: 14/07/2017 Issued by: RGEO

Athena SWAN Bronze Award
INVESTORS IN PEOPLE

Appendix 4: Strathmore University Institutional Review Board approval

Strathmore UNIVERSITY

10th April 2018 SU-IRB 0174/18

Violet Murunga
P.O Box 14688-00800
Westlands, Nairobi

Email: violet.murunga@afidep.org

Dear Violet Murunga,

REF **Protocol ID:** SU-IRB 0174/18
Title: Analysing African researchers' capacity for promoting evidence-informed decision-making

We acknowledge receipt of your application documents to the Strathmore University Institutional Ethics Review Committee (SU-IERC) which includes:

1. Study Proposal Version 2 dated 5th April 2018
2. Participant Information Sheet for Interviews Version dated 4th April 2018
3. Participant Consent Form for Interviews Version 2 dated 5th April 2018
4. Participant Information Sheet and consent form Online Survey Version 2 dated 4th April 2018
5. Online Survey Questionnaire Version 1 dated 11th February 2018
6. Interview guide Version 1 dated 11th February 2018
7. Delegation of Responsibilities
8. Study Budget
9. Declaration of Conflict of Interest by all Participating Investigators
10. Human Subject Protection Certificate for all Investigators
11. CVs for all Investigators

The committee has reviewed your application, and your study *"Analysing African researchers' capacity for promoting evidence-informed decision-making"* has been granted **approval**.

This approval is valid for one year beginning **10th April 2018** until **11th April 2019.**

In case the study extends beyond one year, you are required to seek an extension of the Ethics approval prior to its expiry. You are required to submit any proposed changes to this proposal to SU-IERC for review and approval prior to implementation of any change.

SU-IERC should be notified when your study is complete.

Thank you

Sincerely,

Amina Salim
Regulatory Affairs Fellow

STRATHMORE UNIVERSITY INSTITUTIONAL REVIEW BOARD APPROVED

Ole Sangale Rd, Madaraka Estate, PO Box 59857-00200, Nairobi, Kenya. Tel: +254 (0)703 034000

Appendix 5: Strathmore University Institutional Review Board renewal

Strathmore UNIVERSITY

25th April 2019.

Ms Murunga, Violet,
P.O. Box 14688-00800,
Westlands, Nairobi, Kenya.
violet.murunga@afidep.org.

Dear Ms Murunga,

REF **Proposal: SU-IERC 374/19**
"ANALYSING AFRICAN RESEARCHERS' CAPACITY FOR PROMOTING EVIDENCE-INFORMED DECISION-MAKING"

We acknowledge receipt of your request regarding the referenced study, which was accompanied by the following:

1. A progress report dated 28th March 2019.
2. Interview guides for clinicians and county stakeholders, and focus group discussion guides 28th March 2019.

The Strathmore University Institutional Ethics Review Committee has reviewed and approved the request for an extension for *"Analysing African Researchers' Capacity for Promoting Evidence-Informed Decision-Making."*

The approved extension is effective on **25th April 2019** and will automatically expire on **25th April 2020**.

If the study extends beyond the stated period, you are required to seek another extension approval from the Ethics Committee prior to its expiry. You are required to submit any proposed changes to this protocol to SU-IERC for review and approval prior to their implementation.

SU-IERC should be notified when your study is complete.

Sincerely,

STRATHMORE UNIVERSITY INSTITUTIONAL ETHICS REVIEW COMMITTEE (SU-IERC)
25 APR 2019
TEL: +254 (0)703 034 000
P. O. Box 59857 - 00200
NAIROBI - KENYA

Prof Florence Oloo,
Secretary,
Strathmore University Institutional Ethics Review Committee.

Appendix 6: National Commission for Science, Technology and Innovation (NACOSTI) research permit

THIS IS TO CERTIFY THAT:
MISS. VIOLET IBUKAYO MURUNGA
of UNIVERSITY OF LIVERPOOL,
14688-800 Nairobi,has been permitted to conduct research in *Kilifi , Nairobi Counties*

on the topic: *ANALYSING AFRICAN RESEARCHERS' CAPACITY FOR PROMOTING EVIDENCE-INFORMED DECISION-MAKING*

for the period ending:
22nd May,2019

Permit No : NACOSTI/P/18/97821/22355
Date Of Issue : 24th May,2018
Fee Recieved :Ksh 2000

.....
Applicant's Signature

.....
Director General
National Commission for Science, Technology & Innovation

Appendix 7: NACOSTI research permit renewal

RESEARCH PERMIT Application Approved

NC

NATIONAL COMMISSION FOR SCIENCE,TECHNOLOGY & INNOVATION <nacostil... Monday, 15 July 2019 at 09:

To: Violet Murunga

Hi Violet

Monitoring & Licencing - has approved your NACOSTI Permit Application Reference Number 693015.

To track your application, https://research-portal.nacosti.go.ke/ApplicationsList/viewref/693015/?email=violet.murunga@afidep.org

If you received this email in error, you can safely ignore this email.

Best regards NATIONAL COMMISSION FOR SCIENCE,TECHNOLOGY & INNOVATION

This message was sent to violet.murunga@afidep.org
From: NATIONAL COMMISSION FOR SCIENCE,TECHNOLOGY & INNOVATION

Appendix 8: Participant information sheet

PARTICIPANT INFORMATION SHEET: INTERVIEW

Study Title: Analysing African researchers' capacity for promoting evidence-informed decision-making
Principal Investigator: Violet Murunga, University of Liverpool

I am Violet Murunga, a PhD student at the University of Liverpool based at the African Institute for Development Policy (AFIDEP). My PhD research is nested within the DELTAS Africa Learning Research Programme**.** The overarching aim of my study is to explore the capacity of DELTAS researchers and research support staff to promote use of research evidence in policy and practice decision-making.

You have been identified as someone who could make a valuable contribution to this research project. We hope that you will be willing to participate. Please take time to read the following information carefully. This consent form may contain words or concepts that you do not understand. Please ask me to stop as we go through the information and I will take time to explain them.

What is the purpose of the interview?
To explore the contextual, institutional and individual factors that enable or inhibit sub-Saharan African (SSA) researchers' capacity to promote use of research evidence in policy and practice decision-making.

What will I have to do?
You will be required to participate in an interview that will take 45 to 60 minutes. You will be asked questions about your understanding and experience of promoting use of research evidence in policy and practice decision-making, institutional or consortium structures in place to support this as well as challenges you may face when carrying out, or planning to carry out, activities for promoting use of research evidence in policy and practice decision-making.

Why have I been invited to participate?
You have been asked to participate because you belong to the DELTAS Africa programme and have research or research support experience in a sub-Saharan Africa context.

What are the possible risks and benefits of participation?

The study does not involve the collection of sensitive information and therefore poses minimal risk to participants. The research will yield valuable information that will provide guidance to the DELTAS Africa programme for improving evidence-informed decision-making. The guidance will also be useful for other researchers and research institutions

based in Africa and development partners interested in supporting capacity building activities in this area.

Do I have to take part?

Participation is entirely voluntary. It is up to you to decide whether to take part of not and you may withdraw from the study any time you wish to do so, without giving a reason. If you choose not to participate this will not affect your work or career in any way. You do not have to answer any questions with which you do not feel comfortable.

Procedure

The interview will either be completed in-person or via Skype. All interviews will be completed by myself or a French speaking research assistant at a time of your convenience. If you do not wish to answer any of the questions during the interview, you may say so and the interviewer will move on to the next question. No one else but the interviewer and a note taker will be present unless you would like someone else to be there. The entire interview will be audio-recorded, but no one will be identified by name on the audio tape. The typed record of the conversation will be available for you to see if you wish. If you do not wish to be audio-recorded, then only hand-written notes taken during the interview will be taken.

Confidentiality

The recording will be downloaded and stored in a password protected file on my computer. The information recorded will be stored in an anonymous form and will only be analysed by researchers from the University of Liverpool and Liverpool School of Tropical Medicine in the UK and AFIDEP in Kenya. All reported data will be anonymised and unidentifiable. The recordings will be deleted after data analysis is completed. Interview transcripts will be kept for at least 10 years after the completion of the study as per the Welcome Trust data policy.

Will I be reimbursed for my time?

You will not be paid for being part of this project.

For further details, or if you have any questions or want to file a complaint about the research you may contact:

Organisation responsible for the study:

Dr. Justin Pulford
Liverpool School of Tropical Medicine
Phone: +447704321145
Email :Justin.Pulford@lstmed.ac.uk

Ethics committee in Kenya:

Strathmore University Institutional Review Board
Telephone: +254703034375
Email: ethicsreview@strathmore.ed

Other ethics committees

Liverpool School of Tropical Medicine
Research Ethics Committee
Phone: +441517053762
Email: lstmrec@lstmed.ac.uk

Appendix 9: Consent form

CONSENT FORM: INTERVIEWS

CONFIDENTIAL

Study Title: Analysing African researchers' capacity for promoting evidence-informed decision-making
Principal Investigator: Violet Murunga, University of Liverpool, UK

☐	I have read, or read to me the information sheet concerning this study and I understand what will be required of me if I take part in this study.
☐	My questions concerning this study have been answered.
☐	I understand the risks and benefits associated with study participation.
☐	I understand that at any time, I may withdraw from this study without giving a reason and without affecting my normal medical care and management.
☐	I agree / do NOT agree for the interview to be recorded.
☐	I agree to take part in this study.

Signing this declaration does not affect your right to decline to take part in any future study.

_____ _____ _____

Name of participant Date Signature

_____ _____ _____

Name of person taking Consent Date Signature

Appendix 10: Semi-structured interview guide

Interview guide

Research Title: *Analysing African researchers' capacity for promoting evidence-informed decision-making*

Target population: *DELTAS Africa Programme management, fellows and research support staff*

I. Background information:

Note to researcher: *Populate 1-5 before interview*

1. Name of Consortium:
2. Consortium objectives:
3. Name of institution:
4. Institution's role in the consortium:
    - Lead
    - Partner/collaborator

5. Country (primary base of respondent):

Note to researcher: *Populate 6-9 during interview*

6. What is your title and role at the institution?

7. What training have you received?
    - Education level (highest degree):
    - Discipline e.g., public health, biochemistry:
    - Year completed highest degree:

8. What is your area of expertise e.g., malaria, reproductive health, diabetes etc:

9. Please describe the type of research you conduct or the main research projects you are supporting

II. Knowledge Translation Knowledge

10. What do you understand by the term knowledge translation?

Probes:

- A number of terms are used to explain the process of research findings being used in decision-making. Most commonly the terms evidence-based decision- or policy-making and evidence-informed policy- or decision-making
- Are you familiar with the terms?
- What is your understanding of these terms? Please explain

11. From your understanding, what does knowledge translation involve?

Note to researcher: Explain to the participant that for the rest of the interview, you will refer to the term **knowledge translation**, which encompasses all of the activities involved in moving research from the laboratory, the research journal, and the academic conference into the hands of people and organisations who can put it to practical use. The World Health Organisation defines knowledge translation as the synthesis, exchange, and application of knowledge by relevant stakeholders to accelerate the benefits of global and local innovation in strengthening health systems and improving people's lives.

III. Knowledge Translation Attitude

12. What role can, or should, researchers play in promoting knowledge translation?

Probes:

- What are your thoughts about the importance of promoting knowledge translation relative to other research functions?
- Is this a shared view among African researchers?

13. Ask research support staff, what role can, or should, communications experts play in promoting knowledge translation?

Probes:

- Is this a shared view among communications experts in general?
- Is this a shared view among African researchers?

14. Do you have experience sourcing and managing research grants/funding?

Probes:

- If yes, Which funders and types (national/international) have you dealt with? Please explain

15. If yes to Q 14, what do you think about the funding environment as it relates to supporting knowledge translation activities?

Probes:

- Are funders emphasising knowledge translation in their calls for proposals?
- Are they allocating sufficient resources to knowledge translation activities?

16. Do you have experience making applications to ethics review boards?

17. If yes to Q 15, what is the value ethics review boards place on promoting knowledge translation?

Probes:

- Are they raising questions about this this?

IV. Knowledge Translation Practice

a) In general

18. What informs your research questions?

Probes:

- Does country X have a research agenda?
- If yes, do you or does your institution refer to it when identifying research questions? Please explain.

- Does the research agenda have statements promoting evidence-informed decision-making? Please explain
- Are there other instruments that you align your research to? Please explain
- Are you aware of any policies, strategies and/or guidelines specifically focused on promoting use of research in decision-making? If yes, please describe
- Have they influenced your work or your institution's research activities? Please explain

19. Can you please tell me about the range of knowledge translation experiences you may have had?

Probes:

- Have you been involved in activities aimed to inform a decision or promote change in policy, behaviour or practice targeting one or more stakeholders such as the general public, patients, healthcare professionals, health managers, executives of biomedical companies, media, civil society groups and professional associations.
- What was the aim, who were the target audiences, what activities were implemented, what was your specific role?
- If not mentioned, do you have any experience conducting systematic reviews and/or synthesis and/or health technology assessments/health systems research (e.g., cost-effectiveness, impact evaluations etc) and/or developing clinical guidelines? Please explain
- How are you able to know that your knowledge translation activities have achieved intended aims?

20. What motivated you to engage in the activities you have mentioned?

Probes:

- Was it an expectation of the project/institution or was it your own interest?

21. What factors influence or motivate target stakeholders' decisions, practice and/or behaviour?

Probes:

- What value do target stakeholders place on using research evidence to inform their behaviour and practice in relation to the other factors you have highlighted?

- Do they seek out other types of evidence? Which ones and what is their importance relative to research evidence?
- What are the main challenges stakeholders report when seeking to use research evidence?

Note to researcher: Ask Qs 21 & 22 only to those with experience

22. What knowledge translation activities are research funders mainly supporting?

Probes:

- Are there activities they tend to fund and other that you think they should fund but that they are not funding?
- What can you say about the availability of funding for systematic reviews, synthesis and health technology assessments/health systems research (e.g., cost-effectiveness, impact evaluations etc) and developing clinical guidelines in relation to that for original studies?

b) DELTAS Africa programme

23. Please explain the DELTAS Africa programme expectations in relation to knowledge translation?

Probes:

- What specific activities are being undertaken by your Consortium towards achieving this objective and who are the main groups you target to promote use of research in decision-making?
    - How do you disseminate and communicate your research findings?
    - Can interested groups easily access your research if they want to? Please explain
    - Does the programme implement any activities aimed at assisting target stakeholders to routinely access and use research evidence to inform policy, practice or behaviour? Please explain
    - How are you measuring the change your activities are having?
    - What informed the Consortium's research questions?
- What are the relative roles of the partner institutions and the staff involved in these activities and what informed the allocation of relative institutional roles?

24. What support does the DELTAS Africa programme provide fellows and staff to enable them to fulfil the KT expectations?

Probes:

- Does the DELTAS programme undertake any activities with the fellows and support staff to provide a common understanding of knowledge translation and its importance? Please explain
- Does the DELTAS programme organise skills development workshops for improving capacity of DELTAS fellows and support staff to promote knowledge translation? Please explain

25. What are the main challenges faced in the implementation of the DELTAS Africa knowledge translation activities? Please explain

Probes:

- Do you feel that you or your staff have sufficient skills to undertake knowledge translation activities? Please explain
- Is there sufficient institutional support including guidelines, internet and equipment, access to journal databases, communications staff
-

26. Is knowledge translation valued within your institution? Please explain

Probes:

- What is your institution leadership's stand on knowledge translation and how is this communicated?
- Does your institution have a policy (e.g., strategic plan)? If yes, does it have statements relating to promoting knowledge translation? Please explain
- As part of your research activities are you required to measure and report research impact on policy, practice or behaviour?
- Is promoting knowledge translation considered part of tenure and promotion processes? Please explain
- Does your institution either provide courses as part of its degree training or organise short courses focused on this? Please explain
- Are staff required, when preparing research proposals, to include budgeted activities to promote use of research in decision-making? Please explain

- Is there an office dedicated to knowledge translation or communications activities? Please explain
- Does your institution have staff with knowledge translation or communications expertise? Please explain
- Are you provided with the relevant infrastructure (electricity and internet), equipment and software to support knowledge translation activities? Please explain

27. How does your institution's functioning influence the implementation of DELTAS programme knowledge translation activities? Please explain

Probes:

- Do you experience challenges/barriers in relation to your host institution? Or are there institutional factors that facilitate your work?
- How are these communicated and acted on?

28. How does your Consortium's partner institutions' functioning influence the implementation of DELTAS programme knowledge translation activities?

Probes:

- Do you experience challenges/barriers in relation to your partner institutions'? Or are there factors that facilitate your work?
- How are these communicated and acted on?

29. Has the DELTAS programme in any way influenced your host institution's leadership and support for knowledge translation? Please explain

c) Support for enhancing knowledge translation knowledge, skills and practice

30. Have you participated in or been involved in capacity strengthening activities/training aimed at enhancing your Knoweldge Translation knowledge, skills and practice? if yes, please explain. If No, SKIP to Q32

Probe for each of the following strategies:

- Importance of evidence-informed decision-making
- The policymaking process and the role of research evidence, and how to engage in policy-making processes
- Identification of policymakers and their interests including research questions

- Packaging and communicating research evidence including developing policy briefs and conducting policy dialogues and targeted consultations
- Conducting synthesis and systematic reviews
- Making research easily accessible to research users e.g., through research repositories and rapid response units
- Promoting a culture of research use by research users through training and supporting institutional changes
- M&E for measuring your research impact on policy and practice
- Others?

31. Which would you say was/were most effective in improving knowledge translation skills and practice? Please explain

32. Who have been the main funders of the knowledge translation capacity strengthening activities you have been involved with?

33. What support/additional support would you like to become effective knowledge translation facilitators?

    Probes:
    - Technical skills
    - Institutional support

Note to researcher: Ask section d) only to participants who seem to have extensive experience.

d) Views about what works

34. Do you have one or two examples of knowledge translation activities that you feel would serve as a best practice that can be tested for adaptability and replication? If yes, please describe

Probes:
- What strategy(ies), approach(s), tool, key feature(s) and/or characteristic(s) resulted in the success of the activity?

V. End of interview

35. Do you think that African researchers that are not receiving the kind of support that you get from the DELTAS Africa programme or other similar support have different experiences and views compared to you? Please explain

36. We have come to the end of this interview. Is there something you would like to add that you feel is important?

Note to researcher: *Ask key informant to provide documentation of activities and materials referred to if available.*

Appendix 11: List of institutional documents/websites reviewed

Universities/ research institutions*

- Vision statements
- Mission statements
- Strategic plans or objectives indicated on institutions' websites
- Research policy documents or statements indicated on websites
- Knowledge translation (research communication) policy documents
- Intellectual property policy documents
- Tenure and promotion documents
- Master's curriculum of faculty or college where DELTAS project is housed
- PhD curriculum of faculty or college where DELTAS project is housed
- Research ethics review application and reporting documents of faculty or college where DELTAS project is housed
- M&E indicators indicated in strategic plans and reports
- Research department webpages and/or Knowledge translation webpages and/or Intellectual property departments webpages
- Communications webpages and/or Public relations webpages
- Internally generated research grant schemes documents or information on website

*This is a summary list of the type of documents of the study institutions that were sourced and reviewed. The specific documents are not identified to maintain the privacy of the institutions.

DELTAS programme/funder documents

- DELTAS Scheme Sheet, 6 October, 2014
- DELTAS Africa Programme Outcome Areas, 23 May 2018
- A Monitoring and Evaluation Approach for DELTAS Africa Initiative, 23 June 2016
- DELTAS Africa factsheet, 30 November 2017
- Concordat for Engaging the Public with Research, 22 March 2011
- UK Research and Innovation Vision for Public Engagement, September 2019
- Welcome Trust - Public Engagement: Ten Common Pitfalls, 5 April 2018
- AAS Community and Public Engagement webpage
- AAS Science Communication webpage
- AAS Think tank webpage
- AESA Community & Public Engagement Strategy: July 2017 – July 2020
- DELTAS award letter, 28 August 2015
- DELTAS Scheme Novation, 23 November 2016
- DELTAS Handover: FAQs, 23 November 2016
- AAS Grants Management System (Ishango) DELTAS report
- DELTAS Africa Community and Public Engagement (CPE) Seed Fund, 29 January 2019

- Consortium A grant proposal, October 2014
- Consortium B grant proposal, October 2014
- Consortium C grant proposal, October 2014
- Consortium A grant award, 28 August 2015
- Consortium B grant award, 28 August 2015
- Consortium C grant award, 28 August 2015
- Consortium A progress reports for 2016, 2017 and 2018
- Consortium B progress reports for 2016, 2017 and 2018
- Consortium C progress reports for 2016, 2017 and 2018