



ANTIMICROBIAL RESISTANCE IN INTERNATIONAL DEVELOPMENT:

UK Research Funding Landscape

2019

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We are a collaborative of government and research funders working on international development. Our core contributing members include:

- Department for Business, Energy and Industrial Strategy (BEIS)
- Department for International Development (DFID)
- Department for Health and Social Care (DHSC)
- UK Research and Innovation (UKRI)
- Wellcome

Our other members include, governmental actors such as the Foreign and Commonwealth Office (FCO), Department for Environment, Food and Rural Affairs (DEFRA), GoScience and the devolved government administrations in the UK. Our wider stakeholders include the UK and international research community, research funding delivery partners, the non-governmental organisation (NGO) sector and private sector.

We are governed by the HMG Strategic Coherence for Official Development Assistance (ODA)-funded Research (SCOR) Board. The SCOR Board is Chaired by an independent member, Prof Baron Peter Piot, and brings together the Chief Scientific Advisers and Directors of our core members. An advisory council comprising expertise from our wider members ensure we have diversity of opinions and views across the sector.

Our Vision

Accelerated global development through the power of research and knowledge.

Our Mission

To amplify the value of research for global development by promoting coherence, collaboration and joint action among UK research funders.

Our Aims

UKCDR has four key aims:

- Mapping, analysis and foresight
- Convening for collaboration and joint action
- Sharing information, learning and best practice
- A collective voice to shape policy

For further information on UKCDR, please visit ukcdr.org.uk.

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- UK Research and Innovation (UKRI)
- Wellcome

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Acronyms & Abbreviations

ABR	Antibacterial resistance	InnoVet-AMR	Innovative Veterinary Solutions for AMR
AMR	Antimicrobial resistance	JPIAMR	Joint Programming Initiative on Antimicrobial Resistance
AMRFF	UK AMR Funders Forum	LMICs	Low and Middle-Income Countries
AMR SORT IT	Antimicrobial Resistance Structured Operational Research and Training Initiative	MMV	Medicines for Malaria Venture
BactiVac	Bacterial Vaccinology Network	MRC	Medical Research Council
BEIS	Department for Business, Energy and Industrial Strategy	MVP	Meningitis Vaccine Project
CARB-X	Combating Antibiotic-Resistant Bacteria Biopharmaceutical Accelerator	NIHR	National Institute for Health Research
DeTACT	Development of Triple Artemisinin Combination Therapies	ODA	Official Development Assistance
DFID	Department for International Development	PDP	Product Development Partnership
DHSC	Department for Health and Social Care	R&D	Research & Development
DNDi	Drugs for Neglected Diseases initiative	ResIn	Research Investments in Global Health
FIEBRE	Febrile Illness Evaluation in a Broad Range of Endemicities	SEDRIC	Surveillance and Epidemiology of Drug-resistant Infections Consortium
FIND	Foundation for Innovative New Diagnostics	TB	Tuberculosis
GAMRIF	Global AMR Innovation Fund	TB Alliance	Tuberculosis Alliance
GBD	Global Burden of Disease	TDR	Special Programme for Research and Training in Tropical Diseases
GCRF	Global Challenges Research Fund	UKCDR	UK Collaborative on Development Research
GHR	Global Health Research	UKRI	UK Research and Innovation
GHS	Global Health Security	UN IACC	United Nations Interagency Coordination Group on Antimicrobial Resistance
HIV	Human Immunodeficiency Virus	WHO	World Health Organisation
IDRC	International Development Research Centre	WWARN	WorldWide Antimalarial Research Network
ICARS	International Centre for AMR Solutions		

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Executive Summary

In 2018/19 the UK Collaborative on Development Research (UKCDR) analysed information on joint initiatives by leading global research funders based in the UK related to combatting antimicrobial resistance (AMR) in low and middle-income countries (LMICs). The purpose was to obtain a comprehensive picture of UK's investment in this area and identify research priorities, strategic gaps that require new research, opportunities for joint working and to help reduce the risk of duplication.

The rise in drug-resistant infections, caused by microorganisms such as bacteria, viruses, fungi, and parasites with increasing AMR, is an urgent threat to global health that has been projected could claim up to 10 million lives by 2050.¹ Investing in research and development (R&D) for drugs, vaccines and diagnostic tools as well as interventions that address the drivers of AMR (including prescribing) is central to global efforts to tackle AMR.

AMR is a complex, multi-sectoral issue spanning human, animal and environmental health, and social, economic and political factors requiring One Health approaches to tackle it successfully. The UK is playing a leading role in tackling AMR internationally using a One Health approach,² particularly in LMICs where AMR could reverse recent progress against diseases such as malaria, Human Immunodeficiency Virus (HIV) and Tuberculosis (TB).³

This paper provides a high-level overview of UK commitments and major UK-funded initiatives in international development research on AMR. It also provides an overview of UK and global coordination mechanisms on AMR research and identifies strategic research gaps to address in the future.

Key Findings

- The UK plays a leading role in international development efforts to combat AMR in LMICs through R&D.
- There are four major global funders of international development research on AMR based in the UK: three government departments, the Department for Business, Energy and Industrial Strategy (BEIS) through UK Research and Innovation (UKRI), Department for International Development (DFID) and Department for Health and Social Care (DHSC) which utilise Official Development Assistance (ODA) to fund international development research and Wellcome, the UK's largest non-governmental charity, which funds global

1 O'Neill (2016) [Tackling Drug-Resistant Infections Globally: Final Report & Recommendations](#), The Review on AMR

2 [Contained and controlled: the UK's 20-year vision for antimicrobial resistance](#)

3 O'Neill (2014) [Antimicrobial Resistance: Tackling a crisis for the health and wealth of nations](#), The Review on AMR.

research and activities that does not report to UK ODA.⁴

- Over 2016-2022, UK funders have currently committed £464.4m towards international development research to tackle AMR globally, through more than 25 strategic initiatives.
- There is considerable UK and global funder coordination in AMR with DHSC taking a leading role on policy aspects and the Medical Research Council (MRC) on research aspects in the UK. There are also many ongoing efforts to thoroughly map the AMR research and funding landscape at the UK and international level.
- UK and co-funded international development research-related initiatives on AMR such as DFID's support for development of new products including through Product Development Partnerships (PDPs), Global AMR Innovation Fund (GAMRIF), a part of DHSC's Global Health Security programme, the DHSC Global Health Research programme, Global Challenges Research Fund (GCRF), Newton Fund and the US-led Combating Antibiotic-Resistant Bacteria Biopharmaceutical Accelerator (CARB-X) which receives significant UK investment, are responding to global AMR agendas and research priorities.
- Over the past few years, as the complexity and drivers of AMR have been recognised, this has positively contributed to a more cross-sectoral and interdisciplinary approach to AMR research, including new holistic One Health initiatives and Tackling AMR – a Cross-Council Initiative in the UK.

⁴ ODA is used to classify sovereign government spending on aid, as defined by the Development Assistance Committee of the OECD. This investment counts towards the UK government's legal commitment of spending 0.7% gross national income (GNI) on overseas development aid each year. Funding from the three UK government departments (BEIS, DFID, DHSC) is classified as ODA, while Wellcome investment and activities does not report to UK ODA.

Antimicrobial Resistance in International Development: UK Research Funding Landscape

Introduction

The rise in drug-resistant infections, caused by micro-organisms such as bacteria, viruses, fungi and parasites with increasing antimicrobial resistance (AMR) is one of the biggest threats to global health. AMR has been estimated to be responsible for approximately 700,000 deaths globally each year – a number that could rise as high as 10 million by 2050.¹

AMR is a complex and multi-sectoral issue spanning human, animal and environmental health, and social, economic and political factors. AMR has been increased and accelerated by actions such as inappropriate use of antimicrobial drugs in healthcare; poor infection prevention and control practices; and non-prudent use of antimicrobial drugs in agriculture amongst other factors. In addition, the potential for AMR to spread rapidly across countries due to global travel, trade and migration, has transformed it into a major global challenge to international development.²

Low and middle-income countries (LMICs) are at higher risk of the emergence and spread of AMR due to the high burden of infectious diseases and factors such as poor water and sanitation, limited access to antibiotics, weak health systems and underdeveloped antibiotic stewardship.³⁴ AMR could also affect LMICs by potentially undermining recent progress against global killers such as malaria, Human Immunodeficiency Virus (HIV) and Tuberculosis (TB).⁵

1 O'Neill (2016) [Tackling Drug-Resistant Infections Globally](#): Final Report & Recommendations, The Review on AMR

2 Barber, S. & Swaden-Lewis, K. (2017) Antimicrobial Resistance Briefing Paper

3 LSTM (2016) [AMR Surveillance in low and middle-income settings](#) - A roadmap for participation in the Global Antimicrobial Surveillance System (GLASS)

4 Singh Poonam Khetrpal (2017) [One Health approach to tackle antimicrobial resistance in South East Asia](#) BMJ; 358:j3625

5 O'Neill (2014) Antimicrobial Resistance: Tackling a crisis for the health and wealth of nations, The Review on AMR.

Methodology

UKCDR analyses information on research investments by leading global funders in the UK to obtain a comprehensive picture of the UK's international development research investments and to identify research priorities, strategic gaps that require new research, opportunities for joint working and to help reduce the risk of duplication. In 2018/19 we analysed funder activities related to combatting AMR in LMICs.

Data on high-level commitments to international development research-related initiatives on AMR was obtained through information provided by five global funders based in the UK -the Department for Business, Energy and Industrial Strategy (BEIS) through UK Research and Innovation (UKRI), Department for International Development (DFID), Department for Health and Social Care (DHSC) and Wellcome. Stakeholder viewpoints and further information on coordination mechanisms and future priorities were also gathered through desk-based research and individual meetings with the Drug Resistant Infections Priority Programme, Wellcome; UKRI/Medical Research Council (MRC), DHSC Global Health Security (GHS) and Joint Programming Initiative on Antimicrobial Resistance (JPIAMR) and discussions with DFID staff.



Scientists at Bugworks, in Bangalore, are at the cutting edge of efforts to develop new antibiotics.

Credit: Fact and Story/Wellcome

Current major strategic UK investments in international development research-related initiatives on AMR

Investing in R&D for drugs, vaccines and diagnostic tools as well as research into interventions to address the drivers of AMR (including prescribing) is central to global efforts to tackle AMR. The UK plays a leading role in international development efforts to combat AMR through R&D. Over 2016-2022, the UK has so far committed £464.4m to tackling AMR globally. Figure 1 shows a breakdown of investments by global funder based in the U'K and UKRI and Wellcome portfolios are highlighted in Annex 2 (Figures 2 and 3 respectively). Annex 3 provides more detail on UK funded AMR research initiatives.

There are four major global funders of AMR research based in the UK: three government departments – BEIS (through UKRI), DFID and DHSC funding international development AMR research through the UK government's ODA budget; and Wellcome, the UK's largest non-governmental charity which funds global research and activities that does not report to UK ODA.²

The Department for Business, Energy and Industrial Strategy (BEIS)

- BEIS, through the Global Challenges Research Fund (GCRF) and Newton Fund, have invested £33.8m in global AMR calls, administered by MRC and other UKRI research councils through the strategic programme Tackling AMR – a Cross-Council Initiative (see Fig. 2). UKRI's approach through GCRF is primarily through targeted strategic calls that select the highest quality research. It is focused on a wide range of research from basic to translational research as well as early and intervention development, with both public and private partnerships. The Newton Fund focuses on interdisciplinary partnership working with emerging economies and LMICs, with matched funding. Figure 3 in Annex 2 for an overview of UKRI's portfolio.

Department for International Development (DFID)

- DFID are investing approximately £161m (for the period 2017-2021) in research relevant to AMR through product development research including Product Development Partnerships (PDPs). PDPs are not-for-profit organisations that bring together public and private stakeholders and enable multi-donor aggregated funding for the development of drugs, vaccines, and other health tools as public goods. DFID are the lead UK department for the UK government's relationship with PDPs. Examples of DFID's PDPs related to AMR include the Foundation for Innovative New Diagnostics (FIND), Medicines for Malaria Venture (MMV), TB Alliance and Global Antibiotic Research, and Development Partnership (GARDP) through support to the Drugs for Neglected Diseases initiative (DNDi), Meningitis Vaccine Project (MVP), Diarrhoeal disease vaccine development, and Development of Triple Artemisinin Combination Therapies (DeTACT) (See Box 1 for more information on DeTACT).

1 Sources: DFID confirmation of text. DHSC – government website communications, paper for SCOR Feb 2018. GCRF & Newton – UKRI submission to HoC Health & Social Care Committee AMR inquiry 2018, MRC presentation SULSA conference in Glasgow, MRC/UKRI email communications and data, UKRI GCRF data extraction. UKRI non GCRF/Newton figures unknown. Wellcome – website, email communications.

2 Wellcome aims to spend £5 billion on health research between 2015 and 2020. Currently 20% of Wellcome funding is in international settings.

- DFID's research focuses on product development (e.g. diagnostics, vaccines, drugs, insecticides), delivery and implementation, for a range of diseases that affect the poorest (e.g. malaria, TB, sleeping sickness). The product development research of the PDPs includes tackling drug-resistant TB, malaria and other diseases, but the relative contribution to AMR is difficult to disaggregate, so it is included in the total funding as indirect AMR funding. DFID are also funding applied health research through initiatives such as Febrile Illness Evaluation in a Broad Range of Endemicities (FIEBRE) and Tracking Resistance to Artemisinin Collaboration (TRAC), and co-funding the AMR Benchmark (led by Access to Medicines Foundation) which provides an independent assessment of company behaviour in AMR relevant domains (e.g. R&D, surveillance, marketing, responsible manufacturing and appropriate access, and stewardship) and has supported the WorldWide Antimalarial Research Network (WWARN).

Box 1: Development of Triple Artemisinin Combination Therapies (DeTACT)

DeTACT is developing triple artemisinin combination treatments to overcome the malaria parasite's emerging resistance to artemisinin drugs. The programme is evaluating the safety, efficacy, economics, ethics and acceptability of new treatments using combinations of three existing antimalarial drugs, across 15 countries. DFID is providing £9.2m to the team led by the Mahidol Oxford Research Unit (MORU), Thailand.

Department for Health and Social Care (DHSC)

- DHSC has a strong track record in leading UK efforts on AMR as the policy holders in the UK government. This includes the publication of the UK 5-year AMR strategy (2013 to 2018)³ and the UK 20-year vision and 5-year national action plan on AMR⁴ which builds upon, and sets out, the first step towards the UK's vision for AMR in 2040. Internationally, through the Global Health Security (GHS) and Global Health Research (GHR) programmes, established in 2016, they are investing a total of £94.6m of ODA in AMR research activities:
- The GHS programme has to date committed up to £57m into strategic AMR research initiatives through the Global AMR Innovation Fund (GAMRIF). See Box 2 below for more information on GAMRIF. GHS also hosts the Fleming Fund, a £265m UK Aid programme delivered by DHSC to support LMICs to generate, share and use critical AMR data. The Fleming Fund works in partnership with 24 priority countries to enhance the surveillance of AMR and improve laboratory capacity and diagnosis. There are no current commitments towards research through the Fleming Fund (and therefore not included in Fig.1), however international research efforts depend upon high quality surveillance data. The Fleming Fund is also funding the Institute for Health Metrics and Evaluation and the University of Oxford to support the integration of AMR data into the Global Burden of Disease Study⁵.

3 [UK Five Year Antimicrobial Resistance Strategy 2013 to 2018](#)

4 [Contained and controlled: the UK's 20-year vision for antimicrobial resistance](#) and [Tackling antimicrobial resistance 2019 to 2024: the UK's 5-year national action plan](#). These were co-developed across government, its agencies, the health family and administrations in Scotland, Wales and Northern Ireland with support from a range of stakeholders.

5 [Measuring and mapping the global burden of antimicrobial resistance](#), BMC Medicine volume 16, Article number: 78 (2018)

- DHSC is investing £37.6m in applied AMR research through the National Institute for Health Research (NIHR) GHR programme. NIHR is directly funding a researcher-led GHR Unit on genomic surveillance of AMR and GHR on genomic surveillance of malaria in West Africa in partnership with LMICs. NIHR is also supporting two strategic partnerships with UKRI research councils under Tackling AMR – a Cross-Council Initiative. During the year 2017-18, DHSC provided contributions to two relevant PDPs (MMV and TB Alliance). This stream of funding is additional to DFID’s significant and longer-term funding to these PDPs, and contributes to a wider portfolio of activity, some of which is related to AMR. In addition, the NIHR, is partnering with the Special Programme for Research and Training in Tropical Diseases (TDR) to deliver the AMR Structured Operational Research and Training Initiative (AMR SORT IT) which will build the capacity of practitioners in six LMICs to use local and national AMR data to respond to drug-resistant infections, bridging the gap between research and practice. This programme will complement Fleming Fund investments to improve in-country AMR surveillance infrastructure and help unlock countries’ potential of utilising data to underpin improvements in AMR policy-making and national programme and service delivery.

Box 2: Global AMR Innovation Fund (GAMRIF)

GAMRIF is a £57m commitment by DHSC GHS programme which takes a One Health approach and invests in neglected and underinvested areas of AMR R&D. It has seven work streams, which provide funding to: global initiatives, including the Combating Antibiotic-Resistant Bacteria Biopharmaceutical Accelerator (CARB-X), the Innovative Veterinary Solutions for Antimicrobial Resistance (InnoVet-AMR) through the International Development Research Centre (IDRC), and the Bacterial Vaccinology Network (BactiVac)¹ through Birmingham University; bilateral partnerships with China (delivered via Innovate UK) and Argentina (delivered via BBSRC/NERC), which jointly fund innovative AMR research; and PDPs, including FIND and the GARDP. GAMRIF’s programmes focus on supporting early-stage research for tangible, product-focused solutions and interventions, and engage with industry to achieve this aim. Additionally, GAMRIF’s investment specifically focuses on antibacterial resistance – excluding TB – as research on TB is supported through other existing global funding mechanisms.

¹ GAMRIF funding to BactiVac was through an existing MRC/BBSRC Networks for Vaccine R&D programme which established five collaborative networks in vaccine R&D targeting LMIC priority diseases integrating basic immunology and pathogen biology with vaccinology.

Wellcome

- Wellcome has developed a priority programme on drug-resistant infections and a dedicated team is leading action in this area. Wellcome is investing in a new way of working to bring science and policy together. They have committed £175m over five years to combat AMR through four different areas:
 1. Evidence base to inform decision making
 2. Developing therapeutics, preventatives and diagnostics,
 3. Accelerating clinical trials and
 4. Global governance and advocacy.

- Their largest investment is into CARB-X (£125m), which will fund new antibiotics, diagnostics and preventative approaches.⁶ They are also funding projects and initiatives such as GARDP, the Global Burden of Disease AMR study, Global clinical trial networks, Surveillance and Epidemiology of Drug-resistant Infections Consortium (SEDRIC) (See Box 3 for more on SEDRIC) and the UN Interagency Coordination Group on AMR (UN IACG) amongst other projects and activities that bridge science and policy to tackle AMR. Wellcome's work with CARB-X is currently focused on bacteria whilst other global efforts as well as surveillance and epidemiology are pathogen agnostic. In addition to their priority programme on Drug-resistant Infections, Wellcome has an existing AMR related portfolio through its Asia and Africa programmes as well as science, innovations and culture and society divisions (see Annex 2, Fig. 4). Wellcome's research focus is on basic research, drug development, delivery and implementation.

Box 3: Surveillance and Epidemiology for Drug-Resistant Infections Consortium (SEDRIC)

SEDRIC is a global think tank set up by Wellcome in January 2018. It brings together a range of international independent experts to advise the global infectious disease research community on how best to coordinate activities and tackle the current gaps in drug-resistant infection surveillance and epidemiology.

How SEDRIC achieves its mission:

- Analysing barriers to tracking the rise of drug-resistant infections at national and global levels
- Advising stakeholders how to strengthen and improve surveillance networks and initiatives
- Advocating for evidence-driven actions in prioritised areas to tackle drug-resistant infections

SEDRIC consists of a Board of experts in AMR surveillance and epidemiology, a Secretariat and a global membership. Areas of work include harnessing alternative sources of surveillance data, methodology for assessing burden of disease of AMR and harmonising AMR data.

Other Funders

Over the past few years the complexity and drivers of AMR have been recognised, which has positively contributed to a more cross-sectoral, interdisciplinary impact to policy and holistic One Health approach to AMR. See example case study in Box 4.

In addition to larger funding by UK government departments and Wellcome, other UK stakeholders such as the National Academies are also contributing to international development research on AMR. This is not indicated under significant UK spend in Fig. 1 because it is likely to be a small percentage of this funding.

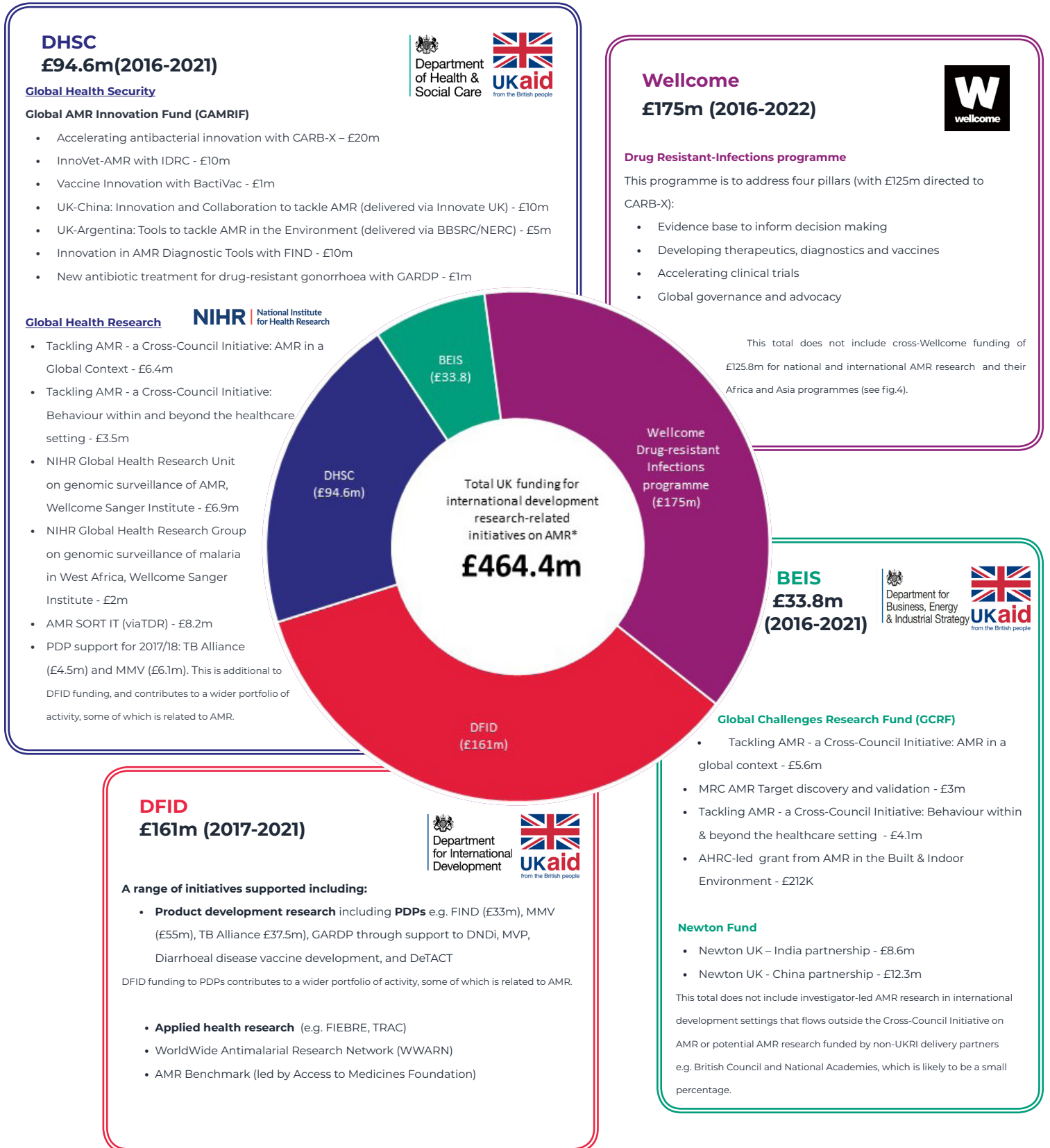
⁶ CARB-X is not solely focused on international development but receives UK investments for international development purposes.

Box 4: Case study: £12 million in grants to tackle superbugs in a global context

The **UK AMR cross-research council initiative** in partnership with the **NIHR**, have funded four awards under the AMR in a Global Context initiative taking a One Health perspective.

Led by teams at the University of Bristol, the University of St. Andrews, the Liverpool School of Tropical Medicine and the University of Glasgow, four consortia will conduct interdisciplinary research into the biological, social, cultural and economic drivers behind the development of AMR in LMICs, to better inform future interventions to prevent the spread of infections and resistance. They will draw together UK groups with researchers and policy makers in partner countries, to identify, understand and prioritise the specific problem of antibacterial resistance (ABR) across different communities and environments in **Kenya, Tanzania, Uganda, Malawi and Thailand**. They will use a range of research approaches, from clinical and microbiological to geography, modelling and social science and enable a unique comparison between contrasting areas of high and low resistance in urban, semi-urban and rural settings.

Figure 1: Major UK-funded international development research-related initiatives on AMR



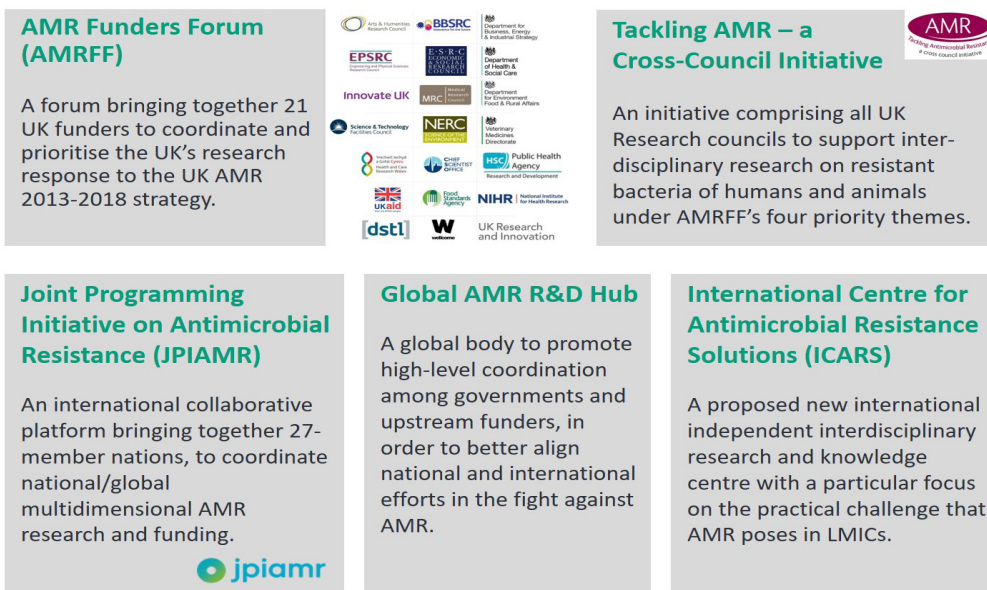
* Funding from the three UK government departments (BEIS, DFID, DHSC) is categorised as Official Development Assistance (ODA), while Wellcome funds global research and activities that does not report to UK ODA.

UK and Global Coordination in AMR Research

Coordination mechanisms in AMR research

There are several mechanisms that support coordination of global funders and stakeholders and research priorities/responses on AMR research, in the UK and internationally. Some also map and analyse cross-funder investments and provide opportunities or mechanisms for joint funding. These include the MRC-led UK AMR Funders Forum and Tackling AMR - a Cross-Council Initiative, JPIAMR, Global AMR R&D Hub and International Centre for Antimicrobial Resistance Solutions (ICARS). Further details are provided in Fig. 2 and Annex 4.

Figure 2: Global and UK AMR research coordination groups



UK Government AMR Strategy and Action Plan

The UK government published its vision for AMR by 2040 and 5-year national action plan¹ in January 2019. The UK's vision is for a world in which AMR is effectively contained, controlled and mitigated and the documents set out how the UK will contribute global efforts to achieve this, and is aligned with global plans and frameworks for action. The vision and national action plan build on the achievements of the cross government One Health UK 2013-2018 AMR strategy².

The UK national action plan for AMR 2019-2024 builds on existing research coordination and collaborations and makes the commitment to continue to invest in research not only in support of new product development but to do the kind of inter-disciplinary research that will inform effective interventions and strategies to support front line teams.

1 DHSC (2019) [Contained and controlled: the UK's 20-year vision for antimicrobial resistance](#) and [Tackling antimicrobial resistance 2019 to 2024: the UK's 5-year national action plan](#)

2 DHSC and DEFRA (2013) [UK Five Year Antimicrobial Resistance Strategy 2013 to 2018](#)

It includes commitments to:

- Promote research in countries affected by contaminated drinking water to identify its role in the global spread of AMR.
- Explore research collaborations and partnerships to improve the scientific evidence base in relation to food.
- Work with global partners to commission and implement evidence-based guidance to optimise infection management for common infections.
- Support multidisciplinary research to identify which AMR interventions work to reduce antimicrobial use at different levels and in different contexts.
- Continuing to develop the scientific capacity and influencing global research strategies.

Mapping of global AMR research investments

There are numerous AMR mapping efforts recently published or underway:

- A recent JPIAMR mapping of AMR funding across 22-member countries in 2017 for the first time looks beyond ABR. Overall funding in 2017 was £1.8bn (for 1,939 projects) and the top six funders of AMR research were the European Commission, Wellcome, MRC, DFID, Canadian Institute of Health Research and DHSC/NIHR. Therapeutics received most funding and ABR received significantly more funding than antiparasitic or antifungal resistance research. This does not however disaggregate international development or ODA spend.
- To better understand the current pre-clinical antibacterial R&D landscape, the World Health Organisation (WHO) is undertaking a review of all products in the pre-clinical pipeline to tackle resistant infections.
- ResIn (Research Investments in Global Health) will publish a study on global health investments of G20 countries in 2019.

Global and international development AMR research

priorities and agendas

Global research priorities and agendas in AMR are now well known and have been identified by key UK and international reviews and bodies highlighted in Table 1. These priorities and agendas include but also go beyond those specific to international development and priorities for LMICs.

Table 1: UK and global AMR agendas and research priorities

UK and international reviews and bodies	AMR agendas and research priorities
The AMR Review – chaired by Lord O’Neill (2016)¹	AMR Review, chaired by Lord O’Neill, identified 10 areas to tackle AMR across the globe: 1) A global public awareness campaign, 2) Improved sanitation and hygiene, 3) Reduce use of antimicrobials in agriculture and the environment, 4) Improved global surveillance in humans and animals, 5) Rapid diagnostics to ensure antimicrobials used appropriately, 6) Vaccines and alternative treatments, 7) Increase human capital, and improve pay and recognition, 8) Global Innovation Fund for early stage and non-commercial research, 9) Incentives for the development of new treatments, 10) Establish a global coalition on AMR.
Tackling AMR - a Cross-Council initiative, UK²	The initiative has four priority themes: 1) Understanding resistant bacteria, 2) Accelerating therapeutic and diagnostics development, 3) Understanding the real-world interactions and 4) Behaviour within and beyond the health care setting.
JPIAMR Strategic Research Agenda (2013)³	Six priority areas have been identified which are currently being updated through public consultation: Therapeutics, Diagnostics, Surveillance, Transmission, Environment and Interventions.
WHO (2015) Global Action Plan on AMR and AMR National Action Plans⁴	<p>International themes to tackle AMR are highlighted under a G7 and G20 commitment to the AMR Global Action Plan. The five objectives outlined are to:</p> <ul style="list-style-type: none"> • improve awareness and understanding of antimicrobial resistance • strengthen knowledge through surveillance and research • reduce the incidence of infection • optimise the use of antimicrobial agents • ensure sustainable investment in countering antimicrobial resistance. <p>All countries are encouraged to develop National Action Plans to tackle AMR.</p>
United Nations Interagency Coordination Group (UN IACG) on AMR⁵	<p>Final recommendations for the UN IACG are categorised under the following 5 objectives:</p> <ul style="list-style-type: none"> • Accelerate progress in countries • Innovate to secure the future • Collaborate for more effective action • Invest for a sustainable response • Strengthen accountability and global governance

1 O’Neill (2016) [Tackling Drug-Resistant Infections Globally: Final Report & Recommendations](#), The Review on AMR

2 [Tackling AMR – a Cross-Council initiative](#), UK

3 [JPIAMR Strategic Research Agenda](#) (2013)

4 [WHO \(2015\) Global Action Plan on AMR and AMR National Action Plans](#)

5 [Draft recommendations](#) of the UN Ad hoc Interagency Coordination Group on Antimicrobial Resistance

Table 2 shows the thematic focus of UK-funded international development research-related initiatives on AMR and how the UK is responding to some of the identified global research priorities and agendas in Table 1 (see Fig.1 for a high-level overview and Annex 3 for more information on these investments):

Table 2: Thematic focus of UK and co-funded international development research-related initiatives on AMR

Global Funders based in the UK	International development research-related initiatives on AMR	Research Themes
Funded by single global funders based in the UK		
BEIS/UKRI	Arts and Humanities Research Council (AHRC) - led grant from AMR in the Built & Indoor Environment	Environment
	Newton UK - China partnership	Therapeutics, Diagnostics, Interventions, Environment, Agriculture
	Newton UK - India partnership	Diagnostics, Therapeutics
	MRC AMR Target discovery and validation	Antibacterial drug discovery, Therapeutics
DFID	Product development Research through PDPs	Diagnostics, Therapeutics, Vaccines, Innovations, Human, Animal
	Applied health research (e.g. FIEBRE, TRAC)	Surveillance, Malaria, Diagnostics, Treatment, Infectious diseases
	AMR Benchmark (led by Access to Medicines Foundation)	Understanding industry behaviour
	WWARN	Global coordination, R&D, Malaria
DHSC GHR	AMR SORT IT (delivered by TDR)	Research capacity strengthening, Informed policy making
	NIHR Global Health Research Unit on Genomic Surveillance of AMR at Wellcome Sanger Institute	Surveillance
	NIHR Global Health Research Group on Genomic Surveillance of Malaria in West Africa at Wellcome Sanger Institute	Surveillance
Wellcome	Drug-resistant Infections programme including four pillars: <ul style="list-style-type: none"> • Evidence base to inform decision making • Developing therapeutics and diagnostics • Accelerating clinical trials • Global governance and advocacy 	Therapeutics, Diagnostics, Clinical trials, Infectious disease, Surveillance, Global coordination and action, Advocacy, Policy

Table 2: Continued

Global Funders based in the UK	International development research-related initiatives on AMR	Research Themes
Co-funded by global funders based in the UK		
	Tackling AMR - a Cross-Council Initiative: AMR in a Global Context	Epidemiology, One Health, Transmission, Interventions
BEIS/UKRI and NIHR	Tackling AMR - a Cross-Council Initiative: Behaviour within and beyond the healthcare setting	Diagnostics, Interventions
DFID and DHSC GHS	FIND	Diagnostics, Innovations
DFID with contributions from DHSC GHR¹	TB Alliance	Therapeutics, Innovations, Tuberculosis
	MMV	Therapeutics, Innovations, Malaria
Wellcome and DHSC	CARB-X	Therapeutics, Alternatives, Preventatives, Diagnostics, Vaccines
Wellcome, DFID and DHSC GHS	GARDP	Therapeutics
Wellcome and DHSC	Global Burden of Disease AMR	Big Data, Understanding burden of disease, Incentives for development of new treatments

¹ DHSC funding to PDPs TB Alliance and MMV is for the financial year 2017/18 and additional to DFID funding, and contributes to a wider portfolio of activity, some of which is related to AMR.

With regards to research agendas and priorities specifically for LMICs and international development and how the UK is responding, feedback from stakeholder interviews highlighted that the UK and LMICs do share common research gaps and priorities but also have divergent needs and that solutions to these may vary across country contexts. Many needs, gaps and priorities for LMICs are prioritised through partnership working between the UK and LMICs.

Future international development research on AMR priorities, coordination and mapping

There is a significant level of UK and global funder coordination in AMR already with DHSC taking a leading role on policy aspects and the MRC on research aspects in the UK. UK and co-funded international development research-related initiatives are responding to global AMR agendas and research priorities, putting the UK in a strong leadership position. The UK's 20-year vision for AMR (2019-2040) and the National Action Plan addresses all antimicrobials including bacteria, viruses, fungi, and parasites.

In recent years there was a deliberate strategy to focus on previously neglected bacterial diseases and ABR. There have been significant investments and strategies, and a strong focus on policy from the Chief Medical Officer for England to put AMR on the global agenda. Not surprisingly the recent 2017 JPIAMR mapping across 22 countries showed that ABR received significantly more funding than antiparasitic or antifungal resistance research.

Although this does not disaggregate ODA and international development spend, nevertheless funders should not underestimate the high risk that still exists of resistance to antiviral, antiparasitic and antifungal drugs that threatens progress to date, particularly to LMICs. While funding for research covering a wider range of resistant pathogens is needed, funders should recognise and consider that access to antimicrobials in LMICs remains a key challenge.

Feedback from stakeholder interviews and a UKRI 2018 submission to the House of Commons Health and Social Care Committee AMR inquiry highlighted future priorities in international development research on AMR including:

- Addressing the challenge of AMR stewardship vs antibiotic access, a key issue for many in LMICs, although this is covered by FIND, GARDP and CARB-X.
- Developing robust predictive models of AMR transmission which will identify tractable cost-effective points of intervention.
- Expanding engagement with industry (although some funded initiatives are addressing this including UK investments in PDPs, GAMRIF and CARB-X).
- Continuing to support the development and evaluation of targeted and innovative interventions and actions.

Feedback from stakeholder engagement about future mapping and coordination also highlighted:

- A detailed analysis of UK funding in international development research on AMR would be useful to get a better picture of UK investments in broad categories such as basic research, product development, commercialisation, access/stewardship/responsible use and environmental management, ABR and non-ABR, and highlight any key gaps e.g. in human health products, animal health products and operational research on underfunded topics. However, a detailed analysis would be resource intensive and risk duplicating existing efforts.

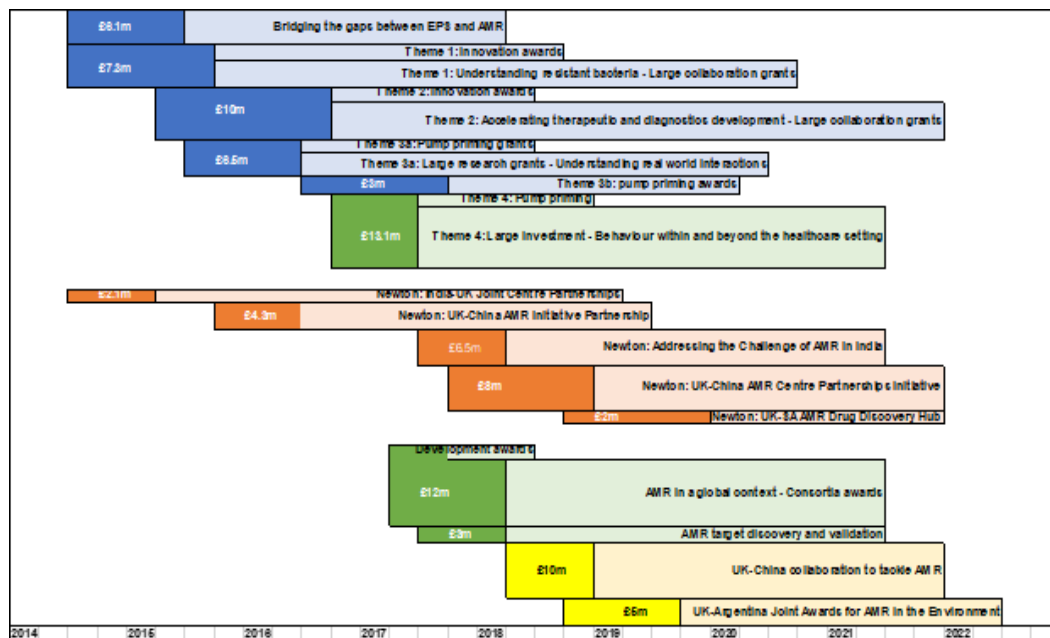
- A live repository of global AMR investments could be useful as static analyses are often outdated as new investments are announced during the publication process. Although this would require significant resources to facilitate, there was interest from some stakeholders in exploring this idea further. Analysis of the value, opportunities and costs, including resources required, for a potential platform would help to understand its feasibility.
- Although there is considerable coordination there is opportunity for better alignment in the UK on international development research on AMR. For example, agreeing on a roadmap of activity for short, medium and long-term actions.

Annexes

Annex 1: UKRI and Wellcome portfolios

Figure 3: UKRI AMR strategic research portfolio

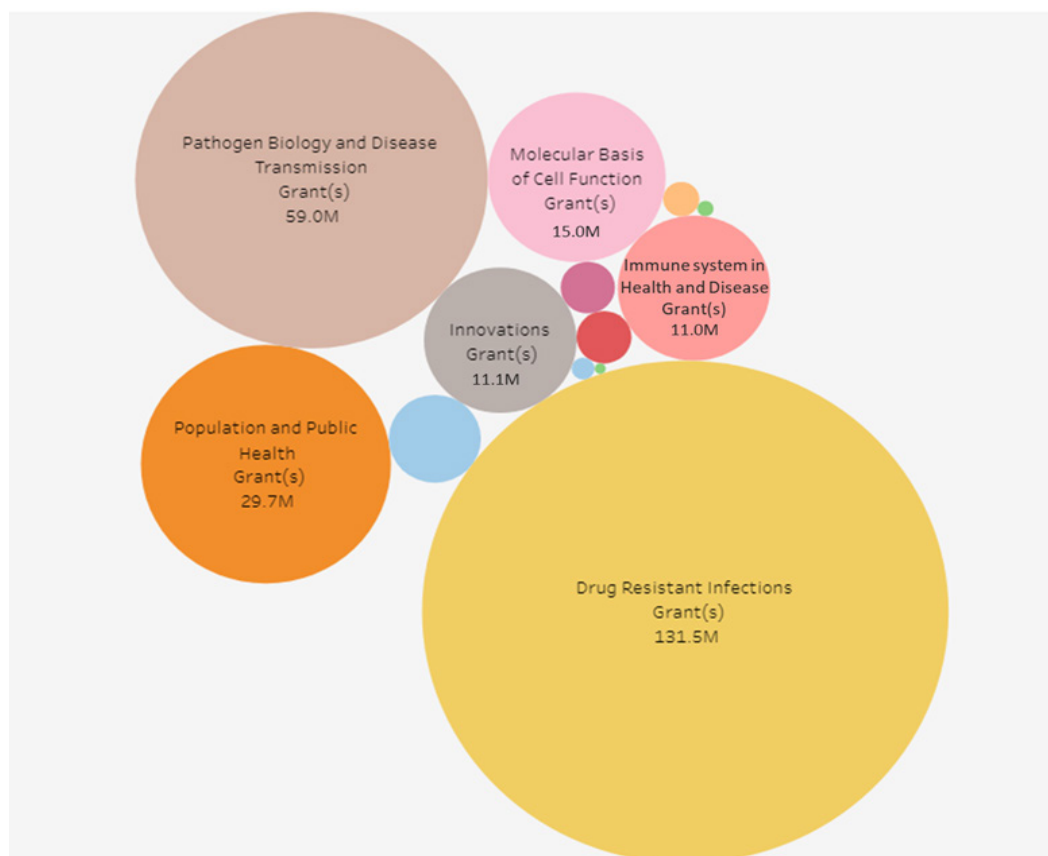
International development research: GCRF in green, GAMRIF in yellow, Newton Fund calls in orange, Tackling AMR – a Cross-Council Initiative calls in blue (mainly UK focused)*.



* The chart does not include AMR-specific grants funded through open research calls (Researcher-led projects). The ODA budget for the Tackling AMR – a Cross-Council Initiative call on Behaviour within and beyond the healthcare setting includes both the GCRF (£4.1m) and NIHR Global Health Research programme (£3.5m) ODA contributions. Similarly, the AMR in a Global Context call funding includes both GCRF (£5.6m) and NIHR Global Health Research programme (£6.4m) ODA contributions. The UK-China Collaboration to Tackle AMR call is managed by Innovate UK on behalf of GAMRIF. (DHSC GHS). The UK-Argentina Joint Awards for AMR in the Environment call is managed by BBSRC and NERC on behalf of GAMRIF. (DHSC GHS).

Figure 4: Cross-Wellcome AMR portfolio

Fig. 4 shows active grants related to national and international AMR since 2015 across Wellcome. Cross-Wellcome funding beyond the Drug-resistant Infections programme investments is £125.8m.



Drug-resistant Infections priority programme:

Wellcome want to transform the world's approach to handling the rise and spread of drug-resistant infections. They are committed to leading action in four areas:

- Evidence base to inform decision making - Generating and using robust epidemiology and surveillance in global and national strategies to combat AMR.
- Developing therapeutics, diagnostics and vaccines - Accelerate the discovery of new therapeutics, diagnostics and vaccines to increase the pipeline of options for preventing and treating resistant infections.
- Accelerating clinical trials - Accelerate the clinical development of new drugs and improved use of existing drugs through expanded clinical trials networks.
- Global Governance and advocacy - Supporting the development and delivery of effective and sustainable global mechanisms for continued collaborative and multi-sectoral response to the challenges of AMR.

Annex 2: UK and co-funded international development research-related initiatives on AMR

Table 3: International development research related initiatives on AMR

International development research-related initiative on AMR	Description	Theme
AMR Benchmark (Access to Medicines Foundation)	The Access to Medicine Foundation has mapped pharmaceutical company efforts to tackle drug resistance. It provides an independent assessment of company behaviour in AMR relevant domains (R&D, surveillance, marketing, responsible manufacturing and appropriate access, and stewardship). It is funded by DFID and the Dutch Ministry of Health, Welfare and Sport.	Understanding industry behaviour
AMR in the Built & Indoor Environment	AHRC-led grant funding a Lancaster University led project on understanding the home as a source of infection of AMR bacteria carried by dust by exploring hygiene practices in different home environments in Ghana.	Environment
Antimicrobial Resistance Structured Operational Research and Training Initiative (AMR SORT IT) delivered by the Special Programme for Research and Training in Tropical Diseases (TDR)	The NIHR, is partnering with the TDR to deliver AMR SORT IT which will build the capacity of practitioners in six LMICs to use local and national AMR data to respond to drug-resistant infections, bridging the gap between research and practice. This programme will complement Fleming Fund investments to improve in-country AMR surveillance infrastructure and help unlock countries' potential of utilising data to underpin improvements in AMR policy-making and national programme and service delivery.	Research capacity strengthening, Informed policy making
BactiVac	DHSC's GAMRIF has provided £1m funding to BactiVac to accelerate the development and uptake of vaccines against bacterial infections in LMICs.	Vaccines
Combating Antibiotic-Resistant Bacteria Biopharmaceutical Accelerator (CARB-X)	CARB-X is a non-profit international partnership supporting research on the most dangerous drug-resistant bacteria. It will fund more than 20 potential new antibiotics, diagnostics and preventative approaches in the next five years, with the aim to have at least one new drug registered by 2027. CARB-X is funded by both Wellcome (£125m) and GAMRIF (£20m, specifically on vaccines and alternatives to antibiotics for people in LMICs) amongst other international funders.	Therapeutics, Alternatives, Preventatives, Diagnostics, Vaccines

Developing Triple Artemisinin Combination Therapies (DeTACT)	DFID is providing funding (£9.2m) to DeTACT, a partnership led by University of Oxford, based in Thailand, to test the use of triple artemisinin combination therapies in the SE Asia region, where malaria parasite artemisinin resistance is emerging	Therapeutics, Malaria
Diarrhoeal Disease vaccine development	DFID is providing core funding to develop new vaccines to protect children against diarrhoeal diseases, in particular for enterotoxigenic Escherichia coli (ETEC) and Shigella.	Vaccine, Diarrhoeal disease, Outbreaks
Febrile Illness Evaluation in a Broad Range of Endemicities (FIEBRE)	DFID is supporting FIEBRE, led by the London School of Hygiene and Tropical Medicine, to build the evidence base about common causes of fever, that is not caused by malaria, in low-income countries and on antimicrobial resistance. This will enable a better understanding of what works most effectively to tackle infectious disease.	Surveillance, Malaria, Infectious diseases, Treatment
Global AMR Innovation Fund (GAMRIF)	A research and development (R&D) fund with the goal of fostering innovations to tackle AMR for the benefit of people in LMICs. Taking a One Health approach, the focus of GAMRIF is to fund early stage research, specifically targeting neglected and underinvested areas of AMR R&D in humans, animals and the environment. Through international collaboration, GAMRIF also aims to stimulate investment in AMR R&D globally from governments, private and third sector. GAMRIF is currently funding three global initiatives (CARB-X, InnoVet-AMR, BactiVac), two bilateral research programmes (UK-China, UK-Argentina) and two PDPs (FIND, GARDP) with a total leveraged investment of c.£42m. See separate initiatives in table for more information.	Innovations One Health
Global Burden of Disease (GBD) AMR	The purpose of the project is to collect and synthesise data on the burden of disease associated with AMR and ensure that this data is included in the Global Burden of Disease (GBD) study. The aim is to increase global awareness and drive support for strategies that can reduce Drug-resistant Infections. Partners include the Big Data Institute and the Centre for Tropical Medicine and Global Health, the University of Oxford, and the Institute for Health Metrics and Evaluation (IHME) at the University of Washington.	Big Data, Understanding burden of disease, Incentives for development of new treatments
	The Fleming Fund and Wellcome are key funders for this project as well as the Bill and Melinda Gates Foundation.	
	The Fleming Fund contribution of £6.2m is to specifically collect and present data on AMR so is a non-research investment.	

Global clinical trial networks	With international partners, Wellcome is building global clinical trial networks to innovate and standardise protocols and make trials more efficient and faster.	Therapeutics, Clinical trials, Infectious disease
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Innovative Veterinary Solutions for Antimicrobial Resistance (InnoVet-AMR)	<p>A four-year, partnership between Canada's International Research and Development Centre (IDRC) and GAMRIF aimed at reducing the emerging risk that antimicrobial resistance (AMR) in animals poses to global health and food security.</p> <p>GAMRIF is investing £10m with co-investment of CA\$10m from IDRC. The scheme is funding research to develop new animal vaccines and other innovations to fight AMR in livestock and aquaculture production in LMICs.</p>	Alternatives to antibiotics, Vaccines, One Health
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MRC AMR Target discovery and validation	Support to multi-disciplinary networks/collaborations to develop innovative approaches to stimulate development of new antibacterials for use in LMICs. To address antimicrobial target validation and drug discovery projects cover multiple disciplines, including basic bacteriology, computational biology, chemical biology etc.	Antibacterial drug discovery, Therapeutics
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Newton Fund Initiatives in China have included:

Newton Fund UK-China partnership	<p>2016: UK-China AMR Initiative Partnership (£4.3m) which supported six new interdisciplinary research partnerships looking at ways of tackling the rise of antibacterial resistance, to better understand the emergence and spread of resistant bacteria, develop new interventions, and improve health and agricultural systems.</p> <p>2017: UK-China AMR Centre Partnerships Hubs (£8m) Funding for four high quality collaborative research partnerships focused on addressing the burden of antibacterial resistance in China which will:</p> <ul style="list-style-type: none"> • investigate the emergence and spread of resistant bacteria • understand the impact this has on the environment, agricultural systems, animals and humans using a 'one health' approach • develop new interventions, including new drugs • support policymakers to improve health and agricultural systems. 	Therapeutics, Diagnostics, Interventions, Environment, Agriculture
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<p>Newton Fund UK-India partnership</p>	<p>Newton Fund Initiatives in India have included:</p> <p>2015: India-UK Joint Centre Partnerships (£2.1m) funding for two centres including:</p> <ul style="list-style-type: none"> • The Cambridge-Chennai Centre Partnership on Antimicrobial Resistant Tuberculosis to develop new diagnostic tools and new treatments to address the sharp rise in cases of multidrug resistant Tuberculosis (MDR-TB) and generate a rich and lasting clinical and genomic dataset. • The UK-India Centre for Advanced Technology for Minimising the indiscriminate use of Antibiotics (UKICAT-MA) to establish smart materials for the detection and targeted delivery of antibiotics for eye infections and promote the use of these new technologies in other infective diseases. <p>2017: Newton: Addressing the Challenge of AMR in India (£6.5m) funding for highly collaborative and interdisciplinary research partnerships between UK and Indian researchers to tackle AMR in India.</p>	<p>Diagnosics, Therapeutics</p>
<p>NIHR Global Health Research Unit on Genomic Surveillance of AMR at the Wellcome Sanger Institute</p>	<p>The Centre for Genomic Pathogen Surveillance based at the Wellcome Sanger Institute, will house an NIHR GHR Unit to monitor antibiotic resistant bacteria around the globe and enable DNA sequencing and genomic surveillance of resistant bacteria through National laboratories in the Philippines, India, Nigeria and Colombia.</p>	<p>Surveillance</p>
<p>NIHR Global Health Research Group on Genomic Surveillance of Malaria in West Africa at the Wellcome Sanger Institute</p>	<p>This NIHR GHR Group supports the establishment of laboratory and computational systems for genomic surveillance of malaria in Ghana and The Gambia and their effective integration into National Malaria Control Programme (NMCP) operations. The aim is to learn to translate genomic data into actionable knowledge, e.g. by providing early warning of newly emerging resistance, and by showing how specific interventions are causing levels of resistance to rise or fall.</p>	<p>Surveillance</p>
<p>Surveillance and Epidemiology of Drug-resistant Infections Consortium (SEDRIC)</p>	<p>SEDRIC is a Wellcome-led initiative that brings together a range of international experts to identify critical gaps in the surveillance and epidemiology of drug-resistant infections, and how these can be overcome at a national and global level.</p>	<p>Surveillance, Coordination</p>

<p>Tackling AMR – a Cross-Council Initiative: Behaviour within and beyond the healthcare setting</p>	<p>Funded through GCRF and NIHR, a Tackling AMR – a Cross-Council Initiative call, awarded £7.6m to 15 projects in 2017, mainly ESRC and MRC-led. This includes 3 large investments in India, South Africa and Thailand and 12 pump priming awards in Pakistan, Bangladesh, South Africa, Nigeria, Colombia, India, Kenya and Lao People’s Democratic Republic. Out of the total £7.6m funding, NIHR made a £3.5m ODA contribution to support two of the large investment projects.</p>	<p>Diagnostics, Interventions</p>
<p>Tackling AMR – a Cross-Council Initiative: AMR in a Global Context</p>	<p>The Tackling AMR – a Cross-Council Initiative in partnership with the NIHR, has funded four awards totalling £12m, led by teams at the University of Bristol, the University of St. Andrews, the Liverpool School of Tropical Medicine and the University of Glasgow to conduct interdisciplinary research into the biological, social, cultural and economic drivers behind the development of AMR in LMICs.</p>	<p>Epidemiology, One Health, Transmission, Interventions</p>
<p>Tracking Resistance to Artemisinin Collaboration (TRAC)</p>	<p>DFID supported the TRAC project, led by University of Oxford at Mahidol, Thailand, which mapped artemisinin and partner drug resistance in South East Asia and assessed the safety, tolerability and efficacy of novel triple antimalarial combinations.</p>	<p>Surveillance, Malaria, Diagnostics, Treatment.</p>
<p>UK-Argentina bilateral partnership for Tools to tackle AMR in the Environment</p>	<p>GAMRIF is investing £5m in the UK-Argentina bilateral partnership for Tools to tackle AMR in the Environment, which is delivered via BBSRC/NERC with matched resource funding leveraged from the Argentinian National Scientific and Technical Research Council (CONICET). The aim is to generate new knowledge and provide the deeper evidence base that can help to reduce the impact of drivers of AMR in the environment from agricultural sources as they apply to Argentina and other LMICs.</p>	<p>Environment, Animal waste management, Animal husbandry and best practice, Surveillance frameworks, One Health</p>
<p>UK-China Innovation and Collaboration to tackle AMR</p>	<p>GAMRIF is investing £10m in the UK-China Innovation and Collaboration to tackle AMR initiative, which is delivered by Innovate UKUK with matched funding from the Chinese Ministry of Science and Technology (MoST). The aim is to support novel projects that neither country would be able to conduct within the same timeframe without the other’s expertise. These should develop new products (including traditional Chinese medicines (TCMs)) or services against AMR, and where appropriate, include clinical evaluation</p>	<p>Therapeutics (including alternatives to antibiotics), Vaccines, Diagnostics, Human, Animal</p>

UN Interagency Coordination Group on AMR (IACG)	The UN IACG is an ad hoc group of global organisations and experts, set up by the UN Secretary General following the 2016 UN Political Declaration on AMR to help sustain and coordinate effective global action against drug-resistant infections. It was tasked with delivering a report and recommendations to the UN Secretary General (published 29 April 2019) which will be followed by a response from the Secretary General later this year.	Global coordination and action
WorldWide Antimalarial Research Network (WWARN)	WWARN is a global platform that provides research evidence to support international efforts to fight antimalarial drug resistance	Global coordination, R&D, Malaria

Table 4: Product Development Partnerships

UK-funded international development research-related PDPs on AMR	Description	Theme
Foundation for Innovative New Diagnostics (FIND)	<p>FIND is a global non-profit PDP developing, evaluating and delivering high-quality affordable diagnostic tests for poverty-related diseases.</p> <p>DFID provides core funding (£33m) for the development of diagnostics, including diagnostics to identify resistant pathogens, for a wide range of diseases and GAMRIF's funding (£10m) supports FIND's work to enhance the impact of diagnostic tools, in particular the connectivity of point-of-care diagnostics for AMR surveillance and through the development of diagnostics for gonorrhoea. The AMR work is coordinated with the work of the Fleming Fund Work is ongoing to test field-based screening technologies to detect substandard and falsified medicines and inform co-deployment strategies in LMICs.</p>	Diagnostics
Global Antibiotic Research and Development Partnership (GARDP)	<p>A PDP that was developed by WHO and Drugs for Neglected Diseases initiative (DNDi), GARDP is developing and aims to deliver up to four new treatments, through improvement of existing antibiotics and acceleration of the entry of new antibiotic drugs.</p> <p>Wellcome, DFID (through DNDi) and GAMRIF provide funding for GARDP amongst other funders. GAMRIF's funding (£1m) supports GARDP's programme on sexually transmitted infections, focusing on the development of a new antibiotic for drug-resistant gonorrhoea.</p>	Therapeutics

Medicines for Malaria Venture (MMV)	<p>MMV is developing new antimalarial drugs. They manage a portfolio of over 65 projects, the largest portfolio of antimalarial R&D and access projects in history. MMV aims to reduce the burden of malaria in disease-endemic countries by discovering, developing and delivering new, effective and affordable antimalarial drugs. They have developed eight different malaria treatments, including combination therapies to slow down the development of resistance. Malaria parasites are developing resistance to the main available treatments and MMV's portfolio includes nine new drugs in clinical development.</p>	<p>Therapeutics, Innovations, Malaria</p>
Meningitis Vaccine Project (MVP)	<p>DFID provides core funding (£55m) with DHSC's GHR providing funding (£6.1m) in 2017/18. The funding supports the development and management of the robust and dynamic R&D pipeline for antimalarials addressing the challenge of drug resistance.</p> <hr/> <p>DFID is providing core funding to MVP, based at PATH. MVP is developing a new pentavalent vaccine to protect against five strains of meningococcal disease (A, C, W, X and Y). This will provide a vaccine which gives protection against the meningitis strains that continue to cause epidemics in sub-Saharan Africa, as well as maintaining the protection against subgroup A that has been established through uptake of MenAfriVac®.</p>	<p>Vaccines, Meningitis, Epidemics</p>
TB Alliance	<p>TB Alliance is a PDP working on the discovery and development of new, better, faster-acting, and affordable tuberculosis drugs that are available to those who need them.</p> <p>DFID provides core funding (£37.5m) with DHSC GHR providing funding (£4.5m) in 2017/18. The funding supports the development and management of the robust and dynamic R&D pipeline for TB, drug sensitive, Multi drug-resistant (MDR) and Extensively drug-resistant (XDR) TB.</p>	<p>Therapeutics, Innovations, Tuberculosis</p>

Annex 4: UK and Global AMR Research Coordination Mechanisms

AMR Funders Forum (AMRFF)

To coordinate and prioritise the UK's research response to the UK AMR 2013-2018 strategy, the MRC established the [AMRFF](#)¹, which brings together 21 research funders, including the UKRI councils, government departments, devolved administrations and charities. AMRFF provides a forum for the sharing of information on activities relating to AMR, and a framework for a more coordinated approach to tackling AMR research to maximise impact on national and international policies and activities. The Forum has identified four key research themes to target investments.

Tackling AMR – a Cross Council Initiative

This inter-disciplinary [AMR Cross-Council Initiative](#) is focused on the AMRFF four themes to supporting research encompassing academia, biopharma, diagnostic companies, veterinary and the health service. The current focus of this initiative is on resistant bacteria of humans and animals. Governance is overseen by a top-level Steering Group to provide scientific guidance and ensure delivery and an Executive Group of funding partners. Membership of the Steering Group includes experts that cross the remit of the research councils. Each theme has its own Expert Scientific Panel to assess the research programmes.

Joint Programming Initiative on Antimicrobial Resistance (JPIAMR)

[JPIAMR](#) is an international collaborative platform that coordinates national research funding, multidimensional AMR research and funding on a global scale and supports collaborative action for filling knowledge gaps on AMR with a One Health perspective. It brings together 27-member nations. A shared Strategic Research Agenda outlines the key areas to address and provides guidance for countries to align their AMR research agendas nationally and internationally. Since its inception, JPIAMR has funded more than 50 research projects and networks with joint funds exceeding €65m to date.

Global AMR R&D Hub

A new body announced by the German Federal government under their G20 presidency in 2017, the Global Antimicrobial Resistance Research and Development Hub – [Global AMR R&D Hub](#) for short – aims to improve the coordination of international efforts and initiatives to tackle AMR while further increasing investments into R&D for AMR. Members are primarily representatives from Ministries of Health and Research plus philanthropic organisations involved in tackling AMR. Membership is open to both G20 and non-G20 states and other donors. Initially, the secretariat of the Global AMR R&D Hub will be based in Berlin, at the German Center for Infection Research (DZIF), funded by the German Federal Ministry of Education and Research (BMBF). The hub will work with existing partnerships, such as CARB-X

¹ AHRC, BBSRC, Chief Scientist Office, Scotland (CSO), BEIS, DFID, Defence Science and Technology Laboratory (Dstl), DEFRA, DHSC, ESRC, EPSRC, The Food Standard Agency (FSA), Health and Care Research Wales, HSC R&D Division, Public Health Agency, Northern Ireland, Innovate UK, MRC, NERC, National Institute of Health Research (NIHR), Public Health England (PHE), Science and Technology Facilities Research Council (STFC), Veterinary Medicines Directorate (VMD), Wellcome.

The International Centre for Antimicrobial Resistance Solutions (ICARS)

[ICARS](#) is proposed to become an international independent interdisciplinary research and knowledge centre with a focus on the practical challenge that antimicrobial drug resistance (AMR) poses in low- and middle-income countries. ICARS is a joint initiative of the Danish government and the World Bank. Currently ICARS is in the process of being established and this includes discussions with potential global partners. The Danish Government has already allocated funds for a small secretariat to help the start-up of ICARS. This pre-ICARS secretariat is expected to appoint its first staff members in the spring of 2019. ICARS will undertake intervention and implementation research to identify solutions that work in LMICs and will support and pursue synergy with ongoing national and international initiatives.



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