A High Return on Investment:

The case for maintaining UK international leadership on global health research and development

Briefing Paper November 2021

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"Ensuring sustained UK government investment in global health research and development (R&D), in the face of cuts to the UK's development assistance budget, is a smart choice. While it represents a relatively small amount of funding, when compared to other government public expenditures, it delivers a high return on investment."

The UK government has committed to scaling-up its public investment in R&D from £14.8 billion in 2021/22 to £20 billion in 2024/25[1] in recognition that "we have a 'once-in-a-generation opportunity to strengthen our global position in research, unleash a new wave of innovation, enhance our national security and revitalise our international ties".[2]

As part of this commitment, it is recommended that the UK government use some of these additional resources to sustain its public investment in global health R&D in light of the budget threats posed to the sector, by recent cuts to the UK's official development assistance (ODA).

The UK government has in the past been a generous investor in global health R&D. In 2019, the UK government allocated just under £1bn of its official development assistance (ODA) budget to research and development (£953mn).[3] Over one-third of this – £354mn – was exclusively for medical research and development[4], though the likely amount is higher than this, when multi-disciplinary research is taken into account.

This funding has helped to make the UK a world leader on global health R&D. The UK was the second largest public investor in the world in 2019 in global health R&D, according to Policy Cures Research's G-FINDER data[5], behind the USA which provided the lion's share of funding in recognition of the high return on investment.[6]

The decision by the UK government to reduce its ODA budget from 0.7% of gross national income (GNI) to 0.5% in 2021, threatens public funding to global health R&D for years to come. The reduction in the budget represents a £4.4 bn (US5.6 billion) decrease in UK ODA budget for 2021/22 when compared to what the UK would have provided in the same year if it had allocated 0.7% of its GNI as ODA.[7] UK R&D ODA will fall to £600 mn in 2021/22 and while it is commendable that the UK government has committed to rescale this back up to £1 billion by 2024/25 there will be a considerable shortfall in R&D ODA funding between 2021- 2024[8] UKRI spending for 2021/22 is £700 mn less than in 2020 and it is being reported that the single biggest reason for this is the cut to the UK ODA budget.[9]

Ensuring sustained UK government investment in global health R&D, in the face of the ODA budget cuts, is a smart choice. While it represents a relatively small amount of funding, when compared to other government public expenditures, it delivers a high return on investment by:

- **ROI 1: Saving lives and promoting Global Britain as a science superpower that is a force for good in the world** – The UK government declared in 2021 its ambition to be a science superpower by 2030 and to use this power for the public good to unlock improvements in health, wellbeing and prosperity for the UK and the rest of the world.[10] UK global health research is already delivering on this mandate. It has led the world in the prevention and treatment of malaria, from pioneering a combination therapy using artemisinin[11] to proving the effectiveness of insecticide bed-nets: contributing to a 50% reduction in malaria deaths worldwide between 2000 and 2015.[12]

  UK global research continues to be at the forefront, working on the clinical trials that have enabled the

1 UK Government (2021) Comprehensive Spending Review, London, UK.
2 UK Government (2020) UK Research and Development RoadMap, London, UK.
3 UK Government (2020) Final Statistics for International Development 2019 Datasheets. The numbers are taken using the OECD's Creditor Reporting Code of 82 which indicates research spend and for health R&D the CRS codes for medical research and research on non-communicable diseases have been included.
4 Ibid.
5 Policy Cures Research G-Finder data focuses on a sub-set of global health R&D spending, capturing only research that delivers new products and technologies aimed at tackling neglected diseases, sexual and reproductive health issues and emerging infectious diseases. For more information on the methodology used see G-FINDER Methodology.
6 Policy Cures Research (2021) G-FINDER: Tracking Funding on Global Health R&D Database. Accessed on 6.10.2021. The US provided 72% of the total funding in 2019.
7 Loft, P, Brien, P (2021) Reducing the UK's aid spend in 2021, House of Commons Briefing 20th July 2021.
8 Financial Times (2021) Can Boris Johnson turn Britain into a scientific leader?, 28 September 2021, London UK. UK Government (2021) Autumn Budget and Spending Review 2021, London, UK.
9 Financial Times (2021) Can Boris Johnson turn Britain into a scientific leader?, 28 September 2021, London UK.
10 UK Government (2021) Prime Minister Boris Johnson's article, 21 June 2021; UK Government (2021) Integrated Review of Security, Defence, Development and Foreign Policy: Global Britain in a Competitive Age: UK Government (2021) UK Innovation Strategy: Leading the Future By Creating It, London, UK.
11 Hasan, D et al (2015) The UK's Contribution to Health Globally Benefiting the country and the world, All Party Parliamentary Group For Global Health, Office of Lord Crisp, London, UK.
12 Our World in Data (2021) Malaria, accessed on 6.10.2021. Malaria deaths were 840,000 deaths per year in 2000, but dropped to 440,000 in 2015.

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continued

first-ever malaria vaccine (RTS,S/AS0) to be rolled out in 2021[13] and a novel control strategy focused on genetically modifying the parasites that infect mosquitoes in order to disrupt their ability to transmit diseases.[14]

UK scientists discovered one of the first effective vaccines against the bacteria pneumococcus.[15] Pneumococcal infection is responsible for around one million deaths every year among children in developing countries. In partnership with others, UK scientists also developed and, effectively deployed, an Ebola vaccine.[16]

- **ROI 2: Enhancing UK security** – The COVID-19 pandemic has taught us how costly global health threats are to UK lives and livelihoods, and how interconnected UK citizens' safety and prosperity is with the lives of people living around the world. UK global health research helped to develop the AstraZeneca COVID-19 vaccine, which now accounts for almost a third of all the vaccine doses ordered globally.[17] It also discovered one of the first treatments for COVID-19, dexamethasone, which is estimated to have saved more than a million lives so far.[18]

  UK global health researchers are working, through AGILE, a new UK-based clinical trial platform, to reduce the speed of testing of new COVID-19 treatments to a matter of months not years.[19]

  UK global health researchers are also at the forefront of ensuing the UK is prepared for the next big pandemic. I-sense, a UK-based Interdisciplinary Research Collaboration (IRC), aims to build a new generation of digital sensing systems to identify and prevent outbreaks of infectious disease and antimicrobial resistance, much earlier than ever before.[20] By 2050, AMR could cause 10 million deaths and reduce GDP by up to 3.5% per year, at a cumulative $100 trillion cost to the global economy.[21]

  In addition, the UK Vax-Hub[22] has set its sights on making the UK the global research centre for the manufacturing of next-generation vaccines drawing on new technologies like bioengineering, and is committed to sharing this knowledge with low- and middle-income countries.

  UK scientists have developed a new machine learning method[23] to detect when animal viruses could jump to humans and are working as part of an international network to understand the level of threat posed by zoonotic viral spill over from animals to humans.[24] UK scientists are also studying the potential impact of climate change on global health. New modelling, for example, shows that malaria and dengue could affect billions more people if global warming continues uncurbed.[25]

- **ROI 3: Supporting the UK to Build Back Better** – UK government funding attracts a vibrant private sector able to translate UK global health research into products and generate UK growth across multiple regions. The Infection Innovation Consortium (iiCON) based in Liverpool, for example, has helped to bring five new products to the market in 2020/21 with a potential market value in excess of £14bn, three of the products are being developed by UK companies.[26]

  iiCON is also supporting the local economy, and will generate a minimum of 364 direct jobs for the local economy and will increase the R&D spend in the Liverpool City Region and Cheshire and Warrington by £1bn a year by 2030.

  The A-WOL Consortium has selected two candidates for clinical trial in the fight against onchocerciasis (river blindness) and lymphatic filariasis (elephantiasis). The drugs have an estimated market value each in excess of US$100mn.[27]

  ROI 4: Leveraging additional funding – Every US$ 1 dollar that the UK government invests in global health technologies R&D, leverages 45 cents in additional UK philanthropic investment.[28] In 2019, the UK philanthropic sector invested US$127mn in global health technologies R&D in the UK and the figure is likely to be higher if broader global health R&D and non-UK philanthropic investments are included.[29]

  There are no clear data on private sector investment in UK global health R&D. The broader UK pharmaceutical industry performed £4.8bn worth of R&D in the UK in 2019 and accounted for around one fifth of total private sector spend on research and development in the UK.[30] The Johnson & Johnson pharmaceutical company recently invested in the J&J Satellite Centre for Global Health Discovery at the London School of Hygiene and Tropical Medicine (LSHTM).

13 London School of Hygiene and Tropical Medicine (2021) LSHTM trial using RTS,S/AS01 accessed 11.10.2021.
14 University of Glasgow (2021) Endosymbionts for Vector Control Research, January 21 2021.
15 UKRI Medical Research Council (2021) TimeLine of Research and Discoveries accessed 11.10.2021.
16 Wellcome Foundation (2020) The UK's role in global research: How the UK can live up to its place in the world, October 2020, London, UK.
17 Statista (2021), 'Drug manufacturers with the highest number of ordered COVID-19 vaccine doses as of March 2021', accessed 28 June 2021 as cited in UK House of Parliament (2021) Coronavirus: lessons learned to date, 12 October 2021, London, UK.
18 NHS England, 'COVID treatment developed in the NHS saves a million lives', accessed 17 August 2021 as cited in UK House of Parliament (2021) Coronavirus: lessons learned to date, 12 October 2021, London, UK.
19 AGILE (2021) Agile Clinical Trial Platform accessed on 6.10.2021.
20 I-Sense (2021) About Us webpage accessed 6.10.2021.
21 Policy Cures Research and Global Health Technology Coalition (2017) Return on Innovation: Why global health R&D is a smart investment for the United States, June 2017.
22 University College London (2021) Vax-Hub accessed on 6.10.2021.
23 University of Glasgow (2021) Machine Learning Can Predict Animal Viruses That Risk Infecting Humans first published 4 October 2021.
24 University of Glasgow (2020) UofG Part of Global Program To Understand Zoonotic Viral Disease 'Spill Over', first published 2 October 2020.
25 London School of Hygiene and Tropical Medicine (2021) Malaria and dengue predicted to affect billions more people if global warming continues uncurbed, 8th July 2021.
26 Liverpool School of Tropical Medicine (2021) UK's Infection Innovation Consortium (iiCON) accessed 6.10.2021.
27 Liverpool School of Tropical Medicine (2021) A-WOL Consortium accessed 6.10.2021.
28 Policy Cures Research (2021) G-FINDER: Tracking Funding on Global Health R&D Database. Accessed on 6.10.2021. The exact amount is 45 cents.
29 Ibid.
30 Hutton. G. (2021) Research and Development Spending, Houses of Parliament Research Briefing, 2 September 2021.

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The Centre, established in 2021, will help build the next-generation of drug regimens needed to treat tuberculosis (TB) and will put the UK at the forefront of innovation on TB. TB kills 1.4mn people each year and is responsible for nearly one-third of all deaths from AMR.

- **ROI 5: Putting the UK at the heart of strategic international science partnerships** – Critical to the UK government's science superpower vision[31] and to high-quality science is the ability of the UK to collaborate with other countries and drive strategic international science partnerships. The top two regions for country-specified UK ODA funded medical research in 2019 were Africa and Asia.[32] Much of this research involves partnerships with research centres in these regions.

  UK global health researchers are working with their counterparts in China to tackle folic acid-resistant' neural tube defects, like spina bifida.[33] They are also working with their counterparts in India, Indonesia and Senegal to help address childhood stunting,[34] and they are working in the Philippines[35] and across a wide range of African countries to share the UK's world-class knowledge and technology on genome sequencing of COVID-19.

- **ROI 6: Ensuring value for money for UK ODA** – The UK is one of the world's top funders of global multilateral health funds via its ODA budget and it has a substantial bilateral global health ODA programme.[36] The UK's rigorous and dynamic evidence base not only underpins these investments but is shaping global health policies around the world by identifying what works and what delivers value for money.

  UK global health research on the management of multi-drug resistant tuberculosis has resulted in reformed practices in over 82 countries and these reforms are estimated to have saved low- and middle-income countries' health systems US$238 per patient.

  Overall societal savings in these countries could be as high as US$357mn per year.[37] UK research has helped improve the nutritional impact of emergency food rations for the UK's multilateral partners[38] and has provided the evidence that self-testing kits for HIV are safe and effective resulting in thousands of kits being rolled out around the world.[39]

In order to maintain UK international leadership and investments in global health R&D given the high return on investment this spend delivers, it is recommended that the UK government undertake the following four actions:

1. Ensure sufficient and stable non-ODA resources for UK global health research funding bodies like UKRI and the National Institute for Health Research over the coming years, to enable these bodies to continue to invest in global health R&D at a minimum of 2019 levels (or above), in light of the substantial reduction in UK ODA funding from 2021 onwards;
2. Deliver at a minimum the levels of ODA for R&D set out in SR2021, and guarantee that this portion of R&D funding is used to drive direct impact in alleviating poverty and improving the health and wellbeing of those in low-income countries.
3. Dedicate one of the Office of Science and Technology's new thematic-driven innovation missions to addressing a major global health challenge in order to bring together the best of British talent across industry, academia and civil society to spearhead innovation.[40] Potential themes could include exploiting mRNA vaccines for other entrenched diseases, accelerating the early development of drugs and vaccines, developing alert systems for new pandemics, addressing bio-terrorism or managing the health implications of climate-change, with a focus on water, heat and pollution; and,
4. Commit in 2022 to producing (or sponsoring the sector to deliver) a UK global health research and development strategy in order to guide investments in this sector. The strategy should identify a set of ambitious goals to prioritise where public and private investment is required.

The UK government has set itself an ambitious and commendable goal over the next ten years to remake the UK as a global science superpower and unleash innovation in order to build back better, enhance UK security, and promote the UK as force for good in this world. Maintaining UK international leadership on investments in global health R&D is critical to the UK achieving this goal.

31 UK Government (2021) Prime Minister Boris Johnson's article, 21 June 2021; UK Government (2021) Integrated Review of Security, Defence, Development and Foreign Policy: Global Britain in a Competitive Age.

32 UK Government (2020) Final Statistics for International Development 2019 Datasheets. The numbers are taken using the OECD's Creditor Reporting Code of 82 to mark research spend and for health R&D the CRS codes for medical research and research on non-communicable diseases have been included.

33 University College London (2021) UCL-PKU Strategic Partner Funds, 26 April 2018.

34 UKRI GCRF (2021) Action Against Global Stunting accessed on 11.10.2021.

35 UKRI (2021) Implementing genomic surveillance to support SARS-CoV-2 control and mitigation strategies in the Philippines accessed on 6.10.2021.

36 The UK is the top international donor to GAVI, the Vaccine Alliance, is set to become the largest donor to the World Health Organisation (WHO) and is the third largest funder of the Global Fund to Fight Aids Tuberculosis and Malaria (Global Fund).

37 Liverpool School of Tropical Medicine (2021) Improving the treatment for MDR-TB: The STREAM trial accessed on 6.10.2021.

38 University College London (2021) Development of NutVal 4 accessed on 6.10.2021.

39 Mulubwa, C et al (2019) Community based distribution of oral HIV self-testing kits in Zambia: a cluster-randomised trial nested in four HPTN 071 (PopART) intervention communities, The Lancet Volume 6, ISSUE 2, e81-e92, February 01, 2019.

40 The UK government's Office of Science and Technology Strategy will set up a series of thematic-driven innovation missions using the model of the vaccine taskforce to bring together a multi-stakeholder group to drive science innovation in key thematic areas. The themes will be decided by a National Council National Science and Technology Council to be chaired by the UK Prime Minister. For more information see UK Government (2021) Prime Minister sets out plans to realise and maximise the opportunities of scientific and technological breakthroughs, Press release 21 June 2021.

Introduction:
UK public investments in global health R&D

The UK government has committed to scaling-up its public investment in R&D from £14.8 billion in 2021/22 to £20 billion in 2024/25[41] in recognition that we have a 'once-in-a-generation opportunity to strengthen our global position in research, unleash a new wave of innovation, enhance our national security and revitalise our international ties'.[42]

As part of this commitment, it is recommended that the government do all it can to ensure that it sustains its public investment in global health research and development (R&D), in light of the budget threats posed by the recent cuts to the UK's official development assistance (ODA).

The UK government has been a generous investor in global health R&D. In 2019, the UK government allocated just under £1bn of its ODA budget to R&D (£953mn).[43] Over one-third of this – £354mn – was exclusively for medical R&D.[44] Though the actual amount the UK government spent on global health research from its ODA budget, is likely to be larger, if multi-disciplinary research is taken into account.

Since 2013 the UK government has increased its ODA spending on R&D from 2.1% of total ODA in 2013 to 6.3% in 2019 and the volume of resources in real terms more than tripled over the same period: global health R&D quadrupled in volume. [45]

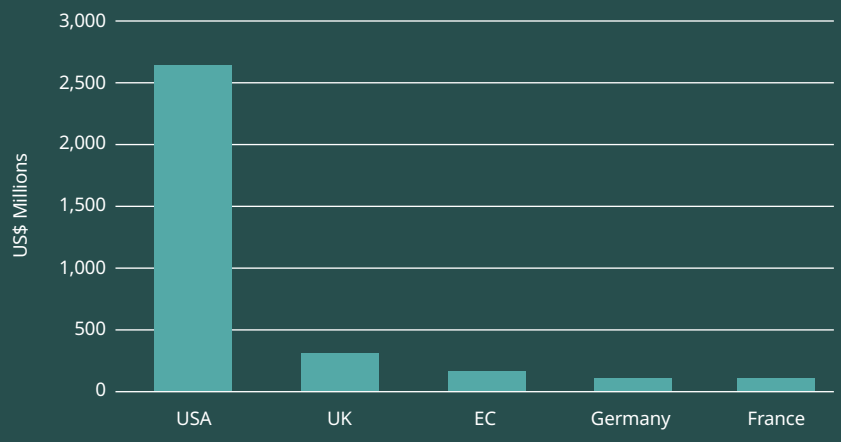
This funding has helped to make the UK a world leader on global health R&D spending as measured by Policy Cures Research's G-FINDER data. The UK was the second largest public investor in the world in 2019, behind the USA which provides the lion's share of funding, but currently ahead of the European Commission, Germany and France.[46]

Policy Cures Research's G-FINDER data measures a subset of global health R&D spending, focused exclusively on new products and technologies aimed at tackling neglected diseases, sexual and reproductive health technologies, and emerging infectious diseases. The former two focused exclusively on areas that significantly affect low- and middle-income countries.

Importantly, the G-FINDER data does not include all global health R&D, for example it excludes research on health systems or programmatic delivery of non-product interventions.[47]

Top 5 Public Finders of Global Health Technology R&D in 2019

(Source: G-FINDER Database, US Dollars Constant 2019)



41 UK Government (2021) Autumn Budget and Spending Review 2021, London, UK.
42 UK Government (2020) UK Research and Development RoadMap, London, UK.
43 UK Government (2020) Final Statistics for International Development 2019. The numbers are taken using the OECD's Creditor Reporting Code of 82 to mark research spend and for health R&D the CRS codes for medical research and research on non-communicable diseases have been included.
44 Ibid.
45 UK Government (2020) Final Statistics for International Development SIDs databases for multiple years. Note that the data is in current prices and was changed into constant 2019 UK pounds prices using the Consumer Price Inflation (CPI) Index obtained from the UK Office for National Statistics.
46 Policy Cures Research (2021) G-FINDER: Tracking Funding on Global Health R&D Database. Accessed on 6.10.2021. These figures include all public government funding for new technologies and products tackling neglected tropical diseases, sexual and productive health and emerging infectious diseases.
47 For more information on what is included in the data, go to Policy Cures Research (2021) G-FINDER Methodology.

Introduction:

UK public investments in global health R&D *continued*

In 2019, the UK government invested US$281mn on global health R&D according to G-FINDER data. It is not possible to assess the full amount of the funding provided as ODA, but at a minimum 42% was ODA from the former Department for International Development.[48]

The vast majority of UK public investment was allocated to new technologies and products in neglected tropical diseases (66%) followed by emerging infectious diseases (19%) and then sexual and reproductive health technologies (6%). The remaining was invested in research that covered one or more of the topics above.[49]

The decision in 2020 by the UK government to reduce the ODA budget from 0.7% of gross national income (GNI) to 0.56 in 2021 and only scale-back up the budget after key fiscal tests have been met threaten UK global health research for years.[50]

The UK ODA budget is estimated to be £10.9 bn in 2021/22[51] This represents a £4.4 bn reduction in the UK ODA budget in 2021/22 compared to what the UK would have provided in the same year, if it had allocated 0.7% of its GNI as ODA.[52] While it is commendable that the UK government has committed to scale back up its R&D ODA spending to £1 billion in 2024/25, between 2021 and 2024 there will be a significant shortfall in financing, with UK R&D ODA falling to £600 million in 2021/22.[53]

UKRI's 2021/22 budget will be £7.9bn. This is £700mn less than last year and it is reported that the largest reason behind UKRI's decrease in funding is the UK government's decision to cut its ODA budget.[54]

Maintaining UK international leadership on public investments in global health R&D is a smart choice. While it represents a relatively small amount of funding, when compared to other UK government public expenditures, it delivers a high return on investment (ROI) – saving millions of lives, promoting Global Britain as a science superpower that is a force for good in the world, deepening international strategic science partnerships and enhancing UK security from current and future global health threats.

It also contributes to UK prosperity, leveraging additional resources, delivering jobs and boosting UK enterprise, through the translation of its research into commercial products and services, and ensures value for money on other government spending for UK taxpayers.

This briefing paper sets out six key ways in which UK public investment in global health R&D delivers a high return to the UK government. It then goes on to recommend how, in light of the budget's cuts to UK ODA, the government can sustain its international leadership in global health R&D.

Sustaining public funding in global health R&D is mission critical for humanity, supports UK security and prosperity and promotes Global Britain as a science superpower and force for good in this world. The UK is already a world leader on global health R&D. It must continue to be one in the future.

48 It is not possible to disaggregate the G-FINDER data on the basis of whether it is official development assistance (ODA) or not. The assumption is based on the fact that the volume of resources captured by G-FINDER is smaller than the total amount recorded by the UK as ODA-funded medical research and development in 2019 and is therefore likely a sub-set of this. The G-FINDER data does reveal the public bodies that provided the funding and the former Department for International Department (DFID) provided 42% of all global health technology R&D in 2019 and a further 30% was delivered via the Department for Health and Social Care, which is also a major provider of ODA for R&D, providing 275 of all UK medical ODA R&D in 2019 according to the UK Government (2020) Final Statistics for International Development 2019.

49 Policy Cures Research (2021) G-FINDER: Tracking Funding on Global Health R&D Database. Accessed on 6.10.2021.

50 The fiscal tests are when the Office for Budget Responsibility (OBR) shows that "on a sustainable basis" the country is not borrowing for day-to-day spending and the ratio of underlying debt to GDP is falling. Based on the financial projections in the Comprehensive Spending Review 2021, the UK is on-track to meet these tests in 2024-25. This was found in the UK Government (2021) Autumn Budget and Comprehensive Spending Review 2021, London UK.

51 Loft, P, Brien, P (2021) Reducing the UK's aid spend in 2021, House of Commons Briefing 20th July 2021.

52 Ibid.

53 UK Government (2021) Autumn Budget and Spending Review 2021, London, UK

54 Financial Times (2021) Can Boris Johnson turn Britain into a scientific leader? September 28, 2021.

Return on Investment 1:

Saving lives and promoting Global Britain as a science superpower

The UK government declared in 2020 its ambition to be a science superpower by 2030, putting science and technology at the centre of UK national and international policy.[55]

The government has stated that it wants to use its scientific powers for the public good and has committed to prioritising public investments in UK R&D that tackle the greatest challenges facing the world today and tomorrow in order to unlock improvements in health, wellbeing and prosperity for the UK and the rest of the world.[56]

UK global health research is already delivering on this mandate. It has been at the forefront of tackling malaria leading the way on the prevention and treatment of the disease.[57] Its innovations have contributed to a 50% reduction in malaria deaths worldwide between 2000 and 2015.[58] It is also at the forefront of tomorrow's solutions. UK researchers, in partnership with scientific colleagues elsewhere, were behind the clinical trials that resulted in the first-ever malaria vaccine to be officially approved by the World Health Organisation (WHO) in October 2021.[59] UK research is also driving novel control strategies that focus on genetically modifying the parasites that infect mosquitoes in order to disrupt transmission of the disease[60], and it is behind the development of a new generation of insecticide treated nets, to avoid the growing problem pyrethroid resistance which has reduced the efficacy of existing nets.[61]

Example 1: UK leading the way on malaria

In 1902 the UK scientist, Sir Ronald Ross, was awarded the Nobel Prize in Physiology or Medicine for his discovery that malaria was a disease transmitted by mosquitoes. This discovery transformed the world's approach to preventing and treating the disease.

Research by UK scientists in 1989 proved the effectiveness of insecticide-treated bed nets and demonstrated the effectiveness of artemisinin for treating malaria. UK scientists also pioneered a combination therapy using artemisinin which is still the first line treatment recommended by the World Health Organisation, today.

These innovations have contributed to a 50% reduction in malaria deaths worldwide from 840,000 deaths per year in 2000 to 440,000 in 2015.

The UK continues to be at the vanguard of malaria research, the London School of Hygiene and Tropical Medicine (LSHTM) helped lead the clinical trials that have resulted in the first-ever malaria vaccine to be rolled out around the world in 2021. The University of Glasgow is working on a new prevention strategy focused on genetically modifying the parasite Wolbachia that infect mosquitoes and can impact their ability to transmit disease. This work is currently being field trialled in Malaysia.

LSHTM in partnership with the Liverpool School of Tropical Medicine's (LSTM) are also leading research into a new class of Insecticide Treated Nets in response to the growth of pyrethroid resistance. A large-scale trial in Uganda found that use of this new net reduced malaria prevalence by 27%. LSTM has also contributed to changing WHO guidelines and country practices in the prevention and treatment of the disease in pregnant women, improving the outcome of approximately 32 million pregnancies at risk annually.

Source: Hasan, D et al (2015) The UK's Contribution to Health Globally Benefiting the country and the world; Our World in Data (2021) Malaria; London School of Hygiene and Tropical Medicine (2021) LSHTM trial using RTS,S/AS01; University of Glasgow's ANTI-VeC is a Vector-borne Disease Network; Developing a new class of ITNs; Treatment and control of malaria in pregnant women

55 UK Government (2021) Prime Minister Boris Johnson's article, 21 June 2021; UK Government (2021) Integrated Review of Security, Defence, Development and Foreign Policy: Global Britain in a Competitive Age.
56 UK Government (2020) Research and Development Roadmap, UK Government (2021) UK Innovation Strategy: Leading the future by creating it, London, UK.
57 Hasan, D et al (2015) The UK's Contribution to Health Globally Benefiting the Country and the World, All Party Parliamentary Group For Global Health, Office of Lord Crisp, London, UK.
58 Our World in Data (2021) Malaria, accessed on 6.10.2021
59 London School of Hygiene and Tropical Medicine (2021) LSHTM trial using RTS,S/AS01 accessed 11.10.2021.
60 University of Glasgow (2021) ANTI-VeC is a Vector-borne Disease Network, January 21 2021.
61 Liverpool School of Tropical Medicine (2020) Reducing Malaria Prevalence in Africa Through New Classes of Insecticide-Treated Nets, October 2020.

Return on Investment 1:

Saving lives and promoting Global Britain as a science superpower *continued*

UK global health scientists discovered one of the first effective vaccines against the bacteria pneumococcus, which is responsible for around one million deaths every year among children in developing countries.[62] This work has led to the life-saving vaccine being licensed and introduced worldwide, with approximately 225 million children vaccinated with it by the end of 2019.[63]

UK research provided the mathematical modelling that confirmed the scale of the Ebola outbreak in West Africa in 2013-2016[64] and it helped to develop, and effectively deploy, an Ebola vaccine.[65]

UK global health research is also working on the prevention and control of existing and emerging zoonotic diseases using a ONE health approach. Endemic livestock zoonoses are important causes of human febrile illness and can have a substantial economic impact due to livestock productivity losses.[66]

Example 2: Adopting a One Health approach to zoonotic diseases

The University of Glasgow is using a ONE health approach to help with the prevention and control of zoonotic diseases in Tanzania. Its Livestock, Livelihood and Health programme, which works with partners in Tanzania, is developing strategies for control and elimination of diseases that can be transmitted from wild or domesticated animals to people. These diseases are known as zoonoses.

Despite having major societal impacts in low- and middle-income countries, this group of diseases remains widely neglected. Although many of these infections can be treated, a lack of access to robust diagnostic tests means that many cases remain undiagnosed, which also limits access to effective treatment. The work includes exploring novel molecular approaches for understanding the epidemiology of endemic anthrax.

The project is funded by the former UK Department for International Development, the Biotechnology and Biological Sciences Research Council, Economic and Social Research Council, Natural Environment Research Council and the Defence Science and Technology Laboratory.

Source: Livestock, Livelihood and Health

62 UKRI Medical Research Council (2021) TimeLine of Research and Discoveries accessed 11.10.201.

63 Mackenzie, G et al (2017) Impact of the introduction of pneumococcal conjugate vaccination on pneumonia in The Gambia: population-based surveillance and case-control studies, The Lancet, Volume 17, Issue 9, P965-973, September 01, 2017.

64 Henao-Restrepo, A et al (2017) Efficacy and effectiveness of an rVSV-vectored vaccine in preventing Ebola virus disease: final results from the Guinea ring vaccination, open-label, cluster-randomised trial (Ebola Ça Suffit!), The Lancet, Volume 389, Issue10068, P505-518, February 04, 2017.

65 Henao-Restrepo, A et al (2017) Efficacy and effectiveness of an rVSV-vectored vaccine in preventing Ebola virus disease: final results from the Guinea ring vaccination, open-label, cluster-randomised trial (Ebola Ça Suffit!), The Lancet, Volume 389, Issue10068, P505-518, February 04, 2017.

66 Livestock Livelihood and Health (2021) accessed on 16.10.2021.

Return on Investment 2:
Enhancing UK Security

Global health R&D is critical for UK security, on a par with science investments required to address the threats posed by climate change.

The COVID-19 pandemic has taught us how costly global health risks are to UK lives and livelihoods, and how interconnected UK citizens' safety and prosperity is with the lives of people living around the world. UK global health research has been at the vanguard of tackling COVID-19. Supported by UK government funding, Oxford University with AstraZeneca developed a COVID-19 vaccine, which now accounts for almost a third of all the vaccine doses ordered globally.[67]

The RECOVERY trial, also run by Oxford University, discovered the first treatment for COVID-19, dexamethasone, which is estimated to have saved over a million lives.[68] The trial is now working at the international level in places like Vietnam, Indonesia, and Nepal, its innovative design will provide a global platform for the study of epidemic infections worldwide.

Example 3: The RECOVERY Trial

Oxford University is leading the RECOVERY trial which carries out clinical trials to discover treatments for COVID-19. RECOVERY discovered the first treatment for COVID19, dexamethasone, which reduces the severity and duration of COVID-19 among patients. This discovery is estimated to have saved over a million lives.

The trial has now become RECOVERY INTERNATIONAL and is working in Indonesia, Nepal, and Vietnam. It is currently exploring other potential treatments for COVID-19 like baricitinib (an immunomodulatory drug used in rheumatoid arthritis), dimethyl fumarate (an immunomodulatory drug used in psoriasis and multiple sclerosis), high-dose vs standard corticosteroids andempagliflozin (a drug for diabetes and heart and kidney disease).

The RECOVERY trial is funded from grants given to Oxford University, including ODA funding from the UK government, support from Wellcome, and the Bill and Melinda Gates Foundation.

Source: Recovery Trial

Example 4: Fast-tracking COVID-19 Treatments – AGILE

AGILE is a clinical trial platform that has been launched in the UK and internationally to specifically speed up the testing of new COVID-19 treatments. Its ambition is to reduce treatment testing to a matter of months not years. It bridges the gap between non-human trials and large-scale testing and has the capability to test multiple potential treatments in parallel and pool control data across patient groups to speed up the process. It will look at all types of treatments, including drugs that try to prevent patients with the infection ending up in hospital.

AGILE is a collaboration between the University of Liverpool, Southampton Clinical Trials Unit, the Liverpool School of Tropical Medicine, and the NHS (Liverpool University Hospitals NHS Foundation Trust). Funding has come from UNITAID, UKRI, Wellcome, philanthropic donors and pharmaceutical companies.

Source: AGILE

Example 5: Low-cost COVID-19 aids – UCL-Ventura Continuous Positive Airway Pressure

A team of University College London engineers, clinicians and industry partners from Mercedes-AMG High Performance Powertrains developed a breathing aid that helps to keep COVID-19 patients out of intensive care. The UCL-Ventura Continuous Positive Airway Pressure (CPAP) device gained regulatory approval in 10 days.

To contribute to the global humanitarian effort, the team released the full design at no cost and are providing technical and clinical support to countries. The design is already in use in 25 countries, including in the UK with 130 NHS hospitals using the aid.

Source: UCL-Ventura Breathing Aids

67 Statista (2021), 'Drug manufacturers with the highest number of ordered COVID-19 vaccine doses as of March 2021', accessed 28 June 2021 as cited in UK House of Parliament (2021) Coronavirus: lessons learned to date, 12 October 2021, London, UK.

68 NHS England, 'COVID treatment developed in the NHS saves a million lives', accessed 17 August 2021 as cited in UK House of Parliament (2021) Coronavirus: lessons learned to date, 12 October 2021, London, UK.

Return on Investment 2:
Enhancing UK Security *continued*

UK global health research leads the world on geonomics sequencing of the virus: the COVID-19 Genomics UK consortium has sequenced over 50% of all the SARSCoV-2 genomes in the world.[69] It was critical to informing the UK response to the pandemic, providing information for the mathematical modelling that underpinned the government's decisions to implement a lockdown.[70] It has led to the design of a breathing aid that can help keep COVID-19 patients out of intensive care and made access to the design free of charge.[71] The aid is being used across 24 other countries including in the UK where it is being used in 130 NHS hospitals.

UK science is also fast-tracking the development of COVID-19 treatments, via a new AGILE platform, that bridges the gap between non-human trials and large-scale testing in a safe and reliable way.[72]

UK global health research is also at the cutting edge of tackling tomorrow's global health challenges. The Infection Innovation Consortium (iiCON) brings together government, industry, philanthropy and academia to accelerate the R&D pathways for drugs, vaccines, diagnostics and public health interventions to combat critical priority pandemics using disruptive technologies.[73] One of its key focus areas is addressing antimicrobial resistance (AMR) and is developing new antibiotics and personal products designed to overcome AMR.

The Consortium has been praised by the UK government's G7 Pandemic Preparedness Partnership's 100 days mission plan[74] as an excellent example of what is needed in order for the world to be better prepared for the next pandemic. By 2050, AMR could cause 10 million deaths and reduce GDP by up to 3.5% per year, at a cumulative US$100 trillion cost to the global economy.[75]

Example 6: Accelerating drugs, vaccines, diagnostics to combat priority pandemics – iiCON

The Infection Innovation Consortium (iiCON), part of the UKRI Strength in Places programme, is a £173mn collaboration between the UK government, industry, philanthropy and academia to radically accelerate the R&D pathway for drugs, vaccines, diagnostics and public health interventions to combat critical priority pandemics. iiCON is a disruptive Platform technology-based initiative that incorporates elements of artificial intelligence, bioinformatics, robotics and advanced materials.

iiCON is heavily engaged in the Antimicrobial Resistance (AMR) agenda, developing new antibiotics and personal products designed to overcome AMR and mapping and modelling the impact that these products have in different settings (Malawi, Uganda and the UK). In 2020/21 the Consortium helped to bring five new products to market. The potential market value of these products is in excess of £14bn. Three of the five products are being produced by UK-based companies.

iiCON is also supporting the local economy and will generate a minimum of 364 direct jobs for the local economy and will increase the R&D spend in the Liverpool City Region and Cheshire and Warrington by £1bn a year by 2030.

iiCON's founding partners are UK Research and Innovation, Liverpool School of Tropical Medicine, Liverpool University, INFEX Therapeutics, Unilever, Evotec and the Liverpool University Hospitals NHS Foundation Trust.

Source: UK's Infection Innovation Consortium (iiCON)

The UK government is scaling up its infrastructure on vaccine production, with the establishment of the UK's Vaccines Manufacturing Innovation Centre[76] in Oxfordshire which will help to promote, develop and accelerate the growth of the UK vaccine industry.

The UK's new Vax-Hub intends to make the UK the global research centre for the manufacturing of next-generation vaccines.[77] Vax-Hub is working to overcome the traditional inefficiencies of current vaccine manufacturing by driving innovation through the application of new technologies like the advances in synthetic biology, antigen design and cell/viral engineering in manufacturing. The Hub is committed to sharing this knowledge with low- and middle-income countries.

69 UK Government (2020) Research and Development Roadmap. The report was written in July 2020 so the data corresponds to this.
70 London School of Hygiene and Tropical Medicine (2021) Centre for Mathematical Modelling of Infectious Diseases, COVID 19 work accessed on 11.10.2021.
71 University College London (2021) UCL-Ventura Breathing Aids accessed on 6.10.2021.
72 AGILE (2021) Agile Clinical Trial Platform accessed on 6.10.2021.
73 Liverpool School of Tropical Medicine (2021) UK's Infection Innovation Consortium (iiCON) accessed 6.10.2021.
74 Pandemic Preparedness Partnership (2021) 100 Days Mission to Respond to Future Pandemics, A report to the G7 by the pandemic preparedness partnership, 12 June 2021.
75 Policy Cures Research and Global Health Technology Coalition (2017) Return on Innovation: Why global health R&D is a smart investment for the United States, June 2017.
76 Vaccine Manufacturing and Innovation Centre (2021) Website accessed on 11.10.2021. The Centre will partner with the academic sector and small and medium enterprises – academic partners include Oxford University, the London School of Hygiene and Tropical Medicine and the University College London to drive innovation in this area.
77 University College of London (2021) Vax-Hub accessed on 6.10.2021.

Return on Investment 2:
Enhancing UK Security *continued*

UK global health research has developed a new machine learning method to detect when animal viruses could jump to humans, based solely on information encoded in the viral genome.[78] It is also contributing to improve our understanding of the threats posed by zoonotic viral spillover from animals to humans, as part of an international research network.[79]

It is leading the way on exploring the impact of climate change on global health. New modelling by UK researchers, for example, shows that malaria and dengue could affect billions more people if global warming continues uncurbed.[80] Additional research on heat-related deaths, shows that that one in three of heat-related deaths between 1991 and 2018 were attributable to human-induced warming of the planet.[81]

Example 7: The UK Vax-Hub – leading on the new generation of vaccine manufacturing

The UK's Vax-Hub aims to make the UK the global research centre for integrated discovery through to bioprocess manufacture of the next-generation vaccines and to share this knowledge with low- and middle-income countries.

Manufacturing vaccines today is inefficient due to the use of serial batch operations in large complex facilities that require highly trained operators and extensive quality testing throughout production. The Vax-Hub aims to research ways to overcome these traditional inefficiencies by driving innovation through the application of new technologies. For example, the extraordinary advances in synthetic biology, antigen design and cell/viral engineering have reached a maturity suitable for development and manufacturing research to realise the knock-on benefits at commercialisation. Benefits include lower cost of goods and modest facility footprints that challenges the economies of scale model currently used by the industry.

The Hub will also importantly provide modelling to assess the cost and ease of the introduction of new technologies and processes in low and lower-middle income countries.

The Hub is led by UCL Biochemical Engineering and The Jenner Institute, University of Oxford and includes the LSHTM as a partner.

Source: Vax-Hub

Example 8: Understanding the impact of climate change on global health

The LSHTM, the University of Liverpool and international partners, are modelling the impact of climate change on infectious diseases. Their analysis shows that an additional 4.7bn people could be at risk of malaria and dengue in future, if temperatures rise by about 3.7°C by 2100 compared to pre-industrial levels.

Other research undertaken by the LSHTM and the University of Bern is looking at the impact of climate change on heat-related deaths. New analysis by this team estimates that one in three (37%) of all heat-related deaths between 1991 and 2018 were attributable to human-induced warming of the planet. The percentage of heat-related deaths attributed to human-induced climate change was highest in Central and South America (up to 76% in Ecuador or Colombia) and South-East Asia (between 48% and 61%).

Sources: Global warming and infectious diseases; Global warming and heat-related deaths

78 University of Glasgow (2021) Machine Learning Can Predict Animal Viruses That Risk Infecting Humans first published 4 October 2021.

79 University of Glasgow (2020) UofG Part Of Global Program To Understand Zoonotic Viral Disease 'Spill Over', first published 2 October 2020.

80 This research is being carried out by the LSHTM with partners from Umeå University, Sweden; Abdus Salam International Centre for Theoretical Physics, Italy; University of Heidelberg, Germany; and the University of Liverpool. For further information see London School of Hygiene and Tropical Medicine (2021) Malaria and dengue predicted to affect billions more people if global warming continues uncurbed, 8th July 2021.

81 London School of Hygiene and Tropical Medicine, Global warming already responsible for one in three heat-related deaths, 31 May 2021.

Return on Investment 3:
Supporting the UK to Build Back Better

Not only is UK global health R&D vital for UK and global wellbeing and security, but it also supports the government's agenda of building back better and levelling-up economic opportunity across the UK.[82]

UK global health research centres and universities provide a world-class research base, which attracts a thriving private sector that delivers jobs across the UK and translates global health research into commercial products. UK centres and universities also work closely with a vibrant non-governmental sector and philanthropy sector which is able to invest in, support and deploy their global health research.

The Infection Innovation Consortium (iiCON) has helped to bring five new products to the market in 2020/21 with a potential market value in excess of £14bn. Three of the five products are produced by UK-based companies (see example 6).[83]

The A-WOL Consortium have produced two candidates for clinical trial in the fight against onchocerciasis (river blindness) and lymphatic filariasis (elephantiasis). The drugs, if they gain successful regulatory registration, have an estimated market value each in excess of US$100mn.[84]

The LSHTM's spin-off company, Arctech, is producing odour-based disease surveillance and control products. The company, working with clients, has helped to bring 300 products to market since it was established in 2011.

Example 9: Bringing new drugs to treat onchocerciasis and lymphatic filariasis – A-WOL

The A-WOL Consortium is focused on bringing new drugs to the market against onchocerciasis (river blindness) and lymphatic filariasis (elephantiasis). 859mn people in 50 countries worldwide remain threatened by lymphatic filariasis.

Two new chemical entities emerging from the A-WOL industrial scale1 drug discovery process which screened over two million compounds, are the clinical candidates ABBV-40832 and AWZ1066S3. These novel filariasis cures have been developed in partnership with AbbVie, Eisai and the not-for-profit product development partner, DNDi. ABBV-4083 is positioned in Phase II, whilst AWZ1066S is in Phase I development. Successful registration of either drug via the Food and Drug Administration regulatory agency will potentially yield a priority review voucher with a current market value in excess of US$100mn.

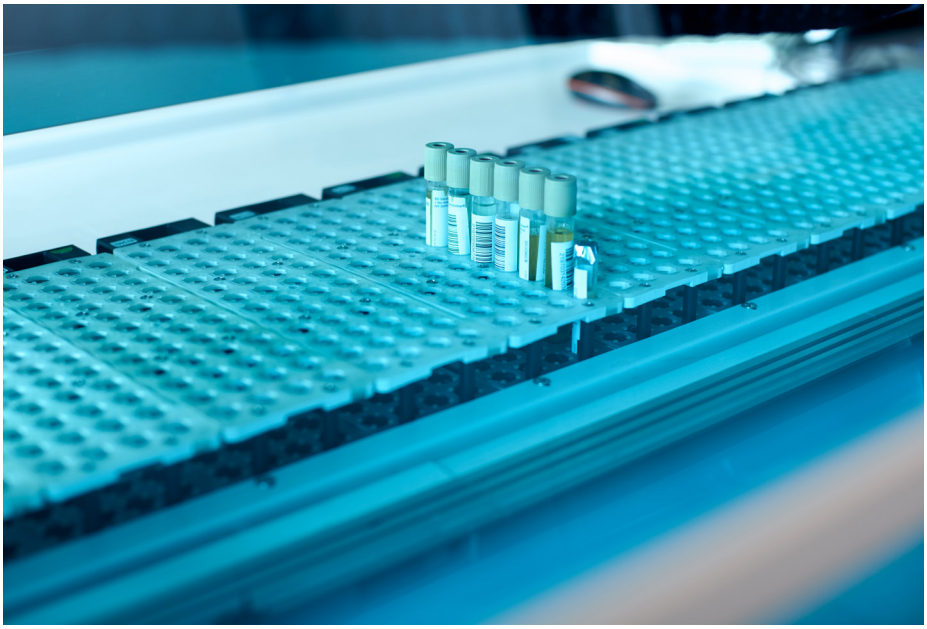
The Consortium is based at the Liverpool School of Tropical Medicine and funded by the Bill and Melinda Gates Foundation, Medical Research Council, Global Health Innovative Technology fund (G-HIT) and NC3Rs.

Sources: 1. Industrial scale high-throughput screening delivers multiple fast acting macrofilaricides. 2. Preclinical development of an oral anti-Wolbachia macrolide drug for the treatment of lymphatic filariasis and onchocerciasis. 3. AWZ1066S, a highly specific anti-Wolbachia drug candidate for a short-course treatment of filariasis.

82 UK Government (2021) Build Back Better: Our Plan for Growth, London, UK.
83 Liverpool School of Tropical Medicine (2021) UK's Infection Innovation Consortium (iiCON) accessed 6.10.2021.
84 Liverpool School of Tropical Medicine (2021) A-WOL Consortium accessed 6.10.2021.

Return on Investment 3:
Supporting the UK to Build Back Better *continued*

ODA research by the University of Glasgow has developed a unique, low-cost diagnostic platform that provides accurate detection of malaria and schistosomiasis infection and is working with UK business to manufacture the devices.[85] While I-Sense, is building a new generation of digital sensing systems to identify and prevent outbreaks of infectious disease and AMR, much earlier than ever before. The team is working with industry partners to produce and manufacture the new technology.[86]



Example 10: New generation digital sensing to identify outbreaks of infectious disease and anti-microbial resistance – i-sense

I-sense is Interdisciplinary Research Collaboration (IRC) building a new generation of digital sensing systems to identify and prevent outbreaks of infectious disease and antimicrobial resistance, much earlier than ever before. It works in partnership with end users in low and middle-income countries, to build innovative digital technologies that meet their needs.

I-sense research is generating intellectual property across a range of areas including new biomarkers and biomimetic capture coatings, novel nanoparticles and surface chemistries, new sensor technologies, signal enhancement strategies and big data analytics. It works with partners in a broad range of industries to translate its research into products and practices. One of its success stories has been the development, by researchers at the UCL and the University of Sheffield, of a novel method using lasers for detecting phenotypic antibiotic resistance. The method has reduced the time from 12-24 hours to 45 minutes. I-sense is funded by the Engineering and Physical Sciences Research Council (EPSRC).

Source: i-sense

Example 11: Low-cost diagnostic platforms for the detection of malaria

ODA-funded research by the University of Glasgow has developed a low-cost diagnostic platform for accurate detection of malaria and schistosomiasis infection.

The platform will not only accelerate processes in tackling neglected tropical diseases saving countless lives, but it also benefits UK businesses. Epigem Ltd, a UK SME, has designed and manufactured the components for the field trials, and is working with the Uganda Industrial Research Institute to develop local manufacturing capacity for the platform.

Source: Low-Cost Diagnostic Tools

85 University of Glasgow (2021) Low-Cost Diagnostic Tools accessed 6.10.2021.
86 I-sense (2021) About Us webpage accessed 6.10.2021.

Return on Investment 3:
Supporting the UK to Build Back Better *continued*

The UK's life science sector, of which global health research forms part, contributes £14.5bn per annum to UK GDP and the broader bioeconomy is worth £220bn in gross value-added, and contributes to over 5 million jobs.[87] The UK is recognised as the third largest bio cluster in the world and its genomics sector accounts for 10% of the global market.[88]

The top 25 global pharmaceutical companies and the top 30 global medical technology companies all have operations in the UK[89] and the UK is also the top European destination for Artificial Intelligence Health starts-up: it is home to a third of them.[90]

A recent survey of 15 companies by ABPI found that there were over 1,000 links between academia and the pharmaceutical industry in the UK.[91] 42% of UK life sciences companies have been spun out from academic institutions – this is ten times the rate across all sectors.[92]

UK global health centres of excellence and universities spanning many regions from Glasgow and Liverpool to London and Oxford are providing local jobs and building regional expertise contributing to the government's objective of levelling up economic opportunities across the UK.

The Infection Innovation Consortium (iiCON), will generate a minimum of 364 direct jobs for the Liverpool City Region and Cheshire and Warrington and will increase the R&D spend of the region by £1bn a year by 2030.[93]

The Liverpool Life Sciences Accelerator, funded in part by LSTM, is also providing a hub that links health academics to health-related SMEs and industrial partners in order to harness the commercial opportunities of global health research.

The broader Life Science sector employs 66% of its workforce outside of London and the Southeast, and the jobs the sector provides tend to be high earning.[94]

Example 12: Developing odour-based disease surveillance and control products

Arctech is a spin off company from the LSHTM's created in 2011. Since its creation it has worked with clients to help bring 300 products to market.

Arctech uses the Semeion IQ chemical ecology platform to exploit odour signals and harness odour chemicals to develop innovative odour-based diseases surveillance and control products.

This includes:

- Long-lasting repellent technologies that offer enduring protection from mosquitoes and other biting insects.
- Pheromone-based attractants and lures for surveillance of disease vectors, pest infestations and other pest control problems.
- Game changing non-invasive, odour-based diagnostic technologies for diseases including malaria and COVID-19.

Source : Arctech

Example 13: Supporting local enterprise and expertise – The Liverpool Life Sciences Accelerator

The Liverpool Life Sciences Accelerator is a unique partnership between the Liverpool University Hospital Foundation Trust (LUHFT) and Liverpool School of Tropical Medicine (LSTM) supporting businesses through collaboration, innovation and investment.

Located in a brand-new building with state-of-the-art laboratories, and part of the city-wide Knowledge Quarter investment in Life Sciences, the Accelerator project co-locates key researchers, with a range of health-related SMEs and industrial partners to support knowledge transfer and the commercialisation of health and life science research. The building was funded by ERDF; Wolfson Foundation; NHS capital funding and Liverpool City Region Single Investment Fund (SIF).

Source: Liverpool Accelerator

87 UK Government (2021) UK Innovation Strategy: Leading the Future By Creating It, London, UK.
88 Ibid.
89 Curran, S, Legido-Quigley, H, Spencer, J (2020) The UK as a global centre for health and health science, February 2020, London.
90 Ibid.
91 Association of the British Pharmaceutical Industry (2019) Industry and Academia Links Survey (2019) cited in UK Government (2021) Life Sciences Vision.
92 Beauhurst (2019) The UK's fastest growing life sciences companies report cited in UK Government (2020) Life Sciences Industrial Strategy Update.
93 Liverpool School of Tropical Medicine (2021) UK's Infection Innovation Consortium (iiCON) accessed 6.10.2021.
94 Beauhurst (2019) The UK's fastest growing life sciences companies report cited in UK Government (2020) Life Sciences Industrial Strategy Update

Return on Investment 4:
Leveraging additional funding

The UK government's significant public funding of health R&D and provision of critical health infrastructure, is not only essential to underpinning the success of this sector but also leverages further funding for research from the private and philanthropic sector in a virtuous circle.

Every US$1 dollar that the UK government invests in global health R&D, leverages 45 cents in additional philanthropic investment.[95] In 2019, the UK philanthropic sector invested US$127 million in global health R&D according to G-FINDER data. The amount is likely to be higher if foreign philanthropic investments was included.[96]

While there is no clear data on private sector investment in UK global health R&D, the broader UK pharmaceutical industry performed £4.8bn worth of R&D in the UK in 2019 and accounted for just under one fifth of total private sector performed research and development in the UK.[97] The UK's largest company investing in R&D in 2019 was GlaxoSmithKline, a pharmaceuticals company.[98] The company is ranked No.1 in the world for improving access to medicines in low-income countries.[99]

The Johnson & Johnson pharmaceutical company recently invested in the J&J Satellite Centre for Global Health Discovery at LHSTM. The Centre established in 2021, will help build the next-generation drug regimens needed to treat tuberculosis (TB) and will put the UK at the forefront of innovation on TB. TB kills 1.4mn people each year and is responsible for nearly one-third of all deaths from AMR.[100]

Global health research centres of excellence and universities that receive UK government investment, can leverage anywhere between 30% and 60% of their total funding from the not-for-profit and private sector.[101] For example, the LSHTM received £63.9mn in non-ODA and ODA funding from the government in 2019/20, and this leveraged a further £104.6mn from charities (UK and foreign), industry and other governments.[102]

95 Policy Cures Research (2021) G-FINDER: Tracking Funding on Global Health R&D Database. Accessed on 6.10.2021 data is based on 2019 figures for the UK. The exact amount is 45 cents for every US$1 dollar spent. In 2019 the UK government provided US$281mn in investments in global health R&D according to the tracker in 2019.

96 Policy Cures Research (2021) G-FINDER: Tracking Funding on Global Health R&D Database. Accessed on 6.10.2021.

97 Hutton. G. (2021) Research and Development Spending, Houses of Parliament Research Briefing, 2 September 2021. The private sector performed R&D worth £25.9bn in 2019 and the pharmaceutical sector performed 18.5% of it.

98 Ibid.

99 Curran, S, Legido-Quigley, H, Spencer, J (2020) The UK as a global centre for health and health science, February 2020, London.

100 London School of Hygiene and Tropical Medicine (2021) LSHTM launches new centre of innovation to tackle antimicrobial resistance and tuberculosis, July 2021.

101 This estimate come from data from a selection of UK Universities that undertake global health research.

102 London School of Hygiene and Tropical Medicine (2020) Financial statement 2019-2020. UK government departments and research councils provided £63.9mn in 2019/20, UK charities provided £20.2mn, Overseas charities £26.1mn, EU industry £11mn, the EU Commission £19.7mn, and other £27.5mn.

Return on Investment 5:

Putting the UK at the heart of international science partnerships

Critical to the government's science superpower vision and to high-quality science[103] is the ability of the UK to collaborate with other countries and drive international science partnerships.

Innovation is by its very nature global and requires cross-border alliances that draw on the global talent pool of expertise. International science partnerships also foster trust and help the UK to build alliances with key countries of wider strategic interest, supporting UK trade and security objectives.

UK global health research is at the forefront of equitable international partnerships with a proven track record of working with other countries and building and sharing expertise and knowledge. The top two regions for country-specified UK ODA funded medical research in 2019 were Africa and Asia.[104] Many of these projects are carried out with research counterparts in these regions.

UK global health researchers are collaborating with their Chinese counterparts to find new treatments to prevent 'folic acid-resistant' neural tube defects like spina bifida.[105] They are working with their counterparts in India, Indonesia and Senegal to help address childhood stunting[106] and are working with partners in the Philippines to build up the country's genomic surveillance capacity to assist it in better tracking COVID-19.[107]

Example 14: Preventing spina bifida – A UK-CHINA partnership

UCL and Peking University have been working together to test a novel therapy that could prevent tens of thousands of babies suffering from spina bifida, one of the world's most common birth defects. Globally, it is estimated that around one in 1,000 pregnancies a year are affected by neural tube defects, with more than 260,000 babies born with spina bifida.

Women are currently advised to take supplemental folic acid before and during early pregnancy to reduce the risk, yet some babies still develop spina bifida, and new protective therapies are needed to prevent 'folic acid-resistant' neural tube defects. The researchers ran a clinical trial in northern China – where the prevalence of spina bifida is among the highest globally. The research has confirmed initial findings that a vitamin common in fruit, vegetables, meat and nuts (inositol) could prevent NTDs. This new evidence will lead to new treatments for tackling neural tube defects in babies.

Source: Spina Bifida Study

Example 15: Addressing childhood stunting – A UK, India, Indonesia, and Senegal partnership

UKRI GCRF's Action against Stunting Hub is led by the LSHTM and brings together partners from the National Institute of Nutrition, Hyderabad, India; SEAMEO Regional Centre for Food and Nutrition, Universitas Indonesia; and University of Cheikh Anta DIOP, Senegal.

The hub conducts vital research addressing the intractable global challenge of child stunting and works directly with communities across India, Indonesia and Senegal who are facing this burden.

Over 150 million children worldwide, under the age of five, are stunted, meaning their growth and development are impaired. Children who are stunted experience diminished cognitive and psychological development, reduced productive capacity and poor health, and at an increased risk of degenerative diseases. In many communities, stunting is an intergenerational problem.

The programme of work explores the relationship between the biological, social, environmental and behavioural causes of stunting with the aim of developing and implementing effective interventions to tackle stunting.

Source: Action Against Stunting

Example 16: Supporting genomic surveillance – A Philippine-UK partnership

The University of Glasgow is working with the Philippine national laboratory network and Epidemiology Bureau to build up the country's genomic surveillance and response capacity for COVID-19. The project will deploy the latest sequencing and analytical technologies to characterise virus circulation from archived samples and enable rapid interpretation of genomic data from new case investigations to directly inform responses. It will embed large-scale real-time sequencing capacity at the national reference laboratory and build local sequencing capacity at Sub-National Laboratories (SNLs).

The project is funded by UKRI Medical Research Council and is ODA-funded.

Source: Implementing genomic surveillance to support SARS-CoV-2 control and mitigation strategies in the Philippines

103 Evidence backs this up with international science partnerships associated with more impactful research. Source: Technopolis Group (May 2017), The Impact of Collaboration: The Value of UK Medical Research to EU Science and Health cited in Wellcome Foundation (2020) The UK's role in global research: How the UK can live up to its place in the world, October 2020, London, UK.

104 UK Government (202) Final Statistics for International Development 2019 Datasheets. The numbers are taken using the OECD's Creditor Reporting Code of 82 to mark research spend and for health R&D the CRS codes for medical research and research on non-communicable diseases have been included.

105 University College London (2021) UCL-PKU Strategic Partner Funds accessed on 6.10.2021.

106 UKRI GCRF (2021) Action Against Global Stunting accessed on 11.10.2021.

107 UKRI (2021) Implementing genomic surveillance to support SARS-CoV-2 control and mitigation strategies in the Philippines accessed on 6.10.2021.

Return on Investment 6:
Ensuring value for money for UK ODA

The UK is a renowned leader on international development. It provided US$18.6 billion of official development assistance (ODA) in 2020, making it the third largest OECD Development Assistance Committee donor.[108] Underpinning the UK's ODA investments is a strong evidence base of what works and what is delivering value for money.

The UK has consistently used its ODA to promote global health: it is one of the top funders of global multilateral health funds and organisations,[109] has a substantial set of bilateral global health ODA programmes, and actively shapes global health policies at the international level.

Underpinning these investments and diplomacy is a rigorous and dynamic evidence base of what works and what delivers value for money for UK taxpayers, developing country governments and multilateral partners.

UK research on the management of multi-drug resistant tuberculosis, for example, has led to changes in WHO guidelines and resulted in reformed practices in over 82 low- and middle-income countries, helping these countries' health systems save US$238 per patient as a result. If the wider overall society savings are taken into account savings could be as high as US$357mn per year.[110]

UK research has also developed a low-cost and reliable COVID-19 diagnostic test that has been manufactured and is already being deployed in developing countries, helping to save lives and money. [111]

108 OECD (2021) ODA 2020 Detailed Summary, 13 April 2020, Paris, France.
109 The UK is the top international donor to GAVI, the Vaccine Alliance, is set to become the largest donor to the World Health Organisation (WHO) and is the third largest funder of the Global Fund to Fight Aids Tuberculosis and Malaria (Global Fund).
110 Liverpool School of Tropical Medicine (2021) Improving the treatment for MDR-TB: The STREAM trial accessed on 6.10.2021.
111 Liverpool School of Tropical Medicine (2020) LSTM begins the validation process for the Mologic COVID-19 point-of-need diagnostic test, News article March 2020.

Return on Investment 6:

Ensuring value for money for UK ODA *continued*

UK research has led to improvements in the way UN agencies and non-governmental organisations (NGOs) calculate the nutritional content of the food rations they provide to communities, improving the safety and cost effectiveness of these organisations' interventions.[112]

It has proved that self-testing kits for HIV are safe and effective which has resulted in international organisations, like UNITAID, backing the roll out of thousands of tests around the world.[113] It has also helped to assess the nutritional impact and cost-effectiveness of cash and voucher-based food assistance interventions in humanitarian settings.[114]

Example 17: Saving time and money in the management of multi-drug resistant tuberculosis

LSTM research on advancing the clinical and public health management of multi-drug resistant tuberculosis has contributed to changes in WHO guidelines for the management of multi-drug resistant tuberculosis (MDR-TB) and is saving countries time and money in their approach to tackling this form of the disease.

The shortened MDR-TB regime they designed and implemented has already benefited 200,000 people, with 82 countries having adopted it. Conservative estimates assume a health system saving of US$238 per patient as a result of the new regime, while broader societal savings could be as high as US$357mn.

Sources: Improving the treatment for MDR-TB: The STREAM trial

Example 18: Improving the nutritional content of food assistance programmes

UK research also undertaken by UCL and funded by a series of series of small grants from WFP, UNHCR, UCL Futures, and the IASC Global Nutrition Cluster, has improved the calculation method for assessing the nutritional value of food rations in order to make it more accurate. NutVal is being used by UN agencies and NGOs and has led to ensuring their food rations are safer and more cost-effective.

Source: NutVal 4

Example 19: Improving the diagnosis of HIV through safe and effective self-testing kits

People need to know their HIV status so they can seek treatment. Research led by the LSHTM – built up over decades of expertise in the field – showed self-testing kits were safe and effective, and could make a huge difference.

This evidence led to the WHO developing policy and guidelines to support HIV self-testing and to UNITAID supporting the rapid scale-up of the strategy. These activities allowed millions of people to learn their HIV status and access appropriate care, resulting in progress towards the UN 90-90-90 targets and the wider Sustainable Development Goal 3.3 to end AIDS by 2030.

Source: Improving Diagnosis

112 University College of London (2021) Development of NutVal 4 accessed on 6.10.2021.

113 Mulubwa, C et al (2019) Community based distribution of oral HIV self-testing kits in Zambia: a cluster-randomised trial nested in four HPTN 071 (PopART) intervention communities, The Lancet Volume 6, ISSUE 2, e81-e92, February 01, 2019.

114 REFANI (2017) Research on Food Assistance for Nutritional Impact Summary Report, November 2017.

Recommendations for Maintaining UK International Leadership in Global Health R&D

The UK government has set itself an ambitious and commendable agenda over the next ten years to remake the UK as a global science superpower and unleash innovation in order in order to build back better in the UK, enhance UK security, and promote the UK as force for good in this world. Maintaining UK international leadership on public investments in global health R&D is critical to the UK achieving this agenda.

For a relatively small expenditure, UK public investments in global health R&D have helped to save millions of lives around the world, promoted Global Britain as a science superpower that is a force for good in the world, and deepened international strategic science partnerships. These investments have also enhanced UK security from current and future global health threats, contributed to UK prosperity, leveraging additional resources, providing direct jobs and boosting UK enterprise and, ensured that other government spending delivers value for money for UK taxpayers.

The UK government has committed to scaling-up its public investment in R&D from £14.8 billion in 2021/22 to £20 billion in 2024/25 and £22 billion in 2026/27.[115] Ensuring that some of this funding is provided to maintaining UK leadership on public investments in global health R&D is vital, in light of the shortfall in financing due to the UK's reduced ODA budget between 2021 and 2024.

In order to secure this much needed funding, invest it wisely, and maintain UK international leadership on global health R&D, it is recommended that the UK government undertake the following four actions:

1. **Ensure sufficient and stable non-ODA resources for UK global health research funding bodies like UKRI and the National Institute for Health Research over the coming years, to enable these bodies to continue to invest in global health R&D at a minimum of 2019 levels (or above), in light of the substantial reduction in UK ODA funding from 2021 onwards;**
2. **Deliver at a minimum the levels of ODA for R&D set out in SR2021, and guarantee that this portion of R&D funding is used to drive direct impact in alleviating poverty and improving the health and wellbeing of those in low-income countries;**
3. **Dedicate one of the Office of Science and Technology's new thematic-driven innovation missions to addressing a major global health challenge in order to bring together the best of British talent across industry, academia and civil society to spearhead innovation.[116] Potential themes could include exploiting mRNA vaccines for other entrenched diseases, accelerating the early development of drugs and vaccines, developing alert systems for new pandemics, addressing bio-terrorism or managing the health implications of climate change, with a focus on water, heat and pollution; and,**
4. **Commit in 2022 to producing (or sponsoring the sector to deliver) a UK global health research and development strategy in order to guide investments in this sector. The strategy should identify a set of ambitious goals and prioritise where public and private investment is required.**

Global health research and development is mission critical for humanity and supports UK security and prosperity. The UK has been a world leader in the past in public investment in global health R&D. It must continue to be in the future.

115 UK Government (2021) Autumn Budget and Spending Review 2021, London, UK.

116 The UK government's Office of Science and Technology Strategy will set up series of thematic-driven innovation missions using the model of the vaccine taskforce to bring together a multi-stakeholder group to drive science innovation in key thematic areas. The themes will be decided by a National Council National Science and Technology Council to be chaired by the UK Prime Minister. For more information see UK Government (2021) Prime Minister sets out plans to realise and maximise the opportunities of scientific and technological breakthroughs, Press release 21 June 2021.

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