ICAI Independent
Commission
for Aid Impact

The UK Department of Health and Social Care's aid-funded global health research and innovation

Literature review

July 2024

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Abbreviations

ARC – Australian Research Council

AIDS – Acquired immunodeficiency syndrome

BHU – Banaras Hindu University

BMGF – Bill & Melinda Gates Foundation

CHEMAL – Chemotherapy of Malaria

CHIS – Controlled human infection study

CHNRI – Child Health and Nutrition Research Initiative

CIDG – Cochrane Infectious Diseases Group

CIOMS – Council for International Organisations of Medical Science

COHRED – Commission on Health Research for Development

DALY – Disability-Adjusted Life Year

DHSC – Department of Health and Social Care

ENHR – Essential National Health Research

ESSENCE – Enhancing Support for Strengthening the Effectiveness of National Capacity Efforts

ESRC – Economic and Social Research Council

FCDO – Foreign, Commonwealth and Development Office

FIELDMAL – Applied Field Research in Malaria

GBD – Global Burden of Disease

GH – Global health

GHE – Global Health Estimates

GHR – Global health research

GRADE – Grading of Recommendations Assessment, Development and Evaluation

HIC – High-income country

HIV – Human immunodeficiency virus

HPSR – Health policy and systems research

HRCD – Health research capacity development

ICAI – Independent Commission for Aid Impact

ICMR - Indian Council of Medical Research

IHME – Institute for Health Metrics and Evaluation

IIMMAL – Immunology of Malaria

JLA – The James Lind Alliance

LIC – Low-income country

LMIC – Low- and middle-income country

LoMIC – Lower middle-income country

MCDC – Malaria Capacity Development Consortium

MENA – Middle East and North Africa

MIC – Middle-income country

MMU – Manchester Metropolitan University

NCD – Non-communicable disease

NGO – Non-governmental organisation

NIH – National Institutes of Health

NIHR – National Institute for Health and Care Research

ODA – Official Development Assistance

PhD – Doctor of Philosophy

PSP – Priority setting partnership

RCT – Randomised controlled trial

REF – Research Excellence Framework

SAMRC – South African Medical Research Council

SDG – Sustainable Development Goal

TB – Tuberculosis

TDR - Special Programme for Research and Training in Tropical Diseases

UKCDR – UK Collaborative on Development Research

UKCDS – UK Collaborative on Development Science

UKRI – UK Research and Innovation

UMIC – Upper middle-income country

UNDP – United Nations Development Programme

UNICEF – United Nations Children's Fund

USAID – United States Agency for International Development

WHO – World Health Organisation

1.   Introduction

1.1   Scope and purpose

The Independent Commission for Aid Impact (ICAI) scrutinises UK aid spending, working to ensure that UK aid is spent effectively for those who need it most and delivers value for UK taxpayers. ICAI's mandate covers all UK Official Development Assistance (ODA). This literature review accompanies and supports ICAI's review of *The Department of Health and Social Care's aid-funded global health research and innovation*. It establishes definitions of key concepts and an overview of existing evidence on best practice in the area of global health research and innovation. The literature review is informative rather than systematic. Its scope is defined by the focus of the main review, and its aim is to summarise findings on a set of sub-questions within the following topics:

- defining global health research
- agenda-setting and priorities in global health research
- equitable research partnerships
- untying aid
- research capacity strengthening
- impact of health research.

1.2   Approach and limitations

For each topic, a set of keywords was selected to find relevant sources. We also relied on evidence synthesis articles and on the input from several experts to identify core texts within the field. Once an initial list of literature had been established, we used a snowballing approach to identify further literature. The literature review is, however, by no means exhaustive. Due to the limited time available and the breadth of relevant literature, we limited the number of sources reviewed and selected those most relevant by reviewing titles and abstracts. We were also limited by language and searched only English-language sources.

Searches were conducted first on Google Scholar, then broadened through a snowballing method of using the bibliographies of the first batch of sources to identify further materials. We also used resource hubs to source literature, particularly from the UK Collaborative on Development Research (UKCDR), and we included specific works by known authors whose contributions are central to discussions in the literature, as identified by experts consulted for this literature review. These are authors who have influenced relevant debates, as made visible by the large number of cross-references in other sources. We reviewed academic publications, in particular articles in peer-reviewed health-related journals, as well as items of grey literature, such as papers, reports, websites and blogs from relevant bodies such as the World Health Organisation (WHO) and health-focused research councils.

1.3   Structure of this literature review

Chapter 2 provides an overview of how global health research can be defined, before turning to the benefits that this research can yield for low- and middle-income countries (LMICs). **Chapter 3** looks at how and by whom strategic directions and agendas are decided in global health research, including how research gaps are identified. **Chapter 4** looks at equitable research partnerships, asking what the key principles underpinning equitability are and what the obstacles are to achieving them. **Chapter 5** discusses tied aid and how untying

official development assistance provided to global health research can support better value for money and an agenda more driven by LMIC partners. **Chapter 6** addresses literature on research capacity strengthening, while **Chapter 7** focuses on what research impact might look like for ODA-funded global health research.

2. What is global health research and what are its benefits?

2.1 How is global health research defined?

Global health research can broadly be defined as international scientific study aimed at understanding health issues, developing interventions, and improving health outcomes across diverse populations and regions. The aim is to improve health outcomes and achieve health equity globally, but with a focus on Low- and middle-income countries (LMICs) since their burden of ill health is more severe.

Within general agreement on this broad definition, there is significant variation in the literature on what components should be included in the term 'global health research'. Some authors view this as a problem. For instance, Koplan et al. (2009) note that "we cannot possibly reach agreement about what we are trying to achieve, the approaches we must take, the skills that are needed, and the ways that we should use resources if international or global health is not distinctly defined. More than a decade later, Garcia-Basteiro and Abimbola (2021, p. 1) echoed the same concern, writing that "a clearer definition of global health research would be useful, given that we have now created global health research structures that need to decide on strategy, content, priorities and action."

Below, we discuss the many elements of the global health research definition, including its global, interdisciplinary and multi-dimensional nature, the focus on primary health care and public health, and its foundation in the principle of equity and the health needs of LMICs.

In 2006, Merson, Black and Mills (2006) defined 'international health' as "the application of the principles of public health to problems and challenges that affect low- and middle-income countries and to the complex array of global and local forces that influence them". Koplan et al. (2009) differentiate among public, international and global health and define the latter as follows: "Global health is an area for study, research, and practice that places a priority on improving health and achieving equity in health for all people worldwide. Global health emphasises transnational health issues, determinants, and solutions; involves many disciplines within and beyond the health sciences and promotes interdisciplinary collaboration; and is a synthesis of population-based prevention with individual-level clinical care."

Beaglehole and Bonita (2010), building on Koplan et al., define global health as "collaborative trans-national research and action for promoting health for all" (p. 1). The authors emphasise collaboration across borders due to the complex nature of the subject and the multitude of actors whose involvement is seen as critical. They also stress the significance of the 'research' part of the global health research definition, emphasising the need to build the foundation for global health policies rooted in evidence.

Global health research is a multi-dimensional and interdisciplinary field. Merson, Black and Mills (2022) note that the skills needed to address global health and develop relevant strategies are held by professionals in diverse disciplines and academic areas. Besides sciences within the biomedical and environmental area, these disciplines include public policy, history, engineering, business and management. Anthropologists, sociologists, economists and psychologists can also be experts within global health research, as can political scientists and professionals

within the international relations sector. In addition to the multi-dimensionality of the subject, Merson, Black and Mills refer to the aims and objectives of global health as another reason for using an approach that cuts across different disciplines.

'Primary health care' is often included as part of the definition of global health. The World Health Organisation (WHO) defines primary health care as "a whole-of-society approach to health that aims at ensuring the highest possible level of health and well-being and their equitable distribution by focusing on people's needs and, as early as possible, along the continuum from health promotion and disease prevention to treatment, rehabilitation and palliative care, and as close as feasible to people's everyday environment" (WHO, 2023a). The significance of primary health care for global health was internationally recognised at the Alma Ata conference hosted by WHO in 1978. The conference resulted in the goal of "the attainment by all peoples of the world by the year 2000 of a level of health that will permit them to lead a socially and economically productive life". To achieve this goal, primary health-care service delivery was prioritised (WHO, 1978).

The concept of 'public health' is also closely linked to global health, and often listed alongside primary health care. Beaglehole and Bonita (2010) advocate for adopting all strategies available within the public health sector, ranging from health promotion to studies of the causes of health from social, political, environmental and economic perspectives. With the formulation 'health for all', Beaglehole and Bonita argue that a priority for global health is "the resurgence of interest in multi-sectoral approaches to health improvement and the need to strengthen primary health care as the basis of all health systems" (p. 2). They draw a connection to the Alma Ata Declaration adopted by WHO in 1978.

'Equity' is another key element within most definitions of global health. Beaglehole and Bonita (2010) emphasise the need to advance health, and equity within health, by using evidence effectively and globally (p. 2). The notion of 'health for all' links to health inequalities, following Braveman's (2006) definition: a "difference in health or in the most important influences on health that could potentially be shaped by policies; it is a difference in which disadvantaged social groups...systematically experience worse health or greater health risks than more advantaged social groups".

LMICs and LMIC institutions are central to most definitions of global health. Global health is often understood to include a collective effort among countries to tackle the broad determinants of public health in LMICs. Global health often focuses on health problems that arise out of inequity. While the issues addressed through global health research may be global, they pose particular challenges for the poor and the disadvantaged (Simon et al. 2007). This framing also aligns with Koplan et al. (2009), who state that "the global in global health refers to the scope of problems, not their location" and associate global health with disparities as well as cross-border issues.

Kumbhar et al. (2023) emphasise 'generalisability' as a key aspect of the definition of global health research. By drawing on the COVID-19 pandemic and the Nipah virus, Kumbhar et al. illustrate the twofold effect of globalisation and increased international connectivity for global health. While globalisation enhances the spread and transmission of diseases, it also fosters an environment of increased international collaboration in resource-sharing, research and surveillance. A virus in one part of the world can quickly affect populations and health-care systems in other areas, as experienced during the COVID-19 pandemic. Therefore, while global health research is often situated in specific contexts, it can inform approaches and measures across borders.

A systematic review of how the academic literature defines global health has recently been conducted by Salm et al. (2021). The systematic review concludes that a common definition 'remains elusive' as different definitions used by different authors reflect the authors' specific priorities. Salm et al. note that the question of 'what is defined' is linked to 'who defines' (and their objectives). The systematic review argues that global health literature can be divided into four categories: "(1) global health is a multiplex approach to worldwide health improvement taught and pursued at research institutions; (2) global health is an ethically oriented initiative that is guided by justice principles; (3) global health is a mode of governance that yields influence through problem identification, political decision-making, as well as the allocation and exchange of resources across borders and (4) global health is a vague yet versatile concept with multiple meanings, historical antecedents and an emergent future." (Salm et al., 2021, abstract)

The systematic review has a useful table providing an overview of some of the main definitions of global health between 2009 and 2019 (Salm et al., Table 2, pp. 5-6). The review article sets out the ethical, ideological and other differences underpinning the great variation in how global health is understood. However, it also notes that there is agreement at a broad level on what global health is: "Between 2009 and 2019, GH [global health] was most commonly defined in the literature in broad and general terms: as an area of research and practice committed to the application of multidisciplinary, multisectoral and culturally sensitive approaches for reducing health disparities that transcend national borders" (p. 12).

Based on the papers examined here, and in particular the conclusions of Salm et al.'s systematic review, we define global health research as research aiming to advance knowledge and innovation to improve health outcomes and achieve health equity globally, centred on health problems and solutions in LMICs, where the burden of ill health is highest.

2.2   What are the benefits of global health research for LMICs?

Strengthening research capacity and research infrastructure in LMICs

The previous section noted the collaborative and transnational nature of global health research. Flowing from this, global health research is often conducted through partnerships involving institutions and researchers in high-income countries (HICs) and low- and middle-income countries (LMICs), with many of the research activities taking place within LMICs. While we will discuss the quality and equity of such partnerships later, the literature notes that global health research, when done well, helps increase research activity in LMICs and can help LMICs develop and increase their own research capacity and expertise (Lester et al. 1998; Cooke, 2005).

LMICs benefit not only from increasingly skilled researchers and stronger research infrastructure, but also from a widened evidence base as more research activities take place within the country. In turn, a widened evidence base allows LMICs to have a stronger voice in the global discourse and the ability to further influence research activities to engage with topics of interest for LMICs. UKCDR (2021a), in a review of UK Official Development Assistance and Wellcome-funded research capacity strengthening activities between 2016 and 2021, note that strong research and innovation capacities in LMICs underpin socio-economic development and can help LMICs collaborate on climate change, food security and the spread of epidemics, to everybody's benefit.

English and Pourbohloul (2017) note the positive effect of supporting publications related to health policy and systems research (HPSR) initiatives and of strengthening research capacity in LMICs. HPSR is a multidisciplinary

research field seeking "to understand and improve how societies organise themselves in achieving collective health goals [...] It also considers how different actors interact in the policy and implementation processes" (Alliance and WHO, 2024).[1] By analysing the knowledge-generation trends regarding HPSR between 1990 and 2015, English and Pourbohloul identify an exponential increase in LMIC-based lead authors in life and biomedical science studies, and they point out that the number of LMIC-led publications addressing relevant topics for LMICs grows more quickly than general publications in the life and biomedical science field.

Ensuring research relevance to country contexts

The definition of global health research includes a focus on equity and on health challenges affecting poorer communities, thus ensuring that global health research has particular relevance for LMICs and for vulnerable communities within LMICs. With more research-experienced and engaged practitioners, professionals and researchers, LMICs can conduct and commission their own research projects, independently of HIC funding priorities. This enables LMICs to direct research efforts to topics of higher relevance to their own context and needs.

Strong research capacity can translate to direct effects in the health sector through skilled practitioners and professionals, impacting the health system and adding value. However, Sam-Agudu et al. (2016) point out the importance of and limitations posed by local research infrastructure (see section 3.3).

Context-relevant research is as important for non-communicable as for communicable diseases, particularly as "the burden of noncommunicable diseases (NCD) continues to rise across the globe, and the risk of dying prematurely from an NCD in a [...] LMIC is almost double that in a high-income country" (Malekzadeh et al., 2020). The authors conclude that "[i]nvesting in research capacity strengthening in LMICs is critical to effectively combating disease, and local researchers are best poised to address the health challenges in their home countries given their understanding of the unique culture and context in which they are working."

A recent article by Pramesh et al. (2022) confirms this point with a specific focus on cancer research, finding that this is "heavily skewed" toward HICs, with little research conducted in and relevant to LMICs. The article argues that LMICs face a "double burden of disease, with non-communicable diseases, including cancer, rising rapidly alongside continued morbidity and mortality from infectious diseases". The article lists four issues with the dominance of HIC-based studies in cancer research: Cancers that are particularly prevalent in LMICs receive less attention; cancer control strategies that are effective in HICs are not always applicable in LMICs; health systems research is highly context-specific due to variations in resources, infrastructure and socio-cultural values; and many interventions developed in HICs are too costly to be implementable in LMICs.

3.   How are strategic directions and agendas decided in global health research?

3.1   How are global health research needs traditionally identified?

A widely used concept within global health research is the 'global burden of disease', which covers the collective impact of diseases, injuries and risk factors on the health of populations worldwide, often measured in terms of

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[1]   The Alliance for Health Policy and Systems Research, which is a partnership hosted at WHO headquarters, is a useful resource for research done in the area of HPSR. See the Alliance website: link.

mortality, morbidity, disability-adjusted life years, or economic costs. The World Health Organisation (WHO) and the World Bank introduced the Global Burden of Disease (GBD) Study in 1991 to address the lack of an exhaustive and uniform information source on the global burden of diseases, risks and injuries (Murray et al., 2013). The GBD study remains the most comprehensive worldwide epidemiological "effort to quantify health loss across places and over time, so health systems can be improved and disparities eliminated".[2] It is led by the Institute for Health Metrics and Evaluation (IHME) in Seattle, US, and publishes regular updates on global data on mortality and morbidity covering 204 countries and territories and 459 health outcomes and risk factors.[3] The GBD produces a single metric, the Disability-Adjusted Life Year (DALY), which combines years lost due to premature mortality and years lived in states of less than full health such as with a disability, with one DALY equalling one year of full health lost (WHO, 2020, p. 6).

Murray et al. (2013) argue that the GBD studies offer a uniform approach to assessing health conditions, comparing findings and generating estimations for countries with gaps in their datasets. The approach includes internal validity checks, such as combining "demographic data on all-cause mortality according to the year, country, age and sex ... with data on cause-specific mortality to ensure that the sum of the number of deaths due to each disease and injury equalled the number of deaths from all causes" (Murray et al., 2013, p. 448). This guarantees that the total number of deaths attributed to each disease or injury corresponds to the sum of all deaths.

The WHO's Global Health Estimates (GHE) (WHO, 2023b) build on GBD studies and other data to provide updates on global, regional and country trends in mortality and morbidity – with the latest available update covering the year 2019.[4]

Critics of the GBD and GHE such as Vaughan et al. (1996a), Vaughan et al. (1996b) and Stuckler et al. (2008) are concerned that the GBD studies dictate where global health efforts should be directed by channelling funding to those subjects that are seen as the most relevant in the context of the global burden of disease. Sridhar (2012) finds a strong correlation between the global burden of disease data and WHO core spending. This illustrates the power of the global burden of disease concept in agenda-setting and the risk that some diseases that are not prominent in GBD data will be neglected.

Hategeka et al. (2022), for instance, argue that evidence on the implementation of prevention and control interventions targeted at priority non-communicable diseases (NCDs) in LMICs is insufficient and suggest that this is linked to the domination of the GBD. It is also argued that the burden of disease concept fails to capture the multidimensionality of global health (and, consequently, global health research). Health is a complex field that exists within a web of interlinkages and overlaps with other fields. The Sustainable Development Goal (SDG) 3 'Good health and well-being' provides evidence for this complexity. One example of a strong interlinkage between health and another field is the impact of malnutrition on health. If food is scarce or of low quality, a person's health can be compromised. Likewise, poverty can negatively affect a person's health due to the inability to pay for medical procedures or medications. Thus, to improve global health, it is necessary not only to look at health and health care but to include activities and programmes indirectly impacting global health. Hategeka et

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[2]   Quotation is from the IHME Global Burden of Disease (GBD) website, link. The GBD pages of the Lancet can be accessed here, link.
[3]   The main findings from the latest GBD study, GBD 2021, can be found here, link.
[4]   The Global Health Estimates webpage can be accessed here, link.

al. (2022) argue that the vertical approach of the burden of disease concept neglects the multidimensionality of global health challenges.

Other methods beyond reference to GBD data are also used to decide research priorities. Wong et al. (2021) assess methods used by research funding organisations to identify gaps, needs or priorities in health research, noting that most funding organisations relied on workshops and meetings to assess gaps and priorities. Quantitative means such as the James Lind Alliance approach[5] were also used. The latter refers to a priority- and research needs-setting process including multiple stakeholders, where importance to stakeholders is the most established criterion for identifying priorities, needs and gaps. Wong et al. (2021, p. 204) conclude that "to ensure optimal targeting of funds to meet the greatest areas of need and maximise outcomes, a much more robust evidence base is needed to ascertain the effectiveness of methods used to identify research gaps, needs, and priorities".

3.2   Strategic direction-setting in global health research portfolios

Global health research is mainly financed by funding bodies in HICs, and major funders can influence the direction of research projects in global health through their financial contribution and dominance. Funders such as the US National Institutes of Health, the European Commission, the Bill & Melinda Gates Foundation (BMGF), and the US Agency for International Development (USAID). In the UK, the Foreign, Commonwealth and Development Office (FCDO), the Department of Health and Social Care (DHSC), and the National Institute for Health and Care Research (NIHR) play a strong role in strategic direction-setting in global health research portfolios. A 2016 study found that the ten top funding organisations in public and philanthropic health research spending provided 40% of all funding globally, and that there was insufficient transparency on how decisions are made on what to fund and what evidence is used in this decision making (Viergever and Hendriks, 2016).

McCoy et al. (2009), looking at BMGF grant-making programmes for global health between January 1998 and December 2007, argue that its "support of vertical, disease-based programmes can undermine coherent and long-term development of health systems, and its sponsorship of global health policy networks and think tanks can diminish the capabilities of ministries of health in low-income and middle-income countries" (p. 1652). McCoy et al. consider the predominance of UK- and US-based grant recipients a reflection of wider discrepancies between the Global North and the Global South "while neglecting support for the civic and public institutional capacities of low-income and middle-income countries" (p. 1652).

Since then, the UK Collaborative on Development Research (UKCDR) has provided guidance for funders that includes a strong emphasis on inclusive agenda-setting. In UKCDR's guidance *Ten ways funders can influence equitable partnerships* (UKCDR, 2021), inclusive agenda-setting is first on the list. The guidance states that inclusive agenda-setting is about working "with governments, funders and research communities in low- and middle-income countries (LMICs) to develop research programmes that meet their needs. This requires taking the time to develop strategic priorities independent of budgetary pressures and being open and honest about the objectives of funders." ESSENCE on Health Research[6] has conducted pilot studies on harmonisation and the optimisation of resources together with government partners in Tanzania and Zambia to assess how best to

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[5]   'The James Lind Alliance (JLA) is a UK-based non-profit initiative that was established in 2004. The JLA process is focused on bringing patients, carers and clinicians together, on an equal basis, in a priority setting partnership (PSP) to define and prioritise uncertainties relating to a specific condition. (Nygaard et al., 2019)

[6]   ESSENCE on Health Research is an initiative to help donors and funders to identify synergies and strengthen the coherence and value of resources and action for health research. For more on ESSENCE's pilot studies on harmonisation with national agendas, which are not published, see its webpage, here: link.

ensure that donors support country-level mechanisms for coordination, harmonisation and alignment of different donors' funding with national agendas.

Funders are not the only Northern-based actors involved in setting global health research agendas. Several institutions whose work centres on collating systematic evidence and influencing policy based on this evidence play a key role in directing the focal point of global health research portfolios, both in and outside the countries where the research takes place. One example is the Cochrane Infectious Diseases Group, based at the Liverpool School of Tropical Medicine and a WHO Collaborating Centre in Evidence Synthesis in Global Health. Cochrane reviews are systematic reviews on the benefits and harms of health-care interventions for infectious diseases with the aim of impacting on policy and research. So far, more than 100 Cochrane reviews have been published, involving 1,000 authors from around 52 countries, many of which have contributed to global guidelines.[7]

When looking at middle-income country (MIC) contexts, there are two prominent examples of strategic direction- setting: the South African Medical Research Council (SAMRC) and the Indian Council of Medical Research (ICMR). The SAMRC is South Africa's largest funder of health research, medical diagnostics, medical devices and therapeutics, and directs its efforts to researching what it calls the country's quadruple burden of disease: maternal, newborn and child health; Human immunodeficiency virus/ acquired immunodeficiency syndrome (HIV/AIDS) and tuberculosis (TB); non-communicable diseases; and interpersonal violence (SAMRC, 2024). SAMRC offers tailored funding to South African researchers, which enables them to conduct highly relevant studies for the local context. Likewise, ICMR pays particular attention to "the need of finding practical solutions to the health problems" of India while also maintaining an outward look at the wider biomedical research landscape (ICMR, 2024).

Sparked by the importance placed on national health research in LMICs by the Commission on Health Research and Development in 1990, different health research priority-setting methods have been developed (McGregor et al., 2014). Among these are formalised approaches such as the Delphi method of structured communication relying on panels of experts, the Child Health and Nutrition Research Initiative (CHNRI) and the Essential National Health Research (ENHR) method, as well as step-by-step approaches such as early literature review, followed by data collection and discussions with stakeholders (McGregor et al., 2014).

3.3   How have LMICs prioritised and addressed gaps in global health research?

The ability of LMICs to prioritise and address gaps in global health research is dependent on the level of research capacity and financial constraints – with the two reinforcing each other. Sridhar (2012) argues that if LMICs are unable to clearly identify priorities, this increases the likelihood that research is directed by the aims and objectives of HIC funders. Ali et al. (2006) voice concern that the priorities of LMICs can be shifted and LMIC-led national research can be weakened by the funders' main concerns and aims.

Within their analysis of 126 papers, McGregor et al. (2014) find that most research priority-setting methods took place at a global scale, concentrating on LMICs but with international actors as initiators. Obstacles such as limited capacity or challenges around engaging stakeholders are mentioned as affecting research prioritisation within LMICs. McGregor et al. (2014, p. 7) conclude that "the use of established strategies to determine priorities currently provide the most useful tools to ensure conduct [sic] in a transparent and repeatable manner. Without

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[7]   See Cochrane Infectious Diseases website here, link.

evidence of implementation and ultimately health outcomes, it remains challenging to assess the quality and impact of health research priority setting strategies in LMICs".

A systematic review of global health capacity building initiatives in LMICs in the Middle East and North Africa (MENA) region was conducted in 2020 (Naal et al., 2020). The review identifies gaps in the alignment of global health capacity building initiatives and local needs. It found, for instance, that capacity-strengthening activities addressing NCDs, despite being core to health needs across the MENA region, were concentrated in Iran and Egypt only, and that conflict-affected MENA countries needed a stronger emphasis on emergency-related capacity building topics. There were very few records of global health capacity- building initiatives in many of the countries covered.

Naal et al. (2020) found a high number of global health capacity building (GHCB) initiatives in Iran, which also had the most academic research outputs to disseminate GHCB results. The authors suggest that this finding may be linked to "the availability of local funding for their initiatives, as opposed to the rest of the countries that seemed to rely on international funding from HICs" (p. 16). The authors argue that this "may be an important indication supporting the need to prioritise the allocation of resources and funding from local sources to encourage the development, implementation and dissemination of GHBC initiatives".

Pai (2022) argues that HICs still hold a monopoly over every element of global health. This aligns with Ong'era, Stewart and Bukusi (2021), who point out that researchers in LMICs would still have fewer or lower-quality resources to conduct studies if they were setting research priorities. This was already highlighted by Yegros-Yegros et al. (2020), who see a persistent imbalance between research needs and research efforts because diseases affecting HICs are favoured.

To answer the question of how LMICs prioritise and address gaps in GHR, it is essential to draw attention to the multiple limitations and challenges that inhibit LMICs addressing gaps in the first place. Most obviously, financial resources are a challenge, as the literature illustrates. Not only do LMICs have more limited financial resources to engage in the prioritisation process, but the financial power of HICs and funders also influences which topics in GHR are addressed.

4. How are equitable partnerships understood and operationalised in global health research?

4.1 What are the established principles of equitable research partnerships?

The Equitable Partnership Resource Hub of the UK Collaborative on Development Research (UKCDR) provides a good starting point for an overview of definitions and key principles of equitable partnerships.[8] The resource hub contains a number of guidance documents, reports and templates for UK government, Wellcome and other funders, as well as for research institutions based in the UK and other high-income countries (HICs), on promoting, establishing and strengthening equitable partnerships with research partners in low- and middle-income countries (LMICs). ESSENCE on Health Research[9] is an initiative based at the World Health Organisation

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[8]   Equitable Partnerships Resources Hub, UK Collaborative on Development Research, link. UKCDR also has a Research Capacity Strengthening Resource Hub, link.
[9]   ESSENCE on Health Research is an initiative to help donors and funders to identify synergies and strengthen the coherence and value of resources and action for health research, with capacity strengthening and equitable partnerships an increasingly central part of the initiative's focus. For more on ESSENCE, see its webpage, link.

(WHO) that supports mostly HIC donors and funders to pursue equitable partnerships in their funding decisions and practice. UKCDR defines equitable partnerships as follows: "Partnerships in which there is mutual participation, mutual trust and respect, mutual benefit and equal value placed on each partner's contribution at all stages of the research process."

4.2　What is good practice in establishing and strengthening equitable research partnerships?

The Good Practice document by UKCDR and ESSENCE (2022) provides a useful overview of current thinking on approaches that support equitable partnerships, from a donor or funder perspective. The document sets out ten ways for funders to help make research partnerships more equitable:

1. Prioritise inclusive agenda-setting.
2. Fund new research questions and value. complementary indigenous skills and knowledge
3. Set the tone around expectations of equity within partnerships.
4. Reward skilled project managers and team players
5. Look for equity beyond the project leaders.
6. Check for equity in budgets and in all aspects of financial and research management.
7. Continuously strengthen institutional capacity.
8. Widen participation by supporting new research partnerships and look beyond the 'usual suspects'
9. Invest for the long term.
10. Collaborate and learn from other funders and agencies in the North and South.

There is convergence in the literature on the need for patient and comprehensive approaches to building equitable partnerships. Alba et al. (2020) argue that, in global health research, study design and preparation must be undertaken in collaboration with local partners and include representatives of the affected populations. The UKCDR and ESSENCE Good Practice document offers four complementary or interconnected approaches that funders, research institutions and researchers need to consider in their pursuit of equitable partnerships: understand the ecosystem, build relationships, allocate resources and transform processes. It offers recommendations for funders, research institutions and researchers under each approach. The document recognises that equitable partnerships take time and considerable effort to build and involve addressing structural inequalities between HIC and LMIC institutions, such as paucity of research funding, infrastructure and facilities, through transformative systems-based approaches (UKCDR and ESSENCE, 2022, p. 19).

Despite the inherent challenges in a complex, evolving field, several papers go further than articulating the broad themes of change required for a more equitable global health research field and attempt to set out more specific guidance.

Larkan et al. (2016) share an evidence-based partnership framework using a series of core concepts. They integrate relational and operational aspects, noting that both are equally important to partnerships. The authors argue that while attributes vary across different collaborations, a number of core concepts tend to remain the same: focus, values, equity, benefit, communication, leadership and resolution. These then lead to outcomes of increased capacity which influence access to services. This in turn leads to successful research partnerships in global health. All partners must engage with these seven core concepts to function effectively, but the authors stop short of suggesting ways to validate the operationalisation of such concepts.

Beran et al. (2017) attempt to define a set of 'obligations' for different partners involved in research capacity building, including those of HIC and LMIC universities and researchers, LMIC governments and journals, such as:

- For HIC funders: Mandate that proposals are developed in equal partnership with LMIC researchers; increase funding for epidemiological, qualitative and health system work to understand the local burden of disease, health care beliefs and other local contexts.
- For HIC universities: Ensure time and funding within grants for HIC researchers to travel to LMICs for in-person training, and consider secondments for LMIC researchers in HICs.
- For LMIC universities and researchers: Be firm in declining collaborations that do not fit with local priorities; ensure adequate training, funding and time for researchers to contribute to manuscripts.
- For journals: Ensure fee waivers for open-access publication where research is not directly supported by HIC funders.

Some authors focus specifically on authorship of journal articles and credit for research contributions. Morton et al. (2022) offer specific pragmatic guidance on equitable authorship and the role of academic journals in the context of international health research partnerships, along with defined actions to promote change and equity. These include recognition of journals' and journal editors' responsibility to leverage their formal power within the scientific publication process to promote equitable partnerships, the removal of arbitrary limits on numbers of permitted authors to support equitable inclusion of LMIC contributors, and the inclusion of structured reflexivity statements where research is published from LMICs by collaborations including one or more HIC partner.

There is general agreement across the literature that although principles and intentions on equitable partnerships have become widely acknowledged and accepted, in practice there is still a long way to go. While global health research studies have become more diverse with respect to ethnicity, geography and socioeconomic factors, there is uncertainty around the subject trends, geographies and authorship with LMICs (Ghani et al., 2021). Ghani et al. looked at the question of where LMIC publications and authors came from in scientific articles published between January 2014 and June 2016 in the four most prominent general medicine and five most prominent general global health journals. They found that no local authors were named in 28.8% of all assessed articles. Similar findings have been identified by others (Kelaher et al., 2016; Odjidja, 2021; Rees et al., 2022). Ghani et al. (2021, p. 96) conclude that without having basic information about "the subject areas of this research, where it is being conducted, and who is receiving the credit for conducting it", there is a "risk of inadvertently promoting the same type of overgeneralisation and disproportional representation that researchers in this field aim to address".

Yegros-Yegros et al. (2020) conducted a quantitative study of global health journal authorship which found that "LMICs make up roughly 85% of the global population and 90% of the global disease burden, while they only produce around 20% of publications. It is worth highlighting as well that UMICs [upper-middle-income countries] produce most of the research outside HICs (17% of total). UMICs include China, most of Latin America, Russia and South Africa. LoMICs [lower-middle-income countries], whose production is dominated by India, account for 3.4% of publications. LICs only produce 0.6% of the world's publications."

Yegros-Yegros et al. (2020, p. 9) also found that in 75% of cases when authors in LICs are published in high-citation journals this was related to research conducted in international partnerships with HICs, while for authors based in middle-income countries (MICs) and HICs, 20% of publications were with international partners. The

authors note that this leads to the artefact of LIC-based researchers in their sample having higher citation rates than MIC-based ones. Looking at MIC-based authors specifically, Yegros-Yegros et al. (2020, p. 12) found that the articles of MIC-based researchers are more likely to be cited if they address diseases that are more prevalent in HICs. They suggest that this may be because there "might exist incentives, either in terms of funding or academic rewards, for researchers to publish in [typically HIC-prevalent] diseases", albeit noting that this conclusion is speculative.

In recognition of the gap between theory and practice, recent guidance tends to be more attentive to the question of how to overcome the many structural barriers to equitable partnerships, and several academic articles have set out practical approaches towards achieving equity. However, many authors continue to be pessimistic about overcoming the structural power imbalances (historical, financial and infrastructure) that form stubborn barriers to equitable partnerships.

The scoping review by Voller et al. (2022, pp. 523-24) notes that "partnerships between institutions in the Global North and the Global South have been beleaguered by structural inequalities and power imbalances, and Northern stakeholders have been criticised for perpetuating paternalistic or neo-colonial behaviours." It finds that the worst examples of extractive behaviour from HIC-based academics are no longer commonly reported in recent literature, but that structural inequalities and historical legacies continue to entrench power differentials and Northern advantage – including in funding relations, agenda-setting, authorship of research outputs and many other areas. The scoping note concludes that there is little available evidence on how equitable partnership guidance is used in practice and that stakeholders in LMICS have been under-represented in developing the guidance in the first place.

Many authors argue that radical change in how global health is seen, understood and pursued is needed if equity and diversity goals are to be achieved. Dodson (2017, p. 2)[10] quotes Carbonnier and Kontinen (2014) arguing that: "The very notion of North-South partnership has turned into yet another development buzzword. Virtually everyone seems to agree with it in principle, but actual practice shows that implementing equitable partnerships is difficult: money flows tend to determine decision-making and actual division of labour."

Some scholars link the call for equitable partnerships to decolonisation. Gedela (2021) calls for a greater emphasis on colonialism's impact on the social, systematic and political context in LMICs and the relations within those countries. Ong'era, Stewart and Bukusi (2021) argue that equitable partnerships and a power shift are possible only when the careers of local researchers and the renewal of research setups in LMICs are given equal priority to those in HICs.

Kwete et al. (2022) recap the key outcomes of a 2021 Symposium in Wuhan, China, hosted by the editorial board of the *Global Health Research and Policy* journal. The discussion focused on what 'global health decolonialisation' looks like and the criteria for assessing whether it has been accomplished. Although framed in the language of 'decolonialisation', the participants' call for a power shift to achieve equitable partnerships is not very different from the view taken by UKCDR, ESSENCE and other HIC-based bodies, which also acknowledge colonial legacies and structural inequality and the need for transformative systemic approaches to overcome these.

Hodson et al. (2023) have developed a Douala Equity Checklist, designed to evaluate global health research projects from a decolonisation perspective during the funding screening and application process, and it is

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[10]   Dodson (2017) presents in the report 'Ten ways for funders to influence equitable partnerships' (Appendix)

targeted at both HIC training institutions and LMIC institutions. The authors recommend that "all team members receive training/education in the history of global health" in areas such as ethics, colonial origins and harms, and LMIC innovations applied in HICs as part of a project's design phase. During a project's execution phase, the authors recommend that "team members from both institutions [LMICs and HICs] ... be trained in the workflows, innovations and technologies of each institution". In the 'analysis and dissemination phase', the authors recommend, for example, publishing manuscripts in multiple languages, including in a language that is accessible to other professionals from the LMIC in which the research took place.

5. Tied aid and its relationship to equitable partnerships

5.1 What is untied aid and why is it desirable?

Tied aid is the "offering of aid on the condition that it be used to procure goods or services from the provider of the aid". In 2001, the UK and other donors in the Organisation for Economic Development's Development Assistance Committee (OECD-DAC), which agrees on common principles and collects donors' official development assistance (ODA) data, adopted a recommendation to untie their aid. Untied aid means ODA funding that does not come with an obligation for low- and middle-income countries (LMICs) to use it to procure goods and services from the donor country (OECD, no date). The International Aid Transparency Initiative (IATI), which provides donor standards for reporting ODA, provides the following definitions for how donors should code their aid when reporting their ODA spending:

- Partially tied: ODA "for which the associated goods and services must be procured from a restricted number of countries, which must however include substantially all aid recipient countries and can include the donor country".
- Tied: "Official grants or loans where procurement of the goods or services involved is limited to the donor country or to a group of countries which does not include substantially all aid recipient countries".
- Untied: "[L]oans and grants whose proceeds are fully and freely available to finance procurement from all OECD countries and substantially all developing countries." (IATI, no date.

The OECD-DAC recommendation endorses the principles that untying aid improves aid efficiency: "Untying aid – removing the legal and regulatory barriers to open competition for aid funded procurement – generally increases aid effectiveness by reducing transaction costs and improving the ability of recipient countries and territories to set their own course". The OECD-DAC notes that "evidence has shown that 'tied aid' [...] can increase the costs of a development project by as much as 15 to 30 percent. Untying aid, on the other hand, avoids unnecessary costs and gives the recipient the freedom to procure goods and services from virtually any country". (OECD, n.d).

The OECD-DAC links untied aid to effective and equitable partnerships. Its rationale for untying aid includes the observation that untying aid can help donors "foster co-ordinated, efficient and effective partnerships with developing countries", "strengthen the ownership and responsibility of partner countries in the development process" and promote partner countries' "integration into the global economy" while "maintaining a basic sense of national involvement in donor countries alongside the objective of calling upon partner countries' expertise" (OECD, no date).

5.2   Tied aid in ODA-funded research

Tied aid has been a long-standing issue in ODA-funded research. ICAI has previously assessed the tied aid status of two large ODA-funded UK aid funds, the Global Challenges Research Fund (GCRF) and the Newton Fund. For the GCRF, ICAI's report concluded that most of the research funding "require[s] a UK research institution to be the primary applicant for funds, even though partnerships with Southern institutions as sub-grantees are encouraged. This has the effect of excluding universities from both developing countries and other donor countries from applying directly to the GCRF – although both are present in GCRF-funded research consortia. In addition, grants from the GCRF through the Funding Councils are available exclusively to UK higher education institutions." ICAI requested the UK government to "look further into whether the funding conditions of the GCRF are consistent with the UK government's established position on tied and untied aid" (ICAI, 2017, p. 27).

In the case of the UK's Newton Fund, ICAI noted that although the UK government reported aid spent through the Fund as untied because it was categorised as 'free-standing technical cooperation', it appeared to be "tied aid in spirit", since "UK aid is [...] almost entirely used to fund UK institutions' participation in the partnership". Only 11% of UK Newton Fund's ODA funding appeared to be spent in partner countries (ICAI, 2019, pp. 26-27). The report recommended to the UK government that it "should ensure that the funding practices of the Newton Fund comply with both the letter and the spirit of the untying commitment" (ICAI, 2019, p. 31).

Soon after ICAI's report, the Centre for Global Development (CGD) wrote a report on aid untying focused on UK ODA-funded research spending. In line with the ICAI report, the CGD authors questioned whether UK ODA for research was in the spirit of the UK's commitment to untie aid (Robinson et al., 2019, p. 12). The report found the UK to be a leading donor on ODA-funded research, but noted that part of the explanation for this could be that other donors do not classify research as aid to the extent that the UK does (Robinson et al., 2019, p. 3). The authors found that the largest individual sector of UK research ODA was "medical research". However, they also found that the largest category of UK research ODA was not classified according to sector at all (medical, education, environment, etc), but simply classified as "research/scientific institutions", a category that the authors suggest can be best described as "miscellaneous". The sub-classification under "research/scientific institutions" was often merely given as "other technical assistance". The authors conclude that the UK reporting on ODA for research "may reflect ill-defined research spend or limited information at the reporting level" (Robinson et al., 2019, pp. 6-8). Among the negative consequences of tying aid for research, Robinson et al. include that it means UK-based research institutions, as the recipient of most UK research ODA, have too much say in where and on what research funds are spent, without sufficient account taken of development considerations (Robinson et al., 2019, p. 12).

5.3   Tied aid in global health research

ICAI did not find literature directly concerned with the concept of 'tied aid' in global health research, but some articles are relevant to the issue without using the term 'tied aid' directly, and often link it closely to the issue of equitable global health research. Cassola et al. (2022) attempt to evaluate ODA-funded granting mechanisms for global health and development research initiated in high-income countries and mention the need to untie aid in this area (citing ICAI's 2019 report on the Newton Fund) without further discussion of the term. Charani et al. (2022) ask if HIC funders and donors are the "missing link in equitable global health research". The authors note that global health research remains "mired by inequities" and that one of the reasons for this is that funders and

donors perpetuate power imbalances through the way in which they disburse their funding, mainly providing funding through their own domestic research institutions to work on global health. The authors argue that: "Funders and donors in HICs should address inequities in their approach to research funding and proactively identify mechanisms that assure greater equity – including via direct funding to LMIC researchers and direct funding to build local LMIC-based, led, and run knowledge infrastructures. To collectively shape a new approach to global health research funding, it is essential that funders and donors are part of the conversation."

Erondu et al. (2021) argue in an editorial in Nature Medicine – without mentioning the concept of tied aid – that the funding model used by HIC-based donors and funders needs to change. The authors argue that there is currently "a more overt [global] stance against what public-health practitioners in both high-income countries and low-income countries have known all along: that the predominant global health architecture and its business model enable 'western' institutions to gain more than, and sometimes at the expense of, the people and institutions in the countries where the actual problems are" (Erondu et al., 2021).

6. Definitions of and approaches to research capacity strengthening

6.1 How is global health research capacity development defined and operationalised?

What is health research capacity development?

A comprehensive definition of health research capacity development (HRCD) is provided by the former Commission on Health Research for Development (COHRED, 1990) and taken up by Lansang and Dennis (2004, p. 764). HRCD is understood as 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.

As the overall definition above shows, research capacity strengthening is generally understood to involve three inter-connected levels: individual, institutional and societal/environmental (national and international) levels. The ESSENCE guide for funders on research capacity strengthening explains the three levels as follows (TDR, 2023b, p. 15):

- "the individual level – primarily through PhD studentships, post-doctoral fellowships and research management training
- the institutional level – relevant to physical facilities and resources, staff levels and skills, research systems and cultures of learning and teaching, and
- the (inter)national or societal level – how knowledge is produced, translated and disseminated within and beyond the academy through research uptake, collaborations and networks."

The 2022 UKCDR report on *Research capacity strengthening: lessons from UK-funded initiatives in low- and middle-income countries* has a similar division into intersecting individual, institutional and environment levels:

- Individual Level: Focuses on career development for researchers and research support staff. This includes training, scholarships, fellowships and mentoring.

- Institutional Level: Aims to develop organisational capacity in research funding, management and sustainability. This involves enhancing research facilities and support structures within institutions.

- Environment Level: Seeks to improve the conditions of the policy and regulatory context, as well as the resource base for research at a national and international level. This level addresses research culture and the broader systems within which research operates (UKCDR, 2022, p. 8).

Dean et al. (2017) found in their study of published literature on the subject that only 36% of assessed definitions clearly considered all three levels. However, the two examples above are both results of broad consultation, suggesting that since the publication of the Dean et al. study, the multi-level nature of the definition of research capacity strengthening has become broadly recognised.

Potter and Brough (2004) subsume the individual and institutional-level aspects of capacity building needs into a comprehensive framework aimed at addressing systemic capacity building. They develop a pyramid consisting of nine interdependent but distinct parts (see **Box 1**), which form a four-level hierarchy of needs for capacity building. This includes, from the top of the pyramid, tools which require skills, which require staff and infrastructure, which require structures, systems and roles. Each level of the pyramid enables the effective use of the levels above it. Potter and Brough argue that the pyramid approach makes it easier to identify gaps and utilise resources more effectively.

Box 1: Nine component elements of systemic capacity building (Potter and Brough, 2004, p. 340)

- Performance capacity: Are the tools, money, equipment, consumables, etc available to do the job? However well trained, a doctor without diagnostic instruments, drugs or therapeutic consumables is of very limited use.
- Personal capacity: Are the staff sufficiently knowledgeable, skilled and confident to perform properly? Do they need training, experience, or motivation? Are they deficient in technical skills, managerial skills, interpersonal skills, gender-sensitivity skills or specific role-related skills?
- Workload capacity: Are there enough staff with broad enough skills to cope with the workload? Are job descriptions practicable? Is skill mix appropriate?
- Supervisory capacity: Are reporting and monitoring systems in place? Are there clear lines of accountability? Can supervisors physically monitor the staff under them? Are there effective incentives and sanctions available?
- Facility capacity: Are training centres big enough, with the right staff in sufficient numbers? Are clinics and hospitals of a size to cope with the patient workload? Are staff residences sufficiently large? Are there enough offices, workshops and warehouses to support the workload?

- Support service capacity: Are there laboratories, training institutions, bio-medical engineering services, supply organisations, building services, administrative staff, laundries, research facilities, quality control services? They may be provided by the private sector, but they are required.
- Systems capacity: Do the flows of information, money and managerial decisions function in a timely and effective manner? Can purchases be made without lengthy delays for authorisation? Are proper filing and information systems in use? Are staff transferred without reference to local managers' wishes? Can private sector services be contracted as required? Is there good communication with the community? Are there sufficient links with non-governmental organisations?
- Structural capacity: Are there decision-making forums where inter-sectoral discussion may occur and corporate decisions made, records kept and individuals called to account for non-performance?
  Role capacity: This applies to individuals, to teams and to structure such as committees. Have they been given the authority and responsibility to make the decisions essential to effective performance, whether regarding schedules, money, staff appointments, etc?

Potter and Brough's (2004) pyramid approach emphasises the importance of resources – ranging from training and collaborations to infrastructures. This is also emphasised by Cooke (2005, pp. 4-8), whose framework for investigating research capacity building in health care identifies six principles of capacity building:

- Principle 1: Research capacity is built by developing appropriate skills, and confidence, through training and creating opportunities to apply skills.
- Principle 2: Research capacity building should support research 'close to practice' for it to be useful.
- Principle 3: Linkages, partnerships and collaborations enhance research capacity building.
- Principle 4: Research capacity building should ensure appropriate dissemination to maximise impact.
- Principle 5: Research capacity building should include elements of continuity and sustainability.
- Principle 6: Appropriate infrastructures enhance research capacity building.

It has become increasingly understood that activities to strengthen research capacity need to consider all three levels, even when focusing activities specifically at one of them. As UKCDR states, "These levels are deeply connected with each other. An initiative at one level may directly or indirectly support or constrain another. Understanding common challenges alongside examples of good practice between them can help design more coherent and effective interventions." (UKCDR, 2022, p. 8)

Another aspect of research capacity building where consensus has built up is on LMIC ownership. Goldberg and Bryant (2012) found an increasing focus on country-owned capacity building during the first decade of this century but said that there was a lack of strong evidence regarding its practical implementation. They noted that, while the Paris Declaration on Aid Effectiveness talks about the specifics of the concept's principles, it was not accompanied by tools to realise those principles. Likewise, Boyd et al. (2013) looked at the existing frameworks for evaluating health research capacity strengthening, including an earlier version of the ESSENCE framework on capacity strengthening, and found that general assumptions did not sufficiently take into account context-specific restrictions. Keating et al. (2019) echo the lack of sufficient consideration of local contexts and

challenges. Bates et. al (2014) attempted to address these gaps by "identifying and using evidence to guide the design and implementation of health research capacity strengthening programmes" (p. 2). Their approach aims to integrate the wider context of health systems and key individuals involved in capacity-strengthening initiatives.

More recent frameworks and guidance from ESSENCE (TDR, 2023b) and UKCDR (2022) have a strong focus on LMIC ownership. In its 2023 guide on research capacity strengthening, ESSENCE observes that "[r]esearch partnerships work best when they are founded on mutual trust, respect and reciprocity. 21). When opportunities to shape research agendas as well as costs and impacts are fairly allocated, partners are more likely to value each other's contributions and collaborate more easily" (TDR, 2023b, p. 21). The ESSENCE guide notes that research capacity strengthening interventions should be designed to ensure local ownership, since locally owned, embedded and valued capacity-strengthening interventions are more likely to be sustainable over time (TDR, 2023b, p. 47). UKCDR's learning from a range of UK ODA-funded research capacity strengthening exercises also emphasises local ownership. Its first 'cross-cutting enabler' to improve research capacity strengthening efforts is LMIC ownership from design, through to implementation and the evaluation of projects. This learning has ensured that agendas are defined in line with LMIC priorities and that partnerships are established on an equal footing. Both the ESSENCE and UKCDR guidance emphasise that the aims of equitable partnerships and research capacity strengthening are closely linked, with effective capacity-strengthening efforts relying on equitable partnerships and two-way learning between institutions and research teams in the Global South and Global North (UKCDR, 2022, p. 10).

References to LMIC ownership in relation to 'high-quality research' have also been strengthened in recent guidance. UKCDR (2022) emphasises the involvement of LMICs in research panels and defines research capacity strengthening as "enhancing the ability and resources of individuals, institutions and/or systems to undertake, communicate and/or use high-quality research efficiently, effectively and sustainably" (UKCDR, 2021, p. 25, emphasis added). Relevant to this, Yegros-Yegros et al. (2020, p. 2) note that an important aspect of producing new knowledge through research is "to create capabilities in human resources and infrastructure for innovation to take place, generally outside of academia, in hospitals, governments or companies. Innovation studies literature has long claimed that the main contribution of research is to create capabilities rather than off-the-shelf solutions."

Mirzoev et al. (2022) propose a framework to inform the strengthening of capacity for health policy and systems research (HPSR). The authors understand capacity as entailing collective as well as individual characteristics and define "capacity for HPSR as the collective ability of individuals, groups and networks, to successfully consolidate, synthesise, harness and apply opportunities in the pursuit of [the] shared goal of advancing, promoting and integrating HPSR for health systems development". The authors argue that capacity-strengthening work should be broadly targeted: "[g]iven the distinctive applied, cross-disciplinary and multi-actor nature of HPSR, central aspects of capacity strengthening for HPSR involve bridging the worlds of research, practice and advocacy with strong emphasis on strengthening collective links among individuals and organisations." (Mirzoev et al., 2022, p. 3.) They develop a conceptual framework for capacity strengthening for HPSR, drawing on the health literature on capacity building, and they set out the distinct but connected characteristics or attributes at the individual, organisational and network levels needed to achieve capacity strengthening in health policy and systems research. This approach places a strong emphasis on reinforcing the collaborative efforts aimed at advancing HPSR within the broader context of health-systems development.

The individual, organisational and network level are interrelated and dependent on the context. Mirzoev et al. emphasise the importance of recognising power relations among and within these levels. This makes it necessary to define, in a context-specific manner, the goals that actors want to achieve through capacity strengthening, as well as the underlying principles and values that underpin capacity-strengthening efforts. The authors list the seven ESSENCE principles of "networking and sharing, context-specificity, local ownership, continuous monitoring and evaluation, robust governance and effective leadership, effective support and mentorship, and thinking long-term" and emphasise the need for "a central focus on context-specificity and equitable ownership at all levels" (Mirzoev et al., 2022, p. 4). While Mirzoev et al. point out that projects working across all three levels would be beneficial, they note that this is not a requirement. The article includes a figure setting out an overall theory of change for capacity strengthening in HPSR (Figure 1, p. 4).

While there remain a variety of approaches and models for understanding the complexity and challenges of operationalising global health research capacity development, there has in recent years been a convergence in practical guidance, as can be seen in this section in the work of Mirzoev and the guidance from ESSENCE and UKCDR. The availability of various approaches and conceptualisations also offers the opportunity for global health research projects to define and operationalise global health research with some flexibility, allowing projects to be tailored towards context-specific capacity needs and incorporating 'best fit' capacity building means. Thus, a context-sensitive definition for global health research capacity development can be an asset for achieving capacity building goals, by allowing projects to address local challenges in a targeted way.

The term 'capacity building' or 'capacity development' itself has been critiqued, in that it could be understood to imply that LMICs depend on HICs to develop their capacity. Instead, the critics argue, capacity strengthening in LMICs should be viewed as a mutually pursued goal to strengthen the quality and relevance of global health research. Most recent literature on the topic, including this review, uses the term 'capacity strengthening'.

6.2   The current status of global health research capacity in LMICs

Global health research capacity in LMICs remains limited. This is particularly true in relation to biomedical research and clinical trial capacity. One example provided in the literature is HIV and AIDS-related randomised controlled trials (RCTs) in Africa (Zani et al., 2011). Zani et al. assess relevant RCTs between 2004 and 2008 and note a clustering of trial locations. Most trials took place in South Africa and Zambia, continuing a trend already noticed in trials up to 1999 (Isaakidis et al., 2002). In that context, Zani et al. point out that trial locations did not always correlate with HIV and AIDS prevalence, as no trials took place in Lesotho and Swaziland. Siegfried et al. (2005) found that the majority of principal researchers were located in non-African countries, predominantly the US.

A recent study in Tanzania found that "lack of funding, experience, know-how, and weak research infrastructures hinders" health workers' ability to "conduct locally relevant research and apply findings to strengthen their health delivery systems". While the authors found an interest among health workers in capacity strengthening, they concluded that individual and institutional engagement was low (Kengia et al., 2023).

Among initiatives to build research capacity in LMICs is the Cochrane Infectious Diseases Group (CIDG), which aims to develop the capacity of professionals and experts in LMICs, collaborating with associated partners to train target groups (CIDG, 2012). The Malaria Capacity Development Consortium (MCDC) is focused on strengthening capacity in areas where disease-specific research capacity is needed (Greenwood et al., 2018). While providing

support during a PhD or first postdoctoral fellowship is costly, Greenwood et al., using the example of MCDC and the Gates Malaria Partnership, note that the value is returned when those individuals take on leading roles within the research or policy domains in their country. The authors also point out that the relevant LMIC research environment must be enabling for scientists who have received adequate training if they are to continue working in these locations. This includes ongoing assistance after a PhD or first postdoctoral programme. The MCDC applies means to establish these conditions by mentoring local scientists and offering small grants to foster innovative approaches and training.

The importance of innovative learning methods and practical approaches is emphasised by Naal et al. (2020), who also outline the importance of local prioritisation and funding to expand the evolution, realisation and distribution of global health capacity-strengthening initiatives.

This links to the aspect of local infrastructures, as analysed by Sam-Agudu et al. (2016), who assess global health research grants and research education in Nigeria and Ghana. Sam-Agudu et al. find that "while some funding, training, and collaborative opportunities exist, these opportunities need to be strengthened, consolidated, transparent, well publicised, and supported at institutional and national levels" (p. 1023). They conclude that the lack of strong research infrastructures hinders those individuals who have participated in research training programmes from establishing independent research careers.

Adegnika et al. (2021) present two examples of successful capacity development as part of collaborative research projects in Ethiopia and the Central African region. In Ethiopia, the evaluation of a community-based intervention included research capacity strengthening through a collaboration of four universities, non-governmental organisations, an international academic partner and the national public health institute. The collaboration was headed by the Ministry of Health. The domestic and external universities supported national PhD students to work on reality-based health system questions, and the research topics addressed the interest of the individuals involved as well as the needs of the evaluation. Adegnika et al. note that this approach convinced the people involved of its benefits, such as a greater network of collaborators. In the Central African region, the aim was to train researchers, raise their awareness around implementation challenges and provide them with experience in collaborating with key individuals working to control and eradicate neglected tropical diseases. The selection process was competitive and the strength of the university-related infrastructure of a country correlated with the number of suggested candidates. The selected individuals based their research propositions on their country's priorities in relation to neglected tropical diseases and responded positively to training and opportunities to engage with actors of the public health sector. The project provided financial support and meetings to create links with the African Research Network for Neglected Diseases. Adegnika et al. elaborate that "these case studies provide examples of embedding PhD training into research efforts, where the scientific agenda is locally defined, bringing together academic institutions from different countries, and networking with the health system, non-governmental organisations and other stakeholders." (p. 2.) Additionally, they emphasise the role of funders in promoting and including capacity strengthening in research projects, the importance of local governments in investing more resources and the need for universities in the Global North to amend their policies to increase equity.

A systematic review by Franzen et al. (2017) of the qualitative literature on health research capacity development in LMICs concluded that "[t]here has been steady progress in LMIC health research capacity, but major barriers to research persist and more empirical evidence on development strategies is required. Despite an evolution in development thinking, international actors continue to use outdated development models that are recognised as

ineffective. To realise newer development thinking, research capacity outcomes need to be equally valued as research outputs. While some development actors are now adopting this dedicated capacity development approach, they are in the minority." (Franzen et al., 2017, p. 1.) The review also noted that "lack of empirical research and monitoring and evaluation meant that [the] effectiveness [of health research capacity strengthening efforts] was unclear and learning was weak". As the account in 6.1 above suggests, funder-focused guidance has strengthened since 2017, and the account in this section (6.2) suggests that modest progress may be continuing and that there is a somewhat strengthening evidence base on which approaches are more successful.

However, the interlinkages among individual, institutional and societal/systemic levels make sustained capacity strengthening challenging, and many Northern-based funders and partners continue to focus mainly on individual-level capacity strengthening. For instance, UKCDR (2021b, pp. 7-8) concludes that holistic approaches are needed to integrate support across the three levels, but found that across the 133 programmes assessed, the majority of UK support is focused on individual capacities, particularly on researchers' abilities to produce high-quality research. A third of the UK-funded programmes included institutional-level interventions, and a bit less than a third targeted the environmental/systemic level of political and regulatory contexts and the enabling environment for research.

7.   Achieving impact through global health research

7.1   Definitions of research impact

A definition of research impact is provided by the UK's Economic and Social Research Council (ESRC), which defines it as "the demonstrable contribution that excellent research makes to society and the economy" (UKRI, 2023a). The ESRC notes three types of research impact:

1. Instrumental impact – influencing the development of policy, practice or services, shaping legislation and changing behaviour
2. Conceptual impact – contributing to the understanding of policy issues and reframing debates
3. Capacity building through technical and personal skill development.

The ESRC definition, by emphasising contribution, differs from the definition used by the Research Excellence Framework (REF), which emphasises the effect of research (Alla et al., 2017). The REF defines research impact as "an effect on, change or benefit to the economy, society, culture, public policy or services, health, the environment or quality of life, beyond academia" (UKRI, 2023a). Alla et al. (2017) point out the higher level of detail in the REF's definition since it includes a wider range of influence areas. Chandler (2013, in Alla et al., 2017, p. 5) argues that "research impact can be defined through its capacity to facilitate innovation." The Australian Research Council (ARC, 2023a) echoes both the ESRC and REF definitions: "Research impact is the contribution that research makes to the economy, society, environment or culture, beyond the contribution to academic research."

Previous approaches focused more on citations to define research impact. Tonta, Ünal and Al (2007, p. 3) defined research impact simply by the "number of times that each article is cited in literature". Assessing the impact of research through citations is also evident in the Strategic Plan 2011-2016 of the Cochrane Infectious Diseases Group (CIDG, 2012), which aimed to increase cross-referencing of its studies, flagging by others and publicity, in order to enhance their impact.

The largest exercise in the UK aimed at assessing the impact of academic research is the REF. In 2014, Research England carried out the first REF exercise on behalf of the Higher Education Funding Council for Wales, the Scottish Funding Council, the Department for Employment and Learning in Northern Ireland, and Research England (REF, 2014). The REF 2014 substituted the previously used Research Assessment Exercise, and included three core objectives, as outlined on the REF's website:

- Provide accountability for public investment in research and produce evidence of the benefits of this investment.
- Provide benchmarking information and establish reputational yardsticks, for use in the higher education sector and for public information.
- Inform the selective allocation of funding for research.

The overarching policy objective agreed upon by the four UK public funding organisations behind the REF is "to secure a world-class, dynamic and responsive research base across the full academic spectrum within UK higher education". The UK government draws on the REF's findings to decide on research funding and higher education institutions use it as an indicator for their accomplishments (REF, 2014). Considering the significance of the REF for UK academic research, the REF's definition of research impact – "an effect on, change or benefit to the economy, society, culture, public policy or services, health, the environment or quality of life, beyond academia" (UKRI, 2023a) – is highly influential and widely used.

7.2   Assessing the impact of global health research

Approaches to assessing research impact

Assessing the impact of research – including health research – continues to pose significant difficulties (Taylor, 2013). Chowdhury et al. (2016) looked at impact indicators and the scores for the impact of research as set out in the REF 2014 for five academic research disciplines, including clinical medicine (but not public health). They noted that the absence of clear impact indicators led to "a significant degree of uncertainty" among the universities submitting their REF impact case studies and that different disciplines had somewhat different impact criteria. For clinical medicine, the conclusion was that the REF panel on clinical medicine sought demonstrations that "research improves the quality of life, life expectancy, reduces morbidity and risk of future illness, improves knowledge transfer, efficiency, productivity of services and safety, and significantly contributes to the industry and UK economy." They said that impact case studies "should also explicitly focus on research income and publications made in high-impact journals" (Chowdhury et al., 2016, p. 10).

To address the challenges for researchers in assessing the impact of their studies, Kuruvilla et al. (2006, p. 5) developed a Research Impact Framework, focusing on the impact of health research and including four potential and, at times, intersecting main areas:

1. Research-related impacts
2. Policy impacts
3. Services impacts: health and intersectoral
4. Societal impacts.

For each of the four core areas, the authors outline key impact categories for researchers to use to describe and categorise the impact of their work, as presented in **Table 1**.

Researchers at the London School of Hygiene and Tropical Medicine trialled the framework and, after initial doubts, identified a broad scale of impacts in their studies (Kuruvilla, Mays and Walt, 2007). The framework also allowed cross-project analysis. However, Kuruvilla et al. (2006) underlined the risk of biases influencing the outcome of a research-impact assessment.

Similarly, in their Strategic Plan 2011-2016, the Cochrane Infectious Diseases Group (CIDG) (2012) formulates four conditions of which at least one must be met for a review to be considered high in impact. To measure the impact of a review, CIDG presents three outputs, two of which have numerical targets (**Table 2**).

Table 1: Research Impact Framework, Kuruvilla et al. (2006)

Research-related impacts	Policy impacts	Service impacts	Societal impacts
• Type of problem/knowledge • Research methods • Publications and papers • Products, patents and translatability potential • Research networks • Leadership and awards • Research management • Communication.	• Level of policy-making • Type of policy • Nature of policy impact • Policy networks • Political capital.	• Type of services health/intersectoral • Evidence-based practice • Quality of care • Information systems • Services management • Cost-containment and cost-effectiveness.	• Knowledge, attitudes and behaviour • Health literacy • Health status • Equity and human rights • Macroeconomic/related to the economy • Social capital and empowerment • Culture and art • Sustainable development outcomes.

Table 2: High-impact reviews, according to the Cochrane Infectious Diseases Group

Research-related impacts

Reviews are high impact if they achieve any of the following:
    • change global, regional or national guidelines and policies
    • influence policies and spending in health programmes
    • are frequently cited in the scientific literature
    • attract newspaper and internet attention.
 	
A review's impact can be measured by (a) use in global guidelines, (b) number of citations in Web of Science per year (target >10) and (c) number of web hits (target >20).

The Australian Research Council (ARC, 2023a) provides six broad principles to underpin the measurement of research impact:

- Acknowledge that excellent research underpins impact.

- Promote understanding through use of common language and terms associated with research impact.
- Respect the diversity in research disciplines/sectors in demonstrating research impact.
- Cooperate in developing a set of common, cost-effective and efficient parameters for data collection and reporting.
- Adopt a consultative approach with stakeholders towards the use of impact reporting to support future research investments.
- Encourage, recognise and reward positive behaviour in planning, monitoring and evaluating research impact.

To support its ability to measure research impact, ARC (2023a and 2023b) provides a table to guide grant applicants on how to present research impact pathways for their projects, with columns for inputs, activities, outputs, outcomes and benefits (see **Table 3**). It encourages applicants to include examples from their research plan under each of the columns.

Table 3: Australian Research Council Research Impact Pathway table

Research Impact Pathways				
Inputs	Activities	Outputs	Outcomes	Benefits
• Research income • Staff • Background IP • Infrastructure • Collections	• Research work and training • Workshop/ conference Organising • Facility use • Membership of learned societies and academies • Community and stakeholder engagement	• Publications including e-publications • Additions to national collections • New IP: patents and inventions • Policy briefings • Media	• Commercial products, licences and revenue • New companies – spin offs, start-ups or joint ventures • Job creation • Implement-ation of programmes and policy • Citations • Integration into policy	• Economic, health, social, cultural, environmental, national security, quality of life, public policy or services • Higher quality workforce • Job creation • Risk reduction in decision making

The REF and ARC definitions of research impact are broad, while ODA-funded research generally prioritises policy and practice influence or impacts as a route to poverty reduction. UKCDR published a booklet with a collection of impact case studies submitted for the latest REF exercise, REF 2021, which makes clear that ODA-funded research needs to show "clear primary intent that contributes to political, economic, social, health or environmental change to the benefit of people in LMICs" (UKCDR, 2021b, p. 5).

The health-related case study in UKCDR's sample found positive impacts in LMICs, UK and even globally. The conclusion on the impact of the case study on transforming the lives of people with communication and intellectual disabilities by Manchester Metropolitan University was that "addressing the needs of individuals with communication and profound intellectual disabilities has led to far-reaching positive outcomes thanks to research led by the Manchester Metropolitan University (MMU) in collaboration with multiple local institutions in Africa and Asia. Part of this research was also supported by the Royal College of Speech and Language Therapists. MMU's research focused on improving the provision and sustainability of low-cost interventions in speech and language therapy, including new therapeutic approaches, training programmes and other mentoring initiatives. This has resulted in better care and quality of life for individuals with communication and profound intellectual disabilities in Africa, South Asia and Europe. In the UK, the research findings also played an important role in developing training for health-care workers and shaping policies that improved access to support services for refugees with communication disabilities. The research influenced policy and funding on the prevention of violence against women and girls with disabilities in humanitarian contexts. (UKCDR, no date).

The role of knowledge translation and evidence synthesis in furthering research impact

The relationship between global health research and policies is part of the discourse of governments and bilateral and multilateral donors in global health, with funders of global health research advocating 'getting research into policy and practice' (GRIPP), the goal of which can be defined as "to ensure knowledge translation, knowledge transfer, knowledge exchange, research utilisation, implementation, diffusion, and dissemination" (Uzochukwu et al., 2016). In the past the emphasis of GRIPP has been on how findings from a single study, such as randomised controlled trials, could be brought into policy or guidance (Morton et al., 2011). While a single study is limited in the impact it can have, the cumulation of knowledge through a growing body of research can lead to generalisation which allows for findings to be applied to national or local settings (Eisenberg, 2002). Sinclair et al. (2013) point out the need for national capacity and procedures in these areas of knowledge translation.

The idea of cumulative knowledge being part of achieving knowledge translation has previously been discussed by Grimshaw et al. (2012), who assess the evidence and main concepts regarding the effectiveness of knowledge translation activities that target diverse groups of stakeholders. Grimshaw et al. (2012, p. 2) recommend the use of five questions proposed by Lavis et al. (2003):

1. What should be transferred?
2. To whom should research knowledge be transferred?
3. By whom should research knowledge be transferred?
4. How should research knowledge be transferred?
5. With what effect should research knowledge be transferred?

Grimshaw et al. (2012) explain that while evidence for different knowledge translation activities addressed by senior managers and health-care professionals is incomplete, recent developments in the health-care system point towards more emphasis on systematic knowledge synthesis. The development of portfolios of methods to communicate research findings to policy makers generates demand for research synthesis and knowledge translation.

Evidence synthesis is based on a conception of knowledge as cumulative and a view that all relevant research ought to be considered through systematic critical appraisal to inform policy (Clarke et al., 2014). The National

Institute for Health and Care Research (NIHR, no date) describes the evidence synthesis projects it supports as "projects that identify, evaluate and combine data from existing research studies to provide best evidence, including on the effectiveness and cost-effectiveness of treatments, tests and other interventions, to support decision-making across health, public health and social care".[11] The discipline of evidence synthesis includes different methodologies, but these have in common the application of rigorous and published protocols guiding the synthesis, including specifying the questions to be addressed, a search strategy for how to source evidence, and criteria for inclusion of studies and findings in the analysis. Evidence synthesis studies need to have transparent and robust strategies to take account of bias; assess quality and inclusion criteria; and address (lack of) consistency between studies, the size of the effect, and generalisability. The results of systematic critical appraisals are interpreted by taking into account the certainty of the evidence, bias and systematic evaluation of applicability through the Grading of Recommendations Assessment, Development and Evaluation (GRADE) approach, developed to support evidence-based medicine. GRADE is "the most widely adopted tool for grading the quality of evidence and for making recommendations with more than 100 organisations worldwide officially endorsing GRADE" (BMJ Best Practice, no date).[12] GRADE offers "a system for rating quality of evidence and strength of recommendations that is explicit, comprehensive, transparent, and pragmatic" (Guyatt et al., 2008, p. 926). GRADE has four levels to describe the certainty in evidence or quality of evidence, as very low, low, moderate or high.

Traditionally, health research is translated into practices based on distinct phases – a time-consuming practice that Trochim et al. (2011, p. 158) propose to improve by suggesting a 'process marker model'. Their model focuses on "identifying a set of observable points in the [translation] process that can be operationally defined and measured, in order to enable evaluation of the duration of segments of the research-practice continuum", laying the basis for improving translational research. The earlier 'knowledge-to-action framework' (Straus, Tetroe and Graham, 2009, p. 166) describes an "iterative, dynamic and complex process" that includes the development and use of knowledge and involves the end-users to guarantee that their needs are met by the knowledge and its implementation. Likewise, Lewis et al. (2012) include consumer preferences and argue that guidance informed by evidence is developed by taking into account aspects of feasibility, acceptability and consumer preferences. The role of consumers has previously been noted by Guyatt et al. (2008), who explain that ultimately consumers ought to be part of weighing the trade-off between benefits and potential harm of any new intervention.

Pearson, Jordan and Munn (2012) emphasise the complexity of knowledge translation, and propose to embed three translation gaps (from need to discovery, from discovery to clinical application and from clinical application to clinical policy/action) to address this complexity of translating knowledge to improve health outcomes.

Despite the extensive literature addressing and discussing knowledge translation and research synthesis, much more research is needed on specifics (Wyborn et al., 2018). Wyborn et al. outline the importance of clearly defined contexts, pathways of impact and audiences to facilitate "synthesis to target the appropriate scale and format of information" (p. 82).

7.3   How is the relevance of global health research for LMICs ensured?

White (2007, p. 6) proposes "a right to substantial benefits from hosting research" for LMICs, which is independent of a study's outcome to enhance the position of LMICs in collaborative partnerships. This builds on the Helsinki Declaration and Council for International Organisations of Medical Science (CIOMS) Guidelines. The Helsinki Declaration states that "medical research is only justified if there is a reasonable likelihood that the populations in which the research is carried out stand to benefit from the results of the research." (WMA, 2004, Article 19 in White, 2007, p. 2.) CIOMS elaborates on this notion in their third and tenth guidelines:

- Guideline 3: "[T]he health authorities of the host country, as well as a national or local ethical review committee, should ensure that the proposed research is responsive to the health needs and priorities of the host country and meets the requisite ethical standards." (CIOMS, 2002, in White, 2007 p. 2.)
- Guideline 10: "Before undertaking research in a population or community with limited resources, the sponsor and investigator must make every effort to ensure that the research is responsive to the health needs and the priorities of the population or the community in which it is to be carried out." (CIOMS, 2002, in White, 2007, p. 3.)

White (2007) places particular emphasis on giving the hosting parties the responsibility to make use of research benefits while prioritising the enhancement of local research capacity and health care. Withford et al. (2000) underline that the likelihood of research translating into practice is increased through enhanced relevance for the audience. The more relevant the research, the higher the likelihood that LMICs will benefit from the research efforts in the form of practical changes or adaptations.

One important aspect of relevance is the goal of health systems strengthening in LMICs. The literature points out that the strengthening of health systems requires research on health policy and systems (Bennett et al., 2011; Sheikh et al., 2011; Gilson, 2012; Mirzoev et al., 2022). However, several researchers note that guidelines and principles on benefit are not always fulfilled in practice, and that this is linked to reduced relevance of the research to the aim of strengthening LMIC health systems. Ong'era, Stewart and Bukusi (2021) saw little to no benefit from global health research for health-care systems in LMICs, which they attribute to financial dependency on funders and HICs that set their own priorities rather than addressing questions and challenges directly faced by the LMICs in which the research takes place.

Relevance is also of importance for clinical trials conducted in an effort to translate research into new vaccines and medications. Such trials are not without ethical implications for health systems, which Hyder et al. (2014) argue need further consideration. Jamrozik and Selgelid (2020) study the ethics and regulation aspects of certain trials occurring in LMICs and describe how the call for controlled human infection studies (CHIS) in LMICs is becoming louder, although to date CHIS have mostly taken place in HICs. They conclude that the high burden of diseases being studied in LMICs warrants CHIS in such contexts. Endemic-region CHIS may carry lower risk for participants in the studies if they are infected with locally dominant pathogens in a controlled situation where medical care is available, reducing the odds of becoming infected outside the study without access to health care. However, CHIS contain a third-party risk for individuals outside the study who might become infected through transmission. Jamrozik and Selgelid note the potential of CHIS to positively contribute towards local research capacity building. Careful and thorough ethical and regulatory considerations are key to designing and conducting successful CHIS in LMICs.

Gomes and Kuesel (2015) provide a practical example of impact within the literature. Drawing on the approach of the Special Programme for Research and Training in Tropical Diseases (TDR), the authors highlight the impact of TDR on finding innovative ways to address malaria and to create practical solutions. The TDR is co-sponsored by the United Nations Development Programme (UNDP), WHO, the World Bank and the United Nations Children's Fund (UNICEF) (TDR, 2023). Gomes and Kuesel (2015) explain how the initial expectation was for scientific knowledge to drive vaccines, drugs and solutions for vector control. Epidemiological data would inform the specifics of the implementation of instruments. Based on these premises, three committees for malaria functioned: Chemotherapy of Malaria (CHEMAL), applied field research focused on the epidemiology of Malaria (FIELDMAL) and Immunology of Malaria (IMMAL). When a FIELDMAL-funded trial in the Gambia eventually led to the identification of a straightforward, uncomplicated and easy-to-use solution (impregnated bed nets) to reduce malaria mortality in children, it led to strategic changes: "(1) total malaria funding increased over the next decade, (2) regional distribution of funding shifted to Africa, (3) TDR's architecture and approach changed, and (4) TDR became far more involved in the process of bringing evidence to policy" (Gomes and Kuesel, 2015, p. 2). Gomes and Kuesel conclude that TDR's "real innovation" was "not to wait for high-tech solutions". Instead, taking simple ideas (such as impregnated bed nets) and testing them thoroughly led to what the authors describe as remarkable accomplishments with a limited budget.

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Appendix

In *Building Partnerships of Equals: the role of funders in equitable and effective international development collaborations* (2017), Dodson proposed ten strategies for funders to influence equitable partnerships (p. 1):

1. Inclusive agenda-setting: Foster inclusive agenda-setting by collaborating with governments, funders and research communities in low- and middle-income countries (LMICs) to develop research programs that address local needs. Prioritise strategic priorities independently of budgetary constraints and communicate funders' objectives transparently.

2. Funding new research questions and valuing complementary skills and knowledge: Support new research questions and recognize complementary skills and knowledge. Valuing the diverse contributions of each partner, such as access to local resources, data, networks and knowledge, enhances mutual benefits.

3. Setting the tone: Set the tone for equity expectations within partnerships by providing clear guidelines and acknowledging the time and costs associated with building international collaborations.

4. Rewarding skilled project managers and team players: Acknowledge and reward skilled project managers and team players who can effectively manage diverse, culturally sensitive and impactful research teams. Invest in project management resources and inquire about leaders' collaboration management approaches.

5. Looking for equality beyond the leaders: Promote equity beyond leadership, considering non-academic partners, students, technicians and contractors. Institutional diversity, encompassing a variety of perspectives, contributes to the success of collaborative initiatives.

6. Equitable budgets, research and financial management: Ensure equitable budgets, research, and financial management by consistently funding both Northern and Southern partners. Avoid directing financial and research management solely through Northern institutions to mitigate power imbalances. Funders should have the option to provide direct funding to Southern institutions, collaborate with Southern governments or engage with regional funds like the Alliance for Accelerating Excellence in Science in Africa. Nonetheless, it is crucial to maintain flexibility, allowing teams to establish adaptable structures that address diverse capacities and challenges.

7. Providing ongoing institutional capacity strengthening: Provide ongoing institutional capacity strengthening to support and manage international research projects, enhancing their long-term sustainability. Funders' roles should be planned in programs to monitor partnerships and build institutional capacity.

8. Widening participation: Facilitate wider participation by supporting research partnerships beyond traditional collaborators. Actively build research networks in both North-South and South-South contexts, considering varying research abilities, infrastructure and contexts.

9. Investing for the long-term: Recognizing that trust in research collaborations takes time to develop. Though funding systems do not always support sustained North-South research collaborations, evidence suggests that such partnerships prove to be successful over time.

10. Working closely with other funders and agencies in the North and South: Collaborate closely with other funders and agencies in the North and South to improve consistency and coordination. Simplify application systems, reduce duplication and enhance partnership and communication with Southern ministries and agencies regarding projects in their countries. Explore matched-effort or co-funded programs.