



igniting our potential

UK Health Research Analysis 2018



UK Clinical Research Collaboration 2020

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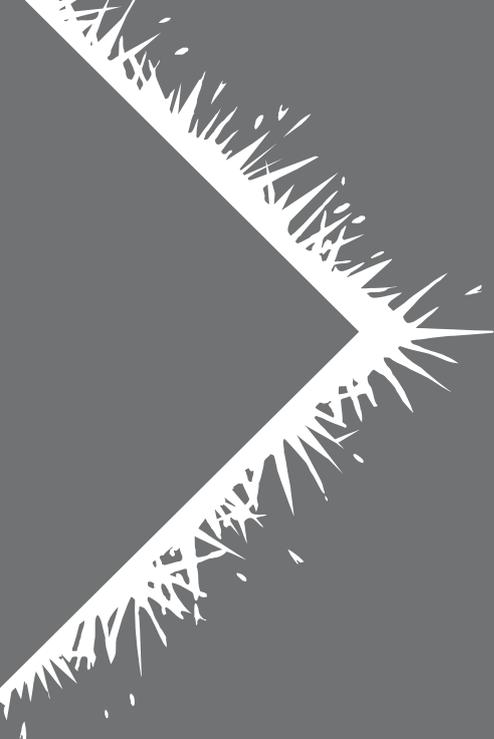
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EXECUTIVE SUMMARY



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Executive Summary

The [UK Clinical Research Collaboration](#) (UKCRC) is a partnership of the main stakeholders who influence clinical research across the business, public and charitable sectors in the UK. The aim of the UKCRC is to keep the UK a world leader in clinical research. For partner organisations to be able to effectively co-ordinate activities, accurate and timely evidence is needed about health research supported across the UK. The UKCRC Health Research Analysis Forum (HRAF) is comprised of representatives from the twelve large public and charity funders of health research, plus the Association of Medical Research Charities (AMRC), who collectively are responsible for periodically analysing the UK health research landscape.

This report is the fourth in the *UK Health Research Analysis* reporting series; a UK-wide analysis of public and charity funded health relevant research, produced by the HRAF since 2004, which provides the most detailed view so far of UK research in this area. [The Health Research Classification System](#) (HRCS) was used to categorise over 22,500 projects supported by 146 funding organisations, corresponding to almost £4bn of spend within the UK in 2018 (£2.5bn spent directly on research projects and £1.4bn on infrastructure). We also estimate a further £850m of health-relevant funding from other sources not directly captured in the analysis, giving a total public/charitable expenditure in 2018 of £4.8bn. This is close to a separate estimate of the health-relevant proportion of total R&D spend, totalling £8.6bn in 2018 (of which £4.3bn is from the pharmaceutical private sector).

Analysis of this dataset shows that public funding for health relevant research in the UK, both by taxation via the Government or by donation via medical research charities, has increased over the 14-year period. However, much of this growth in this funding has occurred in the first five years of reporting (2004-2009) with a compound annual growth rate (CAGR) of 8.5%, and subsequently much slower growth in total funding in real terms between 2009 and 2018 (CAGR 1.7%). In other words, health-relevant research in the UK has had ten years of relatively level funding across the public and charity sectors.

Examining the breadth of research activities undertaken by projects, and comparing 2004 and 2018 data, there has been a decrease in the proportion of total funding for underpinning

(-12%) and aetiological (-4%) research. These fundamental discovery activities, predominantly funded through UK Research and Innovation and medical charities, still account for half of publicly supported health research and have received a real term increase in funding of £490m since 2004.

As first noted in our 2014 report, there has been a noticeable additional investment in research activities important for translation, i.e. research that aids translating scientific discoveries into new treatments and healthcare benefits. Research on detection and diagnosis, treatment development and treatment evaluation have received an increasing proportion of total health research spend (+10%) between 2004 and 2018 resulting in a real term increase of £548m over 14 years. Similarly, and in part due to the evidence provided by previous reports in this series, prevention research has also received an increased proportion of total health research expenditure (+3.4%, real term increase of £120m since 2004). The funding for the earlier stages of translational activity is shared across funders, however the majority of clinically-relevant research topics (e.g. treatment evaluation, disease management and health services) are supported by Government departments and clinical professional bodies, predominantly the Department of Health and Social Care via the National Institute for Health Research.

Assessment of the proportion of overall spend by health category shows relatively stable funding for many diseases or conditions, with a quarter of expenditure on research of a generic health relevance (i.e. applicable to all conditions or without a specific disease focus) and almost a fifth on cancer research. The largest growth has been in the area of infections research (+4.5% since 2004), a steady upward trend across the 14-year reporting period as funders begin to address the challenges of antimicrobial resistance.

The geographical distribution of health relevant research funding remains remarkably stable between 2004 and 2018, with less than 1.9% variances across the 12 regions of the UK. The largest proportion, just under one third of funding, is allocated to London with other research-intensive areas (Oxford and the South East, Cambridge and East of England) at 15% and 14% respectively.

The increase in number of participating organisations beyond the original HRAF contributors has provided a considerably more complex dataset for analysis. With 146 organisations, more than double since the 2014 analysis, the contributions from these additional organisations now totals 23% of awards submitted and 15% of the overall expenditure. In addition to funding made within the UK, this analysis also provides information on international funding; participating organisations awarded an estimated £223m of expenditure to principal investigators based outside the UK. We also estimated a total of £254m of the health-relevant funding flows into the UK from international organisations, overseas public bodies (mostly the European Union) and global charities.

The UK Health Research Analysis series provide a comprehensive update to information about UK health research. Health and biomedical research is a vital component of the UK science base, with a strong positive rate of return to the UK economy¹, and so these regular analyses provide helpful evidence to support monitoring and strategic coordination. The publication of an openly accessible dataset of UK public and charity funded health research - available via the HRCS website (www.hrcsonline.net) – also allows for the data to be re-used for further analysis.

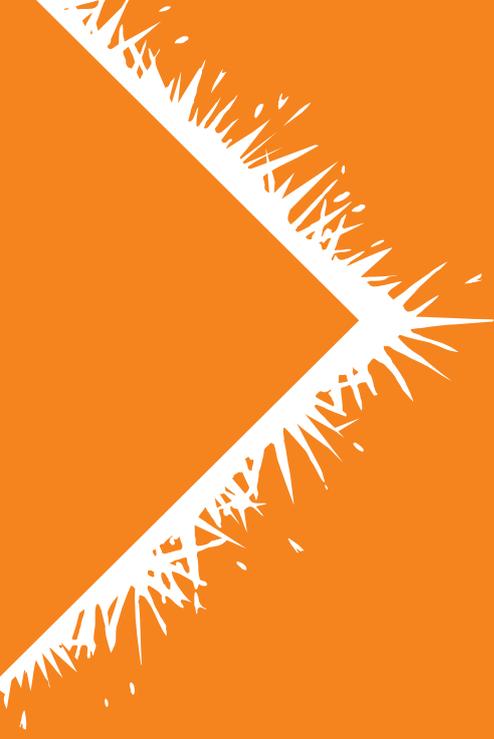
The HRAF will continue to promote the wider use of the HRCS for analysing health research funding, continue to improve the methods used to code awards, disseminate the *UK Health Research Analysis* reports and provide access to the public datasets to support strategic discussions and collaborations.

James Carter PhD,

Chair, UKCRC Health Research Analysis Forum
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1 For examples, see the "Medical Research: What's it worth?" section of the MRC Evaluating Research Outcomes webpage: <https://mrc.ukri.org/successes/evaluating-research-outcomes/>





INTRODUCTION AND PURPOSE OF THE ANALYSIS



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Introduction and Purpose of the Analysis

The UK Clinical Research Collaboration (UKCRC) was set up in 2004 with the aim of establishing the UK as a world leader in clinical research². The collaboration is a partnership of the main stakeholders that influence clinical research across the business, public and charitable sectors. Part of the remit for the collaboration was to compile new high-quality information on the UK health research funding landscape. The aim was to support partner organisations in developing a coherent, unified approach to funding clinical research in the UK.

To compile funding information in a consistent format across different health funders required a new classification system. Established in 2004, the Health Research Classification System (HRCS) was developed by the UKCRC's secretariat using a dual code system covering both areas of health and disease (termed 'Health Categories', (HC)) and type of research (termed 'Research Activity', (RA)) to answer strategic questions about health research investment.

Using the HRCS, the *UK Health Research Analysis* report³ was the first ever UK wide assessment of public and charity funded health research. Published by the UKCRC in 2006, this report captured data from the 11 largest public and charitable health funders for the 2004/05 financial year. The analysis provided a geographical overview of spending across all areas of health research and a detailed assessment of individual areas of health and disease and comparisons to World Health Organisation (WHO) burden of disease across the UK.

This first *UK Health Research Analysis* has been widely cited, providing the basis for high level strategy discussions⁴ and several joint funding initiatives⁵. Its success prompted a series of subsequent reports; first an assessment of other medical charities commissioned by the Association of Medical Research Charities (AMRC)⁶ in 2007, a follow-up nationwide *UK Health Research Analyses* in 2009/10⁷ and a third nationwide analysis in 2014⁸. Each iteration increased the scope and scale of the assessment, introducing new analyses (e.g. total UK health R&D expenditure, quantifying sources of indirect support for health research) and increasing the number of participating organisations (up to 64 funders in 2014).

This analysis is the fourth in the *UK Health Research Analysis* series and its primary aim continues to be to provide detailed information about public and charity funded UK health research projects. The 2018 analysis has gained the widest participation in the exercise to date, with submissions from 146 organisations⁹ connected to health and biomedicine. The increase in participation is coupled with an increase in scope to awards made internationally by UK-based organisations as well as a more detailed assessment of awards made to UK-based organisations from overseas.

This report and analysis were compiled by the Medical Research Council (MRC), overseen and approved by the Health Research Analysis Forum (HRAF)¹⁰ on behalf of the UKCRC.

2 UK Clinical Research Collaboration (UKCRC) <http://www.ukcrc.org/>

3 UK Health Analysis (data from 2004/05), published 2006 by UKCRC http://hrcsonline.net/uk_health_research_analysis_report_2004_05/

4 The HRCS was used to highlight the characteristics of UK health research in the UK Government's review of publicly funded healthcare research chaired by Sir David Cooksey and published in 2006; DOI [10.1136/bmj.39059.444120.80](https://doi.org/10.1136/bmj.39059.444120.80)

5 For example, the UKCRC's own public health research group, and evidenced in the first nationwide prevention research collaboration, [the National Prevention Research Initiative \(NPRI\)](#)

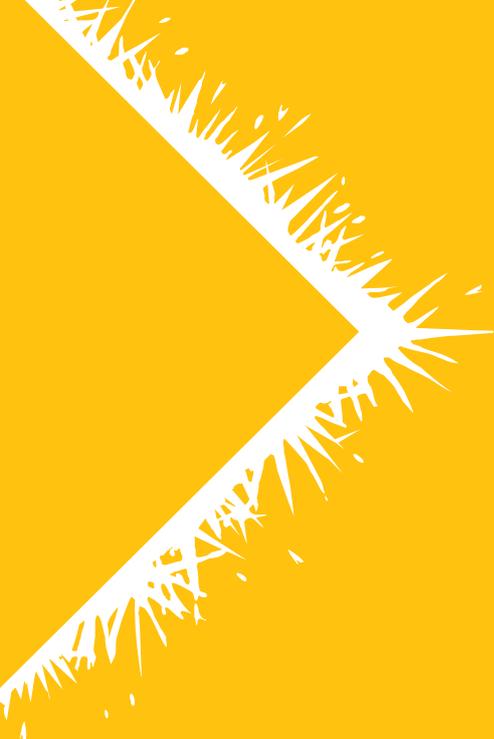
6 *From Donation to Innovation* (data from 2004/05), published 2007 by UKCRC http://hrcsonline.net/uk_health_research_analysis_from_donation_to_innovation_report_2004_05/

7 UK Health Research Analysis 2009/10, published 2012 by UKCRC http://hrcsonline.net/uk_health_research_analysis_report_2009_10/

8 UK Health Research Analysis 2014, published 2015 by UKCRC http://hrcsonline.net/uk_health_research_analysis_report_2014_web/

9 13 HRAF members, plus 86 AMRC members (excluding HRAF) and 47 other organisations

10 UKCRC delegated responsibility for the continued governance of the HRCS and production of subsequent analysis to the HRAF, following disbanding of the UKCRC secretariat in 2007/08. The HRAF consists of representatives from the twelve original funders participating in the 2004/05 and 2009/10 analyses and AMRC



SCOPE OF THE ANALYSIS



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Scope of the Analysis

Participating organisations

Health relevant research and development activity in the UK benefits from funding provided by the public¹¹, charity¹² and private sectors. This report focuses on the details of public and charity funded UK health research and sets this in the context of an estimate of the total funding available for health research in the UK.

One of the objectives of the Health Research Analysis Forum (HRAF) was to widen participation in the analysis to deliver greater representation of funding across disease areas, research activities, and geography. Although the 2014 analysis estimated that over 90% of UK health relevant expenditure had been captured, the inclusion of more UK funders adds reassurance that the analysis is as robust as possible and provides a dataset that can be explored in more detail by others asking specific questions about particular disease areas.

Overall, we approached 288 organisations all of whom were connected to health, healthcare or biomedical research:

- 13 HRAF member organisations
- 142 members of the Association of Medical Research Charities (AMRC) - itself a HRAF member – were approached by AMRC, 87 of whom agreed to join the analysis.
 - This represents 62% of AMRC membership but ~97.5% of total UK expenditure.
- 58 non-AMRC charities were approached independently by the project management team, 9 joined the analysis.
- 40 UK Government and other publicly funded organisations were also approached independently, 25 joined the analysis.
- 31 professional organisations, primarily Medical Royal Colleges, were also approached independently, 12 joined the analysis.

In total, 146 organisations – half of the total number of organisations approached - agreed to participate in the analysis. Of these, 23 provided qualitative-based submissions and 123 provided both a narrative text and data for the analysis.

A full list of participating organisations with a narrative explanation of their role and involvement in health research can be found in **Appendix 1**, with details of funding submitted to the analysis in **Appendix 2**.

Data Criteria

Data included in the main analysis

The criteria for expenditure data to be included in the main analysis broadly match those of previous reports:

- Research is funded by a participating organisation
- Research is of health or biomedical relevance
- The award must be active in the calendar year 2018¹³

We have made a distinction between grants focused on directly supporting specific research programmes and projects¹⁴ and funding that supports more indirect aspects such as infrastructure (which may include administration, building maintenance or support for national facilities). While both types of support are essential for health research our main analysis focuses on the directly funded, usually peer reviewed, research where funding can be directly attributed to a set of clearly defined research objectives. Such awards can be classified using the HRCS by type of research activity and area of health or disease i.e. directly funded research, training awards and projects, plus clearly defined programme and unit awards (direct awards only).

Our assessment of overall UK investment in health-relevant research includes the data gathered on indirect funding – infrastructure, training, equipment - which cannot be easily coded using the HRCS.

As an additional feature of this analysis, not seen in previous *UK Health Research Analyses*, we have also performed the same analysis on awards made by UK funders to organisations outside the UK, alongside awards made within the UK by organisations internationally. While the focus of the analysis remains within the UK, the question of how the UK contributes to global research is becoming increasingly important. However, it is important to note that our geographical analysis focuses on the primary location where the award is made, usually the Principal Investigator's host organisation. As research is often collaborative, this does not necessarily fully reflect where the research funded by the award is taking place.

Data included in the assessment of indirect funding and total health R&D estimation:

By definition it is not possible to attribute indirect funding to particular health areas in a meaningful way. This is usually due to the nature of the funding itself or the detail on an award level being too far removed from the details of the research being supported to be easily coded using the HRCS or indeed most other classification systems. To inform discussion of this type of funding, individual Indirect awards are sub-classified using broadly defined criteria:

- **Infrastructure funding**

- Capital Infrastructure – building construction, maintenance and core costs
- R&D Support for NHS Providers – principally Clinical Research Networks¹⁵
- Administrative Support – including library funding and publication costs
- R&D resources– this includes supportive funding for cohorts, data repositories to ensure the resource is managed and available for use in research

- **Personal funding – supporting individual researchers**

- Individual salary support (separate to project costs)
- Costs relating to attending meetings
- Membership of professional bodies

- **Training and Studentship funding**

- Studentships, fellowships, scholarships and other training where no research objectives are available and therefore are not eligible for core HRCS analysis
- This includes aggregated awards for multiple studentships, where details of the individual student projects being funded are unavailable

- **Unclassified / other award funding**

- Any other funding submitted for the analysis which cannot be quantified under the HRCS or otherwise categorised as above.

Details of the indirect expenditure captured by this analysis can be found in **Appendix 2** on **page 120**.

In addition to this indirect support via the participating organisations, we have also collated data on other health-relevant spending to produce an estimated value for total public/charitable health R&D expenditure for 2018. This estimation come from a variety of sources, but includes

- Higher education funding councils quality-related (QR) funding to universities
- Other sources of NHS funding for research
- Support for full economic costing

Full details of this assessment can be found in **Appendix 4**.

Data excluded from the analysis

The primary exclusion criterion for this report remains research **which is not considered health research relevant**. In expanding the organisations involved in this analysis, we re-visited the definition of ‘health relevancy’.

For this analysis we have included any type of funding for research where health is a consideration, either as an indicator or direct outcome of the project (e.g. impact of pollutants on disease). We would generally exclude funding for topics where the health component is only implied or a long-term consideration. For example, climate change will have eventual health impacts but not all climate change research would be considered health relevant.

Similarly, what is considered research has also required some clarification. This analysis used any funding that asks a question or poses a theory and seeks to answer it. Therefore, any evaluation, comparison, trial or assessment of services, interventions or methodologies would all be considered research here, even if conducted outside the usual academic setting. This means funding for healthcare services or support groups would not be considered research unless they also seek to advance knowledge of the disease or service provided (else this analysis would include the entire NHS budget).

Given these two definitions, there are still areas of UK health research not covered by this analysis:

- **Industry funded research**

- The private sector remains the largest source of undefined health research funding not captured by this analysis, due to the lack of publicly available data.
- We can therefore only estimate the amount of industry funded research based on other sources (e.g. ONS)

- **Research funded by other organisations not included in the analysis, including:**

- the remaining medical charities that are members of AMRC
- research funded by other not-for-profit organisations
- research funded by other aspects of UK Government, including local authorities
- research funded within devolved NHS Trust budgets not administered through NIHR

- **Research taking place in the UK funded by non-UK organisations**

- While we have made some comment on how funding enters the UK from external sources (see **page 44**), international funding into the UK is excluded from the main analysis in this report.

Combined spend analysis

The combined database from all participating organisations (123/146 funders) contains 21,749 awards with a combined spend within the UK of £3.96bn in 2018. Much of this spending (a total of £2.56bn) is from the 18,307 awards that directly fund research. The total for spend across indirect awards (3,442 awards) was £1.40bn.

Overall the value of funding submitted for the analysis in 2018 has doubled since 2004 and increased by 18.7% since 2014. Direct funding for health research in 2018 totals £2.56bn. This compares with £1.24bn in 2004/05¹⁶ and £1.87bn in 2009/10¹⁷ and £2.16bn in 2014¹⁸ (see **Figure 1** and **Table 1** for details).

To remove changes introduced by adding new participating organisations over time, we have also assessed the contributions from the original 12 HRAF organisations separately. Having done this, we still observe an overall increase in health research expenditure. The Compound Annual Growth Rate (CAGR)¹⁹ of HRAF funder expenditure was 4.1% between 2004 and 2018. However, the intervening CAGR between reports is more variable, with a sharp increase between 2004 and 2009 (8.5%) followed by a modest rate of 1.6% from 2009 to 2014 and 1.8% from 2014 to 2018. In effect, health research has received level funding for the last ten years.

New funders to the UK Health Research Analysis series

Both the 2014 and 2018 analyses have included data from organisations beyond the original 12 HRAF funders²⁰. In 2014 the participation of the 52 additional funding organisations who did not participate in the 2009/10 analysis added 2,238 awards and £137m (plus £28m in indirect supportive funding) in real terms to the analysis. Our latest report includes 111 additional organisations²¹, outside of the HRAF, adding 4,244 awards and £393m in research spend and a further £230m on indirect funding active in 2018.

A full breakdown of all funding organisations by award numbers and award value can be found in **Appendix 2**. However, throughout this report we make comparisons with previous reports in the series, which given the variation in participating organisation could lead to conclusions drawn from variances in funders, not funding. To counter this we assessed how the contributions from new participating organisations influenced the HRAF vs all organisation comparisons. A more detailed explanation of this process can be found in **Appendix 3**.

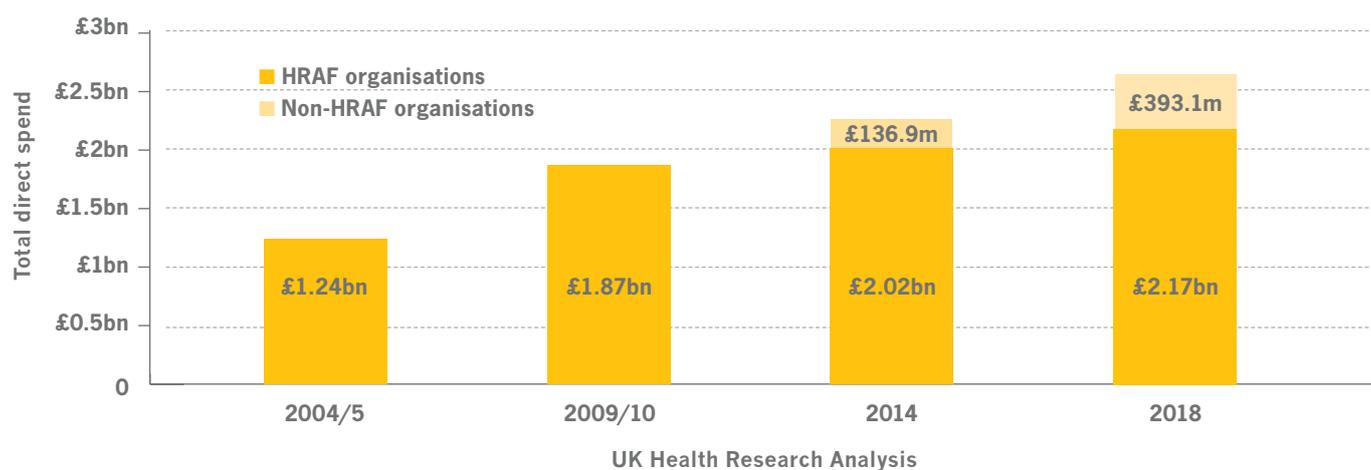


Figure 1 – Combined direct spend totals for *UK Health Research Analysis* series (2004/05 to 2018). Data from the original HRAF (12 funders) and total participating organisations (n=64 in 2014, n= 123 in 2018) are shown separately to allow comparison across time

Report	# of Funders	# Direct Awards	% growth vs previous report	Direct (real terms) ²²	% growth vs previous report	Indirect (real terms)	Total (real terms)
2004/05	(12) ²³	9901	0.0%	£1.24bn	n/a	n/a	£1.24bn
2009/10	12	11482	+16.0%	£1.87bn	+50.3	£0.94bn	£2.81bn
2014 (HRAF)	12	12696	+10.6%	£2.02bn	+8.1	£1.01bn	£3.03bn
2014 (All)	64	14934	+30.1%	£2.16bn	+15.4	£1.04bn	£3.20bn
2018 (HRAF)	12	14064	+10.8%	£2.17bn	+7.3%	£1.17bn	£3.33bn
2018 (all)	123	18307	+22.6%	£2.56bn	+18.7%	£1.40bn	£3.96bn

Table 1 – Number and value of direct research awards and supportive indirect funding across the *UK Health Research Analysis* series (2004/05 to 2018)

Indirect funding assessment

In total £1.40bn of health relevant funding was reported as indirect funding. Most of this funding is classified as Infrastructure (£1.13bn, 81% of indirect total), which includes large capital support funds such as:

- Medical Research Council (MRC)'s core support for the Francis Crick Institute
- Cancer Research UK (CRUK)'s support for its cancer research institutes
- Wellcome's support for the Sanger Institute
- Department of Health and Social Care (DHSC)-funded National Institute for Health Research (NIHR) [Clinical Research Network](#).

The remaining 19% of indirect funding is divided between £171m in funder specific or unclassified awards, training and studentships (£85m) and personal awards supporting individual researchers (£8m).

The 2009/10 Health Research Analysis was the first to introduce an assessment of indirect funding, with a total of £827m (£944m in real terms). In 2014 indirect funding from the HRAF funders totals £952m (£1.01bn in real terms). The 2018 total for indirect funding was £1.40bn, of which £1.17bn is attributed to HRAF funders. This is an increase of £451m (48%) in real terms since 2009/10.

Assessment of additional funding sources – such as the Charities Research Support Fund (CRSF), support for health research from UK devolved administrations and NHS support for clinical academics – was carried out in both 2014 and 2018. These sources of funding, outside of the funding collected in our analysis, are estimated to add a further £849.7m to the support for health research in the UK (see **Appendix 4** for more details).

Estimation of total health-related research performed by UK institutions

Since 2009, the *UK Health Research Analysis* reports have provided estimates for the total health related research and development expenditure by UK public, charitable and private sector institutions for 2018. Calculation of this estimate takes a “top down” approach using information on total research and development activity across the research performing sectors and then determining how much would be considered health relevant. This estimation is based on information compiled by the Office for National Statistics and used to estimate annual UK Gross Expenditure in Research and Development (GERD), full details of which can be found in **Appendix 5**.

The totals for research performed in the business, private not-for-profit (PNP), university and public research institute sectors for 2018 are displayed in **Figure 2** and **Table 2** below. The combined total expenditure estimated for these four research sectors is £8.64bn, which to set this in context is approximately 25% of the £34.8bn estimated total expenditure of R&D performed in the UK.

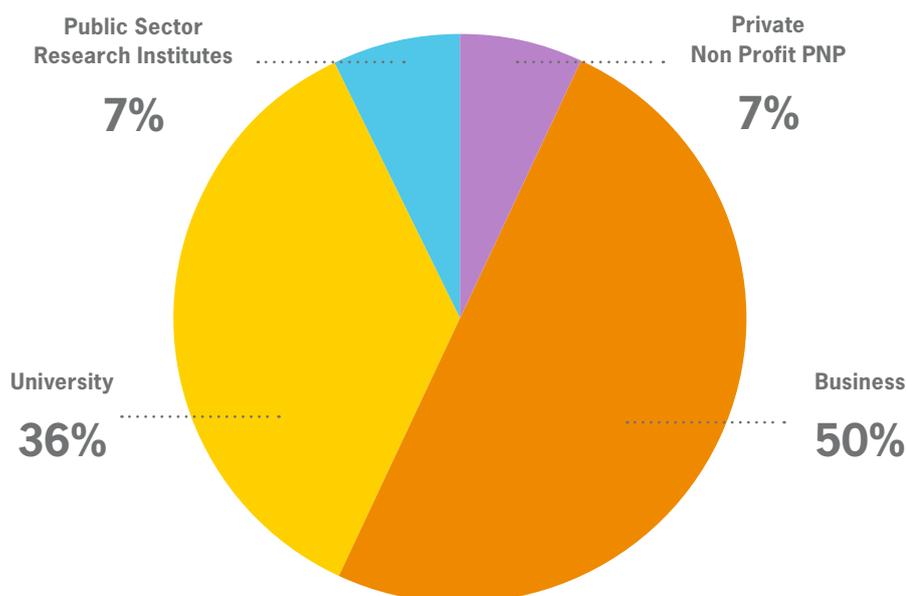
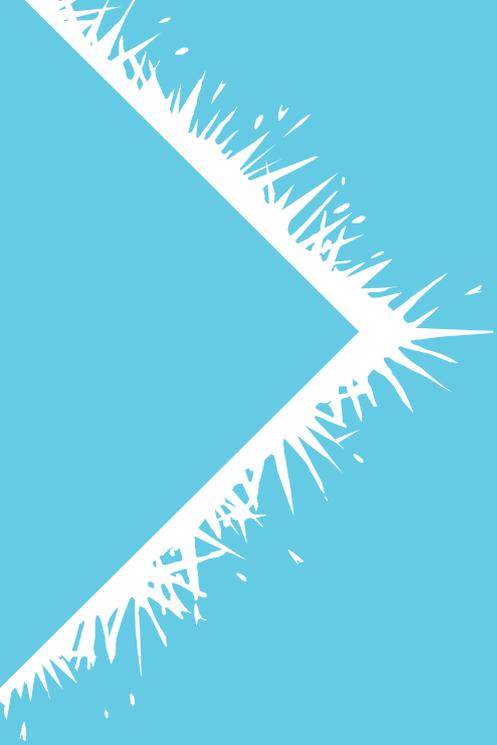


Figure 2 – Distribution of estimated total UK health research expenditure for 2018 by research sector

Performing Sector	2014 estimate (revised)		2018 Estimate		Difference	
	Spend (real terms)	% of total	Spend	% of total	Spend	%
Business	£4.37bn	51.7%	£4.34bn	50.2%	-£0.03bn	-2.0%
University	£2.89bn	34.2%	£3.15bn	36.4%	£0.26bn	+4.6%
Public Sector Research Institutes	£0.77bn	9.2%	£0.61bn	6.7%	-£0.17bn	-8.6%
Private Non-Profit	£0.42bn	4.9%	£0.58bn	6.7%	£0.16bn	2.1%
Total	£8.44bn	100%	£8.67bn	100%	£0.23bn	-

Table 2 – Estimates for the total UK health-relevant R&D expenditure

- 11 In this report “Public” refers to mainly UK Government funding provided via UK Government departments (e.g. Department of Health and Social Care) and non-departmental public bodies (such as UK Research and Innovation).
- 12 In this report “Charity” refers mainly to funding provided by organisations that are members of the Association of Medical Research Charities, although there are other UK non-profit private organisations supporting health relevant research.
- 13 The analysis is designed to provide a snapshot of research that was ‘live’ (i.e. funded research was taking place) at any point on or between the 1st of January and 31st of December 2018. Note that the earliest analyses (2004/05 and 2009/10) used expenditure information for financial years, but for the 2014 analysis it was agreed to standardise on a calendar year so that all awards were active in exactly the same time period.
- 14 While it is recognised that what we refer to in the UK Health Research Analyses as direct awards also include elements of indirect costs (e.g. salaries, full economic costing contributions), this is generally not easily separated from the overall award value.
- 15 Note that support for the NIHR Clinical Research Network (CRN) was not consistently classified as infrastructure in the 09/10 analysis but has been exclusively assigned to the indirect assessment in this report series since 2014.
- 16 GDP real terms adjustment is 1.288 vs 2018 values (100%). Original value in 2004/05 report = £965m.
- 17 GDP real terms adjustment is 1.142 vs 2018 values (100%). Original value in 2009/10 report = £1.636bn
- 18 GDP real terms adjustment is 1.065 vs 2018 values (100%). Original value in 2014 report = £2.03bn
- 19 CAGR is the rate of return required for an investment to grow from its beginning balance to its ending balance, assuming that the profits from each year are re-invested each year (compounded). This is used to give an average annual growth rate for a defined period.
- 20 A total of 29 AMRC medium to smaller charities also participated in the Donation to Innovation report and thus have 2004/05 data available. Of these 20 participated in the 2014 analysis and 21 participated in the current analysis in 2018.
- 21 Including 50 of the 52 new participants from 2014.
- 22 In this report previous analysis figures are expressed in real terms (i.e. 2018 prices) using the UK GDP deflator data as at December 2018. Full details of the calculations can be found in the **Methods** chapter. <https://bit.ly/2S1zGpM>
- 23 Only 11 funders feature in the original 2004/05 report. Arthritis Research UK (now Versus Arthritis) joined the HRAF group for the 2009/10 report and provided retrospective data for the 2004/05 reporting period.



METHODOLOGY



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Data collection and classification

123 participating organisations submitted information relating to 22,591 awards. This included 841 awards made outside the UK, to a total value of £223m. Of the awards made within the UK – and the focus of this analysis – 18,308 awards were considered direct awards, i.e. awards directly contributing towards research, and were fully coded using the HRCS and subject to validation prior to inclusion in the main analysis. A further 3,442 awards were classified as indirect awards, i.e. awards supporting research, for use in the separate infrastructure assessment. However, of these 3,442 indirect awards 1,016 had sufficient information to show they were health relevant, but insufficient information to HRCS code or classify within our indirect funding assessment.

Data validation for direct awards constituted the following checks:

- The data must match the basic inclusion criteria for the analysis.
- The award had sufficient detail to allow accurate HRCS coding.
- The award had sufficient detail to allow accurate calculation of an annualised value for activity in the 2018 reporting period.
- De-duplication assessment to ensure any matching awards submitted by multiple funders (e.g. co-funded awards) only reported each funder's contribution.

Each funder was responsible for extracting the necessary data for its health relevant research portfolio to be categorised using standardised HRCS coding. Full details of this process are available on the HRCS website (www.hrcsonline.net) but to summarise, each award was assigned up to two Research Activities (four for large programmes) according to the type of research performed and up to five Health Categories related to the disease or condition of interest. Fully coded data was returned using a standard format and each funder has provided a commentary describing any changes or caveats pertaining to their data submission.

Since the last analysis in 2014 a new methodology for classification using HRCS has become available. Subscription to the Digital Science Dimensions platform²⁴ (www.dimensions.ai) allows access to automated HRCS coding (“auto-coding”) for awards based on their publicly available titles and abstracts. There is also a coding support tool for manual input of titles and abstracts to allow some limited coding of non-public award data. Several funders with access to Dimensions have switched from manual coding to auto-coding for their 2018 submissions; a factor which must be considered when attempting to compare the resulting analyses with past submissions. A more detailed discussion of manual vs auto-coding comparisons can be found in **Appendix 10**.

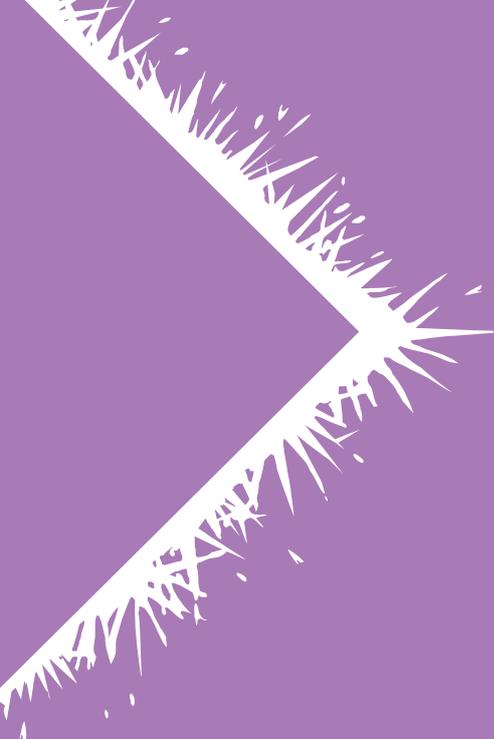
Finally, to obtain a value for the award in our reporting period of 2018, we used a calculation of the overall award value based on the award's duration within the 2018 calendar year or an actual expenditure value if available. This is consistent with methods used for previous reports, to ensure the values presented here are our best estimates for expenditure in 2018. Please note that all comparisons with previous report data uses a ‘real terms’ value, adjusted for inflation.

Further details can be found in the expanded methods section, **Appendix 11**. This includes:

- Further details on the data analysis methods used.
- Oversight and Ownership of the data.
- Understanding the Health Research Classification System
- Understanding the results of the analysis

We recommend those unfamiliar with the HRCS read this section carefully before reviewing the rest of this report. We also strongly recommend [speaking with the project management team directly](#) before undertaking further analysis using the 2018 public dataset, which is made available via the HRCS website under a [creative commons licence](#).

24 Digital Science. (2018-) Dimensions [Software] available from <https://app.dimensions.ai>. Last accessed on 27-09-2019, under licence agreement. For more information contact info@dimensions.ai



DETAILED ANALYSIS: RESEARCH ACTIVITY



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Distribution of funding across Research Activities in 2018

The distribution of the collective research portfolio for the 18,307 awards made within the UK by all 123 funding organisations across the eight major HRCS Research Activity groups is shown in **Figure 3**.

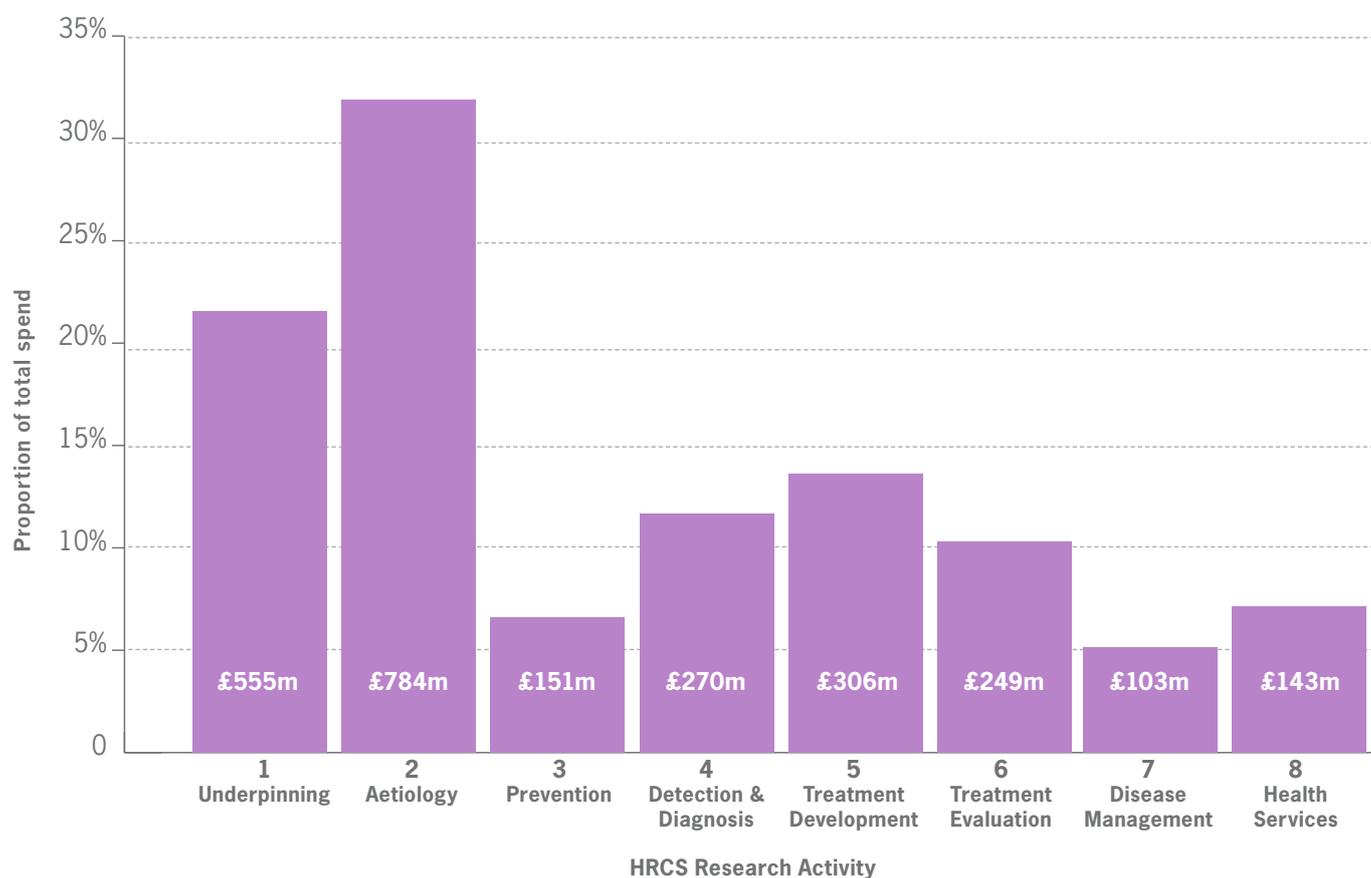


Figure 3 – Distribution of direct health research expenditure by HRCS Research Activity in 2018

Research Activity Group	# of awards	Spend	% of total
1 Underpinning	3,007	£555m	21.7%
2 Aetiology	6,144	£784m	30.6%
3 Prevention	988	£151m	5.9%
4 Detection and Diagnosis	2,047	£270m	10.5%
5 Treatment Development	2,236	£306m	11.9%
6 Treatment Evaluation	1,771	£249m	9.7%
7 Disease Management	953	£103m	4.0%
8 Health Services	1,160	£143m	5.6%
Grand total	18,307	£2.56bn	100%

Table 3 – Total awards and expenditure for 2018 by HRCS Research Activity for all direct awards submitted to the analysis

Underpinning and Aetiology

Half of all funding is concentrated in *Underpinning* and *Aetiology* (21.7% and 30.6%, respectively). *Underpinning* focuses on understanding normal biological, psychological and socioeconomic processes which forms the basis for subsequent research, whereas *Aetiology* looks at the risks, causes and development of disease. Both *Underpinning* and *Aetiology* are considered together as areas of basic research, although not all such research is laboratory based; research activity subgroups include coding options for methodology and research design, population surveillance and infrastructure support. For example, most epidemiological studies will be coded under *Aetiology*.

Prevention

Prevention constitutes 5.9% of funding and is focused on primary preventions (i.e. direct interventions to prevent disease) and to promote wellbeing (i.e. indirect interventions to reduce the risks of ill health). Areas of research coded to *Prevention* include vaccines and preventative medicines alongside behavioural and environmental interventions, from initial conception to translational activity.

Detection/Diagnosis, Treatment Development and Treatment Evaluation

Collectively these three research activity groups cover areas of translational research, building on previous underpinning/aetiological research to develop new procedures to monitor and treat disease. *Detection and Diagnosis* (10.5%) focuses on biomarker discovery and development, the use of new diagnostic technologies and population screening. *Treatment Development* (11.9%) begins the translation of basic research into experimental medicine in preclinical settings and/or model systems, while *Treatment Evaluation* (9.7%) involves testing and evaluation of interventions in human clinical/applied settings, such as therapeutic trials.

Disease Management and Health Services

Research in the processes of healthcare will most commonly be coded to one or other of these research activities. *Disease Management* (4.0%) covers research on individual patient needs and practitioner experiences, including research into quality of life, disease self-management and palliative care. *Health Services* (5.6%) examines healthcare at an organisational level, including service provision as well as welfare, economic and policy issues.

Changes in Research Activity 2004/05 – 2018

Before interpreting the changes in distribution of total UK funding, it is important to note that due to the overall increase in research expenditure no one HRCS Research Activity group shows a decrease in overall funding in real terms. Since 2004 the funding captured by this analysis has increased by £1.32bn (from £1.24bn to £2.56bn), and within each research activity group this has resulted in an increase of between £71m to £353m in spending.

In comparing the distribution of research activity funding in 2018 to previous *UK Health Research Analyses* there has been a noticeable shift in the proportion of total expenditure, primarily from basic discovery research to research with an intent to translate (see **Figure 4** and **Table 4**).

The proportion of funding for the research activity groups (1 & 2) which equate to basic discovery research have both decreased, the proportion of *Underpinning* research has fallen consistently across each successive analysis, falling by 11.9% from 2004 to 2018. Similarly, the proportion of *Aetiology* research has also reduced by 4.1% in the same period, albeit with less consistency between reporting periods.

Research Activity Groups 3 to 8 have all increased as a proportion of total spend from 2004 to 2018, although the main increases are observed in *Prevention, Detection and*

Diagnosis and Treatment Development (+3.4%, +5.3% and +3.3%, respectively). Increased proportion of total spend in *Treatment Evaluation, Disease Management and Health Services*²⁵ has been more modest over the 14 years, and with effectively zero growth between 2014 and 2018.

One noted outlier to this apparent upward trend is observed within *Treatment Development*, which saw a small decrease in proportion of total spend (-1.1%) between 2014 and 2018, despite the increased contributions from additional funders such as Innovate UK. Upon investigation the cause was the inclusion of MRC-administered awards made under the [UK Regenerative Medicine Platform \(UKRMP\)](#) with a value of £10m in 2014. The UKRMP was a joint venture established in 2013 by the Biotechnology and Biological Sciences Research Council (BBSRC), Engineering and Physical Sciences Research Council (EPSRC) and the MRC to address the key translational challenges of regenerative medicine. Awards made under this scheme had a considerable focus on *Treatment Development* via pre-clinical assessment and testing of stem cells and other cell/gene therapies. A new tranche of £17m to support second phase activities (UKRMP2) will support further work in this area from 2018-2023, however most of this funding has yet to be announced/awarded and is therefore absent from this analysis.

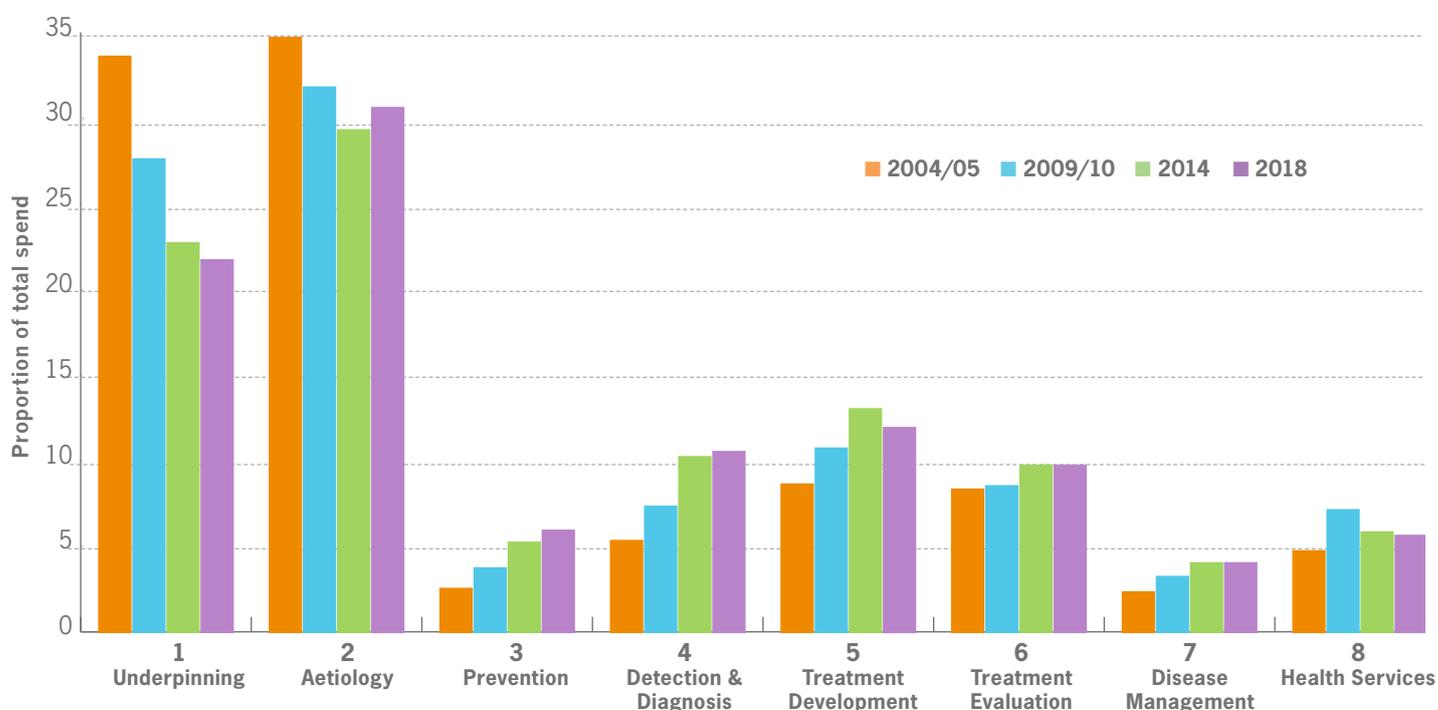


Figure 4 – Funding distribution for all contributing organisations by HRCS Research Activity across the four *UK Health Research Analyses* 2004/05 to 2018

Detailed Analysis: Research Activity

Research Activity Group	2004/05		2009/10		2014		2018		Difference	
	Spend (real terms)	% of total	Spend (real terms)	% of total	Spend (real terms)	% of total	Spend	% of total	Value	%
1 Underpinning	£418m	33.6%	£515m	27.6%	£489m	22.7%	£555m	21.7%	£137m	-11.9%
2 Aetiology	£431m	34.7%	£594m	31.8%	£632m	29.3%	£784m	30.6%	£353m	-4.1%
3 Prevention	£31m	2.5%	£70m	3.7%	£113m	5.2%	£151m	5.9%	£120m	3.4%
4 Detection and Diagnosis	£65m	5.3%	£137m	7.3%	£220m	10.2%	£270m	10.5%	£204m	5.3%
5 Treatment Development	£107m	8.6%	£200m	10.7%	£281m	13.0%	£306m	11.9%	£199m	3.3%
6 Treatment Evaluation	£103m	8.3%	£160m	8.5%	£209m	9.7%	£249m	9.7%	£145m	1.4%
7 Disease Management	£29m	2.3%	£60m	3.2%	£86m	4.0%	£103m	4.0%	£74m	1.7%
8 Health Services	£58m	4.7%	£133m	7.1% ²⁵	£126m	5.8%	£143m	5.6%	£85m	0.9%
Grand total	£1.24bn	100%	£1.87bn	100%	£2.16bn	100%	£2.56bn	100%	£1.32bn	-

Table 4 – Funding distribution for all contributing organisations by HRCS Research Activity across the four UK Health Research Analyses 2004/05 to 2018

Trend assessment; focus on translational research

The data collected across the four UK Health Research Analysis reports have shown that while there is continued willingness to invest in basic discovery research – increasing in real terms and still accounting for half of all research activity - the growth in health research funding is disproportionately in favour of more translationally orientated research activities. These changes appear to be shared across multiple funders and time periods, suggesting this transition is part of a shared, national shift in policy. These changes can probably be traced to the influential review of UK health research funding conducted by Sir David Cooksey in 2006²⁶ - which used data from the original UK Health Research Analysis 2004/05 as part of its evidence base - and its recommendation that increases to health research funding should focus on “*translating ideas from basic and clinical research into the development of new products and approaches to treatment of disease and illness*”.

Research in *Prevention* was highlighted in the 2004/05 analysis as under-funded and this evidence was used to help make the case for establishing the National Prevention Research Initiative (NPRI). Founded in 2004, the NPRI combined 16 funding partners from government departments, research councils and charities to promote research into chronic disease prevention, resulting in £34m across 74 projects supported from 2005-2014²⁷. This investment has contributed to expenditure for prevention research increasing five-fold from a low base of £30m in 2004/05 to over £151m in 2018. Continued interest in supporting prevention research and building on the co-ordinated NPRI approach has resulted in a new cross-funder initiative, the UK Prevention Research Partnership (UKPRP) announced in 2017, with a value of more than £50m.

The first UKPRP awards will start in 2019, so do not contribute to this analysis but will assist in continuing to grow capability in this important area in the future.

The drivers of translational research funding fall across multiple sectors and organisations. Industry has for some time shifted away from fully in-house discovery to collaboration and licencing from academia and biotech SMEs. From the public sector, the MRC budget for directed translational research (i.e. calls and schemes with inherent translational intent, such as the Developmental Pathway Funding Scheme and Confidence in Concept) has risen from <£10m per annum in 2008/09 to >£70m in 2017/18, as noted in a newly published evaluation of translational research²⁸. Similarly, the creation of NIHR Biomedical Research Centres (BRCs) and more recently Invention for Innovation (i4i) has also driven translational research funding. Innovate UK has seen considerable growth in expenditure, from a budget allocation of £440m in 2012/13 to over £1bn in 2017/18²⁹. While not all of Innovate UK’s research expenditure is health-related, the organisation supports a number of key biomedical initiatives, such as the Cell and Gene Therapy and Medicines Discovery Catapults. Finally enhanced translational funding from medical charities has further supported this funding environment, such as Wellcome’s [Innovation Division](#) or CRUK’s [Drug Development Units](#). Collectively, the influence of the Cooksey Review and subsequent interest in enhancing the bench-to-beside pathway of medical research has resulted in a significant shift towards directed translational funding.

Changes in funding distribution by Research Activity sub-group

Assessment of the Research Activity sub-groups shows that the changes in funding seen at overall group level is largely mirrored within sub-groups. Notable exceptions to this are:

- The reduction in *Underpinning* (33.6% in 2004/05, 21.7% in 2018) is almost exclusively due to the most commonly used code, **1.1 Normal biological development and functioning**. The proportion of research coded as 1.1 has decreased by 12.1% since 2004/05, including a decrease of 0.8% since 2014.
- The proportion of research coded *Aetiology* has decreased when comparing 2018 with 2004/5 (-4.1%). This is largely due to the most common sub-groups within *Aetiology*, **2.1 Biological and endogenous factors** and **2.2 Factors relating to the physical environment**, which decreased by 2.9% and 1.8% respectively. Although spend in these categories has decreased as a proportion of overall spend, spend in real terms has increased since 2004/05 with **2.1** increasing by £284m and **2.2** increasing by £41m. We see a different change when comparing 2018 to 2014, where in this period overall spend in *Aetiology* has increased by 1.3%, almost exclusively due to a 1.0% (£125m) increase in **2.1** and 0.3% (£27m) increase in **2.6 Resources and infrastructure**.
- Since 2004/05 research in *Prevention, Detection and Diagnosis and Treatment Development* has increased in its proportion of total funding by 3.4, 5.3 and 3.3% respectively. The largest increases are seen in the subgroups **3.1 Primary prevention interventions to modify behaviours or promote well-being** (+1.5%), **4.1 Discovery and preclinical testing of markers and technologies** (+3.2%) and **5.1 Pharmaceuticals** (+1.7%). Since 2014, *Prevention and Detection and Diagnosis* continued to increase (+0.94% and +0.32%) however *Treatment Development* decreased (-1.09%). Research in *Treatment Evaluation, Disease Management and Health Services* showed small increases in proportional funding (1.1-1.7%) with largely positive proportional changes in subgroups. For example, **7.1 Individual care needs** increased by 0.92% since 2004/05, with a funding increase of £41m in real terms.
- A further observation is that in 7 of the 8 research activities sub-groups for 'Resources and Infrastructure' (codes **1.5, 2.6, 3.5, 4.5, 5.9, 7.4** and **8.5**) have increased since 2004/05 (0.3 to 1.7%). In total, this accounted for a funding increase of £277m in real terms. This suggests a greater focus on investment in resources and infrastructure earlier in our reporting period, with these structural, long term investments then supporting other research activities later in our reporting period.

A full table of these data can be found in **Appendix 6**.

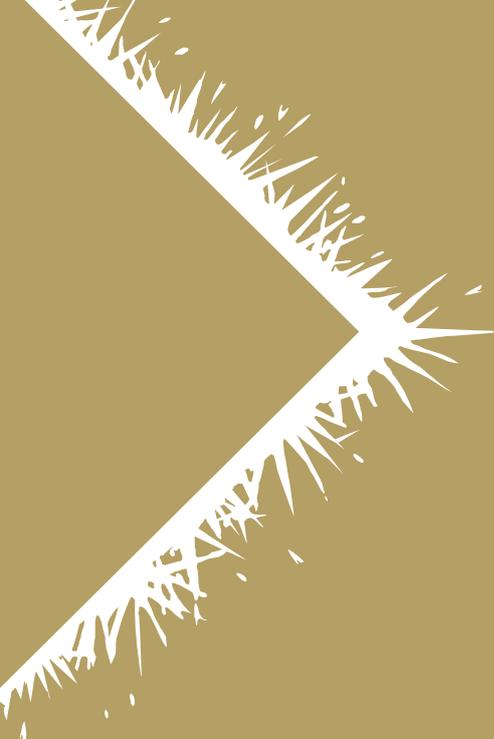
25 Expenditure on Health Services saw a significant increase in 2009/10 vs 2004/05 which appears not sustained into 2014 and 2018. This was due to the inclusion of funding for the NIHR Clinical Research Network (CRN) into the direct analysis in 2009/10, which in subsequent reports have been assessed separately as indirect supportive funding.

26 Sir David Cooksey, December 2006. "A review of UK health research funding" DOI 10.1136/bmj.39059.444120.80

27 National Prevention Research Initiative Report (2015) "Initiative outcomes and future approaches" <https://bit.ly/2mXspvD>

28 MRC Translational Research Evaluation 2008-2018, published September 2019 <https://bit.ly/2AW3wEz>

29 See Innovate UK annual reports. <https://bit.ly/2SdloRS>



DETAILED ANALYSIS: HEALTH CATEGORIES



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Distribution of funding across Health Categories

There are 21 distinct Health Categories used in the HRCS, of which 19 relate to a specific area of health or disease. The health categories cover both normal function and disease state. For example, studies of liver diseases, such as cirrhosis, and normal hepatic function will both be coded under *Oral and Gastrointestinal*. It is also important to consider that many research projects span a range of health categories, where multiple codes can be applied to each award (5 maximum). For example, studies of sexually transmitted diseases will often be classified as both Infection and Reproduction.

The two remaining health categories are used slightly differently. *The Disputed Aetiology and Other* category is used for diseases of unknown or disputed aetiology or research that is not applicable to the other health categories³⁰, and *Generic Health Relevance* is used for studies that are applicable to all diseases and/or general health. *Generic Health Relevance* can therefore cover a wide range of research types, from basic cell and molecular biology to geographical evaluation of health services and is often used in coding for large programme awards with a broad research remit.

The distribution of direct research expenditure by HRCS Health Category is shown in **Figure 5** and **Table 5**, below.

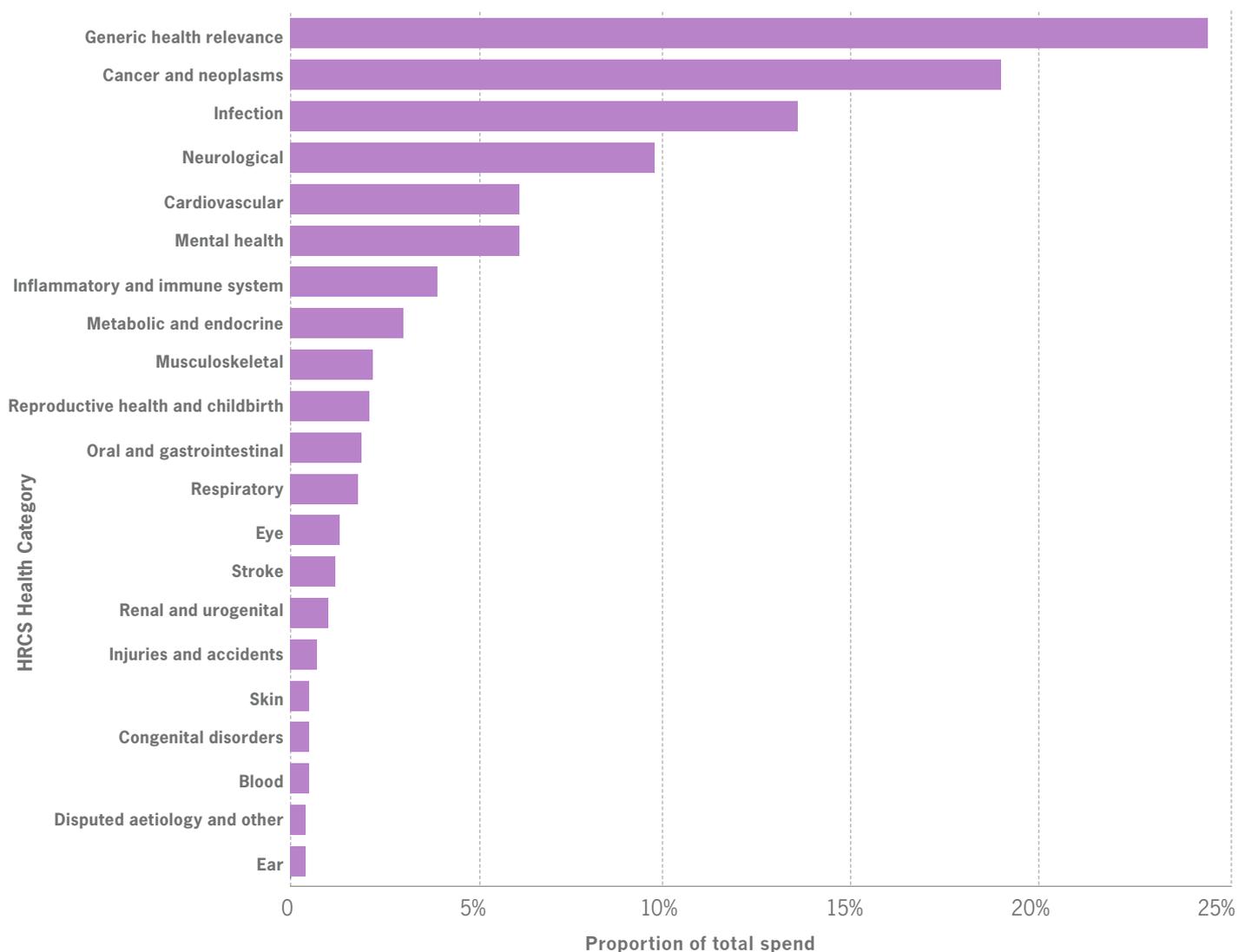


Figure 5 – Distribution of direct health research expenditure by HRCS Health Category in 2018

Detailed Analysis: Health Categories

Health Category	# of awards	Spend	% of total
Blood	98	£12m	0.5%
Cancer and neoplasms	3,312	£483m	18.9%
Cardiovascular	1,637	£156m	6.1%
Congenital disorders	133	£13m	0.5%
Disputed aetiology and other	72	£10m	0.4%
Ear	105	£10m	0.4%
Eye	349	£33m	1.3%
Generic health relevance	3,382	£625m	24.4%
Infection	2,107	£346m	13.5%
Inflammatory and immune system	760	£99m	3.9%
Injuries and accidents	117	£17m	0.7%
Mental health	1,149	£155m	6.1%
Metabolic and endocrine	533	£78m	3.0%
Musculoskeletal	538	£57m	2.2%
Neurological	2,094	£248m	9.7%
Oral and gastrointestinal	421	£48m	1.9%
Renal and urogenital	342	£25m	1.0%
Reproductive health and childbirth	416	£55m	2.1%
Respiratory	359	£47m	1.8%
Skin	116	£13m	0.5%
Stroke	267	£30m	1.2%
Grand total	18,308	£2.56bn	100%

Table 5 – Total awards and expenditure for 2018 by HRCS Health Category for all direct awards submitted to the analysis

Changes in Health Categories 2004/05 to 2018

Broadly the funding landscape for HRCS Health Categories remains relatively stable across the 14 years from earliest analysis in 2004/05 to the latest in 2018. As a proportion of overall funding available, only six Health Categories saw variations above $\pm 1\%$ (see **Figure 6** and **Table 6**).

Generic Health Relevance remains the largest area of research funding in 2018 (£625m, 24.4%). While the amount of funding has almost doubled in real terms (from £313m in 2004/05) the proportion of total funding in this area has only decreased by 1% since 2004/05. *Generic Health Relevance* is used when research is applicable to all areas of health and wellbeing (e.g. assessment of A&E service provision) or does not have a specific disease or condition of focus, which frequently includes *Underpinning* research activity. Therefore, the small proportional decrease in *Generic Health Relevance* funding may be linked to the variations seen in Research Activity and a prioritisation of more specific translational research areas with a more specific disease focus.

Cancer and neoplasms remains the second highest funded Health Category, with an increase in real terms funding of £231m since 2004/05. Proportionally, there has been a small decrease of 1.4% since 2004/05, although this appears to be largely within the last four years (-1.0% since 2014). Cancer Research UK is by far the largest single funder of *Cancer* research (45%) and has maintained its level of funding (after accounting for changes in funding related to the founding of the Francis Crick Institute³¹) across the 14-year reporting period. There does not appear to be one single contributor to this decrease in proportion of total cancer spend and is therefore a potential trend that requires close monitoring in the future.

The third largest Health Category, *Infection*, shows the most significant change over the 14-year reporting period. The proportion of total funding has increased by 4.5% (from 9.0% in 2004/05 to 13.5% in 2018) with a real terms funding increase of £233m, more than triple the value first reported in 2004/05 (£112m vs £346m in 2018). The increasing prioritisation of research on antimicrobial resistance alongside the inclusion of additional organisations with a strong focus on infectious diseases (such as Innovate UK and DFID) accounts for some of this trend, although a focus on overseas development assistance (ODA) funding will also be contributory.

The classifications of *Neurological* and *Mental Health* within the HRCS require some explanation before any conclusions on funding distributions can be drawn. HRCS *Neurological* refers to research conducted directly on the nervous system and the brain - the wiring - which includes neurodegenerative conditions such as Alzheimer's, Parkinson's and dementias. HRCS *Mental Health* refers to research into cognition and behaviour which includes depression, addiction, schizophrenia and a range of other disorders classified by the patient's mental state, cognitive ability and behaviour. While this segregation is useful for analyses of this type to differentiate research in different contexts, the public view of what constitutes mental health is broader; many charities and even other classification systems consider dementias to be within 'mental health' groupings. As a result, it is often helpful to view these health categories together.

In this analysis the proportion of *Neurological* funding has decreased by 1.9%, falling from 11.6% in 2004/05 to 9.7% in 2018, whereas *Mental Health* funding has increased by 1.8%, from 4.3% to 6.1%. In both categories real terms funding has grown by similar amounts (£104m and £101m respectively). If viewed collectively, these two Health Categories have doubled in funding over 14 years with almost no change in combined proportion of total funding. This is likely to increase beyond 2018, with the creation of the £290m [UK Dementia Research Institute](#) (only £4m of which was active in 2018) forming a key hub for work in both *Neurological* and *Mental Health* research.

The Health Category with the largest proportional decrease is *Inflammatory and Immune System*, used to identify research with a focus on the normal function of the immune system and auto-immune diseases. The proportion of total funding decreased by 2.0% since 2004/05 (5.9% to 3.9%), but *Inflammatory and Immune System* has still seen an increase in real terms funding of £26m over this period.

Only one category, *Ear*, showed a decrease in real terms funding over 14 years; from £15.6m in 2004/05 to £10.0m in 2018. Funding for this Health Category - which is focused on research into hearing and hearing loss - is relatively volatile and from only a relatively small number of awards, making it difficult to determine if this is a genuine trend.

Detailed Analysis: Health Categories

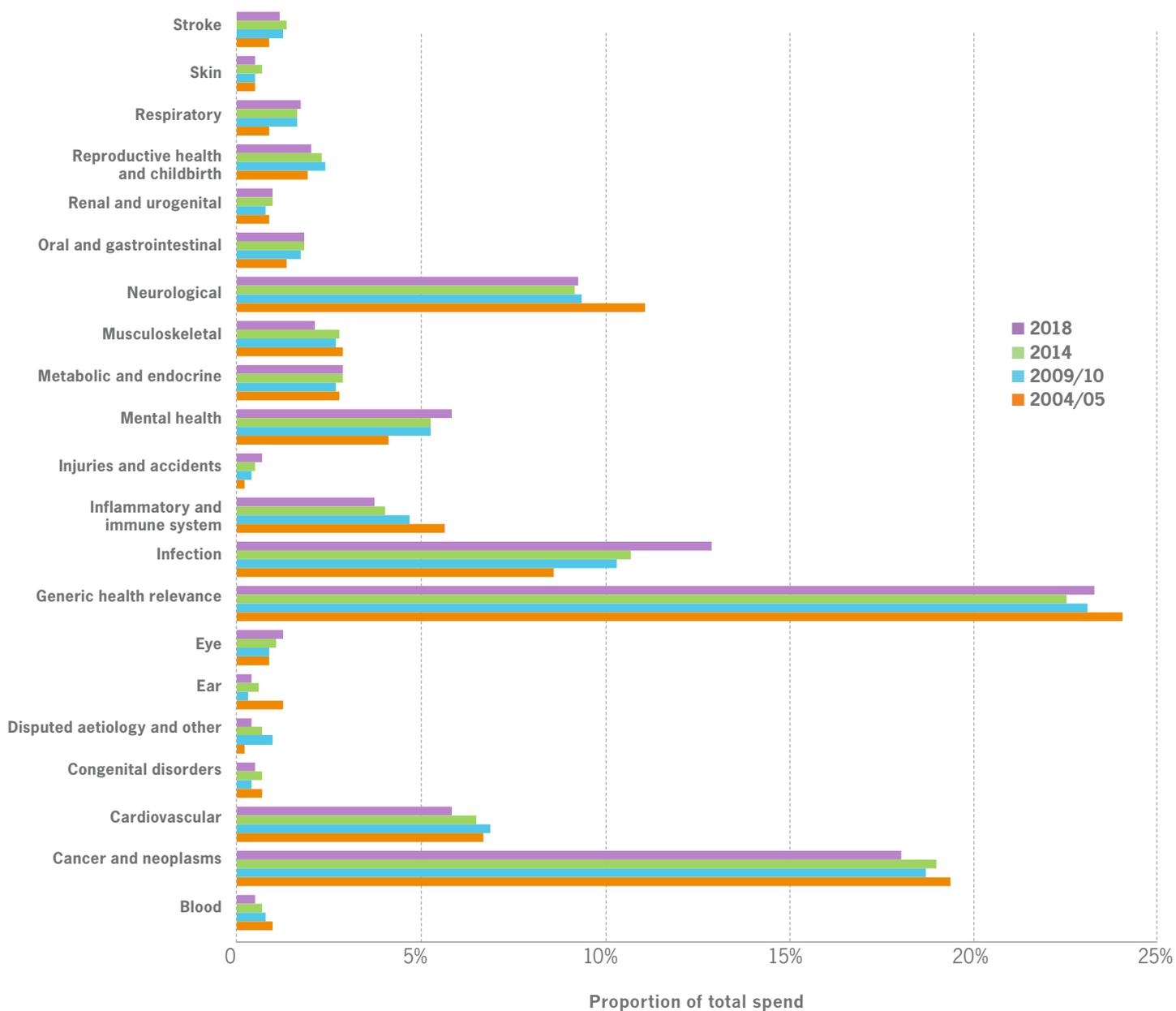


Figure 6 – Funding distribution for all contributing organisations by HRCS Health Category across the four UK Health Research Analyses 2004/05 to 2018

Detailed Analysis: Health Categories

Health Category	2004/05		2009/10		2014		2018		Differences	
	Spend (real terms)	%	Spend (real terms)	%	Spend (real terms)	%	Spend	%	2018 vs 04/05	2018 vs 2014
Blood	£12.4m	1.0%	£14.4m	0.8%	£14.3m	0.6%	£11.6m	0.5%	-0.55%	-0.21%
Cancer and neoplasms	£252.m	20.3%	£366.3m	19.6%	£428.3m	19.8%	£483.4m	18.9%	-1.40%	-0.98%
Cardiovascular	£87.1m	7.0%	£134.5m	7.2%	£147.5m	6.8%	£156.5m	6.1%	-0.90%	-0.73%
Congenital disorders	£8.9m	0.7%	£6.6m	0.4%	£14.1m	0.6%	£12.6m	0.5%	-0.23%	-0.16%
Disputed aetiology and other	£2.1m	0.2%	£17.8m	1.0%	£14.5m	0.6%	£10.5m	0.4%	0.24%	-0.26%
Ear	£15.6m	1.3%	£6.3m	0.3%	£13.1m	0.6%	£10.0m	0.4%	-0.87%	-0.22%
Eye	£10.9m	0.9%	£16.1m	0.9%	£24.2m	1.1%	£32.6m	1.3%	0.40%	0.15%
Generic health relevance	£313.1m	25.2%	£453.1m	24.2%	£509.m	23.6%	£625.5m	24.4%	-0.77%	0.83%
Infection	£112.3m	9.0%	£202.6m	10.8%	£241.7m	11.2%	£346.2m	13.5%	4.49%	2.32%
Inflammatory and immune system	£73.m	5.9%	£91.2m	4.9%	£91.3m	4.2%	£98.6m	3.6%	-2.02%	-0.38%
Injuries and accidents	£2.9m	0.2%	£6.6m	0.4%	£10.m	0.4%	£16.7m	0.7%	0.42%	0.19%
Mental health	£53.2m	4.3%	£102.2m	5.5%	£119.6m	5.5%	£155.0m	6.0%	1.77%	0.51%
Metabolic and endocrine	£35.6m	2.9%	£51.6m	2.8%	£64.3m	2.9%	£78.0m	3.0%	0.18%	0.06%
Musculoskeletal	£37.6m	3.0%	£52.2m	2.8%	£62.5m	2.9%	£57.2m	2.2%	-0.79%	-0.66%
Neurological	£143.6m	11.6%	£183.8m	9.8%	£206.9m	9.6%	£248.5m	9.7%	-1.85%	0.11%
Oral and gastrointestinal	£17.5m	1.4%	£34.2m	1.8%	£42.m	1.9%	£47.8m	1.9%	0.46%	-0.08%
Renal and urogenital	£10.9m	0.9%	£15.6m	0.8%	£21.1m	0.9%	£24.6m	1%	0.09%	-0.02%
Reproductive health and childbirth	£25.2m	2.0%	£46.7m	2.5%	£51.1m	2.3%	£54.9m	2.1%	0.12%	-0.22%
Respiratory	£11.8m	0.9%	£32.4m	1.7%	£36.3m	1.6%	£46.6m	1.8%	0.87%	0.14%
Skin	£6.m	0.5%	£9.3m	0.5%	£14.m	0.6%	£13.4m	0.5%	0.04%	-0.13%
Stroke	£11.1m	0.9%	£25.2m	1.3%	£30.8m	1.4%	£30.2m	1.2%	0.29%	-0.25%
Total	£1.24bn	100%	£1.87bn	100%	£2.16bn	100%	£2.56bn	100%		

Table 6 –Funding distribution for all contributing organisations by HRCS Health Category across the four UK Health Research Analyses 2004/05 to 2018

Disability Adjusted Life Years (DALY) comparison

There are multiple factors that influence the level of research funding in any area, including scientific opportunity, research workforce capacity, ‘researchability’ or tractability, burden of disease and fund-raising potential. Burden of disease is a factor that has previously been used as a comparator for research investment across different diseases. There are many metrics to assess burden of disease such as incidence, prevalence, mortality, morbidity and length of hospital stay. Comparison with each of these can lead to different interpretations about the appropriate relationship with research funding levels.

Disability Adjusted Life Years (DALYs) are frequently used as a measure of burden of disease. DALYs are calculated by combining two established metrics; years of life lost from mortality (YLL)³² and years lost due to disability (YLD)³³. The former uses incidence of disease and life expectancy at death as a measure of mortality whilst the latter adjusts prevalence for the severity of disease as a measure for morbidity. The resulting figure is the total number of years lost (i.e. 1 DALY = one lost year of ‘healthy’ life). The DALY rate used in this analysis is the proportion of DALY for a particular health category relative to the DALY total for the UK.

Detailed Analysis: Health Categories

Figure 7 presents a comparison of the proportion of research funding in 2018 across the health categories (all 123 funders) against the latest UK DALY rates (2016) from the WHO Global Burden of Disease Project. The Health Categories have been combined as necessary to allow appropriate comparison with the WHO Global Health Estimates (GHE) disease coding system used for DALY data. Details of this disease mapping process are available in **Appendix 7**. It is important to note that three health categories, *Inflammatory and Immune System*, *Generic Health Relevance* and *Disputed Aetiology and Other* have no equivalent GHE codes and are omitted from this comparison. Therefore only 71% (£1.82bn) of spend is represented here.

Correlation analysis shows relatively poor matching of the UK's burden of disease in DALY rates and the research funding available (Spearman's coefficient 0.66). *Cancer* received both the highest proportion of 2018 spend and highest DALY, with comparable proportions. Most Health Categories show

research funding is lower than the comparative burden of disease, with difference being significant for the categories *Musculoskeletal*, *Respiratory*, *Oral and Gastrointestinal* and combined group *Blood/Cardiovascular/Stroke*.

In contrast *Metabolic and Endocrine*, *Reproductive Health and Childbirth* and *Infection* all show a higher proportion of research funding than the corresponding UK DALY ranking. *Infection* showed the largest difference, reflecting a general trend for increased *Infection* funding, which rose by £90m between 2014 and 2018. This can largely be attributed to the top three funders (MRC, DHSC and Wellcome), with their contribution increasing from £178m to £247m. The remainder is due to new funders in *Infection* joining the analysis, such as the Department for International Development.

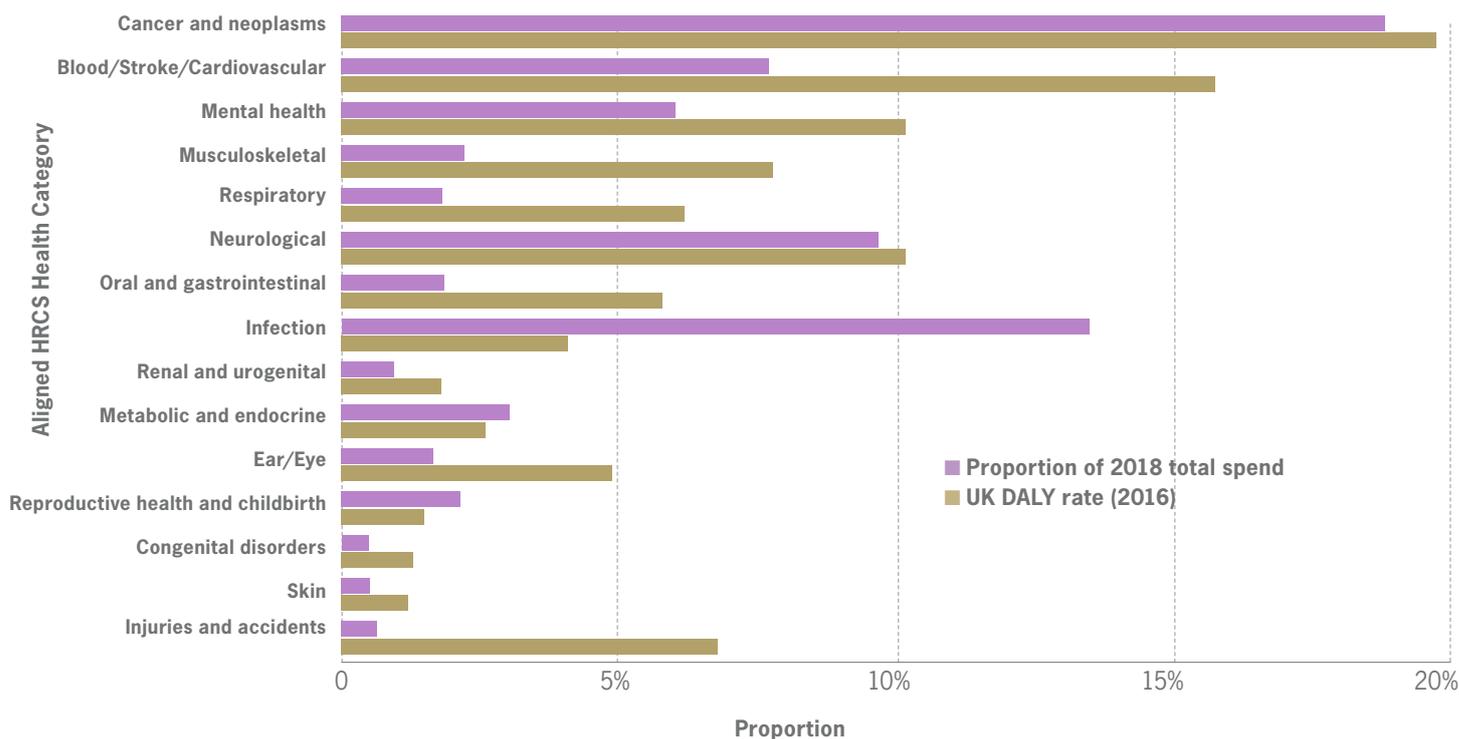


Figure 7 – Comparison of Disability Adjusted Life Years (DALY) rates for the UK in 2016 and the proportion of HRCS Health Category spending in 2018

(DFID) and Department for Environment, Food and Rural Affairs (DEFRA). An increase in the number of awards submitted by Innovate has resulted in their contribution to *Infection* funding increasing from £7.9m to £24.3m between 2014 and 2018.

While comparisons with such data are interesting, there are some important caveats which should be considered. Firstly, the burden of a disease is dependent on severity, duration and risk of premature mortality but this will not automatically correlate with the research costs involved. For example, research into *Injuries and Accidents* is part of HRCS coding and includes external injuries (fractures, burns and poisons) and intervention studies to prevent future accidents. This represents a very small proportion of research funding but the loss of life or quality of life through disability is considerable (6.8%).

Secondly, the relationship of UK research to global health issues is an important issue. While the UK's burden of disease due to infections is relatively low (4.1%), the global DALY loss due to infection is significantly higher (17.7%) and the UK research base is a key international resource for providing new avenues for treatments. With the looming threat of antimicrobial and the related risks of emerging diseases and pandemics, maintaining a research level above current disease burden conditions seems prudent given the potentially catastrophic impact of current antibiotics becoming obsolete.

Thirdly, while both HRCS and GHE disease classifications show similarities, the mapping is imperfect. In particular, there is no suitable GHE classification for funding assigned to HRCS's *Inflammatory and Immune System*, *Generic Relevant Health* and

Disputed Aetiology and Other, so 28.7% (£735m) of research funding is not included in comparison with DALY rates. There is also no method to determine GHE classification for the £1.4bn in indirect funding listed in this analysis. This report has clearly shown that the majority of health research funding is still focused on basic science and the infrastructure to support it. While the ultimate goal is to solve societal health problems, the focus of funding towards developing the capacity/capability to perform research is as important as the burden a specific disease may have on the UK population.

Finally, the outcomes resulting from research are often unexpected, particularly so for basic/fundamental or discovery science. Experience shows that research has wide spill-over benefits to areas beyond that originally envisaged. A good example of this is the recent introduction of the first CAR-T cell therapies for cancer, an approach built on fundamental studies of the immune system and methods for the genetic engineering of cells, that has made cancer immunotherapy a reality. An analysis of the economic benefits of medical research in the UK estimated a total returned investment of around 25p per year for every £1 spent³⁴. 15 to 18p of this value, calculated in a 2016 study funded by the MRC, was shown to be positive spill-over impact in the private sector. These results highlight the importance of tracking progress, productivity and quality of research, not only focusing on the details of applications funded. Managing the composition of research portfolios at the outset (inputs) as well as better understanding how this work translates into impact (by examining outputs and indicators of progress) are both important aspects of co-ordinating health research.

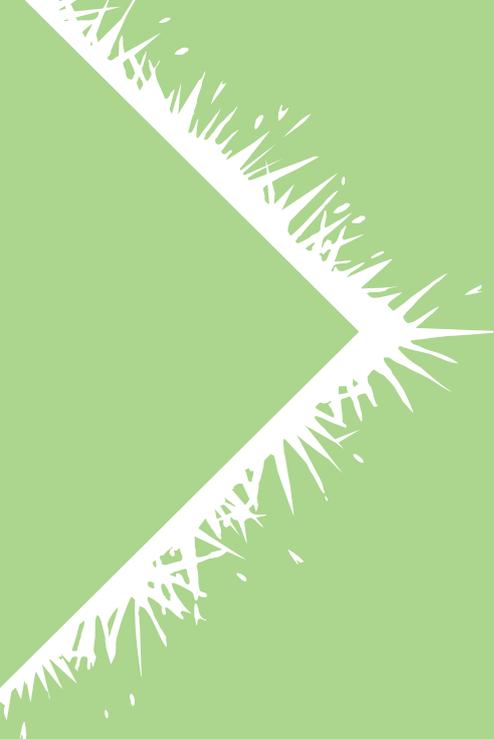
30 Examples of disputed aetiology include myalgic encephalomyelitis (ME) and Post Traumatic Stress Disorder. The Other category is also used for other social service research for at risk groups, such as young people at risk of domestic violence, and studies of animal welfare.

31 In 2014, the proportion of *Cancer* research funding provided by CRUK was 63%, however the formation of the Francis Crick Institute in 2015 was facilitated by the merger of both CRUK's London Research Institute (LRI) and MRC's National Institute for Medical Research (NIMR). Due to the nature of this analysis the research at LRI attributed to CRUK is now attributed directly to the Crick, which provided a further 7% of *Cancer* research funding. This research would be partly supported through CRUK core support contribution, which in 2018/19 was £54m. See the appropriate funder sections of **Appendix 1 – Participating organisations and qualitative submissions** for further details on Crick core contributions.

32 YLL = Number of Deaths x Life Expectancy at age of death.

33 YLD = Prevalence x Disability Weighting (a measure of disease severity)

34 For links to the research papers on economic benefits, see the "Medical Research: What's it worth?" section of the MRC Evaluating Research Outcomes webpages: <https://mrc.ukri.org/successes/evaluating-research-outcomes/>.



GEOGRAPHICAL DISTRIBUTION



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The regional distribution of health research funding across the UK

The compilation of portfolio data centrally provides an opportunity to map the directly funded research of participating organisations by geographical location within the United Kingdom (see **Figure 8** and **Figure 9** below).

As with previous analyses, London still accounts for just under one third of UK health research spend, with the South East (including Oxford), the East of England (including Cambridge) and Scotland (including Edinburgh) sharing a further 40% of UK funding (between 11% and 15% each).

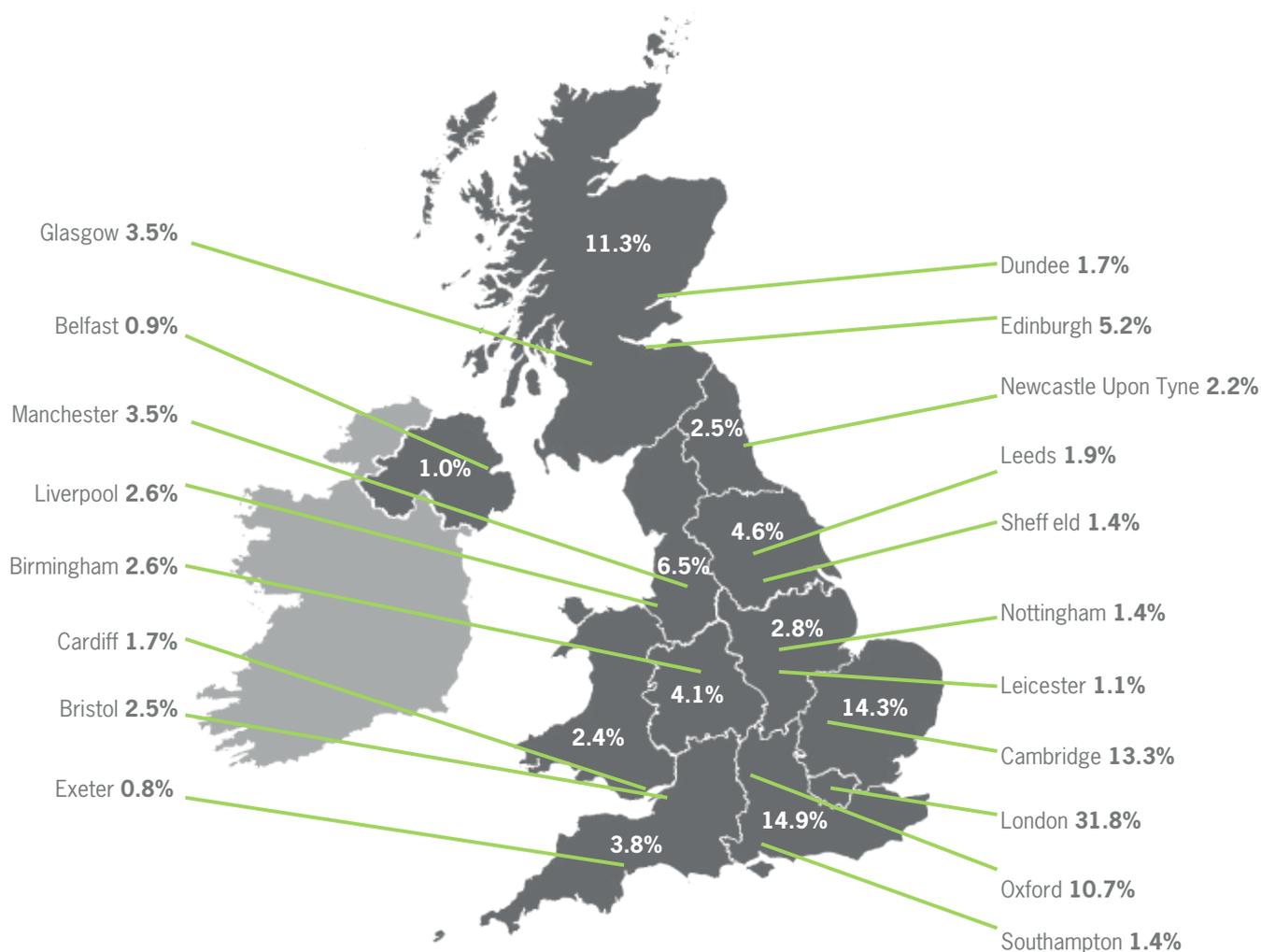


Figure 8 – Map to show regional distribution of combined research funding 2018 in the UK using NUTS level 1 codes

Geographical Distribution

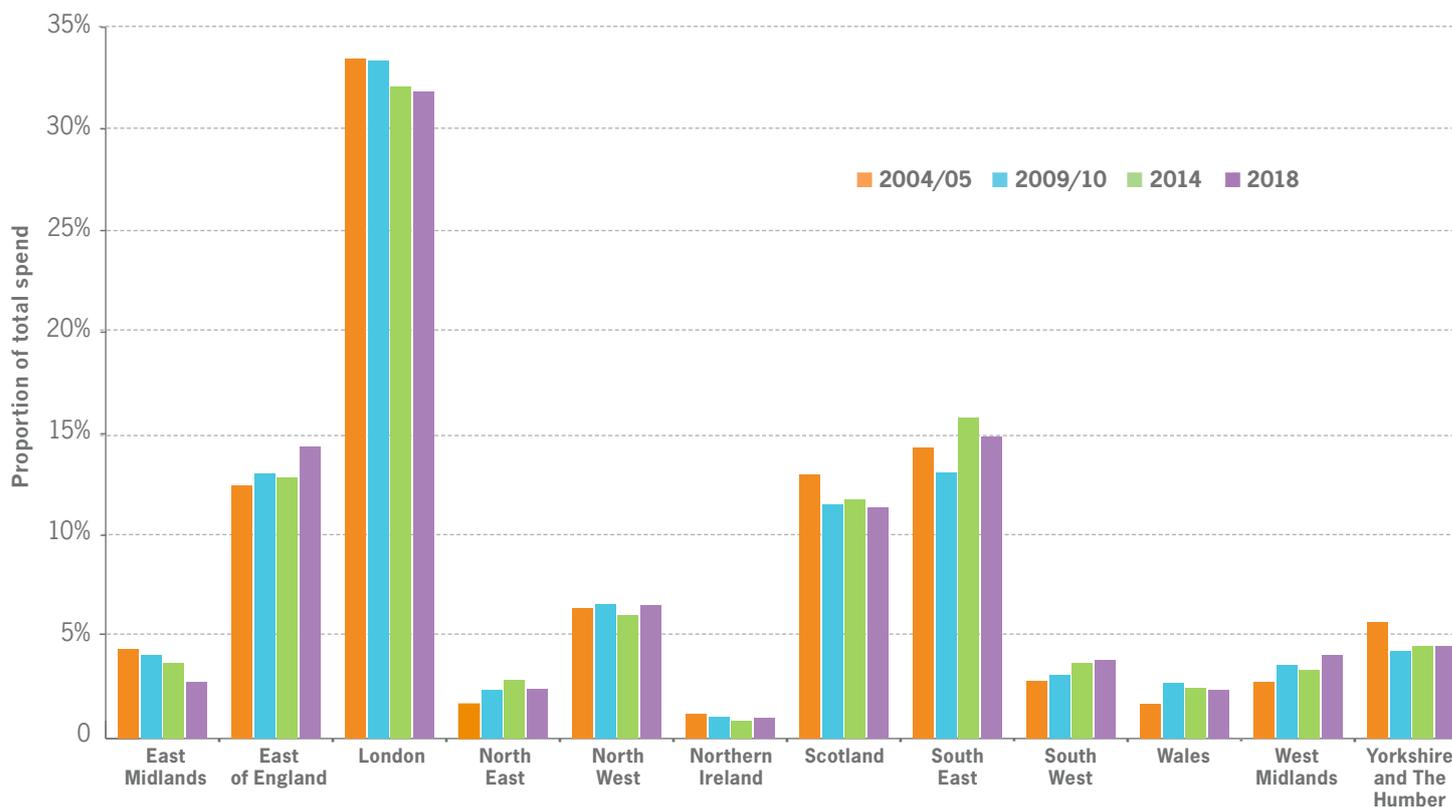


Figure 9 – Funding distribution by geographical region across the UK Health Research Analysis series

Comparison across the four UK Health Research Analysis reports show that the distribution of health research spend in the UK is stable, with less than $\pm 2.0\%$ variation in 14 years. All regions saw an increase in funding in real terms of actual expenditure. The East Midlands was the only region to show the proportion of funding to decline over the 14 years (4.4% to 2.8%, -1.6%), although expenditure in real terms still increased by £16.3m during this period. The East of England has seen a +1.9% increase in proportion of funding since 2014 however this is due to changes in how Wellcome Trust have attributed awards made to the Sanger Institute, growing from £8m in 2014 to £50m in 2018.

This trend is replicated at the city level, where funding has increased in real terms since 2004/05 and with less than $\pm 1.9\%$ variation in proportion of funding over 14 years. Both Liverpool and Oxford have shown the largest proportional growth since 2004/05, the former by $\sim 0.5\text{--}0.7\%$ per report, the latter by $\sim 1\%$ per report to 2014 but no change 2014 to 2018. The largest proportional decrease since 2004/05 was in Manchester (-1.8%, -1.1% occurring between 2009/10 and 2014). However, some cities did experience a decline in funding since 2014, the most significant being in Dundee (+£17.5m in real terms since 2004/05, but -£4.4m since 2014).

It is important to note that this analysis looks at only the lead institution for each award funded. As research projects are rarely carried out by a single institution, these results show a simplified version of a more complex picture of collaboration across the UK. For example, larger awards are more likely to

involve a range of institutions, often distributed across the UK, which would not be represented using this method.

Methodology caveats aside, the regional distribution of health research funding - particularly the clustering around London, Oxford and Cambridge - is not surprising. All three have a long history of research as well as a considerable capacity and infrastructure to support a high proportion of the UK's research funding.

For example, the [Medical Schools Council 2018 survey](#) of clinical academic staffing levels mirrors our findings in that the number of clinical academics in the UK has also remained stable over the last 14 years, with approximately a third located in London. In addition, HESA data show that roughly a third of UK HEI expenditure through biomedically-relevant departments occurs in London-based institutions. It is logical to expect that health relevant research is conducted in institutions that are active in this field and where medical schools can train and host clinical academic staff.

Likewise, proximity to the funder may be a factor. A larger proportion of spend from non-HRAF funders is concentrated in London (45.5%) compared to HRAF members (29.9%), however the difference between the combined total and HRAF is small (2.4%), largely driven by The Francis Crick Institute. Indeed, several of the non-HRAF funders are either located in the capital and/or have a specific remit to fund London institutions (e.g. hospital charities). A complete breakdown of this regional data, including by selected cities can be found in **Appendix 8**.

International funding outside the UK by UK organisations

Research is an international endeavour and researchers will routinely collaborate across national borders. The same is true of research funding. UK-based organisations support international researchers via a range of different mechanisms, including direct research funding. International researchers also benefit from UK-funded research as co-applicants on awards, as members of networks and consortia, and indirectly through research where their country will benefit from the findings.

This analysis focuses on awards made directly to a researcher where the host institution is located outside the UK. This keeps the methodology for analysis consistent with the UK-based analysis; the focus of this report series – but will be an underestimate of overall UK health research funding expenditure made overseas.

Overall, only 37 of the 123 organisations supplied us with data with at least one overseas award. In total, 841 overseas awards made to 66 different countries were submitted to the analysis with a total value in 2018 of £223m (for a geographic display by city, see **Figure 10**).

The recipient country with the most funding was the United States of America, with 38% of international funding (£84m from 115 awards), although £29m of this is due to a single award; Wellcome Trust's 2018 contribution to *The Combating Antibiotic Resistant Bacteria Biopharmaceutical Accelerator (CARB-X) programme* in collaboration with the Biomedical Advanced Research and Development Authority (BARDA), the National Institute of Allergy and Infectious Diseases (NIAID), both within the US Department of Health and Human Services, and Boston University. The second largest recipient country by funding was Switzerland (£45m from 38 awards), due to the headquarters of several international organisations being based in Switzerland, including Drugs for Neglected Diseases Initiative (DNDI), Medicines for Malaria Venture (MMV) and, of course, the World Health Organisation (WHO). A table of expenditure by recipient country is available in **Appendix 8** (ii).

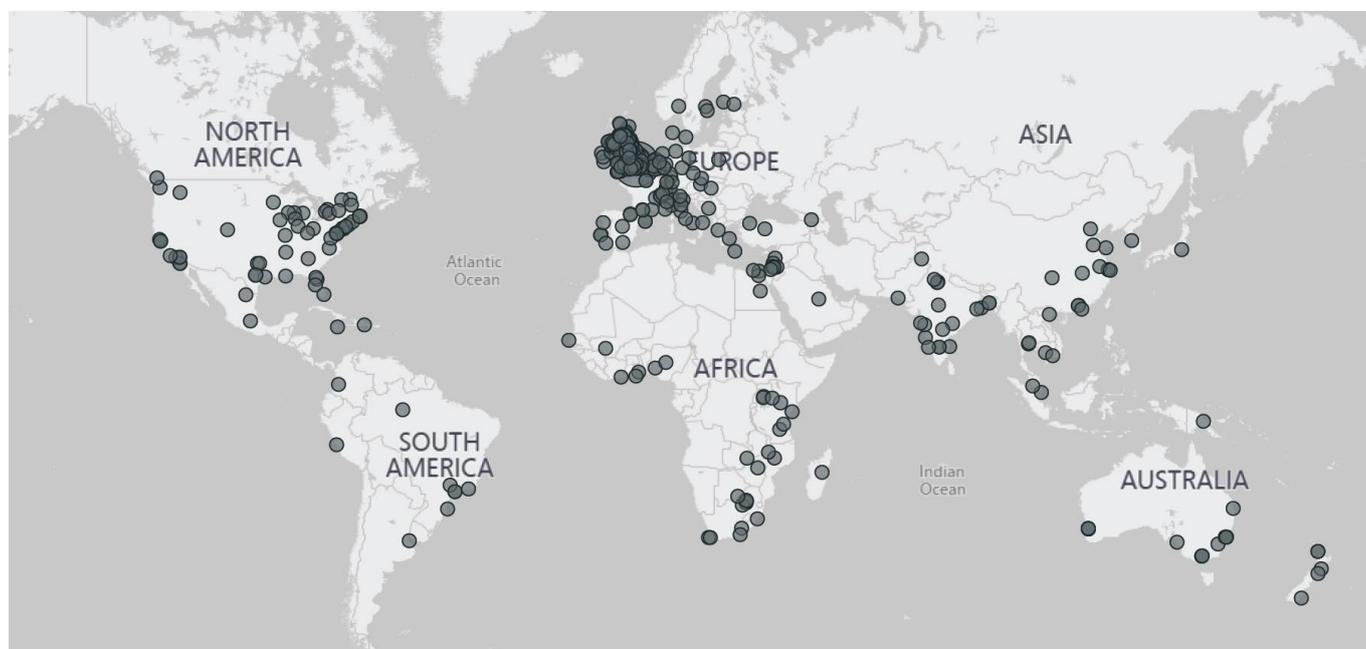


Figure 10 – Distribution by city of international awards made by UK-based organisations for the UK Health Research Analysis 2018

Note: Bubble size indicates relative value.

International funding into the UK

As an analysis of UK-based organisations funding predominantly within the UK, this report does not include an exhaustive analysis of research funding being awarded to UK-based researchers / institutions from international sources. This is partly due to very limited availability of such award information.

Access to the subscription *Dimensions* platform shows 8,426 awards active in 2018 made by funders outside the UK to UK-based institutions. Using our methodology for 2018 value, we estimate a total spend from these awards in 2018 to be £4.4bn. However, many of these awards have UK institutions as one of many partners and therefore much of this funding may not be spent within the UK. To match the methodology for our main geographic distribution analysis, we examined awards where a UK institution was the primary institution; 4,178 (with £1.2bn spend in 2018). As a proxy for health-relevance, we used the presence/absence of HRCS auto-coding; this is not definitive and has some caveats attached (see **Appendix 10** for a broader discussion of this process) but does provide us with the most directly accessible method of sampling from a large dataset. Of the 4,178 UK-funded awards only 940 had complete HRCS auto-coding. The estimated expenditure from these 940 awards was £245m. We therefore estimate that approximately 21% of total research funding from outside the UK is of health relevance.

However, a significant part of the data from *Dimensions* originates in the European Union's CORDIS database³⁶. Indeed, of the £245m identified as health-relevant, internationally-sourced UK health research funding more than 90% is from European sources; 54% directly from the European Commission and a further 38% via the European Research Council. We have access to CORDIS data directly allowing a more detailed view of where EU funding is being distributed. From this analysis we found 10,896 records of EU projects active in 2018 associated with 2,622 unique UK-based recipients with a total spend in 2018 of €1.27bn (£1.12bn)³⁷. As a proxy for health relevance, we found 1,876 records – made to 397 unique UK recipient institutions with total spend in 2018 of £236m - were matched and fully HRCS auto-coded on *Dimensions*. Of these, 790 records (£154m spend in 2018) had the UK institution as either host institution or coordinator, suggesting that UK researchers had a particularly key role in the EC-funded project.

To maximise the accuracy of the available international health research data, we combined directly collated CORDIS data of

all UK recipients with the remaining non-EC awards with UK primary institutions from *Dimensions* (215 with spend in 2018 of £17.8m) to create a combined total of £254m in spending. The HRCS auto-coding then allows us to compare the type of research being funded by international sources with our main 2018 analysis dataset:

- By HRCS Research Activity, a higher proportion of overseas health research funding is for *Underpinning* (+8.8%) but lower for *Aetiology* (-6.0%). Funding for research in *Prevention* was proportionally higher for international funders (+3.2%) while funding for *Treatment Evaluation* was lower (-4.0%). See **Figure 11** (upper panel) below.
- By HRCS Health Category, a higher proportion of overseas health research funding is for *Infection* (+7.5%) and *Neurological* (+3.2%), and a lower proportion of overseas research funding is for *Cancer and neoplasms* (-7.1%) and *Cardiovascular* (-3.1%). See **Figure 11** (lower panel) below.

International awards – just as those from domestic organisations – are won in open competition and as such the type of research funded tends to amplify UK strengths. However, the funding priorities of international funders will not necessarily align strategy in the UK. For example, the ERC awards (38% of funding) has a strong emphasis on fundamental research, with more than 80% of funding within *Underpinning* and *Aetiology*.

Note that due to both the difficulty in assigning research spend to geography and the use of HRCS auto-coding as a proxy for health-relevancy, we do not wish to over-interpret these data. However, our analysis suggests that around 20% of overseas research connected to the UK is health-relevant and this represents 9% of UK's total health research. This funding is predominantly from the European Union and shows some similarities with domestically-supported research but has a greater focus on fundamental underpinning and prevention research and a greater emphasis on infection and neuroscience. If UK researchers were to no longer be able to access European Commission funds it would create shortfalls in health research funding in general and these areas in particular, therefore requiring additional support streams to maintain the current balance of funding.

Geographical Distribution

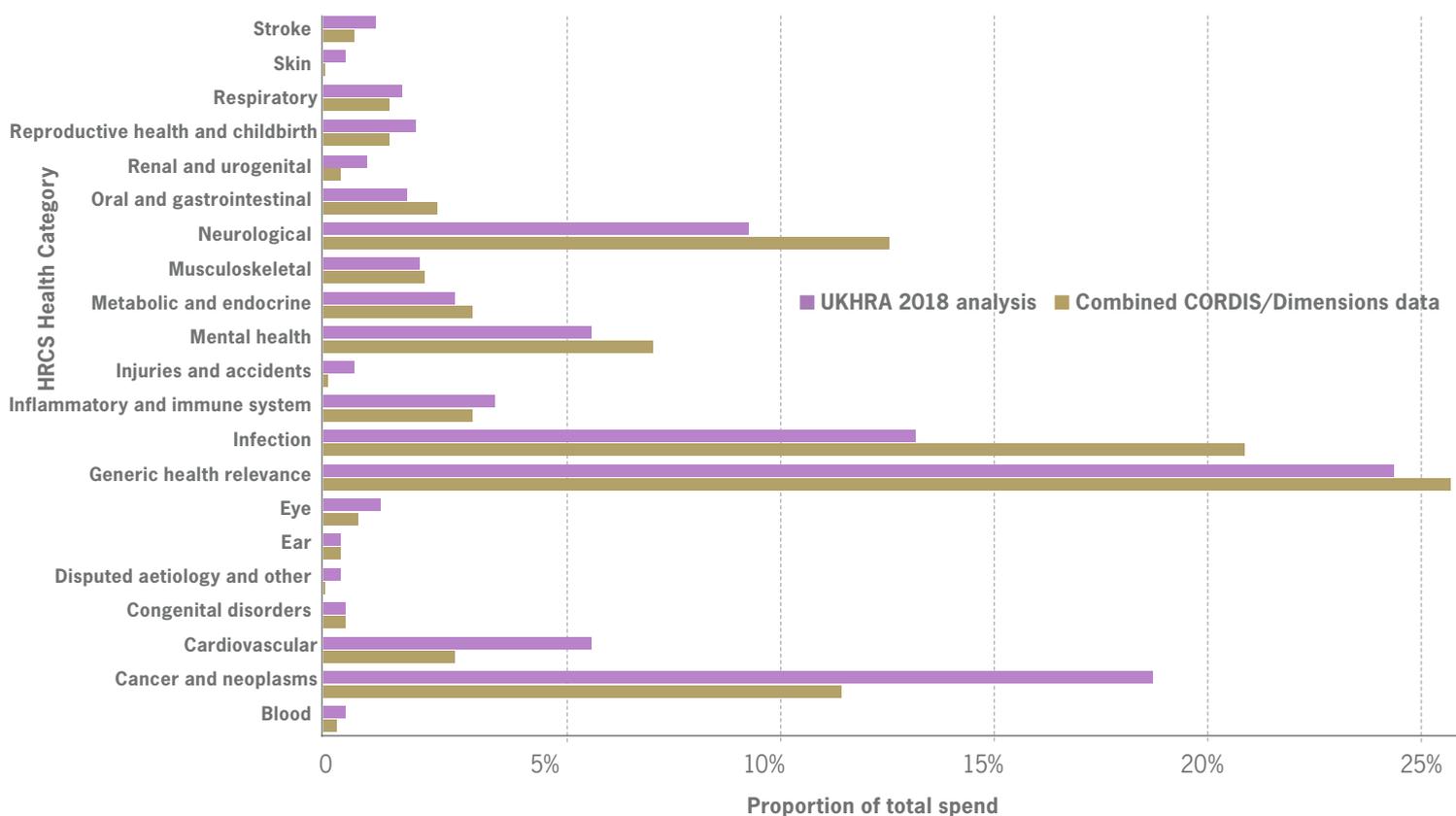
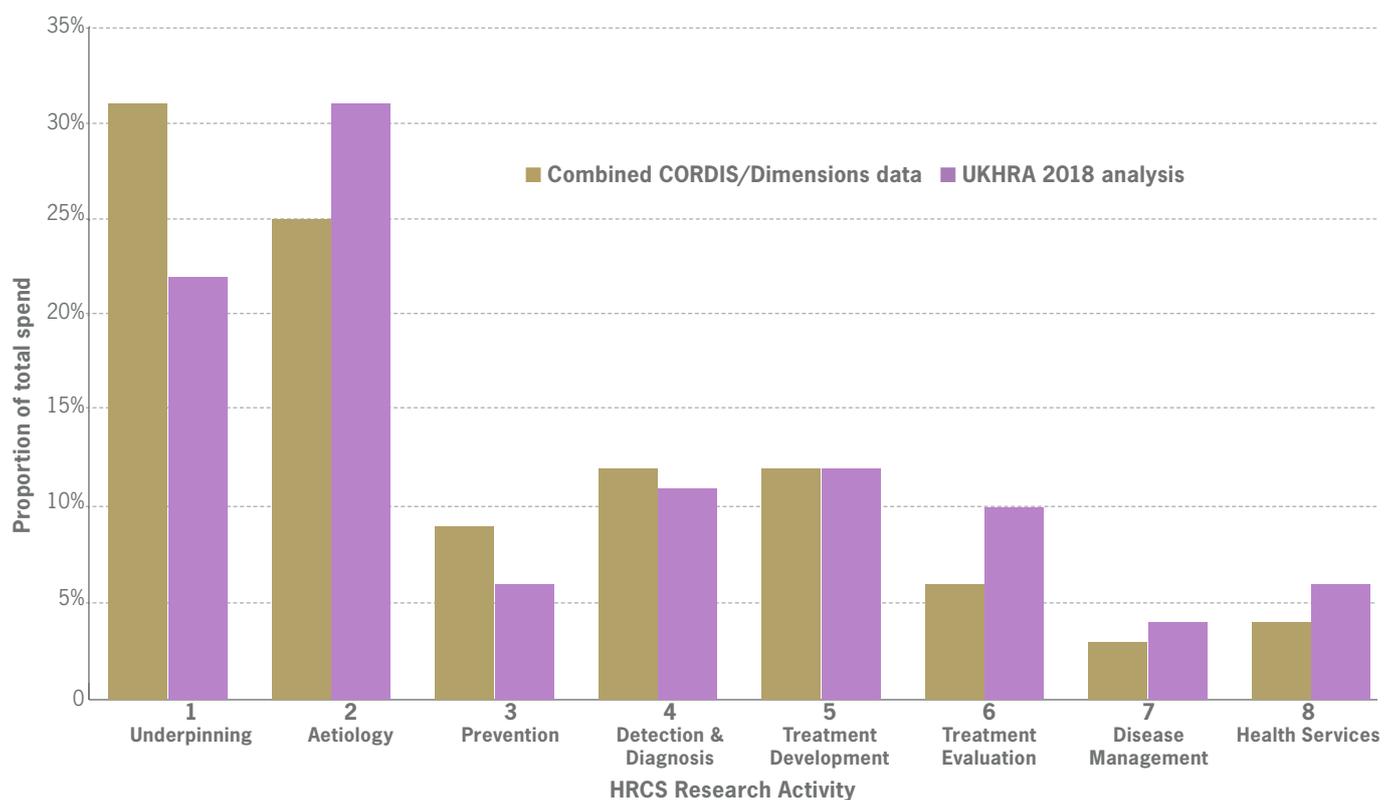
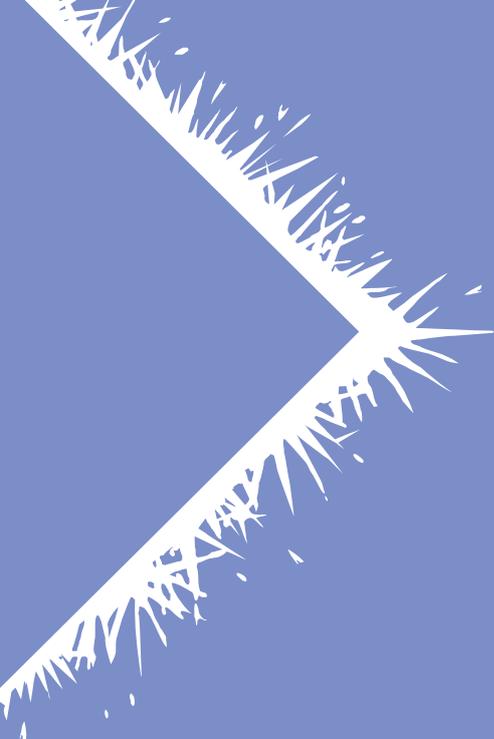


Figure 11 – Comparison of HRCS Research Activity (upper panel) and Health Category (lower panel) for international funders (a combined dataset of funding data from CORDIS and Dimensions) and the UK Health Research Analysis 2018 UK-only dataset

35 The Nomenclature of Territorial Units for Statistics (NUTS) codes are an agreed geographical classification system provided by EuroStat, the statistical office of the European Union and used by a range of Government agencies including the UK Office for National Statistics (ONS).

36 Of the 8,426 awards in Dimensions, 6,415 (76%) are from the European Union. By the 2018 value of these awards, this proportion is higher; £4.17bn, 94% of the £4.44bn total.

37 Exchange rate of 1.1305, based on ONS yearly average for 2018 <https://bit.ly/2YNcL7D>



DISTRIBUTION OF FUNDING BETWEEN CHARITY AND PUBLIC SECTOR



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Distribution of Funding between Charity and Public Sector

The current analysis increased participation from 64 funders in 2014 to 123 funders in 2018, with the inclusion of UK Government departments beyond DHSC, a range of professional associations (such as medical Royal Colleges) and a substantial number of medical charities, many of them members of the AMRC.

For the purposes of this analysis, public funders were split into two groups; UK Research and Innovation (UKRI) and other Government and Public Bodies. UKRI includes the Research Councils as reported in previous analyses - MRC, BBSRC,

EPSRC, Economic and Social Research Council (ESRC), Natural Environment Research Council (NERC) and Arts and Humanities Research Council (AHRC) - plus Innovate UK³⁸ and Science and Technology Facilities Council (STFC). The 'Government' group is primarily the UK Health Departments, but also includes the various learned societies and professional organisations not classified as charities. Funding of direct research in 2018 from Charities and not-for-profits totalled £1.11bn (44%). Funding from UKRI totalled £986m (39%) and Other Government and Public Bodies contributed £460m (18%).

Distribution of research activity funding by charity or public sector

The distribution of combined total funding by research activity is shown in **Figure 12** below. A full breakdown of the data can be found in **Appendix 9**.

The majority of Charitable spend is in *Underpinning and Aetiology* (27% and 37%, respectively), with approximately a quarter of spend in *Detection and Diagnosis* and *Treatment Development* (10% and 14% respectively) which is consistent with determining the causes of disease and developing new strategies for both early diagnosis and novel treatments. Similarly, UKRI funding also supports *Underpinning* (25%) and *Aetiology* (34%), slightly less than a quarter on *Detection and Diagnosis* (10%) and *Treatment Development* (12%)³⁹, with a slightly higher proportion of spend in *Prevention* than charities

(6.8% vs 3.0%, respectively). Overall, rank correlation analysis shows that both charities and UKRI share very similar priorities in research activity funding (Spearman's rank = 0.98) which is consistent with both organisation groups focusing both on basic science and early stage translational activity.

In contrast funding from other Government and public bodies is rarely in *Underpinning* or *Aetiology* (10%). Instead, funding is spent on *Treatment Evaluation* (28%), *Health Services* (17%) and *Disease Management* (14%), *Detection and Diagnosis* (13%) and *Prevention* (11%). This profile reflects the significant contribution of DHSC (80%) and the devolved health departments (9.2%) to the 'other Government' category, and their focus on applied health and care research.

Distribution of Funding between Charity and Public Sector

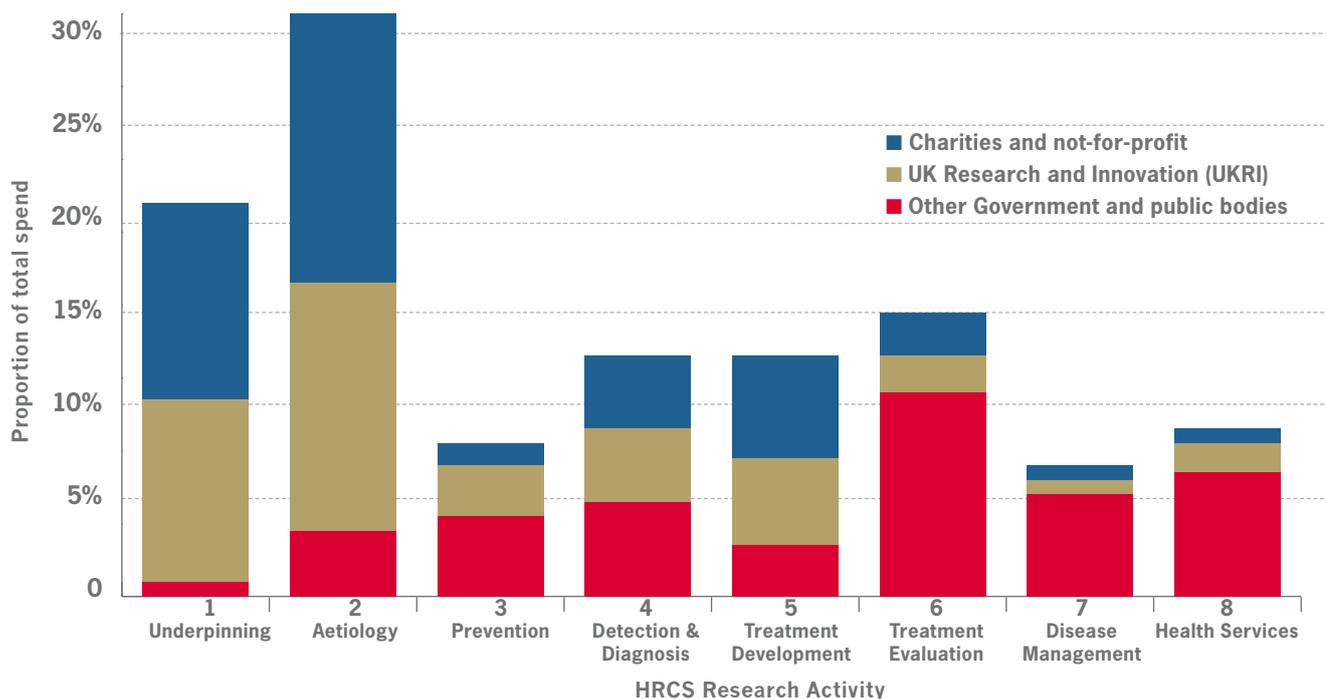


Figure 12 – Distribution of Research Activity spend by Charity and Public funders, as a proportion of combined total expenditure in 2018

Distribution of health category funding by charity or public sector

The distribution of combined total funding by health category is shown in **Figure 13** below. A full breakdown of the data can be found in **Appendix 9**.

UKRI supports the majority of *Generic health relevance* research (52.0%, £325m), which is often used in conjunction with *Underpinning* in studies of basic biological processes. Funding for *Infection* research is a somewhat shared priority, with bulk of spend attributed to the MRC (31%, £108m), Wellcome Trust (31%, £106m) and DHSC (10%, £34m).

Charities support the majority of funding for *Cancer and neoplasms* (73%, £353m), primarily from Cancer Research UK (45%, £219m) although 18 of the medium to smaller charities also have a predominantly cancer-based portfolio. Similarly, 66% (£104m) of *Cardiovascular* funding is from charities, the majority from the British Heart Foundation (55%, £86m).

The health categories where other Government and public bodies contribute the largest spend are *Injuries and accidents*, *Renal and urogenital*, *Stroke and Reproductive health and childbirth*. In general, Government support across the health categories is slightly more diffuse, with 15 of the 21 health categories receiving 2% or more of the total expenditure, compared to just 12 health categories for UKRI and 7 for charities.

While some specific health categories may be favoured by one funder type, in general all three groups distribute their funding in a similar way. Correlation analysis shows that when funding for health categories is ranked by amount funded, charities, UKRI and other Government organisations tend to prioritise in a reasonably similar way (Spearman's coefficient 0.81 to 0.93)⁴⁰. The reasons for this correlation are unclear but may relate to similar strategic priorities in public funding and/or the capacity for funding in certain areas.

Distribution of Funding between Charity and Public Sector

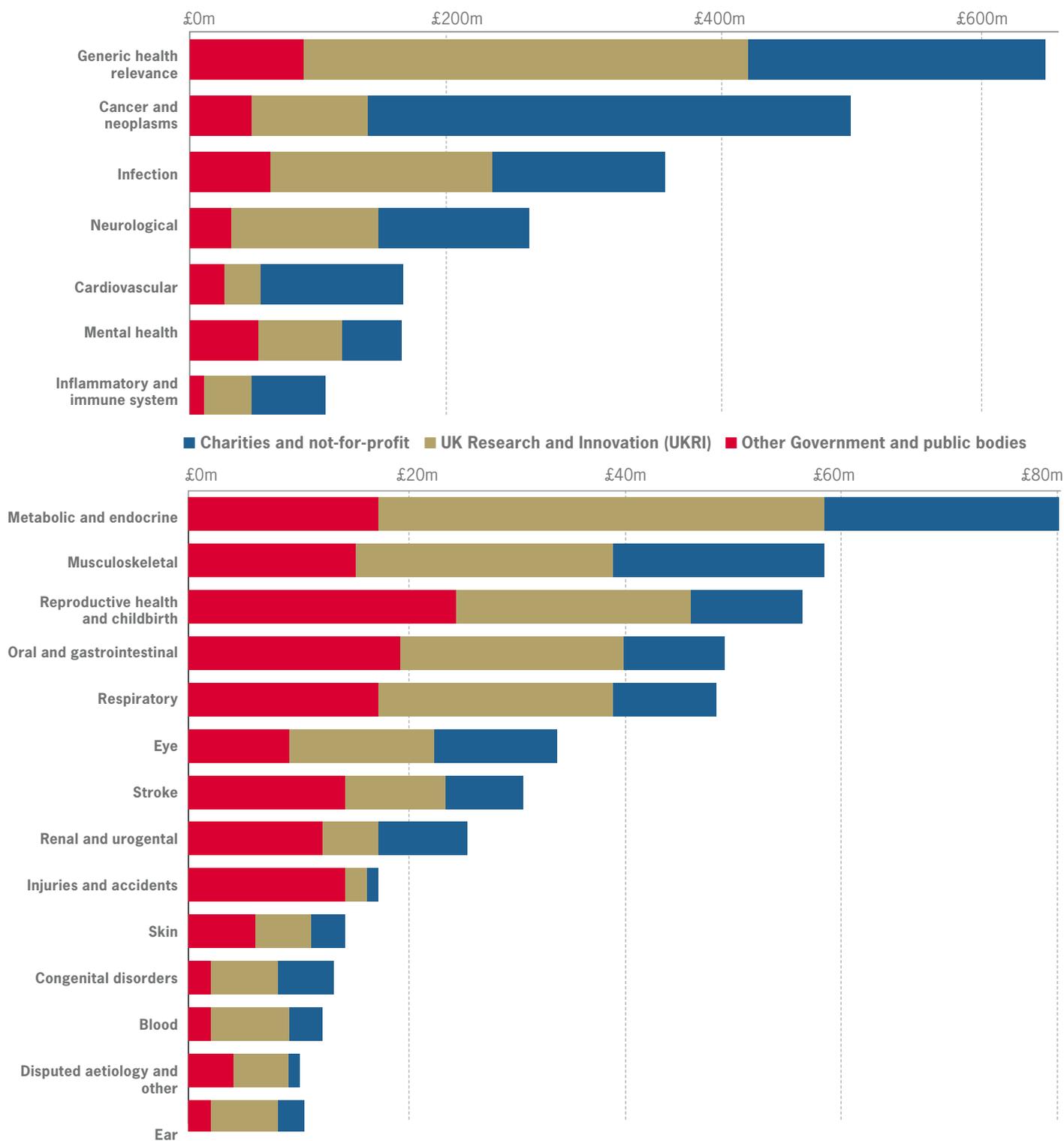
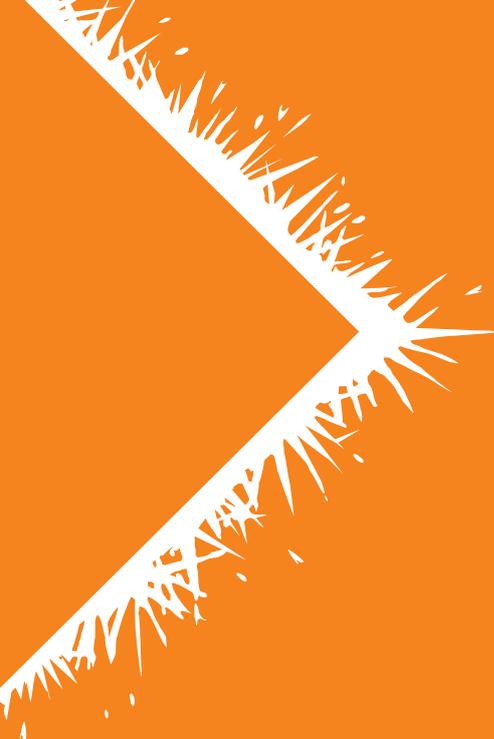


Figure 13 – Distribution of Health Category spending by Charity or Public funders, split by >£90m (upper panel) and <£90m (lower panel)

38 Note: in 2014, Innovate UK was included in the 'other Government' category, but became part of UKRI in 2018.

39 The inclusion of Innovate UK contributes a third (4%) of UKRI's spend on *Treatment Development*. The overall distribution for UKRI in 2018 (12.0%) remains similar versus RCUK and Innovate UK in 2014 (12.5%).

40 This correlation is slightly weaker than observed in the 2014 analysis (0.91 to 0.97) which may be a result of the increase in funders, representing a wider range of strategic priorities and capacities.



NEXT STEPS



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Progress and next steps

In 2014 we set several objectives for completion by the next analysis, all of which have been met by completion of this report:

- **Widening participation**
 - **Encouraging use of the analysis, including identification of research shortfalls**
 - **Expanding data sharing**
 - **Review of the HRCS**
 - **Progression of automated coding**
-
- **Widening the participation beyond core health and biomedicine**

One of the main aims for this analysis was to expand the scope to any organisations which may support health-related research. However, to do so required a considerable amount of administrative effort to identify organisations, establish suitable points of contact with knowledge of the organisation's funding and to collate information on funded research which did not necessarily fit the 'classical research grant' format. Almost three hundred organisations across the public and charitable sectors were contacted with almost half participating with either data or qualitative submissions. Indeed, the initial enquiries with new organisations provided an excellent forum for discussion which shaped our definitions of 'health' and 'research', the requirements for qualitative submissions and ultimately the report itself.

Next steps

The expansion of the 2018 analysis has provided a significant boon to the resulting analysis and dataset. This report provides a process for acquiring details of health research funding from organisations where health is only one topic in a broader funding portfolio, including information not available anywhere else. Its public collation for this analysis allows additional usage without the burden to the participating organisations. The data collection process has also expanded the awareness of the report to those with an interest in health research, which we hope will encourage wider distribution of this report and its findings to a new readership.

The most common reasons from the 143 organisations contacted but not participating were due to a lack of response to initial emails or calls or concerns over public availability of data. Unfortunately, there is little we can do to alleviate these issues, beyond continued enquiries and reassurances over data protection concerns. However, several organisations declined our invitation due to a lack of capacity to source the required data for the analysis in the time provided. This was partly due to the timing of the submission period in Q1 of 2019, building to both the financial year end and additional workload caused by on-going Brexit negotiations. However, one critique of the participation process was the complexity of the submission spreadsheet, particularly for smaller organisations which do not retain a dedicated grants management system. We would recommend that future analyses provide a simplified system to capture the key elements required for the analysis (award value, duration, location and sufficient information to HRCS code) which would be better suited to organisations outside of biomedicine and/or without a central repository of award information.

• Encouraging further use of the analysis

The primary aim of the *UK Health Research Analysis* report series is to track health research funding to establish a distribution across time, geography and the focus of research. With this fourth report we have a 14-year view of health research funding, which shows that the additional investment in the early period quickly reached a plateau and that there has been only modest growth in public and charity funding in the past ten years (which followed the economic crash in 2008/09). The reports have also shown a change in the type of research being funded, such as the increased funding for translational research topics, as well as a growing investment in infection research.

Use of the previous analyses has been extensive and we have made all the underlying data openly accessible to support further re-use and analysis (see below). One such example is

the use of UKHRA data by the Academy of Medical Sciences in their "[Improving the health of the public by 2040](#)" report from 2016, which provides key recommendations to "fully address the many complex health challenges the UK population will face in the next 25 years". The 2014 analysis provided a key evidence base for the current research landscape.

Next steps

As the number and range of participating organisations grows, so the *UK Health Research Analysis* can also grow in terms of recognition and onward use. Both the previous analyses and the HRCS continue to be used and referenced by a range of stakeholders, nationally and internationally, and the HRAF will encourage further uptake with the addition of the 2018 analysis and dataset.

• Expanded data sharing and reuse

In addition to the report, the *UK Health Research Analysis* series also publishes a complete public dataset. This allows for a replication of the report findings and further, more bespoke analysis. As with the 2014 report, the 2018 dataset contains titles and abstracts, which allows for custom searches and the opportunity for text mining for specific terms or keywords. This is exemplified in a [2017 report](#) published by Marie Curie, an AMRC member charity with a focus on care and support for people living with terminal illness, which made extensive use of the 2014 analysis data. The report - "*Does current palliative and end of life care research match the priorities of patients, carers and clinicians?*" - focused on Research Activity Code 7.2 End of life care for palliative care research and fulfilled one of the main aims behind making data from the *UK Health Research Analyses* publicly available; to identify discrepancies in research need versus expenditure and encourage new collaborations to promote funding for these research gaps.

The introduction of new data protection legislation in May 2018 has renewed the interest in what research data are held by organisations. While this did present additional concerns for the 2018 analysis, most funders are aware of the need for greater data transparency and have adjusted internal data protection policies accordingly.

Next steps

The introduction of interactive dashboards to visualise the public datasets is new to the 2018 analysis but provides a more user-friendly format to compare and contrast the results of this latest analysis. We would aim to provide similar visualisations for the previous analyses, alongside a combined dataset to allow direct side-by-side comparisons of health research funding across the 14-year reporting period.

• Review of the HRCS

Following the 2014 analysis, a full review of the HRCS was conducted by the HRAF, including stakeholder surveys from coders, report end users and the wider health and biomedical funding community. This resulted in a new website for the HRCS along with an update and expansion to the guidance for application.

In addition, the HRAF assessed report efficacy, to establish if increased report frequency would be beneficial. Analysis shows that it is productive to continue this exercise every 4-5 years, as this provides enough time to detect changes in research portfolios. More frequent analyses may not be cost effective.

• Automated coding

The costs of compiling information for this analysis continue to decline as the tools to code and analyse have improved. In particular, the launch of Digital Science *Dimensions* platform⁴¹ including the machine learning-based HRCS auto-coding has transformed this kind of analysis.

The HRCS is an [open source system](#), but the HRAF has worked closely with Digital Science in the early stages of auto-coding development. Following the release on Dimensions we have conducted a variety of assessments to compare traditional manual coding with auto-coding (see **Appendix 10**). As an independent private sector organisation, the HRCS auto-coding is only available via subscription to the wider Dimensions platform, although these proprietary tools are offered free to smaller charities. This puts some financial limits on the availability of auto-coding, but with almost half of awards in the 2018 analysis fully or partially auto-coded, there are clear advantages in terms of report costs to the use of such methods.

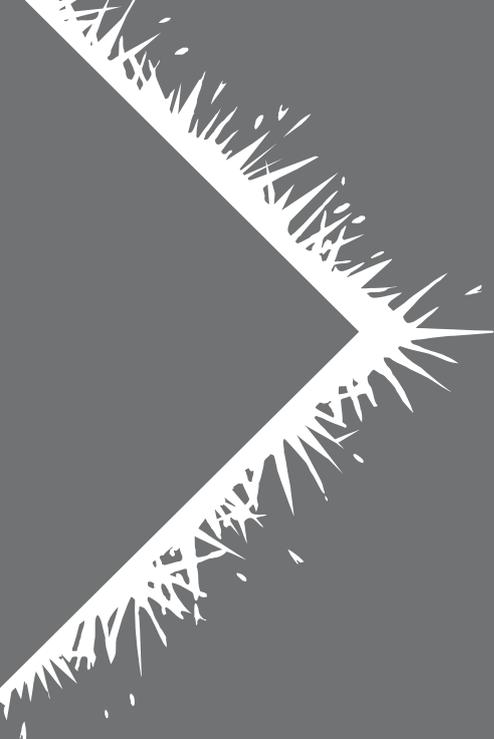
Next steps

The HRAF now records feedback from the HRCS community routinely, to allow for periodic assessment and further review as new research terms rise in prominence. As data from the *UK Health Research Analyses* continue to be collated, we will seek to perform further internal assessment to ensure the HRCS and the report series remain fit for purpose.

Next steps

While the development of new technologies presents challenges for analysis, the HRAF encourages the use and further development of new tools which aid in the collation of research data and provision of HRCS coding. Publication of the 2018 analysis dataset provides a new resource to further develop auto-coding algorithms, and the HRAF endeavours to support any organisation, whether public or private, that supports these efforts to make funding data more accessible.

41 Hook et al. - "Dimensions: Building Context for Search and Evaluation" - *Frontiers in Research Metrics Analytics*, 23 August 2018. <https://doi.org/10.3389/frma.2018.00023>



APPENDICES



igniting our potential

Appendix 1

Participating organisations and qualitative submissions

Part One – Organisations participating in the Analysis 2018

Organisation	Submission	Type	Group	Page no
Academy of Medical Sciences	Data	Multiple	Independent	85
Action Medical Research	Data	Charity	AMRC member	92
Action on Hearing Loss	Data	Charity	AMRC member	92
Alcohol Change UK	Data	Charity	AMRC member	92
Alzheimer's Research UK	Data	Charity	AMRC member	92
Alzheimer's Society	Data	Charity	AMRC member	92
Anthony Nolan	Data	Charity	AMRC member	92
Arts and Humanities Research Council	Data	UKRI	UKRI	69
Asthma UK	Data	Charity	AMRC member	93
Association of Medical Research Charities	Text only	Charity	HRAF member	58
Ataxia UK	Data	Charity	AMRC member	92
UK Atomic Energy Authority	Text only	Public	Other Public (BEIS Partner)	84
Autistica	Data	Charity	AMRC member	93
Biotechnology and Biological Sciences Research Council	Data	UKRI	HRAF member & UKRI	93
Bloodwise	Data	Charity	AMRC member	93
Bowel Cancer UK	Data	Charity	AMRC member	93
Bowel Disease Research Foundation	Data	Charity	AMRC member	93
BRACE	Data	Charity	AMRC member	93
Brain Research UK	Data	Charity	AMRC member	93
Breast Cancer Now	Data	Charity	AMRC member	93
British Association for Counselling and Psychotherapy	Data	Charity	AMRC member	94
British Council for Prevention of Blindness	Data	Charity	AMRC member	94
British Heart Foundation	Data	Charity	HRAF member & AMRC member	59
British Journal of Anaesthesia	Data	Charity	AMRC member	94
British Lung Foundation	Data	Charity	AMRC member	94
British Scoliosis Research Foundation	Data	Charity	AMRC member	94
British Sjögren's Syndrome Association	Data	Charity	AMRC member	94
British Society for Antimicrobial Chemotherapy	Text only	Professional Body	Independent	85
British Skin Foundation	Data	Charity	AMRC member	95
Cancer Research UK	Data	Charity	HRAF member & AMRC member	60
Chest Heart & Stroke Scotland	Data	Charity	AMRC member	95
Chief Scientist Office, Scotland	Data	Public	HRAF member & UK Government	60
Childhood Eye Cancer Trust	Data	Charity	AMRC member	95
Children's Liver Disease Foundation	Data	Charity	AMRC member	95
Chronic Disease Research Foundation	Data	Charity	AMRC member	95
Coeliac UK	Data	Charity	AMRC member	95
Council of Deans of Health	Text only	Professional Body	Independent	87
Crohn's & Colitis UK	Data	Charity	AMRC member	95

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Organisation	Submission	Type	Group	Page no
Cystic Fibrosis Trust	Data	Charity	AMRC member	96
DEBRA	Data	Charity	AMRC member	96
Department for Business, Energy and Industrial Strategy	Text only	Public	UK Government	75
Department for Education	Text only	Public	UK Government	76
Department for Environment, Food and Rural Affairs	Data	Public	UK Government	76
Department for International Development	Data	Public	UK Government	77
Department for the Economy, Northern Ireland	Data	Public	UK Government	75
Department for Transport	Data	Public	UK Government	77
Department for Work and Pensions	Data	Public	UK Government	78
Department of Health and Social Care	Data	Public	UK Government	66
Diabetes Research & Wellness Foundation	Data	Charity	AMRC member	96
Diabetes UK	Data	Charity	AMRC member	96
Duchenne UK	Data	Charity	AMRC member	96
Dunhill Medical Trust	Data	Charity	AMRC member	96
Economic and Social Research Council	Data	UKRI	HRAF member & UKRI	62
Engineering and Physical Sciences Research Council	Data	UKRI	HRAF member & UKRI	61
Epilepsy Action	Data	Charity	AMRC member	96
Epilepsy Research UK	Data	Charity	AMRC member	97
Faculty of Intensive Care Medicine	Text only	Professional Body	Academy of Medical Royal Colleges	89
Faculty of Public Health	Text only	Professional Body	Academy of Medical Royal Colleges	87
Fight for Sight	Data	Charity	AMRC member	97
Food Standards Agency	Data	Public	UK Government	78
Friends of EORTC	Data	Charity	AMRC member	97
Garfield Weston Foundation	Text only	Charity	Independent	105
Great Ormond Street Hospital Charity	Data	Charity	AMRC member	97
Guts UK	Data	Charity	AMRC member	97
Guy's and St Thomas' Charity	Data	Charity	AMRC member	97
Health and Care Research Wales (R&D Division, Health and Social Services Group, Welsh Government)	Data	Public	HRAF member & UK Government	63
Health and Safety Executive	Text only	Public	UK Government	79
Health and Social Care R&D Division, Public Health Agency, Northern Ireland	Data	Public	HRAF member & UK Government	64
Health Education England (Department of Health and Social Care funded)	Data (from DHSC)	Public	UK Government	66
Heart Research UK	Data	Charity	AMRC member	98
Innovate UK	Data	UKRI	UKRI	71
JDRF	Data	Charity	AMRC member	98
Kidney Research UK	Data	Charity	AMRC member	98
Leuka	Data	Charity	AMRC member	98
Leukaemia & Lymphoma NI	Data	Charity	AMRC member	98
LifeArc	Text only	Charity	Independent	105
Lister Institute of Preventive Medicine	Data	Charity	AMRC member	98
Macmillan Cancer Support	Data	Charity	AMRC member	98
Macular Society	Data	Charity	AMRC member	98
Marie Curie	Data	Charity	AMRC member	99
Medical Research Council	Data	UKRI	HRAF member & UKRI	99
Medical Schools Council	Data	Professional Body	Independent	88
Medical Research Foundation	Data	Charity	Independent	106
Medical Research Scotland	Data	Charity	AMRC member	99

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Organisation	Submission	Type	Group	Page no
Meningitis Now	Data	Charity	AMRC member	99
Meningitis Research Foundation	Data	Charity	AMRC member	100
MHA Care Group	Text only	Charity	Independent	106
Ministry of Housing, Communities and Local Government	Text only	Public	UK Government	80
MND Association	Data	Charity	AMRC member	100
Moorfields Eye Charity	Data	Charity	AMRC member	100
MQ: Transforming Mental Health	Data	Charity	AMRC member	100
MS Society	Data	Charity	AMRC member	100
Multiple System Atrophy Trust	Data	Charity	AMRC member	100
Muscular Dystrophy UK	Data	Charity	AMRC member	100
National Centre for the Replacement, Refinement and Reduction of Animals in Research	Data	UKRI	UKRI	70
National Institute for Health Research (Department of Health and Social Care funded)	Data (as DHSC)	Public	HRAF Member (& UK Government)	66
National Physical Laboratory	Text only	Public	Other Public (BEIS Partner)	81
Natural Environment Research Council	Data	UKRI	UKRI	69
Newlife The Charity for Disabled Children	Data	Charity	Independent	106
North West Cancer Research	Data	Charity	AMRC member	100
Northern Ireland Chest Heart and Stroke	Data	Charity	AMRC member	101
Nuffield Council of Bioethics	Text only	Professional Body	Independent	107
Nuffield Foundation	Data	Charity	Independent	107
Office for Standards in Education, Children's Services and Skills (Ofsted)	Text only	Public	UK Government	82
Orthopaedic Research UK	Data	Charity	AMRC member	101
Ovarian Cancer Action	Data	Charity	AMRC member	101
Pancreatic Cancer UK	Data	Charity	AMRC member	101
Parkinson's UK	Data	Charity	AMRC member	101
Pharmacy Research UK	Data	Charity	AMRC member	101
Prostate Cancer UK	Data	Charity	AMRC member	101
Public Health England	Text only	Public	Other Public (DHSC Partner)	82
Research England	Data	UKRI	UKRI	72
Royal Academy of Engineering	Data	Professional Body	Independent	86
Royal College of General Practitioners	Text only	Professional Body	Academy of Medical Royal Colleges	88
Royal College of Obstetricians and Gynaecologists	Text only	Professional Body	Academy of Medical Royal Colleges	89
Royal College of Paediatrics and Child Health	Text only	Professional Body	Academy of Medical Royal Colleges	90
Royal College of Pathologists	Text only	Professional Body	Academy of Medical Royal Colleges	90
The Royal College of Radiologists	Data	Professional Body	Academy of Medical Royal Colleges	91
Royal Hospital for Neuro-disability	Data	Charity	AMRC member	102
Royal Osteoporosis Society	Data	Charity	AMRC member	102
The Health Foundation	Data	Charity	Independent	105
The Lullaby Trust	Data	Charity	AMRC member	103
RS Macdonald Charitable Trust	Text only	Charity	Independent	107
Sands	Data	Charity	AMRC member	102
Sarcoma UK	Data	Charity	AMRC member	102
Science and Technology Facilities Council	Data	UKRI	UKRI	73
Solving Kids' Cancer	Data	Charity	AMRC member	102
Sparks	Data	Charity	AMRC member	102

Organisation	Submission	Type	Group	Page no
Sport England	Text only	Public	Other Public (DCMS Partner)	83
Stroke Association	Data	Charity	AMRC member	102
Target Ovarian Cancer	Data	Charity	AMRC member	102
Tenovus Cancer Care	Data	Charity	AMRC member	102
The Brain Tumour Charity	Data	Charity	AMRC member	103
The Cure Parkinson's Trust	Data	Charity	AMRC member	103
The Francis Crick Institute	Data	Multiple	Independent	104
The Royal College of Anaesthetists	Data	Charity	AMRC member	103
The Urology Foundation	Data	Charity	AMRC member	103
Tourettes Action	Data	Charity	AMRC member	103
UK Clinical Virology Network	Data	Professional Body	Independent	91
UK Space Agency	Data	Public	Other Public (BEIS Partner)	83
Versus Arthritis	Data	Charity	HRAF member & AMRC member	67
Wellbeing of Women	Data	Charity	Independent	104
Wellcome Trust	Data	Charity	HRAF member & AMRC member	68
Welsh Government Office for Science	Data	Public	UK Government	74
Wessex Medical Research	Data	Charity	AMRC member	104
World Cancer Research Fund	Data	Charity	AMRC member	104
Worldwide Cancer Research	Data	Charity	AMRC member	104
Yorkshire Cancer Research	Data	Charity	AMRC member	104

Part Two – Individual organisations; qualitative submissions and coding approaches

As both the number and diversity of organisations participating in this analysis has grown, we sought a short narrative from each participatory organisation. This provided an opportunity to acknowledge the role of each organisation, their broader contribution to the wider research environment, and their connection to the areas of health and biomedical disciplines. This has allowed a small number of organisations to participate even where their contribution to health research is un-quantifiable and no data are available.

Health Research Analysis Forum (HRAF)

Association of Medical Research Charities



The Association of Medical Research Charities (AMRC) was established in 1987 and is the UK's national

membership organisation for health and medical research charities. AMRC supports its members to deliver high-quality research for patient and public benefit. One of AMRC's priorities is to demonstrate the value of the medical research charity sector to the public and policy-makers using data about research activity and impact as an evidence base. AMRC coordinated the 2018 submission to the *UK Health Research Analysis* on behalf of its members for a total of 91 charities

submitted data on grants active in 2018 according to the criteria set by UKCRC. These 91 charities account for 62% of AMRC members but 97.5% of AMRC member's total UK expenditure in 2018 (£1.277bn vs £1.310bn). All grants were sent to be auto-coded through the Digital Science Dimensions platform with the exception of three charities who provided manually coded grants. Any awards that failed to auto-code were checked manually for inclusion in the indirect analysis. More information on individual charities can be found in the [AMRC member directory](#).

Biotechnology and Biological Sciences Research Council (BBSRC)



Biotechnology and Biological Sciences Research Council

The Biotechnology and Biological Sciences Research Council (BBSRC) is

part of UK Research and Innovation (UKRI), a non-departmental public body funded by a grant-in-aid from the UK government.

BBSRC invests in world-class bioscience research and training on behalf of the UK public. Our aim is to further scientific knowledge, to promote economic growth, wealth and job creation and to improve quality of life in the UK and beyond. We support research and training in universities and strategically funded institutes. BBSRC research, and the people we fund, are helping society to meet major challenges, including food security, green energy and healthier, longer lives. Our investments underpin important UK economic sectors, such as farming, food, industrial biotechnology and pharmaceuticals.

Medical research and development is outside of the remit of BBSRC and consequently the majority of BBSRC awards are found in the basic research categories 'Underpinning' and

'Aetiology'. BBSRC supports 'Bioscience for Health' providing sustained research investment to improve health and wellbeing across the life course, reducing the need for medical and social intervention. Fundamental bioscience is vital to revealing the mechanisms underlying normal physiology and homeostatic control during early development and across the lifespan into old age. The Bioscience for Health priority aims to achieve a deep, integrated understanding of the 'healthy system' at multiple levels, and of the factors that maintain health and wellness under stress and biological or environmental challenge. BBSRC's vision for research and innovation in Bioscience for Health is set out in a [Strategic Framework](#).

BBSRC invested £457 million in world-class bioscience in 2018-19 with around 20% of this portfolio classified as "bioscience for health" (defined by routine BBSRC classification procedures). Topics include healthy ageing, diet for health, regenerative biology, pharmaceuticals, one health, and personal care.

Further information on all UKRI grants can be accessed in the public domain at [Gateway to Research](#).

British Heart Foundation (BHF)



The British Heart Foundation (BHF) is the single largest funder of cardiovascular research in the UK. The BHF funds research into the causes, prevention, diagnosis and treatment of cardiovascular diseases, including research that aims to understand

and prevent cardiovascular complications of predisposing conditions. In the 2018-19 financial year, the BHF's research committee expenditure was £128.2m, including supplements made to new and existing grants.

The BHF supports investigator led research across the full spectrum of cardiovascular science, from discovery science and translational research through to clinical trials, population health sciences and, more recently, innovation in practice. The Foundation awards grants supporting projects and high value research programmes. Its personal awards span the entire career pathway, from PhD studentships to BHF professorships. The portfolio includes six Research Excellence Awards, which provide flexible funding to support multidisciplinary research and capacity building at centres across the UK; six Accelerator Awards, aimed at helping universities exploit the full potential of their cardiovascular research programmes (not included in the 2018 HRAF submission); and three Centres of Regenerative Medicine.

The BHF works in partnership with other UK and international biomedical research funders, and is part of large collaborative funding partnerships, for example, in prevention research (the UK Prevention Research Partnership) and data science (Health Data Research UK). The Foundation additionally invests in research facilities, equipment and other indirect support underpinning cardiovascular research.

The BHF manually codes all its awards using the Health Research Classification System. All research awards are classified using only one Health Category: Cardiovascular. The BHF also assigns only one Research Activity code to its awards.

The BHF submission to the *UK Health Research Analysis 2018* includes 1,015 awards that had active funding during 2018, with an overall annualised expenditure of £89m. Of this, £86m is included in the analysis of 994 direct awards. A further £3m was spent on 21 indirect awards supporting infrastructure, personal support that could not be coded using HRCS, and support for meetings or career development.

In contrast to 2014, the six BHF Research Excellence Awards and the three BHF Centres of Regenerative Medicine were included as direct awards as they comply with the criteria to be included in the 2018 direct analysis (with a resultant decrease in the amount of funding attributed to indirect support). Notably, the UK Prevention Research Partnership was not included in the *UK Health Research Analysis 2018* as the initiative did not incur direct spend in 2018.

Cancer Research UK (CRUK)



**CANCER
RESEARCH
UK**

Cancer Research UK (CRUK) is the world's largest cancer charity dedicated to saving lives through research. Our vision is to bring forward the

day when all cancers are cured, from the most common types to those that affect just a few people. CRUK funds a broad portfolio of investigator-led research, from individual projects and fellowships to large-scale team science programmes, multidisciplinary collaborations and international consortia. In addition, CRUK makes long-term investments in state-of-the-art facilities and resources to provide an outstanding research environment; facilitates networking and collaboration through international conferences and community meetings. CRUK partners with industry, charities, not-for-profits and government agencies in the UK and around the world. Supported research covers all types of cancer across all age groups, and ranges from understanding the biology of cancer to prevention, early diagnosis and treatment.

In the financial year 2018-19, CRUK's charitable research expenditure (annual research activity) totalled £442m. In this report, all active research is included except indirect or infrastructural funding. This is the same approach as that taken

for compiling the 2004/05 and 2009/10 and 2014 portfolios. Awards excluded comprise (1) awards which cannot be submitted to HRAF (e.g. awards without publishable abstracts, capital spend awards or research infrastructure not linked to a specific research code) (2) Funding for Cancer Research Technologies projects. The total amount not submitted from the annual research portfolio is approximately £119m, which is instead included in the indirect assessment. In addition, core funding for the Francis Crick Institute (£54m in 2018-19) is not included in CRUK figures but instead is reported separately as the Francis Crick Institute alongside other co-funders' contributions. It should be noted that the figures in this report relate to projects active in the calendar year 2018 and therefore will not correspond exactly with financial year values reported in CRUK's reports and accounts which can be found [here](#).

Coding approach: CRUK's projects were coded to the HRCS automatically under AMRC's contract with Digital Science. Where automated coding was not available, projects were coded by translation from the related Common Scientific Outline (CSO) or if there was no direct translation possible, projects were coded manually by research manager.

Chief Scientist Office (CSO), Scotland



**CHIEF
SCIENTIST
OFFICE**

The aim of the CSO is to support and to promote excellent research in NHS Scotland, that is likely to make a real difference to

clinical practice and the health of the citizens of Scotland. The CSO therefore gears most funding towards the applied end of the spectrum.

The CSO have included all directly funded awards that could be attributed to a set of defined research objectives. This includes our research grants and academic fellowships which were all coded in house.

Scotland contributes to the overall budget for NIHR research programmes managed by NETSCC on behalf of the UK. NIHR have coded all their projects and those projects led from Scotland have been included in the CSO funding breakdown in **Appendix 4**.

The significant balance of CSO funding is allocated as infrastructure funding to support research in the NHS, including that funded by other partners in the analysis.

Engineering and Physical Sciences Research Council (EPSRC)



Engineering and Physical Sciences Research Council

The Engineering and Physical Science Research Council (EPSRC)

is a constituent council of UK Research & Innovation (UKRI) with the mission to promote and support high quality basic, strategic and applied research and related postgraduate training in engineering and the physical sciences. Our vision is to ensure the UK is the place where the most creative researchers can deliver world-leading research with genuine economic and societal impact, supporting the Industrial Strategy ambition to make the UK the most innovative economy by 2030.

EPSRC recognises the importance of engineering and physical sciences research to health and life sciences, and a large section of our researchers are active at this interface. In 2018 EPSRC committed over £90m to new awards in engineering, physical sciences, mathematical sciences and ICT research with relevance to Health.

As part of the objectives in our 2019 delivery plan to deliver economic impact and social prosperity one of the four essential priorities identified where research and skills in engineering and physical sciences add value is for a healthy nation. We will work with partners in UKRI, the National Institute for Health

Research (NIHR), charities and the NHS to invest in research that transforms healthcare delivery and supports healthier living in the UK and worldwide. This is relevant to the Ageing Society Grand Challenge and AI & Data Grand Challenge's early diagnosis mission.

Approach to coding: EPSRC submitted all awards from its portfolio which were active during the reporting period and which were determined upon original submission by portfolio staff to have relevance to health socioeconomic theme. These awards were then auto-coded using Digital Science Dimensions platform to the HRCS.

Due to the non-biomedical nature of EPSRC's research remit some awards will be underpinning or have impact in multiple areas of health research (and other sectors beyond). Other awards will have direct relevance to health research, but it should be noted EPSRC does not normally take a disease specific focus to its funding activities in healthcare, instead encouraging researchers to solve specific health challenges they have identified in partnership with the appropriate users of that research.

Further information on all UKRI grants can be accessed in the public domain at [Gateway to Research](#).

Economic and Social Research Council (ESRC)



Economic and Social Research Council

The Economic and Social Research Council (ESRC) is part

of UK Research and Innovation (UKRI) and is the UK's largest organisation for funding research on economic and social issues. We support independent, high quality research which has an impact on business, the public sector and civil society. ESRC's total budget for 2017-18 was around £202 million. At any one-time ESRC supports over 4,000 researchers and postgraduate students in academic institutions and independent research institutes.

As one of UKRI's councils, ESRC supports both fundamental discovery research—maintaining the health of the 19 social science disciplines—and funds focused research and innovation priority areas—running schemes, competitions and initiatives which advance the frontiers of social science, often through interdisciplinary UKRI collaborations and through working with government, industry, the third sector and internationally. ESRC also maintains investments in data infrastructure (survey data and 'big data') and continues to invest in building research talent, methods and leadership. To make robust funding decisions, we secure independent peer reviews and convene expert panels to assess proposals based on quality, timeliness, potential impact, value for money and fit to the specification of the particular competition.

A proportion of ESRC's funding, through both fundamental discovery research and focused research and innovation initiatives, supports health-related research. Recent examples of health research supported by ESRC core funding are the ESRC [Centre for Lifecourse Studies in Society and Health](#) and the [What Works Centre for Wellbeing](#). Our recent Mental Health priority included commissioning eight [Mental Health Networks](#) with partner councils across URKI, an investment

totalling £7.9m. Previous ESRC priorities included Anti-Microbial Resistance. We also invest in global health research, for example through the [Global Challenges Research Fund](#) and the [Newton Fund](#). The [ESRC Delivery Plan 2019](#) outlines our current priority areas, which include 'Innovation in health and social care' and 'Inclusive ageing'. The 'Innovation in health and social care' priority has led to co-funding four large grants with NIHR, worth £16m, to investigate dementia in the areas of prevention, quality of life, support groups and end-of-life care. As part of the 'Inclusive ageing' priority ESRC is a lead delivery partner for the [Industrial Strategy Challenge Fund Healthy Ageing Challenge](#).

To collate award information for this analysis, we created a keyword search tool to capture health-related awards that incurred spend in the 2018 calendar year. A list of the keywords used is available upon request. Duplicates were removed from the list of awards returned by the search tool. The remaining grants were then manually sorted by office staff into two categories: health relevant (definitely or probably) or not health relevant. The grants that had been identified as health relevant were manually coded by an experienced external HRCS coder. A broad interpretation of health relevance was used throughout the process which reflects the contribution that the social sciences make to the health research landscape. The analysis picked up all research awards, including large scale data resources, some of which were not included in previous analyses due to a narrower interpretation of health relevant being used. Where a grant was deemed to be health relevant, the whole total of that grant was included in calculations of ESRC spend on health (in line with how grants from other funders were dealt with). Studentships were not included.

Further information on these grants can be accessed in the public domain at [Gateway to Research](#).

Health and Care Research Wales (R&D Division, Health and Social Services Group, Welsh Government)



Llywodraeth Cymru
Welsh Government



Ymchwil Iechyd
a Gofal Cymru
Health and Care
Research Wales

Health and Care Research Wales is Wales' national organisation for health and social care research, funded by the Welsh Government and led and managed by the Research and Development Division (RDD)*. Health and Care Research Wales provides an infrastructure to support and increase capacity in R&D, runs a range of responsive funding schemes, and manages the NHS Wales R&D funding allocation. More

information on Health and Care Research Wales can be found [here](#).

HRCS coded expenditure included in this report covers all active research scheme grants awarded through open, peer reviewed competition. RDD funded **70 direct awards in 2018 through Health and Care Research Wales run schemes, at a total annualised* cost of approximately £3.35m (£13.37m total lifetime commitment)**. RDD contributes to the overall budget for agreed NIHR research programmes managed by NETSCC, thus providing access to these schemes for Wales-based researchers. RDD contributed **£5.75m** in 2018

to provide Wales-based researchers with access to the Efficacy and Mechanism Evaluation, Health Technology Assessment, Health Service and Delivery Research and Public Health Research funding calls. NIHR have coded all these projects, and those NETSCC projects led from Wales have been included in our final RDD spend profile, see **Appendix 4** for details.

Infrastructure and other supportive funding of over **£30.1m** has been classified as indirect spend and includes: national clinical trials units; national research centres and units; national research support groups; Wales School for Social Care Research, along with contributions to UK research initiatives. Additional 'indirect' support for health research is provided through NHS R&D funding streams. Total R&D spend was approximately **£39.3m**, which includes 'other' funding not covered by direct awards or infrastructure funding. For more information on Health and Care Research Wales infrastructure and support, please see [here](#).

Notes: Coding of direct awards was undertaken manually by officials in RDD, while figures for indirect or other awards was generated from RDD financial data. Due to the methodology for calculating spend in this report, the total of £39.3m for 2018 differs from our own best figure for calendar year of £43.4m (based on budgets across financial years; £43.4m for 2017/18 and £42.5m for 2018/19).

Health and Social Care Division of the Public Health Authority, Northern Ireland (HSCNI)



The Health and Social Care Research and Development (HSC R&D) Division is part of the Public Health Agency, Northern Ireland.

Established in 2009, it is responsible for the administration and coordination of the HSC R&D budget on behalf of Department of Health, Northern Ireland (DoH NI). Its work is based on the principle that the best health and social care must be underpinned by knowledge, based on well conducted research, which can then be applied in the delivery of care.

The HSC R&D Division supports researchers based in Northern Ireland as well as those in Health and Social Care Trusts or other bodies who use the outputs from research findings. While the effectiveness of research performance and application depends ultimately on the skill and ability of individual researchers and users of research, the HSC R&D Division ensures that researchers can work within an environment that supports, encourages and facilitates them.

For example, the HSC R&D Division:

- funds essential infrastructure for research such as information databanks, tissue banks, clinical research facilities clinical trials units and research networks
- builds research capacity in Northern Ireland through research training opportunities
- enables research governance processes to be as efficient as possible

- creates opportunities for researchers to compete for research funding on a wider UK or international basis
- supports innovation as a means of transferring HSC R&D findings into practice
- ensures personal and public involvement (PPI) in HSC R&D

HSC R&D has made every effort to maximise reporting on the use of all funds. It is important to note that the HSC R&D Division budget is small relative to other UK Health Departments. Developments in the UK R&D landscape over the time period covered by this report have naturally driven funding allocation decisions. This has resulted in a change in the distribution and proportion of funding between direct and indirect awards with indirect R&D support proportionately increasing in order that R&D in Northern Ireland can strive for parity with other regions of the UK which receive larger per capita R&D budgets. Consequently, this has increased the emphasis for Northern Ireland researchers to seek direct R&D funding from national funding sources. The indirect awards included under infrastructure encompass the clinical research networks and centres providing specialist research services and support; some examples of the latter include HSC Innovations, The NI Clinical Trials Unit and The NI Biobank.

In 2018 there were a total of 157 active awards in our portfolio across the various categories in the report. Direct awards were coded using the HRCS by a freelance coder.

Medical Research Council (MRC)



The Medical Research Council (MRC) is part of UK Research and Innovation (UKRI) and invest in health

and medical research on behalf of the UK tax payer. The heart of our mission is to improve human health through world-class medical research. To achieve this, we support research across the biomedical spectrum, from fundamental lab-based science to clinical trials, and in all major disease areas. We do this by providing research grants and career awards to scientists.

Our funding opportunities are either:

- **Researcher-led:** Regular, continuous funding opportunities. Proposals are reviewed at board and panel meetings. Funding is available for any area of science relevant to the MRC, to eligible groups and individuals, offering funding on a range of scales, across career stages, from fundamental to translational research.
- **MRC strategic:** Funding opportunities in a specific research area defined by the MRC, usually for a one-off call or a time-limited period. Proposals may have special application and review mechanisms.
- **Longer term investments:** We also support research through our institutes, units and centres. Some are highly focused on specific science areas, others have a very broad research remit. The intention is to address important scientific opportunities and health needs when stand-alone grant support alone is insufficient.

The MRC routinely codes all awards using the HRCS. This work is carried out by staff in the research programmes group at MRC Head office. Periodic peer review between the internal coders is carried out to ensure a consistent approach from the coding community.

All awards which had active MRC funding during 2018 were selected for this analysis. This included standard grants, studentships, fellowships and programme grants made to MRC

University Units and Institutes. For co-funded awards, the award amount provided was the MRC contribution. For awards where funding was provided by MRC for only part of the year a pro-rata annual award amount was supplied.

MRC programmes have been presented as the figures attributed to each programme during the 2017/18 financial year. These types of awards include both direct research funding and the provision for staff, administrative and infrastructure/equipment, meaning they meet criteria for both direct and indirect analyses. To ensure consistency with previous reports, these awards are fully coded and included in the main direct analysis.

Funding for MRC studentships is primarily via Doctoral Training Partnerships (DTPs) awarded to research organisations (ROs), from which the ROs select outstanding candidates for projects which align to both their and MRC's remit and strategic priority areas. Details of the individual studentships supported are inputted by the ROs in to the Je-S administration portal where MRC can then extract the data and complete HRCS coding. In 2017/18 there were 1,475 students active with an estimated spend of £27.7m - based on MRC's minimum stipend values adjusted accordingly for inside/outside London weighting - fees and duration within 2018. Although 99% of studentships were coded any without sufficient detail are included as part of MRC's indirect submission. Studentships awarded before January 2018 have different data protection policies in their terms and conditions and we have therefore anonymised award information in the public dataset.

MRC provided approximately £24m in infrastructure support in 2018. This is significantly lower than the previous report as much of the MRC's indirect expenditure reported in 2014 was to support the construction and establishment of the Francis Crick Institute. The Crick is now fully established as an independent organisation and is included separately in this analysis.

Further information on all UKRI grants can be accessed in the public domain at [Gateway to Research](#).

Department of Health and Social Care (DHSC)



The Department of Health and Social Care primarily funds health and social care research in England through

the National Institute for Health Research (NIHR). The NIHR works closely with the devolved administrations in Scotland, England, Wales and Northern Ireland which co-fund several NIHR programmes.

In addition to its national role, the NIHR supports applied health research for the direct and primary benefit of people in low- and middle-income countries, using UK aid from the UK government.

HRCS coded spend includes:

- All NIHR research programmes
- All NIHR fellowships EXCEPT those where we do not have project details and all specialty training posts that are awarded through the Integrated Academic Training Programme
- All other NIHR direct research spend (i.e. non-core support costs) at the Biomedical Research Centres, Blood and Transplant Research Units, Collaborations for Leadership in Applied Health Research and Care, Health Protection Research Units, Medtech and In vitro diagnostics Co-operatives, School for Primary Care Research, School for Public Health Research, School for Social Care Research and Patient Safety Translational Research Centres
- DHSC direct research spend (i.e. non-core support costs) at the Health Innovation Challenge Fund.
- DHSC direct research spend contributions to joint funding grants where coding information was provided by other partner organisations.

Indirect spend includes:

For NIHR infrastructure this includes Clinical Research Network costs and other types of research infrastructure and core support at the Biomedical Research Centres, Blood and Transplant Research Units, Collaborations for Leadership in Applied Health Research and Care, Clinical Research Facilities, Clinical Trial Units, Experimental Cancer Medicine Centres, Health Protection Research Units, HEE/NIHR Integrated Clinical Academic Programme, Medtech and In vitro diagnostics Co-operatives, MRC/NIHR Phenome Centre and NIHR Biosample Centre, NIHR Integrated Academic Training, NIHR Research

Methods, Policy Research Programme Units, Patient Safety Translational Research Centres, Research Design Service, School for Primary Care Research, School for Public Health Research, School for Social Care Research, Senior Investigator Award, Surgical Reconstruction Microbiology Research Centre and Systematic Reviews Programme (Infrastructure).

For DHSC funding this includes infrastructure spend that supports AMR Capital funding, Clinical Record Interactive Search, Health Innovation Challenge Fund and UK Biobank.

Data coding and verification

NIHR research and training programmes are coordinated and managed by the NIHR Academy, the NIHR Central Commissioning Facility (CCF) and the NIHR Evaluation, Trials and Studies Coordinating Centre (NETSCC).

At NIHR Academy, Fellowships are double-coded by two trained coders. Coding was done on project abstracts or descriptions. At CCF, all programmes were externally coded and then checked by trained internal coders. At NETSCC, research programmes were coded by trained programme managers and then checked by different internal coders. The Global Health Research programme underwent a further coding check with the Department of Health and Social Care. Coding at CCF and NETSCC was done on project abstracts.

CCF manages the key parts of the NIHR Infrastructure (separate from the Clinical Research Networks) which was 73% coded by Dimensions auto-coding with 27% coded by a trained internal coder. The coding was based on detailed research descriptions for each theme within an award. A proportion of this Infrastructure spend is considered as direct spend and is included in the main analysis. This covers Biomedical Research Centres, Blood and Transplant Research Units, Collaborations for Leadership in Applied Health Research and Care, Health Protection Research Units, Medtech and In vitro diagnostics Co-operatives, School for Primary Care Research, School for Public Health Research, School for Social Care Research and Patient Safety Translational Research Centres.

For Devolved Government Funding (NIHR Contributions) see Appendix 4 for more details.

Versus Arthritis



Versus Arthritis is a leading UK charity dedicated to improving the quality of life for people with arthritis. Our vision is a world

where people no longer have to suffer the pain, isolation and fatigue that arthritis causes to over 10 million people. Versus Arthritis provides funding to support a broad range of arthritis research including basic discovery led concepts, clinical trials, health studies and challenging frontier areas such as pain. Our portfolio of around 300 awards sustains and develops world class musculoskeletal (MSK) researchers, teams and Centres of Excellence creating a galvanized community working to deliver new treatments and services faster to people with arthritis. We work extensively in partnership across sectors to raise awareness of the debilitating nature of MSK conditions and to encourage others to join with us in our research endeavours.

The awards excluded in this report are endowed chair awards (providing a lump sum fund to boost financial investments in recipient host universities including academic and technical

salaries, infrastructure and research facilities supporting MSK research). This investment in 2018 accounts for the difference between the charity's research expenditure for financial year 2018/2019 (£23.1m, including indirect and infrastructure expenditures) and the spend for calendar year 2018 as illustrated in this report (£22.8m, including indirect and infrastructure expenditures).

Versus Arthritis has been manually coding research awards since 2015 including the data submitted for this report. Each award was coded by two coders who have received training provided by MRC. They worked independently and then decided the final codes by comparing and discussing their work. Where necessary a third MRC trained coder was brought in to help reach final consensus.

Wellcome Trust



Our founder, Sir Henry Wellcome, was a medical entrepreneur, collector and philanthropist. How we work today reflects the breadth of his interests and his conviction that health can be

improved when research generates, tests and investigates new ideas. Our governance is based on an updated version of Henry's will.

Today, we have a £25.9 billion investment portfolio which funds all the work we do. In the next five years, we plan to spend around £5 billion helping people across the world explore great ideas.

We directly fund thousands of scientists and researchers around the world at every step of the way from discovery to impact. Our funding schemes offer grants across biomedical science, population health, medical innovation, humanities and social science, and public engagement. Our grants fund 15,000 people in almost 500 different organisations in over 100 countries worldwide. We want to understand the processes underpinning life, and what happens when those processes go wrong. Most of our funding in biomedical science and population health goes to individuals and teams asking questions which have the potential to address a major health need. We also increase the impact of this funding by supporting:

- research centres and institutes that bring together different disciplines in one area of research or innovation
- research at scale that has the potential to transform key areas of science
- research in Africa and Asia, since to improve health we need to act in the locations where health challenges are greatest.

Our areas of research include:

- Genetics, genomics and molecular biology: understanding how genes, proteins and other molecules work together to perform the functions of life and what happens when these functions go wrong.
- Infectious disease and the immune system: from endemic and epidemic infections, such as malaria and Zika, to the role of the immune system in health and disease.

- Cell and developmental biology: how cells function and interact with their environment, and how organisms form, grow and develop.
- Physiology and non-communicable disease: how the human body works, and the mechanisms of diseases such as diabetes, obesity and stroke.
- Neuroscience and mental health: understanding the brain and mind, and investigating conditions such as dementia, depression and schizophrenia.
- Population health research: understanding the causes and consequences of health and disease in populations. We also want to determine how good health and poor health are distributed through populations. Studying how infectious diseases are distributed and transmitted in populations. Supporting longitudinal population studies, which follow individuals over long periods of time. Improving healthcare systems and education. Helping translate research into real-world changes that improve people's lives.
- Humanities and social science research: Science research alone can't always improve people's health. Social, historical, ethical and cultural factors also shape how people experience health. We support research in humanities and social science, spanning a wide range of disciplines and using diverse methods to investigate a large breadth of topics. We encourage collaboration and the sharing of ideas. By working together, humanities and social science researchers, healthcare professionals and scientists can find new ways to think about health and overcome challenges.

We identify areas in which Wellcome can lead significant change within five or ten years, aiming to transform the global response to some of today's biggest health challenges. One of our priority areas is Our Planet, Our Health. It supports research into how we're changing our environment and how these changes affect our health.

Through partnerships across the world, we advocate to ensure that good research is well supported, and that health is improved by changes to policies and practices based on evidence.

UK Research and Innovation (UKRI)

Four of the nine UKRI partners are members of the HRAF. The remaining UKRI partners all contributed data for this analysis.

Arts and Humanities Research Council (AHRC)



**Arts and
Humanities
Research Council**

The AHRC funds world class research across the breadth of the

arts and humanities. One of the key research themes that the AHRC supports is health and wellbeing, which has been developed since 2007 via a wide range of calls that recognise interdisciplinarity and joint initiatives with the other Research Councils within UKRI. Funds are awarded to research projects both through our standard responsive mode schemes that operate with open deadlines and strategically targeted calls that seek to fund projects addressing a specified theme that operate with set deadlines.

Our health portfolio covers a wide range of approaches to, and perspectives on, health and wellbeing. It includes research that seeks to address issues in demographic change and healthy ageing; mental health and resilience; health challenges

in international development contexts; historical and cultural perspectives on health challenges, and arts interventions that attempt to bring positive impacts to health and wellbeing. All of these themes can be seen to be reflected in the project data submitted.

The data presented in this analysis were based on keyword searches on our database of funds awarded across the AHRC's portfolio (comprising research grants, fellowships and studentships) that were active during the calendar year 2018. During this year, there were 33 active grants that fall into the health remit, and a further 28 awards AHRC co-funded with other councils within UKRI. This represents a total funding amount of £3.1m in this analysis. The HRCS codes were then applied to the dataset of projects manually to complete the submission.

Further information on all UKRI grants can be accessed in the public domain at [Gateway to Research](#).

Natural Environment Research Council (NERC)



**Natural
Environment
Research Council**

The Natural Environment Research Council (NERC) is part of

UK Research and Innovation (UKRI) and advances the frontier of environmental science by commissioning new research, infrastructure and training that delivers valuable scientific breakthroughs. We do this because understanding our changing planet is vital for our wellbeing and economic prosperity.

This is the second submission by the NERC and is based upon active grants during 2018 associated with NERC's Environment & Health science topic classification. These grants are worth £6.7m in terms of annualised spend, calculated assuming a flat spending profile across the life of the grants.

However, because much of the metadata was only available in NERC's grants system, the health research embedded within NERC's national capability funding was not covered – national capability being a large component of the funding for NERC's

six established centres: The British Antarctic Survey (BAS), the British Geological Survey (BGS), the Centre for Ecology and Hydrology (CEH), the National Centre for Atmospheric Sciences (NCAS), the National Oceanography Centre (NOC) and the National Centre for Earth Observation (NCEO).

One such example of national capability is the work carried out by NCAS which uses advanced measurement techniques and specialist facilities to investigate the exact molecular composition of pollution particles, contributing to medical research into what air pollutants do in our bodies and how pollution causes disease. Measurements, modelling and analysis undertaken by NCAS will support the next generation of medical research to inform government controls and regulations enabling focus on the chemicals and materials with the greatest health effects. For more information see [here](#).

Further information on all UKRI grants can be accessed in the public domain at [Gateway to Research](#).

National Centre for the Replacement, Refinement and Reduction of Animals in Research (NC3Rs)



National Centre
for the Replacement
Refinement & Reduction
of Animals in Research

The National Centre
for the Replacement,
Refinement and
Reduction of Animals

in Research (NC3Rs) is a scientific organisation dedicated to replacing, refining and reducing the use of animals in research and testing (the 3Rs). It uses the 3Rs to accelerate scientific discovery, support innovation and technology development and address societal concerns about animal research. It achieves this by funding research and knowledge transfer, supporting training and career development, stimulating changes in policy, practice and regulations and working collaboratively with academia and industry.

Awards can be in any area of medical, biological or veterinary sciences related to the 3Rs and span multiple disciplines such as the life sciences, engineering and mathematics. We have a number of funding schemes to support our activities namely; Project grants, Fellowships, Infrastructure awards, Skills and Knowledge Transfer grants, PhD Studentships and Strategic awards. Awards made under our CRACK IT scheme, which aims to accelerate the availability and commercialisation of 3Rs technologies, have not been submitted as part of this

exercise. All our grants undergo peer-review (external, panel or both) as part of the review process prior to an award being made. Reviewers must evaluate awards on both their scientific excellence as well as their potential to achieve a measurable 3Rs impact.

We have shown that research focused on the 3Rs leads to impacts that can benefit human health. A significant proportion of our portfolio aims to apply the 3Rs to models of disease and the safety assessment of pharmaceuticals and chemicals.

In 2018, we made 31 awards across our schemes, excluding CRACK IT, totalling a commitment of £4.7 million (including £270k of co-funding from the British Heart Foundation).

This is the second time that the NC3Rs has taken part in the HRCS data analysis exercise. All data for the coding was taken from the grants management system, Siebel, and grant proposal forms submitted via the joint electronic submission system, Je-S. Coding was completed by the MRC on behalf of the NC3Rs.

Innovate UK



Innovate UK is part of UK Research and Innovation, a non-departmental public body funded by a

grant-in-aid from the UK government. We drive productivity and economic growth by supporting businesses to develop and realise the potential of new ideas, including those from the UK's world-class research base. With a strong business focus, we drive growth by working with companies to de-risk, enable and support innovation. We fund business and research collaborations to accelerate innovation and drive business investment into research and development.

Our support is available to businesses across all economic sectors, value chains and UK regions. Since 2007, we have invested around £2.5 billion in core grant funding to help businesses across the country to innovate, with match funding from industry. We have helped 8,500 organisations create around 70,000 jobs and added an estimated £18 billion of value to the UK economy. All our grants are awarded competitively, with applications going through an independent technical assessment, typically by five assessors. For more information, visit our [Government webpages](#).

Further information on all UKRI grants can be accessed in the public domain at [Gateway to Research](#).

Data notes

Innovate UK provided a portfolio of projects relating to all aspects of Health and Care, including areas of strategic importance such as Stratified Medicine, Regenerative Medicine and Independent Living. This portfolio is predominantly focused on projects awarded through specific Health and Care interventions but also includes:

- Applicant assigned 'innovation areas' - Advanced therapies; Affordable healthcare through big data solutions; Diagnostics, medical technology and devices; Digital Health; Enhancing food quality; Precision Medicine; Preclinical technologies and drug target discovery; Therapeutic and medicine development – where available
- Innovate UK assigned 'themes' – Healthcare; Precision & Discovery Medicine

It does not include:

- Basic bioscience
- Bioscience or Life Science projects where the work is primarily on agriculture, such as livestock or crop health

All grants included in the analysis were active in 2018. Every grant in the analysis was awarded following expert review. This included Biomedical Catalyst, Digital Health Catalyst, Precision Medicine and Medicines Manufacturing funding. The number of health-related projects submitted to the analysis was 808 (408 direct awards, 400 awards in the indirect assessment), with a total 2018 value of £186m and total commitment from Innovate UK of £708m. The total number of active projects in 2018 from all funding mechanisms was 4,217; total commitment from Innovate UK for these projects was £4.5bn.

Research England



Research England is a new council within UK Research and Innovation. Established by the 2017

Higher Education Research Act, Research England is formed of the research and knowledge exchange functions of the former HEFCE. We oversee UK Research and Innovation's England-only functions in relation to university research and knowledge exchange. This includes providing grant funding to English universities for research and knowledge exchange activities; developing and implementing the Research Excellence Framework in partnership with the UK Higher Education funding bodies; overseeing the sustainability of the Higher Education research base in England; managing the £900 million UK Research Partnership Investment Fund (UKRPIF) and the £100 million Connecting Capability Fund (CCF); and administering the Higher Education Innovation Fund (HEIF).

From the total nearly £2.2 billion budget, Research England allocates individual amounts to each higher education institution in England according to criteria that are largely based

on the quality of research and knowledge exchange activity the university carries out. For a more detailed explanation of recurrent and capital funding, what it supports and how it is allocated, see the booklet [Research England: how we fund higher education institutions](#).

The grants submitted to this analysis were collected from the eleven UKRPIF (£188.4m) and five CCF (£24.6m) projects that relate to the health sector and that were in receipt of funding during the calendar year 2018. As capital projects, these are included in the indirect assessment section of this analysis. Institutions are not required to report to Research England the sectors supported by their annual recurrent grants, so this information is not available for inclusion in the analysis.

Further information on all UKRI grants can be accessed in the public domain at [Gateway to Research](#).

Science and Technology Facilities Council (STFC)



**Science and
Technology
Facilities Council**

Formed in 2007,
STFC is a world-
leading multi-
disciplinary science

organisation with a clear mission: to deliver economic, societal, scientific and international benefits to the UK and to the world. Established in 2018, UK Research and Innovation (UKRI) is a new body which works in partnership with universities, research organisations, businesses, charities, and government to create the best possible environment for research and innovation to flourish. UKRI brings together the seven research councils, including STFC, Innovate UK and Research England.

STFC's strength comes from our distinct but interrelated functions:

- **Universities** - we support university-based research, innovation and skills development in astronomy, particle physics, nuclear physics, and space science
- **Scientific Facilities** - we provide access to world-leading, large-scale facilities across a range of physical and life sciences, enabling research, innovation and skills training in these areas
- **National Campuses** - we work with partners to build National Science and Innovation Campuses based around our National Laboratories to promote academic and industrial collaboration and translation of our research to market through direct interaction with industry
- **Inspiring and Involving** - we help ensure a future pipeline of skilled and enthusiastic young people by using the excitement of our sciences to encourage wider take-up of STEM subjects in school and future life (science, technology, engineering and mathematics).

Many of the areas mentioned above are involved in health-related research, both directly and indirectly. As an example, we have supported researchers in universities with projects such as establishing challenge networks in the areas of advanced radiotherapy and cancer diagnosis. These networks aim to create a multidisciplinary community to address challenges in these areas, focusing on developing technologies and techniques that aim to improve patient quality of life, increase the chance of patient survival, develop a research pipeline and contribute to a coordinated national plan and roadmap for these challenges. In 2018, we awarded over £6 million in research grants that were health related. Many of the research projects that we fund have crossover benefits for the health sector that may not have been the initial objective of the research. An example of this is demonstrated in our From Hadrons to Healthcare case study.

Our national facilities have delivered a large amount of beamtime for researchers from across the world conducting health related research. The health research conducted at our facilities is varied, it includes (but is not limited to) developing new methods of treatment, understanding molecular structures and the behaviour of a large variety of molecules and developing new drugs and methods for targeted drug delivery. Facility usage data submitted for this report has been provided by STFC's ISIS and Diamond Light Source (DLS) facilities. In 2018 our ISIS facility provided over £3.8 million worth of beamtime to health-related research and our DLS facility provided over £20 million worth.

Further information on all UKRI grants can be accessed in the public domain at [Gateway to Research](#).

UK Government Departments & Non-Departmental Public Bodies

Chief Scientific Advisor's Office, Welsh Government



Llywodraeth Cymru
Welsh Government

The Welsh Government Office for Science (WGOS) is led by Professor Peter Halligan, Chief Scientific Adviser for Wales (CSAW). WGOS supports the CSAW to ensure that the Welsh government has access to the best scientific evidence and strategic long-term thinking to inform policies and decisions. In keeping with the responsibilities of the CSAW, the main functions of WGOS can be summarised under five headings:

- **Science Advice for Policy**
- **Promotion & Communications**
- **Programme Management & Delivery**
- **Science Capability & Skills**
- **Evidence Synthesis & Analytics**

To date, Sêr Cymru programme elements have successfully supported 3 National Research Networks, 12 Research Chairs, 11 Rising stars, 115 research fellowships (including those supporting researchers returning to academia following a career break) and more than 340 PhD students and postdoctoral researchers. This award has brought the total investment to date for this programme to approximately £100m. With more than £30m of this from the European Commission through Horizon 2020 and Structural Funds, Wales is the only country to have used both European Funding sources in a synergistic manner to support research.

Applications to the Sêr Cymru programme are submitted from Welsh universities and are assessed by international peer review and a specially established Independent Evaluation Panel. Evaluation criteria include measures such as scientific excellence, quality of the research environment and track record of the applicant. Some parts of the scheme require applications to be submitted to set deadlines, whereas others are received and assessed on an ad hoc basis. We differentiate between Sêr Cymru I and II as they are different funding models; I is purely Welsh Government funded but II is a partnership model involving Welsh Government, Welsh HEIs, European Commission, Structural Funds.

The Sêr Cymru programme welcomes applications in its 'Smart Specialisation' areas of: Low Carbon, Energy and the Environment; Life Sciences and Health; Advanced Materials and Manufacturing; and ICT and the digital economy. Sêr Cymru I has a total spend of £41million, £11million of which is relevant to Life Sciences and Health. Ser Cymru has a total spend of £55million, 24% of which is for projects with a sole focus on Life Sciences and Health.



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement no 663830

Welsh Government has multiple mechanisms for conducting and funding research. The proportion of the portfolio included in this exercise however, is funded completely by the Sêr Cymru (Welsh Stars) programme that is managed by WGOS. The aim of Sêr Cymru is to create a globally-competitive science and technology research base in Wales. WGOS is directly involved in the design, delivery and monitoring of the Sêr Cymru programmes. A second programme element, using considerable EU structural and Horizon 2020 funding followed in 2015.

Department for the Economy, Northern Ireland



The Department for the Economy (DfE) was established in May 2016. Its responsibilities include:

- wider economic policy, including specific areas like Energy, Tourism and Telecoms;
- the operation of a range of employment and skills programmes;
- oversight and funding of the further and higher education sectors;
- various aspects of employment law; and
- the management and operation of various EU funding programmes.

The Department for the Economy (DfE) currently funds two international programmes, which promote early stage research collaboration between universities. These are the US-Ireland R&D Partnership, and the Science Foundation Ireland (SFI)-DfE Investigators Programme Partnership.

The US-Ireland R&D Partnership

The US-Ireland R&D Partnership promotes research collaboration between universities in Northern Ireland, the Republic of Ireland and the United States of America (USA). This programme: helps link scientists and engineers in partnerships across academia to address crucial research questions; fosters new and existing industrial research activity that could make an important contribution to the respective economies; and expands educational and research career opportunities in science and engineering.

Each funding agency only supports the research carried out in its own jurisdiction, there is no cross-participant co-funding of individual awards. To date the DfE has agreed to support 38 projects, representing a total investment locally of over £11.5 million. The annual budget for funding projects under the US-Ireland R&D Partnership is capped at £2million. In 2018, a total of five US Ireland R&D Programmes funded by the Department were health related.

The Science Foundation Ireland (SFI)-DfE Investigators Programme Partnership

The SFI-DfE Investigators Programme Partnership supports collaborative projects involving universities from Northern Ireland and the Republic of Ireland undertaking internationally peer reviewed, leading edge discovery and fundamental research. This programme provides an opportunity to develop cross-border research collaborations which will help Northern Ireland universities to take full advantage of funding opportunities under e.g. Horizon 2020 and will consequently lead to economic and societal gain for both Northern Ireland and the Republic of Ireland.

Like the US-Ireland R&D Partnership, each of the projects has significant research participation from each of the jurisdictions, and each funding agency only supports the research carried out in its own jurisdiction. DfE has agreed to support 14 projects, representing a total investment locally of £8.4 million over six years. Of the 14 projects funded under the SFI-DfE Investigators Programme Partnership, five projects are health related.

Department of Business, Energy and Industrial Strategy (BEIS)



Department for Business, Energy & Industrial Strategy

BEIS is a ministerial department, supported by 41 agencies and public bodies. BEIS are building an economy that works for everyone, so

that there are great places in every part of the UK for people to work and for businesses to invest, innovate and grow.

BEIS funds research across a wide range of areas, with a science and research budget of £4.8bn in 2017/18. This money is used by partner organisations for many purposes, including running costs of facilities and Institutes, grant research funding and to pay for the cost of research. This is done primarily through UKRI and the Research Councils, including health and medicine through the Medical Research Council, who received £594m from this funding in 2017/18.

Department for Education



Department for Education

The Department for Education is responsible

for children's services and education, including early years, schools, higher and further education policy, apprenticeships and wider skills in England. DfE is a ministerial department, supported by [18 agencies and public bodies](#).

The Department for Education commissions research on subjects across its entire portfolio of business. Research may be commissioned to provide policy and delivery teams with information about the nature of an issue or to support identification of options available to affect change. The department also commissions evaluation studies to assess the impact of policy change and intervention delivery.

Research commissioned by the department can be funded from either dedicated research budgets, or policy budgets, depending on the nature of the work. The department also

engages with other researchers in a range of ways; such as providing part funding or indicating support for bids. For instance, we have contributed to both the Health Behaviour in School-Aged Children survey and the Millennium Cohort Study, and provided a letter of support to an MRC, ESRC and AHRC joint bid to the UKRI Strategic Priorities Fund for work on "Adolescent mental Health and brain development". Additionally, the department is funding and evaluating local area initiatives, through our "Opportunity Areas" programme. Some of these initiatives do touch on health-related issues.

At present the most obvious area of education research that overlaps with health interests are in relation to mental health initiatives. We currently have a small number of projects evaluating mental health interventions and have asked health related questions in the department's omnibus surveys of teachers and pupils and their parents/carers.

Department for Environment, Food and Rural Affairs

The Department for Environment, Food & Rural Affairs (DEFRA) is the UK government department responsible for safeguarding the natural environment, supporting world-leading food and farming industry, and sustaining a thriving rural economy. Our broad remit means we play a major role in people's day-to-day life, from the food we eat, and the air we breathe, to the water we drink.

The environment is fundamental to all that we do, and we must protect and enhance it. Our job is to make our country a great place for living. We do this by supporting our superb food, farming and fisheries industries, enhancing our beautiful rural environment, and better protecting against flooding, disease and other natural threats.

DEFRA conducts research and analysis to provide evidence for decision-making, ensuring Defra's policies are based on a sound, comprehensive understanding of current evidence. It helps us find new policy solutions and identify and tackle future issues. We use the term 'evidence' to encompass material from a variety of disciplines – science research, statistics, economics, social research or operational research, and geographical information. We use a variety of quality assurance processes.

At any one time, Defra is responsible for around 1000 research projects. This covers research in natural and social sciences as well as projects on economic analysis, monitoring, testing and surveillance activities. They have been commissioned to provide evidence which underpins Defra's policy formulation and development.

Details of all these Defra-funded projects are available through [our science and research projects database](#). Our searchable system provides a range of information on completed and ongoing projects (such as title, cost, contractor, duration, description, reports, etc.).

To obtain information on health-relevant projects for this analysis, the project managers at MRC used awards from our database as they appear on the independent Dimensions platform as at 31 March 2019. These were then manually checked for health-relevance and classified using a mix of manual and automated HRCS coding. Of the 196 awards in Dimensions active in 2018, 56 were selected for this analysis.

Department for International Development (DFID)

The Department for International Development (DFID) leads the UK's work to end extreme poverty. We are tackling the global challenges of our time including poverty and disease, mass migration, insecurity and conflict. Our work is building a safer, healthier, more prosperous world for people in developing countries and in the UK too.

DFID spends about 3% of its total budget on research and recognises that the next wave of scientific discoveries and innovative technologies will underpin progress towards eradicating extreme poverty and achieving the sustainable development goals. Advances in science and technology will play a central role in responding to the critical challenges of our times: population growth, climate change, rapid urbanisation, protracted humanitarian crises and migration. UK aid funded research is critical for global development and it contributes to the stability, security and prosperity of the UK.

DFID research covers many thematic areas including health, agriculture, growth, climate, environment, governance, social development, conflict, humanitarian and education. In health the focus is on research that saves lives, improves health and reduces poverty by generating solutions to persistent and emerging health challenges that affect the poorest, most vulnerable and hardest-to-reach populations, through world-leading product development research, implementation research and collaborative partnerships.

The total DFID spent on health research in 2018 was £19.2m, over 37 different programmes, each managing large portfolios of projects.

Department for Transport



Department
for Transport

The Department for Transport (DfT) works with its partners and agencies to support the transport network and to keep people, goods and services moving around the UK. DfT

aims to deliver its [Single Departmental Plan](#) objectives to support the creation of a stronger, cleaner, more productive economy; help to connect people and places, balancing investment across the country; make journeys easier, modern and reliable; make sure transport is safe, secure and sustainable; prepare the transport system for technological progress, and a prosperous future outside the European Union (EU); and promote a culture of efficiency and productivity in everything we do.

The purpose of our research is to build our evidence base to inform decision making. DfT's research needs are met in a variety of ways to ensure the most timely, focused and cost-effective evidence generation. Some of our research needs are directly commissioned using dedicated budgets held by policy teams. However, the largest proportion of our evidence comes

from existing research produced outside the Department, for example by academia and industry. We also work very closely with the wider research community to inform them of our interests. DfT's [Areas of Research Interest](#) publication is the key tool used to communicate our research needs and provide an overview of our research priorities.

Transport plays a key role in the way people live their lives and is important for supporting health and wellbeing. We are interested in research that increases our understanding of how transport promotes health and wellbeing, particularly on the ageing population. Examples of this include our [Cycling and Walking Investment Strategy](#): Safety Review which encourages physical activity and our interest clean, sustainable technology for travel to reduce air pollution via our [Reducing emissions from road transport: Road to Zero Strategy](#).

Please note that DfT Annual Report and Accounts are available online (latest one relates to 17/18) but this gives a total figure for science, research and support functions. It is not possible to distinguish health research spend from other research spend.

Department for Work and Pensions

The Department for Work and Pensions (DWP) is the UK's largest public service department, developing policy and delivering essential services on work, welfare, pensions and child maintenance. DWP has a strong record of producing, sponsoring and using robust, rigorous and timely research to underpin the development of its policies and operations. DWP's [Areas of Research Interest](#) publication summarises the most important research questions facing DWP over the next 5 to 10 years. The purpose is to raise awareness and improve understanding of these amongst the external research community.

The Joint Work and Health Unit is a joint unit working to ministers of both DWP and Department of Health and Social Care (DHSC). The Unit's vision is "a society where everyone is ambitious for disabled people and people with long term health conditions, and where people understand and act positively upon the important relationship between health, work and disability", see [Improving Lives: The future of work, health and disability](#) for more details. Research and analysis play a critical role in building the evidence base to support strategy, policy and delivery in meeting the aims of the Unit. In addition to significant policy and economic analysis, the analytical arm of the Unit carries out and commissions sophisticated quantitative and qualitative analysis, as well as a long-term research and trialling programme.

Food Standards Agency



The Food Standards Agency (FSA) is an independent, non-Ministerial Government department working across England, Wales and

Northern Ireland to protect public health and consumers' wider interests in food. We make sure that food is safe and what it says it is. The FSA's principles include basing our policies and advice on the best scientific evidence available, as well as being open and transparent in all our work. We aim to use science, evidence and information both to tackle the challenges of today, and to identify and contribute to addressing emerging risks for the future.

As part of this we fund research to help ensure we have the best evidence base available for our work, and particularly to fill gaps in the evidence base, update our knowledge and address new issues. More information on our approach to science and our science priorities is set out in our [Delivery Plan](#). We conduct some research in house (particularly in risk assessment and analytics) but the majority of our research is commissioned externally, through open procurement.

The FSA's remit includes food safety and authenticity and consumers' other interests in relation to food. Our interests and our research cover a number of areas that relate directly to health, including understanding the occurrence and underlying causes of conditions caused by or related to food – such as allergy and food-borne illness – and aspects of people's behaviour that relates to or affect health, such as the composition of their diet and dietary habits. Some of this work is done in collaboration with other funders, including PHE. There are 123 research projects in the dataset used to generate our data for the return. Our total annual spend on science (which includes research as well as other elements of systematic evidence gathering and analysis) is typically around £11-12 million.

Health and Safety Executive



As the UK's Health and Safety Executive our mission is to prevent work-related death, injury and ill health. In addition, our policy and regulatory interventions are all based on the best available evidence, so we also

undertake and commission applied research activities in our areas of interest.

We have a dedicated research budget to fund applied research both internally and extramurally. This research is targeted at understanding present and future risks to health and safety resulting from work activities, and is governed through a Research Committee, with subcommittees including external representation.

In 2017, HSE developed the Health and Work Strategy to substantially reduce the burden of work-related ill health. Research across HSE is brought together, coordinated by the "Health at Work" Science Hub to provide the totality of the available evidence to inform targeting interventions and to support planning, monitoring and evaluation of the interventions. New research studies are developed based on the evidence gaps identified. By way of example, both asthma and COPD are highly prevalent health conditions in the UK population. By removing the relevant harmful exposures in the workplace, incidences could be reduced by over 15%. The HSE has prioritised research to identify preventative and early identification strategies. Specific areas of concern include:

- how do workers attitudes and awareness of workplace health hazards influence their behaviour and affect their risk of occupational disease;
- workers often suffer with multiple complicated health conditions that may well interact with each other, how do we develop our understanding of what related ill health actually looks in real workplaces;
- how do work and non-work factors (i.e. work on health and health on work) interact and influence chronic health conditions, and particularly how these can be optimised to allow continued work where this is needed/wished for;
- what is the impact and consequence of work-related ill-health on the individual and society as a whole (including, human costs, costs of ill-health and impacts upon productivity and employment); and
- how do Government departments with responsibility for health work best together to prevent ill health caused by work?

We also anticipate new and emerging health risks by conducting foresight research to understand future world of work, and the challenges and opportunities it may bring. This includes the impact of demographic change and the need to understand the opportunity afforded by wearable devices in the workplace setting. We have a new research emphasis on investigating "what works" in order to measure and improve the impact of our Health and Work strategic interventions and those of other stakeholders. We have approximately 50 live projects of varying size in the health area, with a total equivalent value of approximately £3-4Million.

Health Education England

Health Education England (HEE) exists for one reason only: to support the delivery of excellent healthcare and health improvement to the patients and public of England by ensuring that the workforce of today and tomorrow has the right numbers, skills, values and behaviours, at the right time and in the right place.

HEE is an Executive Non-Departmental Public Body (NDPB) and an arm's-length body (ALB) of the Department of Health and Social Care (DHSC). Our role is to provide system-wide leadership and oversight for workforce planning, education and training across England. HEE has a total operating budget of £4.9 billion and employs nearly 2,000 people in a variety of leadership, education and support roles, most of whom are based in local teams across England.

Ministry of Housing, Communities & Local Government

The Ministry of Housing, Communities and Local Government's job is to create great places to live and work and to give more power to local people to shape what happens in their area. MHCLG is at the heart of the Prime Minister's objective of making the UK a country that works for everyone.

The Analysis and Data Directorate is responsible for statistics, data collection, research and economic analysis, modelling and through leadership across all MHCLG's policy areas and all the Department's strategic objectives. Analysts carry out internal data collection and research, and commission external research on a project by project basis.

All research carried out or commissioned by the Department flows from the Department's strategic priorities. Our MHCLG's [Areas of Research Interest](#) document, published in May 2018. This provides more information about how analytical work is organised, ongoing work and new priorities, and our commissioning processes for new research. Overall, the department's research programme serves three purposes;

- to improve understanding of the issues and challenges in key policy areas, including the drivers of change
- to synthesise evidence on what works
- to evaluate the impact of new policies and programmes and capture transferable lessons.

A number of our research projects have cross cutting focus which includes a health dimension. These include long term projects such as the major flagship survey [English Housing Survey](#) (EHS) which collects information about the physical condition of the housing stock and also the characteristics of inhabitants.

The EHS is also a key source for BEIS's work on domestic energy efficiency and fuel poverty, and the survey is part-funded by BEIS under a service level agreement arrangement.

We are responsible for the [English Indices of Deprivation](#) (which includes a health related domain) and continued contribution funding of the [What Works Centre for Well Being](#). Some of our long-term evaluation of programmes to support vulnerable groups also include a focus on physical/mental health and improving life chances. This includes the evaluation of the [Troubled Families programme](#), with its pioneering approach to data sharing.

The Department has recently undertaken much research on the causes and impacts of homelessness, which includes some focus on health issue. Some of the key outputs can be found [here](#).

More generally, our analysts also continue to work collaboratively with DHSC/NHS England on cross cutting interests such as Adult Social Care, such as engaging with the Better Care Fund evaluation.

National Physics Laboratory (NPL)

NPL is owned by the Department for Business Energy and the Industrial Strategy (BEIS) and is in a strategic partnership with BEIS and the University of Surrey and the University of Strathclyde.

A large proportion of NPL's funding (c. £56m in 2018) comes from BEIS and is used to deliver the National Measurement System. NPL's funding for research can be broken down into three main streams:

- Funding from the National Measurement System
- Funding from grants for collaborative research and development activities with industry and academia. These grants come from a range of sources for example: the industrial Strategy Challenge Fund, Innovate UK, DHSC, charities (e.g. Cancer Research UK), or from European research programmes (e.g. EMPIR and Horizon 2020)
- Funding to deliver research solutions through consultancy

NPL does not fund other institutions to perform research.

Through the NMS, and in line with BEIS's NMS Strategy and the Industrial Strategy, NPL activity in the [Life Sciences & Health](#) sector includes:

- The development of biological reference materials and methods.
- Metrology for radiation physics for healthcare, to provide measurement infrastructure to support the implementation of optimised patient-specific therapeutic and diagnostic services.

- Developing and supporting advanced ultrasound imaging technologies.
- Development of quantitative molecular imaging techniques for drug discovery and development, digital pathology and radiology.
- The curation of digital healthcare data to provide a standardised and secure way of improved data quality, data analysis and fusion; consistent data quality and provenance is essential to underpin diagnosis and treatment using AI and other future techniques.
- Innovative medicines manufacturing -analysis of pharmaceutical materials, implementation of synthetic biology and development of digital models for the manufacturing processes.

Further, NPL leads one of CRUK's [Grand Challenge Projects](#). Team Rosetta are using new mass spectrometry imaging techniques and instruments that they have developed to study different types of cancer. They are imaging the tumour to create - for the first time - faithful 3D representations.

In 2018 the life science & health sector groups completed £16.7M of work for the NMS, and £6.5M of grant funded projects. A total of 1,122 measurement service calibration certificates were produced in orders completed for a total of 293 different customers. In 2018, NPL published 121 life sciences & health related research articles in peer reviewed journals.

Office for Standards in Education, Children's Services and Skills



Ofsted (the Office for Standards in Education, Skills and Social Care) is the inspector of provision in early years, schools, further education and skills and children's social care, and has a regulatory function in

parts of early years and social care.

We conduct research and evaluation as part of our strategy to be 'a force for improvement'. All our research relates to our function as an inspectorate. This includes contributing to making sure our measures and methods are valid and reliable, aggregate insights that can inform the education and social care sectors, understand the consequences of what we do, and ensure we inspect the right things. Most of our research is done in-house rather than contracted out, and research projects are usually co-constructed between the research team and the inspectorate. Inspectors are involved in projects from scoping to write-up. We do not follow a particular research

methodology but use a mix of approaches, most often a mixed methods approach.

Some of our research projects in 2018 relate to physical or mental health issues:

- We completed a study on knife crime in London ([Link](#))
- We published a study of how schools are tackling obesity ([Link](#))
- We completed a study on teacher wellbeing, which looked amongst other things at teacher stress, mental health and days lost due to illness. ([Link](#))

We have quite a few current or upcoming projects that do not fall in 2018, however. These projects represent 25% of our research work in 2018.

Public Health England



Public Health England is an executive agency, sponsored by the Department of Health and Social Care, which aims to protect and improve the nation's health and wellbeing, and reduce

health inequalities. We have a net operating budget of £291m and employ 5,500 staff. A further £3bn is ring fenced for public health grants to local authorities to discharge their public health responsibilities. Our health research is funded through external competitive awards, many of which feature in this analysis (see [here](#) for latest awards, Annex A).

We commission academics and other researchers to contribute to the evidence base for public health. As with other DHSC sponsored organisations, the majority of research funding is administered by the National Institute for Health Research (NIHR), for example the NIHR Health Protection Research Units (see [here](#) – 'Our facilities' section).

UK Space Agency



The UK Space Agency (UKSA) is an executive agency of the Department for Business, Energy &

Industrial Strategy (BEIS) responsible for all strategic decisions on the UK civil space programme and provide a clear, single voice for UK space ambitions. These responsibilities include:

- leading the UK civil space policy and increasing the UK contribution to European initiatives
- building a strong national space capability, including scientific and industrial centres of excellence
- coordinating strategic investment across industry and academia
- working to inspire and train a growing, skilled UK workforce of space technologists and scientists
- working on national and international space projects in co-operation with industry and academia
- regulating the UK civil space activities and ensuring we meet international treaty obligations

There are several programmes through which the UKSA supports research and innovation but the agency does not generally publish information on individual awards. Below are a range of programmes supported by the agency which have an impact on human health.

[The International Partnership Programme](#) (IPP) is a five year, £152 million programme which focuses on using the UK space sector's research and innovation strengths to deliver a sustainable economic or societal benefit to emerging and developing economies around the world as part of the Government's Global Challenges Research Fund (GCRF). There are two projects funded through the IPP related to health, worth £6.6m.

[The Space for Smarter Government Programme](#) (SSGP) is a strategic, national programme established in 2014 and is delivered in collaboration with the Satellite Applications Catapult. Via the SSGP, the UKSA has supported two projects related to health, with a total value of £317,600 over the last two years.

The Microgravity Science Programme will help scientists with upcoming experiments in European Space Agency microgravity facilities, including the International Space Station and parabolic flights which provide short bursts of weightless conditions, just like in orbit. The UKSA funded [three projects worth £500,000](#) in 2017.

The UKSA is also a member of the [European Space Agency](#) (ESA), which develops Europe's space capability and ensure that investment in space continues to deliver benefits to the citizens of Europe and the world. This is supported through space science programmes funded by a financial contribution from all the Agency's Member States, calculated in accordance with each country's gross national product. Through ESA, the UKSA has funded 18 number of projects related to health, with a total value of €12.971 million (~£10.5m) over the last five years.

Sport England



Sport England's vision is that everyone in England, regardless of age, background or ability,

feels able to take part in sport or activity. Some might be fit and talented, but others won't be so confident. Responsible for grassroots sport in England, we work with national and local partners to ensure everyone in England can benefit from sport and physical activity.

Sport England's research activities can be divided into three broad categories:

- **Evaluation of grant awards** – Between 2016-21 Sport England will invest about £1 billion of Lottery and exchequer money to increase levels of engagement in sport and physical activity. Evaluating the effectiveness of these investments is central to our work.
- **Population measurement** – Sport England is responsible for the Active Lives Adult and Active Lives Children and Young People surveys. Together, these provide a detailed picture of engagement in sport and physical activity in England by people aged 5 years old and above.

- **Other research spend** – Sport England also invests in a range of other research projects to develop the evidence base for sport. In 2017/18 research activity included; a review of published evidence on the individual and community benefits of sport and physical activity, research into the potential of active travel to increase levels of physical activity, support for the What Works Centre for Wellbeing, and drivers / clustering analysis of participation data.

The physical and mental health benefits of sport and physical activity are well understood. A central commitment of Sport England's strategy is to increase the number of people reaching the Chief Medical Officer's recommended level of physical activity and reducing the number of people who are physically inactive. We are increasingly working with other organisations with an interest in promoting public health by addressing the lifestyle factors. Sport England has a focus on an applied and practical focus on better behavioural understanding to inform policy development and investment.

Sport England's net spending on research and evaluation is approximately £3million per year. This money is primarily spent on the evaluation of awards and population measurement.

UK Atomic Energy Authority (UKAEA)



UK Atomic
Energy
Authority

UKAEA manages the UK's fusion research programme at its Culham Science Centre HQ – striving to harness the power source of the Sun for future electricity production here on Earth. UKAEA operates the world's largest fusion experiment –

JET – on behalf of European partners and the UK's own device MAST Upgrade.

UKAEA also has active programmes in fusion relevant technology areas such as remote handling, materials science, tritium fuel cycle and high heat load materials – all essential for future fusion power stations. UKAEA works closely with UK industry to win contracts on future fusion devices and UK universities – who participate in many UKAEA programmes.

Academies, Royal Colleges and Professional Bodies

Academy of Medical Sciences



The Academy of Medical Sciences

The Academy of Medical Sciences is the independent

body in the UK representing the diversity of medical science. The Academy has a portfolio of grant schemes supporting those on the clinical training pathway and those working in basic biomedical and health research in the UK and overseas. All funded research reflects the Academy's mission to improve health through research.

All awards that were live in 2018 were included in this analysis, with the exception of travel fellowships that don't include a research component, i.e. the Hamied Foundation UK-India AMR Visiting Professorships and the GCRF Networking Grants. UKRI extracted the grants included in this analysis from Europe PubMed Central, using the Dimensions platform from Digital Science which was also used to auto-code these awards. In total, 248 awards were included totalling an award value in 2018 of £4.8m. The total for the UK was 187 awards and £3.5m.

British Society for Antimicrobial Chemotherapy



The British Society for Antimicrobial Chemotherapy (BSAC) exists to facilitate the acquisition and dissemination of knowledge in the field of antimicrobial chemotherapy.

Through a series of educational and other initiatives, the Society offers advice to government, its membership, the wider medical profession and the public on issues relating to antimicrobial agents, the appropriate and prudent use of antibiotics, and the management of community and hospital-acquired infection(s).

The BSAC funds research from its charitable income. The society operate an international grants programme which contributes to scientific research in the field of antimicrobial chemotherapy according to our strategy in the areas of:

- Mechanisms of antibacterial action
- Mechanisms of antibacterial resistance
- Antiviral resistance
- Antivirals
- Antifungals
- Antibiotic methods
- Antibiotic prescribing
- Antibiotic therapy
- Antiparasitics
- Evidence based medicine / systematic reviews

Awards are made in the following categories:

- **Research and Education Grants** maximum value is £50,000 for projects of up to one-year in duration. 1- 2 awards are made in this category each year.
- **Project Grants** maximum value is £15,000 for projects of up to one-year in duration. 1- 3 awards are made in this category each year.
- **Postgraduate Studentships** maximum of £25,000 per year (covering fees for up to 4 years in duration).
- **Travel Grants** ECCMID: Maximum of 3 awards each year to a maximum value of £1,000 each. ASM Microbe: Maximum of 2 awards each year to a maximum value of £1,500 each.
- **Vacation Scholarship** Up to 3 awards made each year. Payment of £270 per week for a maximum of 10 weeks, plus a one-off consumable payment of £500.
- **Overseas Scholarship** 1-2 awards made each year. Payment of £1,250 per calendar month for a maximum of 6 months, plus a one-off consumable payment of £600 per calendar month for the duration of the scholarship.

Total grants budget per annum is £140,000.

The Royal Academy of Engineering



As the UK's national academy for engineering, we bring together the most successful and talented engineers from across the

engineering sectors in a Fellowship, for a shared purpose: to advance and promote excellence in engineering for the benefit of society. We are a national academy with a global outlook, and we use our international partnerships to ensure that the UK benefits from international networks, expertise and investment.

The Academy's Fellowship comprises of the country's most successful engineers from across academia and industry, including prominent entrepreneurs and business leaders. We harness their experience and expertise to provide independent advice to government, to deliver programmes that help exceptional engineering researchers and innovators realise their potential, to engage the public with engineering, and to provide leadership for the profession.

The Academy has three strategic priorities:

- make the UK the leading nation for engineering innovation and businesses
- address the engineering skills crisis
- position engineering at the heart of society.

The Academy supports these strategic priorities through our Research Programmes, by making awards to the most promising and talented researchers in the UK across the full breadth of engineering. The awards provide distinctive rounded

support, providing not only funding, but also training, access to our networks, and mentoring from our prestigious Fellowship. The Academy's research programmes are funded by BEIS and other organizations such as the Leverhulme Trust.

Our research programmes support engineers of all disciplines and at all career stages. The Academy defines engineering in the broadest sense possible so that the contribution to the engineering community can be maximised. This means that applications from individuals whose research might focus on artificial Intelligence and data, clean growth, future of mobility, ageing society and healthcare engineering are all welcome.

Health-focused researchers can currently be found in most of our awardee cohorts across each programme (or can be identified in past cohorts which the Academy has previously funded).

The data presented here highlights the work of our 24 current awardees focused on healthcare, representing almost thirteen million pounds of funding. This funding includes research on miniaturised tools for better pregnancy monitoring, 3D-printed biomedical imaging systems, prosthetic limbs, machine learning for computer-assisted neurosurgery, and study of radiotherapy-induced effects on paediatric patients.

In fact, healthcare engineering will be one of the themes of our Research Forum event this year, taking place on November 12, 2019. At least eight awardees who fall under this research theme have been invited to showcase their work. If you're interested in attending, please contact Jorge Ospina at Jorge.Ospina@raeng.org.uk.

Academy of Medical Royal Colleges

The Academy of Medical Royal Colleges is the coordinating body for the UK and Ireland's 24 medical Royal Colleges and Faculties. The aim of the Academy is to ensure patients are safely and properly cared for by setting standards for the way doctors are educated, trained and monitored throughout their careers. Activities concentrate primarily on producing policy and recommendations to inform healthcare. Much of this work is delivered by the Academy's long-standing committees or through working groups and independent short-life projects.

The Academy is not a fund-giving body itself, therefore members of the Academy were approached individually for participation in this analysis.

Council of Deans of Health



The Council of Deans of Health represents the UK's university faculties engaged in education and research for nurses, midwives and allied health professionals. At any one time our members will be educating in the region of 120,000 future registered health professionals.

Operating as a multi-professional organisation at the heart of policy and political debate, we aim to lead policy at national and UK level, promoting the essential contribution of our members to health and social care. We are committed to working in partnership, strengthening membership engagement and intelligence gathering to influence policy UK-wide for high quality education and research. As an organisation that is almost exclusively funded through membership subscriptions, the Council does not fund or commission research externally.

The Council does conduct research in relation to our policy work though. This year, for instance, the Council is conducting an academic staffing census to obtain a detailed picture of retention and recruitment as well as the staff profile for each of our disciplines, which will help inform national, regional and local succession planning in health higher education.

We have also recently published a report on advanced clinical practice education in England, which provides an analysis

Faculty of Public Health

The Faculty of Public Health (FPH) is the leading professional body for public health specialists and practitioners in the UK. The Faculty is a membership organisation for nearly 4,000 public health professionals across the UK and around the world and is also a registered charity. The Faculty's role is to improve the health and wellbeing of local communities and national populations, by supporting the work of our members. This includes encouraging and promoting new research and

of the research we have conducted on this internally and in collaboration with Health Education England.

A third example of the research the Council has been undertaking recently is our report on UK health faculties' global engagement that was published in May 2018. It illustrates the diverse and exciting range of international projects that UK faculties providing nursing, midwifery and allied health education are engaged with.

The Council's research portfolio focuses strategically on:

- promoting the Council's vision of research in our disciplines and influence to increase capacity and capability
- advocating for an increase in research funding and research career opportunities for our disciplines
- promoting strong research environments in universities' health faculties
- advocating for better career pathways for clinical academics in our professions across the UK

For more information contact:

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understanding of public health through our Journal of Public Health, award-winning blog and annual events, lecture and conference programme. Currently the Faculty is not a grant-giving body and does not commission research but supports the research environment through advocacy for the public health research workforce, five yearly curriculum reviews and in partnerships with nationwide public health initiatives/ collaborations.

Medical Schools Council



a key interface between health research and higher education. Medical schools are a base for clinical academics, who drive

The Medical Schools Council is the representative body for all 40 UK medical schools, which provide

innovation and educate future generations of researchers, while the Council acts as a forum for directing national policy in medical school research. Together with the GMC, the MSC created the UK Medical Education Database, a large-scale longitudinal data resource for researchers to access and build an evidence base for medical education, selection and workforce decision-making.

Royal College of General Practitioners



Our purpose is to encourage, foster and maintain the highest possible standards in general medical practice. We support GPs through all stages of their career, from medical students considering general practice, through to training, qualified years and retirement.

Whilst the RCGP is not a research organisation, it recognises the key role that research plays in advancing the highest quality of care for patients.

The Research Programme in CIRC:

- Facilitates making research more relevant to the RCGP membership base
- Upskills and enables GPs and GP practices to participate in research (including through funding research grants and fellowships)
- Highlights and celebrates the highest quality research from the UK to support clinical practice and patient care
- Influences primary care research and funding within the UK

In CIRC we support, celebrate and facilitate research, and encourage the dissemination of research findings across the primary care community. We collaborate with researchers drawing upon our networks of GPs and patients, involving GPs as Clinical Champions and Advisers and working closely with the National Institute for Health Research (NIHR) and NIHR Clinical Research Network (NIHR CRN).

The RCGP is the professional membership body for GPs in the UK.

Research and production of objective evidence is central for GPs to be able to deliver the best care possible to their patients. The College has several strategic partnerships through which it supports and influences research within the UK. The College influences research within the UK by identifying the important research areas within general practice and working with the NIHR to prioritise these.

Our fellowships and grants awarded by the RCGP Scientific Foundation Board (SFB) support GP-led research activities, and our awards celebrate the best of primary care research.

The RCGP SFB offers two types of research grant: Annual Grants (up to £30,000) and Practitioner Allowance Grants (up to £2,000). The RCGP SFB advertises and awards joint-funded fellowships with partners whenever possible. In 2018 the RCGP SFB awarded 3 Annual Grants, worth a total of £60,155.50 and a joint-funded fellowship with Marie Curie (focusing on out of hours palliative care in general practice), worth £39,996. In 2018 the RCGP SFB awarded 7 Practitioner Allowance Grants, worth a total of £14,000. Overall, in 2018 there were 33 Active grants funded by the RCGP SFB, worth a total of over £330,000

The RCGP Policy Team also commission research on a case by case basis. The most recent of these was a £60,000 tender to investigate 'the Future of GP'. This was awarded to the King's Fund in 2018.

Royal College of Obstetricians and Gynaecologists

The RCOG works to improve women's health care across the world. Founded in 1929, we now have over 16,000 members worldwide and work with a range of partners both in the UK and globally to improve the standard of care delivered to women, encourage the study of obstetrics and gynaecology (O&G), and advance the science and practice of O&G.

Currently, the Lindsay Stewart Centre for Audit and Clinical Informatics aims:

To carry out high-quality national clinical audit, research and other quality improvement projects in women's health care.

To support quality improvement within obstetrics, gynaecology and maternity through developing and publishing national performance indicators.

Examples of our current projects:

- [Each Baby Counts](#): A national quality improvement project to reduce the number of stillbirths, neonatal deaths and brain injuries occurring as a result of incidents during term labour.

- [Each Baby Counts: Learn and Support](#): A new RCOG/RCM programme to support multidisciplinary maternity teams in England to implement and evaluate interventions that focus on behaviour, team work, safety and positive work culture in their units.
- [National Maternity and Perinatal Audit \(NMPA\)](#): A new large-scale audit of the NHS maternity services across England, Scotland and Wales

RCOG Research Committee promotes and coordinates the RCOG's research activities out with the Lindsay Stewart Centre. The central objective of the Research Committee is to facilitate the evaluation of interventions to improve reproductive health outcomes for women, their children and their families. Members of the group are chairs of the 12 [Clinical Study Groups](#) (CSGs), which facilitate the process of developing and expanding the portfolio of research in reproductive health care in the UK. CSGs provide the primary route through which new ideas for clinical trials and other well-designed studies are developed in the reproductive health field.

Faculty of Intensive Care Medicine

The Faculty of Intensive Care Medicine

The Faculty of Intensive Care Medicine is the professional

body responsible for the training, assessment, practice and continuing professional development of Intensive Care Medicine doctors and practitioners in the UK. The Faculty was founded in 2010 and has well over 3,000 members, making it the largest organisation of critical care medical professionals in the UK. One of the Faculty's main aims is to promote the specialty and engaging with healthcare policy, including some research-related initiatives. These include:

- supporting funding to the UK Critical Care Research Group (CCRG) to help underwrite their annual conference

- supports research prizes with the NIHR
- supports research through the CCT in Intensive Care Medicine curriculum
- Hosts and chairs the National Adult Critical Care Data Group (NACCDG), which has brought together stakeholders from across the NHS and critical care data management to take forward audit collection. The group advises on the development, content and use of current and future national data within critical care to improve care, support and aid future research and drive change in processes and outcomes for critically ill patients.

Royal College of Paediatrics and Child Health



The RCPH aims to transform child health through knowledge, innovation and expertise, and is responsible for education, standards and

advocacy including dissemination of best practice standards for paediatricians in the UK.

The RCPCH's Research and Quality Improvement Division leads and develops the evidence base to improve child health outcomes across the UK and acts as a trusted source of child health knowledge, innovation, influence and expertise to support members lead and deliver high quality healthcare which meets the needs of children and young people. The Division carries out primary and secondary research to generate, synthesise and translate data and evidence to influence and inform policy and clinical practice, standards and guidance to support the clinical community.

The key areas of research activity include:

- **Promoting and developing child health research** – The RCPCH has developed partnerships with NIHR, Royal Colleges and established the UK Child Health Research Collaboration to promote and influence child health research and aims to embed research in all paediatrician's careers.

- **Fellowship awards** – In 2018, the RCPCH launched the Children's Research Fellowship Fund, a £10 Million campaign for post-doctoral fellowship awards to develop the next generation of future research leaders. An agreement has been put in place with the Medical Research Council to jointly fund future awards, and the RCPCH has successfully co-badged PhD fellowships with Children with Cancer UK in 2016/17, as well as developed joint one-year industry placements with IQVIA.

- **Research projects** – The RCPCH carries out research projects to answer research questions relating to the RCPCH's strategy and produces evidence-based reports and peer review publications to add to the child health evidence base and influence clinical practice, policy and ensure future priorities are based on sound evidence.

- **British Paediatric Surveillance Unit (BPSU)** - The BPSU is a world leading centre for rare paediatric disease surveillance and enables doctors and researchers to investigate how many children in the UK and Republic of Ireland are affected by specific rare diseases, conditions or treatments each year.

- **Clinical guidelines** – The RCPCH produces clinical guidelines, synthesising existing evidence, to provide high-quality guidance as per National Institute for Health and Care the Excellence's methodology (NICE), to inform and improve quality of patient care.

Royal College of Pathologists

The Royal College of Pathologists is a charity with over 11,000 members worldwide. Most members are doctors and scientists working in hospitals and universities in the UK. The College oversees the training of pathologists and scientists working in 17 different specialties, which include cellular pathology, haematology, clinical biochemistry and medical microbiology.

While the College does not fund research activities directly it is committed to promoting excellence in the study, research and practice of pathology and to being responsible for maintaining the highest standards through training, assessments, examinations and professional development, for the benefit of the public.

The Royal College of Radiologists



The Royal College of Radiologists (RCR) leads, educates and supports doctors who are training and working in the specialties of clinical

oncology and clinical radiology and improve the standard of practice in them. The Academic Committee gives out annual grants and fellowships to members to encourage and foster research and contribute to improving the quality of imaging research in the UK.

The following are bequests awarded annually:

- Constance Thornton Fellowship - For projects in cross sectional imaging or paediatric radiology – one award active in 2018.
- Karol Slicher Research Fellowship - Supports three-month secondments in the UK or abroad to gain technical skills in cancer diagnosis, assessment or management.

- Kodak Radiology Fund Research Bursary - Furthering a radiological interest in the UK or abroad – two awards active in 2018.
- Kodak Research Fund Scholarship - Research or educational project in the UK or abroad and may be used to assist the undertaking of an MD – six awards active in 2018.

There are dedicated budgets for the below also awarded annually:

- Pump Priming Grants - Stimulate research for individuals, collaborations, ideas or institutions, e.g. collecting pilot data ahead of larger grant applications - 19 awards active in 2018.
- Joint CRUK CRTF Fellowship - Established in 2010, these Clinical Research Fellowships are administered by the Cancer Research centres across the UK – annual contribution scheme.
- Joint MRC CRTF Fellowship - Established in 2005, these Joint Fellowships are administered by the Medical

UK Clinical Virology Network

The United Kingdom Clinical Virology Network (UK CVN) consists of a linked and co-ordinated group of laboratories distributed throughout the UK and Ireland. It provides advice to membership and to Government, Chief Medical Officers, National Health Services, Public Health bodies and professional societies on all aspects of viral disease and infection. The aim of the UK CVN is to promote the interests of clinical virology, and its medical and laboratory practice in the United Kingdom and Ireland. The

UK CVN promotes agreed protocols for the management of viral diseases and best laboratory practice, supports a rapid and considered response to virological emergencies; acts as an education and training resource, and undertakes related activities.

The over-riding consideration for UK CVN research grants is that the research project should be demonstrably of value to clinical virology laboratories, and applicants will be asked to explain how their research will benefit the CVN. Applicants must be members of the CVN or belong to laboratories/organisations that are CVN members. Grants are offered as and when the UK CVN financial position permits. This is usually every two years. In 2017, the UK CVN Executive Committee announced a competition for one major two-year research grant up to the value of £40,000, and two pump priming small research grants, up to the value of £5000. The committee received nine applications for the major award, and three applications for the pump-priming awards.

Charities, Foundations and Trusts

Members of the Association of Medical Research Charities



Action Medical Research

Action Medical Research is a leading UK-wide charity funding vital research to help sick and disabled babies, children and young people.



Action on Hearing Loss

Action on Hearing Loss (formerly RNID) is the largest UK charity helping people who are confronting deafness, tinnitus and hearing loss. The charity provides support and care, campaigns for equality, and supports research into technology and treatments. It enables people to take control of their lives and remove the barriers in their way.



Alcohol Change UK

Alcohol Change UK, which formed from the merger of Alcohol Concern and Alcohol Research UK, works across the UK to reduce alcohol-related harm by ensuring that policy and practice can always be developed based on high-quality research.



Alzheimer's Research UK

Alzheimer's Research UK funds research into the causes, diagnosis, prevention, treatment and cure for dementia. Backed by passionate scientists and supporters, they're challenging the way people think about dementia, uniting the big thinkers in the field and funding the innovative science that will change lives. Their singular focus on research means that they can channel their expertise and energy with maximum benefit, to make the greatest difference to people affected by dementia today and in the future.



Alzheimer's Society

The Alzheimer's Society funds research to improve care for people living with dementia and to find a cure. Their mission is to transform the landscape of dementia forever. Until the day they find a cure, they will strive to create a society where those affected by dementia are supported and accepted, able to live in their community without fear or prejudice.



Anthony Nolan

Anthony Nolan funds research to make bone marrow and blood stem cell transplants more successful, giving people longer and better lives. The charity matches individuals willing to donate their stem cells to patients needing a stem cell transplant due to blood disorders or cancer. Their mission is to save and improve the lives of people who need a hematopoietic stem cell transplant.



Asthma UK

Asthma UK funds research to understand the biology of asthma, work towards better treatments and a cure, and improve diagnosis and care. They work to stop asthma attacks and, ultimately, cure asthma by funding world leading research and scientists, campaigning for change and supporting people with asthma to reduce their risk of a potentially life-threatening asthma attack.



Ataxia UK

Ataxia UK funds research into finding treatments and cure for the ataxias. They believe that people with ataxia deserve care, understanding and a cure. They raise funds for medical research into finding treatments and cures for the ataxias, raise awareness, and offer support, advice and information for people living with the condition.



Autistica

Autistica funds research to transform understanding of autism and help autistic people have a better quality of life. They exist to offer families and autistic people the chance of a long, healthy, happy life. Autistica support cutting edge research on autism and related conditions. They work with autistic people to understand their priorities for research so that they can make a difference at every stage of their lives. They campaign for increased investment in research and for better services for autistic people. Their current areas of focus defined by their community are mental health, language and communication, physical health and epilepsy in autism.



Bloodwise

Bloodwise funds research to improve the lives of people living with and beyond blood cancer. Around 38,000 people of all ages are diagnosed with blood cancers and related disorders every year in the UK. Blood cancers comprise over 100 individual diseases including leukaemia, lymphoma and myeloma. Together, blood cancers are the fifth most common form of cancer and the third largest cause of cancer death in the UK. The charity's research is targeted at understanding more about blood cancer, improving diagnosis and treatments, and funding ground-breaking clinical trials.



Bowel Cancer UK

Bowel Cancer UK funds research to save lives and improve the quality of life for all those affected by bowel cancer. Bowel Cancer UK and Beating Bowel Cancer have joined together to stop bowel cancer. They are determined to save lives, improve the quality of life and support all those affected by bowel cancer in the UK. They will do this by enabling and supporting research, providing support and information for patients and their families each step of the way, transforming awareness and understanding of the disease, and campaigning for early diagnosis and best treatment and care for all.



Bowel Disease Research Foundation

The BDRF funds research to advance the cure and treatment of bowel disease. They are the subsidiary charity of the Association of Coloproctology of Great Britain and Ireland who are the representative body of leading medical practitioners working in the field of bowel disease. Bowel disease covers a number of illnesses including bowel cancer, Crohn's Disease, Ulcerative Colitis and a host of conditions that affect the function of the bowel.



BRACE

BRACE funds research to improve understanding of the causes of dementia, improve diagnosis, and help develop new forms of treatment. They raise funds for dementia research and awards grants for research at universities in South West England and South Wales.



Brain Research UK

Brain Research UK funds research to discover the causes of neurological conditions, develop new treatments and improve the lives of those affected. They are currently focusing their research funding on three priority areas: acquired brain and spinal cord injury, neuro-oncology, and headache and facial pain.



Breast Cancer Now

Breast Cancer Now is the charity that's steered by world-class research and powered by life-changing care. We're here for anyone affected by breast cancer, the whole way through their experience, providing support for today and hope for the future. We are funding the brightest minds in breast cancer research, we're discovering how we can prevent, save lives and live well with breast cancer. By 2050, we believe that everyone diagnosed with breast cancer will live – and be supported to live well.



British Association for Counselling and Psychotherapy

The BACP funds research that informs and develops counselling and psychotherapy practice. They aim to promote and provide education and training for counsellors and psychotherapists working in either professional or voluntary settings, whether full or part time, with a view to raising the standards of the counselling professions for the benefit of the community and in particular for those who are the recipients of counselling or psychotherapy; and to inform and educate the public about the contribution that the counselling professions can make generally and particularly in meeting the needs of those whose participation and development in society is impaired by physical or psychological health needs or disability.



British Council for Prevention of Blindness

The British Council for Prevention of Blindness (BCPB) is a registered charity that funds research and training to prevent blindness in low and lower middle-income countries – where it is needed most.



British Journal of Anaesthesia

The BJA funds research into anaesthesia, perioperative medicine, critical care, and pain management to improve patient care globally. The aim of the charity is to advance and improve theoretical and practical knowledge and skills in all branches of anaesthesia, critical care and pain medicine and related topics. Thereby, reducing the suffering and dangers of anaesthesia and surgery.



British Lung Foundation

The BLF funds research to improve care and to prevent, treat and cure lung diseases. They've been researching lung conditions for 30 years. Today, it remains at the heart of what they do.

Having lung disease brings questions and anxiety about the future. They don't want anyone to face that alone. Their helpline, support groups, web community and easy-to-understand information offer vital hope and support. They aim to prevent lung disease by campaigning for positive change in the UK's lung health. They're raising awareness about lung disease, the dangers that cause it, and how to look after your lungs.



British Scoliosis Research Foundation

The BSRF funds research to discover the cause of idiopathic scoliosis and to improve the quality of life for people with all types of scoliosis. Each year the BSRF funds a great deal of research into scoliosis and periodically holds an international symposium to spread the knowledge gained from research. The BSRF works closely with the Scoliosis Association (UK), the national patient's support organisation and with the British Scoliosis Society, the organisation for doctors specialising in the treatment of scoliosis.



British Sjögren's Syndrome Association

The BSSA funds research into the cause and treatment of Sjögren's Syndrome. A self-help organisation with nearly 2000 members, the BSSA is dedicated to providing mutual support and information to individuals affected by this disabling disease. They have regional support groups throughout the UK whose members include sufferers and supporters who work together in helping one another cope with the day-to-day challenges of this debilitating and distressing condition. The BSSA also has a helpline and they award an annual research grant.



British Skin Foundation

The British Skin Foundation funds high quality peer reviewed research into all types of skin disease and skin cancer. Grants are awarded twice a year with

the charity accepting applications from institutions across the UK and ROI.



Chest Heart & Stroke Scotland

Chest Heart & Stroke Scotland is an

independent Scottish charity who aims to improve the quality of life for people in Scotland after a stroke, or diagnosis of a chest or heart condition. We offer vital advice, support and information to those affected, arrange community groups and 1-to-1 support, and influence public policy to ensure that people get the services they badly need.



Childhood Eye Cancer Trust
Fighting Retinoblastoma

Childhood Eye Cancer Trust

The Childhood Eye Cancer Trust

(CHECT) is a UK charity dedicated to helping people affected by retinoblastoma. It:

- Provides ongoing support and information to families and individuals.
- Funds research into the prevention and treatment of retinoblastoma.
- Raises awareness among health professionals and the public.
- Influences policy to improve services for patients.



Children's Liver Disease Foundation

Children's Liver Disease Foundation

funds research to enhance understanding childhood liver disease and improve available treatments. CLDF is fighting childhood liver disease by providing information, emotional support, research funds and a voice for all affected.



Chronic Disease Research Foundation

The CDRF, an independent medical

research charity, funds a range of gene research programs that aim to discover the cause of common diseases such as arthritis, back pain, migraine, asthma, dementia and heart disease. The CDRF runs many projects at the department of Twin Research, St Thomas' Hospital. We hope that results of this research will contribute to the development of future diagnostic tests and treatments. We rely on non-governmental donations and grants.



Coeliac UK

Coeliac UK is the charity for people who need to live without

gluten. For nearly 50 years we've been helping people with coeliac disease and other gluten related conditions live happier, healthier lives. We do this by striving for better gluten free food in more places, providing independent, trustworthy advice and support and funding crucial research to manage the impacts of gluten and find answers to coeliac disease. And we do it all so that one day, no one's life will be limited by gluten.



Crohn's & Colitis UK

We are a UK Charity leading

the battle against Crohn's Disease, Ulcerative Colitis and other forms of Inflammatory Bowel Disease (IBD). Our staff, volunteers, and supporters are dedicated to improving the lives of everyone affected by these conditions. Our strategic objectives are to generate greater awareness and understanding; provide high quality information and support; to work with the UK health sector to improve the diagnosis, treatment and management of IBD; and to support life-changing research to better understand the causes and best treatments for Crohn's and Colitis. We want to improve lives now and lead the mission to find a cure.

Cystic Fibrosis Trust

Fighting for a Life Unlimited

The Cystic Fibrosis Trust is the only UK-wide charity dedicated to fighting for a life unlimited by cystic fibrosis (CF) for everyone affected by the condition. Since we started in 1964 we have dedicated ourselves to promoting excellence in research and clinical care, as well as providing practical support and advice to people with CF and their families. Our mission is to create a world where being born with CF no longer means a life-long struggle, when everyone living with the condition will be able to look forward to a long, healthy life.



DEBRA

For people whose skin doesn't work - we do. DEBRA is the national charity that supports individuals and families affected by Epidermolysis Bullosa (EB) - a painful genetic skin blistering condition which, in the worst cases, can be fatal. DEBRA was founded in 1978 by Phyllis Hilton whose daughter Debra had EB – the charity was the world's first EB patient support group. Our vision: We have a vision of a world where no one suffers from the painful genetic skin blistering condition, EB.



Diabetes Research & Wellness Foundation

Diabetes Research & Wellness Foundation

DRWF is a registered charity (No. 1070607) and company limited by guarantee (3496304) set up in 1998 to raise awareness of all types of diabetes and associated complications; provide information and support to promote good self-management and to enhance quality of life. Whilst funding vital diabetes research to establish the causes, prevention and treatment of type 1 and type 2 diabetes; develop improved management and treatment options; and ultimately find a cure, we aim to ensure that people have access to the right information and support to develop a proactive self-care approach to successful self-management, to ensure that they are “staying well until a cure is found...”

Cystic Fibrosis Trust

The Cystic Fibrosis Trust is the only UK-wide charity dedicated to fighting for a life unlimited



Diabetes UK

We are Diabetes UK. Our vision is a world where diabetes can do no harm. Diabetes affects more people than any other serious health condition in the UK. More than dementia and cancer combined. That means we need to take action now. Because we're one of the leading UK charities for people affected by diabetes it's our responsibility to lead the fight against the growing crisis. And this fight is one that involves all of us – sharing knowledge and taking diabetes on together.



Duchenne UK

Duchenne UK funds research to accelerate treatments and find a cure for Duchenne muscular dystrophy. They are committed to continuing to drive momentum to deliver treatments to help this generation of those with DMD. Duchenne Muscular Dystrophy is a muscle wasting disease that mainly affects boys. It's the most common fatal genetic disease to affect children. It is 100% fatal and boys die in their early 20s. There are no treatments and no cure.



Dunhill Medical Trust

The Dunhill Medical Trust funds UK academic and clinical research into understanding the mechanisms of ageing, age-related diseases and frailty; we also support community-based organisations that are working to enhance the lives of those needing extra support in later life.



Epilepsy Action

“We exist to improve the lives of everyone affected by epilepsy”.

Epilepsy Action is a community of people committed to a better life for everyone affected by epilepsy. We want high quality, accessible epilepsy healthcare services, so that people with epilepsy have the support they need to manage their condition. We want wider awareness and understanding of epilepsy, so that people living with the condition are treated with fairness and respect. Our supporters, members, staff and volunteers are united by these common goals.



Epilepsy Research UK

Epilepsy Research UK supports

and promotes basic and clinical scientific research into the causes, treatments and prevention of epilepsy. We are a leading national charity in the UK that is exclusively dedicated to funding independent research into this condition. Epilepsy Research UK supports the work of scientists and clinicians throughout the UK, who are investigating all aspects of epilepsy in both adults and children. They are especially looking at what causes epilepsy, who is at risk of developing it, what goes on in the brain during a seizure, and safer drugs and better surgical techniques to treat it.



Fight for Sight

There are over two million people with sight loss and one in five people will have a serious sight condition in their life time. We are the national charity

funding ground-breaking research into sight loss that's already changing lives today and transforming them tomorrow. We support research into the biology of sight loss conditions, prevention, early detection and treatments. We are committed to revolutionary science, developing researchers, and fostering collaboration. We know that by working with experts in ophthalmology and with our supporters we can make a real difference to the lives of everyone affected by sight loss.



Friends of EORTC

The Friends of EORTC mission is to help accelerate innovation that will improve every cancer patient's

The future of cancer therapy survival and quality of life by raising funds and awareness for the critical translational, academic and non-pharmaceutical clinical research of the European Organisation for Research and Treatment of Cancer (EORTC).



Great Ormond Street Hospital Children's Charity

Great Ormond Street Hospital depends on charitable support to give seriously ill children the best chance to fulfil their potential. Great Ormond Street Hospital Charity (GOSH Charity) funds in 4 key areas, rebuilding and refurbishment, child and family support services, advanced medical equipment and ground-breaking research into child health. GOSH Charity is the UK's largest dedicated charitable funder of medical research into children's health. Through the charity's research strategy, we fund research across the UK but are also investing in 6 priority areas across the hospital and its research partner, the UCL Great Ormond Street Institute of Child Health (ICH).



Guts UK

Guts UK's vision is of a world where digestive disorders are better understood, better treated and everyone who lives with one gets the support they need. Guts UK is the only charity in the

UK committed to fighting all digestive disorders. Digestive disorders are conditions and diseases that affect the gut, liver and pancreas. Guts UK does this in 3 key ways:

- Funding vital research that develops new treatments and saves lives
- Providing expert information for people affected, their families and their carers
- Promote awareness and discussion about digestive health



Guy's and St Thomas' Charity

Guy's and St Thomas' Charity is an independent, place-based foundation which works with Guy's and St Thomas' NHS

Foundation Trust and others to improve the health of people in the London boroughs of Lambeth and Southwark.



Heart Research UK

For over 50 years HRUK has funded pioneering and ground-breaking research projects in hospitals and universities across the UK to help treat, prevent and cure heart disease. The Charity also helps teach and support the medical experts of today with expert Masterclasses and helps the experts of tomorrow by funding scholarships. Heart Research UK was founded to help make surgery safer and did just that by funding six of the first eight successful UK heart transplants. The charity continues to show that research works, helping people live healthier, happier and longer lives.



JDRF

JDRF is the type 1 diabetes charity, improving the lives of people with type 1 diabetes by driving research to cure, treat and prevent type 1 diabetes and its complications.



Kidney Research UK

Kidney Research UK is one of the leading charities dedicated to research into kidney disease in the UK. We rely almost wholly on the generous donations of the UK public and we believe that everybody deserves a life free of kidney disease. Our mission is to fund and deliver life-saving research into kidney diseases, improve treatments for people with kidney diseases and enhance their quality of life, increase awareness of kidney health, and support the early diagnosis and prevention of kidney disease and damage.



Leuka

Leuka supports life-saving research into the causes and treatment of leukaemia, other blood cancers and related diseases. Our ultimate aim is to find cures for all types of leukaemia and blood cancers, by translating research into new treatments as quickly as possible so that patients can live better, longer lives.



Leukaemia & Lymphoma NI

Leukaemia & Lymphoma raises funds for blood cancer research. We operate with the main objective of improving survival rates for blood cancers by supporting the scientists and students researching these diseases in Northern Ireland. We currently fund researchers in the blood cancer research group based at the Centre for Cancer Research and Cell Biology (CCRCB) at Queen's University Belfast, who are working on projects to identify, target and eliminate the abnormalities that cause blood cancer. The impact of their research is changing lives both locally and globally.



Lister Institute of Preventive Medicine

The Lister Institute's competitive research prizes give young scientists the opportunity to develop their potential through flexible funding over a five-year period. The awards are aimed at younger researchers in the early years of running their own groups, for whom receipt of the prize would make a significant difference to their research work.



Macmillan Cancer Support

Macmillan Cancer Support is a leading UK charity providing care, information and support to people affected by cancer. We fund research that helps us to understand the numbers, needs and experiences of people living with cancer and to generate the evidence needed to enable a better cancer experience.



Macular Society

Macular disease is the biggest cause of sight loss in the UK, with around 300 people diagnosed every day.

The Macular Society is the only charity determined to beat the fear and isolation of macular disease with world class research, and the best advice and support. To support people affected by macular disease now, the Macular Society provides a range of support, information and services. Our research programme is focused on finding new treatments and a cure to Beat Macular Disease forever."



Marie Curie

Marie Curie is a UK charity dedicated to the care and support of people living with a terminal illness and their families, carers and friends. It is also the largest charitable funder of palliative and end of life care research in the UK, funding and supporting research in the following ways in 2018 (* = included in this analysis):

- The open and competitive Marie Curie Research Grants Scheme funds research to improve care and support for people living with a terminal illness and their families, carers and friends. *
- Marie Curie's Research Centres are based at University College London and Cardiff University, receiving Core/ Programme Grant funding from Marie Curie, as well as funding from other sources. *
- The Marie Curie Research Lead programme has helped increase research activity at Marie Curie's hospices. Marie Curie currently has Research Leads at Glasgow, Edinburgh and Liverpool hospices. The Research Lead programme is evolving into Marie Curie Research Fellowships to develop collaborations with local universities and other organisations. Marie Curie Research Fellows are based at the West Midlands, Bradford and Belfast hospices. Marie Curie's Liverpool, Edinburgh and Newcastle hospices also have clinicians with research sessions as part of their job plan.
- The Marie Curie Internal Small Research Grants Scheme supports Marie Curie staff to develop research skills, providing funds to enable protected time to engage in research activities. Grants were awarded to staff at Marie Curie's Edinburgh and Belfast hospices in 2018.
- The Design to Care Programme was initiated to develop an innovative and sustainable approach to palliative and end of life care.
- The Annual Marie Curie Palliative Care Research Conference held in partnership with the Royal Society of Medicine focused on implementing new models of palliative care.

Marie Curie's research spend in 2018 from all the activities outlined above was approximately £3.4 million. Marie Curie also submits grant data to the National Cancer Research Institute (NCRI), a UK-wide partnership of cancer research funders who each have an annual spend of over £1million. In this dataset, end of life care cancer research amounts to 0.2-0.3% of non-commercial cancer research funded in the UK, with 40-60% of this funded by Marie Curie. As an example, in 2017/18, the total spend on end of life care cancer research was just under £1.4million with around 61%, that is just over £830,000, from Marie Curie. It should be noted that the NCRI dataset has its own caveats and so is not directly comparable to the HRCS dataset.



Medical Research Scotland

Medical Research Scotland is an independent medical research charity which provides funding for research which aims to improve the diagnosis, treatment or prevention of any disease; to understand basic disease processes; or to develop medical technology. We do this through our undergraduate Vacation Scholarships, PhD Studentships and Medical Research Scotland-sponsored Daphne Jackson Fellowships which support and encourage early stage scientists to develop and establish successful research careers. We are not restricted to funding research into any one disease or condition and the research we fund takes place in Scotland.



Meningitis Now

Meningitis Now is the founder of the meningitis movement and one of the leading charities dedicated to fighting meningitis in the UK. With over 30 years' experience, the charity is a powerful and united voice for people affected this disease. The charity funds high quality research, which aims to assist the charity to deliver its two over-riding goals: (1) Saving lives and preventing disability through improving prevention, early diagnosis and treatment; (2) Rebuilding futures and improving quality of life through increased recognition of the impact of meningitis and provision of timely, effective support.



Meningitis Research Foundation

Meningitis Research Foundation (MRF) is a charity that brings

together people and expertise to achieve a vision of a world free from meningitis and septicaemia. They aim to bring this vision closer through funding research of the highest scientific merit, in terms of the importance of the investigation, excellence of the study, ability of the research team, and probability of success. MRF also aims to promote early recognition, diagnosis of these infections, help improve treatment, raise awareness among the public and provide ongoing personal help to individuals and families in times of crisis, and as they live with the after effects of the diseases.



MND Association

The Motor Neurone Disease Association is the leading national

charity in England, Wales and Northern Ireland focused on improving access to care, research and campaigning for MND. We are a membership organisation with over 9,000 members, forming a powerful national and local network that provides information and support alongside fighting for improved services.



Moorfields Eye Charity

Moorfields Eye Charity is the main fundraising and grant-making charity for Moorfields Eye Hospital and the UCL Institute of Ophthalmology.

The charity provides targeted funds, above and beyond the responsibility of the NHS, to research cures and find treatments for our patients and millions of people affected by eye disease in the UK and around the world.



MQ: Transforming Mental Health

MQ is the first major charity exclusively funding scientific research into mental health. Our vision is simple: to create a world where mental illnesses are understood, effectively treated, and ultimately prevented. Since 2013, we have awarded over £9.7 million to mental health projects across the different scientific disciplines and covering multiple conditions. Find out more at www.mqmentalhealth.org



MS Society

We're the MS Society – a community of people living with MS, scientists, campaigners, volunteers and fundraisers. We understand what life's like with MS, and we support each other through the highs, lows and everything in between. And we're driving research into more – and better – treatments. For everyone. Together, we are strong enough to stop MS.



Multiple System Atrophy Trust

We work to support all people affected by MSA, by providing support services and information on the web, via a telephone helpline and a nurse specialist service. We also have a research programme to fund innovative research into the cause and ultimately find a cure for MSA.



Muscular Dystrophy UK

Muscular Dystrophy UK is the leading UK charity dedicated to fighting muscle-wasting conditions. Our work covers more than 60 rare and very rare progressive muscle-weakening and wasting conditions, which affect around 70,000 individuals in the UK. We fund research into identifying treatments and cures for these conditions that will improve the lives of everyone affected by them. We are leading the drive to get faster access to emerging treatments for families in the UK and are working to ensure everyone has access to the specialist NHS care and support they need, in order that they can live as independently as possible.



North West Cancer Research

North West Cancer Research is the leading cancer research charity in the North West of England that is helping to find life-saving solutions to stop cancer sooner. We achieve this by funding world class cancer research in North West England and North Wales. We are committed to achieving a cancer free future and like Rutherford Cancer Centres, greater outcomes for patients. Since funding our very first project almost 70 years ago, we have been at the forefront of life-saving research - supporting some of the best cancer research at the University of Liverpool, Bangor University and Lancaster University.



Northern Ireland Chest, Heart and Stroke

Northern Ireland Chest Heart & Stroke is a local charity which helps people living with these conditions and their families. Each year we need to raise over £3m to fund our range of programmes, community services and research in the hospitals and universities of Northern Ireland.

Our vision for Northern Ireland is one where everyone can live life to the full, free from chest, heart and stroke illnesses. To achieve this, our work is focused in these areas: Care Services, Prevention, Health Promotion, Research, Lobbying and Policy Work. All our work is within Northern Ireland. When people donate to NICHHS, they know their entire gift will be used for local benefit.



Orthopaedic Research UK

We are a medical charity that strives to improve the quality of lives for millions of people. Through research and education we are aiming to eliminate bone and joint disease.



Ovarian Cancer Action

Ovarian Cancer Action is the UK's ovarian cancer research charity. Scientific research is how we make the biggest impact on the UK's most deadly gynaecological disease. We're committed to funding research to accelerate progress in three main areas: prevention, diagnosis and treatment. And while our scientists are busy in the lab, we're on the ground campaigning for change and raising awareness of the disease, so that every woman and healthcare professional knows the signs to look out for.



Pancreatic Cancer UK

Pancreatic cancer is a tough one but we're taking it on. It is tough to diagnose, tough to treat, and tough to research.

For too long this disease has been side-lined. We want to make sure that everyone affected by it gets all the help they need. We provide expert, personalised support and information. We fund innovative research to find the breakthroughs that will change how we understand, diagnose and treat pancreatic cancer. We campaign for change; for better care, treatment and research and for pancreatic cancer to have the recognition it needs. Together we're taking on pancreatic cancer.



Parkinson's UK

Every hour, someone in the UK is told they have Parkinson's.

Because we're here, no one must face Parkinson's alone. We bring people with Parkinson's, their carers and families together via our network of local groups, our website and free confidential helpline. Specialist nurses, our supporters and staff provide information and training on every aspect of Parkinson's. As the UK's Parkinson's support and research charity we're leading the work to find a cure, and we're closer than ever. We also campaign to change attitudes and demand better services. Our work is totally dependent on donations. Help us to find a cure and improve life for everyone affected by Parkinson's.



Pharmacy Research UK

Supporting the production of timely evidence that informs policy and practice relating to pharmacy's contribution to the health of the public, medicines and their use.



Prostate Cancer UK

Prostate Cancer UK is one of the main charities leading the fight against prostate cancer. Funding ground-breaking research, driving improvements in treatment, and fighting injustice in care, Prostate Cancer UK has a simple ambition – to stop men dying from prostate cancer.



Royal Hospital for Neuro-disability
A national medical charity

Royal Hospital for Neuro-disability

Founded in 1854, we are a well-respected national charitable hospital and research centre, providing services for adults with brain injuries. Our Putney based community provides specialist care, therapies and innovative technology to meet the complex needs of people with profound disabilities.



Royal Osteoporosis Society
Better bone health for everybody

Royal Osteoporosis Society

The Royal Osteoporosis Society is the only UK-wide charity dedicated to improving the prevention, diagnosis and treatment of osteoporosis. With more than 30 years of expertise and experience behind them, they are committed to helping keep the nation's bones stronger for longer. The charity provides vital information, fight for faster diagnoses, and speak up for those affected. Driving research for the development of new medications and treatments – they are determined to find a cure. ROS dream of a future without osteoporosis and they won't stop until it's a reality.



Sands

Sands funds research into stillbirth and neonatal death.



Sarcoma UK

Sarcoma UK is a national charity that funds vital research, supports everyone affected by sarcoma cancer and campaigns for better treatments.



Solving Kids' Cancer

Solving Kids' Cancer provides specialist support to children and families affected by neuroblastoma. They help equip parents with the information and resources they need to fight the disease and feel empowered to make informed choices about their child's treatment. They help families raise funds to access treatment and trials abroad while working hard to improve options in the UK, so families don't have to travel overseas. Solving Kids' Cancer is shaping and funding ground-breaking research to improve survival rates for children with neuroblastoma.



Sparks

Sparks raises money to fund pioneering child health research across the UK, helping to find new treatments and cures for children and families who desperately need them. Sparks supports clinicians and scientists who have the skills, innovation and passion to improve children's lives forever. Since 1991, we have funded more than 300 ground-breaking child health research projects in over 90 hospitals, universities and research institutions across the UK and overseas. In February 2017, Sparks partnered with Great Ormond Street Hospital (GOSH) Charity merging our national research funds, making up to £2 million available. This is the largest fund in the UK dedicated to child health research, and will benefit children at GOSH, nationally and around the world.



Stroke Association

We are the Stroke Association. We believe in life after stroke. That's why we support stroke survivors to make the best recovery they can. It's why we campaign for better stroke care. And it's why we fund research to develop new treatments and ways of preventing stroke. We rely on your support to change the lives of people affected by stroke and reduce the number of people who are struck by this devastating condition. Please help us to make a difference today.



Target Ovarian Cancer

Target Ovarian Cancer is the UK's leading ovarian cancer charity. We work to improve early diagnosis, fund life-saving research and provide much-needed support to women with ovarian cancer. We're the only charity fighting ovarian cancer on all three of these fronts, across all four nations of the UK.



Tenovus Cancer Care

Tenovus Cancer Care brings practical advice, emotional support and treatment to where it matters most; the heart of the community. We help cancer patients and their loved ones cope, and through our vital research, we offer hope.



The Brain Tumour Charity

The Brain Tumour Charity is at the forefront of the fight to defeat brain tumours, making a difference every day to the lives of people with a brain tumour and their families. We fund pioneering research to increase survival, raise awareness of the symptoms and effects of brain tumours and provide support for everyone affected to improve quality of life. We are committed to having the greatest possible impact for every person affected by a brain tumour, so that getting the diagnosis of a brain tumour no longer means a death sentence.



The Cure Parkinson's Trust

The Cure Parkinson's Trust has one simple aim: to find ways to slow, stop and reverse the condition. It funds preclinical studies and clinical trials and involves people living with Parkinson's in every decision and every process.



The Lullaby Trust

The Lullaby Trust raises awareness of sudden infant death syndrome (SIDS), provides expert advice on safer sleep for babies and offers emotional support for bereaved families.



The Royal College of Anaesthetists

The Royal College of Anaesthetists (RCoA) is the professional body responsible for the specialty of anaesthesia throughout the United Kingdom. Its principal responsibility is to ensure the quality of patient care through the maintenance of standards in anaesthesia, pain medicine and intensive care. The RCoA supports the development of high-quality research within the healthcare profession and works collaboratively, through the National Institute of Academic Anaesthesia (NIAA), to enhance high quality research activity by funding research that aims to improve patient care and by supporting and promoting academic research in anaesthesia at all levels.

The NIAA was established in 2008 by the Royal College of Anaesthetists, the Association of Anaesthetists of Great Britain and Ireland and the journals *Anaesthesia* and the *British Journal of Anaesthesia*. It is a uniquely collaborative

umbrella organisation that incorporates these four bodies, plus several anaesthetic specialist society funding partners, to improve patient care by supporting and promoting research in anaesthesia via biannual grant distribution rounds, to which all NIAA partners make contributions at different times.

The Health Services Research Centre (HSRC) was launched in 2011 as an offshoot of the NIAA, with the aim of being a hub for world-class anaesthesia research (including perioperative, pain related and sub-specialty research). The HSRC is now the operational delivery arm for all the health services research conducted by the RCoA, including such projects as the National Emergency Laparotomy Audit (NELA), the Perioperative Quality Improvement Programme (PQIP), the Sprint National Anaesthesia Projects (SNAPs) and the RCoA National Audit Projects (NAPs). The HSRC's projects are direct health services research, focusing on patients undergoing anaesthesia and surgery and their broader perioperative pathway. This broadens our reach beyond just the surgical episode itself, to include health outcomes from many months or even years later. This data is captured through a variety of methods including directly reported patient outcomes and statistical analysis and comparison via linkage to national datasets such as ONS and HES.



The Urology Foundation

We are dedicated to beating all urology diseases through cutting-edge research and leading education and training to ensure that fewer lives will be devastated.



Tourettes Action

Tourettes Action works in England, Wales and Northern Ireland and is one of the leading support and research charities for people with Tourette Syndrome and their families. We want people with TS to receive the practical support and social acceptance they need to help them live their lives to the full, which lays the foundations of the major medical breakthroughs. Much of the research we have funded has led to the care and cures which are now part of everyday clinical practice.



Wellbeing of Women

Wellbeing of Women is the only charity in the UK funding peer-reviewed pioneering medical research across the whole spectrum of women's reproductive and gynaecological health. Our mission is to improve diagnoses and treatments and find cures and preventions to transform the lives of women and their babies everywhere. Since the charity was established in 1964, we have invested around £54 million in the vital early science which lays the foundations of the major medical breakthroughs. Much of the research we have funded has led to the care and cures which are now part of everyday clinical practice.



Wessex Medical Research

Wessex Medical Research funds research to fight disease; to tackle underlying causes of ill health; to find better treatments and, potentially cures for conditions that affect every age group.



World Cancer Research Fund

World Cancer Research Fund (WCRF) is one of the world's leading cancer prevention charities funding research into the associations between nutrition, physical activity, body fatness and cancer prevention



Worldwide Cancer Research

Worldwide Cancer Research is one of the leading UK charities funding research into any type of cancer, anywhere in the world. We have awarded almost £200 million to ground breaking early-stage and translational research, in 34 different countries. We fund cancer research projects in the world's best research institutions. Some of the world's most diverse and unexpected projects. We fund world-renowned specialists and up and coming talent. Our mission is to enable these pioneers to deliver the new discoveries that will save millions of lives and realise our vision of no life cut short by cancer.



Yorkshire Cancer Research

Yorkshire Cancer Research - Taking action to help prevent cancer and improve the likelihood of survival across Yorkshire.

Other charities, foundations and trusts

The Francis Crick Institute



The Francis Crick Institute ('the Crick') is dedicated to understanding the fundamental biology underlying health and disease. Formed in 2015, the Institute is located in a brand [new state-of-the-art building](#) in central

London, which brings together 1500 scientists and support staff working collaboratively across disciplines. This makes the Crick the biggest biomedical research facility under a single roof in Europe. Our work is helping to understand why disease develops and to translate discoveries into new ways to prevent, diagnose and treat illnesses such as cancer, heart disease, stroke, infections and neurodegenerative diseases. We bring together outstanding scientists from all disciplines, carrying out research that will help improve the health and quality of people's lives, and keep the UK at the forefront of medical innovation.

The Crick is an independent organisation supported by our [founding partners](#); the Medical Research Council (MRC), Cancer Research UK, Wellcome Trust, UCL, Imperial College London and King's College London. The core contribution for the financial year 2017/18 from our Founders was £116.8m split as follows; MRC £47.3m, Cancer Research UK £53.8m and Wellcome Trust £15.7m.

This core contribution allows the Crick to support a wide range of research programmes led by Group Leaders appointed based on scientific excellence. The award data in this analysis contains all programmes supported by the Crick in 2018, as published on UKRI's Gateway to Research. The cost of the individual programmes for the financial year 2017/18 is an approximation of expenditure using direct spend and an allocation of other costs based on headcount per Group, rather than actual expenditure.



Garfield Weston FOUNDATION

Garfield Weston Foundation

The Garfield Weston Foundation is a family-founded, charitable grant-making foundation, which supports a wide range of charitable causes across the UK, donating over £70 million annually and more than £1 billion in total since its establishment in 1958. The Foundation aims to be responsive to where need is greatest and therefore supports a wide range of charitable activity including the arts, environment, youth, community, health and welfare. As a result of this responsive approach, the Foundation does not work in the health sector directly, although may fund charities who do so. While the Foundation does accept applications from organisations that work in healthcare, such as hospitals, hospices and other direct delivery healthcare charities, the Foundation does not generally award grants for medical research.



The Health Foundation

The Health Foundation is an independent charity committed to bringing about better health, and health and social care for people in the UK.

Our aim is a healthier population, supported by high quality health care that can be equitably accessed. We learn what works to make people's lives healthier and improve the health care system. From giving grants to those working at the front line to carrying out research and policy analysis, we shine a light on how to make successful change happen.

We make links between the knowledge we gain from working with those delivering health and health care and our research and analysis. Our aspiration is to create a virtuous circle, using what we know works on the ground to inform effective policymaking and vice versa.

We believe good health and health care are key to a flourishing society. Through sharing what we learn, collaborating with others and building people's skills and knowledge, we aim to make a difference and contribute to a healthier population.

As the second largest endowed foundation in the UK focusing on health, we spend around £37 million a year on improving health and health care.

Our activities expand across four key work streams:

- to promote healthy lives for all
- to understand the quality of health and care
- to support health care improvement
- to make health and care services more sustainable.

LifeArc

LifeArc is a self-funded medical research charity. Our mission is to advance translation of early science into health care treatments or diagnostics that can be taken through to full development and made available to patients.

We've been doing this for more than 25 years and our work has resulted in four licensed medicines and a diagnostic for antibiotic resistance. Our success allows us to explore new approaches to stimulate and fund translation. We have our own drug discovery and diagnostics facilities, supported by experts in technology transfer and intellectual property who also provide services to external clients. Our model is built on collaboration, and we partner with a broad range of groups including medical research charities, research organisations, industry and scientists. We are motivated by patient need and scientific opportunity.

Two funds help us to progress science for the benefit of patients - our Philanthropic Fund providing grants to support medical research projects focused on the translation of rare diseases research and our Seed Fund aimed at start-up companies focused on developing new therapeutics and biological modalities. Find out more about our work [here](#).



MHA Care Group

MHA is an award-winning charity providing care, accommodation and support services for older people

throughout England, Scotland and Wales. We are one of the most well-respected care providers in the sector and one of Britain's Top 20, providing services to older people for 75 years.

We do not fund research, but we do participate in it, if we feel it will be for the benefit of our residents. We mainly work with academic partners and our current main areas of interest are dementia, particularly improving the quality of life for people living with dementia. As a provider of music therapy, we are particularly looking at how this can reduce agitation for people living with dementia and are building the evidence base on the effectiveness of music therapy to influence policymakers, so that it becomes a recognised treatment for reducing agitation in dementia and available freely to more people.



Medical Research Foundation

*"Changing medicine today.
Changing lives tomorrow" -*

The Medical Research Foundation's vision is to advance medical research, improve human health and change people's lives.

Many of the diseases and conditions that affect human health have been cured or overcome as a result of medical research. But there will always be more to do. Although significant resources are being spent around the world on developing exciting new treatments and therapies, there are areas of medical need that receive little or no support – and people's lives that see no improvement. That is where we step in.

We are devoted to ensuring donations from our supporters are directly invested in cutting-edge medical research – not on campaigning, advocacy, or support services.

Our longstanding connection with the Medical Research Council (MRC) means that we have access to some of the best medical knowledge in the world. That, along with our careful governance, ensures we make the greatest impact where it is most needed and that we use our supporters' donations responsibly.

Unlike many charities, we do not have to provide support for a particular disease or condition, or a particular research institution. We are free to choose our own research priorities and we are responsive and flexible in the way we allocate our funding. We are always looking for opportunities to support exciting new research.



Newlife Foundation for Disabled Children

Newlife the charity for Disabled Children started back in 1991, funding research towards work to improve children's health, focusing on the aetiology, prevention and treatment of birth defects. We have since broadened our aims and we now have a team of Nurses who operate a helpline, our Equipment Services and a department who campaign for a fairer deal for disabled children. Newlife runs the only emergency equipment service in the UK helping those children in the most urgent need.

Our volunteers and supporters know that 100% of every penny they donate or fundraise can be restricted where they want the funds to be spent.

We have invested in Research more than £16million, in over 300 individual projects at more than 80 research institutions across the UK. Over 50 disease causing genes have now been identified as a result of Newlife funding in part or in full and Newlife is funding projects into new treatments. Newlife's ten-year medical training programme has helped over 60 PhD students get an insight into the world of research.

While Medical Research has continued to help children with birth defects, our charity widened its remit in 2008 to help all disabled children including helping children through our equipment services who have a disability as a result of cancers, infections, prematurity and accidents

Newlife exists because if it was your child, you would want the best for them and that's what we are working for every day.

NUFFIELD COUNCIL ON BIOETHICS

Nuffield Council on Bioethics

The Nuffield Council on Bioethics

is an independent body that examines and advises on ethical issues on bioscience and health. We are jointly funded by the Nuffield Foundation, Wellcome Trust, and Medical Research Council.

When we identify and define ethical questions raised by recent developments in biological and medical research that concern, or are likely to concern, the public interest, we make arrangements for the independent examination of such questions with appropriate involvement of relevant stakeholders, and we make policy recommendations to Government or other relevant bodies and to disseminate our work through published reports, [briefing notes](#), and other appropriate outputs.

Our main work involves conducting two-year inquiries into a particular topic, led by a multi-disciplinary working group. Throughout the course of an inquiry, we gather evidence through a number of ways including consultations (open and expert), workshops, meetings with relevant stakeholders, and evidence reviews (in-house or commissioned). Our evidence-gathering activities for each project are made available on our [website](#).



Nuffield Foundation

The Nuffield Foundation funds research, analysis, and student

programmes that advance the educational opportunity and social wellbeing across the UK. The Foundation funds research with the aim to improve the design and operation of social policy, within Education, Welfare and Justice. This research includes health-relevant projects, for example:

- Pupil special education needs and disabilities: identification, access and patterns of mental health. This focuses on mental health
- Impact of the Universal Infant Free School Meal Policy. This tackles issues such as BMI and obesity
- A portfolio of work focused on Speech and Language Impairment

In addition to this research, the foundation funds other organisations such as the Food Foundation whose projects include supporting evidence driven policy influencing food and health. The Nuffield Foundation contributes towards The Oliver Bird Fund, with up to £12.5 million dedicated to research into musculoskeletal conditions in the next ten years. Up to £6.25 million of this will be awarded within the next 5 years.



RS Macdonald Charitable Trust

The RS Macdonald

Charitable Trust was established in 1978. We are an endowed Trust, and invest in charities across Scotland, to the value of around £3m each year. Our funding is distributed around several themes set by our Trustor. Two of our themes are neurological conditions and visual impairment and within each we fund support services and medical research. Our current focus within medical research is twofold: we provide direct funding to universities in Scotland, by way (principally) of seedcorn grants. We also directly fund research charities, to fund projects which are looking into these themes in Scotland. There is no dedicated budget for each our funding themes and we allocate according to the level of ask and the recommendations formed during our assessment process. We do not undertake any in-house research. We are particularly interested in early career researchers and in funding post-doctoral research which may open opportunities to support larger grant funding. We have also provided funding for medical equipment within academic centres.

The two funding themes are wide ranging. One of our principal relationships is with a Scottish University, whose seedcorn funding is addressing the following health conditions: epilepsy, Alzheimer's, Parkinson's, schizophrenia, autism and others. We also have a grant dedicated to neurophotonics and its application to neurodegenerative conditions. An example of one of these studies is "Visualising the effects of Glial Activity on Synapses in the Spinal Cord". Some more focused funding of PhD doctorates working on applied healthcare for those who have neurological conditions including spinal cord injury and Huntingdon's Disease.

In the calendar year we provided nine grants within medical research, average value £42,468. The total value of the awards made is £382,211.

Appendix 2

Combined UK spend breakdown by funding organisation

Part One – Direct Awards

Funding Organisation	2004/05	2009/10	2014	2018		
	Spend (real terms)	Spend (real terms)	Spend (real terms)	Spend	Indirect	Total
A – C						
Academy of Medical Sciences	-	-	-	£3.6m	-	£3.6m
Action Medical Research#	-	-	£2.9m	£3.2m	£0.3m	£3.5m
Action on Hearing Loss	-	-	Indirect	Total	-	£1.1m
Alcohol Change UK	-	-	£0.6m	£0.4m	<£0.1m	£0.4m
Alzheimer's Research UK#	£1.8m	-	£4.4m	£15.3m	£1.0m	£16.4m
Alzheimer's Society#	£1.2m	-	£2.8m	£8.5m	£0.3m	£8.8m
Anthony Nolan	-	-	-	£0.7m	-	£0.7m
Arts and Humanities Research Council	-	-	£3.2m	£3.1m	-	£3.1m
Asthma UK#	£3.0m	-	£0.9m	£1.4m	-	£1.4m
Ataxia UK	-	-	£0.1m	<£0.1m	-	<£0.1m
Autistica	-	-	-	£0.7m	<£0.1m	£0.7m
Biotechnology and Biological Sciences Research Council*	£19.5m	£32.1m	£64.5m	£46.2m	£0.3m	£46.5m
Bloodwise	-	-	-	£17.0m	£0.3m	£17.3m
Bowel Cancer UK	-	-	-	£0.2m	-	£0.2m
Bowel Disease Research Foundation	-	-	-	£0.2m	-	£0.2m
BRACE	-	-	-	£0.4m	£0.1m	£0.6m
Brain Research UK	-	-	-	£0.7m	£1.1m	£1.8m
Breast Cancer Now#	£6.6m	-	£6.4m	£8.4m	£2.6m	£10.9m
British Association for Counselling and Psychotherapy	-	-	-	£0.1m	<£0.1m	£0.1m
British Council for Prevention of Blindness	-	-	-	£0.2m	<£0.1m	£0.2m
British Heart Foundation*	£59.6m	£68.3m	£75.4m	£86.1m	£3.0m	£89.1m
British Journal of Anaesthesia	-	-	-	£0.7m	<£0.1m	£0.7m
British Lung Foundation	-	-	£0.7m	£1.3m	£0.4m	£1.7m
British Scoliosis Research Foundation	-	-	-	<£0.1m	-	<£0.1m
British Sjögren's Syndrome Association	-	-	-	<£0.1m	-	<£0.1m
British Skin Foundation	-	-	-	£0.6m	£0.1m	£0.7m
Cancer Research UK*	£225.8m	£263.5m	£268.8m	£234.3m	£119.0m	£353.3m
Chest Heart & Stroke Scotland	-	-	£0.6m	£0.3m	-	£0.3m
Chief Scientist Office, Scotland*	£17.5m	£25.5m	£29.5m	£24.8m	£42.4m	£67.2m
Childhood Eye Cancer Trust	-	-	-	<£0.1m	-	<£0.1m
Children's Liver Disease Foundation	-	-	-	<£0.1m	-	<£0.1m
Chronic Disease Research Foundation	-	-	-	£0.3m	-	£0.3m
Coeliac UK	-	-	-	<£0.1m	-	<£0.1m
Crohn's & Colitis UK	-	-	-	£0.7m	<£0.1m	£0.8m
Cystic Fibrosis Trust	-	-	-	£4.1m	<£0.1m	£4.1m

Appendix 2

Funding Organisation	2004/05	2009/10	2014	2018		
	Spend (real terms)	Spend (real terms)	Spend (real terms)	Spend	Indirect	Total
D – F						
Debra	-	-	-	£0.4m	-	£0.4m
Department for Environment, Food and Rural Affairs	-	-	-	£8.0m	<£0.1m	£8.0m
Department for International Development	-	-	-	£19.2m	£5.0m	£24.2m
Department for the Economy, Northern Ireland	-	-	-	£1.0m	-	£1.0m
Department for Transport	-	-	-	<£0.1m	-	<£0.1m
Department for Work and Pensions	-	-	-	£2.4m	-	£2.4m
Department of Health and Social Care (including NIHR)	£124.8m	£229.6m	£304.5m	£364.6m	£610.1m	£974.8m
Diabetes Research & Wellness Foundation	-	-	-	£0.2m	£0.1m	£0.3m
Diabetes UK#	£5.8m	-	£6.5m	£7.2m	£0.1m	£7.3m
Duchenne UK	-	-	-	£0.2m	£0.2m	£0.5m
Dunhill Medical Trust	-	-	£2.3m	£2.1m	£0.9m	£3.0m
Economic and Social Research Council*	£12.5m	£29.9m	£38.6m	£49.3m	£13.9m	£63.2m
Engineering and Physical Sciences Research Council*	£33.9m	£101.6m	£119.7m	£114.1m	£63.0m	£177.1m
Epilepsy Action	-	-	-	<£0.1m	-	<£0.1m
Epilepsy Research UK#	£0.2m	-	£0.8m	£0.7m	<£0.1m	£0.7m
Fight for Sight	-	-	£3.3m	£2.6m	£0.4m	£3.1m
Food Standards Agency	-	-	-	£2.4m	-	£2.4m
Friends of EORTC	-	-	-	£0.3m	<£0.1m	£0.4m
G– I						
Great Ormond Street Hospital Children's Charity	-	-	£4.6m	£0.7m	£0.6m	£1.3m
Guts UK	-	-	£0.3m	£0.1m	-	£0.1m
Guy's and St Thomas' Charity#	£2.1m	-	£1.7m	£5.3m	£2.0m	£7.4m
Health and Care Research Wales (R&D Division, Health and Social Services Group, Welsh Government)	£2.4m	£18.4m	£9.6m	£9.2m	£30.1m	£39.2m
Health and Social Care Research and Development Division (HSC R&D) of Public Health Agency, Northern Ireland	£10.9m	£10.9m	£4.7m	£7.9m	£8.6m	£16.6m
Health Education England	-	-	-	£7.9m	£5.4m	£13.4m
Heart Research UK	-	-	-	£0.8m	<£0.1m	£0.9m
Innovate UK	-	-	£44.7m	£81.9m	£103.8m	£185.7m
J– L						
JDRF	-	-	£2.7m	£4.1m	-	£4.1m
Kidney Research UK#	£1.9m	-	£2.8m	£5.6m	£0.7m	£6.3m
Leuka	-	-	-	<£0.1m	-	<£0.1m
Leukaemia & Lymphoma NI	-	-	-	£0.1m	£0.3m	£0.4m
Lister Institute of Preventive Medicine	-	-	-	£0.7m	-	£0.7m

Appendix 2

Funding Organisation	2004/05	2009/10	2014	2018		
	Spend (real terms)	Spend (real terms)	Spend (real terms)	Spend	Indirect	Total
M– O						
Macmillan Cancer Support	-	-	-	£1.1m	-	£1.1m
Macular Society	-	-	£0.2m	£0.6m	-	£0.6m
Marie Curie#	£2.3m	-	£1.5m	£2.6m	-	£2.6m
Medical Research Council*	£431.8m	£668.7m	£682.7m	£678.1m	£51.8m	£729.9m
Medical Research Foundation	-	-	-	£2.0m	£1.2m	£3.2m
Medical Research Scotland#	£0.9m	-	£0.8m	£1.6m	£0.1m	£1.7m
Meningitis Now	-	-	£0.4m	£0.2m	-	£0.2m
Meningitis Research Foundation	-	-	£0.2m	£0.4m	-	£0.4m
MND Association#	£0.9m	-	£1.5m	£4.1m	<£0.1m	£4.1m
Moorfields Eye Charity	-	-	-	£4.3m	£0.5m	£4.8m
MQ: Transforming Mental Health	-	-	<£0.1m	£1.9m	-	£1.9m
MS Society#	£3.4m	-	£2.4m	£4.3m	£0.2m	£4.5m
Multiple System Atrophy Trust	-	-	-	£0.2m	-	£0.2m
Muscular Dystrophy UK	-	-	-	£2.1m	<£0.1m	£2.2m
National Centre for the Replacement, Refinement and Reduction of Animals in Research	-	-	£6.3m	£4.9m	-	£4.9m
Natural Environment Research Council	-	-	£4.6m	£6.6m	<£0.1m	£6.7m
Newlife The Charity for Disabled Children	-	-	-	£0.6m	-	£0.6m
North West Cancer Research	-	-	-	£1.6m	£0.4m	£2.0m
Northern Ireland Chest, Heart and Stroke	-	-	£0.2m	£0.2m	-	£0.2m
Nuffield Foundation	-	-	-	£0.5m	-	£0.5m
Orthopaedic Research UK	-	-	£0.6m	£0.2m	-	£0.2m
Ovarian Cancer Action	-	-	-	£0.3m	<£0.1m	£0.3m
P– R						
Pancreatic Cancer UK	-	-	£0.6m	£0.9m	<£0.1m	£0.9m
Parkinson's UK#	£1.7m	-	£5.4m	£3.8m	<£0.1m	£3.9m
Pharmacy Research UK	-	-	£0.2m	£0.2m	<£0.1m	£0.2m
Prostate Cancer UK	-	-	£4.3m	£6.6m	<£0.1m	£6.7m
Royal Academy of Engineering	-	-	-	£1.6m	-	£1.6m
Royal College of Radiologists	-	-	-	£0.1m	-	£0.1m
Royal Hospital for Neuro-disability	-	-	£0.1m	£0.2m	-	£0.2m
Royal Osteoporosis Society	-	-	-	<£0.1m	<£0.1m	<£0.1m
S– U						
Sands	-	-	-	£0.2m	-	£0.2m
Sarcoma UK	-	-	£0.1m	£0.3m	<£0.1m	£0.3m
Science and Technology Facilities Council	-	-	-	£1.5m	£23.9m	£25.5m
Solving Kids' Cancer	-	-	-	£0.1m	-	£0.1m
Sparks#	£0.7m	-	£1.3m	£0.2m	<£0.1m	£0.3m
Stroke Association#	£2.3m	-	£2.0m	£3.0m	-	£3.0m
Target Ovarian Cancer	-	-	-	£0.2m	-	£0.2m
Tenovus Cancer Care#	£2.6m	-	£0.4m	£0.5m	£0.1m	£0.6m

Appendix 2

Funding Organisation	2004/05	2009/10	2014	2018		
	Spend (real terms)	Spend (real terms)	Spend (real terms)	Spend	Indirect	Total
The Brain Tumour Charity	-	-	£1.0m	£2.9m	<£0.1m	£2.9m
The Cure Parkinson's Trust	-	-	-	£0.4m	<£0.1m	£0.4m
The Francis Crick Institute	-	-	-	£92.5m	£24.3m	£116.8m
The Health Foundation	-	-	-	£1.0m	-	£1.0m
The Lullaby Trust	-	-	<£0.1m	<£0.1m	-	<£0.1m
The Royal College of Anaesthetists	-	-	-	£0.1m	<£0.1m	£0.2m
The Urology Foundation	-	-	-	<£0.1m	<£0.1m	<£0.1m
Tourettes Action	-	-	-	<£0.1m	-	<£0.1m
UK Clinical Virology Network	-	-	-	<£0.1m	-	<£0.1m
UK Space Agency	-	-	-	£2.7m	-	£2.7m
V – Y						
Versus Arthritis	£22.2m	£30.0m	£22.5m	£22.8m	£0.2m	£23.0m
Wellbeing of Women	-	-	-	£0.8m	<£0.1m	£0.9m
Wellcome Trust	£282.2m	£390.2m	£400.2m	£521.8m	£217.5m	£739.2m
Welsh Government Office for Science	-	-	-	£4.4m	£0.9m	£5.3m
Wessex Medical Research	-	-	-	£0.2m	<£0.1m	£0.3m
World Cancer Research Fund	-	-	£0.6m	£0.6m	-	£0.6m
Worldwide Cancer Research#	£7.2m	-	£3.6m	£1.3m	-	£1.3m
Yorkshire Cancer Research#	£2.8m	-	£2.3m	£6.2m	<£0.1m	£6.3m
Grand totals	£1.29bn	£1.87bn	£2.15bn	£2.56bn	£1.40bn	£3.96bn

Key:

* Funding Organisation is a member of the Health Research Analysis Forum and participated in the 2004/05, 2009/10 and 2014 analyses. In this 2018 report, data from these 12 funders may be presented separately as 'HRAF Funders' but also appear in 'All Funders' groups.

Funding organisation is AMRC member that participated in the UKCRC Donation to Innovation report (2007), and data from this report is displayed under 2004/05 columns. In this 2018 report, these 19 organisation's data are included in the 'All Funders' group but are occasionally referenced separately.

Note: All tables in this report may contain small rounding errors. Values from previous reports have been adjusted for inflation, see Appendix 11 for details.

Part Two – Indirect Awards

Funder	Indirect Spend by Category (£m)				
	Infrastructure	Training and studentships	Personal	Other	Total
AMRC*	£6.5m	£0.5m	£1.5m	£5.7m	£14.2m
Biotechnology and Biological Sciences Research Council	-	£0.2m	-	<£0.1m	£0.3m
British Heart Foundation	£2.4m	£0.2m	£0.4m	-	£3.0m
Cancer Research UK	£119.0m	-	-	-	£119.0m
Chief Scientist Office, Scotland	£41.1m	-	£1.3m	-	£42.4m
Department for Environment, Food and Rural Affairs	<£0.1m	-	-	-	<£0.1m
Department for International Development	£4.8m	£0.1m	-	-	£5.0m
Department of Health and Social Care (including NIHR)	£606.0m	-	£4.1m	-	£610.1m
Economic and Social Research Council	£13.8m	£0.1m	-	-	£13.9m
Engineering and Physical Sciences Research Council	£13.5m	£17.6m	-	£31.8m	£63.0m
Health and Care Research Wales (Welsh Government)	£14.6m	<£0.1m	-	£15.4m	£30.1m
Health and Social Care Research and Development Division (HSC R&D) of Public Health Agency, Northern Ireland	£8.6m	-	<£0.1m	-	£8.6m
Health Education England	£5.1m	-	£0.3m	-	£5.4m
Innovate UK	-	-	-	£103.8m	£103.8m
Medical Research Council	£24.0m	£27.7m	-	-	£51.8m
Medical Research Foundation	-	£1.2m	<£0.1m	-	£1.2m
Natural Environment Research Council	-	<£0.1m	-	-	<£0.1m
Research England	£56.4m	-	-	-	£56.4m
Science and Technology Facilities Council	£23.9m	-	-	<£0.1m	£23.9m
The Francis Crick Institute	£24.3m	-	-	-	£24.3m
Versus Arthritis	<£0.1m	<£0.1m	-	£0.2m	£0.2m
Wellcome Trust	£165.4m	£37.6m	£0.4m	£14.1m	£217.5m
Welsh Government Office for Science	£0.9m	-	-	-	£0.9m
Grand total	£1130.5m	£85.4m	£8.0m	£171.1m	£1395.1m

*the AMRC entry represents the combined indirect awards from all members excluding BHF, CRUK, Versus Arthritis and Wellcome Trust (members of the HRAF). The definitions of Infrastructure, Personal, and Training and Studentships can be found on **page 17**. Any addition indirect funding is classified as 'Other' and is either described on **page 17** or in the funding organisation's qualitative submission in **Appendix 1**.

Appendix 3

Contributions of additional participating organisations to the 2018 analysis

The first two analyses in the *UK Health Research Analysis* report series focused on the twelve largest public and charity funders of health research, who collectively constitute the Health Research Analysis Forum (HRAF). In 2018, these 12 funders still contribute the majority (85%) of the total expenditure in this analysis.

However, both the 2014 and 2018 analyses included awards from a range of additional funders (n=52 and 111) contributing a further £129m and £393m (6% and 15% of total analysis expenditure), respectively.

Distributions by funder

One of the primary aims of the *UK Health Research Analysis* series is to widen participation to provide not just a comprehensive view of funding but also the depth and nuance of how and why so many organisations dedicate time and funding to support health research. For this report every award record submitted to us is valuable information and will contribute to how we view funding for a particular health category, research activity or other classifications used by those who access our publicly available datasets.

The 111 non-HRAF organisations submitting data to the analysis provided records of 5,447 awards with a value in 2018 of £709m. Of this, £86m was awarded internationally and £229m was classified as indirect, leaving £393m from 4,244 awards for inclusion in the main analysis.

As the proportions by Research Activity, Health Category and geography for HRAF organisations alone did not differ significantly from the total (all organisations including HRAF) the main analysis focuses on the total all-organisation values, unless explicated stated otherwise (e.g. assessment of compound annual growth rates on page 16).

In this appendix we present both an analysis of the core HRAF organisations which is consistent across reports and an analysis of HRAF and non-HRAF organisations combined.

However, in comparing aggregated data much of the focus will be on which organisations contribute the most, particularly when comparing against other aggregated data (such as the HRAF funders). For example, of the £393m of spend submitted to the main analysis in 2018 from non-HRAF sources, almost half is from two organisations (The Francis Crick Institute at 24% and Innovate UK at 21%) and over two-thirds from just nine non-HRAF organisations with largest spend. Similarly, 90% (£208m of £230m) of indirect award funding comes from just four organisations (Innovate UK, Research England, The Francis Crick Institute and the Science and Technology Facilities Council).

Impact on HRCS Research Activity

The £393m of research funding from the 111 additional funders in 2018 produces relatively small shifts (all <1.3%) in the all-funder distribution across research activities compared with the HRAF only portfolio. These shifts include an increase in *Treatment Development* (+1.2%) and decreases in *Underpinning* research (-1.0%), and *Treatment Evaluation* (-0.7%). Data from this comparison is shown in **Table 7**, below. This mirrors findings from the 2014 analysis, where there were similarly small variations between HRAF and all funder spending distributions.

In comparison between HRAF and non-HRAF organisations, there are more pronounced differences. HRAF organisations had a higher proportion of spend in both *Underpinning* and *Treatment Evaluation* (6.3% and 4.6%, respectively). We propose that the larger, dedicated biomedical research funders have a greater capacity to support investigations into fundamental biological and socioeconomic systems coded as *Underpinning* than organisations with either limited capacity or a broader

focus beyond health. Similarly support for clinical trials is costly, thus limiting the support for awards coded as *Treatment Evaluation* to those organisations with a research budget capable of such a burden.

In contrast, the 111 non-HRAF organisations have a higher proportion of spend in *Prevention* (2.4%) and *Treatment Development* (7.9%). The former is due to the inclusion of just two funders, Innovate UK and Department for International Development, which account for 70% of non-HRAF spend in *Prevention* (£21.7m of £31.2m). Similarly Innovate UK's contribution to *Treatment Development* is substantial, with 52% of non-HRAF funding (£38.3m of £73.3m) and is fourth largest funder in the all-funder analysis⁴² of *Treatment Development* research (13% of £297m) after CRUK, MRC and Wellcome Trust.

Data from this comparison is shown in **Figure 14** below.

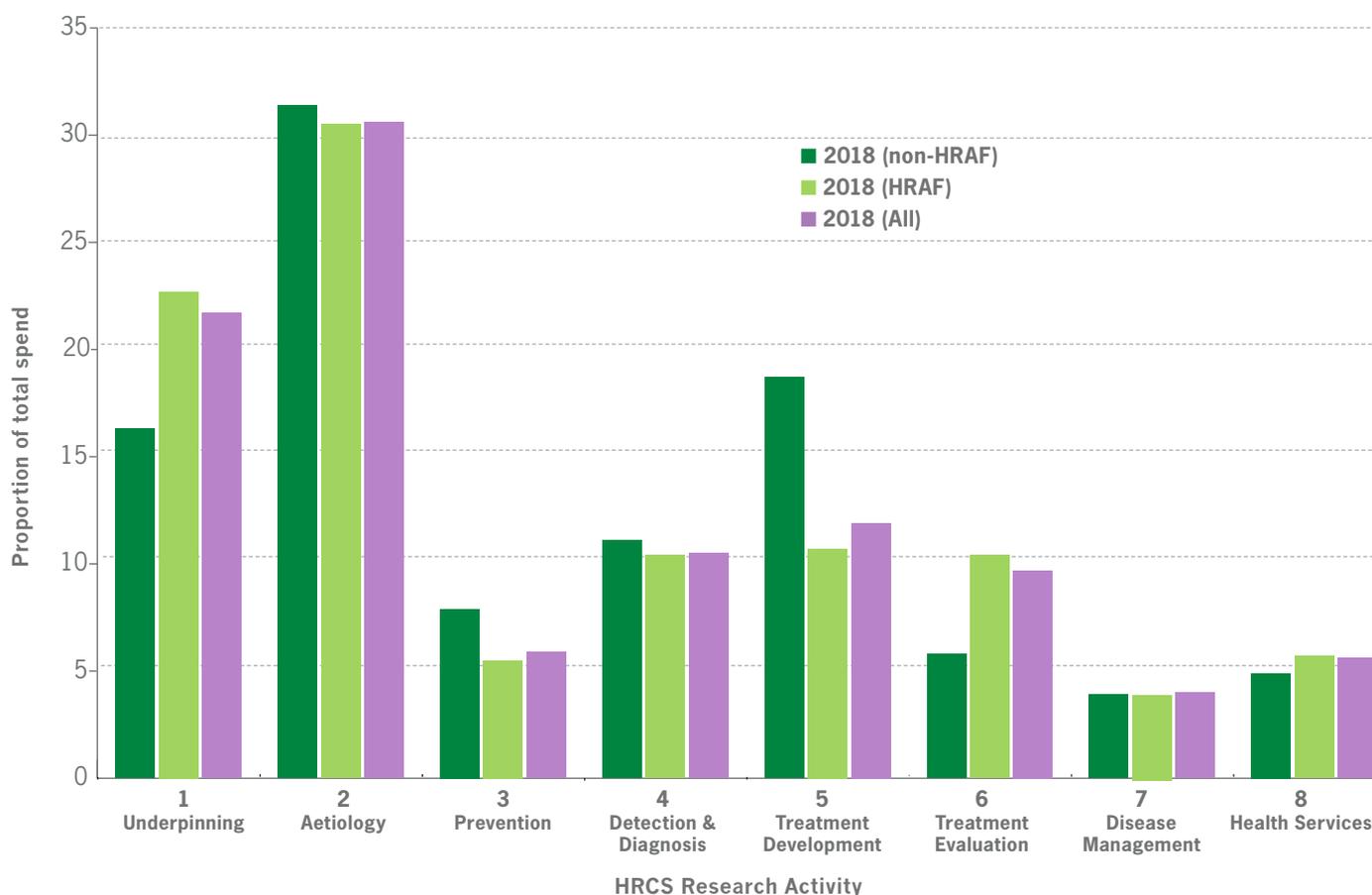


Figure 14 – Differences in the proportion of combined health research spend in 2018 by HRCS Research Activity for all organisations (123 total), HRAF funders (n=12) or non-HRAF organisations (n=111)

Research Activity Group	2018 (non-HRAF)		2018 (HRAF)		2018 (All)		Difference (All vs HRAF)
	Spend	%	Spend	&	Spend	&	
1 Underpinning	£64m	16.3%	£491m	22.7%	£555m	21.7%	-1.0%
2 Aetiology	£123m	31.4%	£661m	30.5%	£784m	30.6%	0.1%
3 Prevention	£31m	7.9%	£120m	5.5%	£151m	5.9%	0.4%
4 Detection and Diagnosis	£44m	11.1%	£226m	10.4%	£270m	10.5%	0.1%
5 Treatment Development	£73m	18.7%	£232m	10.7%	£306m	11.9%	1.2%
6 Treatment Evaluation	£23m	5.8%	£226m	10.4%	£249m	9.7%	-0.7%
7 Disease Management	£15m	3.9%	£88m	4.0%	£103m	4.0%	0.0%
8 Health Services	£19m	4.9%	£124m	5.7%	£143m	5.6%	-0.1%
Grand total	£393m	100%	£2.16bn	100%	£2.56bn	100%	n/a

Table 7 – Funding distribution by HCRS Research Activity for the 2018 datasets

Impact on HCRS Health Category

As with Research Activities, the introduction of additional funders to this analysis does not significantly disrupt the overall funding distribution by Health Category. In a comparison of total funding (all 123 funders) versus the 12 HRAF funders which featured in the 2004/05 and 2009/10 reports, only 6 of 21 Health Categories vary by $>\pm 0.2\%$. The largest variation is in *Generic Health Relevance*, where the proportion of funding from HRAF is 1.5% higher than total; as HRAF consists of some of the largest organisations in health and biomedical research it is perhaps not too surprising that they support a larger contribution to broader research topics. *Cardiovascular* research also received a slightly higher proportion of funding from HRAF organisations (0.8%), largely due to the British Heart Foundation (BHF)'s contribution.

In contrast the Health Categories that received a slightly higher proportion from total funding are *Cancer and neoplasms* (1.3%), *Infection* (0.7%) and *Neurological* (0.7%). The contribution of non-HRAF organisations to *Cancer* research is due to the inclusion of the Francis Crick Institute as a separate research organisation, which accounts for a third of non-HRAF funding. While the Crick receives core support from several HRAF organisations (MRC, CRUK and Wellcome Trust) its research programmes are chosen and implemented independently. The non-HRAF contributions to *Infection* research are predominantly from Innovate UK (35%), the Crick (23%) and the Department for International Development (22%), while non-HRAF *Neurological* research comes from Alzheimer's Research UK (26%), the Crick (18%) and Alzheimer's Society (13%).

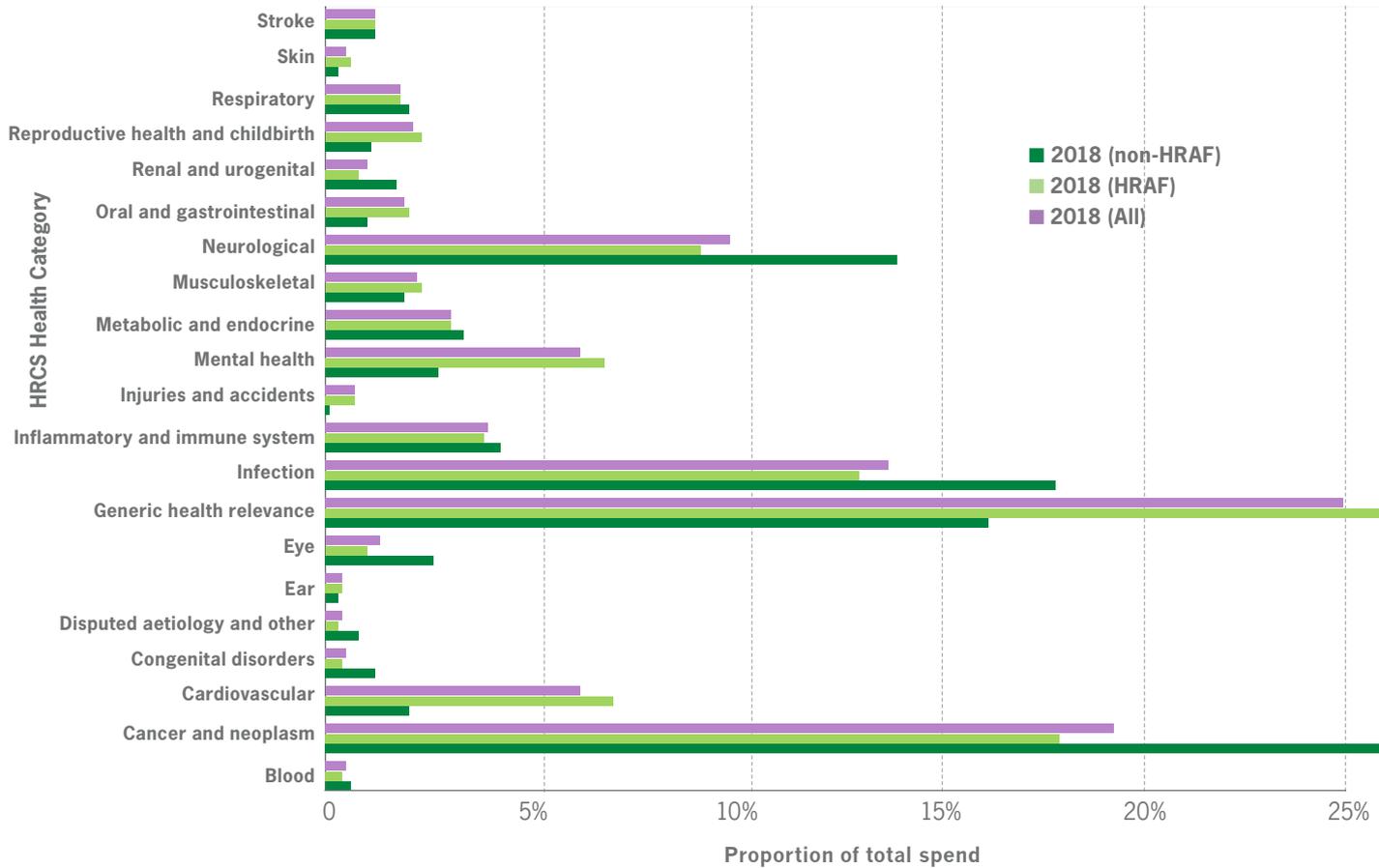


Figure 15 – Differences in proportion of combined health research spend in 2018 by HRCS Health Category for non-HRAF (111), HRAF (12) or all organisations (123)

Appendix 3

Health Category	2018 (non-HRAF)		2018 (HRAF)		2018 (All)		Difference (All vs HRAF)
	Spend	%	Spend	%	Spend	%	
Blood	£2m	0.6%	£9m	0.4%	£12m	0.5%	0.0%
Cancer and neoplasms	£102m	26.0%	£381m	17.6%	£483m	18.9%	1.3%
Cardiovascular	£8m	2.0%	£149m	6.9%	£156m	6.1%	-0.8%
Congenital disorders	£5m	1.2%	£8m	0.4%	£13m	0.5%	0.1%
Disputed aetiology and other	£3m	0.8%	£7m	0.3%	£10m	0.4%	0.1%
Ear	£1m	0.3%	£9m	0.4%	£10m	0.4%	0.0%
Eye	£10m	2.6%	£22m	1.0%	£33m	1.3%	0.2%
Generic health relevance	£63m	15.9%	£563m	26.0%	£625m	24.4%	-1.5%
Inflammatory and immune system	£16m	4.2%	£82m	3.8%	£99m	3.9%	0.1%
Injuries and accidents	£1m	0.1%	£16m	0.7%	£17m	0.7%	-0.1%
Mental health	£10m	2.7%	£145m	6.7%	£155m	6.1%	-0.6%
Metabolic and endocrine	£13m	3.3%	£65m	3.0%	£78m	3.0%	0.0%
Musculoskeletal	£8m	1.9%	£50m	2.3%	£57m	2.2%	-0.1%
Neurological	£54m	13.7%	£195m	9.0%	£248m	9.7%	0.7%
Oral and gastrointestinal	£4m	1.0%	£44m	2.0%	£48m	1.9%	-0.2%
Renal and urogenital	£7m	1.7%	£18m	0.8%	£25m	1.0%	0.1%
Reproductive health and childbirth	£4m	1.1%	£51m	2.3%	£55m	2.1%	-0.2%
Respiratory	£8m	2.0%	£39m	1.8%	£47m	1.8%	0.0%
Skin	£1m	0.3%	£12m	0.6%	£13m	0.5%	0.0%
Stroke	£5m	1.2%	£25m	1.2%	£30m	1.2%	0.0%
Grand total	£393m	100%	£2.1bn	100%	£2.5bn	100%	n/a

Table 8 – Funding distribution by HRCS Health Category for the 2018 datasets

42 Innovate UK also provided award data to the 2014 analysis, where they were eighth largest contributor with 209 awards and £41.9m in spend. Due to a change in how health-relevant awards were selected for this analysis, Innovate UK's contribution in 2018 has grown considerably, to 409 awards and £81.9m. NOTE – the Innovate UK submission was even higher but awards with a 2018 value of £104m failed to auto-code and are therefore part of the indirect assessment.

Appendix 4

Additional funding sources for UK health R&D expenditure

The data submitted by participating organisations for this analysis - whether the direct awards supporting projects and programmes or the indirect funding supporting infrastructure - does not constitute the sum total of health-relevant funding in the UK. This appendix aims to identify and quantify some of the many other additional funding sources outside of the scope of this analysis that can nevertheless be identified as supporting UK health research.

Universities, the 'dual support' system and core support for health research

As this analysis and other sources show, the majority of public and charity funded research takes place in universities and other elements of the Higher Education Institution (HEI) sector⁴³. Within the UK, the public funding for research in the university sector in the UK is provided through two main routes;

- 1) block allocations made by UK funding councils via a quality-related (QR) system of periodic assessment.
- 2) funding won in peer reviewed competition from UKRI and other grant-making bodies such as medical research charities.

Most data in the *UK Health Research Analysis* series focuses on the latter, however a considerable proportion of the former is required to support health-related research. The QR funding supports research infrastructure necessary for universities to conduct research, including permanent academic staff salaries, premises, libraries, central computing costs and a contribution to postgraduate training. This is administered by the devolved funding councils to the different regions of the UK:

- **England** - In 2017/18, Research England (formerly HEFCE, now part of UKRI) had a total budget of £3.6bn, of which £1.4bn was allocated to research⁴⁴. Of this, a total of £432.1m (30.6%) was coded to units of assessment relevant to health and biomedicine⁴⁵.
- **Scotland** - The Scottish Funding Council allocated a total of £278.6m to their Research and Knowledge Exchange Grants in 2017/18, but without unit of assessment classification⁴⁶. Based on the proportion from Research England data (30.6%), we estimate £85.2m of this funding would be relevant to health and biomedicine.
- **Wales** - The Higher Education Funding Council for Wales (HEFCW) allocated £71.1m of QR funding in 2017/18 to research, of which £30.6m (43%) was classified to units of assessment relevant to health and biomedicine⁴⁷.
- **Northern Ireland** - The Department for the Economy (DfE,NI) allocated £43.2m in 2017/18 to research, with £12.6m (29%) classified as health relevant⁴⁸.

Based on these sources, the total research budget relevant to health and biomedicine from QR funding is **£560.5m**.

Support for full economic costing including charity-funded research

Funding from the other side of the dual support system is reliant on this core QR funding to support the full economic cost (FEC) of conducting and delivering research. For example, the research councils which now constitute UKRI have required, since 2006, to typically fund 80% of this FEC value. The recipient research organisation(s) must therefore agree to find the balance of FEC from other resources. While the absolute proportion can vary (e.g. work in MRC institutions or researchers/staff based overseas are 100% FEC funded) it is still broadly representative that 20% of the cost of research primarily funded via UKRI is met via funding from core QR funding.

Similarly, UK charities can only cover the direct cost of research. However, given the size of the charity sector in the UK, the funding councils provide separate QR streams to support the indirect costs of charity supported research:

- **England** - The Charity Research Support Fund (CRSF) is administered by Research England and since 2010 has stood at £198m per year⁴⁹.
- **Scotland** - The Scottish Funding Council allocates a charity support stream of funding within its Research Excellence Grants. This funding was £25m in 2017/18⁵⁰.
- **Wales** - The Welsh National Assembly allocated a total of £3.1m of charity support funding via HEFCW in 2017/18⁵¹.
- **Northern Ireland** - The Department for the Economy (DfE, NI) QR research funding stream for charity support funding allocated £3.4m in 2017/18⁵².

Therefore, the combined total available charity support funding in the UK is £229.5m. In **Appendix 5**, we estimate that 89% of not-for-profit expenditure is health relevant, and we can therefore extrapolate that £204.2m of the charity support funding in the UK would be used to support health and biomedicine-related research.

NHS funding of health R&D

The funding of health-related R&D within the NHS is primarily derived from within the Department of Health and Social Care (England) and the National Institute for Health Research (NIHR). This includes, among other streams, funding for Clinical Research Networks (CRNs), Biomedical Research Centres (BRCs) and Biomedical Research Units (BRUs). In 2018 this core support is included in the 'indirect' assessment of this analysis, valued at £610m.

In combination with the £362m in our main analysis, the DHSC/NIHR data represents the largest contribution by value to this report. However, there are some additional elements of the funding landscape not captured, or captured somewhat indirectly, which must be addressed here.

Devolved administration funding (NIHR contributions)

The devolved funding administrations for Scotland, Wales and Northern Ireland also provide support for NHS research, such as allocations to NHS trusts, and these are included under the assessment of indirect funding. In addition, the devolved administrations make contributions to the DHSC in order to gain access to specific NIHR research programmes including i4i, HTA, PHR, HSDR and EME.

These contributions allow their researchers to apply to these funding streams. However, as these awards are not made on any geographical criteria, the amount in contributions and value of awards funded may not correlate. All grants in these communal research programmes awarded to Scotland, Wales or Northern Ireland are included in the analysis and are attributed to the devolved funders. The amounts paid in the 2017/18 financial year are in the **Table 9** below:

Contributors	Funding
CSO, Scotland	£11.20m ⁵³
HCR, Wales	£6.07m
HSC, Northern Ireland	£3.53m

Table 9 – Devolved administration funding for NIHR programmes

NHS support for clinical academics

In 2018 there were 3,155 clinical academics employed across 34 UK Institutions⁵⁴. Funding from NHS constitutes 1,278 (41%) of clinical academic posts, the remainder supported by universities (45%) and other sources (14%). These 1,278 NHS-supported posts consisted of 459 Professors, 387 Readers/

Senior Lecturers and 433 Lecturers. Based on current average clinical academic salaries⁵⁵, this constitutes a further ~£85m in salary alone and will be considerably more when accounting for full economic costings for staffing.

Total for additional funding sources

The combined spending for health-related research outside of the scope of this analysis is £849.5m (see **Table 10** below):

Funding Source	Detail	Value
QR funding from higher education funding councils (HEFCs)	Total based on the combined estimate of health-relevant expenditure from HEFC total QR budgets	£560.5m
Charity Support Funding	Estimation of FEC support for health-relevant research from the HEFC charity support funding streams	£204.2m
Devolved administration funding for NIHR programmes	All funding from CSO, HCRW and HSCNI are included in the main / indirect assessment. NIHR contributions are recorded above, but awards are already included in the main analysis.	n/a
NHS Support for Clinical Academics	Based on 3,094 clinical academics supported in 2017.	£85.0m
Additional Sources of Funding Total		£849.7m
Main Analysis (Direct and Indirect Awards)		£3.96bn
Combined Total 2018 (Main analysis + Additional Funding)		£4.81bn

Table 10 – Final combined analysis totals

- 43 For example, the AMRC estimated that in 2018 approximately 87% of charity-funded medical research takes place in universities, based on awards in their grants database <https://www.amrc.org.uk/charity-research-support-fund-fags>
- 44 Source: HEFCE 2017/18 allocation for research <https://bit.ly/2YrnNuX>. This includes mainstream QR funding including London weighting (£1.098bn), research degree programme (RDP) supervision fund (£240m), business research element (£64m) and research libraries (£7m). We analyse the charity support contribution of £198m separately (see next section)
- 45 Unit of Assessment (UoA) classifies research by area, with 01-05 relevant to biomedicine. In total, £327.7m of QR funding (29.8% of £1.07bn) and £81.7m of RDP funding (34% of £240m total) was allocated to these five UoAs. There are no UoA breakdowns for business research elements or research libraries data, therefore we have taken an average of the proportion for QR and RDP funding (32%) to allocate a further £22.7m from these budgets to health and biomedical research.
- 46 Source: Scottish Funding Council (SFC) Research Excellence Grant Announcement for 2017/18: <https://bit.ly/2yVeZDT>
- 47 Source: HEFCW Funding allocations for Higher Education in 2017/18, Annex A: <https://bit.ly/2GU362y>
- 48 Source: Department for the Economy university recurrent research grant summary tables (excluding charity support, see below): <https://bit.ly/2HAaTpT>
- 49 Source: HEFCE QR business and charity support funding 2017/18 <https://bit.ly/2YrnNuX>; Note that the allocation for 2018/19 has increased to £204m per annum <https://re.ukri.org/research/how-we-fund-research/>
- 50 Scottish Funding Council Research Excellence Grant and Global Challenges Research Fund for AY 2017-18 www.sfc.ac.uk/nmsruntime/saveasdialog.aspx?IID=17449&SID=10310
- 51 Source: HEFCW policy for QR funding allocations 2017/18: <https://bit.ly/2P0lhv9>
- 52 From Department for the Economy University Recurrent Research Grant Summary for FY 2017/18: <https://www.economy-ni.gov.uk/publications/university-recurrent-research-grant-summary-tables>
- 53 Source: CSO Outturn Summary 2017/18, section 3.2: <https://bit.ly/2Yrn3GI>
- 54 Medical Schools Council Report Survey of Medical Clinical Academic Staffing Levels in UK Medical Schools – data taken from new interactive format, published July 2018. <https://www.medschools.ac.uk/clinical-academic-survey>
- 55 The latest pay scales are no longer publicly available via either the BMA or UCEA directly, although several universities do publish local pay scales that appear to replicate the BMA/UCEA formats (example, QMUL). This estimation is therefore based on the median threshold salaries for Post-2009 Clinical Lecturers in England (threshold 6, £43,247 as at 01/10/18) Senior Lecturers (3rd level, £60,589 as at 01/04/18) and Consultants (threshold 6, £93,459 as at 01/10/18).

Appendix 5

Total UK health R&D expenditure

Estimating the health-relevant proportion of research and development

In the previous HRCS Analysis (2014) we reported total health R&D expenditure in the UK of £8.5bn (£9.1bn at 2018 prices). Approximately 36.5% (£3.01bn) was captured as part of the 2014 analysis. The majority of total UK health R&D funding (48%) came from the business sector and was outside of the scope of the analysis.

In this report, a similar process has been used to provide an estimate for total UK health R&D expenditure for 2018. Due to changes in reporting over time, some methods for data gathering have been altered. While we have still presented the estimations for total UK health R&D expenditure from previous reports (adjusted for inflation) it is difficult to draw direct comparisons with these findings and any conclusions drawn may not be valid.

Total UK R&D expenditure

To provide an estimate for total health relevant R&D first requires a figure for total R&D expenditure across all disciplines. The UK Gross Domestic Expenditure on Research and Development (GERD) is issued annually by the Office for National Statistics (ONS) and the latest data for 2017 was released on the 21st of March 2019⁵⁶. The total GERD for 2017 was £34.8bn.

In current prices, the GERD was £25.054bn in 2004 and £26.796bn in 2009. This indicates on-going growth in total R&D expenditure, increasing by 7.3% in the last five years and an increase of 13.3% in the last 10 years. By compound annual

growth rate (CAGR), this represents a year-on-year growth of 1.44% over ten years (1.35% between 2004 and 2009, 1.91% between 2009 and 2014).

To assess the proportion of the GERD that is of health relevance requires separate assessment of the Business, Private Non-Profit, University and Public Research Institute expenditures to obtain appropriate estimations. A breakdown of the funding flows between these different sectors can be seen in **Figure 16** below. These combined sources form the total UK health relevant R&D expenditure.

Research and development in the private sector

Business

The Business Enterprise Research and Development (BERD), also reported annually by the ONS, gives a total expenditure within the business sector in 2017⁵⁷ of £23.7bn, of which £4.3bn (18%) is categorised as pharmaceuticals. While a significant health relevant area, using data purely on pharmaceuticals will provide an underestimation of true private sector funding with health research relevance.

Interestingly, the expenditure in pharmaceutical has remained relatively consistent since the last analysis; £4.1bn reported (£4.3bn in real terms). In the BERD, it was noted that pharmaceuticals continued to be the largest product group, increasing from the 2016 BERD.

As there are no further public records of business expenditure, it is impossible to estimate where within the flow of funding

health-relevant expenditure is occurring. Therefore, the total of **£4.3bn** is separated from the breakdown in subsequent sector assessment.

Overseas funding for health research

This analysis focuses primarily on UK derived health expenditure, thus overseas expenditure in UK health research is excluded from this assessment.

However, the contribution of overseas investment in UK R&D is substantial. Data of R&D expenditure from the GERD 2013 estimates a total of £5.4bn enters the UK from overseas. The majority (~£4.0bn) goes to industry, but £1,417m is invested in charity, university and public research institutes (PRIs). The previous report estimated 20% of this funding would support health research, giving a total of **£283.4m** based on current data.

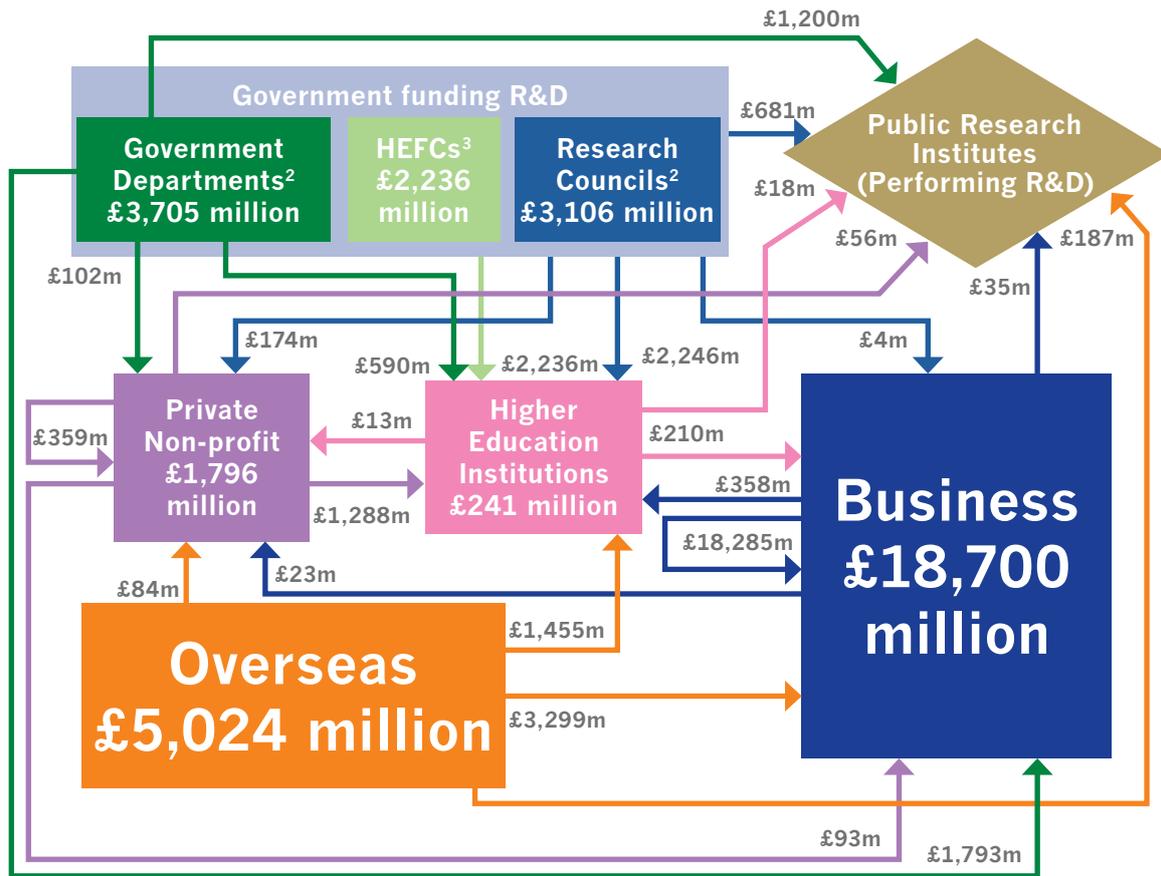


Figure 16 – Flows of R&D funding in the UK, 2017. From the Gross Domestic Expenditure on Research and Development (GERD) 2017 issued by the Office for National Statistics (Figure 4, published 14 March 2019) <https://bit.ly/2XLLxhV>

Private Non-Profit (Charities)

Total Private Non-Profit (PNP) expenditure in the UK GERD for 2017 was £1.796bn. The majority of PNP expenditure (£1.288bn) is within the University sector (which is assessed separately, below), whilst a further £56m goes to public research institutes and £93m to Business.

UK-based expenditure within the PNP sector is £671m, with the largest contribution of £359m from re-investment within PNP sector, which would include non-profit, charity funded research institutes (e.g. CRUK’s London Research Institute).

The AMRC reported a total research expenditure by their members of £1.6bn in 2017⁵⁸. In direct comparison with the GERD data, we estimate **89%** of PNP R&D expenditure is relevant to health⁵⁹. Therefore, the health relevant re-invested expenditure within the PNP sector is £319m (89% of £359m re-investment).

Of the remaining intra-PNP expenditure, Overseas (£84m) is excluded and Business (£23m) is accounted for elsewhere in this assessment, leaving £289m from Government, Research Councils and Higher Education Institutions. Using the same proportion as above (89%) would provide an estimate of £257m health-relevant expenditure from these funding sources. **Thus, the estimated total expenditure within the PNP sector relevant to health is £577m.** This would imply a substantial increase from previous estimations (£400m in 2009 and £415m in real terms) using a broadly similar methodology.

Research performed in the university sector

The UK University Higher Education Institution (HEI) sector is primarily supported by government funding via the Higher Education Funding Councils (HEFCs) and the Research Councils via UKRI. In the GERD 2017, the HEFCs expenditure in the HEI sector was £2.236bn, while Research Council expenditure was £2.246bn. A further £1.288bn comes from PNPs, £1.455bn from Overseas, £590m from Government Departments and £358m from businesses giving a total of £8.473bn expenditure in the University Sector.

Data on HEIs in the GERD comes from the Higher Education Research and Development (HERD) data provided to the ONS by the Higher Education Funding Councils (HEFCs). This data in turn is monitored by the Higher Education Statistics Agency (HESA). To estimate HEI health-relevant spend, we have collated HESA data on research income. This is not ideal, as expenditure and

income do not necessarily correlate, but use of income data allows us to breakdown cost centres to separate biomedically relevant funding from other disciplines (see **Table 11**, below). The total health-relevant income for latest available year (2016/17) is **£3.149bn**, constituting more than half (54%) of total HEI research income (£5.802bn). This relative proportion has remained remarkably consistent, although the level of income reported by HEIs has grown considerably; by £220m between 2009/10 and 2013/14, and by £259m between 2013/14 and 2016/17. At least some of this increase can be attributed to the transfer of MRC Units to University Units, which took place between 2012 and 2018 with ~£122m per annum of MRC expenditure transferred to the HEI sector.

Cost Centre	Income 2009/10			Income 2013/14			Income 2016/17		Differences	
	(£m)	Real Terms (£m)	% of Total	(£m)	Real Terms (£m)	% of Total	(£m)	% of Total	% since 09/10	% since 13/14
101 Clinical Medicine	1,450	1,655	62.0%	1,729	1,841	63.7%	2,000	63.5%	1.5%	-0.2%
102 Clinic Dentistry	17.7	20.2	0.8%	21.4	22.8	0.8%	20.4	0.6%	-0.1%	-0.1%
103 Nursing & Allied Health Professionals	45.7	52.1	2.0%	51.2	54.5	1.9%	64.1	2.0%	0.1%	0.1%
104 Psychology & Behavioural Science	79.3	90.5	3.4%	81.1	86.3	3.0%	201.1	6.4%	3.0%	3.4%
105 Health and Community Studies	53.8	61.4	2.3%	62.5	66.5	2.3%	78.4	2.5%	0.2%	0.2%
106 Anatomy & Physiology	52.9	60.4	2.3%	58.6	62.4	2.2%	61.7	2.0%	-0.3%	-0.2%
107 Pharmacy & Pharmacology	59.	67.4	2.5%	64.9	69.1	2.4%	67.7	2.1%	-0.4%	-0.2%
112 Biosciences	579.8	662.1	24.8%	645.3	687.2	23.8%	655.3	20.8%	-4.0%	-3.0%
Total Selected Cost Centres (101-107,112)	2,338	2,670	100%	2,714	2,890	100%	3,149	100%	0.0%	0.0%
Total (all cost centres)	4,322	4,935		5,061	5,390		5,802			

Table 11 – Breakdown of income by cost centre (academic departments), for all UK Institutions available (n=204). Adapted from HESA finance returns (Table 5b: Research grants and contracts)

Public Sector Research Institutes

The GERD 2017 gives a total funding to public research institutes of £2.19bn, the majority coming from Government Departments (£1.22bn, 56%) and Research Councils (£681m, 31%)⁶⁰. There are no figures available for health relevant research in this sector, thus the calculation of this value requires some additional data for various sources:

Governmental department contribution

To determine a proportion for health-relevant contributions from Government departments, we used data on Government expenditure on science, engineering and technology (SET), as this provides a breakdown by civil departments⁶¹. In the SET 2017 data, the total spending is broadly similar (£3.6bn) and the primary civil department for health-relevant contributions is the National Health Service, with an estimated contribution for 2017 of £1.1bn, 31% of total⁶². Using this proportion, we estimate the health-relevant contribution to Public Research Institutes from Government departments to be **£372m** (31% of the £1.22bn GERD 2017 total).

This is likely to be an underestimate of health-relevant Government R&D expenditure. The largest civil department of SET expenditure is the Department for Business, Energy and Industrial Strategy (BEIS). Several BEIS partner organisations (i.e. those organisations which receive allocations of BEIS funding) are included in this analysis (e.g. the Academy of Medical Sciences, National Physics Laboratory and UK Atomic Energy Authority). However, our analysis shows **£5.5m** of non-DHSC Government sources attribute to health-relevant research in PRIs.

UKRI contributions

The primary UKRI partner for health relevant contribution is MRC, of which **£150m** (22% of the £681m GERD 2017 total) can be directly attributed to MRC-administered research

institutes⁶³. Again, this will be an underestimate of expenditure as other partners within UKRI will contribute to health-relevant research in PRIs. Our analysis shows **£29.8m** of non-MRC funding attributed to health-relevant research in PRIs, the majority from STFC's estimate of beamtime use of the Diamond Light Source for medical research projects (£20m for 2018).

Charity contributions

A few charities support research in dedicated research institutes, such as the Wellcome Trust Sanger Institute in Cambridge and Cancer Research UK's Beatson Institute in Glasgow, although they do also support work within institutes under public ownership. Using the estimation of the health-relevant proportion of private-not-profit expenditure calculated previously (page 133, 89%), we estimate that £49.8m of the £56m spent by charities in PRIs will be health-related.

Estimated total health-relevant expenditure for Public Sector Research Institutes

Combining these three estimates, provides an estimated total of **£607m** for health-related public sector research institute spend, suggesting approximately 28% of total expenditure in PRIs has biomedical relevance⁶⁴. Note that this estimation of expenditure is a significantly lower than previous *UK Health Research Analyses* due to changes in available data. Using this revised methodology, we estimate the PRI spend in 2014 to be £726m, £773m in real terms⁶⁵.

Total UK health-relevant R&D expenditure

The combined total estimation of health-relevant R&D expenditure of all four research sectors was £8.67bn.

Please refer to the main report on **page 21-22** for further assessment of this figure and its implications.

56 Office for National Statistics (2019). Gross Domestic Expenditure on Research and Development (GERD), 2017 <https://bit.ly/2XLLxhV>

57 Office for National Statistics (2019) Business Enterprise Research and Development 2017, released 21st of November 2018. <https://bit.ly/2OW4C7G>

58 Source:AMRC Expenditure Report 2019: <https://www.amrc.org.uk/research-expenditure>

59 NOTE: The data used to calculate the PNP estimation comes from a biennial survey of PNP organisations of which a relatively few conduct research and development, whereas AMRC expenditure comes directly from financial return data, making this comparison problematic. However, the GERD report itself does acknowledge the majority of PNP organisations performing R&D specialise in mainly health and medical research.

60 As noted, we are excluding overseas expenditure and are accounting for all health-related business R&D spend separately.

61 The SET differs from the GERD as it comprises not just in-house R&D, but also purchased R&D and other funding provided to external organisations for R&D. However, both collate data sourced from the GovERD, an annual census of R&D expenditure of government departments from over 140 departmental responders.

62 Source: Office for National Statistics (ONS) report Government expenditure on science, engineering and technology relating to research and development, UK: 2017; <https://bit.ly/2MsdWCl>

63 From MRC Annual Report and Accounts (2017/18), page 98 – total operating expenditure and intramural total expenditure <https://bit.ly/2VprBwO>

64 Note this estimation uses a different methodology to previous analyses, due to the changes in publicly available data.

65 SET for civil departments (DHSC) is 0.95/2.7bn=35.2%, of 1.127bn is £396.5m.

Appendix 6

Total funding distribution by HCRS Research Activity sub-groups

Research Activity Group	Research Activity Code	2004/05	2009/10	2014	2018	2018 vs 04/05	2018 vs 2014
Underpinning	1.1 Normal biological development and functioning	28.28%	22.14%	17.03%	16.23%	-12.05%	-0.80%
	1.2 Psychological and socioeconomic processes	1.27%	0.94%	1.17%	0.96%	-0.31%	-0.21%
	1.3 Chemical and physical sciences	1.50%	1.77%	1.46%	1.03%	-0.47%	-0.43%
	1.4 Methodologies and measurements	0.12%	0.76%	0.57%	0.45%	0.33%	-0.12%
	1.5 Resources and infrastructure (underpinning)	2.45%	1.96%	2.47%	3.03%	0.58%	0.56%
Underpinning Total		33.63%	27.57%	22.69%	21.70%	-11.93%	-0.99%
Aetiology	2.1 Biological and endogenous factors	22.50%	20.24%	18.58%	19.58%	-2.92%	1.00%
	2.2 Factors relating to physical environment	5.42%	3.30%	3.68%	3.65%	-1.77%	-0.03%
	2.3 Psychological, social and economic factors	1.60%	1.31%	1.10%	0.84%	-0.76%	-0.26%
	2.4 Surveillance and distribution	1.84%	2.42%	1.76%	1.85%	0.01%	0.09%
	2.5 Research design and methodologies (aetiology)	0.22%	1.16%	0.75%	0.90%	0.68%	0.15%
	2.6 Resources and infrastructure (aetiology)	3.11%	3.34%	3.46%	3.79%	0.68%	0.33%
Aetiology Total		34.69%	31.77%	29.32%	30.61%	-4.08%	1.29%
Prevention	3.1 Primary prevention interventions to modify behaviours or promote well-being	0.52%	1.33%	1.94%	1.97%	1.45%	0.03%
	3.2 Interventions to alter physical and biological environmental risks	0.20%	0.40%	0.91%	1.02%	0.82%	0.11%
	3.3 Nutrition and chemoprevention	0.82%	0.63%	0.91%	0.52%	-0.30%	-0.39%
	3.4 Vaccines	0.91%	1.03%	0.91%	1.77%	0.86%	0.86%
	3.5 Resources and infrastructure (prevention)	0.03%	0.36%	0.55%	0.61%	0.58%	0.06%
Prevention Total		2.48%	3.75%	5.22%	5.89%	3.41%	0.67%
Detection and Diagnosis	4.1 Discovery and preclinical testing of markers and technologies	1.88%	2.57%	4.35%	5.09%	3.21%	0.74%
	4.2 Evaluation of markers and technologies	2.17%	1.84%	3.00%	3.18%	1.01%	0.18%
	4.3 Influences and impact	0.14%	0.12%	0.17%	0.12%	-0.02%	-0.05%
	4.4 Population screening	0.52%	0.76%	0.73%	0.38%	-0.14%	-0.35%
	4.5 Resources and infrastructure (detection)	0.57%	2.04%	1.95%	1.75%	1.18%	-0.20%
Detection and Diagnosis Total		5.27%	7.33%	10.20%	10.52%	5.25%	0.32%

Appendix 6

Research Activity Group	Research Activity Code	2004/05	2009/10	2014	2018	2018 vs 04/05	2018 vs 2014
Treatment Development	5.1 Pharmaceuticals	3.85%	4.95%	6.01%	5.54%	1.69%	-0.47%
	5.2 Cellular and gene therapies	2.24%	1.46%	2.23%	2.33%	0.09%	0.10%
	5.3 Medical devices	0.73%	0.50%	0.91%	0.72%	-0.01%	-0.19%
	5.4 Surgery	0.57%	0.35%	0.44%	0.26%	-0.31%	-0.18%
	5.5 Radiotherapy	0.28%	0.39%	0.40%	0.30%	0.02%	-0.10%
	5.6 Psychological and behavioural	0.14%	0.25%	0.19%	0.23%	0.09%	0.04%
	5.7 Physical	0.03%	0.14%	0.14%	0.10%	0.07%	-0.04%
	5.8 Complementary	0.01%	0.00%	0.01%	0.03%	0.02%	0.02%
	5.9 Resources and infrastructure (treatment development)	0.77%	2.64%	2.71%	2.44%	1.67%	-0.27%
5 Treatment Development Total		8.61%	10.68%	13.04%	11.95%	3.34%	-1.09%
Treatment Evaluation	6.1 Pharmaceuticals	3.11%	3.82%	4.22%	3.92%	0.81%	-0.30%
	6.2 Cellular and gene therapies	0.25%	0.16%	0.56%	0.46%	0.21%	-0.10%
	6.3 Medical devices	0.41%	0.35%	0.71%	0.71%	0.30%	0.00%
	6.4 Surgery	0.70%	0.97%	1.07%	1.06%	0.36%	-0.01%
	6.5 Radiotherapy	0.42%	0.43%	0.28%	0.40%	-0.02%	0.12%
	6.6 Psychological and behavioural	0.41%	0.63%	0.83%	1.21%	0.80%	0.38%
	6.7 Physical	0.40%	0.56%	0.58%	0.49%	0.09%	-0.09%
	6.8 Complementary	0.12%	0.05%	0.06%	0.01%	-0.11%	-0.05%
	6.9 Resources and infrastructure (treatment evaluation)	2.46%	1.57%	1.37%	1.45%	-1.01%	0.08%
6 Treatment Evaluation Total		8.29%	8.55%	9.69%	9.71%	1.42%	0.02%
Disease Management	7.1 Individual care needs	1.11%	1.41%	2.15%	2.03%	0.92%	-0.12%
	7.2 End of life care	0.08%	0.10%	0.16%	0.21%	0.13%	0.05%
	7.3 Management and decision making	0.97%	1.24%	1.42%	1.29%	0.32%	-0.13%
	7.4 Resources and infrastructure (disease management)	0.16%	0.49%	0.26%	0.49%	0.33%	0.23%
7 Disease Management Total		2.32%	3.23%	4.00%	4.02%	1.70%	0.02%
Health Services	8.1 Organisation and delivery of services	2.52%	3.43%	2.77%	2.81%	0.29%	0.04%
	8.2 Health and welfare economics	0.62%	0.56%	0.54%	0.37%	-0.25%	-0.17%
	8.3 Policy, ethics and research governance	0.60%	0.68%	0.82%	0.93%	0.33%	0.11%
	8.4 Research design and methodologies	0.59%	1.15%	1.00%	0.47%	-0.12%	-0.53%
	8.5 Resources and infrastructure (health services)	0.38%	1.30%	0.71%	1.02%	0.64%	0.31%
8 Health Services Total		4.70%	7.12%	5.84%	5.84%	1.14%	0.00%

Appendix 7

Details of mapping between WHO DALY rates and HRCS Health Categories

GHE #	GHE Cause ID	Mapping to HRCS Health Categories	2002	2004	2012	2016		% Difference from 2016		
			%	%	%	DALY	%	vs '02	vs '04	vs '12
2	I-A. Infectious and parasitic diseases	Infection	1.39	1.40	1.38	177.3	0.99	-0.40	-0.42	-0.39
38	I-B. Respiratory infections	Infection	3.11	1.68	2.60	555.6	3.10	-0.01	1.42	0.50
42	I-C. Maternal conditions	Reproductive health	0.32	0.43	0.03	8.1	0.05	-0.28	-0.39	0.01
49	I-D. Neonatal conditions	Reproductive health	1.31	1.35	1.20	247.2	1.38	0.07	0.03	0.18
54	I-E. Nutritional deficiencies	Metabolic and endocrine	0.55	0.38	0.46	72	0.50	-0.15	0.02	-0.05
61	II-A. Malignant neoplasms	Cancer and neoplasms	15.46	15.59	19.14	3452.8	19.26	3.80	3.67	0.12
79	II-B. Other neoplasms	Cancer and neoplasms	0.24	0.27	0.34	74.3	0.41	0.17	0.15	0.07
80	II-C. Diabetes mellitus	Metabolic and endocrine	1.32	1.80	1.29	312.4	1.74	0.42	-0.06	0.45
81	II-D. Endocrine, Blood, Immune Disorders	Metabolic and endocrine	1.25	1.28	1.02	153.6	0.86	-0.4	-0.42	-0.17
82	II-E. Mental and Behavioural Disorders	Mental health	26.08*	26.66*	13.66	1816.1	10.13	-	-	-3.53
94	II-F. Neurological conditions	Neurological			6.97	1828.1	10.20	-	-	3.23
102	II-G. Sense organ diseases	Ear / Eye	4.42	7.04	1.54	872.8	4.87	0.45	-2.17	3.33
110	II-H. Cardiovascular diseases	Blood / Cardiovascular / Stroke	17.17	16.18	16.10	2827.1	15.77	-1.40	-0.41	-0.33
117	II-I. Respiratory diseases	Respiratory	9.14	8.27	7.70	1106.8	6.17	-2.97	-2.09	-1.53
121	II-J. Digestive diseases	Oral and gastrointestinal	5.08	5.09	4.00	716.8	4.00	-1.08	-1.09	0.00
126	II-K. Genitourinary diseases	Renal and urogenital	1.22	0.93	2.81	328.1	1.83	0.61	0.9	-0.98
133	II-L. Skin diseases	Skin	0.19	0.21	0.92	211.6	1.18	0.99	0.97	0.27
134	II-M. Musculoskeletal diseases	Musculoskeletal	4.06	4.11	9.31	1395.8	7.79	3.73	3.73	-1.52
140	II-N. Congenital anomalies	Congenital disorders	1.16	1.22	0.95	223.5	1.25	0.09	0.09	0.30
147	II-O. Oral conditions	Oral and gastrointestinal	0.71	0.63	0.80	312.0	1.74	1.03	1.03	0.94
152	III-A. Unintentional injuries	Injuries and accidents	4.07	3.75	6.45	901.7	5.03	0.96	0.96	-1.42
160	III-B. Intentional injuries	Injuries and accidents	1.75	1.75	1.32	320.6	1.79	0.04	0.04	0.47
0	ALL CAUSES	-	100	100	100	17925.0	100			

Note: Over the course of the *UK Health Research Analysis* series there has been some minor modification to the GHE disease classifications, the most notable being the segregation of Neuropsychiatric Conditions (see *) to Neurological Conditions and Mental and Behavioural Disorders. These changes allow for better comparison with the HRCS *Neurological* and *Mental Health* categories, which were previously assessed together. In general, the UK's burden of disease remains static for most disease classifications ($<\pm 1.5\%$ differences) but with some notable exceptions; decreases in DALY rates are seen for Neuropsychiatric (HRCS *Neurological & Mental Health*) and Sense Organs (*Ear & Eye*), but increases in Malignant Neoplasms (*Cancer*), Genitourinary (*Renal*), Musculoskeletal and Injuries. Please note there are no GHE equivalent codes for three HRCS health categories; *Inflammatory and Immune System*, *Generic Health Relevance* and *Disputed Aetiology and Other*.

Appendix 8

Part One – Total funding distribution by UK geographical region (NUTS 1) including selected cities

UK Region	2004/05		2009/10		2014 (All)		2018 (All)		Difference vs 04/05		Difference vs 09/10		Difference vs 2014	
	Spend (£m) (real terms)	%	Spend (£m) (real terms)	%	Spend (£m) (real terms)	%	Spend (£m)	%	Change in %	Change in spend	Change in %	Change in spend	Change in %	Change in spend
East of England	154.3	12.4	243.7	13.0	276.7	12.8	367.0	14.34%	1.91%	212.7	1.34%	123.3	1.51%	90.3
Cambridge	151.3	12.2	235.7	12.6	260.7	12.1	340.0	13.3%	1.09%	188.6	0.68%	104.3	1.19%	79.3
Norwich	3.0	0.2	8.0	0.4	14.6	0.7	10.8	0.4%	0.22%	7.8	0.02%	2.8	-0.26%	-3.9
East Midlands	54.9	4.4	76.5	4.1	65.6	3.7	71.2	2.8%	-1.62%	16.3	-1.32%	-5.3	-0.92%	5.6
Nottingham	28.3	2.3	35.3	1.9	34.7	2.3	36.2	1.4%	-0.89%	7.8	-0.49%	0.9	-0.86%	1.5
Leicester	25.6	2.1	33.9	1.8	25.9	1.2	29.3	1.1%	-0.96%	3.7	-0.66%	-4.6	-0.06%	3.3
North East	21.1	1.7	44.3	2.4	57.4	2.9	62.8	2.5%	0.75%	41.6	0.05%	18.5	-0.40%	5.4
Newcastle-upon-Tyne	18.8	1.5	40.8	2.2	52.8	2.4	56.1	2.2%	0.69%	37.3	-0.01%	15.3	-0.26%	3.3
Durham	1.4	0.1	2.7	0.1	2.7	0.1	5.0	0.2%	0.09%	3.6	0.09%	2.2	0.07%	2.3
North West	79.7	6.4	123.2	6.6	149.1	6.1	167.1	6.5%	0.13%	87.4	-0.07%	43.9	0.47%	18.0
Manchester	66.5	5.3	94.1	5.0	83.6	3.9	90.7	3.5%	-1.76%	24.2	-1.46%	-3.4	-0.34%	7.0
Liverpool	9.3	0.7	26.7	1.4	40.0	1.9	65.9	2.6%	1.87%	56.6	1.17%	39.2	0.72%	25.9
Northern Ireland	14.8	1.2	19.9	1.1	18.3	0.8	26.1	1.0%	-0.18%	11.3	-0.08%	6.2	0.17%	7.8
Belfast	12.9	1.0	18.4	1.0	15.4	0.7	23.3	0.9%	-0.09%	10.4	-0.09%	4.9	0.19%	7.9
Coleraine	0.9	0.1	0.8	0.0	0.6	0.0	1.2	0.0%	-0.05%	0.3	0.01%	0.4	0.02%	0.7
Scotland	161.5	13.0	215.4	11.5	253.7	11.8	290.3	11.3%	-1.66%	128.8	-0.16%	74.9	-0.42%	36.6
Edinburgh	68.7	5.5	96.2	5.1	97.6	4.5	132.0	5.2%	-0.34%	63.4	0.06%	35.9	0.63%	34.4
Glasgow	50.6	4.1	56.5	3.0	76.0	3.5	88.2	3.4%	-0.65%	37.6	0.45%	31.7	-0.08%	12.2
Dundee	27.2	2.2	39.3	2.1	49.1	2.3	44.7	1.7%	-0.45%	17.5	-0.35%	5.4	-0.53%	-4.4
Aberdeen	10.8	0.9	15.9	0.9	15.3	0.7	14.3	0.6%	-0.34%	3.4	-0.34%	-1.6	-0.15%	-1.1
South East	178.0	14.3	244.3	13.1	340.6	15.8	380.4	14.9%	0.56%	202.4	1.76%	136.1	-0.93%	39.7
Oxford	109.4	8.8	181.6	9.7	231.3	10.7	273.7	10.7%	1.89%	164.3	0.99%	92.1	-0.04%	42.3
Southampton	18.9	1.5	22.4	1.2	35.9	0.7	35.4	1.4%	-0.12%	16.5	0.18%	13.0	0.68%	-0.5
Brighton	9.4	0.8	11.6	0.6	15.2	1.7	17.3	0.7%	-0.12%	7.9	0.08%	5.7	-0.99%	2.1

UK Region	2004/05		2009/10		2014 (All)		2018 (All)		Difference vs 04/05		Difference vs 09/10		Difference vs 2014	
	Spend (£m) (real terms)	%	Spend (£m) (real terms)	%	Spend (£m) (real terms)	%	Spend (£m)	%	Change in %	Change in spend	Change in %	Change in spend	Change in %	Change in spend
South West	35.3	2.8	58.5	3.1	79.9	3.7	98.2	3.8%	1.03%	62.9	0.73%	39.7	0.12%	18.2
Bristol	25.0	2.0	38.6	2.1	57.4	2.7	62.7	2.5%	0.45%	37.8	0.35%	24.1	-0.21%	5.4
Exeter	1.9	0.2	5.7	0.3	9.5	0.4	20.9	0.8%	0.61%	18.9	0.51%	15.1	0.38%	11.4
Wales	20.7	1.7	50.8	2.7	53.1	2.5	60.9	2.4%	0.68%	40.2	-0.32%	10.1	-0.08%	7.8
Cardiff	18.4	1.5	39.6	2.1	36.8	1.7	42.9	1.7%	0.18%	24.5	-0.42%	3.3	-0.03%	6.2
Swansea	1.0	0.1	6.6	0.4	10.7	0.5	7.3	0.3%	0.18%	6.2	-0.12%	0.6	-0.21%	-3.4
Bangor	1.0	0.1	3.1	0.2	4.6	0.2	5.4	0.2%	0.11%	4.4	0.01%	2.3	0.00%	0.8
West Midlands	34.4	2.8	67.0	3.6	72.5	3.4	104.5	4.1%	1.28%	70.1	0.48%	37.4	0.72%	32.0
Birmingham	28.7	2.3	45.9	2.5	49.6	2.3	66.7	2.6%	0.31%	38.0	0.11%	20.8	0.30%	17.1
Coventry	3.1	0.2	15.1	0.8	15.3	0.7	24.7	1.0%	0.76%	21.6	0.16%	9.6	0.26%	9.4
Yorkshire & The Humber	70.8	5.7	80.6	4.3	98.0	4.5	116.8	4.6%	-1.14%	46.0	0.26%	36.2	0.02%	18.8
Leeds	36.5	2.9	33.3	1.8	41.8	1.9	47.5	1.9%	-1.04%	11.1	0.06%	14.2	-0.08%	5.7
Sheffield	21.6	1.7	29.8	1.6	34.7	1.6	34.6	1.4%	-0.35%	13.0	-0.25%	4.8	-0.26%	-0.1
York	7.7	0.6	12.2	0.7	14.5	0.7	24.0	0.9%	0.34%	16.3	0.24%	11.8	0.27%	9.5
London	415.8	33.5	623.4	33.4	691.6	32.1	815.1	31.8%	-1.66%	399.3	-1.56%	191.7	-0.23%	123.5
No Location Info	1.4	0.1	20.8	1.1	0.0	0.0	0.0	0.0	-	-	-	-	-	-
All Regions	1,241	99.9	1,847	98.9	2,156	100.0	2,560	100	-	-	-	-	-	-

Part Two – International expenditure by country

Recipient Country	# of awards	Spend in 2018	% of total spend
United States of America	115	£84.2m	37.7%
Switzerland	38	£45.3m	20.3%
Kenya	66	£14.3m	6.4%
India	31	£11.6m	5.2%
South Africa	63	£10.4m	4.7%
Australia	44	£9.6m	4.3%
Ireland	126	£5.0m	2.3%
Belgium	12	£3.7m	1.7%
Italy	29	£3.4m	1.5%
Canada	14	£3.3m	1.5%
Bangladesh	4	£2.9m	1.3%
Singapore	6	£2.8m	1.3%
Netherlands	29	£2.8m	1.3%
Japan	2	£2.2m	1.0%
International	3	£2.1m	1.0%
Germany	12	£1.9m	0.9%
Spain	27	£1.9m	0.9%
France	23	£1.9m	0.8%
Brazil	22	£1.8m	0.8%
Denmark	7	£1.5m	0.7%
Norway	3	£1.1m	0.5%
Uganda	11	£1.1m	0.5%
Papua New Guinea	3	£1.0m	0.4%
China	15	£0.7m	0.3%
Tanzania	10	£0.6m	0.3%
Sweden	4	£0.6m	0.3%
Finland	5	£0.4m	0.2%
Austria	2	£0.4m	0.2%
Czechia	8	£0.4m	0.2%
Portugal	6	£0.3m	0.1%
Thailand	3	£0.3m	0.1%
Georgia	2	£0.2m	0.1%
New Zealand	8	£0.2m	0.1%
Peru	4	£0.2m	0.1%
Remaining overseas funding (32 countries)*	84	£2.9m	1.3%
Grand total	841	£223.1m	100%

*Of the 66 countries receiving funding from UK-based organisations participating in this analysis, 32 received less than £200,000.

NOTE: This data focuses on awards made directly to a researcher where the host institution is located outside the UK. In addition, only 37 of the 123 organisations provided data with overseas award information. The data presented here will therefore be an underestimate of overall UK health research funding expenditure made overseas.

Appendix 9

Total funding distribution by organisation type; Government, UKRI or charitable

Part One – Government, UKRI and charitable funding by HRCS Research Activity

Research Activity Group	Other Government & public bodies		UK Research and Innovation (UKRI)		Charities & not-for-profit		Total Spend
	Spend	%	Spend	%	Spend	%	Spend
1 Underpinning	£6m	1%	£247m	44%	£302m	54%	£555m
2 Aetiology	£39m	5%	£338m	43%	£407m	52%	£784m
3 Prevention	£51m	34%	£67m	45%	£33m	22%	£151m
4 Detection and Diagnosis	£59m	22%	£103m	38%	£108m	40%	£270m
5 Treatment Development	£31m	10%	£120m	39%	£155m	51%	£306m
6 Treatment Evaluation	£129m	52%	£49m	20%	£71m	29%	£249m
7 Disease Management	£66m	64%	£20m	19%	£17m	17%	£103m
8 Health Services	£79m	55%	£43m	30%	£21m	15%	£143m
Grand total	£460m	18%	£986m	39%	£1115m	44%	£2.56bn

Part 2 – Government, UKRI and charitable funding by HRCS Health Category

Health Category	Other Government & public bodies		UK Research and Innovation (UKRI)		Charities & not-for-profit		Total Spend
	Spend	%	Spend	%	Spend	%	Spend
Generic health relevance	£82.9m	13%	£325.1m	52%	£217.4m	35%	£625.5m
Cancer and neoplasms	£45.2m	9%	£85.1m	18%	£353.1m	73%	£483.4m
Infection	£58.9m	17%	£161.6m	47%	£125.6m	36%	£346.2m
Neurological	£30.0m	12%	£108.8m	44%	£109.7m	44%	£248.5m
Cardiovascular	£25.3m	16%	£27.5m	18%	£103.6m	66%	£156.5m
Mental health	£50.3m	32%	£60.9m	39%	£43.7m	28%	£155.m
Inflammatory and immune system	£10.0m	10%	£34.8m	35%	£53.8m	55%	£98.6m
Metabolic and endocrine	£16.8m	22%	£40.4m	52%	£20.7m	27%	£78.m
Musculoskeletal	£14.9m	26%	£23.1m	40%	£19.2m	34%	£57.2m
Reproductive health and childbirth	£24.5m	45%	£20.7m	38%	£9.7m	18%	£54.9m
Oral and gastrointestinal	£19.3m	40%	£20.0m	42%	£8.6m	18%	£47.8m
Respiratory	£16.8m	36%	£20.6m	44%	£9.3m	20%	£46.6m
Eye	£8.8m	27%	£12.6m	39%	£11.2m	34%	£32.6m
Stroke	£14.2m	47%	£9.3m	31%	£6.7m	22%	£30.2m
Renal and urogenital	£12.0m	49%	£4.9m	20%	£7.7m	31%	£24.6m
Injuries and accidents	£13.9m	83%	£1.6m	10%	£1.2m	7%	£16.7m
Skin	£5.6m	42%	£4.9m	37%	£2.9m	21%	£13.4m
Congenital disorders	£2.4m	19%	£5.6m	45%	£4.6m	36%	£12.6m
Blood	£2.1m	18%	£6.8m	59%	£2.7m	23%	£11.6m
Disputed Aetiology and Other	£4.5m	43%	£5.1m	49%	£.9m	8%	£10.5m
Ear	£1.5m	15%	£6.1m	61%	£2.4m	24%	£10.m
Grand total	£460m	18%	£986m	39%	£1115m	44%	£2.56bn

Appendix 10

Changes in coding methodology and uptake of auto-coding

Background to auto-coding methodology

The HRCS classification model developed by Digital Science uses machine learning algorithms created using the data available in the *UK Health Research Analysis 2014* (UKHRA2014) dataset to refine the scoring process before its release onto *Dimensions*⁶⁶ in 2017.

Comparison of UKHRA2014 data

Digital Science kindly provided a bespoke request for auto-coding for more than 11,000 awards from the UKHRA2014 public dataset⁶⁷, from which direct comparison between manual and auto-coded data could be assessed. Overall, the matching between manual coding and auto-coding was very high, with less than one per cent variance across all health categories and research activities. However, given that the algorithm was built based on the coding for the UKHRA2014 dataset, it is perhaps not too surprising that there is near perfect comparative matching between the two.

We did note some variations in how auto-coding is applied in comparison to manual. Firstly, the number of codes applied to an award is generally higher with auto-coding. For example, 56% of manually coded awards in the UKHRA2014 dataset had a single health category and research activity while 93% of awards had one or two codes. This compares to 43% and 88% respectively by auto-coding. Secondly, the upper limit for research activities on Dimensions is five whereas manual coding is limited to four, although the additional fifth research activity auto-code was rarely used (<0.5% of UKHRA2014 awards).

Comparison of biomedical research funding (2012-2016)

To compare the relative accuracy of auto-coded data against a partially naïve dataset, we extracted awards active across five years of reporting (2012-2016)⁶⁸ from both the Dimensions platform and publicly available MRC awards published via Gateway to Research. This provided excellent coverage of total expenditure over these periods, with an average of 94% of expenditure from MRC core databases on Dimensions. Award data from both systems were analysed as per the UKHRA2014 methodology and overall, for both Research Activity and Health Category, auto-coding was reasonably comparable, with variability of $\pm 1-2\%$ (max $\pm 3-4\%$) between the two methods.

Comparison with non-biomedical funding data

Given the differences in terminology across disciplines, and that the majority of UKHRA2014 data used to train the algorithm would be from the three largest biomedical funders (MRC, NIHR and Wellcome Trust), we sought to compare the accuracy of auto-coding to data the algorithm was less familiar with. We examined data from 2014 for the three other HRAF member research councils; BBSRC, EPSRC and ESRC, each of which provide different methods for selecting health-relevant awards from their total portfolio. For BBSRC and EPSRC the algorithm successfully auto-coded 93-94% of awards, with proportions of spend against research activity and health category reasonably well matched to manual coding⁶⁹. This matching was significantly lower for ESRC with just 68% of awards fully auto-coded and significant variations in the resulting manual coding compared to auto-coding (with variance of $\pm 18\%$ in some research activities and health categories).

Looking across the complete portfolio of awards for these three councils, we observed a large number of awards eligible but not selected by the awarding council for the 2014 analysis that were HRCS auto-coded; for BBSRC almost half of their portfolio was HRCS auto-coded, but only $\sim 11\%$ of awards were submitted to the analysis. This suggests either the methodology used by councils to select awards for submission to the analysis is an underestimate of their total health-relevant expenditure, or the algorithm may be allocating HRCS codes to non-health related awards (“false positive coding”). Although we do not have a rigorous analysis to test this, an anecdotal assessment suggests the latter. Much of the terminology used for veterinary and agricultural research is shared with medical research. Similarly, our work to filter a health-relevant submission on behalf of DEFRA showed several awards HRCS auto-coded that would not be considered health relevant.

Conclusions

Much of the comparative work summarised here requires both manually and auto-coded data and given that a significant proportion of the available manually coded information was used to develop the auto-coding algorithm makes truly naïve

comparisons troublesome. Therefore, without additional manually coded data to compare against, it is difficult to draw definitive conclusions on the use of automated coding. However, this initial analysis shows some clear benefits and limitations of auto-coding which we feel are useful to record here:

- **Manual and auto-coded data is broadly similar for large-scale analysis.**

- Despite some variation in how coding is applied, the results of large-scale analyses of biomedical research data do show close correlation between manual and auto-coding.
- However, given auto-coding tends to apply more codes per award than manual, smaller scale analyses with a more bespoke dataset may see more significant variations.

- **Auto-coding has the potential for identifying health-relevancy from broader portfolios but struggles with differing terminology or text structure across disciplines.**

- Our initial comparisons suggest that using auto-coding as an indicator of an awards’ health-relevancy may provide a method for ‘skimming’ award portfolios from non-biomedical funders but will require manual curation to ensure true health-relevancy.
- In particular, social sciences research with a relevance to health suffers from a higher mismatch between manual and auto-coding, requiring more manual analysis to avoid discrepancies.

- **Auto-coding is reliant on the quality of publicly available information**

- The high exclusion rate in our comparisons of 2014 data (25%) shows that unless appropriate title/abstract information is available, there will still be a need for a manual component to analyses using HRCS coding.

66 Digital Science. (2018-) Dimensions [Software] available from <https://app.dimensions.ai>. Last accessed on 27-09-2019, under licence agreement.

67 It is important to note that this assessment was limited to data in the public dataset, some of which was redacted to be allowed to be released publicly. As a result, only 11,315 (75%) of the 14,934 awards in the dataset were eligible for this comparison.

68 Given the parallel in reporting periods, a third of awards in this analysis were also present in the UKHRA2014 dataset. This again means the algorithm is at least partially coding against awards it has been ‘trained’ on, which may imply a higher level of compatibility than a completely naïve dataset.

69 The most substantive variances between original manual coding and auto-coding observed for BBSRC were in Underpinning (-3.0%) and Aetiology (+5.2%) and Generic Health Relevance (+7.8%). The rest were $<1\%$. EPSRC had $<3\%$ variance across all HRCS codes examined, with the majority $<0.5\%$

Appendix 11

Additional methods

Data analysis

Annualised values

The UK Health Research Analysis series has primarily used annualised values for each award, dependent on the award's total value ("commitment"), duration and period of activity in the reporting period (i.e. 01/01/2018 – 31/12/2018)⁷⁰. Roughly 85% of award values are calculated using this method.

Using actual 'live' spend could provide a more accurate snapshot of activity in 2018 however actual spend data for the period would only be available some months after the end of 2018 whereas expected commitment and duration information is often available from the outset for awards.

Note that any values quoted from previous analyses (2004/05, 2009/10 or 2014) have been adjusted for inflation ('real terms', see below) and will therefore differ from those seen in previous reports.

Conversion of data

Following final coding and de-duplication/data cleaning processes, the complete analysis data set was converted from single award lines to multiple lines dependent on the number of both Health Category and Research Activity codes. For example, an award of £10,000 coded with two health categories and two research activities is converted from single line:

Award001	£10,000	HC1	HC2	RA1	RA2
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To multiple lines:

Award001	HC1	RA1	0.25	£2,500
Award001	HC1	RA2	0.25	£2,500
Award001	HC2	RA1	0.25	£2,500
Award001	HC2	RA2	0.25	£2,500

This conversion places all Health Categories and all Research Activities, regardless of number applied to the award in a single column. The number of new lines shows the proportions allocated to each category (4th column) and the original award value is also proportionally distributed. This allows the generation of pivot table summary data from which any required analysis can be performed.

The conversion to multiple lines was achieved through 'unpivoting' the dataset using Microsoft Power BI. A more detailed discussion document, including some 'how to' steps, is available via [the HRCS website](#).

Comparison analysis and calculation of proportion changes

To compare nominal funding values between 2004/05, 2009/10 and 2014 analyses and the current 2018 data required an inflation adjustment to generate real terms values (i.e. at 2018 market prices). To achieve this, we used the Gross Domestic Product (GDP) deflators calculated by the ONS and issued by HM Treasury⁷¹, with 2017/18 financial year as the baseline (100). The GDP deflator values for 2004/05, 2009/10 and 2013/14 were 77.643, 87.585 and 93.899, respectively. Therefore, to calculate the 2018 values of funding from previous analyses requires the original values to be converted by a factor of 1.288 for 2004/05 ($=100/77.643$), 1.142 for 2009/10 ($=100/87.585$) and 1.065 for 2014 ($=100/93.899$). These values are referred to as “real terms” in the text and tables.

Differences between current data and previous data, adjusted to current 2018 values, are presented in three main formats:

- **Difference:** $= V_2 - V_1$

Used for showing differences from the original value (V_1) to the comparison value (V_2) in funding totals (i.e. raw difference in Pounds Sterling) or differences in the percentage of funding allocated to an area.

- **Proportional Changes:** $= (V_2 - V_1) / V_1 \times 100$

This shows percentage changes over time, calculated by comparing the difference in value proportional to the original value. This is used extensively when comparing between 04/05, 09/10, 2014 and 2018 data, and the original value is usually referenced as ‘proportional to’, ‘compared to’ or ‘versus’ in the text and tables.

- **Compound Annual Growth Rate (CAGR):** $= (V_2 / V_1)^{(1/\#years)} - 1$

The CAGR is applied to give a value to the year-on-year changes, as it provides an average rate at which funding increases (or decreases) over time. This report uses the CAGR to show the annual rate of change over the various reporting intervals, up to the 14-year span from first report (2004/05) to latest (2018).

Co-funding and geographic location

Unlike other analyses of health research, we have gone to significant lengths to obtain details of co-funding from participating organisation and search the combined dataset for shared titles/abstracts to identify awards where funding is shared between multiple organisations. The data presented in the final analysis is therefore only the funders individual contributions, or as close as we are able. This avoids duplication of award values.

However due to the nature of award funding and financial reporting, we are unable to distinguish how much of an awards value is being distributed to co-applicants and other collaborations. Most funding organisations provide awards to a single, principal award recipient, from which the funds can be distributed as needed. This report only demonstrates where the initial award is made, not necessarily where all research funded by that award is being conducted. This skew of geographical distribution is also varied between different organisations. Smaller funders tend to make awards to single researchers at a fixed location, whereas larger funders can support complex programmes involving dozens of researchers. In particular, Innovate UK awards can have a high number (20+) of co-applicants or project partners associated with a single award. As data availability increases this caveat could be addressed in future analyses.

Spearman’s rank correlation coefficient

To compare similarity in funding priorities, Spearman’s Rank Correlation Coefficient is used. This statistical measure is used to compare two sets of nonparametric variables by rank to assess how similar or dissimilar they are. In this context, a perfect positive correlation ($r=1$) would denote matches in funding priorities, whereas a perfect negative correlation ($r=-1$) would denote polar opposite funding prioritisation. In general, a coefficient value of $>\pm 0.8$ would suggest good correlation between two datasets.

Oversight of the process

The compilation of data was managed via the Health Research Analysis Forum (HRAF). The HRAF includes representatives from the 12 original HRCS participating organisations plus AMRC.

Ownership of the data

Data collected in the course of this work is owned by the organisations funding the research and held in confidence by the MRC. Details of individual awards will not be circulated or published unless agreement is obtained in advance by participating organisations.

The dataset used in this analysis is available via the [HRCS website](#) and we encourage other organisations to make use of this data to perform further analysis beyond the scope of this report. This dataset contains all awards used in the analysis although certain modifications have been made to meet each participating organisations requirements for data publication and sharing. Any subsequent use of this data in publications and/or use of the HRCS coding process itself must cite the UKCRC as per the [conditions of use](#) also on the HRCS website.

Understanding the Health

Research Classification System

The Health Research Classification System (HRCS) is a two-dimensional framework for classifying research awards. One dimension of the framework, the Research Activity Codes, classifies awards according to type of research activity. The other dimension, the Health Categories, classifies research according to the area of health and disease being studied. Full details of the HRCS are available to download from www.hrcsonline.net.

The **HRCS Research Activity** codes are modelled on the Common Scientific Outline which is a cancer research specific classification system developed by the International Cancer Research Partners. The Common Scientific Outline has been successfully used by the National Cancer Research Institute (NCRI) Partners for the strategic analysis of cancer research in the UK. The Research Activity Codes describe broad areas of research activity organised into eight overarching categories:

- **Underpinning Research (Underpinning)** - research that underpins investigations into the cause, development, detection, treatment and management of diseases, conditions and ill health
- **Aetiology** – identification of determinants that are involved in the cause, risk or development of disease, conditions and ill health
- **Prevention of Disease and Conditions, and Promotion of Well-Being (Prevention)** – research aimed at the primary prevention of disease, conditions or ill health, or promotion of well-being
- **Detection, Screening and Diagnosis** (Detection and Diagnosis) – discovery, development and evaluation of diagnostic, prognostic and predictive markers and technologies
- **Development of Treatments and Therapeutic Interventions** (Treatment Development) – discovery and development of therapeutic interventions and testing in model systems and preclinical settings
- **Evaluation of Treatments and Therapeutic Interventions** (Treatment Evaluation) – testing and evaluation of therapeutic interventions in clinical, community or applied settings
- **Management of Diseases and Conditions** (Disease Management) – research into individual care needs and management of diseases, conditions or ill health
- **Health and Social Care Services Research** (Health Services) – research into the provision of health and social care services, health policy and research methodology

Each of these main categories is further subdivided, to give a total of 48 Research Activity sub-codes. The main eight Research Activity codes can be used for a 'top level' analysis, a more detailed examination can be carried out by analysing the sub-codes of each main category, and cross-cutting analyses can be performed by combining sub-codes from across different categories.

The **HRCS Health Categories** are based on the International Classification of Diseases (ICD) codes⁷² and contain 21 separate groupings which encompass all diseases, conditions and areas of health. Where possible these Health Categories have been designed to match the ICD codes. However, as the ICD codes only describe diseases and ill health, they are not always adaptable to capture the breadth of research funded by the participating organisations. The key differences between ICD codes and HRCS Health Categories are as follows:

- There is no appropriate ICD code to accurately classify studies of normal development and function of the immune system. Therefore, the separate category of Inflammatory and Immune System was created.
- Some categories have been created in areas of specific interest to the UKCRC Partners. For instance, the Stroke Research Network, part of the UK Clinical Research Network, required a separate Stroke HRCS Health Category.
- A further difference from the ICD codes is the Infection category, which includes all diseases caused by infectious agents regardless of the type of infection or system affected.
- Additionally, a Generic Health Relevance category has been added to the system to classify research that is applicable to all diseases and conditions or general health and well-being.

Understanding the results of the analysis

The analysis is designed to show trends in the research activities of the largest public, government and charity research organisations in the UK since 2004. There are several factors that should be considered when reviewing the results of this analysis. Firstly, analysis of the database can provide valuable information on the relative amounts of directly funded research activity in different areas, but it has not been designed to analyse all spending on biomedical and health research in the UK. Secondly, a research award may have a number of objectives; the Health Research Classification System is designed to capture the central aim of the research taking place rather than every facet or possible outcome of the work. The analysis described here provides an indicator of the 'centre of gravity' of the research awards held on the database.

All participating organisations fund research in differing ways. Most use a peer review system to ensure the quality of the research they fund. Some funders commission evaluations or other types of research to answer specific questions. Others focus on the support of dedicated institutes or centres for research priority areas. More typically however, research grants are awarded via 'response mode' – where researchers apply for funding in open competitive calls - to fund the highest quality proposals submitted to them by the research community.

Considering this, there are several factors that might influence the amount of activity in any given area of health-related research. These include:

- The scientific opportunity in an area
- The size and quality of the research workforce in each area
- The 'researchability' or tractability of an area
- The burden of disease in an area
- The level of charity fundraising conducted in an area

This analysis is primarily focused on the combined research portfolios of the participating organisations and the distribution of HRCS Health Categories and Research Activities to assess the national health research landscape. It is possible to carry out a more detailed breakdown of the research using our own Research Activity sub-codes (or bespoke text mining approaches across the dataset), but given the extensive potential for this approach, these analyses are outside the scope of this report. However, we actively support and encourage others to make use of this dataset, and those from previous analyses, for exactly this purpose.

Finally, as the fourth in a continuing series this analysis seeks to identify and assess potential trends in funding over the 14 years reporting period. However, it is important to note that any shift in the coding approach between funders or reports could influence the potential trends observed. In particular, the shift towards automated coding in this 2018 analysis is a considerable methodological change. This report shows that on a national, aggregated level the automated coding appears broadly comparable (see **Appendix 10**). However, a more detailed assessment of specific coding comparisons may require a more considered methodology to adjust for variations between a manual and an automated HRCS coding approach.

70 For example, an award with a total commitment value of £12,000 active for 12 months, beginning on the 1st of October 2014 would report an annualised spend of £3,000 in this analysis.

71 HM Treasury National Statistics Autumn Statement (December 2018) <https://bit.ly/311eZ09>

72 International Classification of Diseases (ICD) <http://www.who.int/classifications/icd/en/>



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