Report

DELTAS Africa Learning Research Programme: Learning Report No.1 (Aug 2016 – Mar 2017)

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EXECUTIVE SUMMARY

The DELTAS Learning Research Programme (LRP), led by the Capacity Research Unit (CRU) at the Liverpool School of Tropical Medicine (LSTM), was designed to work alongside DELTAS Africa consortia to produce research-based learning about how to train and develop world-class researchers, foster their careers and collaborations, and promote research uptake. Specifically, the LRP draws on the collective experience of the DELTAS Africa initiative to generate and share robust evidence in the following three thematic areas:

1. promote **equitable career pathways** for internationally competitive African researchers including women and other under-represented groups
2. improve strategies for, and the quality of, i**nstitutionalised research training** and identify synergies among African and partner (public and private) institutions
3. encourage researchers to do **research that is needed and contributes to socio-economic development**

The LRP contributes to the success of the DELTAS Africa initiative by providing relevant findings to consortia members *during* their respective project implementation as well as advancing current understanding of best practice in global health research capacity strengthening (HRCS). The annual DELTAS LRP learning reports are designed to provide practical information that may usefully inform decision-making within, and across, DELTAS consortia and beyond. This is the inaugural DELTAS LRP learning report and covers the period Aug 01, 2016 – March 31, 2017[1].

In addition to very preliminary learning generated by the LRP[2], a range of findings from complementary CRU projects are presented. The collective 'learnings' are relevant to DELTAS consortia and may usefully inform decision making in the following areas:

- Identifying common barriers and enablers to women's scientific career advancement
- Strengthening research management and support systems (RMSS) and PhD training
- Implementing health research capacity strengthening initiatives

In addition, findings from a CRU-led scoping review of HRCS-related publications indicate that research interest in the 'practice and science' of implementing HRCS programmes has increased substantially in the last decade. However, most HRCS-related publications are commentary or opinion pieces, original research publications remain relatively rare and a conclusive, consistently used definition of HRCS has yet to emerge in the literature. These findings further highlight the need for embedding robust learning and evaluation processes within HRCS initiatives and ensuring publication and dissemination of the resulting findings.

[1] The DELTAS LRP commenced February 2016. Project activities and outcomes for the period Feb-Jul, 2016 were presented in a previous 'DELTAS LRP Induction Phase Report'. Future annual learning reports will be for a 12-month period (April-March).

[2] This initial report contains relatively few outputs from the DELTAS LRP thematic areas as, in accordance with the project timeline (see Annex 1), planned research has only recently commenced in these areas and we have yet to reach scheduled 'deliverable' dates.

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ACRONYMS

AAS	African Academy of Sciences
ACBI	Africa Capacity Building Initiative
AESA	Accelerating Excellence in Science in Africa
AFIDEP	African Institute for Development Policy
AGM	Annual General Meeting
CRU	Capacity Research Unit
DELTAS	Developing Excellence in Leadership, Training and Science
DFID	Department for International Development
HRCS	Health Research Capacity Strengthening
IDeAL	Initiative to Develop African Research Leaders
GIS	Geographic Information System
LMIC	Low- and Middle-Income Countries
LRP	Learning Research Programme
LSTM	Liverpool School of Tropical Medicine
LE	Learning & Evaluation
MCDC	Malaria Capacity Development Consortium
PI	Principal Investigator
RMSS	Research Management & Support Systems
RCS	Research Capacity Strengthening

1. INTRODUCTION

The Wellcome Trust and the Department for International Development (DFID) 'Developing Excellence in Leadership, Training and Science (DELTAS)' initiative aims to improve health in Africa through research driven by the most urgent regional challenges. Eleven DELTAS research programmes are currently funded, each involving a consortium of world class researchers led by an African research institution and all are committed to training the next generation of researchers through programmes that support women in science, create opportunities for masters, doctoral and post-doctoral candidates and provide mentorship. By supporting the training of scientists within the continent, DELTAS Africa is seeking to stem the 'brain drain' of the best African scientists and promote Africa-led development of world class research leaders to solve the continent's most pressing health needs. The scheme will run for five years (2016-2020), but fits into a longer-term strategy with a 20-year time horizon.

The DELTAS Learning Research Programme (LRP), led by the Capacity Research Unit (CRU) at the Liverpool School of Tropical Medicine (LSTM), was designed to work alongside DELTAS Africa consortia to produce research-based learning about how to train and develop world-class researchers, foster their careers and collaborations, and promote research uptake. Specifically, the LRP draws on the collective experience of the DELTAS Africa initiative to generate and share robust evidence in the following three thematic areas:

1. promote **equitable career pathways** for internationally competitive African researchers including women and other under-represented groups
2. improve strategies for, and the quality of, i**nstitutionalised research training** and identify synergies among African and partner (public and private) institutions
3. encourage researchers to do **research that is needed and contributes to socio-economic development**

The LRP contributes to the success of the DELTAS Africa initiative by providing relevant findings to consortia members *during* their respective project implementation as well as advancing current understanding of best practice in global health research capacity strengthening (HRCS). The LRP is led by LSTM in close partnership with the Alliance for Accelerating Excellence in Science in Africa (AESA), the African Institute for Development Policy (AFIDEP), Institut Pasteur, Paris, and all DELTAS Africa consortia. Findings from the DELTAS LRP will be further assessed alongside those of similar learning programmes carried out by the LSTM, including for the Royal Society – DFID Africa Capacity Building Initiative[3], to allow cross-learning from multiple consortia-based research capacity strengthening initiatives.

The annual DELTAS LRP learning reports, of which this is the first, are a primary (but not exclusive[4]) forum for disseminating constructive research findings, lessons and good practice

[3] https://royalsociety.org/grants-schemes-awards/grants/africa-capacity-building/

[4] Research findings and useful resources will also be shared with DELTAS consortia at annual general meetings, through quarterly newsletters and through email alerts as appropriate.

examples pertaining to HRCS across the DELTAS consortia. Each learning report will be designed to provide practical information that may usefully inform decision-making within, and across, DELTAS consortia.

This report presents an update on DELTAS LRP activities for the period Aug 01, 2016 – March 31, 2017[5], preliminary findings from a review of the literature pertaining to enablers and barriers to gender-equitable scientific career pathways (DELTAS LRP Theme 1) and a wide range of HRCS-related findings from complementary LSTM learning programmes and activities. This initial report contains relatively few outputs from the DELTAS LRP thematic areas as, in accordance with the project timeline (see Annex 1), planned research has only recently commenced in these areas and we have yet to reach scheduled 'deliverable' dates. Nevertheless, it is anticipated that the report content will be of value to DELTAS consortia and the various stakeholders.

2. DELTAS LRP PROGRESS

Theme 1: Equitable Career Pathways

Work on thematic area 1 is conducted within the frame of a PhD studentship. Recruitment of the PhD students for themes 1 and 3 was previously described in the DELTAS LRP Induction Phase report [1]. To briefly recap, following an extensive selection process the theme 1 studentship was offered to Ms Millicent Liani, from Nairobi, Kenya. Ms. Liani completed her formal PhD registration with LSTM in December 2016. Ms. Liani's PhD project is titled: "**Examining barriers and enablers to gender-equitable scientific career pathways in African research institutions"**. She is supervised by Dr. Rachel Tolhurst (LSTM), Dr. Stefanie Gregorius (LSTM) and Prof. Isaac K. Nyamongo (University of Nairobi, Kenya) and will be based at the University of Nairobi, Kenya, for the duration of her PhD. Ms. Liani is currently finalizing her PhD proposal and workplan, has commenced work on her ethics review application as well as a literature review examining enablers and barriers to equitable career advancement in science. She remains on track to meet her milestones for 2017 per the timeline presented in the Induction Phase report (Annex 1). These include: Completion of study protocol (March 31st), ethics submission approved (June 30th), commence data collection (July 1st) and completion of literature review (August 31st).

Theme 2: Research Training

Progress in this thematic area has been substantially delayed due to difficulties employing the required Francophone research assistant. The position was first advertised in June 2016, although no suitable applications were received. The position was re-advertised in August 2016 for a four-week period which, pending poor response again, was subsequently extended

[5] The DELTAS LRP commenced February 2016. Project activities and outcomes for the period Feb-Jul, 2016 were presented in a previous 'DELTAS LRP Induction Phase Report'. Future annual learning reports will be for a 12-month period (April-March). The Induction Phase report can be access here: http://www.lstmed.ac.uk/research/centres-and-units/capacity-research-unit-cru/our-projects/deltas-learning-research

for an additional four weeks. A small number of high quality applications were received during this extension period and, following a short-listing and interview process, a formal offer of employment was made to a Cameroon national in the latter stages of completing a PhD at the University Paris 1-Pantheon Sorbonne. The preferred candidate is fluent in both French and English and has substantial work experience across sub-Saharan Africa in research and development contexts. The preferred candidate is unable to commence his employment with LSTM until a formal work visa is issued. LSTM initiated this process in December 2016 and a decision is expected imminently.

Nevertheless, work has begun on this thematic area. A draft protocol for the creation of a pan-African 'health and biomedical training registry' has been developed in consultation with the Institut Pastuer, Paris. This protocol (and registry) will update and extend a previous registry developed by the Institut Pasteur for Francophone Africa. Despite the delays in recruitment, activity in this thematic area is expected to continue per the timeline presented in the 'Induction Phase' report (see Annex 1), with the first 'outputs' (completed registry and survey of researcher training needs) due for completion by March 31, 2018.

Theme 3: Research Uptake

Work on thematic area 3 is also conducted within the frame of a PhD studentship. Following the aforementioned PhD selection process, the theme 3 PhD studentship was offered to Ms. Violet Murunga from Nairobi, Kenya. Ms. Murunga completed her formal PhD registration with LSTM in October 2016. Her PhD project is titled: **"Exploring the research uptake strategies used by African researchers to promote evidence-informed decision making".** She is supervised by Prof. Imelda Bates (LSTM), Dr Justin Pulford (LSTM) and Dr Rose Oronje (AFIDEP) and will be based at the African Institute for Development Policy (AFIDEP), Nairobi, Kenya for the duration of her PhD. Ms. Murunga has completed her PhD proposal and workplan, has commenced work on her ethics review application as well as a literature review examining enablers and barriers to research uptake in Africa. She remains on track to meet her milestones for 2017 per the timeline presented in the Induction Phase report (Annex 1). These include: ethics submission approved (June 30th), commence data collection (July 1st) and completion of literature review (August 31st).

Complementary PhD Research

The DELTAS Africa Initiative to Develop African Research Leaders (IDeAL) consortium has offered a DELTAS LRP-related PhD studentship to Ms Nadia Tagoe from Kumasi, Ghana. This exciting partnership between IDeAL and the DELTAS LRP was developed in response to the number of outstanding applications for the LRP PhD studentships, of which Ms Tagoe was one. Ms Tagoe commenced her PhD registration with the Open University UK, in March 2017. Her PhD project is titled: **"A systematic examination of the process and experience of establishing and managing research capacity strengthening consortia".** She is supervised by Dr Samson Kinyanjui (KEMRI-Wellcome Trust), Prof. Sassy Molyneux (KEMRI-Wellcome Trust) and Dr Justin Pulford (LSTM) and will be based at KEMRI-Wellcome Trust, Kilifi, Kenya for the duration of her PhD. Ms Tagoe has commenced her PhD proposal and workplan.

3. DELTAS LRP LEARNING

As noted in the introduction, this initial learning report contains few outputs from the DELTAS LRP thematic areas as the earliest scheduled 'deliverable' dates have yet to arrive. The first formal outputs will be presented in the second learning report (due March 31st, 2018). However, in this report we present preliminary findings from a literature review pertaining to DELTAS LRP Theme 1.

Enablers and Barriers to Gender Equitable Scientific Career Pathways: Preliminary Findings from a Review of the Published Literature

Studies of scientific occupations have shown that, compared to men, women tend to drop out of the career pipeline at the point they should be moving upward [2]. Accordingly, female scientists are increasingly under-represented at each stage of the scientific career ladder [3]. The reasons why women have more difficulty pursuing research careers than men has been extensively investigated in high income countries, yet there is little comparative evidence from low- and middle-income counterparts [4].

Ms Millicent Liani, in the context of her PhD project in support of DELTAS LRP Theme 1, is currently completing a review of the existing literature pertaining to barriers and enablers to gender equitable scientific career pathways in African research institutions. It is anticipated that the findings from this review will highlight the scope of the African-specific evidence-base in this subject area and identify priority areas for subsequent investigation during her PhD. The scoping review, based on key word searches across eight academic search engines, identified a total of 23 publications. Final review findings will be circulated across DELTAS consortia via annual meetings, reports and through formal publication in a peer-reviewed journal.

A preliminary analysis of commonly reported barriers and enablers to women's scientific career advancement is presented below. These findings usefully highlight broad areas that may impede or facilitate career advancement for female scientists.

Barriers to female scientific advancement

- Competing demands of marriage, family life and work
- Lack of professional mentors and role models
- Lack of professional networking opportunities
- Unfair process and style of promotion and tenure
- Pressure of research productivity based on publications
- Difficulties in securing research funding
- Limited International scientific mobility
- Socio-cultural behavioural norms
- Work place discrimination

Enablers of female scientific advancement

- Actions that address the gender pay gap
- Family-friendly related policies and workplace reforms
- Actions that address research productivity and funding obstacles
- Networking, mentorship, role modelling and collaboration opportunities
- Family support and faith

4. Complementary Learning

Royal Society – DFID Africa Capacity Building Initiative (ACBI)

The purpose of the ACBI is to 'strengthen the research and training capacity of higher education institutions and support the development of individual scientists in sub-Saharan Africa through UK-Africa research collaborations'. ACBI is a pilot programme funded by DFID focusing on research in water and sanitation, renewable energy and soil science and aims to initiate lasting changes in the research environment within the African host organisations. It funds ten research consortia, each comprising one UK and three African institutions. Embedded in the ACBI is a research project for expanding and using learning about the science of research capacity strengthening (the Learning and Evaluation [LE] project) led by the CRU. The purpose of the LE project is to generate research-informed learning from the ACBI to improve the ACBI within the project life span and to contribute to the global pool of evidence on the science of research capacity strengthening.

Using an evidence-based 'benchmark' which describes the optimal capacity needed by an institution to effectively support PhD programmes and high quality research, CRU conducted a study of the existing research capacity and PhD training during visits to eight African institutions across the 10 ACBI consortia. Multiple research methods were used for the LE project; data collection comprised semi-structured interviews (N=55) with African Principal Investigators (PIs) and different cadres of stakeholders and focus group discussions (N=3, including 13 participants in total). In addition to the site visits, 31 interviews with PIs of other African institutions were conducted during consortia (inception) meetings and by phone or Skype, and face to face interviews (n=7) were held with ACBI participants when they visited the UK. When possible, stakeholder workshops were held at the end of the site visits to present and validate findings, resolve any discrepancies and to explore possible reasons for the findings. Data were analysed using a framework approach[6] to identify the institutions' research capacity strengths and weaknesses, to highlight shareable examples of good practice and to draw out lessons that can be used by funders and implementers to inform the ACBI and other similar programmes (e.g. DELTAS Africa programme).

Key findings concerning research systems and research training in the ACBI African institutions were:

[6] Lewis, J. and Ritchie, J., 2003. *Qualitative research practice: A guide for social science students and researchers*, London: Sage Publications.

- Institutions reported increasingly investing in improving internet and Wi-Fi access though problems with unreliability and inadequate bandwidth remain
- Institutional email systems generally do not function adequately and do not appear to be a priority for institutions. This is a critical bottleneck in enhancing research capacity since several of the problems identified in the baseline studies are the result of poor communication within institutions
- Researchers rely almost entirely on electronic resources rather than library books and felt they lacked access to specialised resources; many were unaware that their institutions had free access to relevant journals through, for example, 'Research4Life' (http://www.research4life.org/)
- Laboratories are critical for many types of research but are one of the weakest components of research systems in the institutions and are often neglected in terms of training, infrastructural support and professional recognition
- Although all institutions offer courses for research students, the quality and range is variable; training is often linked to projects and is therefore not widely accessible, institutionalised or sustainable
- The training needs of staff involved in research support units and graduate schools, and particularly laboratory technicians, are often overlooked though these individuals are essential for research
- Institutional research strategies exist and are linked to national needs, but this focus is diluted at the level of departmental strategies which tend to reflect individual researchers' interests and opportunities; this may be partially due to insufficient skills in strategic planning
- Research support units are widespread but their functions, effectiveness and utilisation are variable, and poor communication means that researchers are often not aware of the support that these offices can provide
- PhD applications are generally handled through graduate schools but there are often significant delays in registration and in the examination process. The quality and availability of student induction programmes and handbooks is variable
- Heavy teaching and administrative loads impact on supervisors' ability to provide adequate support for doctoral students; mentoring programmes which could be helpful, especially for some marginalised students, seem to be under-valued and are not widely available
- There are very limited national funds available for research, with research activities in some institutions relying entirely on funding through international projects
- Long delays in transferring funds to African institutions, and then passing these to students, were common, particularly when the UK institutions had little experience of working with African institutions
- African PIs often had little support in managing their projects' finances and most did not receive regular financial updates
- International collaborations were widely recognised as important for strengthening research capacity of individuals and institutions. High value was therefore placed on initiatives such as the ACBI

The findings from this ACBI baseline study reflect those from CRU's previous studies which focused on health-related university departments, indicating that many of the research capacity gaps in African institutions are generic. These could therefore be effective targets for improvement through the strategic and joint efforts of national governments and international organisations that invest in strengthening research capacity in Africa. Actions that could be taken that emerge directly from our findings include:

- Establish a stepwise programme to improve research laboratory systems with the ultimate goal of achieving and maintaining international laboratory accreditation
- Configure grant-making so that laboratory and other support staff (e.g. administrators, accountants) are explicitly catered for within research projects
- Facilitate the sustainable establishment of locally-owned and managed high quality courses in regional African centres for researchers and support staff covering for example, critical thinking and appraisal skills, data analysis software ('R', 'SPSS'), GIS, academic and proposal writing, English language, Laboratory Information Management Systems, Quality Assurance Management, Health and Safety and equipment maintenance and repair. For doctoral students, this may take the form of a formal, accredited, mandatory research methodology course
- Ensure that criteria for selecting PhD students, and the funds available to them, are clearly stated, and known and followed by all consortium partners
- Provide opportunities for sharing guidelines[7] and experiences about UK-Africa research-related financial transactions across consortia. This is important because the UK government is launching new UK-developing country initiatives (e.g. http://www.rcuk.ac.uk/funding/gcrf/), and, while recognising the importance of adequate governance mechanisms, delays in financial transactions will jeopardise project activities.
- Effectively communicate about initiatives such as the ACBI and DELTAS within and beyond the programmes since this will facilitate new research collaborations which are important for sustainability, quality and vibrancy of research
- University level endorsement of participation in research consortia that includes a plan for integrating consortia-related capacity strengthening initiatives within University (rather than college/department/project) systems
- Advocate for:
    - reliable power supplies
    - dedicated postgraduate study space
    - good quality internet
    - national/internal research grant schemes
    - effective institutional email systems
    - institution-wide gender equity training
    - access to/knowledge about free online academic journals
    - streamlined procurement processes for equipment and supplies
    - sharing of equipment between institutions including with the private sector
    - a solution to the high teaching and administrative workload which impedes potentially productive researchers

[7] http://www.who.int/tdr/publications/five_keys/en/

- high quality regional and inter-institutional courses in, for example, research methods, data analysis software, GIS, academic and proposal writing, and where relevant, in English language

Malaria Capacity Development Consortium (MCDC): Strengthening Research Management and Support Systems in African Universities[8]

A key aim of the MCDC programme[9] was to strengthen the capacity of its African partner universities to provide academic, administrative and financial support for international quality research activities. In 2013 MCDC requested the CRU research team at LSTM to undertake a review of the research support systems and structures within four of MCDC's partner African universities and to identify gaps that could be addressed within the time scale of the project. This was known as the Research Management and Support Systems (RMSS) project (2014-16).

Baseline RMSS capacity was reviewed during visits to the universities in 2014 and university-specific reports as well as an overview report were produced. These reports contained recommendations for solving the capacity gaps. The solutions had been agreed during debriefing sessions which were held in each university the end of the visits. This 2016 overview report outlines progress made in strengthening RMSS capacity since the 2014 baseline visits and is based on information contained in each of the university's individual 2015-16 follow up reports. The information in these follow up reports is based exclusively on the MCDC principal investigators' self-reported progress and has not been independently verified. MCDC had allocated funds (of up to £25k) to enable the principal investigators in each university to fulfill some of the actions needed to address RMSS capacity gaps. The funds were to be awarded following submission of a justified budget by principal investigators, but in practice minimal or no funds were transferred. The progress made by each university is therefore a useful indicator of what might be achieved by other research institutions in Africa who do not have external support.

To develop the data collection tools for the 2014 baseline study, CRU conducted a literature search and consulted with experts in various aspects of RMSS to reach a 'saturated' comprehensive list of all the structures and systems needed by research institutions to produce high quality research. The list was converted into a data collection toolkit comprising three methods (i.e. interview guides, document reviews and observation guides for institutional research facilities) for use during visits to the four universities. The items in list were grouped into eight RMSS components to aid analysis of the findings: 1. Research Strategies and Policies; 2. Institutional Support Services and Infrastructure; 3. Supporting Funding Applications; 4. Project Management and Control; 5. Human Resource Management for Research; 6. Human Resource Development for Research; 7. External Promotion of Research; and 8. National Research Engagement

[8] Link to full report: http://www.lstmed.ac.uk/research/centres-and-units/capacity-research-unit-cru/our-projects/strengthening-research-management

[9] http://www.mcdconsortium.org/

For the 2016 follow up reports, interviews were conducted over 15 months by Skype and telephone interviews with the MCDC principal investigator. Information obtained about progress against the 2014 recommendations was mapped against the eight RMSS components using a pre-prepared matrix. We used a rough scoring system to gauge whether the collective progress against the recommendations for the four anonymised institutions was 'good', 'moderate' or 'little/none'. This helped us understand which components of research support systems the universities found most easy to address and which were the hardest.

All universities had made substantial progress in addressing their RMSS capacity gaps within their departments, schools and colleges and also, more impressively, at university level.

- **Most progress** was made on components concerning improved support for research applications and project management.
- **Intermediate progress** was made on strengthening research infrastructure, research skills training and research-related management of human resources.
- **Least progress** was made on components related to the development of research strategies and dissemination and uptake of research outputs.

Common findings across the universities which could be useful learning points for future HRCS programmes included the need for:

- research capacity 'change' agents or teams with sufficient institutional standing to influence university-level decision making
- a university-wide, collaboratively-developed research capacity strengthening strategy with actions and progress monitoring indicators
- forums for inter-university sharing of experiences, challenges and resources for strengthening research capacity

CRU Research Capacity Strengthening 'Lessons' for Grant-Makers and Grantees[10]

CRU have recently developed two, two-page flyers, one for grant-makers and the other for grantees, highlighting RCS lessons and good practice examples emerging from experiences and literature on RCS science. The flyers are included in Annex 2 and 3. The content of Flyer 2 (annex 3), designed specifically for researchers involved in implementing HRCS initiatives, may be informative for programme leaders of the various DELTAS consortia.

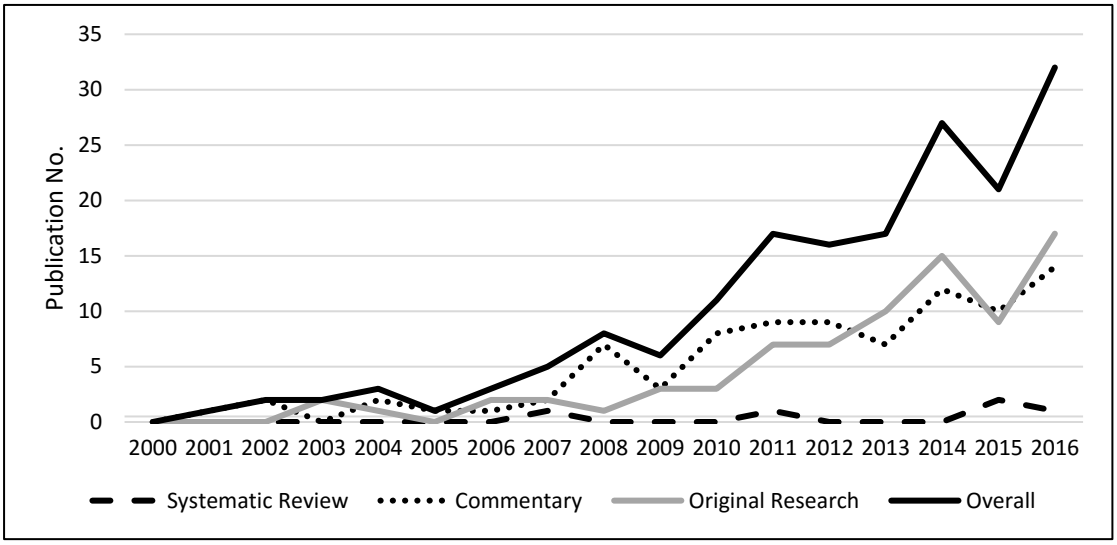
Health Research Capacity Strengthening: A Review of the Published Literature, 2000-2016

CRU have recently completed a scoping review of research pertaining to health research capacity strengthening (HRCS) in low- and middle-income countries (LMICs) published between January 1st, 2000 to December 31st, 2016. The broad aim of the review was to

[10] Links to flyers:
http://www.lstmed.ac.uk/sites/default/files/centre/Research%20capacity%20strengthening%20lessons.pdf
http://www.lstmed.ac.uk/sites/default/files/centre/Research%20capacity%20strengthening%20lessons_grant%20makers_flyer_FINAL.pdf

marshal the disparate, yet inter-connected, evidence-base under common headings in order that the level, type, cohesion and conceptual sophistication of the existing HRCS-related research effort may be understood more fully. The review manuscript will shortly be submitted for peer-review publication and will be circulated across DELTAS consortia once published. Selected findings are presented below:

Figure 1. Number of HRCS publications per year by publication type (N=172)



172 papers pertaining to some aspect of HRCS, published between 2000-2016, were retrieved by a keyword(s) guided search of the PubMED, Scopus and Global Health databases. The frequency of publication by year and by publication typology – 'systematic review', 'perspective, opinion or commentary' or 'original research' – is presented in Figure 1. As shown, the number of HRCS publications identified by the search methodology consistently increased over time, from 0 in the year 2000 to a maximum of 32 in 2016. The increase over time is evident in both original research and commentary publications. Systematic reviews have rarely been published at any point in time.

51% (88/172) of publications presented a perspective, opinion or commentary, 46% (79/172) original research and 3% (5/172) findings from a systematic review (Table 1). The first and/or last author was from an institute located in an LMIC in 58% (100/172) of publications, 'capacity building' (CB) was the favoured term in 59% (102/172) of publications, followed by 'Capacity Strengthening' (CS) and 'Capacity Development' (CD) (26% & 15%, respectively). An operational definition of HRCS was included in 19% (33/172) of publications.

Table 1. Selected characteristics of reviewed HRCS publications

Publication Type	No.	LMIC Authorship[1]			Capacity Term[2]				Defined HRCS[3]
		1st	Last	Either	CB	CD	CS	Oth.	
Original Research	79	31	32	41	38	18	24	0	17
Pers. Opin. Commentary	88	36	42	56	63	6	19	0	16
Systematic Review	5	3	1	3	1	1	2	0	0
Total	**172**	**70**	**75**	**100**	**102**	**25**	**45**	**0**	**33**

1 Based on location of listed organisational affiliation of first and last authors. 2 Where more than one term employed in the text, then capacity term used in title or keywords given priority. If different in both title and key words, then title given priority. (CB=capacity building, CD=capacity development, CS=capacity strengthening, Oth.=other). 3 The number of papers in which an operational definition of HRCS was presented.

Table 2 presents the range of HRCS definitions presented across these 33 publications, the original source and the papers in which each was cited. The definition specifically pertained to health research capacity in 7 publications; in the remaining publications' narrower definitions of 'research capacity' (n=10), 'capacity' (n=6) or 'organisational capacity' (n=1) were presented and in 2 publications capacity was operationally defined as 'progress'. 25 separate definitions were presented of which 9 were original. Seven of the 25 definitions were cited by 2 (n=4), 3 (n=2) or 4 (n=1) publications. In all other cases the definition was only presented in a single publication. Three publications presented two definitions. These data suggest that, despite the increase in HRCS publication, the concept typically remains undefined and when it is defined, it is done so inconsistently.

Table 2. HRCS definitions, sources and citing papers

Subject	Capacity Term	Definition	Cited In
Health Research Capacity	Building [5] Strengthening [6]	"an ability of individuals, organisations or systems to perform and utilise health research effectively, efficiently and sustainably" [6]	[5, 6]
	Building [7] Strengthening [8, 9]	"the ability to define problems, set objectives and priorities, build sustainable institutions and organisations, and identify solutions to key national health problems" [10]	[7-9]
	Strengthening	"'a strategy that is implemented worldwide to improve the ability of developing countries to tackle the persistent and disproportionate burdens of disease they face" [11]	[12]
	Development	"the process required for building capacity in health research would be define the institutional systems needed to support research, enumerate existing and missing resources and improve research support by addressing the identified gaps" [6]	**[13]**
	Strengthening	"the level of expertise and resources needed for the production of new knowledge and its application" [14] [1]	[15]
	Building	"an approach to the development of sustainable skills, organisational structure, resources and commitment to health improvement…to multiply health gains many times over" [16][2]	[17]
	Building	"a systematic, purposeful and goal-oriented effort to strengthen human resources and infrastructure to enable local scientists and institutions to become independent and responsive to existing and emerging health needs and threats" [18][2]	[18]
Research Capacity	Building [19] Strengthening [12, 20, 21]	"the ongoing process of empowering individuals, institutions, organisations, and nations to: define and prioritise problems systematically; develop and scientifically evaluate appropriate solutions; and share and apply the knowledge generated" [19][3]	[12, 19-21]

Research Capacity Cont…	Strengthening [22, 23]	"process of individual and institutional development which leads to higher levels of skills and greater ability to perform useful research" [24]	[22, 23]
	Development [25] Strengthening [8, 26]	"the process by which individuals, organisations, and societies develop abilities (individually and collectively) to perform functions effectively, efficiently and in a sustainable manner to define problems, set objectives and priorities, build sustainable institutions and bring solutions to key national problems" [27]	[8, 25, 26]
	Building	"the ability to conduct, manage, disseminate, and apply research in policy and practice" [28]	[28]
	Building [29, 30]	"Includes any efforts to increase the ability of individuals and institutions to undertake high-quality research and to engage with the wider community of stakeholders" [31]	[29, 30]
	Building	"a long-term process that requires a systematic and inter-sectoral approach to developing appropriate regulatory frameworks, building and maintaining physical infrastructure, and investing in human resources, equipment and training in an environment conducive to research commitment and institutional support" [32]	[33]
	Strengthening	"consists of two main closely inter-related and inter-dependent activities, which, together, form the basis of institutional development. The two parts are: improving, through appropriate training, the capabilities of scientists to undertake quality research; improving institutional support – equipment, supplies and other logistic support to the institution in which the trained scientists have to work" [34]	[34]
	Building	"strengthening the abilities of individuals, institutions, and countries to perform research functions, defining national problems and priorities, solving national problems, utilizing the results of research in policy making and programme delivery." [35]	[36]
	Strengthening	"goes beyond facilitating or funding a research project to the broader objectives of nurturing the prerequisites of the research process, such as state and institutional support, specialized training, infrastructural development, networking opportunities, publications and career paths." [37]	[37]
	Building	"a deliberate effort to augment health and social science research outputs as well as human capital, so as to favourably impact upon a research focus area" [7]	[7]

Capacity	Building	"a process that improves the ability of a person, group, organisation or system to meet its objectives or perform better" [38]	[39]
	Building	"the process of helping communities and organisations harness human, technical and financial resources, which allows them to respond adequately to health issues in ways that inform such policies" [40]	[41]
	Strengthening	''process through which people, organisations, and society as a whole are enabled to shape their own development and adapt it to changing conditions and frameworks'' [42]	[43]
	Strengthening	''process of improving individual skills, processes, and structures at the organisational level and the networks and context in which the organisation functions'' [44]	[44]
	Building	"helping recipient countries to invent, develop and maintain institutions and organisations which are capable of learning and bringing about their own transformation, so that they can play a dynamic role in supporting national development processes" [45]	[46]
	Strengthening	"the ability of individuals or groups to perform tasks in a sustainable manner" [47]	[47]
Organisational capacity	Development	"the capacity of research departments in universities, think tanks and so on to fund, manage and maintain themselves" [48]	[49]
Progress	Building [50] Development [51]	"ability to understand, interpret, select, adapt, use, transmit, diffuse, produce and commercialise scientific and technological knowledge in ways appropriate to culture, aspirations and level of development" [52]	[50, 51]

1. Presented as a definition of 'Health Systems Research' capacity. 2. Presented as a definition of 'research capacity' in citing publication, but included in the 'health research capacity' definition list as contains specific reference to 'health research'. 3. Cited as definition of 'health' research capacity in Vasquez et al [12].

5. Discussion

This is the first learning report prepared by the DELTAS LRP. While limited LRP-derived findings were available for inclusion, a range of findings from complementary CRU projects have been presented. The collective 'learnings' are relevant to DELTAS consortia and may usefully inform decision making in the following areas:

- Identifying common barriers and enablers to women's scientific career advancement (preliminary literature review)
- Strengthening research management and support systems (RMSS) and PhD training (ACBI & MCDC findings)
- Implementing health research capacity strengthening initiatives (CRU Flyers)

In addition, the findings from a CRU-led scoping review of HRCS-related publications indicate that research interest in the 'practice and science' of implementing HRCS programmes has increased substantially in the last decade. However, most HRCS-related publications are commentary or opinion pieces, original research publications remain relatively rare and a conclusive, consistently used definition of HRCS has yet to emerge in the literature. These findings further highlight the need for embedding robust learning and evaluation processes within HRCS initiatives (e.g. the DELTAS LRP) and ensuring publication and dissemination of the resulting findings.

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ANNEX 1: LRP ACTIVITIES & DELIVERABLES TIMELINE (START DATE AUGUST 2016)

Activities	Year 1	Year 2	Year 3	Year 4
Theme 1: Equitable Careers				
PhD registration				
Protocol development				
Ethics submissions				
Data collection				
Data analysis & writing				
Thesis first draft				
Thesis revision				
Thesis submission				
Theme 2: Training				
Protocol development				
Data collection				
Data analysis & writing				
Theme 3: Research Uptake				
PhD registration				
Protocol development				
Ethics submissions				
Data collection				
Data analysis & writing				
Thesis first draft				
Thesis revision				
Thesis submission				
Deliverables				
Quarterly newsletters				
Annual 'learning' report				
Interim 'aims & outcomes' rep				
DELTAS AGM presentation				
Conference presentation				
LRP Publications*				
Final report				

ANNEX 2: FLYER – LESSONS & GOOD PRACTICE EXAMPLES FOR GRANT MAKERS

Strengthening Research Capacity in Low & Middle Income Countries:
Lessons and good practice examples for grant makers

Introduction

Strengthening capacity for research in low- and middle-income countries (LMICs) is a long-term and complex process that requires regular input at multiple levels (individual, institutional and environmental). This note outlines research capacity strengthening (RCS) lessons and good practice examples emerging from experiences and literature on the science of RCS.

The Capacity Research Unit at the Liverpool School of Tropical Medicine specialises in the science of RCS. This note is designed to support organisations and individuals involved in the design and awarding of RCS-related grants.

Award design stage

- Ensure one or more participants in the award-design stage have adequate RCS expertise (i.e. they should have detailed knowledge of RCS theory and literature as well as practical experience in RCS implementation in LMICs).
- Shared principles of RCS should be identified and agreed by all stakeholders involved in design stage[1].
- The overall RCS goal and objectives should be identified and agreed by all stakeholders involved in design stage and stated in the call for proposals.
- Consider use of an award mechanism that allows RCS goals and objectives to be appropriately aligned with existing capacities of potential LMIC partners (i.e. existing capacity varies widely across LMIC research institutions and flexibility in investment, and expected outcome, may need to be aligned accordingly).
- Ideally, specific awards to support RCS in especially low capacitated LMIC institutions could be considered.
- Maximise opportunities for RCS learning and evaluation and be explicit about how learning and evaluation appropriate to RCS activities (i.e. complex, non-linear interventions) can be built into individual grants or across the award scheme as a whole.
- Develop clear RCS assessment and weighting criteria for reviewers and panel members that take account of the agreed principles, goals and objectives. Requiring applicants to provide evidence of senior management support from partner institutions, as well as a plan for integrating proposed RCS activities within institutional systems, may enhance RCS outcomes and sustainability.
- Ensure consistency about RCS across scheme notes, applicant information and panel guidance documents.

Information provided for applicants

- Design succinct application form with clear guidelines on how to complete the RCS component of the form and a description of the RCS assessment criteria
- Provide a definition of RCS and outline the RCS principles, goal and objectives of the award
- Provide links to RCS good practice resources
- Ensure any expectations for embedded learning and evaluation, or participation in award-associated learning and evaluation, are clearly communicated in the call for proposals and reporting requirements. This may include exemplars of potential learning and evaluation approaches appropriate to complex, non-linear RCS interventions

Award making stage

- Ensure all review panel members have a common understanding of the shared RCS principles, goal and objectives, the associated assessment criteria and their weighting (through for instance a briefing before the panel meeting starts)
- Follow a structured format for discussing each application to encourage consistency by panel members and external reviewers in applying (weighted) assessment criteria and in considering the RCS goal and objectives of the grant
- Ensure RCS expertise in panel, as described above

Post award

- For large grants, with multiple award recipients, consideration could be given to hosting RCS 'good practice' meetings with awardees prior to dispersal of funds. Early-stage awardee meetings may also present an opportunity to facilitate RCS collaboration across award holders and to develop/implement cross cutting RCS learning and evaluation programmes
- Ensure clarity with awardee institutions on the level and uses of overhead payments to support RCS activities. Encourage the use of some overhead funds to support institutional investment in research management and support

Capacity Research Unit (CRU) at LSTM: pioneering methods and approaches for RCS

CRU specialises in the science of RCS. We are expanding practical and theoretical knowledge about what works, and does not work, for RCS in LMICs. We focus particularly on strengthening capacity for research and laboratory systems and have developed an innovative and robust approach for designing, tracking and evaluating RCS programmes which works in different settings. This approach includes two pioneering steps, which are often missing in RCS programmes:

- defining the RCS goal and the pathways for change with all partners involved in the RCS programme, and
- describing the 'optimal' capacity needed to achieve the goal, based on best evidence from the literature and consultations with experts. This provides a 'benchmark' and indicators against which to assess baseline capacity and to measure and track change.

By applying this approach to diverse RCS programmes across LMICs, we have identified areas that are important for RCS programmes that target universities or research institutions (see Section 3 above).

We work closely with grant makers and review panels, using qualitative research to help them improve grant making and grant management processes. We feedback research data from site visits and consultations grant makers and RCS implementers so they can adjust and improve their programmes in real-time.

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http://www.lstmed.ac.uk/research/centres-and-units/capacity-research-unit

[11] E.g. ESSENCE (2016). Planning, Monitoring and Evaluation framework for Research Capacity Strengthening. ESSENCE Good Practice Document Series.

ANNEX 3: FLYER – LESSONS & GOOD PRACTICE EXAMPLES FOR RESEARCHERS & IMPLEMENTERS

Strengthening Research Capacity in Low & Middle Income Countries:
Lessons and good practice examples for researchers and implementers

Introduction

Strengthening capacity for research in low- and middle-income countries (LMICs) is a long-term and complex process that requires continuous input at multiple levels (individual, institutional and environmental). This note outlines research capacity strengthening (RCS) lessons and good practice examples emerging from experiences and literature on the 'science' of RCS.

The Capacity Research Unit at the Liverpool School of Tropical Medicine specialises in the science of RCS. The purpose of this note is to share our experiences with institutions applying for or involved in research programmes which aim to strengthen research capacity. This includes institutions based in the UK as well as those in LMICs.

Lessons and good practice examples of strengthening research capacity

Examples presented below will help strengthen research capacity at the individual, institutional and environmental levels at each stage of the research process.

1. Applying for research funds

- Respectful and equitable relationships between research partners are essential; our research indicates that RCS programmes are more likely to be successful if they are built on existing partnerships.
- Meet all research partners and key stakeholders involved in the RCS programme face-to-face to discuss their contributions, synergies, strengths, challenges and weaknesses.
- Ensure research partners and stakeholders have a common understanding of the funding call, and agree the goal of their proposed programme and the pathway for achieving impact.
- Establish a regular, participatory communication process and define the roles for each partner and their contributions to the application to help facilitate an equitable and effective partnership.

2. Starting up a new RCS programme

- Hold participatory inception meetings to develop a detailed RCS programme plan based on an explicit pathway to impact (e.g. a theory of change). These meetings should engage key players beyond the grant holders (e.g. researchers, laboratory technicians, managers, representatives from government, civil society, industry and think tanks) to ensure the programme addresses national needs, facilitates research uptake and promotes sustainability.
- Plan for annual partner meetings with clear objectives, ensuring all partners contribute to the aims and agenda of the meeting. Use the workshop to agree the contents, timing and responsibility for the RCS programme work plan.
- Publicise the new programme within, and beyond, partners' institutions to engage relevant networks and to ensure RCS activities have broad impact.

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3. Embedding RCS programmes within institutions

3a. Research strategies and quality assurance

- RCS programmes should complement the institution's research strategy, which itself should be linked to an institutional plan with activities, timings and monitoring indicators.
- There should be institution-wide and high-level buy-in (e.g. Head of Department, Faculty Dean, Vice Chancellor) for the RCS programme and the research strategy.
- Carefully think through the arguments that are likely to persuade institutions and external stakeholders to invest in RCS programmes in the face of high teaching loads in LMICs.
- Plan for the financial sustainability of changes introduced through RCS programmes from the outset.
- Explore opportunities to strengthen research offices, which support and track research activities and promote research quality, and to share skills and good practice between partners (e.g. through staff exchanges).

3b. Research facilities

- Improve access to academic journals for LMIC partners through registration with www.research4life.org and similar schemes.
- Plan to empower and train laboratory staff, who are critical to much research but are often overlooked in programme planning and implementation.
- Develop a participatory laboratory working group so programmes can make 'smart decisions' about purchasing and maintaining equipment and supplies, and technical training.
- Laboratory accreditation will significantly enhance international research credibility and opportunities to market laboratory services.

3c. Research training, supervision and mentoring

- Make programme-funded training available to related disciplines across the institution to maximise capacity strengthening impact.
- Actively include research support staff (e.g. accountants, administrators, technicians) in training opportunities.
- Identify opportunities to share skills, training and good practice across programme partners.
- Establish mentorship and supervision systems which are sensitive to culture and gender; consider developing an informal contract between supervisors and students defining their roles.

3d. Research uptake

- Engage policy makers and influencers throughout the RCS programme including, if appropriate, as co-supervisors of research students.
- Develop a research dissemination plan and include research uptake training for researchers in the programme plan.

Capacity Research Unit (CRU) at LSTM: pioneering methods and approaches for RCS

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- defining the RCS goal and the pathways for change with all partners involved in the RCS programme, and
- describing the 'optimal' capacity needed to achieve the goal, based on best evidence from the literature and consultations with experts. This provides a 'benchmark' and indicators against which to assess baseline capacity and to measure and track change.

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We work closely with grant makers and review panels, using qualitative research to help them improve grant making and grant management processes. We feedback research data from site visits and consultations grant makers and RCS implementers so they can adjust and improve their programmes in real-time.

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