Outputs, outcomes and impact of MRC research 2017

Introduction

This report forms part of the MRC's Investing for Impact series, which provides both qualitative and quantitative analysis of the outputs, outcomes and impact of MRC research.

The outputs data from the MRC portfolio of awards included in this report were collected during the 2018 researchfish® data gathering period (Feb to Mar 2018). The new outputs reported in 2018 combine with those from past submission periods to provide more than 10 years of researchfish® data from all MRC awards active between April 2007 and October 2017.

Evaluation and analysis of the outputs, outcomes and impact of MRC research require a detailed understanding of how data are collected and interpreted. Data on awards and their associated outputs also come from a variety of sources which need to be integrated to allow more direct comparisons between the support for research and its collective impact.

This report presents data from the various outputs as both:

- **Quantitative analysis** – the figures and charts displaying the outputs data from *All MRC* (the total MRC portfolio) awards[1].

- **Tabulated data** – a series of tables containing the numerical data used in the figures of the main quantitative analysis.

The links within the list below can be used to navigate to specific output types:

- **Publications** – Figures and Tables
- **Collaborations** – Figures and Tables
- **Further funding** – Figures and Tables
- **Engagement activities** – Figures and Tables
  - Includes *Artistic and creative products* – Figures and Tables
- **Policy influences** – Figures and Tables
- **Research materials** – Figures and Tables
  - Includes *Tools and methods*,
  - *Databases and models* and
  - *Software and technical products*
- **Intellectual property** – Figures and Tables
- **Medical products, interventions, and clinical trials** – Figures and Tables
- **Awards and recognition** – Figures and Tables

If you have any queries regarding these data, please contact the MRC Evaluation & Analysis Team

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[1] For further information on portfolio analysis, see the **methodology pages of the MRC website.**

Quantitative Analysis

Publications

Peer-reviewed publications are an important output from research and the most frequently reported. Their main functions — communicating information, building a knowledge base and validating research quality — have remained largely unchanged since they first came into existence, around 350 years ago[2].

It takes time for researchers to publish their results and so there will naturally be fewer publications resulting from more recent awards. However, publications tend to be produced before any other type of output such as policy influence or intellectual property. This year's publication data has been taken from Dimensions and includes the average Relative Citation Ratio.

The Relative Citation Ration (RCR) his is defined by Dimensions as: "the relative citation performance of an article, when compared to other articles in its area of research. The RCR is normalized to 1.0 and calculated for all articles funded by the NIH in the Dimensions catalog. An RCR of more than 1.0 shows that a publication has an above average citation rate for its group, when defined by the subject area citation rates of the articles that have been cited with it. Articles that are less than 2 years old, or do not have citations, do not have an RCR."

researchfish® question: Publications arising from research funded.
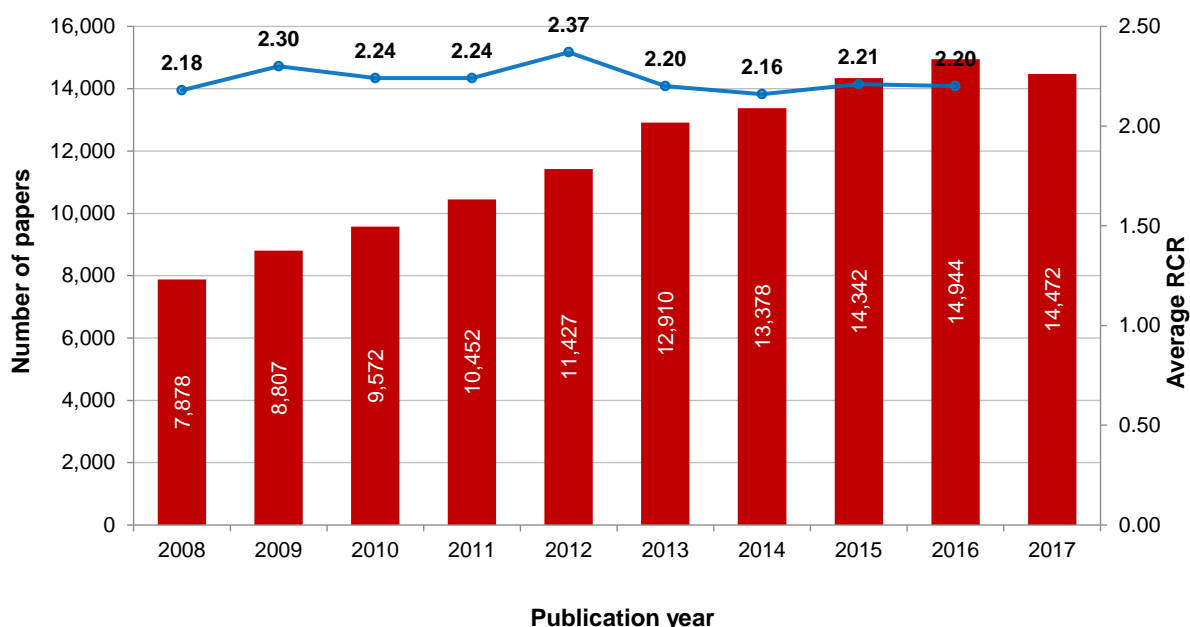

Figure 1: Number of unique publications for each year since 2008 and RCR (average relative citation ratio). RCR is only displayed until 2016 as publications less that two years old do not have an RCR (data in Table 1)

Researchers report approximately 13,900 new publications to the MRC each year. Values taken from dimensions.

Collaborations

Research collaborations might take the form of joint funding, exchanging expertise, staff and facilities, accessing datasets (for example when conducting meta-analyses), or simply bringing together the critical mass required to tackle complex multidisciplinary problems. Collaboration as measured by co-authorship, particularly international co-authorship, has been shown to increase citation impact. Feedback from researchers via researchfish® shows that collaborations are frequently global, cross-sector and interdisciplinary, and are essential to maximise translational impact from research. During a period of constrained public finances it is even more important for researchers to pool resources and expertise to enable access to wide-ranging facilities and equipment.

It takes time for researchers to set up collaborations and so there will naturally be fewer collaborations resulting from more recent awards.

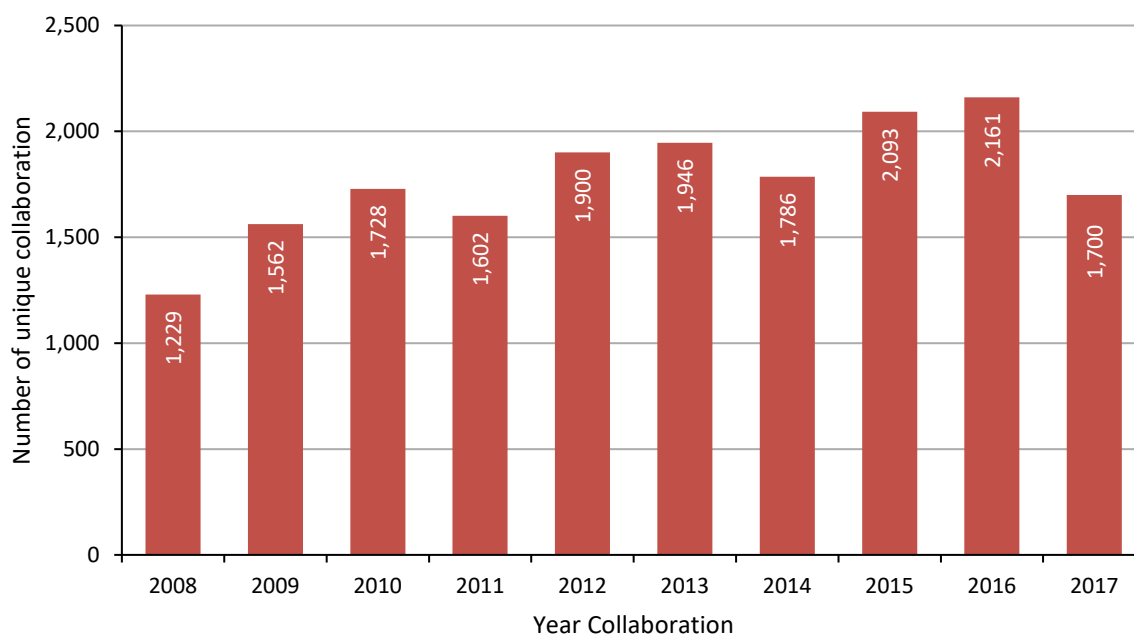*researchfish® question: Collaborations or partnerships which develop as a result of research funded.*

Figure 2:   Number of unique collaborators by award start date (data in Table 2)

MRC researchers report approximately 1,900 new collaborations each year.

Collaborations by sector

researchfish® provides data on the extent to which MRC researchers are engaging with collaborators from different sectors, including from the private sector.
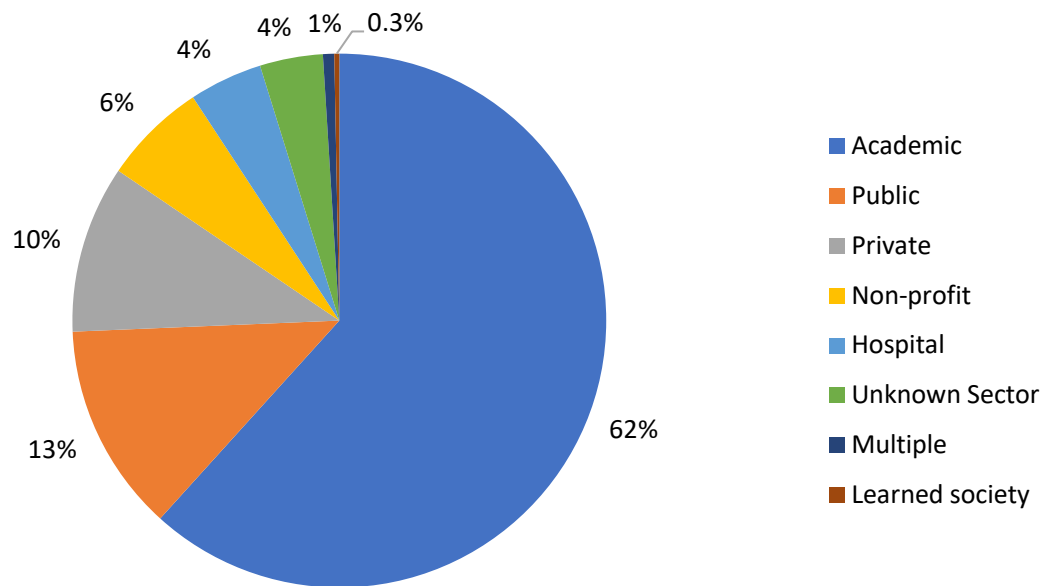

Figure 3: Number of collaborators by research sector (data in Table 3)

Almost two thirds of new collaborations reported are within academia (62%). Publicly-funded organisations (13%) and the private sector (10%) are also frequent sectors for collaboration.

Further Funding

In addition to establishing and maintaining collaborations, researchers obtain funding to continue or expand on their work. This *further funding* may be competitively won, at least in part, because of MRC support. Success in obtaining further funding may indicate that the research group has established a high-quality track record and is therefore able to present attractive proposals for future research.

researchfish® question: Additional funding which develops as a result of research funded.
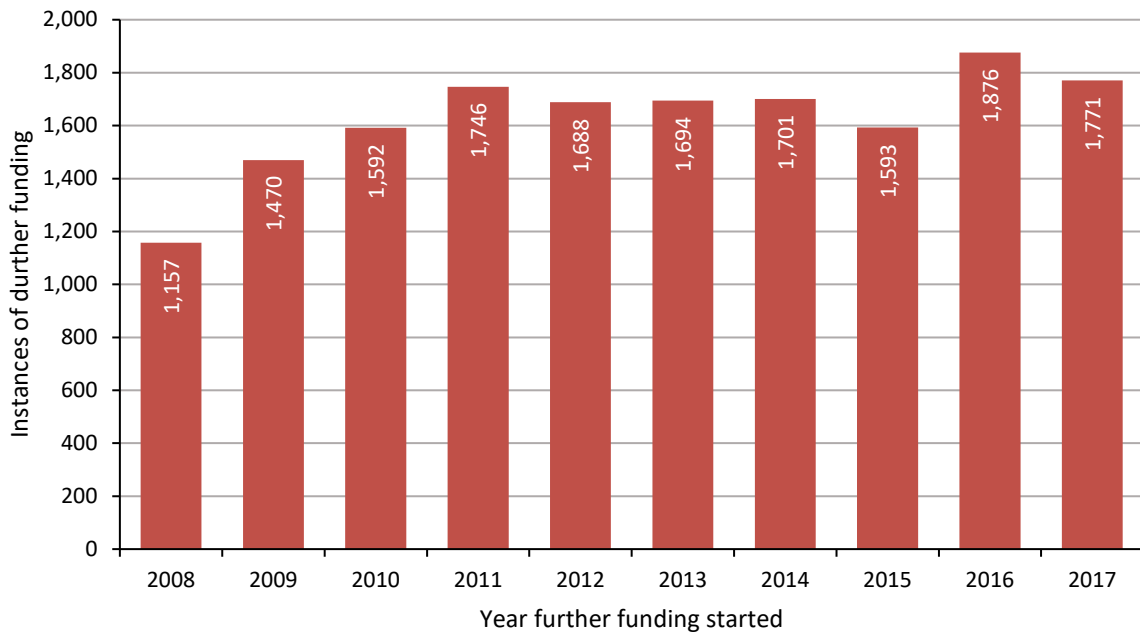
Figure 4:   Instances of further funding by start date (data in Table 4)

Researchers report around 1,700 new instances of further funding each year.

Further funding sources by sector

£28m, <1% £29m, 1% £22m, <1%

£559m, 7%

£810m, 10%

£3,711m, 48%

£2,660m, 34%

- ■ Public
- ■ Non-profit
- ■ Academic
- ■ Private
- ■ Learned society
- ■ Multiple sectors
- ■ Hospital

Figure 5:   Percentage of further funding by sector (data in Table 5)

Awards from public and charitable/non-profit organisations accounts for 82% of all further funding reported by MRC researchers.

Engagement activities

Engaging with audiences outside of academia is an important part of the research process. It helps to enhance public understanding of complex research topics, communicate the importance of the research carried ou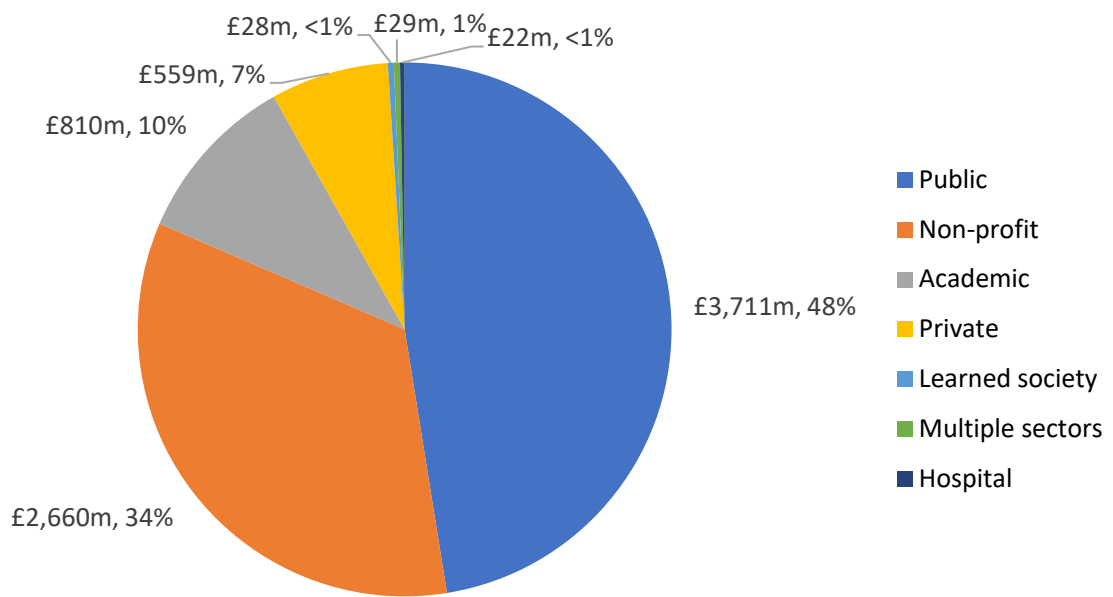t and inspire future careers in science. The MRC runs a varied public engagement programme involving many researchers, from open days and participation in science festivals to our annual Max Perutz science writing competition. However public engagement is not limited to these MRC-run events. The MRC recognises the importance of public engagement: helping the public to understand our scientific findings, reflecting their views in our decision-making and effectively communicating these policies. This is why the MRC encourages our scientists to engage, educate and inspire the public through various mediums, exhibitions, workshops, lectures or the media and to report on their activities.

researchfish® question: Forms of communication of research results and science communication activities.
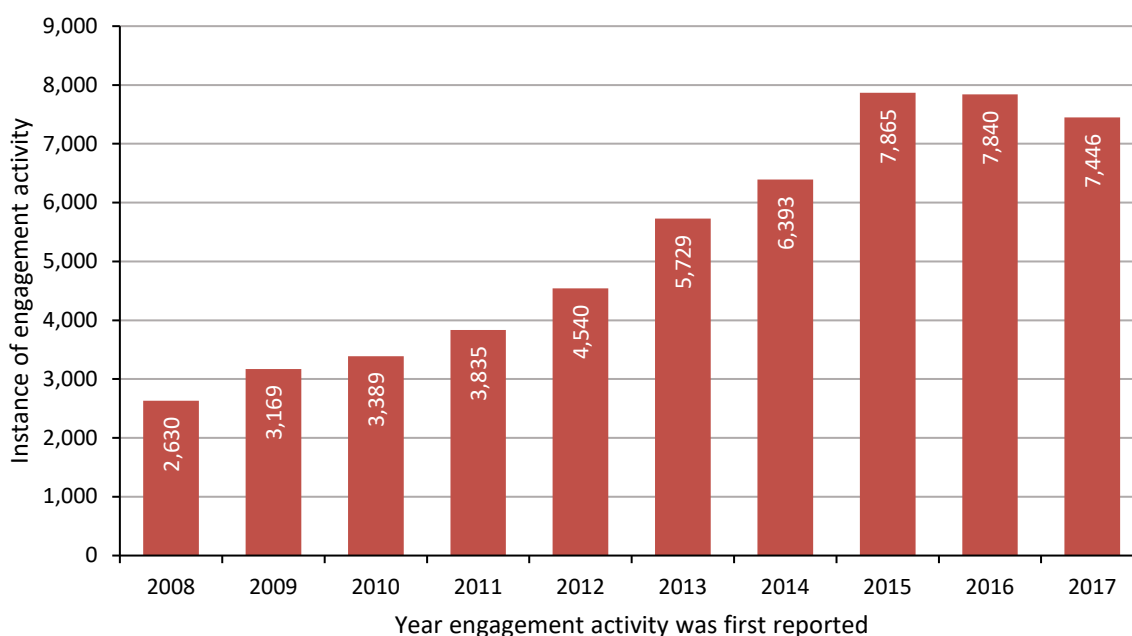
Figure 6: Instances of engagement activities by year activity was first reported (data in Table 6)

In the last five years, MRC researchers have reported more than 7,000 engagement activities per annum on average.

Engagement activity by audience and type
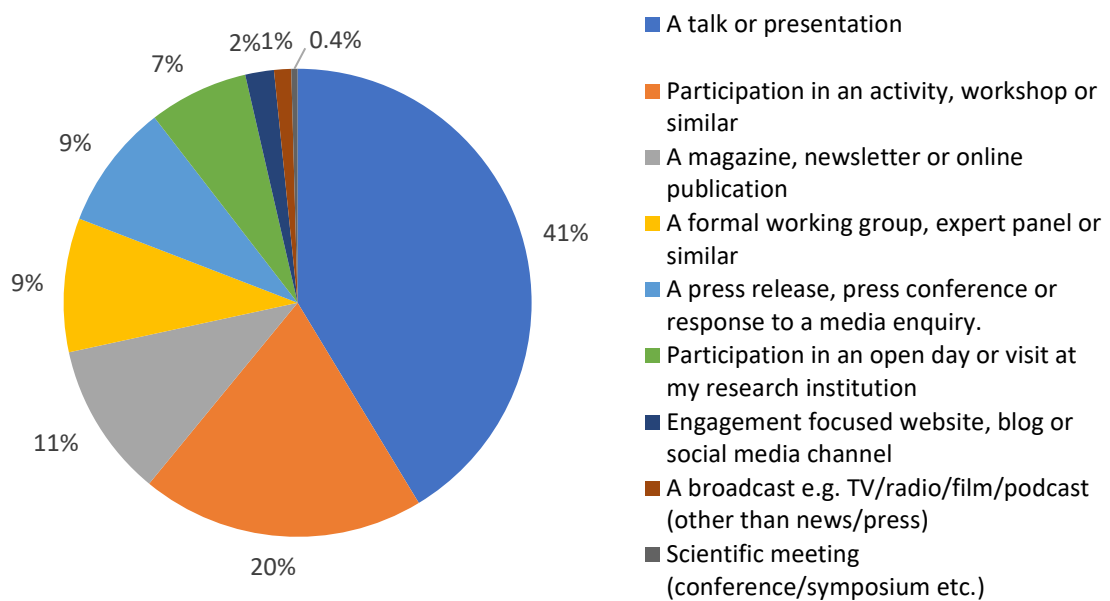
Figure 7:   Engagement activities by type (data in Table 7)

There are many mechanisms by which MRC researchers disseminate their work, with a talk or presentation the most frequent (41%). Both traditional media (such as press releases, magazines, newspapers, TV/radio) and 'new' media (such as blogs, social media, podcasts) feature prominently (23% combined).
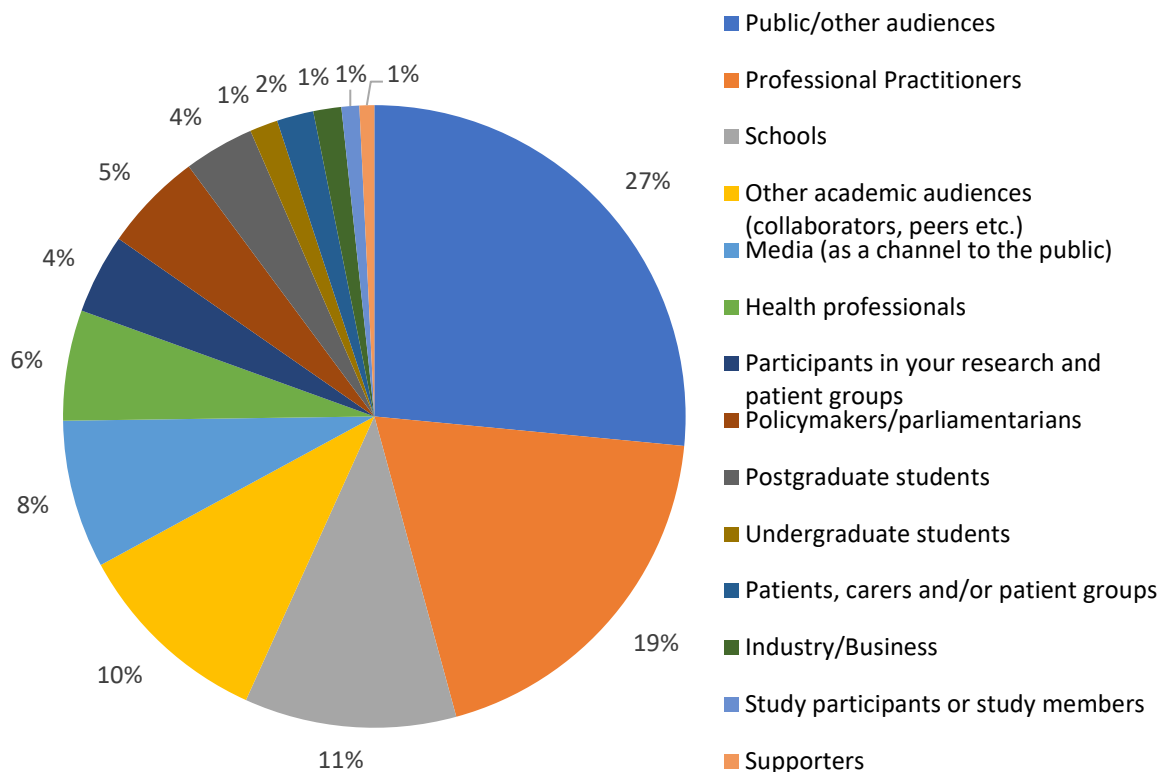
Figure 8:   Engagement activities by audience type (data in Table 8)

The audience for engagement activities from MRC researchers are also mixed. The general public is most frequently reported (27%), but schools, professionals, policymakers and research participants are also featured.

Artistic and Creative Products

For many, the pairing of medical research and artistic products seems unlikely. However, over the past two years, the combined use of researchfish® across both medical and arts/humanities research funders has provided MRC researchers with the opportunity to report on their more creative endeavours. While relatively few, just 369, it has been interesting for the MRC to follow how research can be viewed in different, more widely accessible artistic means. Scientists are creative individuals and it has been interesting to observe novel ways in which scientific achievements can be expressed.
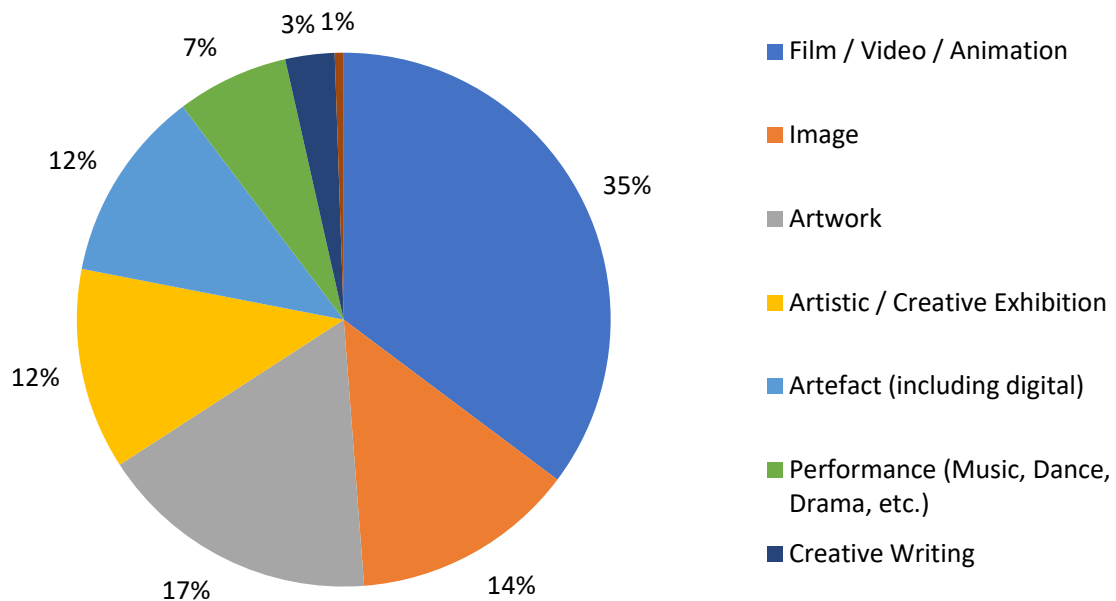

Figure 9: Number of instances of artistic and creative products by type (data in Table 9)

Around 35% of artistic products reported are films, videos or animations. These include advocacy work, often created directly by researchers themselves, on social media video channels like YouTube. Also included are exhibits in science museums and artistic installations. Photographs, often taken for the purposes of research (for example, captured by microscopy) can be subsequently used for more artistic purposes, such as the cover of books or magazines, or public display.

Policy influence

Translating research evidence into improved policy occurs via many different routes, but engagement — communicating and exchanging information and expertise — between researchers, the public and policymakers is crucial. Policymakers, including politicians, regulatory organisations and arms-length bodies, have a duty to use the best possible evidence to benefit society's health and wellbeing. Researchers are therefore encouraged to maximise opportunities for their findings to inform policy decisions. MRC researchers play a critical part in shaping and influencing national and international policy, ensuring that public policy decisions and health interventions are based on research of the highest quality. Researchers contribute regularly to developing and revising clinical guidelines; recommendations to clinicians on the diagnosis, management and treatment in specific areas of healthcare based on systematic evidence, such as NICE and WHO clinical guidelines. MRC researchers also have an influence on policy through membership of guideline committees, participation in national consultations, and the training of practitioners. However, this is not always a straightforward pathway and academic research is not always ready for application or can easily be put into practice by policymakers.

This is why the MRC requires researchers to consider including ways to engage with the public, policymakers and other potential beneficiaries in their research design. Extending and improving this exchange is at the heart of our strategic plan.

researchfish® question: influence on policy or practice resulting from research outcomes.
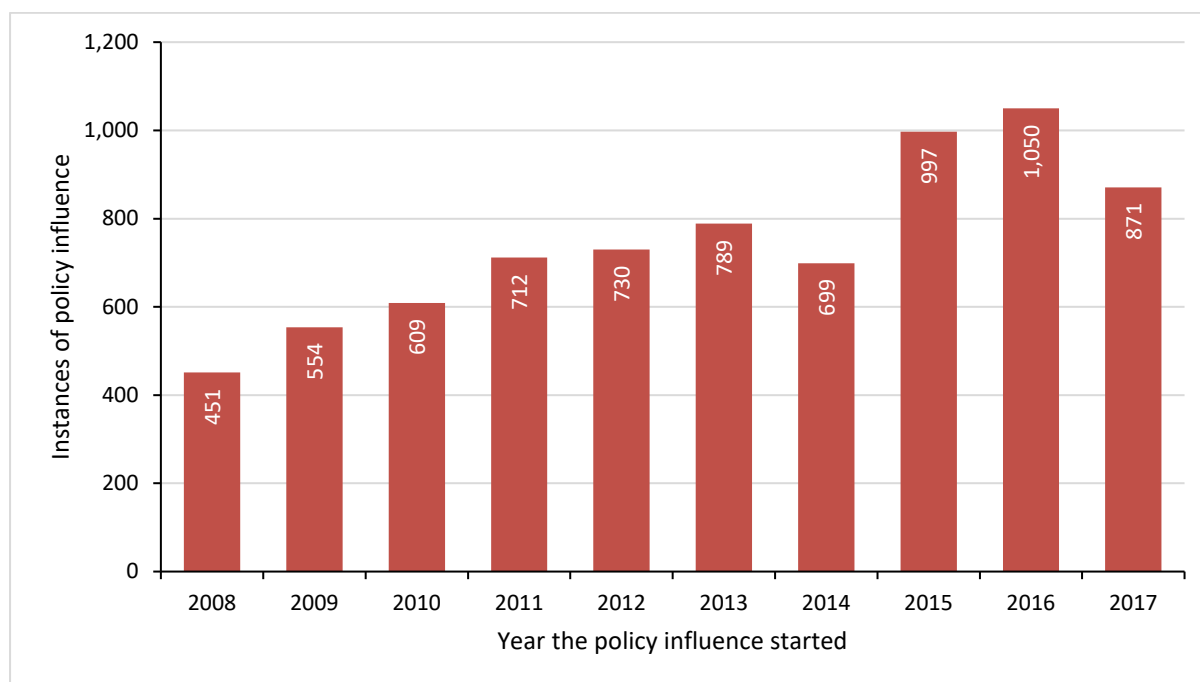
Figure 10: Number of instances of policy influence by year policy influence started (data in Table 10)

MRC researchers report ~880 new policy influences each year.

(A) Citations

- Citation in clinical guidelines
- Citation in other policy documents
- Citation in systematic reviews
- Citation in clinical reviews

- Participation in an advisory committee
- Influenced training of practitioners or researchers
- Membership of a guideline committee
- Participation in a national consultation
- Gave evidence to a government review
- Implementation circular/rapid advice/letter to eg Ministry of Health

(B) Other Policy Influence

Figure 11: Instances of policy influence by type, divided by citations (a) and other types (b) (data in Table 11)

Citations (a) account for 23% of policy influences reported, the most frequent type being citations in clinical guidelines. Other types of policy influence (b) tend to focus on researcher expertise directly, as members of advisory groups, developing training or as part of committees, consultations or reviews that shape wider organisational / national policies.
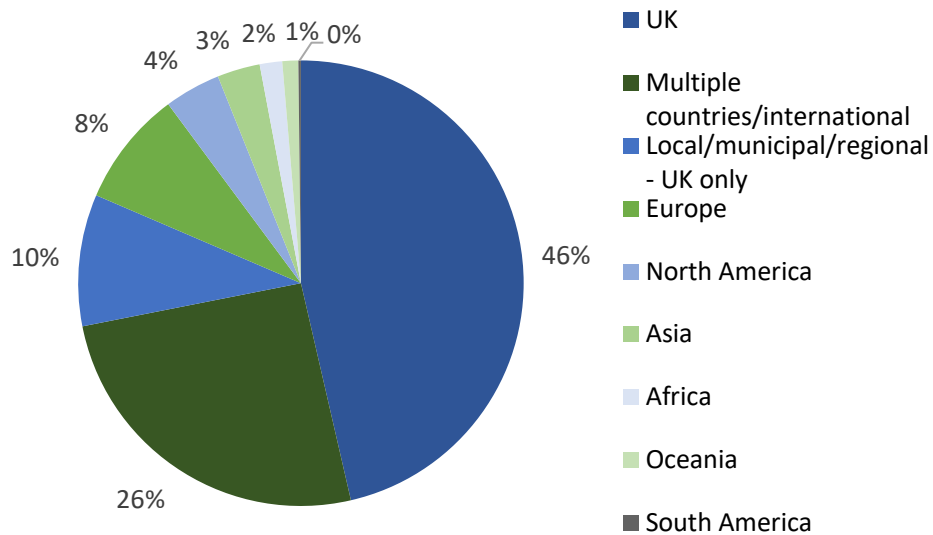
Figure 12: Instances of policy influence by location (data in Table 12)

Just over half of policy influences reported occur exclusively in the UK (46% nationally, 10% on a more local level). The remaining 44% are international in nature, of which more than half (26% of total) affect multiple countries

Research materials

The materials generated in the course of research are many and diverse. They may include new biological models (which may be whole living organisms or cell cultures engineered for a particular purpose), databases containing information about experimental observations or instructions for new techniques. These materials are tangible evidence of the research process and, although usually generated exclusively for the original research programme, they may be used more widely in other research projects. Using these materials may open up entirely new lines of enquiry and/or accelerate research in closely-related fields or even entirely different disciplines. These spill-over benefits are important outputs of MRC-supported research. Feedback captured via researchfish® aims to identify where studies have generated research materials and, importantly, where these have been used by others.

researchfish® question: Research materials developed during the funded project.

Tools and methods by type
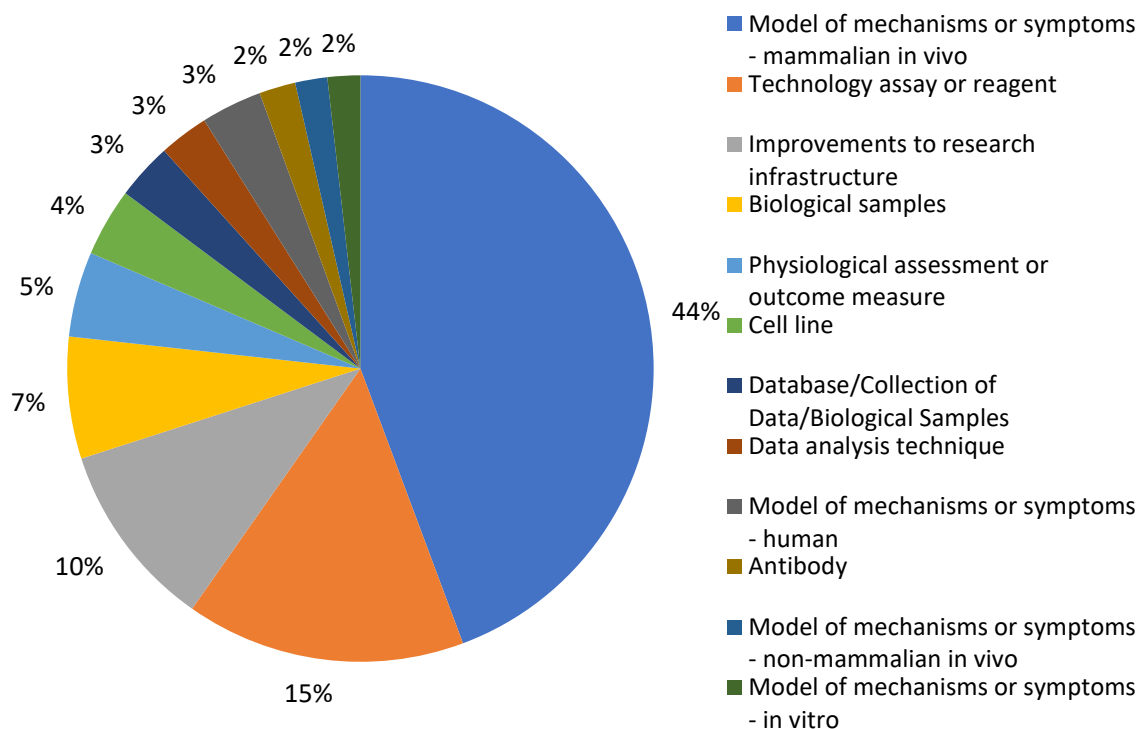
Figure 13: Instances of research tools and methods by type (data in Table 13)

The most frequently reported type within research tools and methods are mammalian in vivo models (44%), followed by new technology assays or reagents (15%).

Databases and models
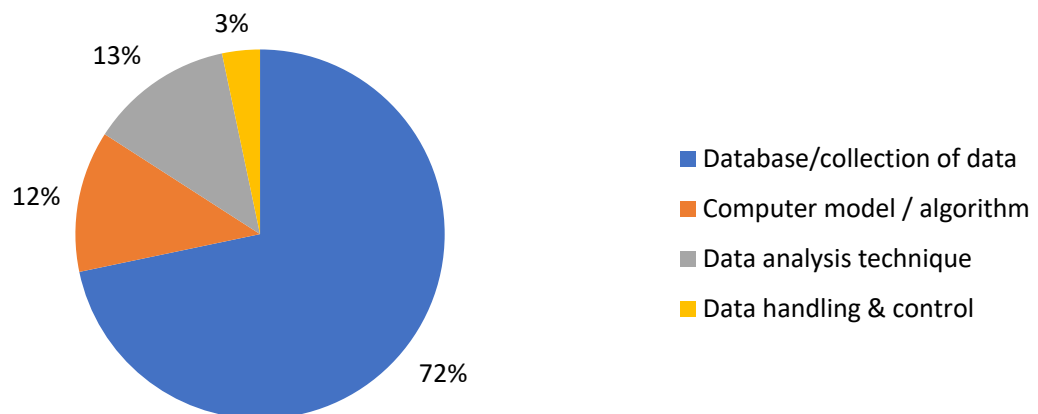
Figure 14: Instances of research databases and models by type (data in Table 14)

MRC researchers have reported 935 new research databases and models.

Software and technical products
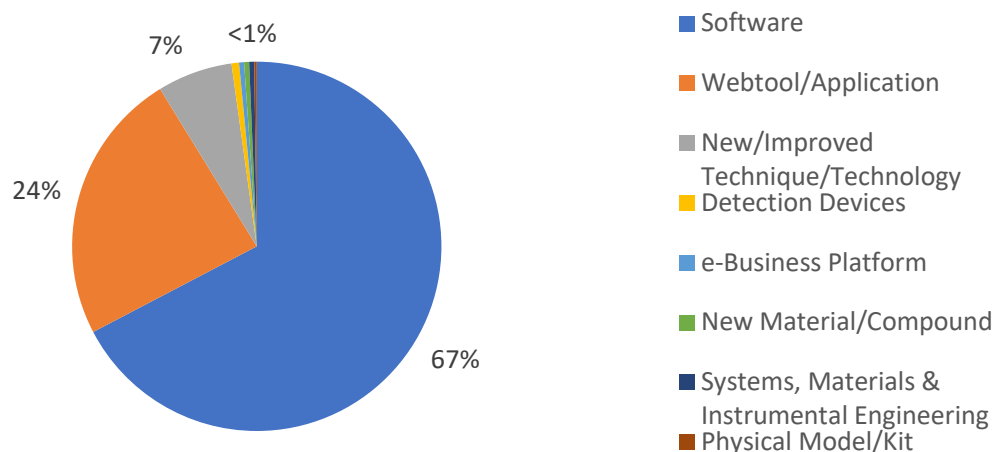
Figure 15: Instances of software or technical products by type (data in Table 15)

MRC researchers have reported 456 new research software and technical products.

Intellectual property

In instances where a medical product or interventions cover 'new' functional or technical aspects, researchers take steps to ensure their discoveries are recognised as intellectual property. Creating intellectual property can take a long time and therefore the longer that an award has been active, the greater number of opportunities there are to create a patentable idea.

researchfish® question: Patents or licencing arising from funded research outputs.
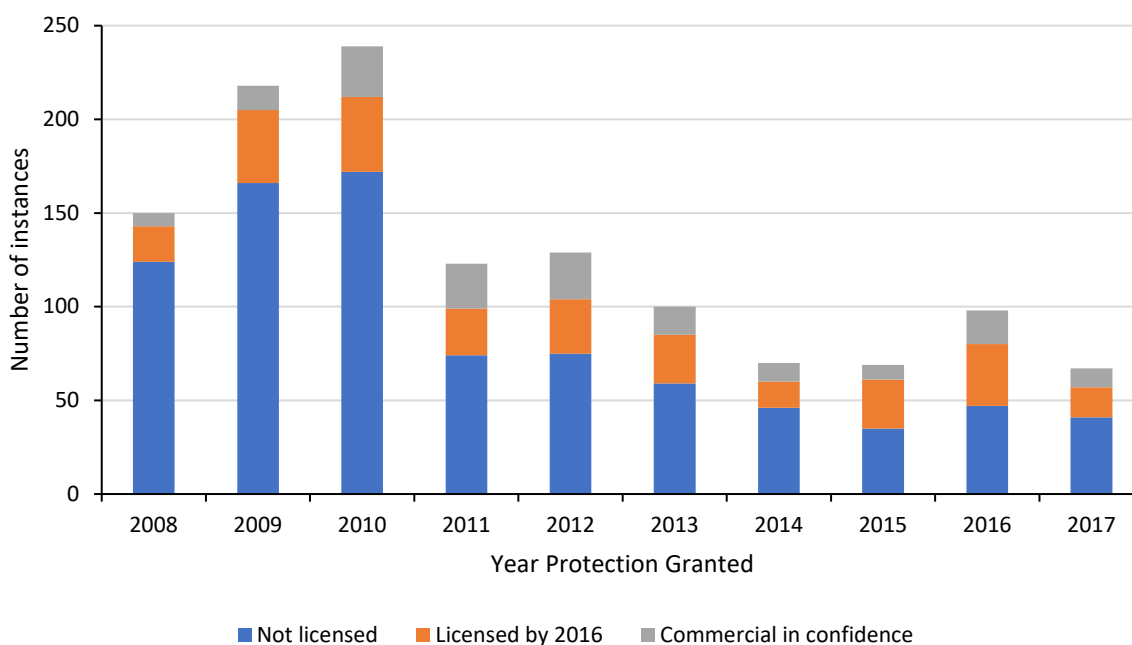
Figure 16:   Number of instances of Intellectual property (IP) by category and year in which IP was realised (data in Table 16)

MRC researchers have reported 1,263 items of intellectual property since 2008, with 404 in the past five years.
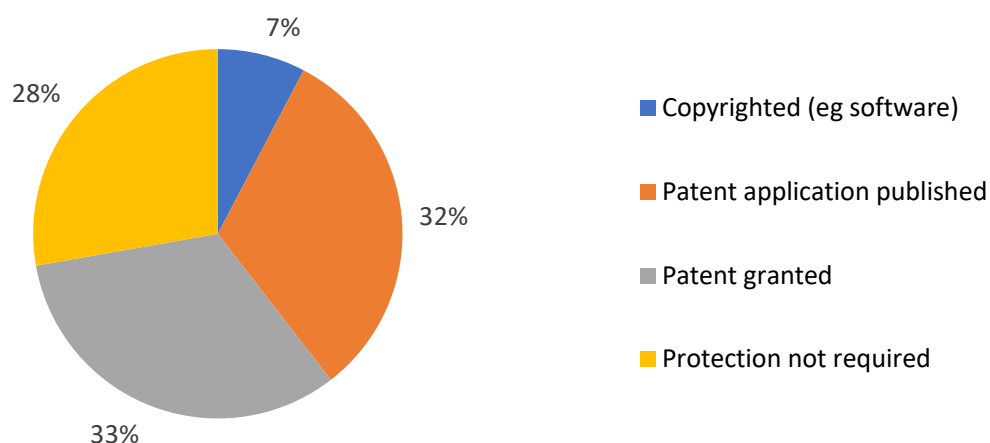
Figure 17:   Type of intellectual property protection reported (data in Table 17)

Just over one third of items of IP are granted patents (33%), with a further 32% as patents in application.

Medical products, interventions and clinical trials

New products, from vaccines and other therapies to technological advances for disease monitoring and diagnostics, are important and direct impacts from MRC-supported research. There is a long history of MRC discovery science leading to new products, interventions and clinical trials that have widespread impact, from the early development of the first antibiotic, penicillin, through to stem cells and monoclonal antibodies. The MRC provides sustained support for significant and pioneering research and has done much in partnership with others to ensure important UK discoveries can be rapidly translated into practice.

researchfish® question: Products, interventions or clinical trials arising from the funded research outcomes.

Legend:
- Therapeutic intervention - drug
- Diagnostic Tool - Non-imaging
- Support tool - for fundamental research
- Diagnostic Tool - imaging
- Therapeutic (psychological/behavioural)
- Management of diseases and conditions
- Therapeutic (cellular and gene therapies)
- Therapeutic intervention - vaccines
- Support tool - for medical intervention
- Preventative (behavioural risk modification)
- Therapeutic intervention - medical devices
- (eight remaining product types)

Figure 18: Instances of medical products, interventions and clinical trials by type (data in Table 18)

There are many different types of therapeutics which MRC researchers contribute towards, the most frequently reported being new drugs (31%) and non-imaging diagnostic tools (15%).

Awards and recognition

The MRC celebrates the awards and wider recognition won by our researchers. Awards, prizes and other means of recognition in part acknowledge the quality of research undertaken by MRC scientists. Certain 'markers of esteem', such as being appointed to the editorial board of a journal or attracting visiting staff, can also be seen to have a wider impact on the research and teaching community. Measures of esteem are used internationally by some funders alongside citation analysis, peer review and research income as indicators of research quality.

researchfish® question: Awards or recognition received as result of the funded research outcomes.

Pie chart legend:
- Invited speaker at conference — 50%
- Prestigious/honorary/advisory position — 12%
- Research prize — 11%
- Editorial board/advisor to journal / book series — 9%
- Learned society membership/fellowship — 7%
- Poster/abstract prize — 5%
- Attracted visiting staff or internships to lab — 3%
- Medal — 2%
- NIHR Senior Investigator/Clinical Excellence Award — 1%
- National honour eg Order of Chivalry, OBE — 0.5%
- Honorary Degree — 0.3%

Figure 19: Instances of awards and recognition by type (data in Table 19)

Half the awards and recognition reported (50%) are invitations to be a keynote speaker at a conference. Conferences are a primary source of rapid research dissemination within academia, where researchers present their latest findings. To be invited shows the researcher has gained considerable recognition within their field of research. Honorary and advisory positions, alongside awards made within the research community, also show how influential a researcher's body of work has become.

Tabulated data

Publications data

Table 1: Number of unique publications reported by publication year (shown in Figure 1)

Year published	Number of papers	Average Relative Citation Ratio
2008	7,878	2.18
2009	8,807	2.30
2010	9,572	2.24
2011	10,452	2.24
2012	11,427	2.37
2013	12,910	2.20
2014	13,378	2.16
2015	14,342	2.21
2016	14,944	2.20
2017	14,472	
TOTAL (to 2017)	**118,182**	**2.23**

Collaborations data

Table 2: Number of unique collaborations reported by collaboration start year (shown in Figure 2)

Year Collaboration Started	Number of unique collaborations
2008	1,229
2009	1,562
2010	1,728
2011	1,602
2012	1,900
2013	1,946
2014	1,786
2015	2,093
2016	2,161
2017	1,700
TOTAL	**17,707**

Table 3: Number of collaborators by sector (shown in Figure 3)

Collaboration sector	Number of instances	Percentage
Academic	13,254	62%
Public	2,713	13%
Private	2,179	10%
Non-profit	1,350	6%
Hospital	952	4%
Unknown Sector	820	4%
Multiple	146	1%
Learned society	65	0.3%
TOTAL	**21,479**	**100%**

Further funding data

Table 4: Instances of further funding reported by year in which the further funding started (shown in Figure 4)

Year further funding started	Number of instances	Percentage
2008	1,157	7%
2009	1,470	9%
2010	1,592	10%
2011	1,746	11%
2012	1,688	10%
2013	1,694	10%
2014	1,701	10%
2015	1,593	10%
2016	1,876	12%
2017	1,771	11%
TOTAL	**16,288**	**100%**

Table 5: Value of further funding by sector (shown in Figure 5)

Sector	Amount	Percentage
Public	£3,711m	47.46%
Non-profit	£2,660m	34.02%
Academic	£810m	10.36%
Private	£559m	7.15%
Learned society	£28m	0.36%
Multiple sectors	£29m	0.37%
Hospital	£22m	0.28%
TOTAL	**£7,819m**	**100%**

Engagement activities data

Table 6: Instances of engagement activities by year activity was first reported (shown in Figure 6)

Year activity first reported	Number of instances	Percentage
2008	2,630	5%
2009	3,169	6%
2010	3,389	6%
2011	3,835	7%
2012	4,540	8%
2013	5,729	10%
2014	6,393	11%
2015	7,865	14%
2016	7,840	14%
2017	7,446	13%
TOTAL	**52,836**	**100%**

Table 7: Engagement activities by type (shown in Figure 7)

Engagement activity	Number of instances	Percentage
A talk or presentation	23,777	41%
Participation in an activity, workshop or similar	11,278	20%
A magazine, newsletter or online publication	6,136	11%
A formal working group, expert panel or similar	5,320	9%
A press release, press conference or response to a media enquiry.	4,992	9%
Participation in an open day or visit at my research institution	3,954	7%
Engagement focused website, blog or social media channel	1,140	2%
A broadcast e.g. TV/radio/film/podcast (other than news/press)	679	1%
Scientific meeting (conference/symposium etc.)	250	0.4%
Other/Unknown	0	0%
TOTAL	**57,526**	**100%**

Table 8: Engagement activities by audience type (shown in Figure 8)

Audience type	Number of instances	Percentage
Public/other audiences	15,193	26%
Professional Practitioners	11,029	19%
Schools	6,308	11%
Other academic audiences (collaborators, peers etc.)	5,913	10%
Media (as a channel to the public)	4,411	8%
Health professionals	3,290	6%
Participants in your research and patient groups	2,375	4%
Policymakers/parliamentarians	2,963	5%
Postgraduate students	2,091	4%
Undergraduate students	836	1%
Patients, carers and/or patient groups	1,094	2%
Industry/Business	833	1%
Study participants or study members	530	1%
Supporters	440	1%
Third sector organisations	218	0%
TOTAL	**57,524**	100%

Artistic and creative products data

Table 9: Number of instances of artistic and creative products by type (shown in Figure 9)

Type of artistic and creative product	Number of instances	Percentage
Film / Video / Animation	130	35%
Image	50	14%
Artwork	63	17%
Artistic / Creative Exhibition	45	12%
Artefact (including digital)	43	12%
Performance (Music, Dance, Drama, etc.)	25	7%
Creative Writing	11	3%
Composition / Score	2	1%
TOTAL	**369**	**100%**

Policy influence data

Table 10: Number of instances of policy influence by year policy influence started (shown in Figure 10)

Year policy influence started	Number of Instances	Percentage
2008	451	7%
2009	554	8%
2010	609	9%
2011	712	11%
2012	730	11%
2013	789	12%
2014	699	11%
2015	997	15%
2016	1,050	16%
2017	871	13%
TOTAL	**6,591**	**100%**

Table 11: Instances of policy influence by type, divided by citations (a) and other types (b) (shown in Figure 11)

Influence Type	Number of Instances	Percentage
Citation in clinical guidelines	1,032	11%
Citation in other policy documents	642	7%
Citation in systematic reviews	378	4%
Citation in clinical reviews	134	1%
Participation in an advisory committee	3,257	34%
Influenced training of practitioners or researchers	1,684	18%
Membership of a guideline committee	1,092	11%
Participation in a national consultation	602	6%
Gave evidence to a government review	466	5%
Implementation circular/rapid advice/letter to eg Ministry of Health	239	3%
Other	1	0%
TOTAL	**9,527**	**100%**

Table 12: Instances of policy influence by location (shown in Figure 12)

Location of policy influence	Number of Instances	Percentage
UK	3,810	46%
Multiple countries/international	2,094	25%
Local/municipal/regional - UK only	785	10%
Europe	689	8%
North America	335	4%
Asia	255	3%
Africa	134	2%
Oceania	95	1%
South America	15	0%
TOTAL	**8,212**	**100%**

Research materials data

Table 13: Instances of research tools and methods by type (shown in Figure 13)

Type of research tool or method	Number of instances	Percentage
Model of mechanisms or symptoms - mammalian in vivo	2,851	44%
Technology assay or reagent	992	15%
Improvements to research infrastructure	663	10%
Biological samples	432	7%
Physiological assessment or outcome measure	302	5%
Cell line	242	4%
Database/Collection of Data/Biological Samples	201	3%
Data analysis technique	176	3%
Model of mechanisms or symptoms - human	216	3%
Antibody	129	2%
Model of mechanisms or symptoms - non-mammalian in vivo	114	2%
Model of mechanisms or symptoms - in vitro	116	2%
TOTAL	**6,434**	**100%**

Table 14: Instances of research databases and models by type (shown in Figure 14)

Type of research database or model	Number of instances	Percentage
Database/collection of data	672	72%
Computer model / algorithm	116	12%
Data analysis technique	118	13%
Data handling & control	31	3%
Other / Unknown	0	0%
TOTAL	**937**	**100%**

Table 15: Instances of software or technical products by type (shown in Figure 15)

Type of research software or technical material	Number of instances	Percentage
Software	307	67%
Webtool/Application	109	24%
New/Improved Technique/Technology	30	7%
Detection Devices	3	1%
e-Business Platform	2	0.4%
New Material/Compound	2	0.4%
Systems, Materials & Instrumental Engineering	2	0.4%
Physical Model/Kit	1	0.2%
TOTAL	**456**	**100%**

Intellectual property data

Table 16: Number of instances of Intellectual property (IP) by category and year in which IP was realised (shown in Figure 16)

Year IP was Realised	Protection Type			
	Not licensed	Licensed by 2016	Commercial in confidence	TOTAL
2008	124	19	7	**150**
2009	166	39	13	**218**
2010	172	40	27	**239**
2011	74	25	24	**123**
2012	75	29	25	**129**
2013	59	26	15	**100**
2014	46	14	10	**70**
2015	35	26	8	**69**
2016	47	33	18	**98**
2017	41	16	10	**67**
TOTAL	**839**	**267**	**157**	**1,263**

Table 17: Type of intellectual property protection reported (shown in Figure 17)

Type of IP protection	Number of instances	Percentage
Copyrighted (eg software)	112	8%
Patent application published	463	32%
Patent granted	476	33%
Protection not required	404	28%
TOTAL	**1,455**	**100%**

Medical products, interventions and clinical trials data

Table 18: Instances of medical products, interventions and clinical trials by type (shown in Figure 18)

Product type	Number of instances	Percentage
Therapeutic intervention - drug	456	31%
Diagnostic Tool - Non-imaging	215	15%
Support tool - for fundamental research	84	6%
Diagnostic Tool - imaging	83	6%
Therapeutic (psychological/behavioural)	66	5%
Management of diseases and conditions	82	6%
Therapeutic (cellular and gene therapies)	85	6%
Therapeutic intervention - vaccines	79	5%
Support tool - for medical intervention	66	5%
Preventative (behavioural risk modification)	85	6%
Therapeutic intervention - medical devices	45	3%
Preventative (nutrition and chemoprevention)	25	2%
Therapeutic intervention - surgery	16	1%
Health and social care services	19	1%
Therapeutic intervention - physical	16	1%
Therapeutic intervention - radiotherapy	15	1%
Preventative (physical/biological risk modification)	13	1%
Products with applications outside of medicine	8	1%
Therapeutic intervention - complementary	4	0.3%
TOTAL	**1,462**	**100%**

Awards and recognition data

Table 19: Instances of awards and recognition by type (shown in Figure 19)

Award or recognition type	Number of instances	Percentage
Invited speaker at conference	13,848	49%
Prestigious/honorary/advisory position	3,407	12%
Research prize	3,027	11%
Editorial board/advisor to journal / book series	2,385	9%
Learned society membership/fellowship	2,074	7%
Poster/abstract prize	1,298	5%
Attracted visiting staff or internships to lab	795	3%
Medal	662	2%
NIHR Senior Investigator/Clinical Excellence Award	295	1%
National honour eg Order of Chivalry, OBE	126	0%
Honorary Degree	77	0%
Other award	2	0%
TOTAL	**27,996**	**100%**