wellcome

Wellcome Success Framework

Report for data 2012–17
published January 2020

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Foreword

Wellcome has a clear mission: improving health. We do this by helping great ideas to thrive across science, research, innovation and society.

This encompasses a breadth of current and potential new activities, which can make it challenging to get an overall sense of Wellcome's work – including what has been achieved, and what we will do next. Are we getting the balance right between taking a long-term view and being agile enough to respond to new opportunities? How should we decide what to take on and what to leave? And how do we explain these choices to the outside world?

We realise that we not only need a shared vision, we also need a shared understanding of what success looks like for Wellcome. The Wellcome Success Framework provides that common understanding. It sets out, in plain language, what matters to Wellcome, what we're doing, and how our activities contribute to our mission.

I am extremely grateful to Wellcome's Insight & Analysis team and all our Wellcome colleagues who have worked tirelessly over the past couple of years to develop the Wellcome Success Framework. We have taken on a huge challenge and delivered something that has significantly improved how we think about and approach our work, and will continue to do so at Wellcome in the years ahead.

I am delighted to introduce the first report from the Wellcome Success Framework. The framework has been used to gather and analyse data from a baseline period of five years (2012 to 2017). This report represents work in progress: it presents some of the data, discusses the quality and coverage of the data, and describes methods we are developing to improve it. The team will welcome your questions, comments and suggestions. I hope this work will inspire other charities and foundations to consider a similar approach.

In future, we will publish annual reports on the Wellcome Success Framework. The framework will enable us to understand the results of our work at an organisation-wide level. It will help us to assess our progress toward achieving our ambitions and gain a deeper understanding of what is being achieved in partnership with others. We will use it to demonstrate how we hold ourselves accountable to society for delivering Wellcome's mission, while ensuring that as a charitable foundation, we're making the most of our independence for public benefit.

Chonnettia Jones
Director of Insight and Analysis, Wellcome

Introduction: What does success look like at Wellcome?

Image © Thomas Farnetti / Wellcome

Introduction: What does success look like at Wellcome?

Wellcome's mission is improving health by helping great ideas to thrive. We support researchers, we take on big health challenges, we campaign for better science, and we help everyone get involved with science and health research.

We want to be sure that these activities, and the work that we fund across science, research, innovation, culture and society, are making the most of our resources to improve health. And that they are, ultimately, improving health. This is important for shaping future strategies and actions, but also because of our status as an independent foundation. Wellcome is accountable to society for delivering our mission, while using our independence for public benefit. We want to become more open about our goals and our progress so that anyone can see what we are trying to do, and can judge for themselves how well we are succeeding.

The Wellcome Success Framework is a big first step towards making Wellcome more effective and more accountable, as well as supporting a greater focus on outcomes and learning. We aim to continuously improve our capability to monitor and evaluate progress, as well as using the framework to inform strategic decisions. And while contributing to the evolution of Wellcome's organisational strategy over the next year or so – including, but not limited to, a fundamental review of how we fund science – the Wellcome Success Framework will also be able to adapt to take account of any changes in direction, focus or prioritisation.

What is the Wellcome Success Framework?

The Wellcome Success Framework brings together the broad range of activities through which we achieve our mission. Organising them in this way helps us to evaluate different forms of success, be that transformative research, new health interventions, better policies and practices, or effectively engaging people with health research. Given that many of our activities achieve impact over many years, the Wellcome Success Framework more clearly ties outcomes to intentions, which will make the link between the data and our decision-making stronger in the years ahead.

At the centre of the framework is our mission, surrounded by nine long-term ambitions. This is not a comprehensive list of everything Wellcome does today, but it captures those most directly related to our mission and strategy. The numbering of the ambitions does not imply a simple path from scientific ideas to healthier societies: there can be complicated relationships between these ambitions and how they contribute to our mission.

While all of the ambitions are addressed in this report, therefore, they are organised slightly differently. First, those that relate most immediately to our mission of improving health (6, 7), then those that connect medical innovation to research (1, 5). Next, we look at the ambitions that support research (2, 3, 4), and finally those that support the role of science and health in society (8, 9), vital to any efforts to improve people's health.

The scale and diversity of Wellcome's activities and contributions make it impractical to monitor everything. Each ambition, therefore, has been further broken down to reach a set of lead indicators that capture the minimal amount of information required to monitor relative progress towards achieving each ambition. To gain a better understanding of what is happening, for whom, and under what circumstances, findings are supplemented by additional analysis and the knowledge and experience of Wellcome teams and partners. This enables us to identify, aggregate and analyse data from the work we support as much as possible.

Some types of data widely used to evaluate scientific work do not necessarily yield meaningful information about Wellcome's progress; conversely, there are gaps where we currently have little or no high-quality data. Over time, therefore, we will refine our use of existing and new types of data so we monitor the best possible indicators of how well we are achieving our mission.

This report presents some of the qualitative and quantitative evidence collected for **a baseline period of five financial years from October 2012 to September 2017**. We explain the rationales for our choices, identify gaps in the data and present some initial analysis. In future, we intend to publish analyses of these data each year.

The funding data presented here is a subset of Wellcome's total expenditure on charitable activities over the period. The figures here differ from those in our Annual Reports and Financial Statements because they:

- exclude grants associated with Wellcome's reserve fund and priority areas
- take into account timing differences based on the actual start dates of the awards and the date they are recognised under our accounting treatment.

How will the Wellcome Success Framework be used?

The Wellcome Success Framework has already helped to clarify what Wellcome aims to achieve and how. By carefully tracking what Wellcome does – whether directly or with award holders and partners – we are able to make more confident links between how we use our resources and subsequent outcomes. Taking that further to see what impact those activities and outcomes have on our long-term ambitions helps us to understand what works, and how.

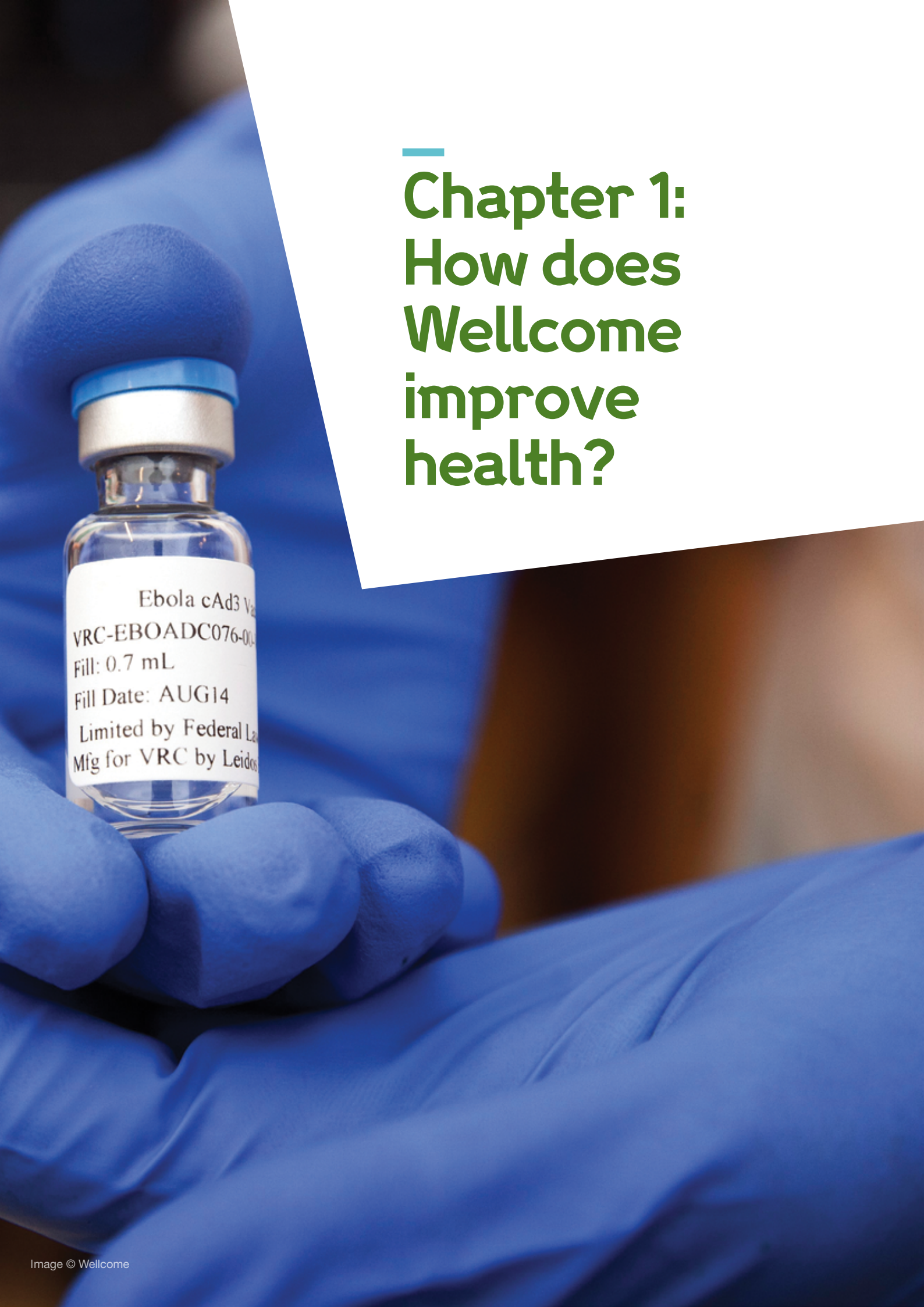
Having this framework means strategies and plans can be developed in line with our desired outcomes, ambitions and mission. It is supporting strategic decisions by Wellcome's Executive Leadership Team and Board of Governors, and facilitates reflection and learning based on evidence to improve practice and make the most impact. Its findings can also signal knowledge gaps and areas of opportunity for Wellcome to explore further.

More generally, it is a structure within which data collection, analysis and reporting efforts can be discussed, agreed and implemented. It draws together a range of operational, financial, administrative and monitoring data collected by teams across Wellcome to provide an organisational picture of activities and results, complemented by secondary and independent sources of information where appropriate. This is especially important to evaluate complex areas of our work, such as influencing policy.

Externally, our experiences of implementing the Wellcome Success Framework will contribute to the evidence base for evaluating research and health impacts. We will freely share what we learn so that other organisations can consider similar approaches to monitoring and evaluating their work.

Fundamentally, the Wellcome Success Framework is about making better and more accountable decisions, to help us more effectively achieve our mission of improving health.

Chapter 1: How does Wellcome improve health?



Chapter 1: How does Wellcome improve health?

People's health can be improved through the effective application of interventions, policies and practices by individuals, healthcare professionals or governments. Through Ambition 6, Wellcome supports interventions that improve the health of many people, while Ambition 7 focuses on improving health through changes in policy and practice.

New and better health interventions

Health interventions come in many forms: population screening, vaccination programmes, diagnostic tests, cognitive therapies, drugs, medical devices and so on. Having the right choice of effective interventions gives society tools to improve the health of individuals, groups and populations.

Wellcome was founded in 1936 on the assumption that basic and translational science can result in research outputs that lead to better health interventions and, ultimately, better health outcomes. As such, our strategies from October 2012 to September 2017 focused on supporting science and other research-related activities that had the potential to contribute to the future development or implementation of new interventions, rather than making direct health interventions ourselves (this may change in future as Wellcome's strategy evolves).

Although none of the of the funding in our baseline dataset can therefore be allocated as primarily supporting Ambition 6, work funded by Wellcome during this period will have gone on to support interventions that improve many people's health. We are now introducing ways to systematically collect and use information to build case studies, such as Example 1, that show exactly how Wellcome's funding leads to more effective health interventions. In future, these will be strengthened by more robust methods, such as outcomes harvesting, to ensure we are using valid and credible examples of Wellcome's role in the development of effective health interventions.

Example 1: Artesunate-based Combination Therapy for malaria

In 2011, the World Health Organization (WHO) extended its malaria treatment guidelines to recommend therapies based on artesunate as the global first-line treatment for malaria, including in children. It was the result of research that had started over 30 years earlier.

In 1979, Chinese government researchers reported clinical studies demonstrating that artemisinin compounds could treat malaria. Wellcome's contribution began with support for an early clinical trial of artemisinin derivatives run by our research unit in Thailand. Results were reported in 1992. Further studies at Wellcome research units in Thailand and Vietnam in 1994, 1996, 2003 and 2004 were among the first large randomized controlled trials to demonstrate that artesunate, either on its own or used with other treatments as artesunate combination therapy (ACT), was more effective than existing treatments, even in areas where multi drug resistant malaria was common.

In 2006, citing this research, the WHO recommended ACT as a first-line treatment for malaria in adults. However, ACT was not widely used until 2008, when the Global Fund's Affordable Medicines Facility started to subsidise distribution of ACT in the public and private sectors. This was 14 years after evidence from the first Wellcome-funded trials had shown that ACT was superior to existing treatments.

In 2011, the WHO extended their recommendation of artesunate as a first-line treatment to children, citing the 2010 results of a Wellcome-funded clinical trial.

Policy and practice informed by research

In the case of ACT for malaria (Example 1), it was about 15 years from Wellcome-funded research starting to report positive results and the subsequent health intervention being implemented. Wellcome today has opportunities to reduce this time lag, such as funding more translational research and implementation, or taking more of an active role in ensuring research is taken up and used both in policy making and in practice.

Indeed, in the past five years or so, Wellcome's policy teams have increasingly focused on addressing cross-cutting and underlying issues that might reduce the impact, or time to impact, of research on policy. Whether intervening on global health research policy, a deal for UK and EU science post-Brexit, or access to medicine, the question is how we can best evaluate these activities. Policy making is a complex and dynamic social process, involving different people with their own priorities all trying to influence change. It will take sophisticated evaluation approaches to understand what works, and why.

For direct influence on policy, we are testing an outcomes harvesting approach to develop and evaluate cases of policy change to which Wellcome has contributed through direct advocacy and other activities, such as Example 2.

The work of Wellcome's award holders and partners can also influence policy change. For example, many researchers participate in advisory or guidelines committees, and may as such have opportunities to increase the uptake of research by policy makers and health professionals. In the baseline period, 20% of research awards for which output data was available reported policy-related activities.

In addition to research grants with policy outputs, Wellcome funded some awards with a more explicit policy remit. £6m out of £3.5bn (0.2% of total spend) in the baseline period primarily contributed to this ambition, representing 0.6% of all awards (38 out of 5,991).

Given the large volume of awards that have potential for policy influence and impact, we have introduced contribution tracing and data science techniques to develop and test an organisational-wide approach to evidencing policy influence resulting from Wellcome funding. This has helped to identify key evaluation questions and appropriate evidence, informing how we will approach case studies in future and how data science outputs can fit in.

To account for published research used to influence policy without the knowledge of the researchers who produced it or their funders, we used a machine learning algorithm to develop an automated workflow for identifying references to Wellcome-funded research in policy publications. These references are proxy measures for reach and use of knowledge produced with support from Wellcome, and we are exploring how best to characterise them.

For example, a total of 15,791 WHO policy documents were searched. Of these, 30.3% (4,792) contained a formal reference section and of these, 13.4% (641) documents cited Wellcome research. For other sources, the proportions of documents citing Wellcome research were 8.5% for the UK's National Institute for Health and Clinical Excellence (NICE), 10.0% for Médecins Sans Frontières and 22.6% for UNICEF. More sources will be added in future analyses, while secondary and independent sources of information will be used to triangulate our findings. This will give us a much stronger evidence base to understand our policy and practice impact.

Example 2: An experimental Ebola vaccine rapidly deployed to control epidemics

In 2014, a vaccine developed by a coalition of funders including Wellcome was deployed in West Africa as part of the response to the largest ever outbreak of Ebola virus disease, a severe emerging infection that is fatal in 50% of cases.

Pre-clinical studies, jointly financed by the Public Health Agency of Canada and the US Defense Threat Reduction Agency in 2005, had shown that the vaccine, known as rVSV-ZEBOV, was effective in animal models of the disease.

Wellcome's contribution started in 2014, as part of a consortium of funders supporting a clinical trial of the vaccine in Guinea. Other contributions included funding for a second candidate vaccine and a clinical trials platform in West Africa to fast-track tests of candidate treatments; anthropological, public health and humanitarian research into the outbreak; and support for UK researchers volunteering in West Africa.

Throughout the outbreak Wellcome advocated privately in meetings with the WHO, and publicly through editorials in the press and academic journals, for reform of WHO's mandate and processes during an emergency response. This included the creation of an R&D agenda that anticipates and takes place during epidemics.

WHO reforms, announced in 2016 after the outbreak in West Africa had ended, included creating a dedicated WHO Health Emergencies Programme and an "R&D Blueprint" coalition to accelerate research and development for health emergencies. As a member of the coalition, Wellcome funded some of the work to develop the R&D Blueprint, and to create Target Product Profiles that help direct R&D for specific infections.

Wellcome advocated for compassionate use of rVSV-ZEBOV, which had been shown to be 97% effective, and chaired a consultation on clinical trials for experimental therapeutics. This led to a protocol in 2018 to guide multi-centre, multi-outbreak, clinical trials in future epidemics.

The vaccine was subsequently used during an outbreak of Ebola in the Democratic Republic of the Congo in 2018, and again in the second-largest outbreak (2018-2019), protecting over 20,000 people.

Chapter 2: How do we connect science and medical innovation?

Image © Saiyna Bashir / Wellcome Trust

Chapter 2: How do we connect science and medical innovation?

Knowledge generated and tested through research should be used to help develop new health policies and interventions. Wellcome's Ambition 1 is that our understanding of science and health is transformed by research, while Ambition 5 supports the translation of discoveries into new health interventions.

Research transforms understanding

Wellcome funds a wide range of projects in science, social science and the humanities, building cumulative knowledge and transforming understandings of health and disease.

In the Wellcome Success Framework baseline period, £1.9bn out of £3.5bn (53.6% of total spend) primarily supported research, representing 31.3% of all awards (1,876 out of 5,991). Research outputs from these awards include knowledge produced through research publications, books and monographs – about 8,000 publications a year acknowledged Wellcome support during the baseline period.

Our ability to track other research outputs from Wellcome funding should improve next year with the introduction of Researchfish, a platform for collecting information directly from award holders. Rather than absolute numbers of outputs, we are interested in understanding the use of research within and across research fields.

Relative Citation Ratio (RCR) is a proxy indicator for reach and use of published research. The median RCR for publications solely funded by Wellcome during the baseline period was estimated to be 0.780, more than twice the global RCR median of 0.370. For jointly-funded publications, the estimated median RCR was even higher, at 1.240. A statistical model showed that the two strongest positive attributes associated with RCR were higher number of countries and higher number of authors. Example 3 shows the potential reach of large, multi-national collaborations.

During the baseline period, around 15% of publications funded by Wellcome had an RCR in the global top 5%, and 4% of them were in the global top 1%, suggesting that research in our portfolio compared favourably against other research published within the baseline period.

To complement RCR analysis in future reports, we are developing a case study approach using outcomes harvesting to capture instances where Wellcome-funded research has contributed to significant shifts in theory, methods or technology.

Example 3: Tranexamic acid for controlling bleeding after childbirth

In 2017, the results of a large clinical trial showed that tranexamic acid (TXA) is an effective way to control bleeding after childbirth if it is administered within three hours of bleeding. Bleeding after childbirth is one of the leading causes of death among mothers, particularly in parts of Africa and Asia. Following publication of the results, the WHO published new guidance citing the findings and strongly recommending use of TXA.

A generic drug, TXA was known to be effective in controlling bleeding after surgery. However, the WOMAN trial, which started in 2010, was the first assessment of whether TXA could reduce deaths from bleeding after childbirth. In 9,881 people treated with TXA, the rate of death was 1.5% – a 19% reduction compared to usual care. The benefit was greatest when TXA was given within three hours of birth. The effect of TXA in the trial was equivalent to preventing 36 deaths.

WOMAN built on an earlier trial, funded by the National Institute for Health Research, Bupa Foundation and the J P Moulton Charitable Foundation, showing that TXA reduced the risk of death following traumatic bleeding. After a run-in phase for WOMAN funded by Pfizer and the London School of Hygiene and Tropical Medicine, Wellcome's contribution was a £3m award in 2010, jointly funded with the UK Department of Health, for the main phase. This was followed by funding from the Bill & Melinda Gates foundation for the final phase of the trial.

Wellcome has also developed a research uptake strategy for TXA, which is now being implemented.

Research fuels innovation

The journey from translational potential to health intervention has many stages, from pilot studies through to clinical trials and beyond. During the baseline period, £374m out of £3.5bn (10.7% of spend) contributed primarily to the development of health interventions. These represent 4.9% of all awards (292 out of 5,991).

Of those intervention projects, 78% focused on late-stage development, such as clinical trials or equivalent testing – see Example 4 – with the rest focusing on early-stage development, such as pre-clinical drug testing. Of interventions relating to clinical trials, 54% were in phase 1, 22.5% in phase 2, and 23.5% in phase 3 or equivalent. The total number of trials in the baseline period linked with Wellcome funding was 285, of which almost one in five were hosted by Wellcome's Africa and Asia Programmes.

Across all the trials supported by Wellcome, a total of 2.2 million participants were reported, with approximately 306,000 involved in phase 1, 25,000 in phase 2, and 1.9 million in phase 3 or later.

Even if an intervention project is successful, it needs further development before it can move closer to being used in practice. We looked at data on further development for 62 intervention projects that had completed their period of Wellcome support as of 2017.

From this sample, 20% showed evidence of further development – mostly projects that were already at the testing stage when Wellcome funded them. The most common type of further development was securing an advanced development partner, followed by licensing a product, and launch into the care pathway. Further development was identified most often for projects involving perinatal health or blood or eye conditions, and least often for projects involving the nervous system and mental health.

Our ability to track this area of work should improve with the introduction of new policies for revenue sharing and clinical trials, and the introduction of Researchfish in 2019.

Translational potential explored

For knowledge generated by scientific discoveries to be used in the development of new health interventions, the potential of these discoveries needs to be recognised and acted upon. £7m out of £3.5bn (0.2% of spend) in the baseline period contributed primarily to providing institutional support for researchers who already hold Wellcome research funding, to help them explore the translational potential of their work. These represent 0.2% of all awards (12 out of 5,991).

We estimate that 43% of spend during the baseline period (£1.5bn out of £3.5bn) went to research with translational potential. This represents 22% of all awards (1,334 out of 5,991). We have defined translational potential as any research-focused award held by principal investigators with institutional positions, excluding medical humanities, education, training and infrastructure funding.

Using a sample of 318 Wellcome research awards with translational potential, we found that around 29% of these award holders were actively exploring translation. Of those, translational collaborations were the most common type of translational activity reported (35%) and generally involved researchers working with commercial or clinical partners. Around 28% of award holders reported securing further funding for translational activity – the most common sources in this sample being the UK government and industry. The third most common type of translational activity reported (27%) was translational technology, including intellectual property creation, pre-clinical development or equivalent, and commercial licensing.

Our ability to track other translational research outputs should improve next year with the introduction of Researchfish.

Example 4: Large-scale collaborations to understand genetics of schizophrenia

Schizophrenia disrupts how someone thinks, their understanding and their perception of the world around them, including what they see or hear. The prevalence of schizophrenia in the global population is approximately 1%.

Research in twins and families in the 20th century showed that genetic factors must contribute to schizophrenia, but it was more challenging to identify specific genetic regions and genes involved. As methods in behavioural genetics matured over the first two decades of the 21st century, it became clear that promising results from early studies involving hundreds of participants were false starts. New ways of working at scale were needed to understand the small contributions of many different genes.

With more than 150,000 participants, a study by the Schizophrenia Working Group of the Psychiatric Genomics Consortium was, at the time, the largest ever study of genetics and mental health problems. The 108 new genetic risk factors it identified in 2014 are relevant to the majority of people with schizophrenia. These risk factors could potentially help to predict whether an individual will experience schizophrenia, which could have many research and clinical applications.

This research was a collaboration of 300 authors from 133 research institutions across 35 countries, supported by over 20 public and charitable funders in the US, UK and EU. It built on existing population genetics resources, including many funded by Wellcome more than a decade earlier.

Wellcome's main contribution was population data from the Wellcome Trust Case Control Consortium, first funded in 2005 as a new model for running genetic studies at greater scale. Other Wellcome-funded resources that contributed included UK Blood Services Common Controls funded in 2005, 'Resource for psychoses genomics, Ireland (RPGI)' funded in 2003, and the British 1958 Birth Cohort sequencing funded in 2002. Many of these resources depended on technical and organisational support from the Wellcome Centre for Human Genetics in Oxford, opened in 2000, and the Wellcome Sanger Institute.

Chapter 3: How do we support researchers?

Image © Thomas Farnetti / Wellcome

Chapter 3: How do we support researchers?

An environment that promotes good research practice will support researchers and increase their potential to contribute to improving health. In the Wellcome Success Framework, Ambition 2 commits us to helping sustain a research community that is well trained, diverse and inclusive. Ambition 3 recognises the need for knowledge and discoveries to be shared, accessed and used to maximise health benefit. And Ambition 4 supports an enabling research environment in which research is carried out to the highest appropriate standards.

Enabling research environment

In the baseline period, £834m out of £3.5bn (23.9% of spend) was awarded to projects that primarily support the provision of resources, equipment, facilities and infrastructure to enable research, representing 6.6% of all awards (396 out of 5,991). These awards include some of the highest in value that Wellcome makes, such as core awards for the Wellcome Sanger Institute (Example 5), the Francis Crick Institute, our Africa and Asia Programmes, Wellcome Centres, and Diamond Light Source.

Wellcome also provides support for equipment and other enabling resources for a large proportion of research awards on a project-by-project basis. Of 3,254 research-related awards in the baseline period with an available breakdown of costs, 74.7% included at least some budget allocated towards equipment, resources and related costs.

Example 5: The Wellcome Sanger Institute

For 25 years, the Wellcome Sanger Institute has carried out ground-breaking genomic research, including helping to sequence the first human genome. Today, it is at the heart of the Wellcome Genome Campus, an international centre for scientific, business, cultural and educational activities relating to genomes and biodata.

Over the baseline period, Wellcome has awarded over £500m to the Wellcome Sanger Institute to fund and enable research, including £240m in support of building and developing Sanger's core research environment and facilities. The institute's faculty numbered 41 in 2015, with 31 external faculty members based at other institutions participating in scientific activities at the Wellcome Genome Campus. The faculty, their collaborators and other research groups all benefit from the large-scale genomics resources, facilities and expertise on-site, as well as from being part of a global scientific network that includes businesses based in the BioData Innovation Centre on the campus.

Genomics training courses are available to research and healthcare professionals in person on the campus and in low- and middle-income countries, as well as online. The Wellcome Sanger Institute also shares genomic resources that would be impractical or expensive for smaller labs to produce. Since 2010, it has distributed 64,860 targeted embryonic stem cell clones, 6,790 targeting vectors and 1,100 mutant alleles directly or through repositories. A further 1,027 distributions of transgenic strains were made to 764 research groups at 497 institutes in 30 countries. And since 2013, it has distributed 27 human induced pluripotent stem cell lines to collaborators and the European repository.

Well-trained research workforce

£253m out of £3.5bn (7.3% of spend) during the baseline period contributed primarily to supporting formal training and direct skills development, representing 35.3% of all awards (2,116 out of 5,991).

The majority of these awards supported PhD training (45.9%), with the rest supporting Masters training (4.6%), postdoctoral development (9.0%), training fellowships (8.6%) and vacation scholarships (31.8%). The majority of the awards were administered by organisations in the UK and Ireland (96.6%), while the rest were administered by organisations across 20 countries in Africa, Asia and the Americas.

In addition, Wellcome implements direct interventions targeted at PhD students and early postdoctoral researchers. These include development of both targeted and transferrable skills. Targeted skills development has focused on policy engagement, commercialisation, mentoring, management and leadership, and science communication.

Currently, there is no systematic collection of information on the effectiveness of Wellcome-funded training and development awards. We are reviewing our approach to monitoring and evaluating these activities.

Inclusive research community

Despite evidence demonstrating the benefits of a diverse and inclusive working culture, the research community still has marked disparities across gender, ethnicity, age, disability, location, and more.

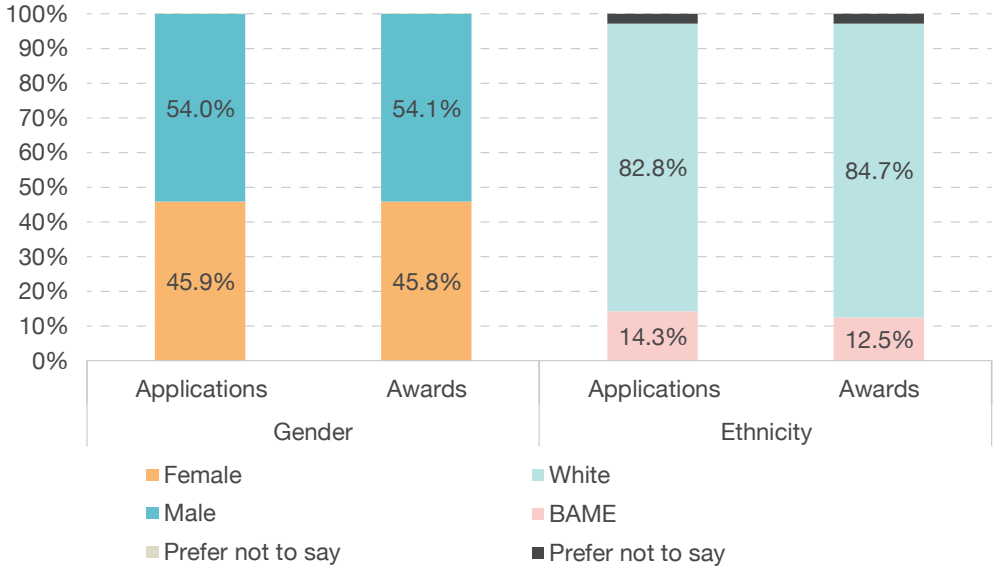
Wellcome monitors the proportions of applicants and award holders in various demographic groups. Figure 1 presents data related to the proportion of Wellcome applicants and awardholders by gender and ethnicity groups over the baseline period. The number of female applicants was lower than the number of male applicants (45.9% compared to 54.0%). However, the award ratio between men and women was not significantly different to the application ratio, suggesting there was no bias in assessment.

The proportion of women applicants and award holders drops as career stage and age increases. For example, over the baseline period, 54.5% of Studentship award holders and 50.3% of Intermediate Fellows were women, compared to 31.3% of Senior Fellows and 28.3% of Investigator Award holders.

Of BAME award holders, 59.1% identified as Black, 24.8% as Asian, 9.4% as Mixed ethnicity and 6.7% as Other minority ethnic group. While 16.7% of intermediate fellowship award holders identified as BAME, this drops to 13.5% for senior fellowships and 7.8% for investigator awards.

Age correlates with career stage: the majority of applicants for earlier career awards came from younger age groups, and the majority of applicants for more senior career stage awards came from older age groups. Studentship award holders had an average age of 27 years, compared to 37 years for intermediate fellowships and 50 years for investigator awards.

Fig. 1: Proportions of applicants and award holders by demographic group



Data source: Wellcome grant applications and awards, 2012/13–2016/17. UK and competitively assessed research schemes only. Excludes applicants and awardees for which there is no data available.

Good research practice

All awards that primarily support research, or support another activity that potentially generates research outcomes, are expected to comply with good research practice as defined by Wellcome's Guidelines on Good Research Practice (updated April 2018). In this report we focus on one: open research.

Wellcome promotes open research practices for knowledge and discoveries in order to maximise the potential for research to help benefit people's health. We fund open access initiatives as well as directly trying to influence wider sector practice for open research (Example 6).

Among other direct activities aimed at promoting open access, Wellcome leads an alliance of 27 biomedical and life sciences research funders supporting Europe PubMed Central (Europe PMC), a global repository for biomedical literature that provides free access to articles, books, patents and clinical guidelines. The alliance stipulates that, to maximise the impact of the work they fund, articles describing the results of biomedical and life sciences research they have supported must be made freely available in Europe PMC within six months of publication. Europe PMC is now recognised as one the 'core resources' underpinning life sciences research in Europe.

In 2012, Wellcome launched eLife, a top-tier open access journal, in partnership with the Howard Hughes Medical Institute and the Max Planck Society. This was followed in 2016 by the Wellcome Open Research publishing platform for Wellcome awardholders. These are now respectively the sixth and fourth most popular open access publication venues for Wellcome-attributed articles.

The application of findability, accessibility, interoperability, and reusability (FAIR) principles helps make research open and maximises the potential benefits of knowledge creation. Wellcome funding contributing to FAIR practice increased from £4.8m in 2012/13 to £6.6m in 2016/17. Most was through institutional Open Access Awards, usually given in the form of block awards to institutional libraries who then use these funds to cover open access costs for Wellcome-supported researchers at their institution.

Example 6: UK government adopts Wellcome's model to finance open access

In July 2012, the UK government formally indicated that it would accept the recommendations made in a publication called Expanding Access to Published Research Findings ("The Finch report") to implement a new open access policy with a new financing model.

The Finch report recommended the UK government change their model for funding open access charges to an alternative 'block' model, pioneered by Wellcome. The report explicitly acknowledged the influence of Wellcome being the first research funder to introduce a mandatory open access policy in 2005, after which national funders in the US and EU introduced similar policies.

The Finch report was produced by a cross-sector working group interested in how public research funders could achieve better, faster access to research publications "for anyone who wants to read or use them". Wellcome's Head of Digital Services was a member of the working group.

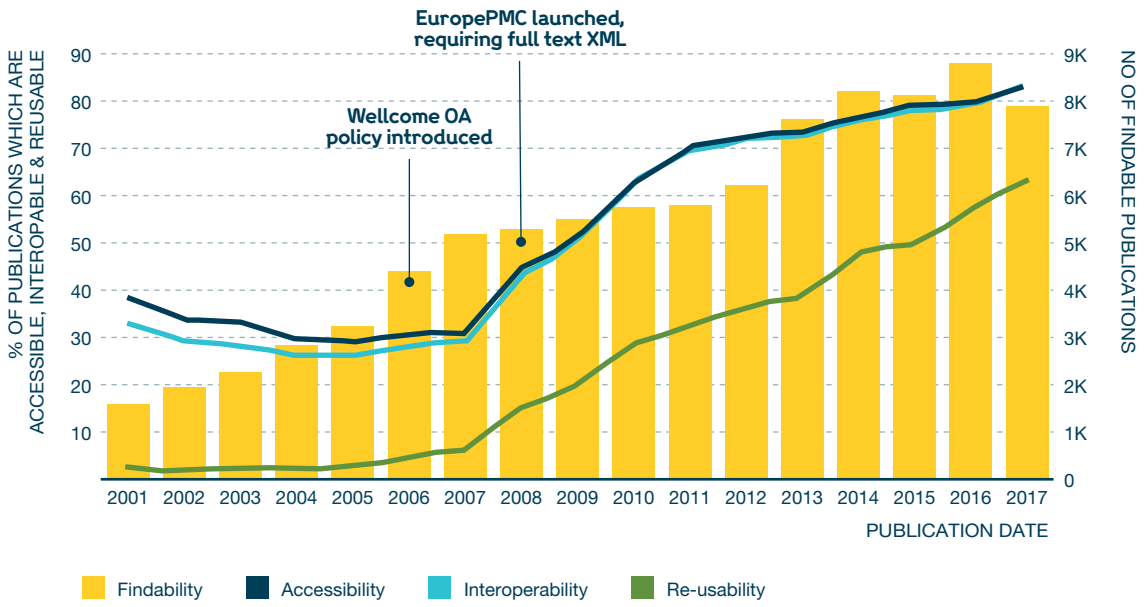
In 2012, 68% of research outputs from the UK Medical Research Council were accessible, compared with 82% from Wellcome. In 2017, five years after implementation of the government's new policy, these proportions were 79% and 90%, respectively.

From monitoring the proportion of Wellcome-funded research outputs that are FAIR, it's clear that compliance went up after Wellcome's Open Access policy was introduced in 2005. At the moment, we can only systematically track FAIR status for publications, although we are developing means to track equivalents for pre-prints, datasets, code and software, and clinical trials resulting from Wellcome funding.

We define FAIR as follows:

- A research article is **Findable** if it is indexed by PubMed. Between 1 January 2000 and 31 December 2016, 95,441 articles produced with support from Wellcome were indexed by PubMed
- The proportion of these articles that are **Accessible**, defined as available as full text in Europe PMC, has risen by an average of 12% a year, from 28% of all publications in 2000 to 81% in 2016
- The proportion of **Interoperable** articles – those published in a machine-readable format such as XML – has risen by an average of 30% a year, from 2% of all publications in 2000 to 66% in 2016
- The proportion of **Reusable** articles, published under a licence which allows users to reuse the work, has risen at an average of 69% a year, from 0% in 2000 to 61% of all publications in 2016.

Fig. 2: FAIRness of research articles associated with Wellcome funding



Data source: PubMed indexed articles produced with support from Wellcome, 2001–2017

Chapter 4: How do people get involved?

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Science and health research should be open to anyone. For many years, Wellcome has supported activities to give people opportunities to be aware of, engage with and understand science and health research, in line with Ambition 8 in the Wellcome Success Framework. Ambition 9 is that people trust Wellcome, as well as science and health research more generally. If people feel able to trust the communities generating and applying science and health research, we are more likely to succeed in improving people's health.

Education and engagement

An excellent science education inspires young people to engage with science and health for the rest of their lives. Wellcome is contributing to evidence-based teaching practice, funding and improving the training of teachers in primary and secondary schools and in further education, and supporting informal science learning.

£7.3m out of £3.5bn (0.2% of spend) in the baseline period contributed primarily to supporting young people's science and health education, representing 0.4% of all awards (22 out of 5,991). A further £8.6m was spent on direct activities in this area, and there were over 21,000 participations by teachers in major Wellcome-funded education programmes.

Wellcome funding has supported 12,753 participations in continuing professional development courses for science teachers at the National STEM Learning Centre. Using self-completion surveys, 94% of participants in these courses reported high or medium impact on knowledge and practice for the period 2015-17. Of those who accessed courses with Wellcome support, 71% reported improvement on their subject teaching quality, while 69% of their colleagues reported improvements in the quality of participants' subject teaching and leadership.

Wellcome also runs Explorify, a free online platform that provides bitesize activities designed for use in primary school science lessons. Explorify was launched in September 2017 and more than 9,000 teachers used the resource during its first year.

Engaging critically with science and health should not end when we leave school. Encouraging curiosity and defining science as a way of thinking as well as a body of knowledge helps people to evaluate facts and assertions, challenge assumptions and make connections. £91.8m out of £3.5bn (2.6% of spend) in the baseline period primarily supported people to engage with science and health, including funding for a BAFTA-winning video game (Example 7). These grants represent 11.3% of all awards (675 out of 5,991).

Example 7: Immersive insight into experiences of psychosis

Hellblade: Senua's Sacrifice is a fantasy action-adventure video game and one of the first to use a state-of-the-art binaural technique that mimics 3D human hearing. During the game, players experience visual and auditory hallucinations as if they are the character Senua, and hear voices that seem to be just behind them or whispering in their ear.

The game was developed by the production company Ninja Theory, supported by Wellcome with a £300,000 award in 2014. Although the award financed only a small part of the multi-million-pound production costs, Wellcome's involvement helped bring together game developers, mental health researchers and people with lived experience of mental health issues to accurately represent complex experiences.

Offering innovative ways to explore the mind and mental illness, Hellblade won five BAFTAs at the 2018 British Academy Games Awards.

We estimate that £23m was spent on Wellcome's direct public engagement activities during the financial years 2015-17, mainly through Wellcome Collection, the free museum and library that aims to challenge how we all think and feel about health. Since opening in 2007, Wellcome Collection has received over 5.4 million visits, averaging 550,000 a year during the baseline period.

As well as exhibitions, Wellcome Collection runs a programme of youth and adult events, publishes books, and commissions a variety of artist-led engagement work and original digital content. The library's designated collection is one of the world's major resources for the study of medical history. Wellcome also has a large-scale programme to digitise and make freely available on the web a substantial proportion of its collection.

Across the baseline period, we have participation or audience-count data for less than half of all Wellcome-funded engagement activities. From just the available data, 22.5 million physical participations and 33.4 million online participations were recorded. We are reviewing how we monitor and evaluate engagement work, as we do not yet have a systematic approach and some parts of Wellcome's strategy for public engagement are changing.

Participation and trust

More people could be playing an active role in research, such as participating in or informing the direction of research, accessing and using research, or helping the development of health innovations (see Example 8). £2.3m out of £3.5bn (0.1% of spend) in the baseline period contributed primarily to supported active participation in science and health research or innovation, representing 0.4% of all awards (24 out of 5,991). Again, because we do not as yet have a systematic approach to monitoring activities in this area, it is under review.

Trust is essential in healthcare because no matter how innovative a new intervention or policy is, the people who stand to benefit must find it acceptable if it is to have a positive impact. More often than not, that means people putting their trust in healthcare professionals and the science and technologies that underpin modern medicine.

The Wellcome UK Monitor assesses public attitudes to science and health in the UK, while Wellcome Global Monitor does the same in over 140 countries worldwide.

Example 8: Participatory research to improve mother and child health in Kenya

The Baby Friendly Community Initiatives (BFCI) was a participatory action research project based in the African Population & Health Research Center in Kenya in 2013 and 2014. Researchers, practitioners, policy makers and community members were involved in designing the programme, including intervention packages and monitoring and evaluation tools. They were trained to develop policy briefs and were involved in the dissemination of findings from the project through blogging or being programme representatives. Findings from the work were included in a government-proposed package of work to improve maternal and infant nutrition.

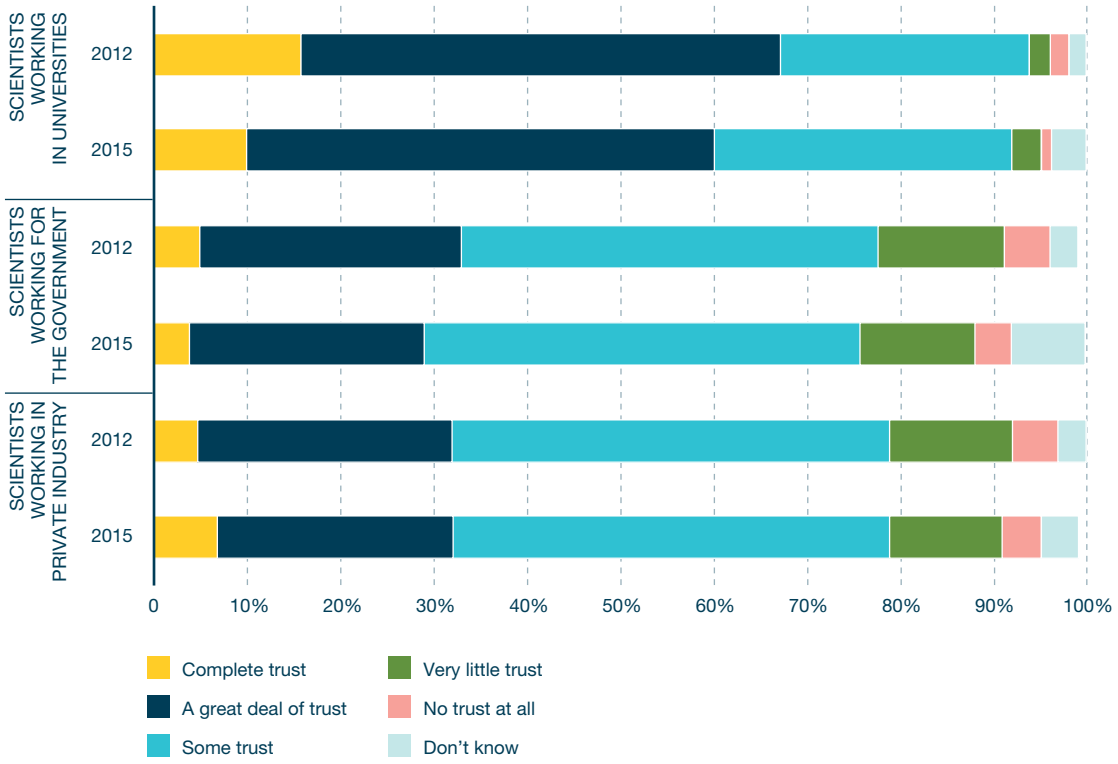
Wellcome awarded this project £29,000 (80% of its total costs) in 2012/13 to establish innovative, public-informed approaches towards community engagement in maternal, infant and young child nutrition initiatives. It built on previous Wellcome-funded work and was part of a wider set of activities establishing the benefits of BFCI within Kenyan pubic health services.

The project lead, Dr Elizabeth Kimani-Murage, received Wellcome funding for another International Engagement Award in 2015/16. She became a Wellcome Public Engagement Fellow in 2016/17 to further develop her practice and networks in health-related public engagement and community action research.

In the 2012 and 2015 UK Monitor surveys, respondents were asked about their trust in scientists working in university, government and private industry roles. University scientists were the most trusted, with over 90% trust in both waves. However, this group's score for 'complete trust' fell from 16% to 10% across the two waves, while the score for 'some trust' rose from 27% to 32%, suggesting the depth of public trust in science may have decreased during the baseline period of this report.

Both the UK and Global Monitor can be used to inform research, public health interventions and public engagement strategies. Within the Wellcome Success Framework, this area will remain under review to assess the value of these relatively new tools, as well as others under consideration.

Fig. 3: Trust in scientists to provide accurate and reliable information about medical research



Data source: Wellcome UK Monitor survey, 2012 and 2015 Waves

Conclusion: Is Wellcome successful?

Image © Wellcome

Conclusion: Is Wellcome successful?

The Wellcome Success Framework has increased our confidence that Wellcome is making progress in many different ways across different fields of research and beyond. However, it also reveals significant gaps in knowledge about the outcomes and impact of many of Wellcome's activities. Lack of data is not a reason to stop activities, but we now have opportunities to develop appropriate evaluation tools for them. Where possible, we will align indicators across shared ambitions within Wellcome so that disparate activities can be monitored and evaluated alongside each other.

Additional benefits of introducing the Wellcome Success Framework include greater clarity about Wellcome's approach to achieving its mission. This enables us to test assumptions about how each aspect of Wellcome's broad portfolio of funding and direct activities contributes to improving health, while bringing different parts of Wellcome together in pursuit of our shared ambitions.

Reflection and learning exercises have been conducted within Wellcome over the last year to increase engagement with and use of findings from the Wellcome Success Framework in decision-making. One result has been the decision to review Wellcome's support for science. The output of this review will be an improved vision and strategic plan for Wellcome-supported science to ensure the best possible advances in scientific knowledge and health.

Evolving this approach

Wellcome's overall approach to improving health has evolved since the idea of a success framework was developed. It now includes activities taking on big health challenges directly in new and ambitious ways. With an updated vision for Wellcome-funded science will come a clearer organisational strategy. As such, the framework must also evolve to continue capturing and identifying the full impact of our work.

Improvements to our reporting systems and capacity will increase our ability to monitor, evaluate and learn from the Wellcome Success Framework. These nclude:

- The introduction of Researchfish from 2019, which should improve our ability to track a range of research outputs from a subset of Wellcome's award schemes
- Improvements to award-making reporting systems not included in Researchfish that will track relevant outcomes more consistently in future
- The use of outcomes harvesting to systematically develop and evaluate case studies across a wide range of thematic areas, from significant shifts in the academic world to cases of health impact
- The use of contribution tracing to inform our approach to evaluating influence on policy and practice by Wellcome award holders.

What next?

This report marks completion of the first phase of measurement, analysis and reporting. Following this, the first annual Wellcome Success Framework report will use data collected from the financial year 2017/18.

As we build data and analysis over the coming years, the Wellcome Success Framework will become an ever more powerful tool for understanding Wellcome's mission, monitoring progress, and shaping future strategies for improving health.

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Please contact Y. Jessica Romo with questions or comments: success@wellcome.ac.uk

Wellcome exists to improve health by helping great ideas to thrive.

We support researchers, we take on big health challenges, we campaign for better science, and we help everyone get involved with science and health research.

We are a politically and financially independent foundation.

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