Covid-19 Funding Trends

Insight and analysis on the research funding patterns emerging in response to the coronavirus pandemic.

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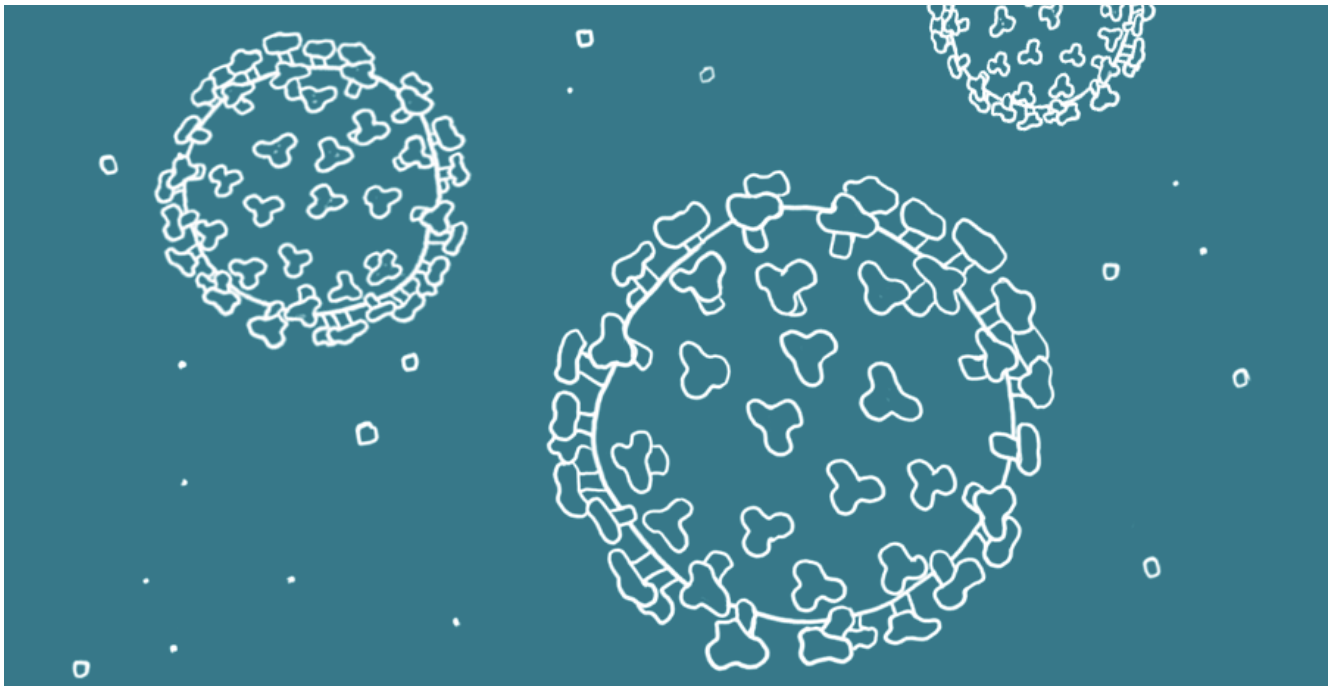
INTELLIGENCE | Funding trends

Big spenders

A vast flow of funds to researchers around the world, in response to Covid-19, has been unprecedented

Robin Bisson



The mobilisation of research and development to fight Covid-19 has outstripped the response to any infectious disease outbreak in history. The successful development of effective vaccines has been compared with research triumphs such as the space race and the development of nuclear weapons in the Manhattan Project. But unlike such previous research races, which were proxy battles between individual superpowers, the research response to the coronavirus pandemic has been a global effort.

Nonetheless, tensions between national interests and international collaboration have been at play since the Sars-Cov-2 virus was first identified. Trends in how countries have funded Covid-19 research and development illustrate these and are likely to impact how the world moves from response to recovery.

Funding has flowed to researchers around the world in unprecedented amounts since the disease was first detected in China in 2019. But some sectors, countries and even whole disciplines have been relatively neglected as governments and charities focus on the immediate need to develop and scale up medical work.

A significant percentage of the huge numbers bandied around for Covid-19 spending also include procurement of vaccines and other medical products, rather than traditional R&D spending. This has further confused the picture for those trying to unpick the largest flood of money to engulf the research sector in living memory.

In this report, Research Professional News presents an analysis of who the biggest players have been in funding the Covid-19 research response, how their money has been spent, and what lessons global funders have learned about working together as the world begins to look beyond the pandemic.

Big bio spending

Researchers working on vaccines, drugs, diagnostics and devices for Covid-19 have claimed the lion's share of funding announced to date.

Between 1 January and 1 October 2020, the global health think tank Policy Cures Research (PCR) tracked public, philanthropic and industry research funding commitments in these areas of nearly $9.2 billion.

This dwarfs such spending in previous attempts to fight diseases. For example, total R&D funding for Ebola between 2014-2018 came to less than $2bn.

To put the sums in context, global spending on all R&D runs to around $1.7 trillion annually according to UN data.

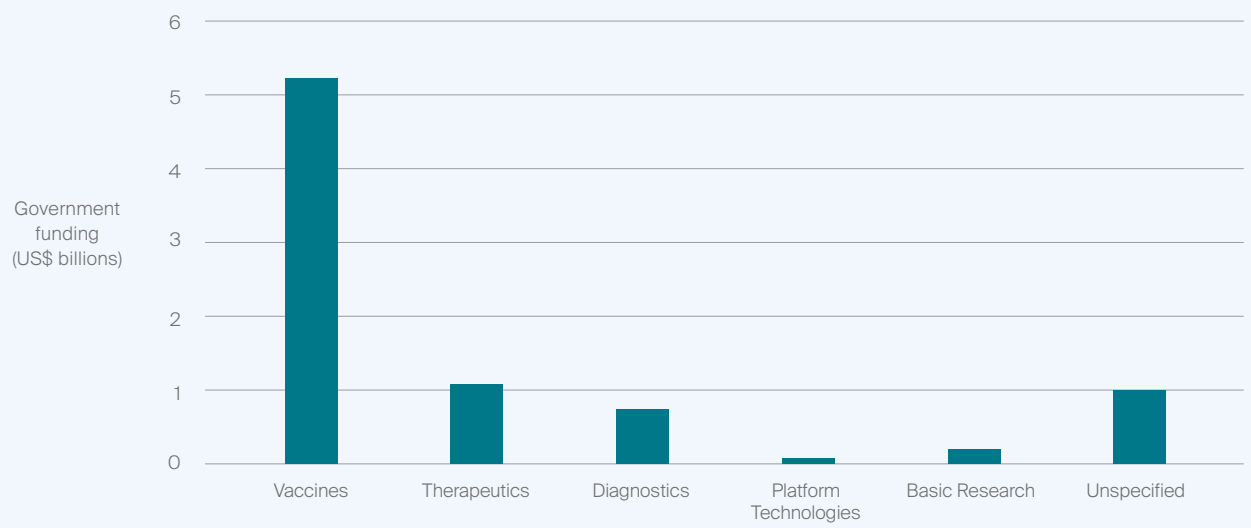
By far the biggest Covid commitments have been for vaccine research, accounting for 60 per cent of announced funding at nearly $5.5bn. This is more than quadruple the amount committed for drug development, at $1.3bn, and nearly seven times the amount committed for diagnostics, at $804 million. Basic research comes in at just $213m.

While these figures do not include self-funded investment by the pharmaceutical industry, companies have been promised by far the most money, mostly by governments,

> “The United States dominates the leaderboard of highest spending countries, having committed nearly 50 per cent of the global total spending on research, some $4.4bn.”

Government priorities

Government spending on Covid-19 has focused heavily on vaccines, but millions have also flowed into basic research and other areas.



Source: Policy Cures Research–1 January to 1 October 2020

reflecting the massive costs of staging large-scale clinical trials. Half of all funding commitments tracked by PCR, totalling $4.5bn, went to companies, with just four vaccine candidates—those from GlaxoSmithKline and Sanofi, Moderna Therapeutics, Janssen, and Novavax—accounting for $2.6bn of that.

Rather than looking at funding commitments announced for Covid-19 R&D, the UK Collaborative on Development Research (UKCDR), alongside the Global Research Collaboration for Infectious Disease Preparedness (GLoPID-R), have been tracking grants awarded by funders on Covid-19. Up to 11 February, UKCDR had tracked 1,842 research projects in 139 countries funded by over 100 funders, totalling at least $4.1bn.

While the UKCDR figure is an underestimation, since not all funders have yet made their grants public, it gives an impression of how funding is percolating from the big commitments made by governments and other funders down to the research front lines.

National interests

Spending on Covid research mirrors traditional national strengths in science, to a large extent. The United States dominates the leaderboard of highest spending countries, having committed nearly 50 per cent of the global total earmarked for research, some $4.4bn, according to PCR.

The remaining members of the top five biggest global donors for R&D are, in order: Germany, the United Kingdom, Canada and the European Union. The top nine national governments and the EU—which ranks fifth—jointly committed just under $7.8bn, more than 90 per cent of total public funding.

China comes seventh, according to publicly available data, but this is not a true reflection of the resources the country has directed toward the pandemic, especially considering there are at least five Chinese-developed vaccines in phase three clinical trials. The state-owned pharmaceutical company Sinopharm, whose vaccine has been approved for emergency use in China and the United Arab Emirates, allocated $142m to R&D, according to Chinese state media.

Some countries that have not traditionally been big beasts of global R&D are also notable for committing major sums. Canadian funders, for instance, had announced $653m by 1 October 2020 compared with the EU’s $472m. Similarly, both Norway and Saudi Arabia make the top ten list for biggest commitments to Covid-19 R&D. Other countries are notable by their absences, particularly Japan and Russia.

Big money from big funders

The US dominance of Covid-19 R&D funding in the available data is largely down to a single funder: the Biomedical Advanced Research and Development Authority.

Barda was set up in 2006 to counter bioterrorism; it primarily funds pharmaceutical companies to develop and scale-up vaccines and other medical interventions against public health threats. In September 2020,

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> “The only non-government funder to make it into the top ten biggest donors is the Bill and Melinda Gates Foundation.”

Global powers

Of the top ten Covid-19 funders, the United States stands in a league of its own, although data from some major powers such as China are too patchy for comparisons to be made.

	Country	US$ million
1	United States	4,060
2	Germany	1,084
3	United Kingdom	661
4	Canada	653
5	European Union	472
6	South Korea	304
7	Norway	219
8	Saudi Arabia	160
9	France	120
10	Spain	113

Note: Data from China not available

Source: Policy Cures Research–1 January to 1 October 2020

United we stand

The United States, United Kingdom and Canada are significantly in the lead in the top ten of where Covid-19 research projects are located, although there are major caveats on the data.

	Country	Number of projects
1	United States	1,443
2	United Kingdom	1,146
3	Canada	992
4	France	247
5	Germany	187

	Country	Number of projects
6	Switzerland	125
7	Netherlands	125
8	Ireland	124
9	Mexico	109
10	Portugal	100

	Country	Number of projects
14	Australia	79
16	Italy	70
19	Spain	60
22	China	47
34	New Zealand	16
36	Israel	15

Note: A limited number of projects are multi-national and counted under more than one country; 170 unknown location projects are omitted from this data.

Source: UKCDR–January 2020 to December 2020

European Commission president Ursula von der Leyen announced plans to create a European body modelled on Barda, which is expected in late 2021. While many of Barda's commitments include manufacturing and stockpiling, PCR calculates that its research managers earmarked some $3.2bn for R&D, including a shared commitment of $1.1bn from Barda and the US Department of Defense.

The next single largest funding body is Germany's Federal Ministry of Education and Research, BMBF, which committed $1.1bn up to 1 October. BMBF part-funded work on the vaccine developed by BioNTech and Pfizer, which was the first to produce successful results in late-stage clinical trials.

UKCDR data, which do not include Barda, show that the National Institutes of Health in the US had given out the largest total in grants up to 11 February, at $1.3bn.

Many funders who have clocked up the largest totals in grant announcements so far will be familiar to research managers. In Europe, reported Horizon 2020 funding has totalled nearly $1.2bn. In Britain, UK Research and Innovation and the National Institute for Health Research have given out $479m between them. And other public funders have reported major sums, including the US National Science Foundation ($234m), Germany's BMBF ($223m) and the Canadian Institutes of Health Research ($128m). These figures don't take into account funds which have been committed but not yet published as grants, so don't include some major donors.

The only non-government funder to make it into the top ten biggest donors, according to PCR, is the Bill and Melinda Gates Foundation, which by 1 October had committed $232m—almost as much as the governments of France and Spain combined. The UK-based Wellcome Trust charity was the second biggest non-profit funder, committing $63m.

Other philanthropic players to have made significant contributions to R&D during the coronavirus pandemic include the Chan Zuckerberg Initiative and Michael & Susan Dell Foundation in the US, the Avast Foundation in the Czech Republic.

Vaccine focus

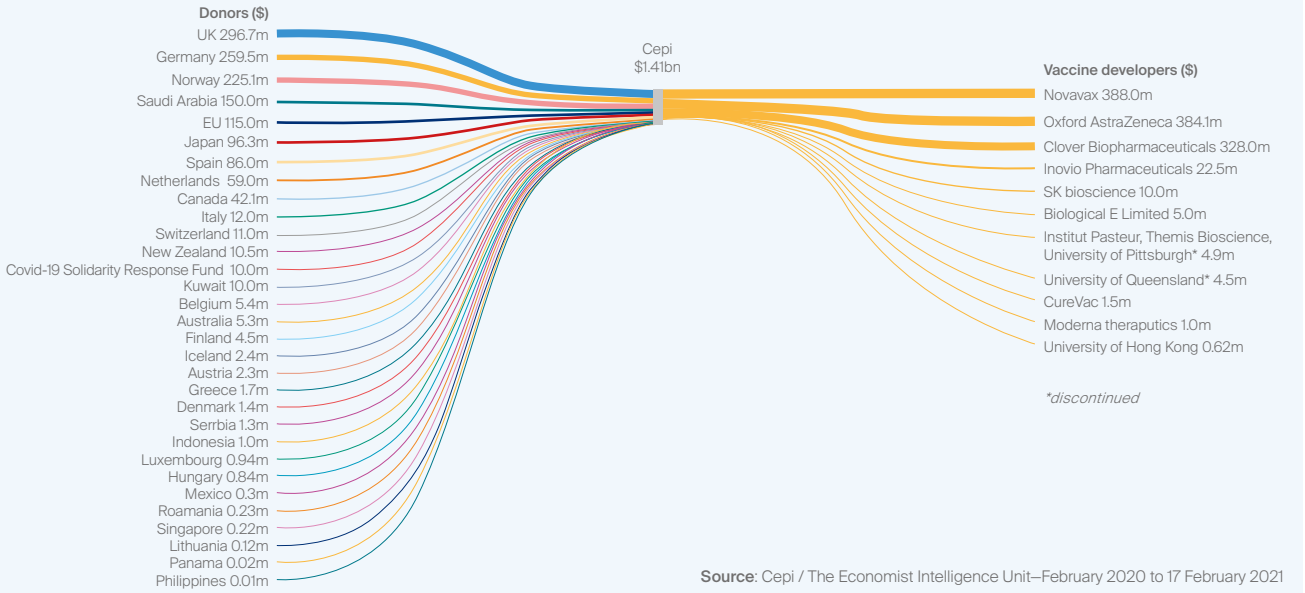
While countries around the world prioritised developing vaccines, not all of them went about it the same way. Researchers in China largely targeted the older, more tested approach of using an inactivated virus, while many of those in the US and European countries focused on newer technologies. This meant some teams who got major funding commitments were working for smaller, more experimental companies and university-based labs.

Moderna Therapeutics, which received the second largest commitment for vaccine R&D at just under $1bn, according to PCR, is a spinout from Harvard University, formed in 2010. Its successful vaccine uses messenger RNA, molecules involved in processing information stored in DNA, to produce an immune response, as does the successful Pfizer/BioNTech vaccine. No vaccine created using this technology had ever been successfully licensed for use before. Similarly, the US company Novavax is a relatively small vaccine maker using

> “A University of Oxford team…along with AstraZeneca, were one of the first to get their vaccine through phase 3 trials.”

Funding flows

The international vaccine funder Cepi has channelled over $1bn from 31 donors to 11 global vaccine developers since the start of the pandemic.



Source: Cepi / The Economist Intelligence Unit—February 2020 to 17 February 2021

an experimental approach and it stands to receive up to $485m for R&D.

Two UK universities feature in the top ten biggest recipients of R&D funding for vaccines—with researchers at the University of Oxford and Imperial College London heavily funded via the UK government. A University of Oxford team, along with partners at pharmaceutical giant AstraZeneca, were one of the first to get their vaccine through phase three trials. They received $107m, while fellow researchers at Imperial College London received $52m.

The Coalition for Epidemic Preparedness Innovations, a global coalition for developing vaccines against emerging infectious diseases, has been a key player in vaccine R&D. Having raised $750m before the Covid-19 pandemic, Cepi was able to mobilise funds rapidly and has played an intermediary role between governments and vaccine developers.

Since February 2020, Cepi has been pledged $1.4bn by 31 donors with more than 50 per cent of that coming from the UK, Germany and Norway. The $1.2bn Cepi has committed to 11 Covid-19 vaccine developers puts it in second place behind Barda in terms of the biggest funders of Covid-19 R&D. But since Cepi acts as an intermediary between major donors, such as Germany’s BMBF, and developers, it is not included in our ranking of top funders.

Therapeutic work

While vaccine researchers and developers have hogged the limelight and taken $5.5bn in funding, the earlier stages of the pandemic saw a greater emphasis on work on treatments to help control the disease, and $1.3bn has been spent on this. Rapid turnaround clinical trials of repurposed drugs were a key feature during the first months of the pandemic, with a second wave of novel antivirals coming later.

PCR has tracked products through the R&D pipeline up to 21 December, counting 207 repurposed drugs and 155 new candidates. Only three repurposed drugs had received emergency or full regulatory approval, the most high-profile being remdesivir. While US regulators approved the drug after an NIH trial concluded it cut recovery time for severely ill patients, a global study coordinated by the World Health Organization found no positive impact.

A further three novel antiviral treatments had received emergency approval. One of these is Regeneron’s antibody treatment, which was given to former US president Donald Trump when he contracted Covid-19. Regeneron is the only company in the top five biggest recipients of funding to have been developing a drug, not a vaccine, having received $237m from Barda.

The top spending donors on therapeutics are similar to the situation with vaccines, with two notable exceptions: Canada’s government made a single commitment of $124m to the company AbCellera for developing antibody treatments, making it the second largest funder after Barda, while the French government similarly pushed $39m towards the company Abivax.

While companies tended to bag the

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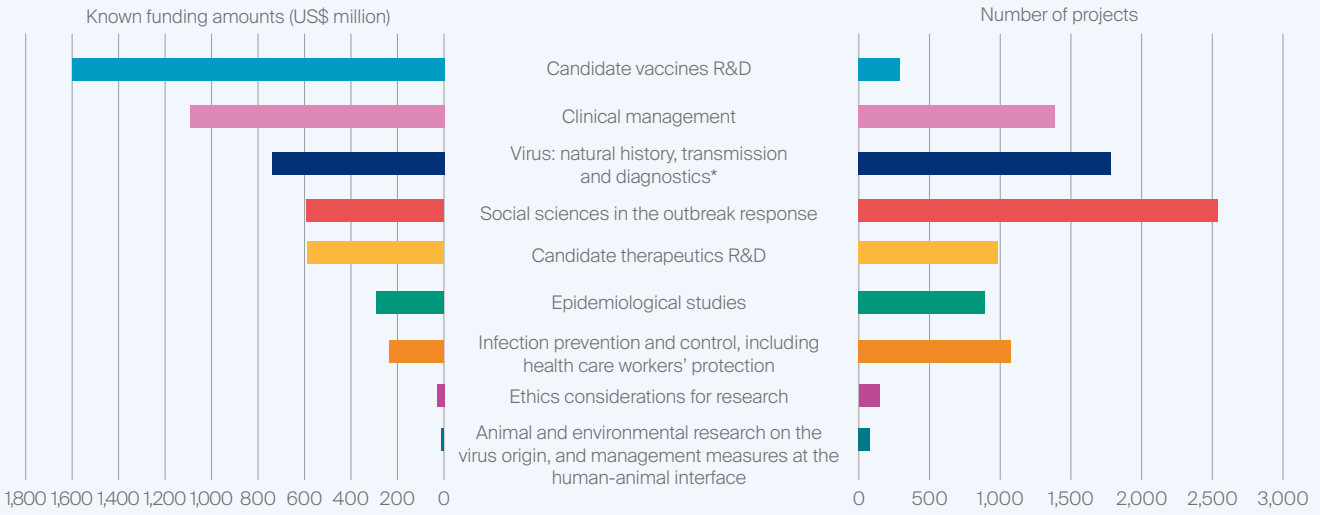
> “Over 90 per cent of research projects are located in high-income countries, with the greatest number in the US.”

Priority areas

Thousands of research projects have been funded and billions of dollars spent on them, but while vaccine work as a category has claimed the lion’s share of the money, the total number of projects shows a very different balance.



Notes: *This category includes tests. Not all projects are costed, so funding totals are underestimated

Source: UKCDR–1 January 2020 to 11 February 2021

biggest commitments in therapeutics, universities and research institutes attracted a larger share of money than for vaccines, with the Canadian government, EU and the Australian government in particular funding research across a swathe of institutions. Similarly to the Cepi setup, a significant amount of funding for therapeutics has been routed through the Covid-19 Therapeutics Accelerator, an initiative set up in March by the Gates Foundation, the Wellcome Trust and Mastercard to raise funds for research.

Up to 1 October, the accelerator had dished out $72m, having received commitments of $249m. Notably, while Cepi’s funders are almost entirely national governments, philanthropic funders have played a much larger role in the Therapeutics Accelerator, accounting for 60 per cent of total funding.

Diagnostics

The NIH is by far the biggest funder of diagnostics research at $500m, more than 60 per cent of the total tracked by PCR. But diagnostics R&D has also attracted a slightly more varied stable of funders, with some of the biggest commitments coming from non-profits such as the Gates Foundation ($25m), the Amazon Web Services Diagnostic Development Initiative ($20m), and the Open Philanthropy Project ($10m).

UKCDR also found that projects on diagnostics accounted for a substantial portion of grant announcements, potentially reflecting the early push for workable tests. Its team found 633 projects on developing tests, funded with at least $204m. In comparison, there were 987 projects on therapeutics R&D totalling at least $599m, and 297 projects on vaccines R&D totalling at least $1.6bn.

Western dominance

UKCDR data show a dramatic skew in the location of where Covid-19 research is taking place. Over 90 per cent of research projects are located in high-income countries, with the greatest number in the US followed by the UK and Canada (see 'United we stand' box on P4). Chinese funders have only announced fewer than 100 projects, though the number is likely far higher.

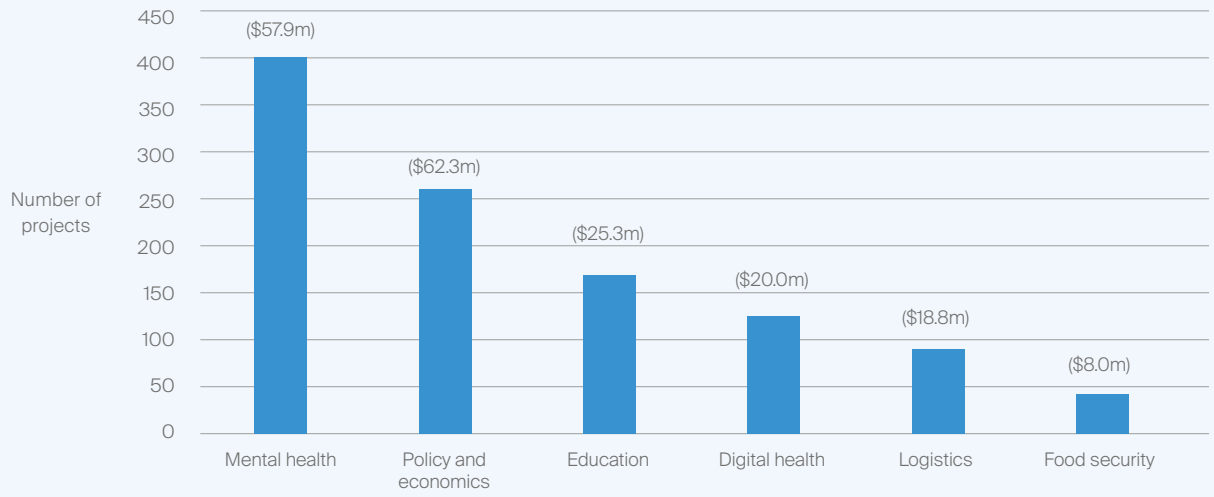
In a paper published on 18 December, Alice Norton and her colleagues at UKCDR point out that projects on the underfunded area of viral emergence often need to take place in low- or middle-income countries, where diseases are more likely to occur because of the higher chance of interaction between humans and animals that allow viruses to make the jump. In one controversial episode, an NIH grant to the US-based non-profit Eco-Health Alliance, which was investigating coronaviruses in bats in collaboration with the Wuhan Institute of Virology in China, was cancelled in April 2020. The Chinese institute had been at the centre of unfounded claims, supported by some senior US politicians, that it could be the source of the Covid-19 pandemic.

One factor behind the low number of projects outside high-income countries could be that the virus hit Western countries

> “The pandemic led to a proliferation of research projects that were underpowered and unable to achieve their aims.”
> **UKCDR** paper, published 18 December

Outsider research

Outside of the WHO priority areas, mental health and policy research dominates on both number of projects funded and total funding amounts.



Source: UKCDR–1 January 2020 to 11 February 2021 **Note:** Total funding for topic area shown in brackets for each topic.

before it hit the developing world, so funders in high-income countries prioritised urgent domestic matters. Norton says that there was a second wave of calls by funders in high-income countries for research in low- or middle-income countries, which is only starting to come through. “We’re also aware of funders within low- or middle-income countries who, in the past few months, have put funding calls in place, so I do see research in that context expanding,” Norton adds.

International coordination

As soon as the virus began spreading internationally, it was clear that a coordinated global research effort was needed. Charu Kaushic is the chair of GLoPID-R, an international network of 29 major funders focused on infectious diseases that has worked hand-in-hand with the World Health Organization. Kaushic says that, compared with the 2014 Ebola epidemic in West Africa, international coordination kicked in quickly. “One of the big differences in this pandemic was that we were coordinating right from the beginning, so we had eyes and ears on the ground,” says Kaushic, who is also a director at the Canadian Institutes of Health Research, the country’s major health funder.

Kaushic said there were GLoPID-R meetings in December 2019 and January 2020 that primed funding bodies to start looking at which research groups in their countries were doing relevant work.

Funding by discipline

The WHO released an agenda for research priorities on 12 February as part of its R&D Blueprint programme for reacting to epidemics.

UKCDR data shows that the least well-funded of the nine WHO priority areas are ethics, with 139 projects totalling at least $29m, and animal and environmental research on the virus origin, with only 77 projects totalling at least $16m.

Outside of the WHO priorities, which are focused on health research, UKCDR has found that the majority of projects were in the social sciences, suggestive of a research response to the wider impacts of the pandemic.

The areas where research is already taking place beyond the WHO priority list sheds some light on what researchers and funders are focused on. Top of the list are policy and the economy, with $62m of known funding for 262 projects, and mental health, with $58m in funding for 400 projects.

Duplicated efforts

GLoPID-R’s Kaushic says the WHO-led coordination helped funders immediately engineer their funding opportunities to react to the outbreak. But this did mean that “the horses all left the stall at the same time”, leading to some duplication of effort. “To me, that is probably a lesson learned—and something for us to think about,” she adds.

“We could have coordinated better instead of, for example, funding 15 trials in 10 different

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Opportunities in numbers from Pivot-RP

556

Opportunities offering funding for Covid-related research, equipment, facilities or programme development.

224

The number of these funding opportunities that are from private foundations or non-profits.

$50m

The amount on offer from the US Centers for Disease Control and Prevention scheme to address Covid health disparities in high-risk groups.

$140m

Amount available from the Coalition for Epidemic Preparedness Innovations to support Covid-19 vaccines in clinical trials.

Note: Some of these funding opportunities are forecast and not yet confirmed
Source: Pivot-RP database, March 2021 https://pivot.proquest.com/funding/results

countries with 300 people each, many of which might have been stopped because they were on things that didn't pan out."

According to some research-watchers, this duplication meant funding ended up being spread too thinly. In their December analysis, researchers at UKCDR said the pandemic had led to "a proliferation of research projects [that were] underpowered and unable to achieve their aims".

It is too early to estimate how much duplication there has been, says Norton. But she says that the overarching issue of uncoordinated research is a huge problem, and one of the reasons behind the tracker itself, which matches funded research to the WHO's research priorities.

"I think research funders are actively trying to be more coherent in response to this pandemic and fill areas where there is need," Norton says.

Kaushic points out that there has been unprecedented sharing of information between funders, which has enabled research to move at incredible speeds. "We made remarkable progress [given] that on 30 January, we were still figuring out what we should name this virus," she says.

With the arrival and growing rollout of effective vaccines, the picture of Covid-19 R&D at the end of 2021 is likely to look very different. Major clinical trials will continue, of course, and the global Covax initiative for equitable access to Covid-19 vaccines has said it will need an additional $800m for R&D in 2021, even as global rollouts of vaccines get underway.

But as the world moves from response to recovery, there is also likely to be an evolution in research priorities.

Building back

In November, the United Nations released a research roadmap for recovery from Covid-19 that called for strengthening research ecosystems via investments in data systems. Steven Hoffman, a researcher from the Canadian Institutes of Health Research who led the development of the roadmap, says that such investments "can lead to better understanding of problems but also better understanding of where the solutions are actually working, and whether those solutions are reaching everybody".

The UN report also said it would be important for the research community to take stock of the impact of the pandemic on national and international research ecosystems—spanning governments, civil society and the private sector—and strengthen them against future shocks. The disruption to research from lockdowns has been expensive, and the Organisation for Economic Co-operation and Development warned in a briefing to the G20 nations in November that 2021 might see tighter public budgets for non-Covid-19 research and a potential fall in business R&D.

One important lesson for research funding from Covid-19 has been the effectiveness of pre-positioned funds for pandemic response, such as Cepi, which had been facilitating platforms for developing vaccines. "I think it is clear that a lot of the really effective research that has been undertaken has been facilitated by pre-prepared structures," says Norton.

Kaushic agrees and points out that the case for preparedness could not have been emphasised more clearly than during 2020. One idea for the future is to have a mechanism, agreed by governments, where a pot of funding is accessible to international bodies during an outbreak so funders don't have to spend time coordinating, Kaushic suggests. "What would it take? A systemic change," she says.

COMMENT | Clinical research

An ounce of prevention

Let's prepare for the next pandemic, not always fight the last one

Paul Barnsley is senior analyst at Policy Cures Research, based in Sydney, Australia

At the height of the west African Ebola outbreak in July 2015, the pharmaceutical company Johnson and Johnson began trialling a vaccine for the disease. One trial was originally intended to run until November 2016, but as the outbreak waned this was repeatedly pushed back until it finally concluded in July 2019.

This illustrates the catch-22 that pandemics present to policy-makers. Recurring outbreaks can only be prevented through clinical research, but this can only be conducted while the disease is out of control. If non-pharmaceutical strategies such as contact tracing, isolation and social distancing reduce infections, it can be impossible for trials to distinguish statistically between infection rates in patients given a vaccine candidate and those given a placebo.

Mobilising R&D is more difficult still because the pathogens with the most pandemic potential are inherently the ones we know least about. When a novel pathogen appears or when a known pathogen acts in unexpected ways, such as the previously unknown effect of the Zika virus on unborn children, it takes time to understand its basic biology, let alone begin work on diagnostics, treatments and vaccines.

Outbreaks of an emerging infectious disease therefore present health systems with a narrow window to conduct late-stage clinical trials of vaccines and therapeutics.

Reactive funding

A report by Policy Cures Research, called Landscape of Emerging Infectious Disease R&D, shows that policy and funding can do more to adjust to this dynamic. Tracking spending between 2014 and 2018, the report shows that most funding comes in response to each outbreak, with comparatively little devoted to preparing for the next one.

Global funding for Ebola, for example, more than tripled between 2014 and 2015 as the west African outbreak took hold. Most of this came from massive investments from public organisations in the United States and multinational pharmaceutical companies. As falling case numbers made late-stage trials difficult or impossible, funding fell by around $125 million (€106m) in both 2016 and 2017.

In those years, attention switched to South America's Zika outbreak. R&D spending on Zika went from a relative afterthought—just $6m in 2015—to $170m in 2016, peaking at $243m in 2017. As with Ebola, funding dropped sharply as the outbreak receded.

In 2018, an Ebola outbreak in the Democratic Republic of the Congo drove a rebound in funding and provided an opportunity for renewed testing. A number of treatments completed successful trials and received regulatory approval, leaving us in a stronger position for future Ebola outbreaks.

In some ways, then, the system works: a swift global response eventually led to a vaccine. But by focusing so much on each new outbreak, the global community risks constantly refighting the last war rather than preparing for the next one.

The focus on Ebola and Zika is likely to have reduced funding for research on other pathogens. Some 80 per cent of funding for basic research between 2014 and 2018 was directed to these two viruses. Tellingly, funding for coronavirus research fell in 2018, as memories of the Mers and Sars outbreaks began to fade.

Pandemic preparedness

The good news is that policy-makers have taken two important steps beyond purely reactive funding. First, 2017 saw the establishment of the Coalition for Epidemic Preparedness Innovations. This pools funding from smaller public and philanthropic investors to make forward-looking commitments to R&D on epidemic diseases.

Cepi's initial disbursements in 2018 drove a 30 per cent increase in funding for Lassa fever and bolstered funding for Mers and Nipah virus, at a time when global funding for lesser-known priority pathogens was otherwise in decline.

The second crucial step taken is increased funding to prepare for as-yet-unknown pathogens. This is exemplified by the World Health Organization's inclusion of Disease X in its list of priorities, and Cepi's 2019 funding for multi-disease R&D. These changes benefited platform technologies used to underpin the response to emerging pathogens, which have assisted product development in response to Covid-19.

Together, such initiatives helped to lay the foundation for the unprecedented R&D response to Covid-19. In hindsight, though, it is obvious that the cost of an uncontrollable global outbreak dwarfs any increased investments in pandemic preparedness.

There is a real risk, once this crisis passes, of forgetting hard-won lessons and reverting to a focus on the last threat, instead of increasing and diversifying our efforts to prepare for whatever the next pandemic turns out to be.

> "In hindsight, it is obvious that the cost of an uncontrollable global outbreak dwarfs any increased investments in pandemic preparedness."