Annexes for the report

Funding and undertaking research during the first year of the COVID-19 pandemic

COVID CIRCLE lessons for funders

November 2021

GLOPID-R

UKCDR
UK Collaborative on Development Research

ANNEXES

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ANNEX A. CASE STUDIES

Find the case studies on the UCKDR website:

https://www.ukcdr.org.uk/resource/case-studies-funding-and-undertaking-research-during-the-first-year-of-the-covid-19-pandemic/

ANNEX B. COVID CIRCLE ONE YEAR COVID-19 FUNDING ANALYSIS

INTRODUCTION

As part of the COVID CIRCLE initiative, the COVID-19 Research Project Tracker by UKCDR and GloPID-R is a live database of research projects funded in response to the global pandemic. By providing an overview of research projects mapped against the priorities identified by the WHO in their Coordinated Global Research Roadmap on COVID-19 published in February 2020, the tracker has supported funders and researchers to deliver a more effective and coherent global research response. Since its launch in April 2020, the tracker contains more than 10 thousand projects worth more than $4.7 billion from over 200 funders around the world and has been viewed close to 30 thousand times.

As part of the ongoing efforts by COVID CIRCLE to enhance the effectiveness and coherence of the global research response to the pandemic, this analysis makes use of the April 2021 version of the tracker to understand how the research response has evolved in the year since the launch of the tracker, thereby providing key insights to funders that may be used to inform the next phase of the research response.

To further COVID CIRCLE's mission this analysis places particular emphasis on research focusing on low- and middle-income countries (LMICs) – defined as any research project that is taking place in at least one LMIC[1]. This includes any project where the research may be taking place in a high-income country, as long as that research is also partially taking part in at least one LMIC (based on the information provided).

It should be noted that this analysis should be considered as an extension to the open-access, peer-reviewed paper produced by COVID CIRCLE (ref) that provides an in-depth analysis of the breadth of funding, remaining gaps, opportunities, and trends – which is updated on a quarterly basis. Therefore, this analysis will not duplicate that of the quarterly-updated paper.

DATA LIMITATIONS

The over-arching limitation of the data in the tracker is the varying levels of completeness – which is unsurprising in light of the multiple sources of data from the more than 200 funders around the world. Most notably, data on financial information was only available for 119 of 201 funders included in this version of the tracker – translating to 59.2% of all projects. This figure is reduced to 45.1% when only considering LMIC-focused projects. With less than half of the LMIC-focused projects having financial information, this analysis avoids presenting any key findings based on amounts of funding – focusing instead on the number of projects.

Another key consequence of the varied levels of data completeness is the potential implication that a lack of qualitative data (e.g. abstracts) has on the accuracy of any coding that was performed on research projects – most notably when categorising projects against the priority areas outlined in the WHO Research Roadmap. To offset the impact of this, all coded projects performed by a member of the COVID CIRCLE Team were validated by an independent reviewer not involved with the initial screening and coding process.

[1] LMICs are, in turn, defined as being any country on the OECD Development Action Committee list of Official Development Assistance Recipients.

Lastly, the comprehensiveness of the tracker database is limited to those funders that either provided data to the COVID CIRCLE team or who have made their awards data publicly (and freely) available online.

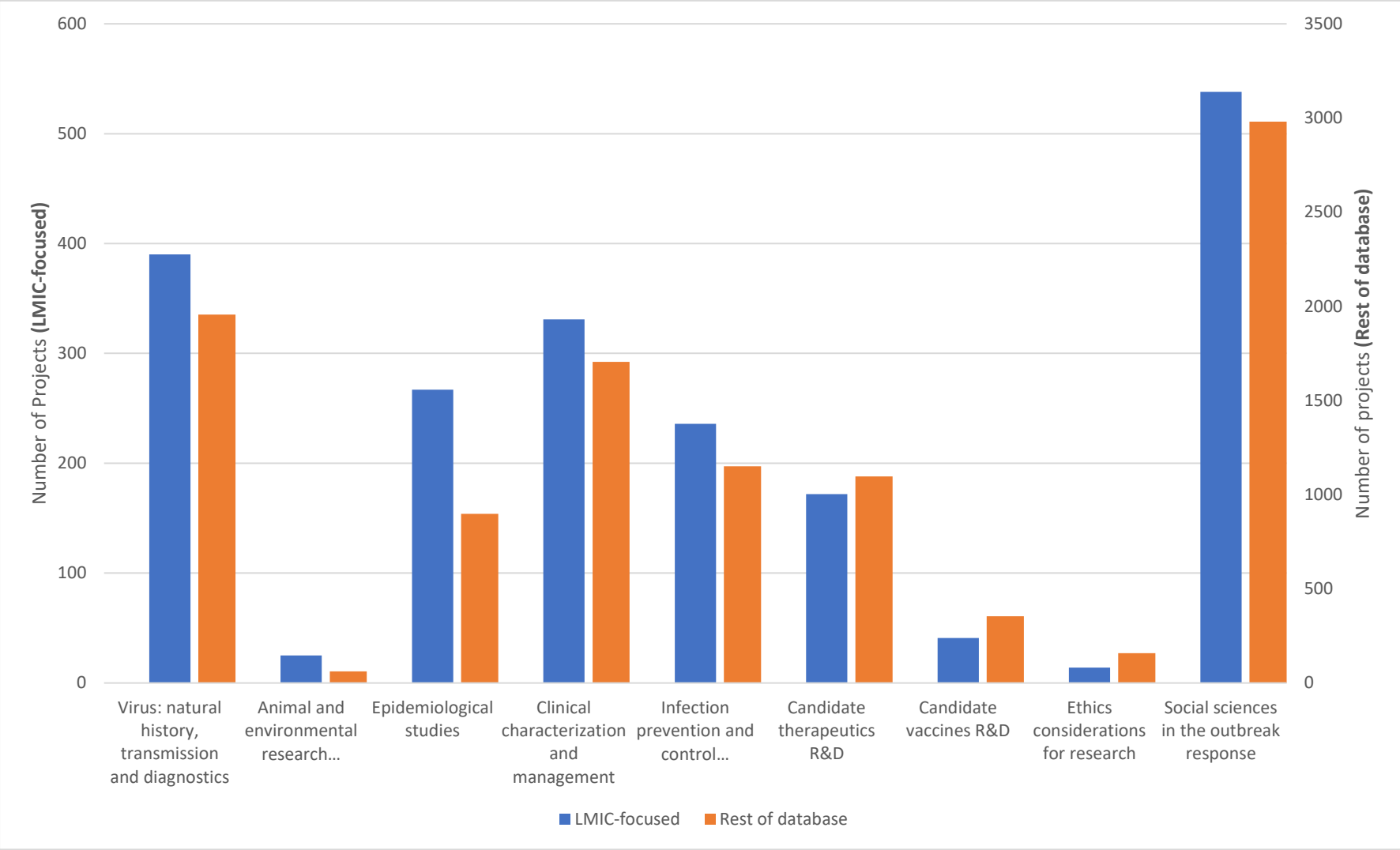
WHO PRIORITY AREAS

When comparing the portfolio of LMIC-focused projects on the tracker (1,706 projects) to the rest of the database (8,902 projects), in terms of the priority areas outlined in the WHO Research Roadmap, it can be seen from Figure 1 that, though the distribution of the LMIC-focused projects across the priority areas largely reflect that of the rest of the (non-LMIC-focused) portfolio, there are some key differences to consider. Firstly, the data on the tracker suggests that COVID-19 research relevant to LMICs focus more on epidemiological studies than the research from the reset of the database being conducted elsewhere. Not only does the 'Epidemiological Studies' priority area rank higher for LMIC-focused research (with an upper-middle ranking of fourth out of nine priority areas) than for the rest of the database (lower-middle at sixth), the proportion of projects under this priority area is significantly greater for LMIC-focused research (15.7%) than for the rest of the database (10.1%).

When looking deeper into the priority areas, much of this emphasis on epidemiology can be thought of as being driven by the large number of projects examining transmission dynamics – the second-most commonly-funded of the 44 sub-priority areas for LMIC-focused research, constituting 9.0% of the 1,706 projects under consideration (compared to just 5.7% of projects on the rest of the database).

Key differences also emerge when examining the opposite end of the priority area rankings. Interestingly, while the 'Animal and Environmental Research' and 'Ethics Considerations for Research' are the two bottom-ranked priority areas for both the LMIC-focused research and research being conducted elsewhere, their rankings differ between the two different subsets of data ('Ethics Considerations for Research' ranking last for LMIC-focused data and 'Animal and Environmental Research' ranking last for the rest of the database). Furthermore, for either sets of data, the number of projects relevant to the bottom-ranked priority area (14 projects under the 'Ethics' priority area for LMIC-focused data and 62 under the 'Animal and Environmental Research' priority area for the rest of the database) is significantly smaller than the number of projects under the corresponding eighth-ranked priority area (56% and 39.2%, respectively).

Figure 1 - Number of projects by WHO priority area



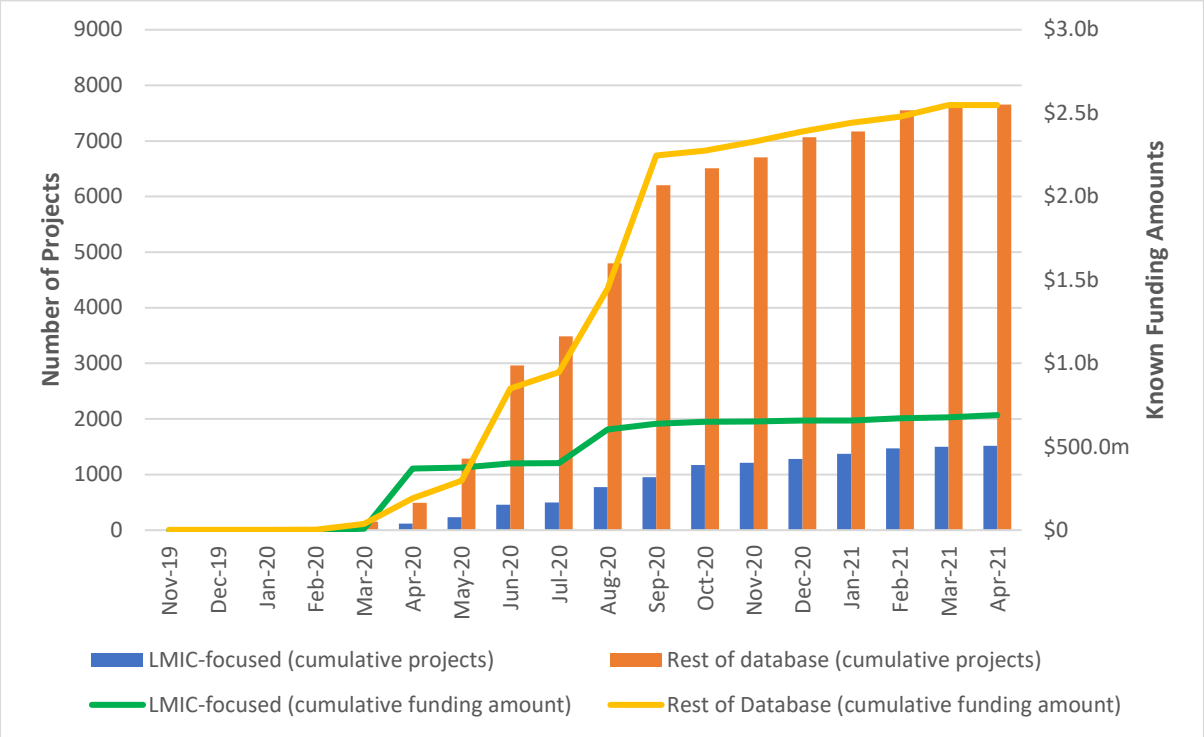
Note for Figure 1: *Emphasis has been placed on presenting the number of projects as opposed to amounts awarded by funders as financial information was only available for 59.2% of all projects in entire database (45.1% for LMIC-focused projects).*

OVERALL TIMELINE OF LMIC-FOCUSED FUNDING

Analysing how the size of both sets of data have evolved over time again reveals broad similarities with some key differences. By plotting the number of projects for both sets of data according to the publication date of award information by funders (where available), Figure 2 can be used as an approximate timeline to understand when projects were funded during the pandemic response. Generally speaking, while both sets of data see their largest increases over the summer of 2020, the increase in the number of LMIC-focused data was at its greatest in August 2020 (276 projects) – two months after the peak increase for the rest of the database (1,678 projects in June 2020). Figure 2 also shows that a greater proportion of LMIC-focused data were added to the tracker in the past six months (between November 2020 and April 2021) than the rest of the (non-LMIC-focused) database.

In terms of funding amounts, while Figure 2 shows that the greatest increase for LMIC-focused projects took place in April 2020 ($28.2m), five months prior to the greatest increase experienced for the rest of the database ($841.3m in September 2020), it is worth reiterating the issues with the completeness of the financial information. Specifically, financial information could only be obtained for 59.2% of the projects in the entire database. This figure is reduced to 45.1% when only considering LMIC-focused projects. With less than half of the LMIC-focused projects having financial information, greater emphasis is this analysis is therefore placed on the number of projects.

Figure 2 - Cumulative Number of Projects and Known Funding Amounts by Publication Date of Award Information of Projects on Tracker



Note for Figure 2: *Financial information available for 59.2% of all projects in entire database (45.1% for LMIC-focused projects). Publication date available for 86.5% of projects in entire database (88.9% for LMIC-focused projects).*

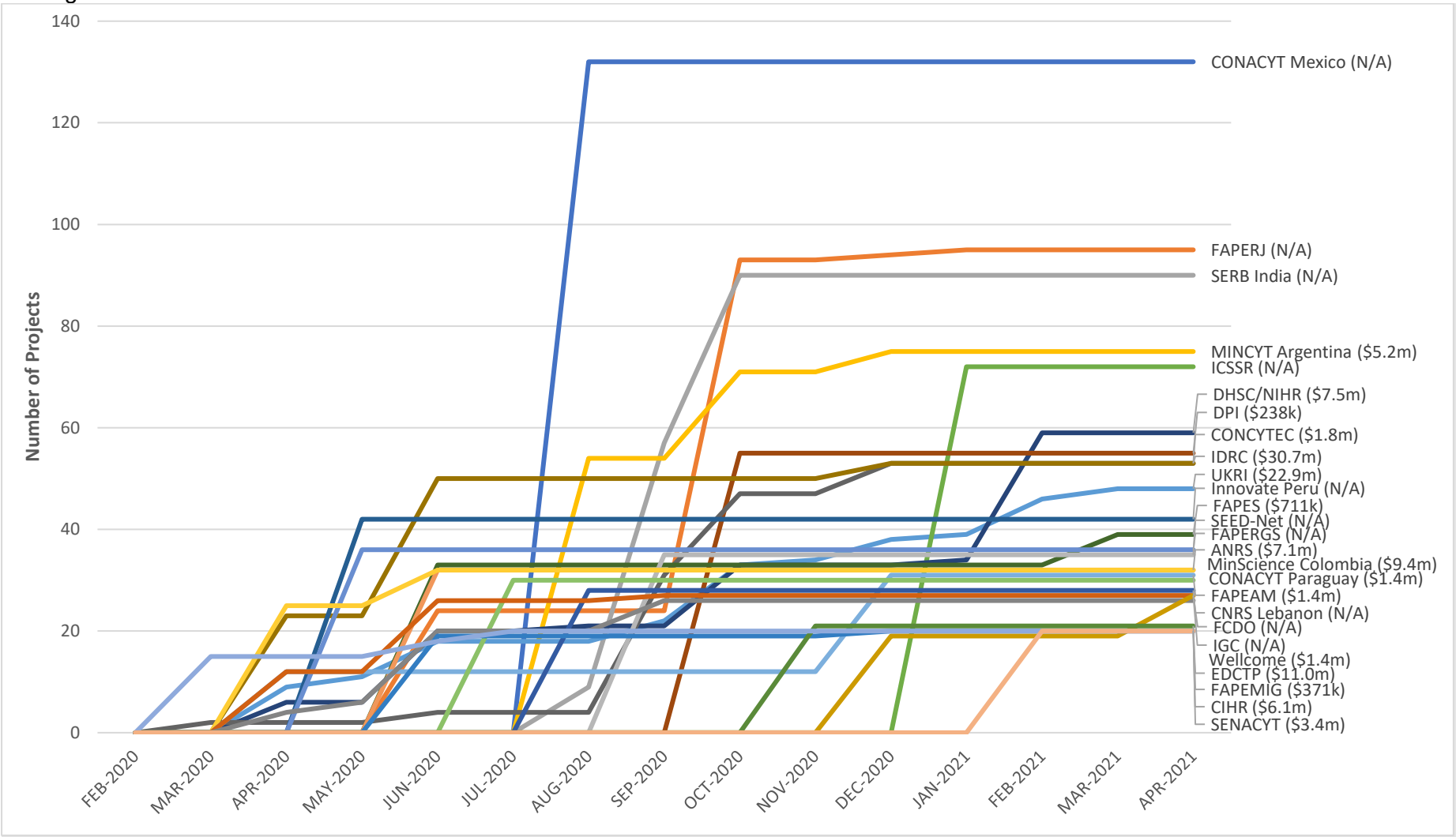
Funders of LMIC Research

However, rather than the peak in the number of LMIC-focused COVID-19 research funding being indicative of a general trend among research funders, this peak in August 2020 is largely

a result of the presence of data from the National Council of Science and Technology of Mexico (CONACYT) – the funder with the greatest number of LMIC-focused projects on the tracker (132) - who published all of their award information during this month (accounting for 47.8% of the projects funded in August 2020).

In total, 102 funders based in 35 countries have funded COVID-19 research taking place in at least one LMIC. Along with CONACYT, the timeline of the funders awarding the greatest number of LMIC-focused COVID-19 research (funding at least 20 research projects taking place in at least one LMIC with database date information) is presented in Figure 3. From Figure 3, it can be seen that Canadian research funders, specifically the Canadian Institutes of Health Research (CIHR) and the International Development Research Centre (IDRC), were the first to fund COVID-19 research relevant to LMICs early on in the pandemic. According to the data included in the latest version of the tracker, by March 2020, CIHR and IDRC had funded 19 projects taking place in LMICs – representing more than two-thirds (67.9%) of the number of LMIC-focused projects that had been funded up to this point.

Figure 3 - Timeline of funders awarding the greatest number of LMIC-focused research projects by date of publication of award information. funding amounts indicated in brackets*.



Minimum 20 LMIC-focused research projects with database date information.

Note for Figure 3: *Emphasis has been placed on presenting the number of projects as opposed to amounts awarded by funders as financial information was only available for 59.2% of all projects in entire database (45.1% for LMIC-focused projects). Publication date available for 86.5% of projects in entire database (88.9% for LMIC-focused projects).*
Funding amounts for individual organisations **do not account for co-funding between multiple organisations as no information was provided on how funding amounts were divided between the co-funding organisations.*

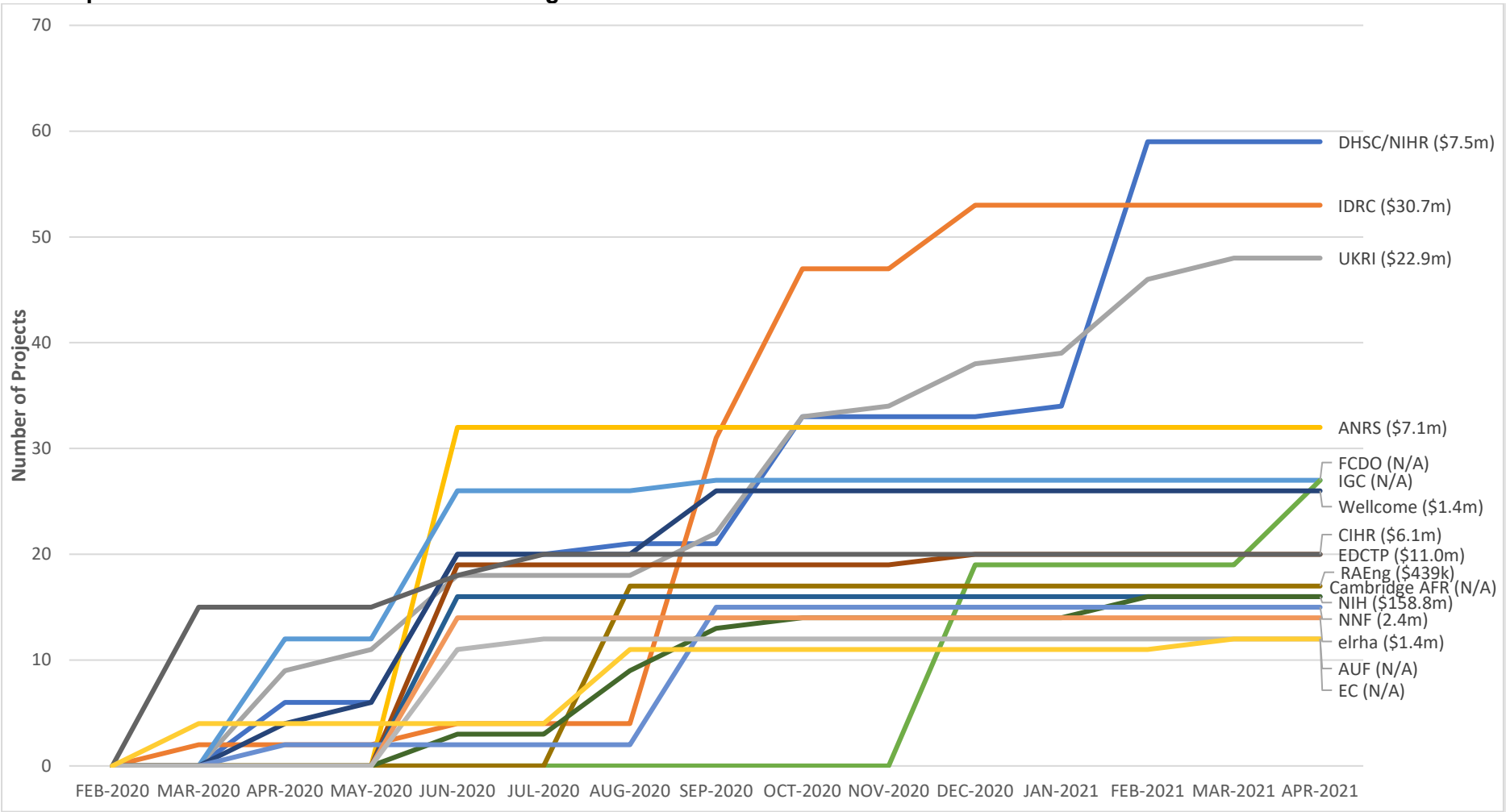
Table 1 - Portfolio by WHO priority area of top 10 funders of LMIC-focused research

	Virus: natural history, transmission and diagnostics	Animal and environmental research…	Epidemiological studies	Clinical characterization and management	Infection prevention and control…	Candidate therapeutics R&D	Candidate vaccines R&D	Ethics considerations for research	Social sciences in the outbreak response	TOTAL LMIC-Focused Projects
CONACYT Mexico	38	1	14	17	15	12	4	2	42	**132**
FAPERJ	34	2	14	38	4	17	3	0	6	**95**
SERB India	28	0	30	9	11	24	2	0	2	**90**
FAPESP	34	0	7	45	3	22	6	0	10	**78**
MINCYT Argentina	21	2	11	17	17	7	0	0	15	**75**
UKRI	17	2	15	7	10	3	1	2	42	**74**
ICSSR	0	0	0	3	8	0	0	2	59	**72**
DHSC/NIHR	8	0	10	3	15	2	0	2	42	**59**
DPI - Universidade de Brasilia	5	0	6	5	6	4	0	1	25	**55**
IDRC	1	0	6	5	5	1	0	0	48	**55**

Note for Table 1: *Emphasis has been placed on presenting the number of projects as opposed to amounts awarded by funders as financial information was only available for 59.2% of all projects in entire database (45.1% for LMIC-focused projects).*

Abbreviations and acronyms: ***CONACYT*** *- Consejo Nacional de Ciencia y Tecnología (Mexico National Council of Science and Technology);* ***DHSC*** *- Department of Health and Social Care (UK);* ***DPI*** *- Decanato de Pesquisa e Inovação (Dean of Research and Innovation);* ***FAPERJ*** *- Fundação de Amparo à Pesquisa do Estado do Rio de Janeiro (Research Foundation of the State of Rio de Janeiro);* ***ICSSR*** *- Indian Council of Social Science Research;* ***IDRC*** *– International Development Research Centre;* ***MINCYT*** *- Ministerio de Ciencia, Tecnología e Innovación (Argentina Ministry of Science, Technology and Innovation);* ***NIHR*** *- National Institute for Health Research;* ***SERB*** *- Science and Engineering Research Board;* ***UKRI*** *- UK Research and Innovation.*

Figure 4 - Timeline of funders based in high-income countries awarding the greatest number of LMIC-focused Research projects by date of publication of award information. Funding amounts indicated in brackets*.



Minimum 10 LMIC-focused research projects with database date information.

***Note for Figure 4:** Emphasis has been placed on presenting the number of projects as opposed to amounts awarded by funders as financial information was only available for 59.2% of all projects in entire database (45.1% for LMIC-focused projects). Publication date available for 86.5% of projects in entire database (88.9% for LMIC-focused projects).*

Funding amounts for individual organisations **do not account for co-funding between multiple organisations as no information was provided on how funding amounts were divided between the co-funding organisations.*

Table 2 - Portfolio by WHO priority area of top 10 funders based in high-income countries of LMIC-focused research

	Virus: natural history, transmission and diagnostics	Animal and environmental research…	Epidemiological studies	Clinical characterization and management	Infection prevention and control…	Candidate therapeutics R&D	Candidate vaccines R&D	Ethics considerations for research	Social sciences in the outbreak response	TOTAL LMIC-focused Projects
UKRI	17	2	15	7	10	3	1	2	42	**74**
DHSC/NIHR	8	0	10	3	15	2	0	2	42	**59**
IDRC	1	0	6	5	5	1	0	0	48	**55**
ANRS	4	4	12	5	2	2	0	0	11	**35**
FCDO	2	0	5	1	7	0	0	1	20	**28**
Wellcome	4	0	8	2	6	5	1	3	14	**28**
IGC	0	0	1	0	1	0	0	0	27	**27**
EDCTP	12	0	11	7	1	1	2	0	1	**23**
CIHR	3	1	5	4	1	1	0	0	10	**20**
Institut Pasteur	7	2	8	4	1	0	0	0	0	**17**
RAEng	2	0	0	4	6	0	1	0	6	**17**

***Note for Table 2:** Emphasis has been placed on presenting the number of projects as opposed to amounts awarded by funders as financial information was only available for 59.2% of all projects in entire database (45.1% for LMIC-focused projects).*

***Abbreviations and acronyms: ANRS** - Agence nationale de recherche sur le sida et les hépatites virale (National Agency for AIDS Research); **CIHR** - Canadian Institutes of Health Research; **DHSC** - Department of Health and Social Care (UK); **EDCTP** - European & Developing Countries Clinical Trials Partnership; **FCDO** - Foreign, Commonwealth and Development Office; **IDRC** – International Development Research Centre; **IGC** - International Growth Centre; **NIHR** - National Institute for Health Research; **RAEng** - Royal Academy of Engineering; **UKRI** - UK Research and Innovation.*

This figure for Canadian-based funders is increased to 82.1% when considering all funders not depicted in the figure that had funded LMIC-focused projects by March 2020 (namely the Social Sciences and Humanities Research Council with four projects, and Alberta Innovates with two).

Interestingly, five organisations (CIHR; the Colombian Ministry of Science, Technology and Innovation; Innovate Peru; Peruvian National Council of Science, Technology and Technological Innovation; and CONACYT) have at one point held the position of having funded the greatest number of LMIC-focused projects over the course of the time period in question, as depicted in Figure 3 – with all five based in the Americas (including four from Latin America). On a related note, each of the top five funders in the figure that have funded the most LMIC-focused projects overall (CONACYT, FAPERJ, SERB India, MINCYT Argentina and ICSSR) are all based in middle-income countries.

To understand the thematic nature of the research funded by the ten funders with the greatest number of LMIC-focused research, Table 1 summarises their portfolios, respectively, against the WHO priority areas.[2] Notably, the top two priority areas for each of the ten funders included in Table 1 were either the priority area of 'Social sciences in the outbreak response' (top priority area for six funders) or 'Virus: natural history, transmission and diagnostics' (top priority area for one funder and second most populous priority area for five funders). Interestingly, the four funders in the top ten where the social sciences priority area was not the most populous priority area are based in an LMIC.

In addition to the findings presented in Figure 1, Table 1 provides further insight into the three priority areas with the fewest LMIC-focused projects. Specifically, less than half of the top funders of LMIC-focused research have funded any projects under the 'Animal and environmental research on the virus origin, and management measures at the human-animal interface' (four funders in the top ten with any projects), 'Candidate vaccines R&D' (five funders), and 'Ethics considerations for research' (five funders) priority areas.

However, rather than just thinking about the overall research response to COVID-19, Figure 4 restricts the analysis by displaying which funders based in high-income countries (HICs) awarded the greatest number of LMIC-focused research to understand the international research response to the challenges of the pandemic faced by LMICs (funding at least 10 research projects taking place in at least one LMIC with database date information).

Of the 16 funders based in high-income countries included in Figure 4, four have demonstrated an active and significant commitment to funding research addressing challenges relating to COVID-19 in LMICs throughout the time period under consideration, having awarded projects in at least 5 different months (as indicated by the publication date of award information, where available). Of these four funders, UKRI demonstrated the most sustained funding activity, funding LMIC-focused projects across 10 months (at least - due to the fact that approximately one-third of projects funded by UKRI on the tracker database lack information on the database date). This is followed by the UK's National Institute for Health Research (6 months), IDRC (5) and the United States' National Institutes of Health (5).

At a national level across the entirety of the period, funders based in the UK awarded 222 COVID-19 projects relevant to LMICs – the most of any high-income country (which accounts for 13% of all LMIC-focused projects). This is followed by funders based in Canada (with 89

2 The total number of LMIC-focused research projects funded by an individual funder (such as UKRI) may vary between figure 3 and table 1 as data on the publication date of awards was not always made available for all projects – including projects funded by the same funder.

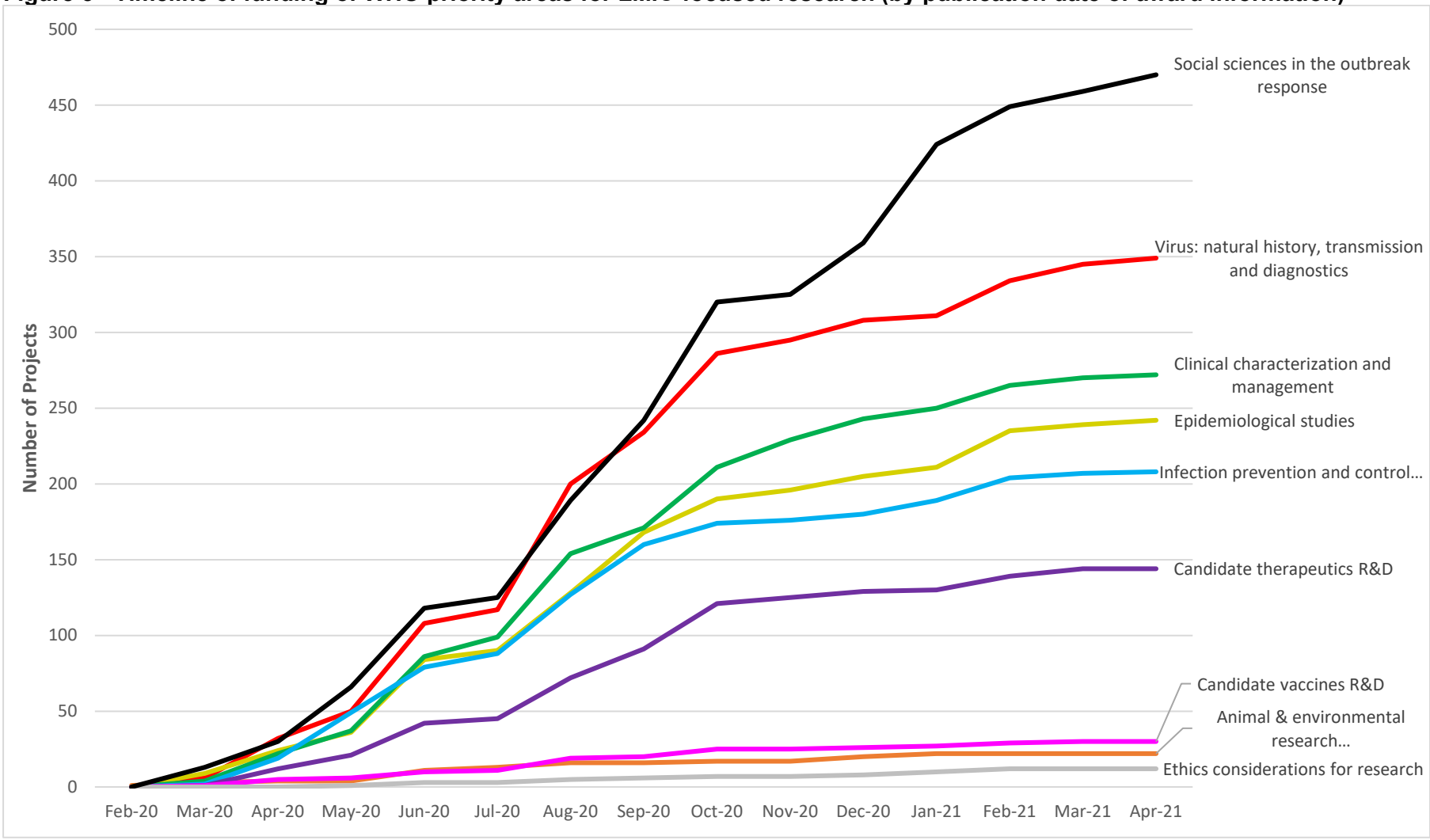
projects accounting for 5.2% of all LMIC-focused projects), France (85 projects translating to 5.0%) and the United States (59 projects translating to 3.5%).

Interestingly, when looking at the distribution of research projects funded by the top funders of LMIC -focused research based in high-income countries across the WHO priority areas (Table 2), the portfolios of these funders are typically more concentrated on a smaller number of priority areas compared to the portfolio of funders based in LMICs included in Table 1. Furthermore, of all the funders presented in Table 2, only one (UKRI) has funded LMIC-focused projects across all nine priority areas.

PRIORITY AREAS OVER TIME

The publication date of award information by funders can also be used to explore changes to the allocation of funding across the WHO priority areas over time for LMIC-focused funding (Figure 5). When considering Figure 5, it is not surprising to see the priority area on 'Social Sciences in the Outbreak Response' being consistently ranked among the priority areas with the most LMIC-focused projects throughout the time period due to how broad social sciences are as a discipline. Additionally, it is worth noting that more than half of all LMIC-focused social sciences projects (56.7%) could not be classified against any of the six corresponding sub-priority areas outlined by the WHO – despite falling under the 'Social Sciences in the Outbreak Response' priority area (this figure reduces to 55.7% when only considering projects with information on the publication date of awards). Should those projects be excluded from Figure 5, the social sciences priority would rank joint-fourth over the course of the time period being examined (along with the priority area examining 'Infection Prevention and Control').

Figure 5 - Timeline of funding of WHO priority areas for LMIC-focused research (by publication date of award information)



Note for Figure 5: *Emphasis has been placed on presenting the number of projects as opposed to amounts awarded by funders as financial information was only available for 59.2% of all projects in entire database (45.1% for LMIC-focused projects).*

When viewing the entire timeline, it is interesting to note the similarity in the number of projects funded under the priority areas on 'Social Sciences in the Outbreak Response' and 'Virus: Natural History, Transmission and Diagnostics' up to September 2020 before the rate of new projects being funded under the latter priority area decreased relative to the former. The drop off in projects funded under the 'Virus: Natural History, Transmission and Diagnostics' priority area can be partially explained by the sharp decline in the number of projects funded under the sub-priority area to 'support development of diagnostic products to improve clinical processes' after October 2020.

Taken together with the fact that this sub-priority area ranks first among all of the 44 sub-priority areas in terms of number of projects (being the only sub-priority area to account for more than 10% of the total number of LMIC-focused projects with 12%), and that by October 2020, 83.4% of the projects that fall under this sub-priority area had already been funded, it comes as little surprise that the rate of increase in the number of LMIC-focused projects funded under the 'Virus: Natural History, Transmission and Diagnostics' priority area was outpaced by the (broadly-defined) social sciences priority area before the end of 2020.

It is also interesting to see that, early on in the pandemic response, comparatively more emphasis was placed on research that addressed challenges under the 'Infection Prevention and Control' priority area in LMICs – ranking as high as third in May 2020 (only a single project less than the 'Virus: Natural History, Transmission and Diagnostics' priority area) before eventually being ranked fifth a year later (based on available data on the publication date of awards).

DIFFERENCES IN PRIORITY AREAS ACROSS COUNTRY GROUPS

Significant insights emerge when examining differences in the distribution of research projects across the WHO priority areas over time between different groups of countries. Figures 6 and 7 contrasts the evolution of the priority areas of research taking place in the least developed and low-income countries, with those taking place in middle-income countries.

Among the main differences in the distribution of priority areas between the two country income groupings is the rapid proliferation of the number of research projects taking place among the least developed and low-income countries under the social sciences priority area from after August 2020. By the end of the period under consideration, projects under the social sciences priority area accounted for 44.1% of all research projects taking place in at least one of the least developed and low-income countries – far outnumbering the number of projects under 'Epidemiological Studies' (17.2%) – the priority area with the second-greatest number of projects.

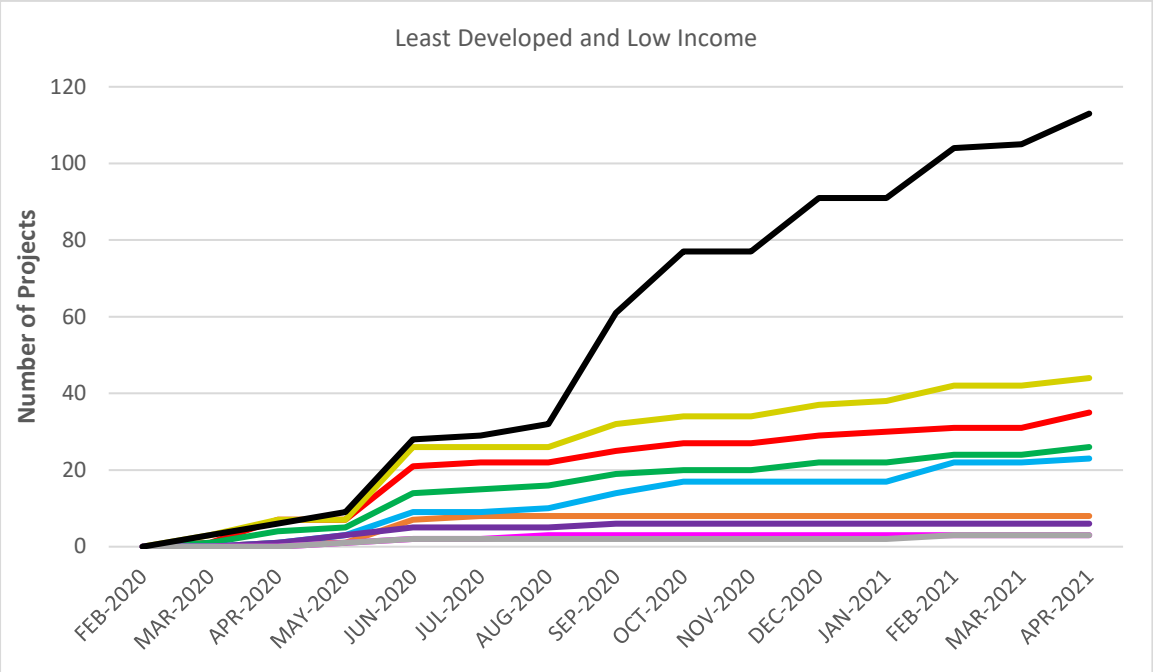
As was mentioned earlier, there is a greater emphasis on research under the priority area of 'Epidemiological Studies' for LMIC-focused projects (Figure 1) – and this is particularly pronounced for research being conducted among the least developed and low-income countries where it has consistently outranked research under the (otherwise popular) 'Virus: Natural History, Transmission and Diagnostics' priority area (Figure 6).

Furthermore, when dividing the data on the tracker according to where the research is taking place (Figures 8 to 13), it is only for COVID-19 research that is being conducted in Africa that the 'Epidemiological Studies' priority area ranks highly (second) among the nine WHO priority areas – ranking either fifth (Europe; Latin America and the Caribbean; and North America) or sixth (Asia and Oceania) for all other regions.

Continuing to examine the data along regional lines, the distribution of research projects being conducted in Asia across the WHO priority areas (Figure 9) stands out as being far more volatile than other regions. Over the course of the period under consideration, the overall rankings of the priority areas changed on 10 occasions – more than any other region (and twice as many times as the changes experienced by research being conducted in Europe – the region with fewest ranking changes). Additionally, in terms of ranking, the priority area on 'Clinical Characterization and Management was highest for projects taking place in Asia (second).

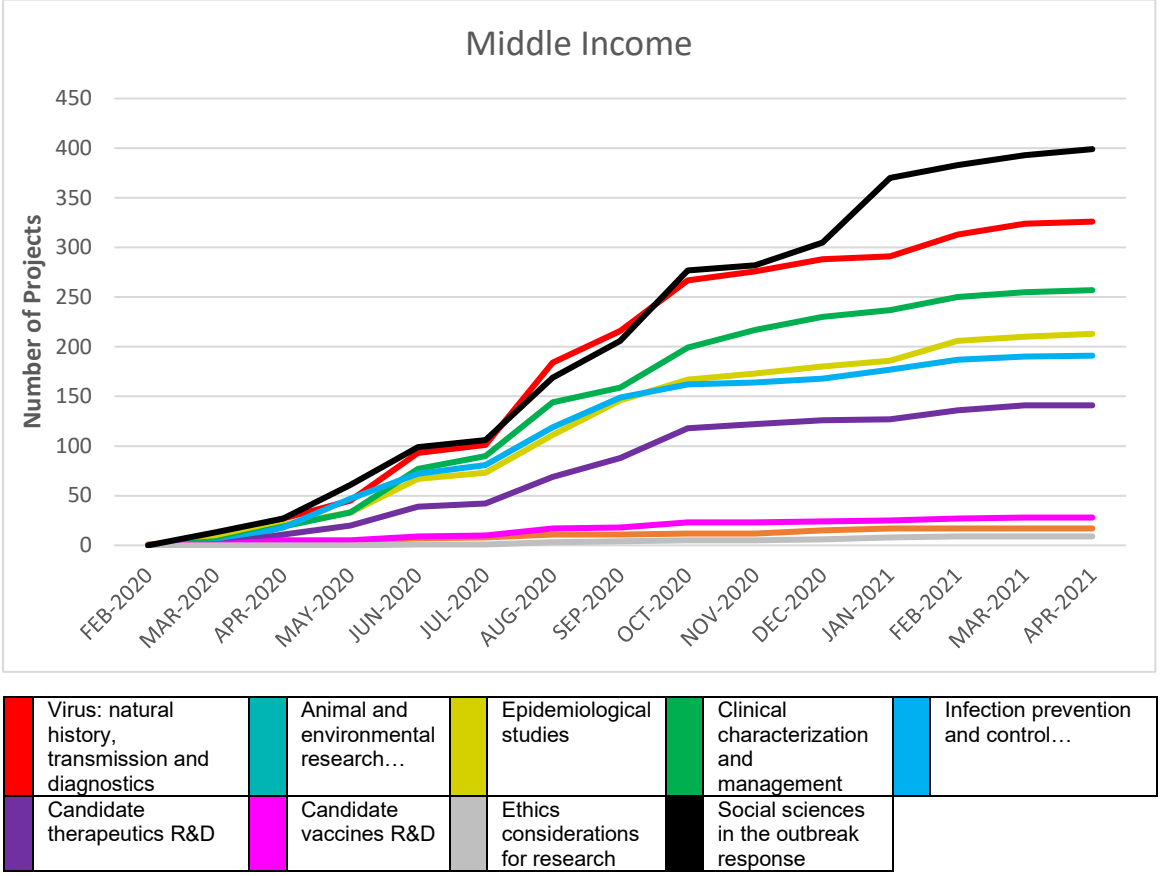
For research projects taking place in Latin America and the Caribbean (LAC), key findings emerge when looking at the distribution of priority areas across the timeline. Firstly, LAC is the only region where 'Social Sciences in the Outbreak Response' was not ranked first among all priority areas by the end of the time period under examination (being ranked behind 'Virus: Natural History, Transmission and Diagnostics'). Secondly, for at least two months early in the pandemic (April and May of 2020), there was more emphasis on research under the 'Infection Prevention and Control' priority area than any other priority area – making this the only time that this priority area ranked first in any region.

Figure 6 - Timeline of funding of WHO priority areas for research relevant to the least developed and low-income countries (by publication date of award information)



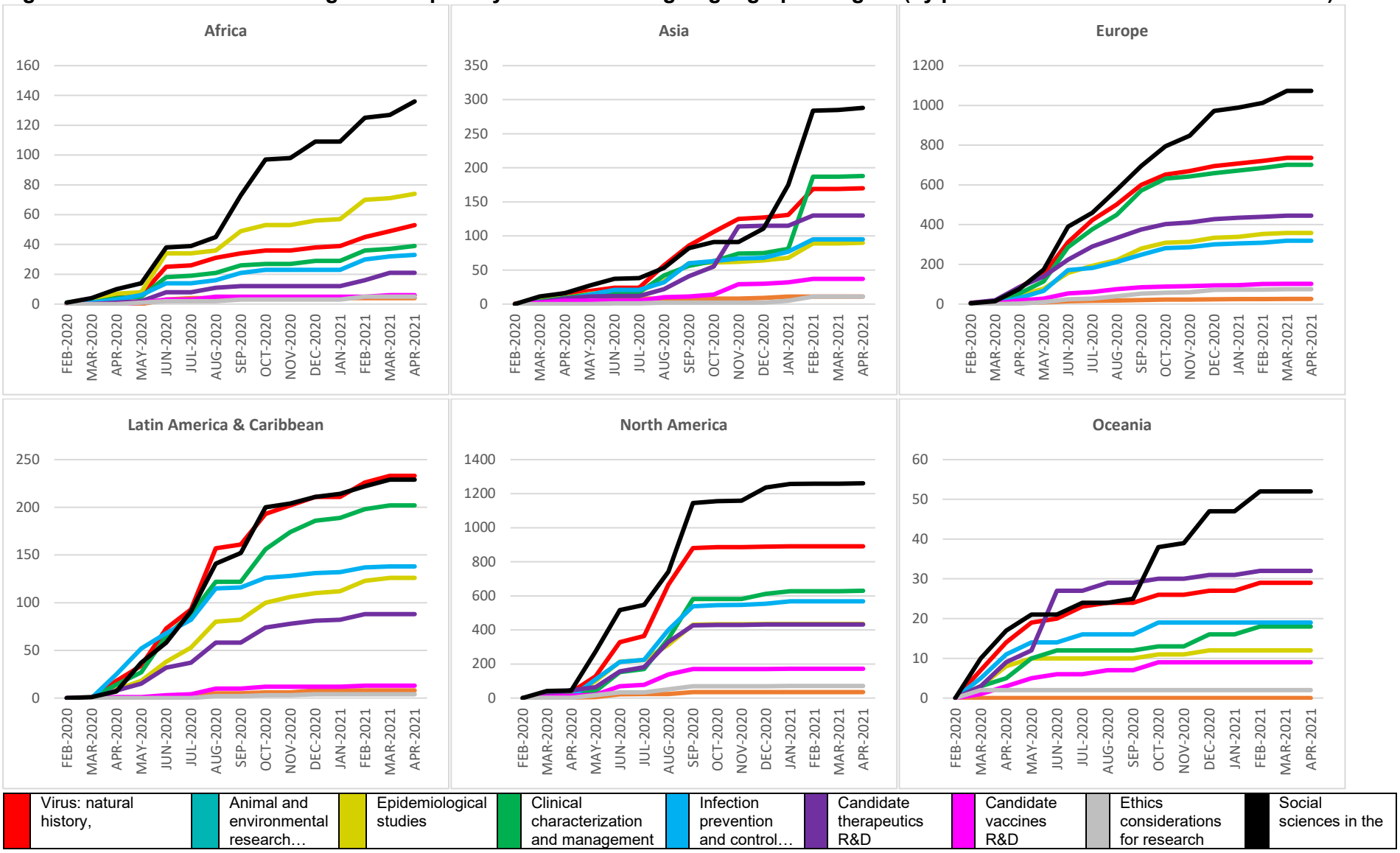
Note for Figure 6: *Emphasis has been placed on presenting the number of projects as opposed to amounts awarded by funders as financial information was only available for 59.2% of all projects in entire database (45.1% for LMIC-focused projects).*

Figure 7 - Timeline of funding of WHO priority areas for research relevant to middle-income countries (by publication date of award information)



Note for Figure 7: *Emphasis has been placed on presenting the number of projects as opposed to amounts awarded by funders as financial information was only available for 59.2% of all projects in entire database (45.1% for LMIC-focused projects).*

Figs. 8 – 13 - Timeline of funding of WHO priority areas according to geographic region (by publication date of award information)



Note for Figures 8-13: *Emphasis has been placed on presenting the number of projects as opposed to amounts awarded by funders as financial information was only available for 59.2% of all projects in entire database (45.1% for LMIC-focused projects).*

INTERNATIONAL COLLABORATION

Despite the more than 10,500 projects on the tracker being conducted in 142 countries across the world, available data suggests that only 425 projects (4.0% of projects on the latest version of the tracker) take place across multiple countries. However, the data also suggests that projects taking place across multiple countries mostly involve at least one LMIC (62.8% of projects taking place across multiple countries), as indicated in Table 3.

Table 3 - Summary of types of multi-country collaborations

TYPE OF MULTI-COUNTRY COLLABORATION	NUMBER OF PROJECTS
Any multi-country collaboration	**425**
At least one LMIC	**267**
At least one LMIC and at least one high-income country	**153**
At least one least developed and/or low-income country and at least one high-income country	**42** *(**21** when excluding projects that also focus on a middle-income country)*
At least one middle-income country and at least one high-income country	**132** *(**111** when excluding projects that also focus on a least developed and/or low-income country)*
At least one least developed and/or low-income country and at least one middle-income country	**81** *(**60** when excluding projects that also focus on a high-income country)*

Note for Table 3: *Emphasis has been placed on presenting the number of projects as opposed to amounts awarded by funders as financial information was only available for 59.2% of all projects in entire database (45.1% for LMIC-focused projects).*

The figures presented in Table 3 suggest that projects designated as taking place across multiple countries largely involve collaboration between high-income and middle-income countries – accounting for 86.3% of all projects taking place in at least one LMIC and at least one high-income country, and just under half of all multi-country research projects involving at least one LMIC (49.4%).

Significantly, Table 3 also shows that, in terms of collaboration across income groups, collaborations with the least developed and low-income countries comes more frequently from middle-income countries as opposed to high-income countries (almost three-times more frequently when not taking into account collaborations that occur across all three income groups).

Looking at the funders of these 425 multi-country projects, Tables 4 (number of projects) and 5 (known funding amounts) summarise the top funders of this type of research – both in terms of overall multi-country projects as well as those taking place in at least one LMIC. Overall, 70 organisations have funded multi-country projects – which is reduced to 46 when only considering LMIC-focused projects taking place across multiple countries. Additionally, across those funders with at least one project taking place across multiple countries, on average, 52.7% of the portfolio is taking place in at least one LMIC. However, should only funders that have funded projects taking place across multiple countries *and* at least one LMIC, the average proportion of the portfolio taking place in at least one LMIC increases to 80.1%.

Furthermore, of the 70 funders with multi-country projects, only 7 are not (at least partially based) in high-income countries (including research funded under the BRICS-STI Framework Programme – the only non-high-income country-based funder in either Tables 4 or 5).

Table 4 - Top-10 funders of multi-country projects and LMIC-focused multi-country projects by number of projects

Funder	Number of International Projects
European Commission	59
UK Research and Innovation (UKRI)	51
International Development Research Centre (IDRC)	39
Canadian Institutes of Health Research (CIHR)	25
National Institute for Health Research (NIHR)	24
Sino-German Center for Research Promotion	20
Wellcome	16
Agence Nationale de Récherche sur le Sida et les Hépatites Virale (ANRS)	15
Volkswagen Stiftung	14
National Institutes of Health (NIH)	13
Research Council of Norway	13
Funder	**Number of LMIC-Relevant International Projects**
International Development Research Centre (IDRC)	38
UK Research and Innovation (UKRI)	33
National Institute for Health Research (NIHR)	20
Canadian Institutes of Health Research (CIHR)	19
Sino-German Center for Research Promotion	19
Agence Nationale de Récherche sur le Sida et les Hépatites Virale (ANRS)	15
Wellcome	15
BRICS-STI	12
European Commission	12
European & Developing Countries Clinical Trials Partnership (EDCTP)	11

Table 5 - Top-10 funders of multi-country projects and LMIC-focused multi-country projects by known funding amounts

Funder(s)	Known Funding Amount Awarded to Multi-Country Projects
National Institutes of Health (NIH)	$259.8m
European Commission	$82.8m
International Development Research Centre (IDRC)	$25.8m
UK Research and Innovation (UKRI)	$10.7m
Agence Française de Développement (AFD)	$10.5m
COVID-19 Therapeutics Accelerator (Wellcome / Bill & Melinda Gates Foundation)*	$9.1m
Canadian Institutes of Health Research (CIHR)	$8.7m
UKRI / Dept. Health and Social Care / National Institute for Health Research*	$8.7m
Dept. Health and Social Care / National Institute for Health Research (DHSC/NIHR)	$7.4m
Research Council of Norway (RCN)	$5.6m
Funder(s)	**Known Funding Amount Awarded to LMIC-Focused Multi-Country Projects**
National Institutes of Health (NIH)	$157.5m
European Commission	$45.4m
International Development Research Centre (IDRC)	$25.0m
Agence Française de Développement (AFD)	$10.5m
COVID-19 Therapeutics Accelerator (Wellcome / Bill & Melinda Gates Foundation)*	$9.1m
UK Research and Innovation (UKRI)	$8.8m
Dept. Health and Social Care / National Institute for Health Research (DHSC/NIHR)	$7.4m
Canadian Institutes of Health Research (CIHR)	$5.9m
European & Developing Countries Clinical Trials Partnership (EDCTP)	$5.2m
UKRI / Dept. Health and Social Care / National Institute for Health Research*	$4.6m

Note for Table 5: *Financial information available for 59.2% of all projects in entire database (45.1% for LMIC-focused projects).*

**Indicates co-funding between multiple organisations listed.*

Looking at the multi-country collaboration from the perspective of global coverage, Table 5 presents the funders that have funded research taking place across the greatest number of countries throughout their portfolios.

Taking Tables 4 and 6 together, it can be seen that, not only does the International Development Research Centre fund the greatest number of LMIC-focused COVID-19 research projects that take place across multiple countries (Table 4), they also fund projects taking place across the greatest number of countries (Table 6) – both in terms of overall countries (67, averaging 3.3 countries per project) and LMICs (60, averaging 3 LMICs per project).

Table 6 - Top-10 funders with the greatest numbers of different (named) countries where research is being conducted (total number of different countries indicated in brackets)

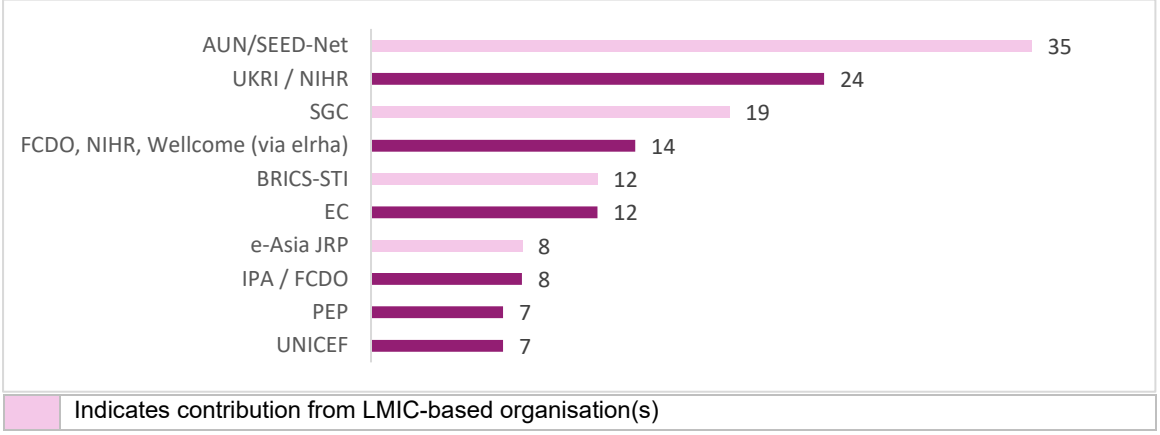
Entire Portfolio	LMICs Only *(Entire Portfolio)*	Portfolio of Projects Taking Place Across Multiple Countries	Portfolio of Projects Taking Place Across Multiple Countries AND at least one LMIC
IDRC (67)	**IDRC** (60)	**IDRC** (66)	**IDRC** (66)
EC (51)	**NIHR** (40)	**EC** (51)	**EC** (49)
CIHR (49)	**UKRI** (35)	**CIHR** (49)	**CIHR** (49)
UKRI (49)	**ANRS** (32)	**UKRI** (45)	**UKRI** (39)
NIHR (46)	**Wellcome** (29)	**NIHR** (41)	**NIHR** (39)
ANRS (33)	**FCDO** (27)	**Wellcome** (30)	**Wellcome** (30)
Wellcome (33)	**CIHR** (24)	**ANRS** (28)	**ANRS** (28)
FCDO (30)	**EDCTP** (21)	**Alberta Innovates** (25)	**Alberta Innovates** (25)
Alberta Innovates (25)	**elrha** (19)	**FCDO** (23)	**FCDO** (23)
EDCTP (24)	**RAEng** (18)	**EDCTP** (22)	**EDCTP** (22)

Note for Table 6: *Emphasis has been placed on presenting the number of projects as opposed to amounts awarded by funders as financial information was only available for 59.2% of all projects in entire database (45.1% for LMIC-focused projects).*

Abbreviations and acronyms: ***ANRS*** *- Agence nationale de récherche sur le sida et les hépatites virale;* ***CIHR*** *- Canadian Institutes of Health Research;* ***EC*** *- European Commission;* ***EDCTP*** *- European & Developing Countries Clinical Trials Partnership;* ***FCDO*** *- Foreign, Commonwealth and Development Office;* ***IDRC*** *- International Development Research Centre;* ***NIHR*** *- National Institute for Health Research;* ***RAEng*** *- Royal Academy of Engineering;* ***UKRI*** *- UK Research and Innovation*

At a higher funding level, a total of 630 out of the 10,608 projects on the tracker (5.9%) were funded as a result of co-funding – either from multiple organisations directly or from membership-based organisations. Of this, 191 projects (30.3%) are being conducted in at least one LMIC, with the top 10 co-funders of these projects presented in Figure 14). At the individual level, the UK's National Institute for Health Research co-funded 40 LMIC-focused projects – the most out of any organisation that co-funded such research. This is reflective of data at a national level whereby 66 of the 630 co-funded projects were co-funded by at least one organisation based in the UK – the most out of any of the more than 30 relevant countries, followed by China (36) and the United States (31).

Figure 14 - Top co-funding organisations awarding the greatest number of LMIC-focused projects



Note for Figure 14: *Emphasis has been placed on presenting the number of projects as opposed to amounts awarded by funders as financial information was only available for 59.2% of all projects in entire database (45.1% for LMIC-focused projects).*

Abbreviations and Acronyms: ***AUN/SEED-Net*** *- JICA Technical Cooperation Project for ASEAN University Network/Southeast Asia Engineering Education Development Network;* ***BRICS-STI*** *- Brazil, Russia, India, China, and South Africa Science, Technology, and Innovation Framework Programme;* ***e-Asia JRP*** *- East Asia Science and Innovation Area Joint Research Program;* ***EC*** *- European Commission;* ***FCDO*** *- Foreign, Commonwealth and Development Office;* ***IPA*** *- Innovations for Poverty Action;* ***NIHR*** *- National Institute for Health Research;* ***PEP*** *- Partnership for Economic Policy;* ***SGC*** *- Sino-German Center for Research Promotion;* ***UKRI*** *- UK Research and Innovation*

INTERDISCIPLINARITY

Another way to understand the extent of the collaboration associated with the research projects included in the tracker is to examine how many are interdisciplinary in nature. To assess this, a project was deemed interdisciplinary if either of the following conditions were met:

1. The WHO priority area assigned to a project included one of the seven medical science-oriented priority areas AND either one of the two non-medical science priority areas (namely 'Ethics considerations for research' and 'Social Sciences in the Outbreak Response');
2. The abstract of a given project (where available) makes reference to the project being inter-/cross-/multi- disciplinary.

Overall, 1,112 projects (10.5%) of the projects on the tracker were considered to be interdisciplinary using either method – 148 of which are LMIC-focused (13.3% of all interdisciplinary projects).

Outside of the non-medical science priority areas, projects deemed interdisciplinary were most-commonly categorised against the priority area on 'Infection Prevention and Control' – accounting for 43.2% of the interdisciplinary LMIC-focused projects and 34.9% of interdisciplinary projects overall (Table 7).

Table 7 - Interdisciplinary projects by medical science-oriented WHO priority area

WHO Priority Area	Total number of Interdisciplinary Projects (percentage indicated in brackets)	Total number of LMIC-focused Interdisciplinary Projects (percentage indicated in brackets)
Virus: natural history, transmission and diagnostics	**140** (12.6%)	**15** (10.1%)
Animal and environmental research...	**13** (1.2%)	**6** (4.1%)
Epidemiological studies	**223** (20.1%)	**29** (19.6%)
Clinical characterization and management	**230** (20.7%)	**29** (19.6%)
Infection prevention and control...	**388** (34.9%)	**64** (43.2%)
Candidate therapeutics R&D	**58** (5.2%)	**8** (5.4%)
Candidate vaccines R&D	**23** (2.1%)	**2** (1.4%)

Note for Table 7: *Emphasis has been placed on presenting the number of projects as opposed to amounts awarded by funders as financial information was only available for 59.2% of all projects in entire database (45.1% for LMIC-focused projects).*

In both cases, this can be considered largely a result of one of this priority area's sub-priorities that examines '*factors and methods influencing compliance with evidence-based IPC interventions during outbreak response*' which, conceptually, has natural linkages to social sciences. It is thus unsurprising to learn that, not only was this the most common sub-priority area for all interdisciplinary projects (accounting for 29.1% of all LMIC-focused interdisciplinary projects and 21.5% of interdisciplinary projects overall), but that the number of projects categorised against this sub-priority area greatly outnumbers the sub-priority area with the second greatest number of projects. For LMIC-focused projects, this was the sub-priority looking at the '*effectiveness of restriction of movement of healthy exposed and infected persons to prevent secondary transmission*' (12.8% of LMIC-focused interdisciplinary projects), and for all interdisciplinary projects, this was the sub-priority area examining '*transmission dynamics*' under the 'Epidemiological Studies' priority area (7.8% of all interdisciplinary projects).

Table 8 presents the top-10 funders of interdisciplinary research (both for LMIC-focused research and overall). With respect to all interdisciplinary projects, funders based in the United States collectively funded 528 interdisciplinary projects (47.5%) – the most out of any country, followed by funders based in the UK (173 projects totalling 15.6%) and Canada (111 projects totalling 10.0%). When considering LMIC-focused projects, funders based in the UK are ranked first (44 projects worth 29.8% of all interdisciplinary research relevant to LMICs) followed by funders based in Brazil (21 projects totalling 14.2%) and Canada (18 projects totalling 12.2%).

Interestingly, while funders based in high-income countries collectively funded 94.5% of all interdisciplinary projects, this figure is reduced to 59.5% when only considering research taking place in at least one LMIC.

Table 8 - Top-10 funders of interdisciplinary projects

Rank	Top Funders of Interdisciplinary Projects (1,112 total)	Top Funders of Interdisciplinary LMIC-focused Projects (148 total)
1	**NSF** (294 projects; 36.4%)	**NIHR** (22 projects; 14.9%)
2	**NIH** (180 projects; 16.2%)	**UKRI** (20 projects; 13.5%)
3	**UKRI** (118 projects; 10.6%)	**FAPESP** (10 projects; 6.8%)
4	**CIHR** (39 projects; 3.5%)	**IDRC** (10 projects; 6.8%)
5	**NIHR** (32 projects; 2.9%)	**Innovate Peru** (9 projects; 6.1%)
6	**PCORI** (21 projects; 1.9%)	**CONACYT Mexico** (8 projects; 5.4%)
7	**SNF** (19; projects; 1.7%)	**FCDO** (7 projects; 4.7%)
8	**NWO Netherlands** (17 projects; 1.5%)	**ICSSR** (7 projects; 4.7%)
9	**BMBF** (16 projects; 1.4%)	**Wellcome** (7 projects; 4.7%)
10	**ZonMw Netherlands** (15 projects; 1.3%)	**elrha** (6 projects; 4.1%)

Note for Table 8: *Emphasis has been placed on presenting the number of projects as opposed to amounts awarded by funders as financial information was only available for 59.2% of all projects in entire database (45.1% for LMIC-focused projects).*

INSTITUTIONS

The 10,608 COVID-19 research projects under consideration for this analysis was awarded to 3,995 institutions based in 101 countries (Figure 8) – though institutional data was missing for 578 projects, or 5.4% of the database).

Figure 8 - Location of institutions leading on COVID-19 research

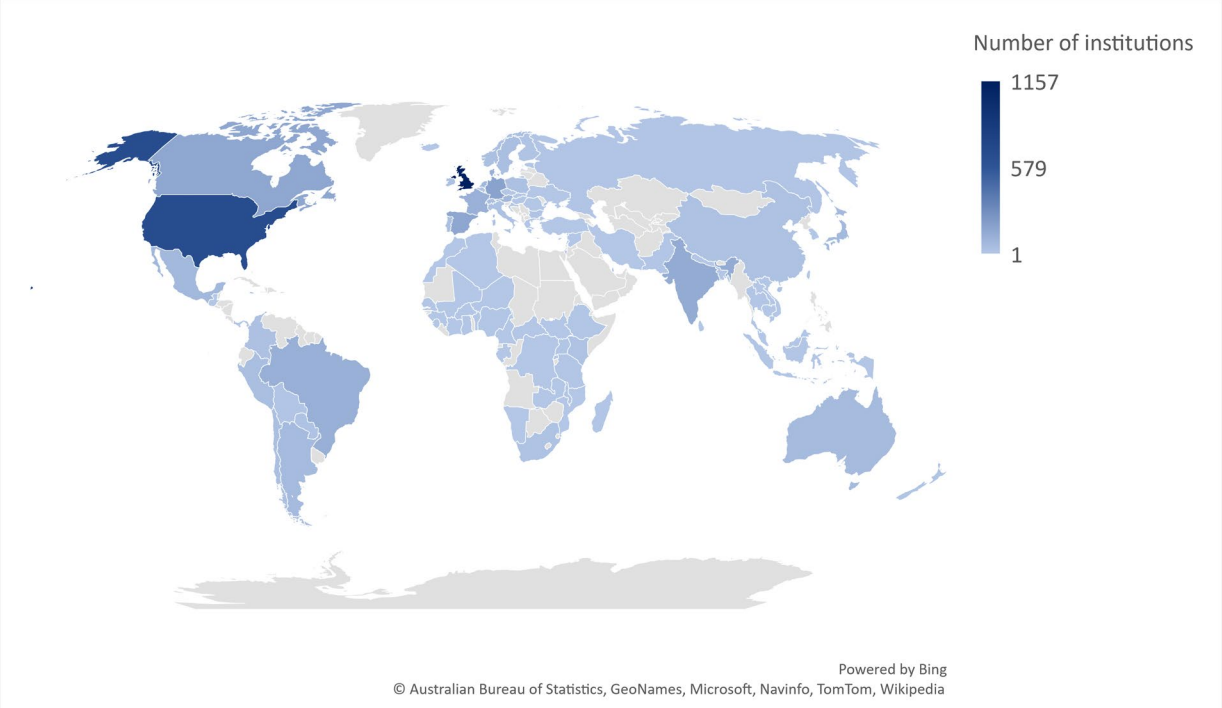
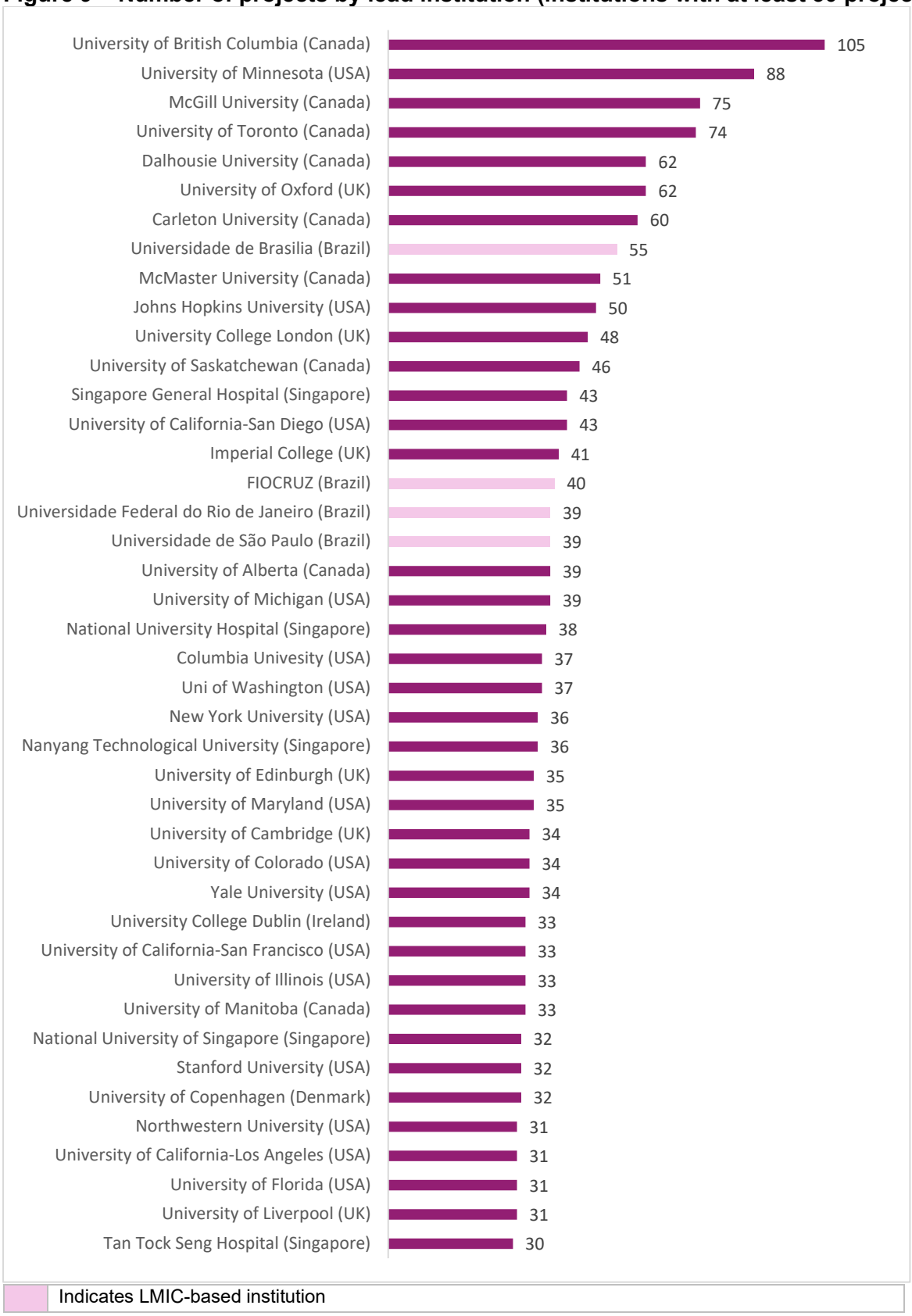


Figure 9 summarises the institutions that were designated as the 'lead' institution for the greatest number of projects. From figure 9, it can be seen that the institutions leading on the greatest number of COVID-19-related research (according to data on the tracker) are largely based in Canada – with six Canadian-based institutions ranking in the top ten.

While individual institutions are prominent, the 161 institutions based in Canada ranks fifth in terms of the total number of institutions at the national level – behind the United Kingdom (1,157 institutions), the United States (663), Germany (182), and Spain (162). This suggests that research being conducted in Canada is concentrated in a relatively smaller number of institutions. Looking at the projects-per-institution ratio (PPIR), Canada's PPIR of 7.07 ranks third among all countries – which is significantly greater than the only other countries whose

institutions are also leading in excess of 1,000 projects, namely the United States (PPIR of 4.09 – ranking sixth) and the United Kingdom (PPIR of 1.83 – ranking 34th).

Figure 9 – Number of projects by lead institution (institutions with at least 30 projects)

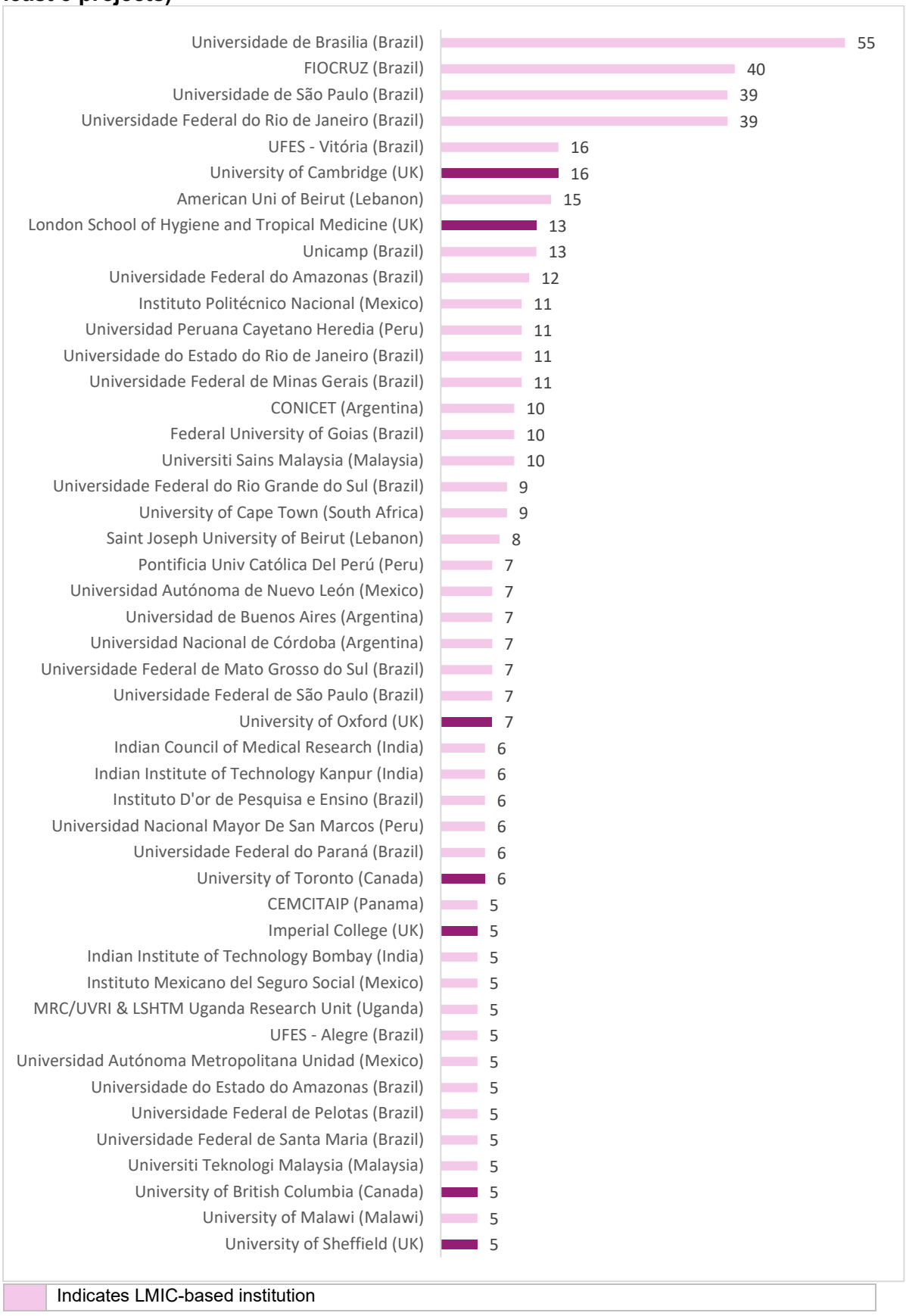


Note for Figure 9: *Emphasis has been placed on presenting the number of projects as opposed to amounts awarded by funders as financial information was only available for 59.2% of all projects in entire database (45.1% for LMIC-focused projects).*

Significantly, of the 42 institutions presented in Figure 9, only four LMIC-based institutions are the lead on at least 30 projects – all of which are based in Brazil. Overall, of the 3,995 institutions leading on COVID-19 research, 720 (18.0%) are based in LMICs.

To get a better understanding of the research response to COVID-19 as it pertains to LMICs, Figure 10 presents the institutions that were designated as the lead for the greatest number of LMIC-focused research projects. Continuing on the initial findings that were suggested in Figure 9, it can be seen from Figure 10 that Brazilian-based institutions led on the greatest number of LMIC-focused COVID-19 research projects – with seven institutions listed among the top ten. Furthermore, the large difference in the number of LMIC-focused research projects between the institutions ranked fourth and fifth in Figure 10 further underlines the prominence of Brazilian institutions for LMIC-focused research.

Figure 10 - Number of LMIC-focused projects by lead institution (institutions with at least 5 projects)

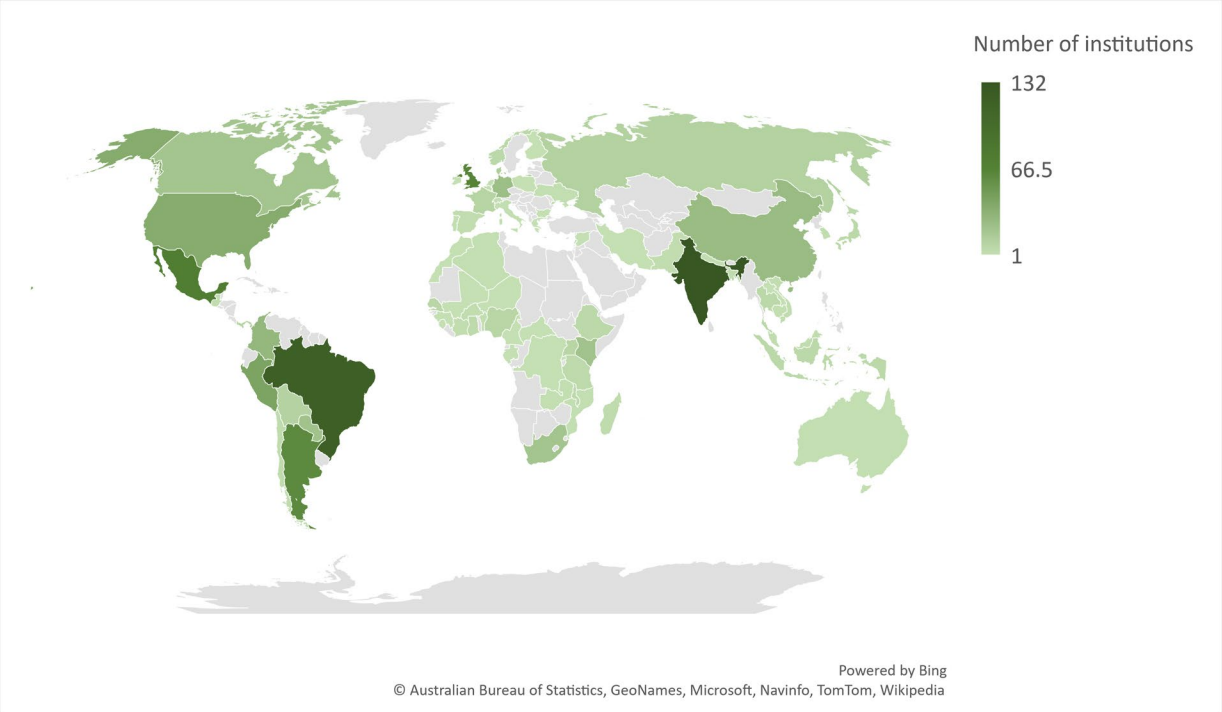


Note for Figure 10: *Emphasis has been placed on presenting the number of projects as opposed to amounts awarded by funders as financial information was only available for 59.2% of all projects in entire database (45.1% for LMIC-focused projects).*

Despite there being 118 institutions leading on LMIC-focused research based in Brazil, the total number of Brazilian institutions still ranks second to India's 132. However, due in large part to the large difference in the total number of projects being led by institutions based in Brazil (444 ranking first) and India (191 ranking second), the PPIR for Brazilian institutions as a whole (3.8 ranking third) is far greater that of Indian institutions as a whole (1.4 ranking 27th).

In addition to Brazil, it can also be seen from Figure 10 more widely that there is a heavy presence of institutions based in LAC. Out of the 910 institutions leading on LMIC-focused COVID-19 research, 372 (40.9%) are based in the LAC region – the first among all regions followed by Southern Asia (142 institutions), Northern Europe (86), and Eastern Africa (57). The distribution of all 910 institutions leading on LMIC-focused research is presented in Figure 11.

Figure 11 - Location of institutions leading on LMIC-focused COVID-19 research



Despite their relatively low numbers in Figure 11, there are a total of 214 institutions based in high-income countries leading LMIC-focused research – second only to institutions based in upper-middle income countries (Table 9). However, only approximately one quarter of these institutions (24.8%) have led on more than one LMIC-focused project. On average, LMIC-focused research constituted 49.7% of the portfolio of a lead institution based in a high-income country that has led on at least one LMIC relevant project. This figure is reduced to 32.2% when only considering the 53 institutions based in high-income countries that have led on at least two LMIC-focused projects.

Table 9 - Number of lead institutions of LMIC-focused research by OECD DAC income group

	Number of Institutions	Number of Institutions with more than one LMIC-focused project
Least Developed and Low Income	61	11
Lower-Middle Income	199	49
Upper-Middle Income	436	123
High Income	214	53

Looking more closely at the portfolios of the lead institutions, table 10 presents the institutions leading on the greatest number of projects under each of the WHO priority areas for both the overall and LMIC-focused portfolios. Taken together with the large number of institutions and corresponding number of projects of institutions based in Brazil (Figure 10), it comes as little surprise to see that Brazilian-based institutions led on the greatest amount of LMIC-focused research under each of the WHO priority areas (Table 10). Furthermore, the top two institutions (in terms of the number of LMIC-focused research) under seven of the nine priority areas are based in Brazil (with the exceptions being the priority areas on 'Infection Prevention and Control'; and 'Social Sciences in Outbreak Response') – further highlighting the heavy concentration of Brazilian institutions with respect to LMIC-focused research.

Table 10 - Lead institutions with the greatest number of projects by WHO priority area. Number of projects indicated in brackets.

WHO Priority Area	Overall	LMIC-focused
Virus: natural history, transmission and diagnostics	Uni Minnesota (38)	FIOCRUZ (18)
Animal and environmental research…	City Uni New York (4)	FIOCRUZ (3)
Epidemiological studies	Uni British Columbia (20)	Uni Federal Rio de Janeiro (7)
Clinical characterization and management	Uni British Columbia (26)	Uni São Paulo (24)
Infection prevention and control…	Uni British Columbia (19)	Uni Brasilia (6)
Candidate therapeutics R&D	Uni British Columbia (23)	Uni São Paulo (11)
Candidate vaccines R&D	Imperial College (7)	Uni São Paulo (4)
Ethics considerations for research	Nanyang Technological Uni (4)	*{16 institutions}* (1)
Social sciences in the outbreak response	Carleton Uni (35)	Uni Brasilia (9)

Note for Table 10: *Emphasis has been placed on presenting the number of projects as opposed to amounts awarded by funders as financial information was only available for 59.2% of all projects in entire database (45.1% for LMIC-focused projects).*

ANNEX C. COVID CIRCLE FUNDERS SURVEY REPORT

COVID CIRCLE FUNDER CONSULTATION

INTRODUCTION

The COVID CIRCLE initiative, a joint initiative between UKCDR and GloPID-R aims to collate learnings from the funding and research response to the COVID-19 pandemic to inform the response to this and future epidemics and pandemics. The learning is framed around the Seven Principles for supporting high quality research for the most pressing needs in epidemics and pandemics and will have a global view with a low- and middle-income country focus.

AIM

To facilitate learning for both funders and researchers to improve future response to epidemics and pandemics.

OBJECTIVES

a. Explore barriers and enablers to COVID-19 research funders fulfilling the Seven Principles for funding high quality research for the most pressing global needs in epidemics and pandemics.
b. Identify potential enablers or windows of opportunity for the translation of the Seven Principles into practice within the ongoing research response for the COVID-19 pandemic in LMICs.

METHODS

COVID CIRCLE undertook a funder consultation between 1st February, 2021 and 21st April, 2021. This consultation involved a survey of research funders involved in the COVID-19 response, funder interviews and consultations with UKCDR funders groups.
The survey was developed and internally piloted, before opening between 1st February, 2021 and 15th March, 2021, using *SurveyMonkey*.

Both open and closed-ended questions were included in the survey's three sections which focused on: defining respondents, proposal of case studies and specific questions pertaining to the application of the seven funder principles respectively. Funders were offered the option of presenting a consolidated response from their organisations or individual contributions and could also contribute through an interview (survey questions provided in Annex A).

In addition, four UKCDR funders groups (Disasters Research Group, Capacity Strengthening Group, Epidemics Funders Group and Equitable Partnerships Taskforce) were consulted, between 21st February 2021 and 22nd April, 2021, to facilitate cross-sectoral learning, gain expert insights into specific funder principles and

increase the breadth of responses, as these groups have representation from multiple funding organisations including LMIC funders.
Proposed case studies were reviewed by a selection panel and shortlisted cases were developed through further in-depth funder interviews to identify key learnings and innovative funder practice in response to COVID-19. Cross cutting themes and recommendations from these interviews are also incorporated in the results section here.
All responses were anonymised and data was managed in accordance with Wellcome policies.

FINDINGS/ RESULTS

SURVEY AND FUNDER CONSULTATION

Survey responses were received from 10 funding organisations (global, LMIC-based and UK-based) and included private, public, non-governmental and philanthropic organisations. Four UKCDR funders groups were consulted: Disasters Research Group, Capacity Strengthening Group, Epidemics Funders Group and Equitable Partnerships Taskforce.

Each of the seven principles was ranked between 3 – 5 (out of 5) by the majority of funders in an assessment of the extent to which their application was prioritised in the development of research funding responses to COVID-19 in LMICs. This is an indication of the high level of importance funders attach to the application of the seven principles for an effective pandemic response.

ENABLERS TO APPLYING THE SEVEN FUNDER PRINCIPLES

Cross cutting enablers
Funders can play a vital role in setting the standards for the adherence to best practice in research during epidemics and pandemics. Several approaches were taken to embed the principles in pre and post award activities including:

a. Embedding the seven principles in the design of projects and programmes.
b. Specific requirements of grantees (which were considered by peer reviewers) in funding call specifications.
c. Requiring grantees to demonstrate application of the principles in submitted research proposals. Where there were doubts of successful projects meeting specific principles, written contingencies or changes of the project plan were requested prior to funding being approved.

Enablers of the application of specific principles:

1. **Alignment to global research agendas and locally identified priorities**

a. Funders highlighted the importance of the timely availability of the WHO Research Roadmap for setting their research agenda. Further, the availability of regional research goals e.g. Research for Development goals for Africa Report and LMIC research priorities identified by AAS/TGHN/UKCDR

collaborative study was appreciated by funders. COVID CIRCLE activities complemented these efforts by providing regular analyses of funded projects (mapped against research priorities) and enabled identification of potential gaps in research funding, which some funders considered in prioritising research activities.

b. Engagement and coordination with local/regional research and policy organisations particularly in Africa gave funders insights into the evolving local/regional research needs and promoted the support of projects with high potential for influencing policy and practice. Key partners mentioned by funders include Africa CDC, WHO Afro and the African Academy of Sciences.

2. **Research capacity for rapid research**

a. Rapid funding was most easily facilitated through supplementing existing funded research activities and harnessing existing research partnerships.

b. Amending research funding processes for new grantees - Several funders initiated "rapid funding mechanisms" to address the urgent need for research evidence during the pandemic. Funders highlighted introducing fast track processes or simplified grant application processes as key enablers for rapid funding and initiation of research, particularly where these mechanisms were in place prior to the pandemic.

3. **Appropriate ethical consideration**
    a. Rapid ethical approval was easier for projects with existing Institutional Review Board (IRB) /Ethics Review Board (ERB) certification
    b. Engaging local partners - Obtaining ethical approval was easier where in- country partners with an understanding of how to navigate local approval systems facilitated review processes
4. **Collaboration and learning enhanced through coordination**
    a. Monitoring and evaluation for learning for the future - Several funders plan to or have undertaken monitoring and evaluation activities to assess the alignment of their COVID-19 response to the seven principles to learn lessons for the future. Funders either incorporated these into their routine M&E activities (e.g. annual reviews) or created bespoke processes for learning from their COVID-19 responses.
    b. Data sharing and engagement of partners - *"I think Africa did well in terms of coordination between major decision-making institutions".*
    A high degree of coordination and interaction within regional research and policy organisations and strong networks in the African sub-region was identified by funders as important for collaboration and information sharing.
    c. COVID CIRCLE activities- Several funders used the COVID CIRCLE Tracker and analyses to inform their decision making.

BARRIERS TO APPLYING THE SEVEN FUNDER PRINCIPLES

Cross cutting Barriers

The following barriers cut across several of the seven principles and limited funders' application of the principles in their research responses.

a. Time – "*Anything new e.g. commissioning research and new calls/rapid funding mechanisms, takes additional time as it requires new staff resource and processes to be developed*". Time was a significant limiting factor to applying the principles given the urgent need for rapid initiation of research in response to the pandemic.
b. Cost - Funders identified additional cost of supporting researchers to align their activities to the seven principles and additional operational costs as significant barriers to aligning with the principles. In LMICs partnerships this was further exacerbated by the relative lack of funding available through local organizations.
c. Difficulty monitoring compliance of grantees with the principles post award- Some funders attributed this to the lack universal metrics to monitor progress on applying some of the principles such as equity in partnerships.
d. Limited application of the principles in proposal review processes. It is difficult to assess the degree to which the principles are understood and factored into review panel processes.

Barriers of application of specific principles are highlighted below:

1. **Alignment to global research agendas and locally identified priorities**:
    a. Delayed development of and in some case absence of local and regional priorities hindered funders alignment of research agenda to these.

2. **Research capacity for rapid research**
    a. Grant review process- Funders identified the following barriers to rapid grant review processes. These include:
        i. Shortage of appropriate reviewers – inadequate numbers or reviewers of high expertise leads to delays in reviewing grant proposals.
        ii. Delays in funding processes- "*I think a big barrier is us ourselves, the review process even though we wanted them to be rapid…There are a lot of in-built breaks in reviewing and contracting*".
    b. Financial administration made it challenging for funders to fund LMIC partners directly without going through northern universities/ partners.
    c. Delayed ethical approvals hindered rapid initiation of research.

3. **Equitable, inclusive, cross-sectoral and interdisciplinary partnerships**:
    a. Insufficient funding to adequately support and sustain partnerships.
    b. Rapid research could potentially compromise the ability to ensure the strength and equity of research partnerships.

4. **Open science and data sharing**:
    a. Lack of clear guidelines on the optimal data sharing requirements (for the different types of research).

5. **Appropriate ethical consideration**
    a. "How fit for purpose are the ethical review processes for rapid research?" Rapid research could potentially compromise ethical considerations

including limiting the time to fully engage communities in setting research agenda, defining methods, and sharing findings.

Recommendations for future practice

Cross cutting Recommendations

a. Embed the application of the seven principles in the entire funding process including in the processes, proposal scoring and awarding of grants.
b. Develop guidance for applying ("operationalising") the seven principles
c. Funder collaboration to facilitate:
    - agreement on guidance for applying the principles
    - development of agreed mechanisms for tracking progress on applying the principles. For instance, research capacity strengthening, equitable partnerships, data sharing etc
d. Preparedness:
    - Application of the principles should be included in funders' epidemic/ pandemic preparedness activities. Here, funders can invest in partnerships, engage with relevant regional/ local stakeholders, develop rapid funding mechanisms and pilot these prior to disease outbreaks.
    - Increase awareness of funder and researcher coordination initiatives such as GLoPID-R and UKCDR and plans made to resource when required.
    - Increase awareness of existing research mechanisms for funding research during acute crises. Many funders developed responsive mechanisms for research following the West Africa Ebola (2014-2016) outbreaks and these, together with mechanisms developed during this current pandemic, will be useful for preparedness for future pandemics.

Recommendations for the application of specific principles are highlighted below:

1. **Alignment to global research agendas and locally identified priorities**: Establish partnerships/groups of expert consultants in advance of future pandemics to facilitate rapid consultation for regional and local research priority setting.
2. **Research capacity for rapid research** – Funder coordination to prevent shortage of reviewers through joint funding calls with well-coordinated review processes where reviewer lists are shared "*We can do better at coordinating the databases, so you don't for instance send several applications to one reviewer".*
3. **Open science and data sharing**:
    a. Development of clear and consistent policy expectations and guidance for openness across funders
    b. Make clear what the optimal requirements and guidelines are for sharing data for different kinds of research i.e. for biomedical research (which perhaps can be fully anonymised) versus social sciences research where information/ interviews on cultures and detailed accounts are used.
    c. Develop community infrastructure and practices for data sharing.
    d. To address ethical, legal and political constraints to data sharing. This will ensure trustworthy and equitable approaches which have the buy-in and support of LMICs.

e. Establish appropriate incentives for researchers that recognise and reward the rapid sharing of high-quality data and findings.

SUMMARY TABLE OF FINDINGS

Table 1: Crosscutting enablers and barriers to and recommendations for applying the seven funder principles

Enablers
▪ Embedding principles in the design of projects and programmes
▪ Including grantee requirements in funding call specifications
▪ Grantees demonstrating application of the principles in submitted proposals
Barriers
▪ Time
▪ Cost
▪ Difficulty monitoring compliance with principles post award
▪ Limited application of the principles in the proposal review process
Recommendations
▪ Embed application of the principles in the entire funding process
▪ Develop guidance for "operationalising" the principles
▪ Funder collaboration to agree on guidance for applying the principles
▪ Funder collaboration to agree on mechanisms to track progress on the principles
▪ Application of principles in funders' pandemic preparedness activities
▪ Increase awareness of existing funder and researcher coordination initiatives
▪ Increase awareness of existing responsive funding mechanisms which are important for pandemic preparedness

Table 2: Enablers to applying the seven funder principles

Principles	Enabler(s)
Alignment to global research agendas and locally identified priorities	▪ Timely availability of the WHO Research Roadmap for setting research agenda ▪ Engagement with local/regional research and policy organisations to gain insights into evolving priorities
Research capacity for rapid research	▪ Supplementing existing funded research activities and funding research through existing partnerships ▪ Expediting research funding processes through rapid funding mechanisms
Appropriate ethical consideration	▪ Projects with existing IRB/ERB certification ▪ Engaging local partners knowledgeable in navigating local ethics review processes
Collaboration and learning enhanced through coordination	▪ Monitoring and evaluation for learning for future response ▪ Data sharing and engagement of partners ▪ COVID CIRCLE tracker and analysis for informing decision making

Table 3: Barriers to applying the seven funder principles

Principles	Barrier(s)
Alignment to global research agendas and locally identified priorities	▪ Delayed development or absence of regional or local priorities
Research capacity for rapid research	▪ Shortage of appropriate reviewers ▪ In-built delays in funding processes ▪ Financial administration especially in funding LMIC processes ▪ Delayed ethical approvals
Equitable, inclusive, cross-sectoral and interdisciplinary partnerships	▪ Insufficient funding to adequately support and sustain partnerships ▪ Rapid research could potentially compromise the ability to ensure the strength and equity of research partnerships
Open science and data sharing	▪ Lack of clear guidelines on the optimal data sharing requirements (for the different types of research).
Appropriate ethical consideration	▪ Rapid research could potentially compromise ethical considerations in research

Table 4: Recommendations for applying the seven funder principles

Principles	Recommendation(s)
Alignment to global research agendas and locally identified priorities	▪ Establish partnerships/groups of expert consultants in advance of future pandemics to facilitate rapid consultation for regional and local research priority setting.
Research capacity for rapid research	▪ Funder coordination to prevent shortage of reviewers through joint funding calls with well-coordinated review processes where reviewer lists are shared.
Open science and data sharing	▪ Development of clear and consistent policy and guidance expectations for openness across funders ▪ Make clear what the optimal requirements and guidelines are for sharing data for different kinds of research i.e. for biomedical research versus social sciences research. ▪ Develop community infrastructure and practices for data sharing. ▪ To address ethical, legal and political constraints to data sharing in LMICs.

SURVEY QUESTIONS

COVID CIRCLE FUNDER CONSULTATION

Page 1: Introduction
This survey forms part of the COVID CIRCLE funder consultation for the learning element of our work. If you would prefer to contribute to this consultation though an interview (especially the proposals for case studies), please contact Rachel Miles at R.Miles@ukcdr.org.uk to arrange a time.

The consultation aims to:

1. Explore barriers and enablers to COVID-19 research funders fulfilling the Seven Principles for funding high quality research for the most pressing global needs in epidemics and pandemics. (link to PDF)
2. Identify potential enablers or windows of opportunity for the translation of the Seven Principles into practice within the ongoing research response for the COVID-19 pandemic in LMICs.
3. Identify any new lessons learnt from the first year's research response to COVID-19 to inform funder practice for future epidemics or pandemics in LMICs.

The survey takes approximately **20 – 30 minutes** to complete. You may wish to seek input from colleagues within your organisation to provide a consolidated response. To facilitate this, a text version of the survey questions is available **here.**

COVID CIRCLE Initiative Learning Project
The COVID CIRCLE Initiative is a learning and coordination partnership between UKCDR and GloPID-R aimed at supporting funders and researchers to deliver a more effective and coherent global research response during the COVID-19 pandemic.

This survey is part of the COVID CIRCLE initiative to facilitate learning for funders and researchers to improve research responses to pandemics and epidemics in LMICs.

Page 2: Consent form
The information/data you provide may be used in a publication on learning from the COVID-19 research response and will feed into discussions at various UKCDR Funders Groups, GloPID-R Working Groups and the COVID CIRCLE Steering Group. Any quotes used will be anonymised and refer only to your high-level type of organisation (for example, a public research funder). The original data forms collected will not be shared with any other third parties. In line with Wellcome policies, under which UKCDR operates, data generated in the course of the project will be kept securely in electronic form for a period of nine months in accordance with Wellcome policy.

- I agree to complete the questionnaire

- I understand that my participation is voluntary and that I am free to withdraw at any time, without giving reason
- I agree to the use of anonymised quotes in the COVID CIRCLE Learning publication.
- I agree to the use of anonymised quotes in other COVID CIRCLE public communications e.g., blogs, annual report
- I agree to be contacted by COVID CIRCLE for further information

----------Section A: Defining respondents----------

Q1)

a. What funding organisation are you responding on behalf of?
b. Name & position of respondent in organisation
c. Email address
d. Name & country of organisation
e. Type of organisation (public, private, non- governmental, Other)
f. What proportion of your COVID-19 research funding has been focussed on research undertaken in LMICs? (please include amounts and period of investment and whether the funding is ODA)
g. How are you planning to learn from or evaluate your own COVID-19 research investments?

----------Section B: Proposals for case-studies----------

As part of the COVID CIRCLE learning element, we will be developing case studies with research projects or programmes which have demonstrated innovative best practice in research in epidemics. These case-studies will identify the factors of success that might inform future funding and research practice in epidemics and will be selected by the COVID CIRCLE Steering Group from any recommendations provided.

Q2) Please propose any of your funded projects or programmes as examples that demonstrate innovative practice for research in epidemics for LMICs against any of these seven principles? (up to 5 projects or programmes)

a. Project name & funder reference
b. Additional details
c. Principal Investigator name
d. Please confirm whether you can facilitate an introduction if selected as a case study (Y/N)
e. Please summarise why this would make a good case study?
f. Which of the Seven COVID CIRCLE Funders Principles does it address?

Alignment to global research agendas and locally identified priorities	
Research capacity for rapid research	
Equitable, inclusive, cross-sectoral and interdisciplinary partnerships	
Open science and data sharing	
Protection from harm	
Appropriate ethical consideration	
Collaboration and learning enhanced through coordination	

----------Section C: Enablers, barriers and recommendations for applying the Seven Funders Principles for Supporting High-Quality Research for the Most Pressing Needs in Epidemics----------

Principle 1. Alignment to global research agendas and locally identified priorities.
To consider global research priorities, such as proposed by the World Health Organisation (WHO) and other multilateral entities or regional bodies such as the African Union, as well as local research priorities, in addition to funder strategic priorities, when funding research for global benefit.
Q3) To what extent has "***Alignment to global research agendas and locally identified priorities"*** been a priority in developing your research funding response to the COVID-19 pandemic in LMICs?

1	2	3	4	5

<rank score: 1 = not at all, 5 = to a great extent>

a. Which research priorities have you aligned your funding to?
   i. WHO Research Roadmap for COVID-19
   ii. African Academy of Sciences priorities
   iii. LMIC priorities
   iv. UN Recovery Roadmap
   v. Other [please specify]
b. What are the additional specific enablers to applying this principle (including any changes you made to funding practice in response to this pandemic)? <open ended>
c. What are the specific barriers to applying this principle and how can these be overcome? <open ended>

Principle 2. Research Capacity for Rapid Research
a. To build upon existing research capacity and systems, where available.
b. To support capacity strengthening necessary for the research.
Q4) To what extent has "***Research capacity for rapid research"*** been a priority in developing your research funding response to the COVID-19 pandemic in LMICs?
<rank score: 1 = not at all, 5 = to a great extent>

1	2	3	4	5

a. Have you leveraged prior funded research programmes to respond to COVID-19? (Y/N)
   If yes, what type of programmes were these?
   i. Clinical research networks
   ii. Cohorts
   iii. Other- please specify
b. Have you used any flexible or rapid funding mechanisms to support research on COVID-19? (Y/N)
   If yes, how did you achieve this?
   i. Supplementing existing grantees
   ii. Approving pivoting of already funded research projects

iii. Commissioning research
iv. Closed research calls to existing grantees
v. Rapid open funding call mechanisms
vi. Others

Please comment on the success of these mechanisms in expediting
i. decision making <open ended>
ii. research being undertaken <open ended>
iii. Funding flowing to grantees <open ended>

c. Have you explicitly supported capacity strengthening as part of the research response? (Y/N)
If yes, please provide details <open ended>
d. What are the additional specific enablers to applying this principle (include any changes made to funding practice in response to this pandemic)? <open ended>
e. What are the specific barriers to applying this principle and how can these be overcome? <open ended>

Principle 3. Equitable, inclusive, cross-sectoral and interdisciplinary partnerships
a. To support equitable partnership throughout the research process.
b. To promote inclusive and cross-sectoral partnerships to ensure that research is most likely to impact policy and practice.
c. To promote interdisciplinary research

Q5) To what extent have "***Equitable, inclusive, cross-sectoral and interdisciplinary partnerships"*** been a priority in developing your research funding response to the COVID-19 pandemic in LMICs?
<rank score: 1 = not at all, 5 = to a great extent>

1	2	3	4	5

a. Have you given or referred to any specific guidance for your researchers on partnerships? (Y/N)
If yes, which of these partnership aspects did it address (You can link to the guidance)?
i. KFPE
ii. COHRED Research Fairness Initiative
iii. TRUST Global Code of Conduct
iv. UKCDR building a partnership of equals
v. Other [Pease specify]
b. Has the research approach to COVID-19 catalysed your organisation forming new, equitable partnerships or hindered it? <open ended>
c. What are the additional specific enablers to applying this principle? <open ended>
d. What are the specific barriers to applying this principle and how can these be overcome? <open ended>

Principle 4. Open Science and Data Sharing
To require that research findings and data relevant to the epidemic are shared rapidly and openly to inform the public health response.

Q6) To what extent has "***Open Science and Data Sharing"*** been a priority in developing your research funding response to the COVID-19 pandemic in LMICs?
<rank score: 1 = not at all, 5 = to a great extent>

1	2	3	4	5

a. Have you given or referred to any specific guidance for your researchers on **open science** (e.g., that outputs arising from grants should be publicly available or shareable)? (Y/N)
   If yes, what is the requirement (you can link to the guidance) and was this updated in response to the COVID 19 funding? <open ended>
b. Have you given or referred to any specific guidance for your researchers on **data sharing**? (Y/N)
   If yes, what is the requirement (you can link to the guidance)? <open ended>
c. Please list any specific repositories mentioned in your guidance. <open ended>
d. What are the additional specific enablers to applying this principle? <open ended>
e. What are the specific barriers to applying this principle and how can these be overcome? <open ended>

Principle 5. Protection from harm.
To take all reasonable steps to anticipate, mitigate and address harm to those involved with research funded.
Q7) To what extent has "***Protection from harm"*** been a priority in developing your research funding response to the COVID-19 pandemic in LMICs?
<rank score: 1 = not at all, 5 = to a great extent>

1	2	3	4	5

a. Have you given or referred to any specific guidance for your researchers on protection from harm? (Y/N)
   If yes, what is the guidance?
   i. UKCDR Guidance on Safeguarding in International Development Research COVID addendum
   ii. UK Research and Innovation (UKRI) Preventing harm in research
   iii. National Institute of Health Research (NIHR) Safeguarding Guidance
   iv. DFID Enhanced Due Diligence: Safeguarding for external partners
   v. Other [Please specify]
b. What are the specific enablers to applying this principle? <open ended>
c. What are the specific barriers to applying this principle and how can these be overcome? <open ended>

Principle 6. Appropriate ethical consideration.
To ensure appropriate ethical consideration is embedded throughout research conducted, in particular regarding access to the products of research.
Q8) To what extent has "***Appropriate ethical consideration"*** been a priority in developing your research funding response to the COVID-19 pandemic in LMICs?
<rank score: 1 = not at all, 5 = to a great extent>

1	2	3	4	5

a. Have you given or referred to any specific guidance for your researchers on ethical consideration? (Y/N)
   if yes, what is the guidance?
   i. Declaration of Helsinki – ethical principles for medical research involving human subjects
   ii. Nuffield Council on Bioethics – Research in Global Health Emergencies: Ethical Issues
   iii. CIOMS and WHO International Ethical Guidelines for Health Related Research involving humans
   iv. WHO Ethical Standards for research During Public Health emergencies: Distilling Existing Guidance to Support COVID-19 R&D
   v. TRUST Global Ethics Code of Conduct for research in resource poor settings
   vi. San Code of Research Ethics
   vii. Other [Please specify]
b. What are the specific enablers to applying this principle? <open ended>
c. What are the specific barriers to applying this principle and how can these be overcome? <open ended>

Principle 7. Collaboration and learning through enhanced coordination. Coordination to ensure maximum impact of investments for research on the most pressing global needs for epidemics through cross- funder and cross-researcher collaboration learning and evaluation.
a. To map research funded, use these data to enhance coordination, and ensure it is publicly available.
b. To foster collaboration between studies funded in epidemics and facilitate shared development of research protocols, data collection tools, data sharing and exchange of knowledge.
c. To where relevant to embed operational research and support impact evaluation across funded projects to learn from and improve future funder and researcher responses for epidemics.

Q9) To what extent has "***Collaboration and learning through enhanced coordination"*** been a priority in developing your research funding response to the COVID-19 pandemic in LMICs?
<rank score: 1 = not at all, 5 = to a great extent>

1	2	3	4	5

a. Have you co-funded or collaborated with any other funding organisations for COVID-19 research funding? (Y/N)
b. If yes, please provide details.
c. Have any funders collaboration groups facilitated your funding response?

i. UKCDR
ii. GloPID-R
iii. COVID CIRCLE activities
iv. Other

d. Have you used the UKCDR & GloPID-R COVID-19 funding tracker to inform your activities? (Y/N)
   If yes, how?
   i. For informing funding decisions
   ii. For briefing strategy panels
   iii. For identifying opportunities for collaboration
   iv. Other [please specify]

e. Have you used the COVID CIRCLE Living Mapping Review? (Y/N)
   If yes, how? <open ended>
f. What are the additional specific enablers to applying this principle (including any changes you made to funding practice in response to this pandemic)? <open ended>
g. What are the specific barriers to applying this principle and how can these be overcome? <open ended>

Q10) Is there anything further that you would like to share regarding the research funding response to COVID-19 in LMICs (after considering the entire survey)?

a) If yes, please provide details <open ended>

RESEARCHER SURVEY FINDINGS

Introduction

The COVID CIRCLE initiative, a joint initiative between UKCDR and GloPID-R aims to collate learnings from the funding and research response to the COVID-19 pandemic in and for low resource settings, to inform future epidemics and pandemics. To capture this learning, surveys were undertaken with funders and researchers of COVID-19 research in low- and middle-income countries (LMICs). This researcher survey analysis complements a separate analysis of a funder consultation survey undertaken as part of the COVID CIRCLE initiative.

Aim

To capture researchers' perspectives on barriers and enablers to an effective funding and research response to the COVID-19 pandemic.

Objectives

- Highlight specific barriers and enablers to an effective funding and research response to COVID-19 in alignment with the 7 funder principles for supporting high quality research for the most pressing global needs in epidemics and pandemics.
- Identify recommendations on how funders could support researchers to fulfil the relevant 7 funder principles, and highlight broader research system needs to ensure an effective research response to future epidemics and pandemics.

Methods

The COVID CIRCLE researcher survey was developed and distributed using the Survey Monkey tool, and open between 3rd March 2021 and 23rd April 2021. The survey was shared through an event invitation for the COVID-19 Research in LMICs meeting, which brought together researchers and funders #from across the world working on COVID-19 research focussed on LMICs, and attended by over 500 researchers. The survey was re-shared during the meeting, to capture perspectives from the researchers present at the meeting, and interim findings were shared during the meeting to facilitate discussion. To ensure inclusion of non-English speakers, the survey was also translated into French, Spanish and Portuguese and responses translated using DeepL. Informed consent was sought from all survey respondents. The questions were a mix of ranked quantitative and open text response qualitative options, and qualitative analysis was undertaken using inductive qualitative research methodology to explore and identify key themes emerging from the data.

Results

The survey was completed by 70 researchers from across the world, with the majority of respondents from East Africa, Western Europe, South Africa and South-East Asia followed closely by South Asia and West Africa. Other respondents were based in Central Africa, Central America, South America, South-East Asia and Northern Europe.

Barriers to effective and high-quality research during epidemics and pandemics

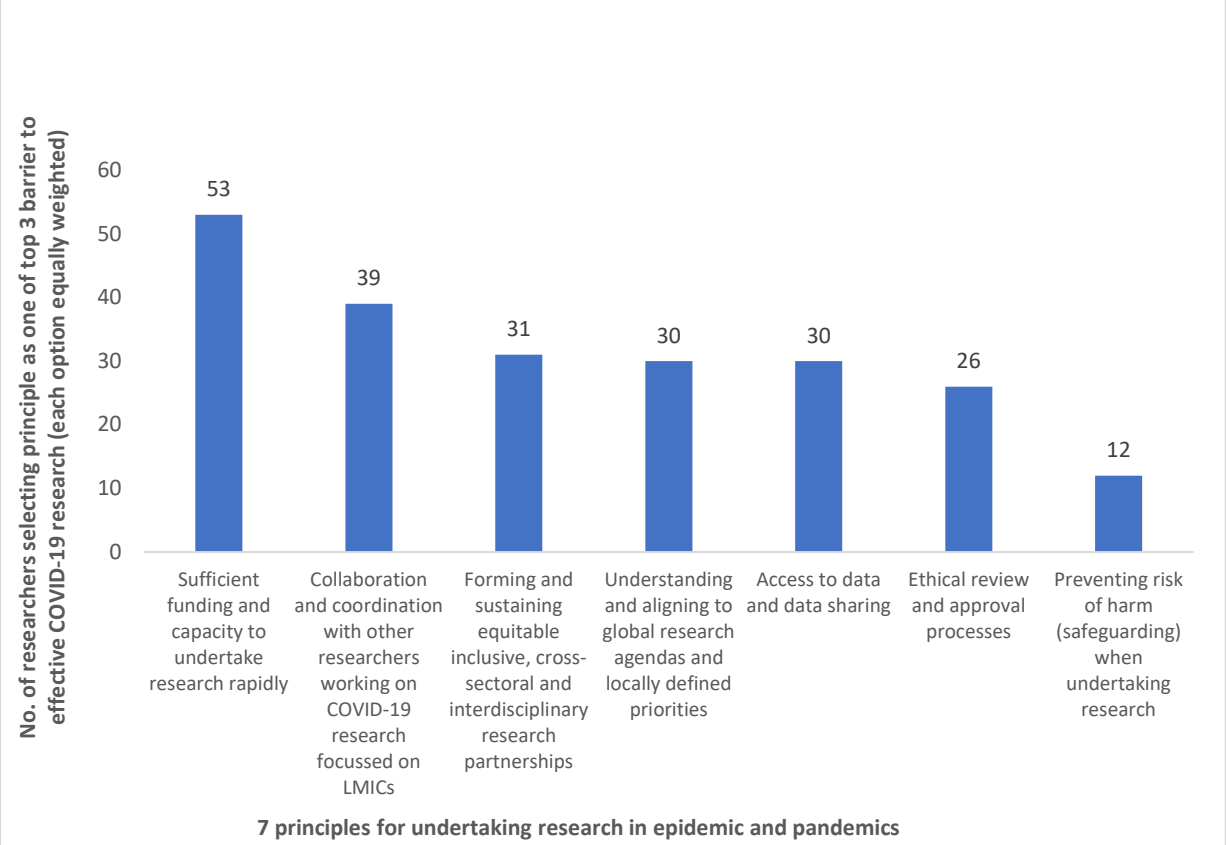
The survey explored researchers' perspectives on barriers to effective research for epidemics and pandemics, framed around the 7 funder principles. Respondents were asked

to identify the greatest barriers to research, and asked to select up to 3 top key barriers to undertaking research aligned to the 7 funder principles.

Top 3 barriers identified by researchers were (represented as percentage of researchers who ranked principle as top 3 barrier to effective COVID-19 research):

- Sufficient funding and capacity to undertake rapid research (76% of researchers ranked this one as of the top 3 barriers to effective COVID-19 research)
- Collaboration and coordination with other researchers working on COVID-19 research (56% of researchers ranked is this one as of the top 3 barriers to effective COVID-19 research)
- Forming and sustaining equitable, inclusive, cross-sectoral and interdisciplinary partnerships (44% of researchers ranked is this one as of the top 3 barriers to effective COVID-19 research)

Fig 1: Barriers to effective COVID-19 research focussed on low- and middle-income countries



Whilst majority of the data on barriers was collected through multiple choice options, respondents were asked to provide any additional comments at the end of the survey. This additional feedback provided further detail about some of the barriers selected aligned to the 7 funder principles which are detailed below.

Principle	Barriers
Alignment to global research agendas and locally identified priorities	Whilst this was highlighted as a key barrier to undertaking effective COVID-19 research, respondents did not provide much further detail about this barrier. Some barriers highlighted by individual respondents were:

	• Sometimes difficult to identify locally defined research priorities. • Lack of collaboration and negative competition between national entities/countries
Research capacity for rapid research	• Demand for researchers with specific expertise (e.g epidemiology, disease modelling and health economics) in LMICs outstripped supply. • Regular funding calls and grant application processes took a long time and huge competition for relatively small amounts of funding. • Limited funding for policy-oriented research. • Challenges in obtaining funding, with some researchers or institutions highlighting need to rely on local funding, which was sometimes insufficient to address local priorities or build capacity, and put a strain on the institution and impeded delivery of existing projects. • Limited funding for early career researchers to participate in COVID-19 research. • Some funding focussed more on high income country priorities rather than LMIC priorities.
Equitable, inclusive, cross-sectoral and interdisciplinary partnerships	Barriers highlighted by some respondents were: • Limited funding to support partnerships. • Difficulty connecting with some partners. • Limited pool of researchers in LMICs with expertise relevant to epidemics and pandemics (e.g. mathematical modelling and epidemiology, health economics) research for partnership with Northern partners. One respondent indicated there was some competition between global North researchers for the same research teams in the Global South.
Open science and data sharing	Access to data and data sharing was highlighted as a key barrier. Specific issues identified included: • Issues with data quality for research (for example poor quality data in health information systems to monitor or detect an emerging epidemic). • Hesitance in sharing clinical data – sometimes difficult to obtain from public hospitals or institutions. Local collaborators also hesitant to share data due to concerns it reflects poorly on clinical practice. • Some institutions hesitant to share data to enable them to apply for their own research grants or use for publications. • Single centre data bias • Competition and conflict of interest hindering data sharing – particularly data used for vaccine development. • Limited funding available to access available data or hire data analysts. • Data secrecy • Poor infrastructure and limited internet connectivity.

Protection from harm (safeguarding)	• There was limited feedback about barriers to safeguarding. However, one researcher highlighted cross-infection and adverse outcomes thought to be due to PPE shortage.
Appropriate ethical consideration	• Slow ethics review was highlighted as a key barrier to research, and respondents highlighted number of different reasons including bureaucracy, need for ethical approval from multiple countries, slow national ethics committee review, delayed national ethics review processes, institutional review board delays and dependency on busy clinicians. • One researcher highlighted lack of transparency of ethics review board.
Collaboration and learning enhanced through coordination	There was limited expansion of barriers relating to collaboration and coordination. Some barriers highlighted were: • Lack of funding for sustaining collaboration • Lack of networks in key regions similar to Africa CDC or ALERRT networks in other regions such as South East Asia • Lack of fora for enhancing and sustaining collaboration • Difficulties establishing contact with other researchers. • Funding of small underpowered studies whose data could not be pooled was highlighted as a barrier as it limits coordination and potential research impact.
Cross-cutting barriers	**A number of cross-cutting barriers were highlighted which included:** • Bureaucracy, administrative delays and slow processes were key barriers to undertaking research rapidly (e.g. ethics approval). • Governance and political issues

Enablers of effective and high-quality research during epidemics and pandemics

This survey also identified factors which enabled researchers to effectively undertake COVID-19 research focussed on low- and middle-income countries, framed around how they enabled researchers to fulfil the 7 funder principles. The identified enablers associated with the individual principles, and cross-cutting enablers are highlighted below:

Principle	Enablers
Alignment to global research agendas and locally identified priorities	• International webinars, conferences and online literature and resources. For example, whilst the first WHO COVID-19 Global Research and Innovation Forum to identify global COVID-19 research priorities was initially hosted in person, subsequent meetings including WHO COVID-19 research working groups, have been held virtually and greater numbers of researchers have been able to participate, in particular those from low- and middle-income country researchers.

	• Availability of global research agendas was identified as a key enabler to understanding and aligning to global research agendas. • Existing relationships, networks and partnerships between and with local researchers, key stakeholders, organisations supported alignment with aligning to locally defined research priorities. However, one researcher highlighted the challenge of identifying locally defined research priorities.
Research capacity for rapid research	Enablers to supporting research capacity for rapid research were: • Launch of rapid research calls during the COVID-19 outbreak such as the Wellcome/FCDO Joint Initiative on Research in Epidemics Preparedness and Response, UKRI GCRF-Newton rapid response calls and the Institute Pasteur Network. • Availability of previous or existing local or institutional sources of research funding facilitated research to be undertaken rapidly. • Other enablers mentioned included small grants from some funders to undertake fieldwork and collaboration with projects e.g REMAP-CAP, ISARIC, CCP.
Equitable, inclusive, cross-sectoral and interdisciplinary partnerships	Enablers to building and sustaining partnerships were: • Pre-existing and previous partnerships (e.g ISARIC, MORU's Critical Care Asia Network), and the trust built through these partnerships was identified as a key enabler to equitable research partnerships. • Networking, webinars and opportunities for researchers to communicate and engage. • Agreeing principles on equity with partners, and also changing the perspective to equity rather than Northern partners such as the UK being there "to help".
Open science and data sharing	A number of enablers to open science and data sharing were identified including: • Availability of public data and existing public databases (e.g. NCBI databases) and access to national and government data (E.g. ministry of health database). • Internet access – particularly in LMICs. • Partnerships and collaborations with other researchers, both local and international which facilitated data collection, data sharing, and data sharing agreements, shared cross-country protocols and databases.
Protection from harm (safeguarding)	Researchers highlighted enablers for safety/prevention of risk and harm such as: • The use and availability of PPE, and the availability of standard operating procedures and protocols (such as safety protocols). • The use or provision of research ethics guidance to prevent risk of harm, such as the Canadian Tri-Council Policy statement, as well as ethics review

	by national ethics committee and institutional review boards (IRBs). • The ability to work remotely online and minimise face-to-face contact and PCR testing prior to undertaking field work. • The availability of safeguarding policies, risk assessment, COVID specific research guidelines, training in infection control and relevant safety information provided to participants.
Appropriate ethical consideration	Whilst ethics review was highlighted as a key barrier, some enablers of appropriate ethics review were: • Rapid/expedited ethics review processes were identified as a key enabler to effective research in epidemics and pandemics - particularly through specific activities such as the establishment of COVID specific ethics review committees or boards, online/remote ethics review and prioritised ethics review for COVID-19 research projects. • Standardisation of processes, the value of well-established ethics review mechanisms and working with local partners to quickly address IRB concerns.
Collaboration and learning enhanced through coordination	During an epidemic or pandemic, collaboration and coordination between researchers to identify potential research gaps, understand ongoing research activities and explore potential synergies or collaborations is particularly important. The following enablers to this identified by researchers were: • The value of existing partnerships and research networks (such as ISARIC, CCA, ALERRT) for supporting collaboration and coordination. • Webinars, virtual communication and online platforms (such as the Health Systems Global platform) to facilitate greater engagement and collaboration between researchers. • Willingness amongst researchers to share, engage and connect. The COVID-19 Research in LMICs meeting was highlighted as a space which could open up collaborative opportunities. • One respondent from the South East Asia region highlighted that it might be valuable to explore network/models such as the African Coalition for Epidemic Research, Response and Training (ALERRT) and replicate in other regions to facilitate greater research coordination and collaboration.
Cross-cutting enablers	• Established networks and partnerships seem to impact/enable a range of principles to ensure high quality and effective research, and therefore it may be important for funders and researchers to invest in building and sustaining networks and partnerships in between disease outbreaks to support preparedness and rapid research response in the event of another infectious disease outbreak.

KEY RECOMMENDATIONS

Researchers were also asked to identify recommendations to support fulfilment of the 7 funder principles for high-quality for the most pressing global needs in epidemics or pandemics.

Key recommendations were:

1. Ensure funding for building research capacity (including surveillance) in between epidemics and pandemics and balance this with funding emergency research during the an infectious disease outbreak.
2. Provide funding for establishment of partnerships, collaborations, networks or coordination mechanisms to support future rapid research response. There was a specific recommendation that the ASEAN region should use the Africa CDC model or the ALERRT network to coordinate response to COVID-19 (or future epidemics or pandemics) in South East Asia. Also a need for more global approaches from governments and funders to research and pandemic response.
3. Introduce small grants for epidemics/pandemic research for early career researchers.
4. Provide dedicated or direct funding to low- and middle-income countries– EDCTP rapid response funding in Africa was found to be critical, and more similar dedicated funding would be beneficial.
5. Provide funding for diverse types of research such as health systems research funding, rather than just disease specific applied research. Also provide funding for broader applied research, implementation science and cohort studies.
6. Provide funding to support with data sharing during epidemics or pandemics, including set up of data sharing platforms.
7. Remove of operational bottlenecks to expedite ethics review process.

Other relevant recommendations highlighted by individual researchers to be considered by funders to support future research response included:

- Earlier and easy access to broaden access to funding and grants.
- A “Global Fund” for preventing and dealing with emerging infectious disease.
- Follow on funding for dissemination of research results with policy makers to facilitate research uptake.
- Value and include LMIC regional leadership in agenda setting and research priorities for funding.
- One health approach to epidemics and pandemic research.
- Quicker turnaround on grant decisions, and easy to fill and focussed request for proposals.
- Review impact and quality of rapidly funded research projects to inform future research response.
- Long interdisciplinary programme-based funding involving industry partners.
- Less numerous dispersed calls and high funding amount per project available – this could address limitation of funding various, small underpowered studies of which data can't be pooled limits coordination and impact of research.
- Support human resource exchanges and clinical samples access through international agreements to simplify procedures.
- Greater flexibility at the time of grant application and more rapid grant applications.

- Creation of an international registry of researchers with COVID-19 or broader epidemics expertise and who could be immediately informed when relevant research funding is available.
- Fair renumeration for data collectors.
- Pre-approved protocols for research during epidemics – approved by all relevant stakeholders.
- Provide resources to strengthen and ensure long-term sustainability of health information systems for pandemic preparedness.