An Overview of the Healthcare Research and Development (R&D) Funding Landscape

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Summary

This research analyses the distribution and focus of awarded grants from major UK funding bodies (BBSRC, MRC, NC3Rs, and Innovate) between 2021 and 2024. Cancer and neoplasms and neurology were the most common focus of research awards. Analysis of future funding opportunities in the UK and US highlights substantial financial support for advanced therapies, diagnostics, AI, and interdisciplinary research, with significant investments in cancer research.

- Analysis of advanced therapy awards demonstrates a strong emphasis on neurology and cancer, highlighting precision medicine, gene, and cell therapies, novel therapeutic targets, and advanced technologies.
- Gut health-microbiome-nutrition awards focus on diet, immune function, and metabolic diseases, key themes include: dietary patterns, gut microbiota modulation, nutrition-related interventions, and AI in microbiome monitoring.
- Biomedical engineering awards focus on neurological and cancer research, but there is substantial funding for blood and congenital disorders. Key themes include: precision medicine, stem cell models, organoid development, advanced imaging, and AI in diagnostics.
- Diagnostics awards focus on cancer diagnostics and neurological diagnostics. Key themes include: imaging technologies, disease mechanism understanding, personalized therapies, and sustainable medical imaging practices.
- Drug/therapy/device combination awards focus on neurological disorders and cancer. Key themes include: innovative technologies, personalized treatments, AMR diagnostics, and AI-driven tools.
- Artificial Intelligence awards focus on Cancer, Neurology, and Infection. Key themes include: machine learning for diagnostics, genomic profiling, precision medicine, and AI in imaging technologies.
- There is a substantial focus on diagnostics research across Cancer Research UK awards (70%), with notable growth in advanced therapies.
- **S**carcity of available opportunities **identified** in Asia, suggest**s** a need for targeted searches in region-specific repositories.

Background

Approximately a fifth of public sector expenditure in the United Kingdom (UK) is dedicated to healthcare Research & Development (R&D).[1] In 2022, R&D expenditure for healthcare in the UK was estimated at a total of £10.13bn.[2] Just under half (£5.01bn) comes from industry and

is mostly invested in research on pharmaceuticals, medical devices and diagnostics. Public/charitable sectors provide the rest - about £5.12 billion, funding a combination of basic science, clinical and health services research. [2]

Healthcare and biomedical research are a vital component of the UK science base, with a strong positive rate of return to the UK economy, [2] with ways and means to allocate research funding considered one of the most influential elements in attempts to govern contemporary public science.[3] The availability of research funding can embody signals about needs that governments, their agencies, industries and societies expect funded research to address. Regular analyses can therefore provide helpful evidence to support monitoring of emergent trends and strategic coordination.

This report is split into two parts; the first focusses on publicly funded UK healthcare research grants awarded from 2021-2024 by funding bodies that offer grants that are similar in remit to that of NIHR's i4i. These include: Medical Research Council (MRC), Biotechnology and Biological Sciences Research Council (BBSRC), Innovate and NC3Rs. With almost a fifth of UK healthcare research funding dedicated to cancer research,[2] Cancer Research UK (CRUK) grants awarded from 2021-2024 were also included in the analysis. The scope of the analysis is expanded in the second part of the report, which focusses on the details of funding calls made from 2024 onwards by funders in the UK, US and Asia. Details of upcoming, future opportunities may be indicative of prospective trends within the healthcare funding landscape.

Understanding prospective trends within the healthcare funding landscape can therefore provide valuable insights for researchers, policymakers, and funding bodies. It allows them to anticipate the direction of future funding priorities, identify emerging areas of research, and allocate resources effectively. By analysing details of upcoming funding calls, stakeholders can stay ahead of the curve and ensure that funding is directed towards areas that have the potential to drive innovation and make a significant impact on healthcare outcomes.

Aims

- Provide an overview of recent awards made by UK funders (CRUK, MRC, BBSRC, N3CRs and Innovate) from 2021 onwards to outline emergent trends in advanced therapies, biomedical engineering, drug/therapy and medical device combinations, diagnostics, Artificial Intelligence (AI) and gut health-microbiome-nutrition.
- Provide an overview of future funding opportunities offered by funders in the US, UK and Asia from 2024 onwards.

Methods

Data is reported separately for funding awards and funding calls. We distinguish between awards and calls to indicate current funding activities (funding awards) and potential future trends (funding calls).

Searching

Awarded Grants

UKRI Gateway to Research (GtR) was searched in June 2024 to capture all records of awards made by MRC, BBSRC, NC3Rs and Innovate from 2021 to current day (n=9106). Recently funded awards published by CRUK on their website from 2021-2022 and 2023-2024 were manually extracted (n=191).

Funding Calls

ResearchConnect was searched in June 2024 to identify all records of funding calls announced by funders based in the UK, US or Asia from January 2024 onwards related to Biotechnology and Biology, Biomedical Engineering, Healthcare Technologies, Medical Research focussing on research activities linked to R&D, academic and industry research (n=774).

Screening

As a result of the large number of returned results from GtR, AI prioritisation tools were utilised to support screening and data extraction. By identifying and reporting on the top 100 most relevant records for each remit, we can illustrate trends and activities within the funding landscape more broadly. For a more detailed description of the screening process, please see Appendix A. Records from all other searches were screened manually.

Data Extraction

Awarded Grants

Titles and abstracts of the top 100 most likely relevant records per remit for awarded grants were subject to analysis to classify records according to health category using UKCRC's Health Research Classification System (HRCS). This analysis was used to identify current R&D trends within the healthcare funding landscape.

Funding Calls

As data related to funding calls is less detailed, it was often difficult to determine relevance, increasing the likelihood of overlap between health categories and research activities within a single call. Titles and abstracts of funding calls from the UK and US were subject to thematic analysis. This analysis was used to identify potential for future R&D trends within the healthcare funding landscape.

Results

Awarded Grants: UKRI

We identified a total of 9106 awarded grants made by BBSRC, MRC, NC3Rs and Innovate during the period of 2021-2024. This represents £4.1 billion of funding. Across the entire

corpus of 9106 awarded grants by BBSRC, MRC, NC3Rs, and Innovate, it appears that there has been a year-on-year increase in funding consistent across all funders, with some fluctuation in NC3Rs funding. The top 100 most relevant awards for each remit were identified (advanced therapies, drug/therapy and device combinations, biomedical engineering, diagnostics, artificial intelligence and gut health-microbiome-nutrition).

391 duplicate records were present within the 600 awards identified as most relevant across the 6 identified remits[1]. This suggests that awards are likely to focus on a combination of research areas.

Using the remaining 209 unique awards, the total cumulative spend from 2021-2024 was approximately £168.1 million, with a minimum award amount of £3180 and maximum amount of £12.36million.

The MRC was the largest cumulative funder (n= 131 awards, spend = £126million), however the BBSRC was the largest funder when spend was averaged across number of awards (average amount per grant £1.4million), as outlined in Table and Figure 1.

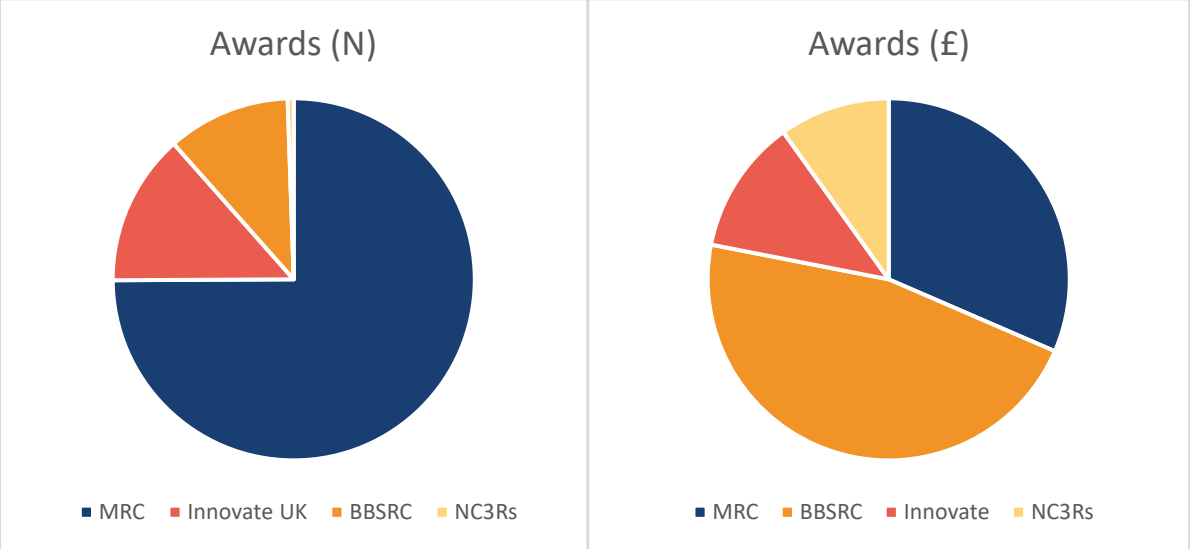

Figure 1. Comparative chart to show difference between number of sponsored research awards and average spend per award in £ across funders

Funding Body	Awards (N)	Awards (£)	Average (£)
MRC	131	126,009,073	961,901
BBSRC	13	18,490,338	1,422,333
Innovate	62	22,786,258	367,520

[1] As awards could span multiple remits, if an award was marked as an include for more than one remit, it was duplicated in order to conduct analysis on the most representative dataset for that remit.

NC3Rs	3	906,065	302,021
Total	209	168,191,734	804,745

Table 1. Number of sponsored research awards and average spend per award in GBP(£) across funders

Comparing across the top 100 most relevant awards for each remit, Biomedical Engineering and Advanced Therapies received the largest amount of cumulative funding with over £100million. Differences between award funding across all remits are small (Figure 2, Figure 3). Across all remits, Neurology, Cancer and Neoplasms are the most frequent focus of awards (Figure 4).

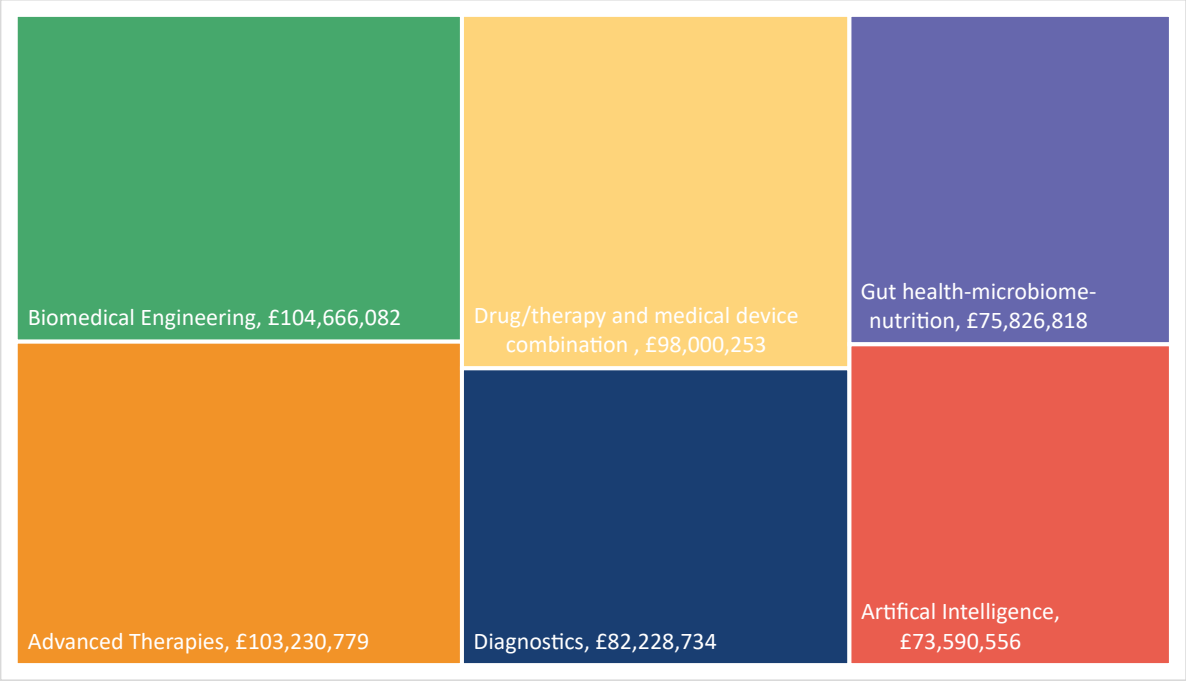

Figure 2. Hierarchy chart representing cumulative funding in £ for research awards related to biomedical engineering, advanced therapies, drug/therapy/device combinations, diagnostics, gut health-microbiome-nutrition and artificial intelligence

These findings should be treated with caution however, as awards have been restricted to the top 100 most likely based on relevance and include duplicate awards. Only 6 months of awards for 2024 have been captured so this may not be fully representative of historical trends across the funding awards landscape.

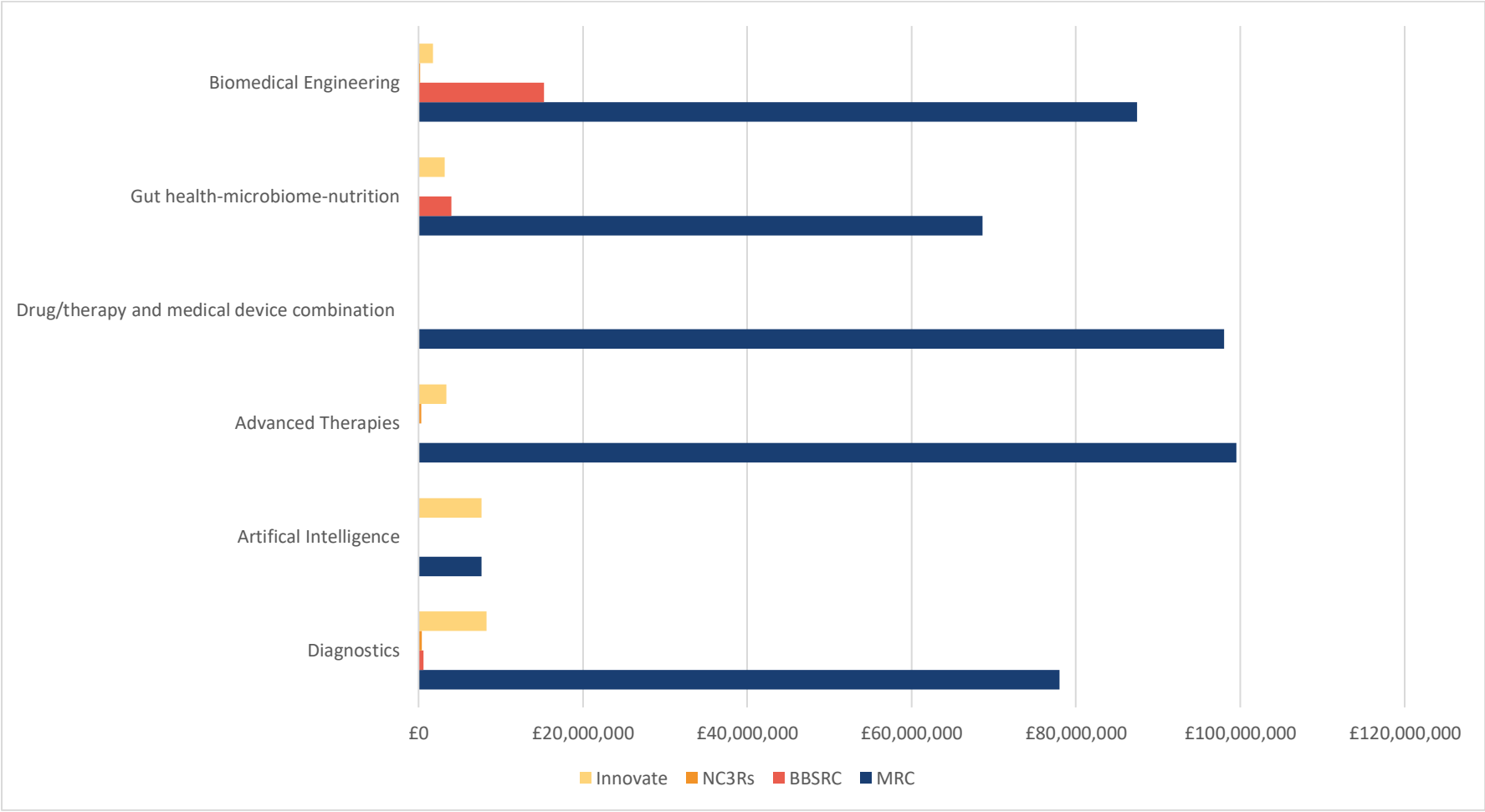

Figure 3. Amount of funding allocated by funders for research awards by remit in £

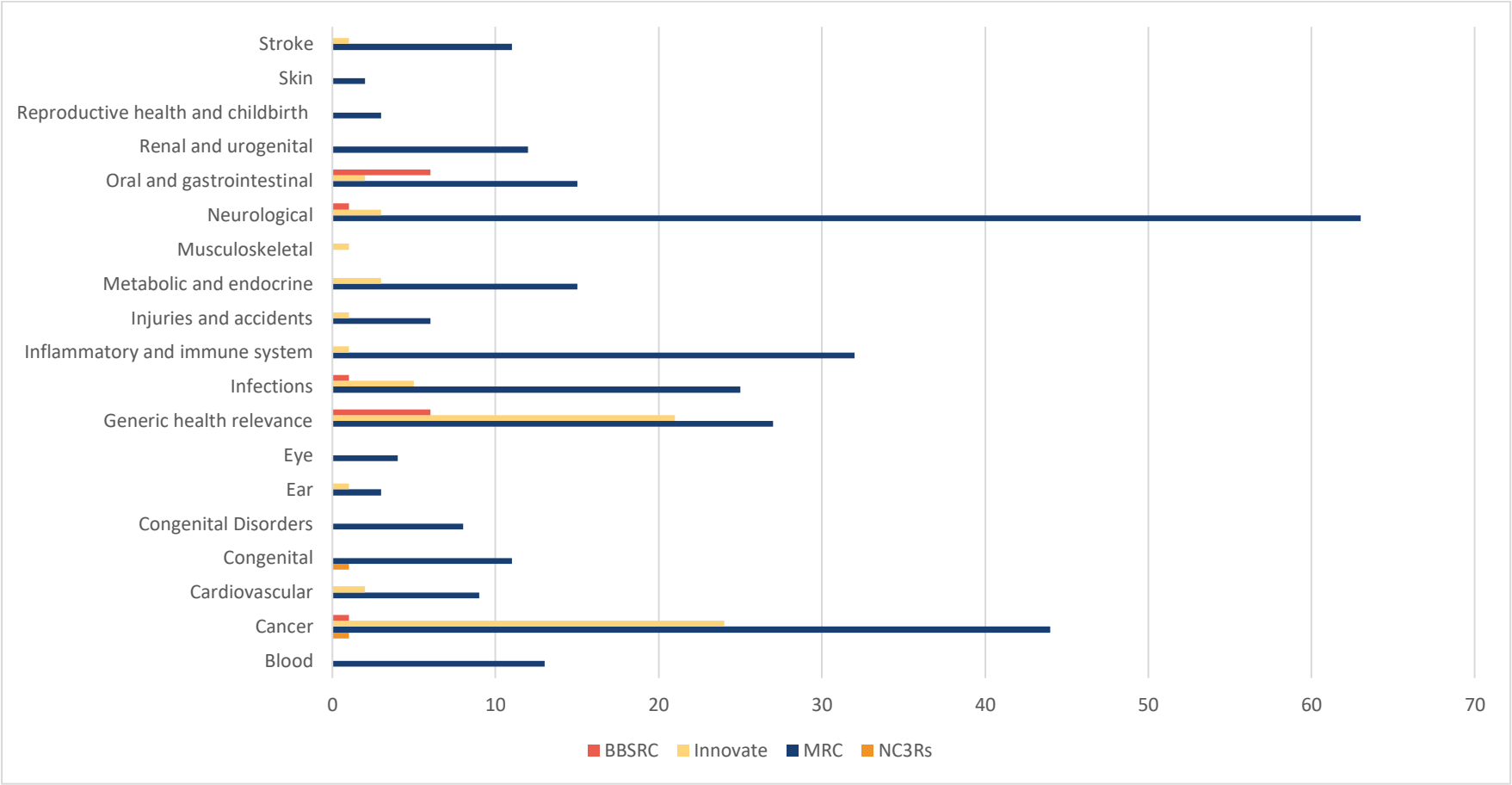

Figure 4. Amount of funding allocated by funders for research awards by health category in £

Advanced Therapies

Of the top 100 relevant awards related to Advanced Therapies, 95 were awarded by MRC, 4 by Innovate, 2 by BBSRC and 1 by NC3Rs. In total, these grants represent £103.23million of research expenditure, with an average grant size of £1million (minimum £3,180, maximum £6.84million).

The analysis reveals a strong emphasis on Advanced Therapy awards in Neurology and Cancer and Neoplasms, both in terms of the number of projects and the amount of funding allocated (see Figures 5 and 6). There is also considerable activity in Inflammatory and Immune System, Congenital Disorders and Infections. Despite Inflammatory and Immune System being the third most popular focus of Advanced Therapy research grants, it ranks fifth in terms of funding amount.

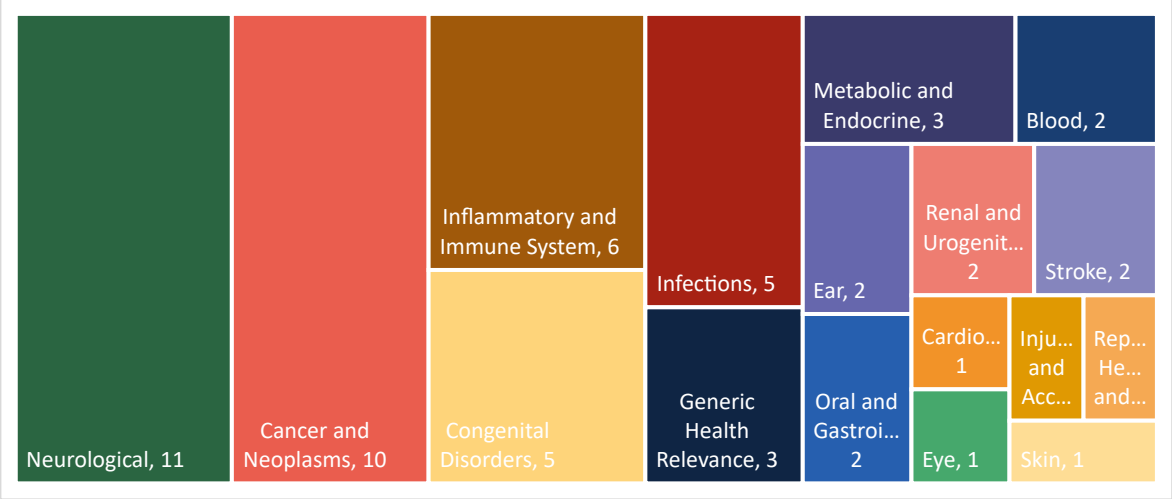

Figure 5. Hierarchy chart representing number of advanced therapies research awards

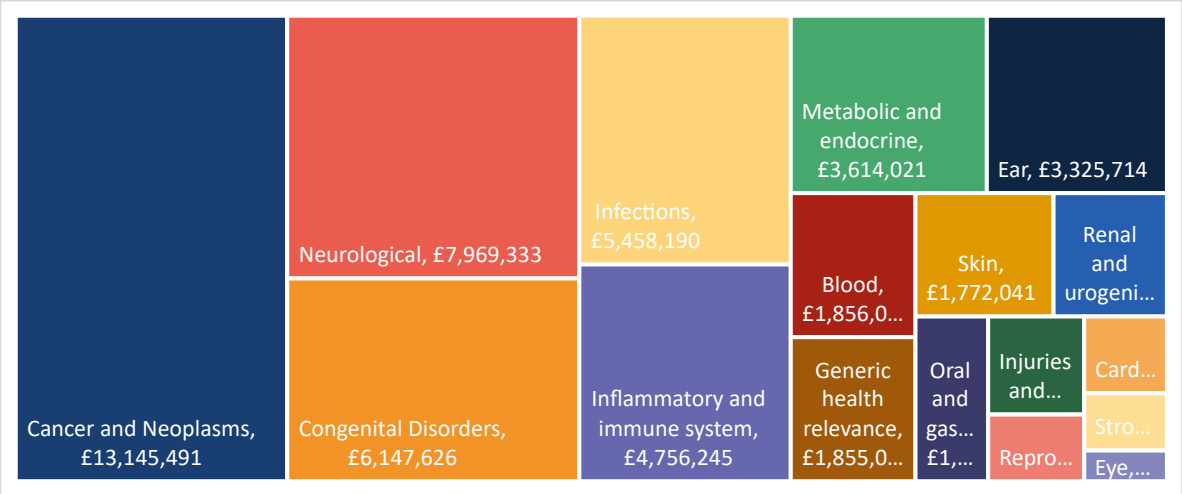

Figure 6. Hierarchy chart representing cumulative amount of funding in £ for advanced therapies research awards

Key themes across Advanced Therapies awards include precision medicine, gene and cell therapies, novel therapeutic targets, and advanced technologies.

- Precision medicine approaches are prominently featured, with projects like developing precision genome editing for severe immune-mediated diseases and targeting specific gene therapies for conditions like Acute Myeloid Leukaemia (AML). These efforts underscore a shift towards personalized treatments tailored to individual genetic profiles and disease characteristics.

- Gene and cell therapies represent a significant focus, ranging from the preclinical development of stem cell therapies for hearing loss and Hirschsprung disease to the investigation of gene editing techniques for immune-mediated diseases. The development of novel gene targets for cellular reprogramming and the use of NanoCAR technology for democratizing access to cell and gene therapies highlight efforts to expand therapeutic options and improve treatment outcomes across diverse patient populations.

- There is also a strong emphasis on understanding disease mechanisms and improving therapeutic efficacy. Projects exploring mechanosensing in stem cells, investigating microbial predictors of therapy response in inflammatory diseases like Crohn's and ulcerative colitis, and developing prognostic biomarkers for conditions such as Parkinson's disease highlight efforts to deepen understanding of disease biology and optimize treatment strategies accordingly.

- Finally, some awards address critical healthcare challenges such as antimicrobial resistance (AMR), with projects focusing on phage therapy to combat AMR bacteria and developing innovative solutions for AMR diagnostics.

Gut health-microbiome-nutrition

Of the top 100 relevant awarded grants on gut health-microbiome-nutrition, 80 were awarded by MRC, 10 were awarded by BBSRC and 10 by Innovate. In total, these grants represent £75.82million of research expenditure, with an average grant size of £758,268 (minimum £4,693 maximum £6.84million).

The gut health-microbiome research awards highlight initiatives focused on understanding, modulating, and leveraging the gut microbiota to promote health across various populations and conditions.

Key themes emerge around the interplay between diet, immune function, and metabolic diseases.

- Studies such as those exploring time-restricted feeding in obese individuals and the effects of food on the brain-gut axis highlight efforts to elucidate how dietary patterns influence overall health outcomes through multi-omic approaches and brain plasticity modulation.

- Projects like the 'Nutrition responsiveness of the immune system' initiative explore diet, infectious diseases, and metabolic disorders, aiming to uncover mechanisms for tailored therapeutic interventions.

- Innovative strategies to manipulate the gut microbiota for therapeutic purposes are also prominent. Initiatives such as the Brazil-UK Partnership targeting new bioactives for a healthy gut and projects exploring bacteriophages for gut health underscore novel approaches to microbiome modulation. The use of AI and omics technologies for monitoring the gut microbiome in precision farming and the development of diagnostic biomarkers indicative of healthy aging further emphasize the role of advanced technologies in personalized medicine approaches.

- Moreover, awards reflect a commitment to addressing global health challenges related to antimicrobial resistance and infectious diseases through microbiota intervention strategies. Projects investigating nutrient competition in the gut microbiota to mitigate antibiotic-resistant bacteria growth and the development of phage therapy for AMR Enterobacteria highlight efforts towards sustainable solutions in the One Health domain.

- Finally, awards utilise technologies such as wearable textiles for joint pain management, advanced imaging techniques for early disease detection, bioinformatics systems for precision medicine in inflammatory bowel disease (IBD) and deep learning in disease diagnosis.

Biomedical Engineering

Of the top 100 relevant awarded grants on biomedical engineering, 90 were awarded by MRC, 4 were awarded by BBSRC, 5 by Innovate and 1 by NC3R. In total, these grants represent £104.66million of research expenditure, with an average grant size of £1million (minimum £3,180, maximum £12.36million).

Top areas are neurology and cancer and neoplasms, with the largest amount of funding directed to awards on cancer and neoplasms, blood and congenital disorders (Figure 7 and 8).

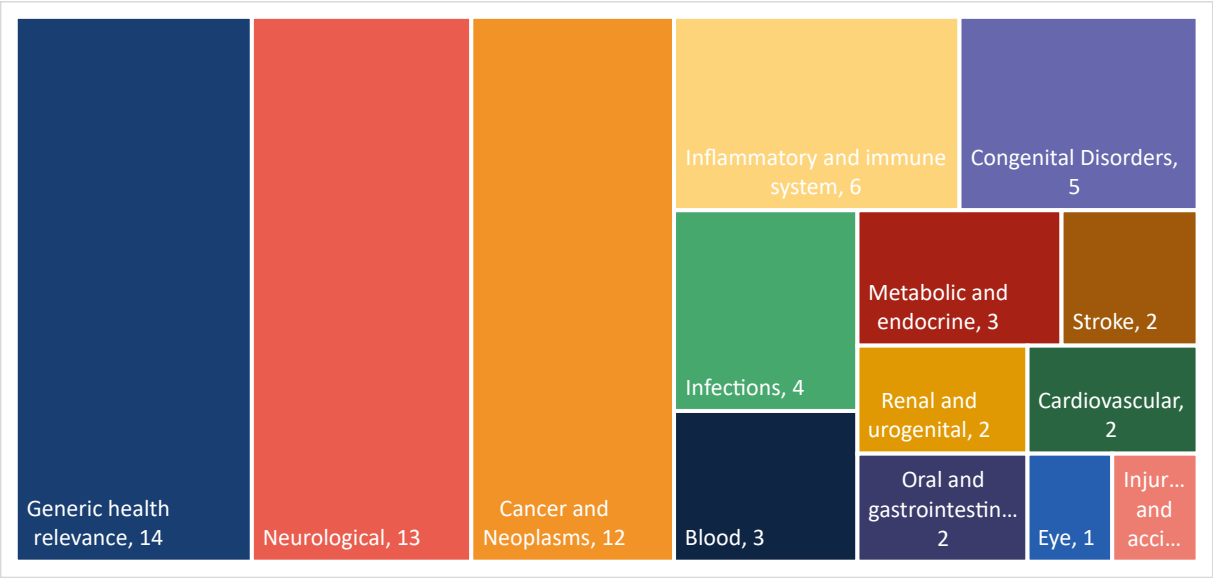

Figure 7. Hierarchy chart representing number of biomedical engineering research awards

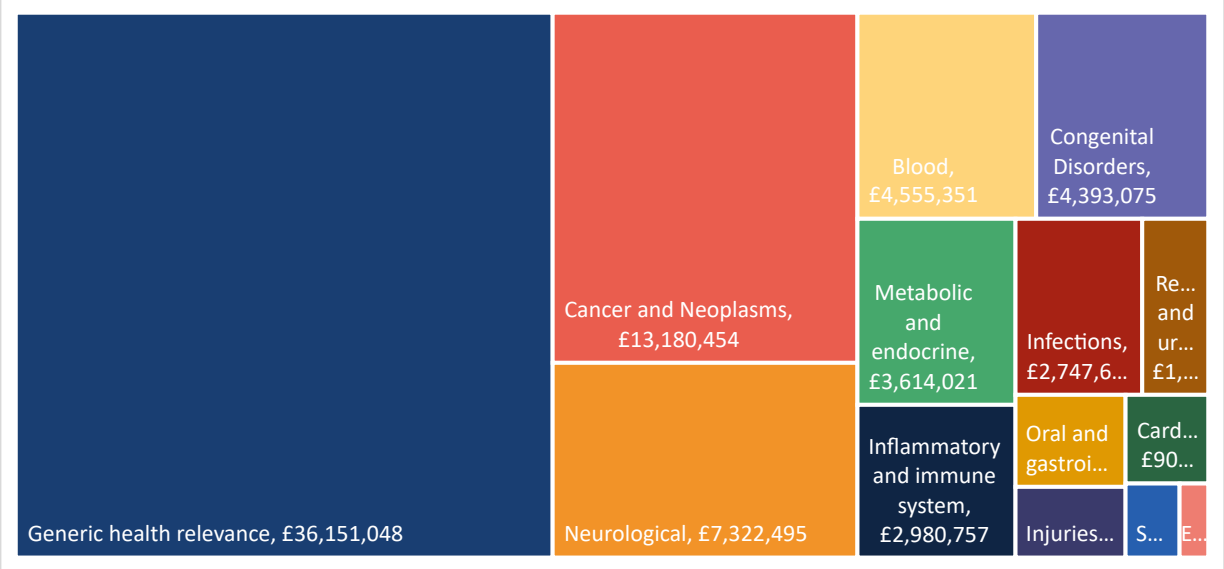

Figure 8. Hierarchy chart representing cumulative amount of funding in £ for biomedical engineering research awards

Key themes across biomedical engineering awards include the integration of advanced physiological tissue models with machine learning to unravel genomic instability and its implications from oncogene activation to cancer initiation.

- Engineering innovations for cell and gene therapies are prominent, such as next-generation automation and process analytical technology (PAT) implementations, along with the development of bioengineered cells and systems using hydrogel-based platforms and spatiotemporal modelling.

- There is significant focus dedicated to enhancing therapeutic outcomes through precision medicine approaches and personalized treatments. This includes optimizing human stem cell models for better understanding organogenesis, developing synthetic matrices to support organoid development, and engineering genetic control systems for advanced therapeutic interventions. The establishment of specialized centers and hubs for gene therapy and genome engineering underscores the commitment to translating research into scalable clinical applications.

- Technological advancements in imaging and diagnostics are also evident, with projects ranging from real-time live cell imaging platforms to multi-modal assessments of organ grafts and optical biosensors for early disease detection. The application of artificial intelligence (AI) in genomic profiling, disease modelling, and diagnostic algorithms further enhances precision medicine strategies across diverse disease areas.

- Biomedical engineering initiatives address complex challenges such as antimicrobial resistance, neurodegenerative disorders, and autoimmune diseases through novel therapeutic modalities and targeted interventions. There is also focus on the development of advanced therapies for conditions like Parkinson's disease, autoimmune uveitis, and chronic pain.

Drug/therapy & medical device combinations

Of the top 100 relevant awarded grants on drug/therapy and medical device combinations, all were awarded by MRC. In total, these grants represent £98million of research expenditure, with an average grant size of £980,000 (minimum £3,180, maximum £6.84million).

Again, the most common areas of study and largest amounts of funding are dedicated to neurology and cancer and neoplasms (Figures 9 and 10).

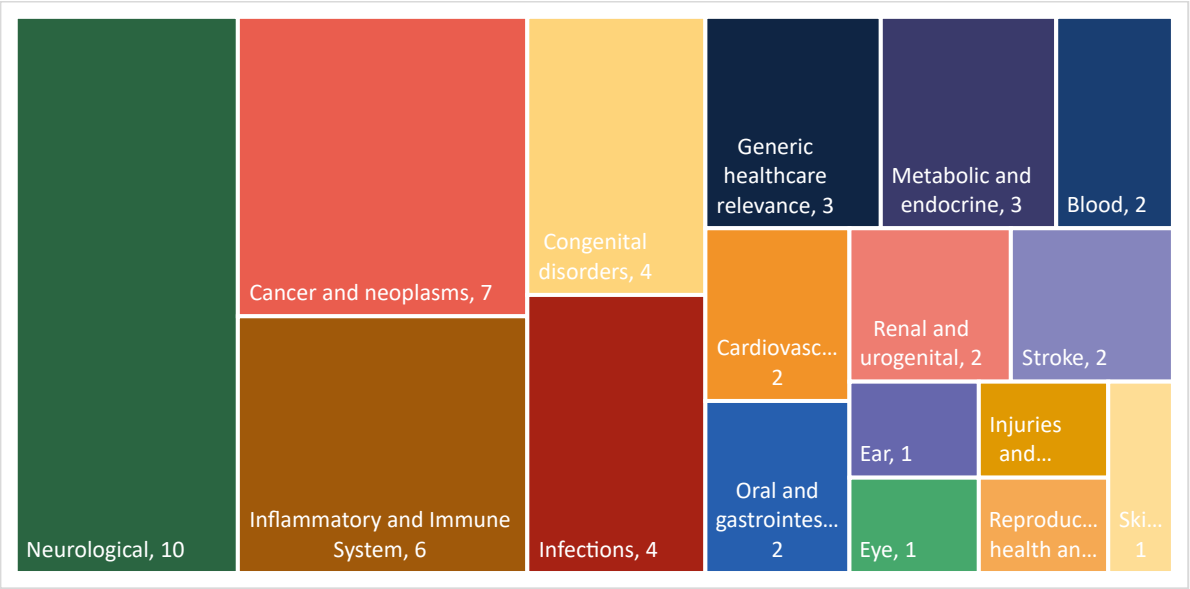

Figure 9. Hierarchy chart representing number of combination research awards

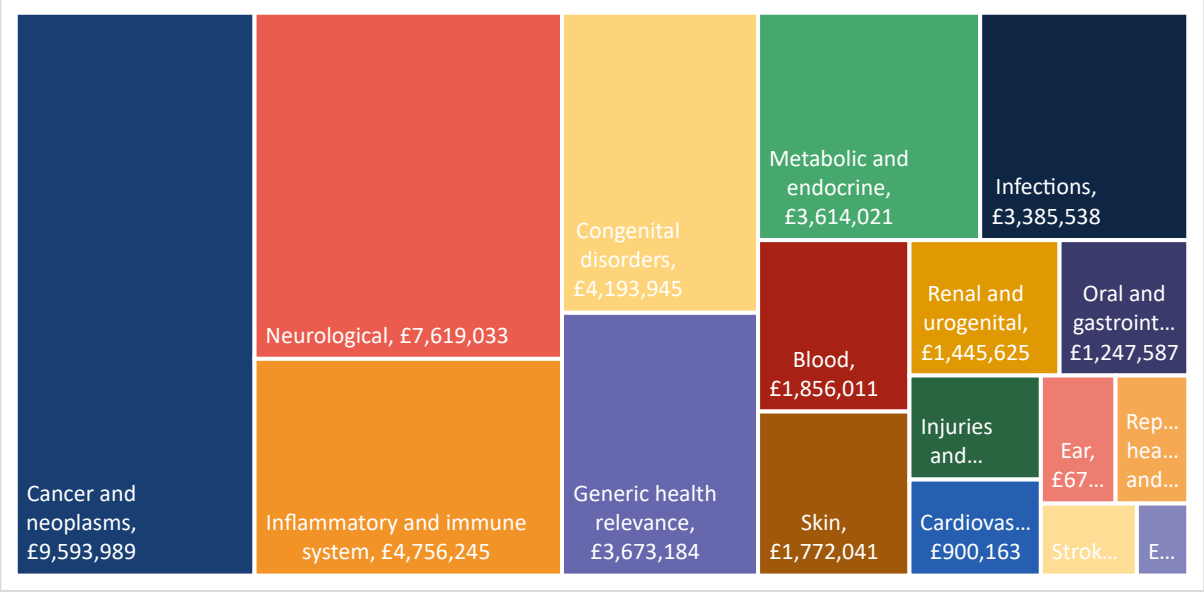

Figure 10. Hierarchy chart representing cumulative amount of funding in £ for combined research awards

Themes across combination research awards include innovative technologies, personalized treatments, and improved diagnostic and therapeutic strategies.

- Projects such as ultrasound-responsive agents for fracture healing and wearable textiles for joint pain management demonstrate a focus on non-invasive interventions to enhance patient mobility and comfort.
- Addressing global health challenges, initiatives like AMR diagnostics and phage therapy aim to combat antimicrobial resistance from a One Health perspective, suggesting an interdisciplinary approach to infectious disease management.
- Advanced therapeutic developments include humanized delivery systems for treating traumatic brain injury and gene therapies at specialized hubs.
- Precision medicine approaches, such as targeting metabolism in peritoneal dialysis and developing miRNA therapeutics for ovarian cancer, emphasize personalized treatment strategies tailored to individual patient needs.
- Studies on the gut hormone LEAP2 and modulation of neutrophil activity in intestinal immunopathology explore novel pathways for treating metabolic diseases and inflammatory conditions.
- The integration of genomic insights with machine learning to understand diseases like epilepsy and dementia underscores the role of data-driven approaches in optimizing treatment outcomes and patient care.
- Awards such as those developing AI-driven tools for personalized medicine and diagnostic algorithms for tuberculosis reflect the growing importance of artificial intelligence in enhancing healthcare delivery.
- There is also a focus on biotechnological advancements, such as engineering synthetic receptors for cancer immunotherapy and developing novel gene editing techniques.
- Additionally, initiatives exploring the role of mesenchymal stem cells in treating liver failure and neurological disorders underscore the potential of regenerative medicine in improving patient outcomes.

Diagnostics

Of the top 100 relevant awarded grants on diagnostics, 78 were awarded by MRC, 19 by Innovate, 2 by BBSRC, and 1 by NC3Rs. In total, these grants represent £82.22million of research expenditure, with an average grant size of £822,287 (minimum £3,180 maximum £6.84million).

Analysis reveals a strong emphasis on cancer diagnostics, both in terms of the number of projects and the amount of funding allocated (see Figures 11 and 12 below). The most frequently researched areas were Cancer and Neoplasms (26 awards) and Neurological Diagnostics (10 awards). Other notable areas include Infections (5 awards), Inflammatory and Immune System (4 awards), and Metabolic and Endocrine (2 awards).

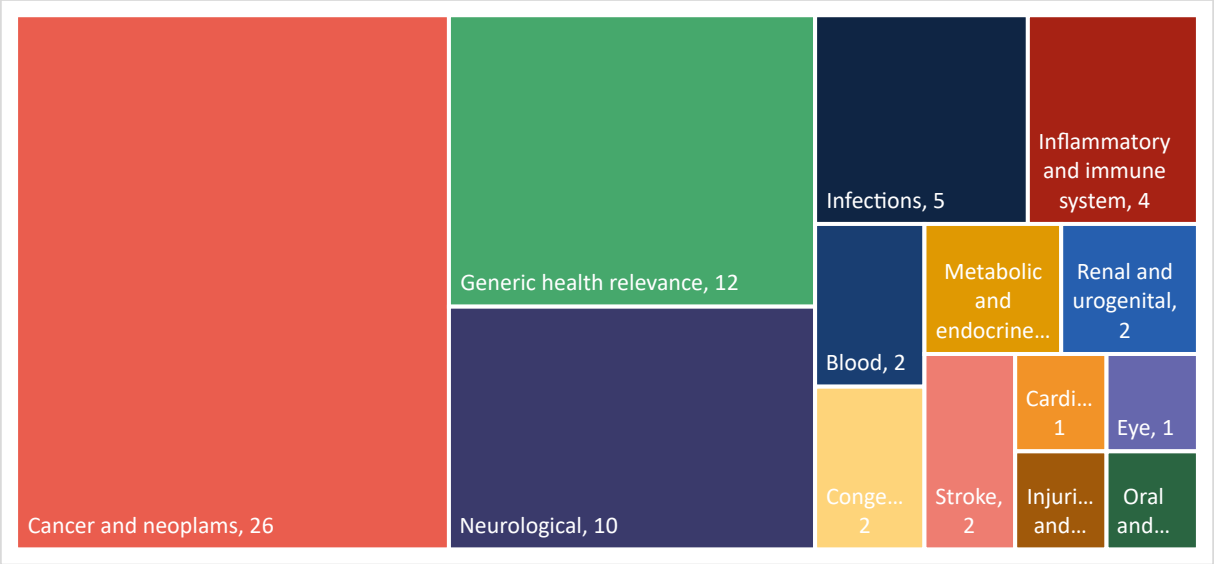

Figure 11. Hierarchy chart representing number of diagnostic research awards

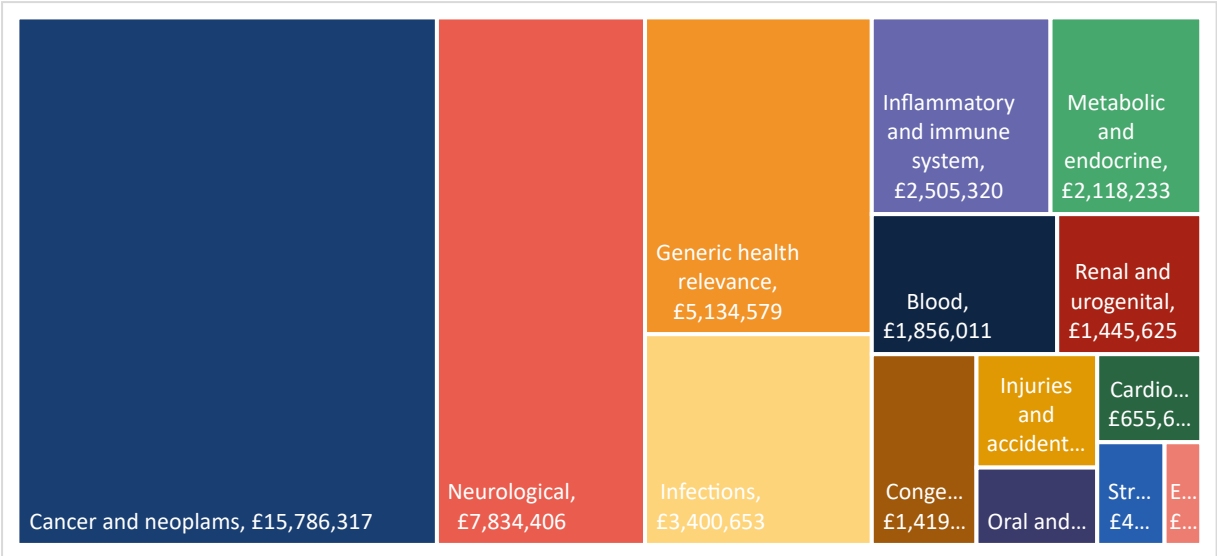

Figure 12. Hierarchy chart representing cumulative amount of funding in £ for diagnostic research awards

Diagnostic research awards encompass medical diagnostics, therapeutics, and understanding of disease mechanisms.

- Several projects focus on pioneering imaging technologies and platforms, such as real-time live cell imaging and the development of magnetic particle imaging (MPI) and nanopathology platforms for early disease detection and monitoring.

- Integration of physiological tissue models with machine learning aims to elucidate genomic instability in cancer initiation, while awards screening for Alzheimer's disease utilize novel diagnostic tools for early cancer recurrence detection and prognostic screening, respectively.

- Precision medicine is a recurring theme across multiple projects, including efforts targeting specific disease mechanisms and patient populations. Examples include the development of personalised therapies for leukemic stem cells in AML and B-cell targeted therapies in Sjogren's syndrome.

- Gene therapies are also prominently featured, focusing on advancing treatments for neurological disorders, renal diseases, and genetic conditions such as Niemann-Pick disease type C.

- Advancements in biotechnology and bioengineering are evident in projects developing new diagnostic algorithms for tuberculosis, optical electromyography for nerve and muscle disorders, and novel sensors for early stroke detection. Sustainable practices in medical imaging and therapeutic delivery are explored, such as environmentally friendly brain imaging practices and cryogel technologies for glioblastoma treatment.

- The intersection of immunology and microbiology is another significant theme, with projects investigating immune-microbiota interactions in intestinal inflammation, and the development of therapies leveraging mesenchymal stem cells to modulate autoimmune responses and improve organ transplantation outcomes.

- Technological innovations are also driving progress in therapeutic modalities, including the development of AI-driven tools for treatment personalization, advanced gene editing techniques for severe immune-mediated diseases, and the use of extracellular vesicles for neuroprotection in neonatal encephalopathy.

- Finally, awards emphasize the importance of interdisciplinary collaborations and global partnerships, as seen in projects like the UK/Canada collaboration for MPI and international efforts to combat antimicrobial resistance through phage therapy and microbiome research.

Artificial Intelligence

Of the top 100 most relevant awarded grants on Artificial Intelligence, 72 were awarded by MRC and 28 by Innovate. In total, these grants represent £7.66million of research expenditure, with an average grant size of £735,906 (minimum £3,180, maximum £6.84million).

Most frequently funded areas are Generic Health Relevance (13 awards), Cancer and Neoplasms (11 awards), Neurology (11 awards) and Infection (8 awards) (Figure 13). AI awards related to Cancer and Neoplasms, Neurology, Inflammatory and Immune System and Infections received substantial funding (Figure 14).

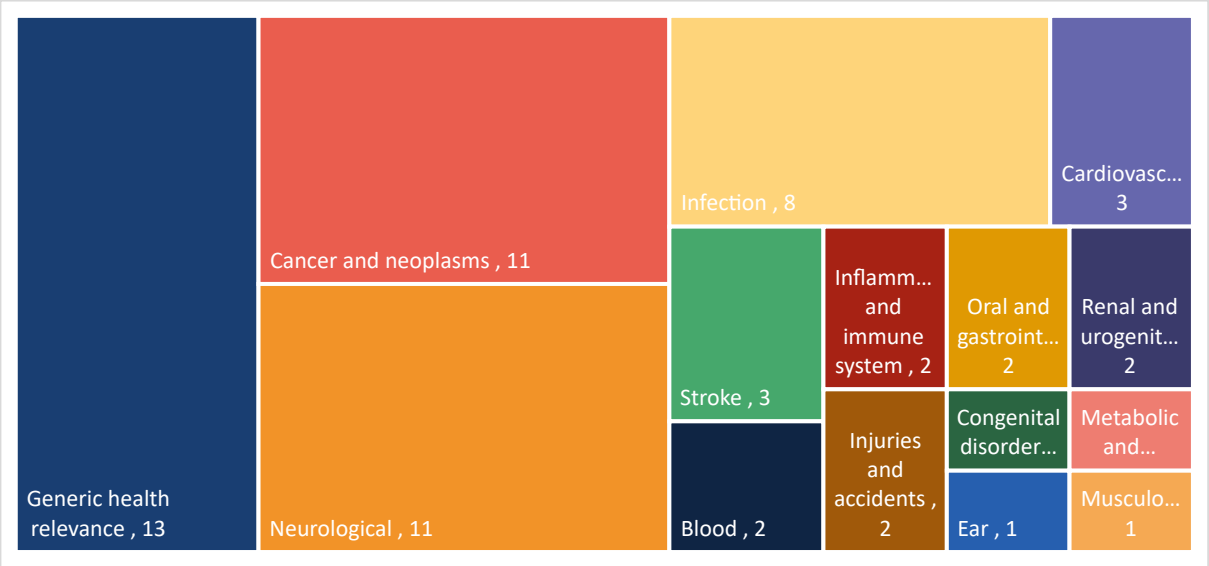

Figure 13. Hierarchy chart representing number of artificial intelligence research awards

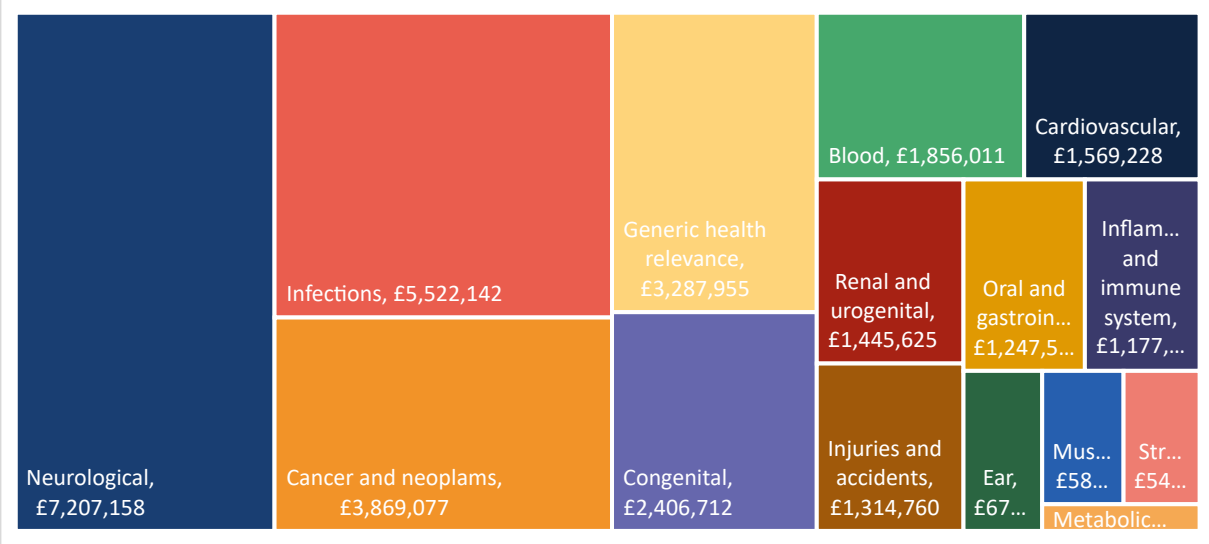

Figure 13. Hierarchy chart representing cumulative amount of funding in £ for artificial intelligence research awards

Across Artificial Intelligence awards, machine learning and genomic research features prominently.

- Machine learning is applied in various awards such as predicting stroke risk using historical data, developing diagnostic algorithms for tuberculosis, and mitigating bias in AI applications within medicine. These initiatives aim to enhance diagnostic accuracy, treatment personalization, and patient outcomes by leveraging big data and computational models.

- Genomic research is another significant theme, with projects integrating physiological tissue models and machine learning to unravel the complexities of oncogene activation and cancer initiation.

- Similarly, AI-assisted genomic profiling seeks to tailor treatments and manage infections more effectively by identifying disease-specific genetic markers and mechanisms, contributing to precision medicine initiatives.

- The development of novel therapeutic strategies is highlighted across multiple projects through for example, targeted treatments for neurofibromatosis tumors, and precision genome editing for immune-mediated diseases. These efforts reflect a shift towards personalized medicine approaches that aim to address specific genetic conditions and optimize therapeutic outcomes.

- Technological innovation is also central, with projects focusing on advanced imaging techniques like Magnetic Resonance Imaging abnormality Deep Learning Identification (MIDI) and the development of environmentally sustainable brain imaging practices.

- Additionally, innovations such as optical electromyography for nerve disorders and wearable textiles for joint pain management illustrate efforts to improve diagnostics and patient care through non-invasive and patient-centric technologies.

- Finally, the intersection of microbiology and immunology emerges prominently, with studies on microbial predictors of treatment responsiveness in inflammatory bowel diseases (IBD-RESPONSE) and the role of immune-microbiota interactions in intestinal inflammation and infection control. These awards aim to deepen understanding of disease mechanisms and improve therapeutic strategies through microbiome modulation and targeted immunotherapies.

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Awarded Grants: CRUK

We identified a total of 191 awarded grants made by CRUK during the period of 2021-2023. All records were screened manually and 86 were identified as relevant using the remits identified by NIHR as inclusion criteria. Research activity across each of the remits is outlined below.

Data on awards made public by CRUK does not include the amount of funding allocated per award so it is not possible to determine research expenditure. CRUK state that in 2022-2023 £176m was spent on research projects focused on specific cancer types (Figure 14).[4]

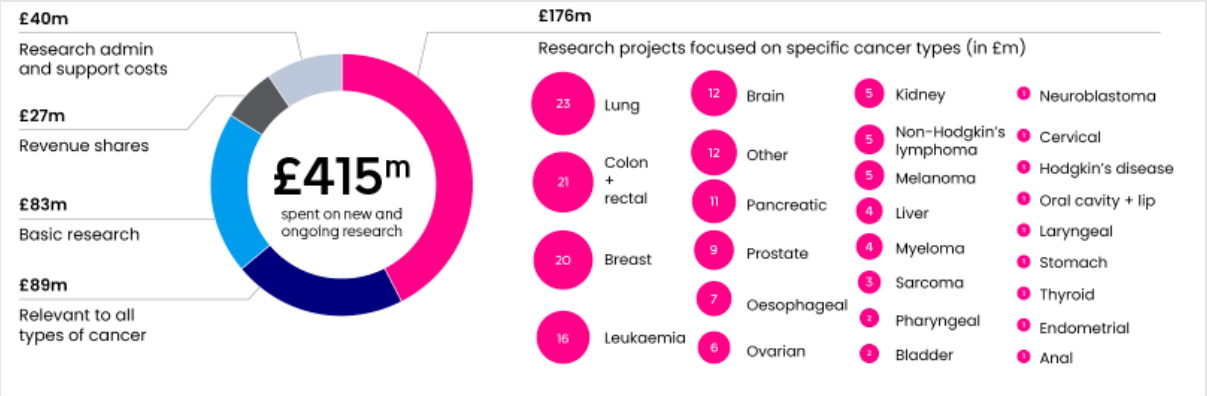

Figure 14. Cancer Research UK 2022-2023 research activity spending in £

From the £415m spent in 2022/23, 46% of funds were spent on basic research projects focused on biology, aetiology and cancer control, survival and outcomes; 38% on translational research investigating treatment, early diagnosis, detection and prevention; and 16% on clinical research into cancer control and survival, early diagnosis and detection, and treatment (Figure 15).

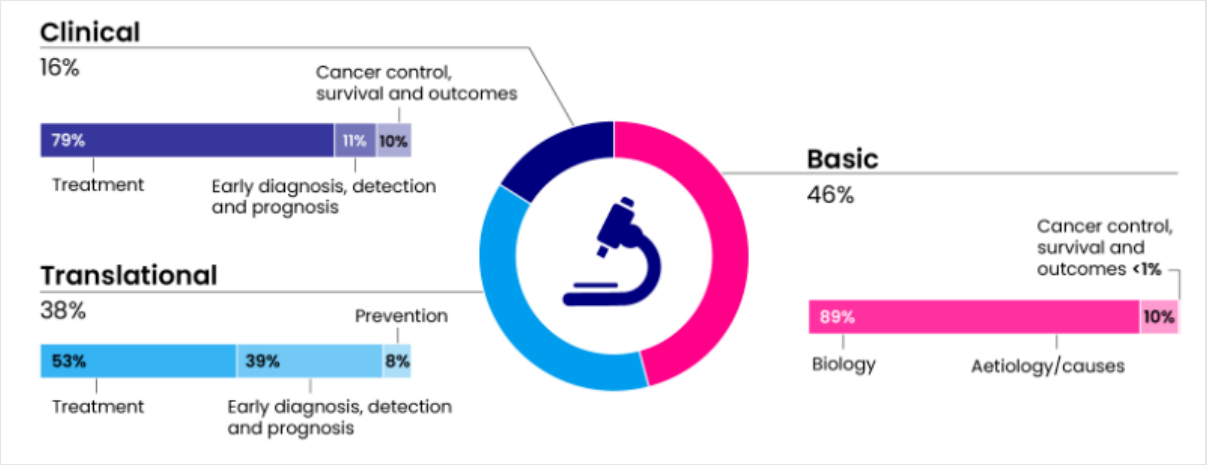

Figure 15. Cancer Research UK 2022-2023 research pipeline spending

The most frequent area of research for CRUK awards from 2021-2023 is diagnostics, with 70% of awards fitting this remit (n=60).

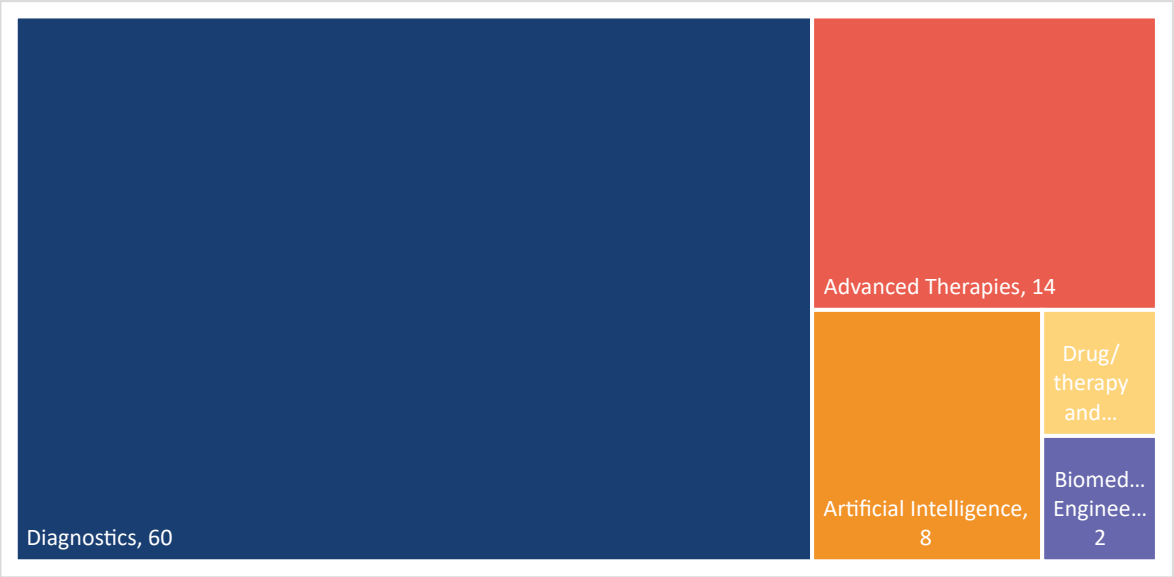

Figure 16. Hierarchy chart representing number of CRUK research awards for diagnostics, advanced therapies, artificial intelligence, drug/therapy/device combinations and biomedical engineering.

Over time, CRUK awards related to Advanced Therapies have increased, awards related to other remits appear to be largely consistent (Figure 17).

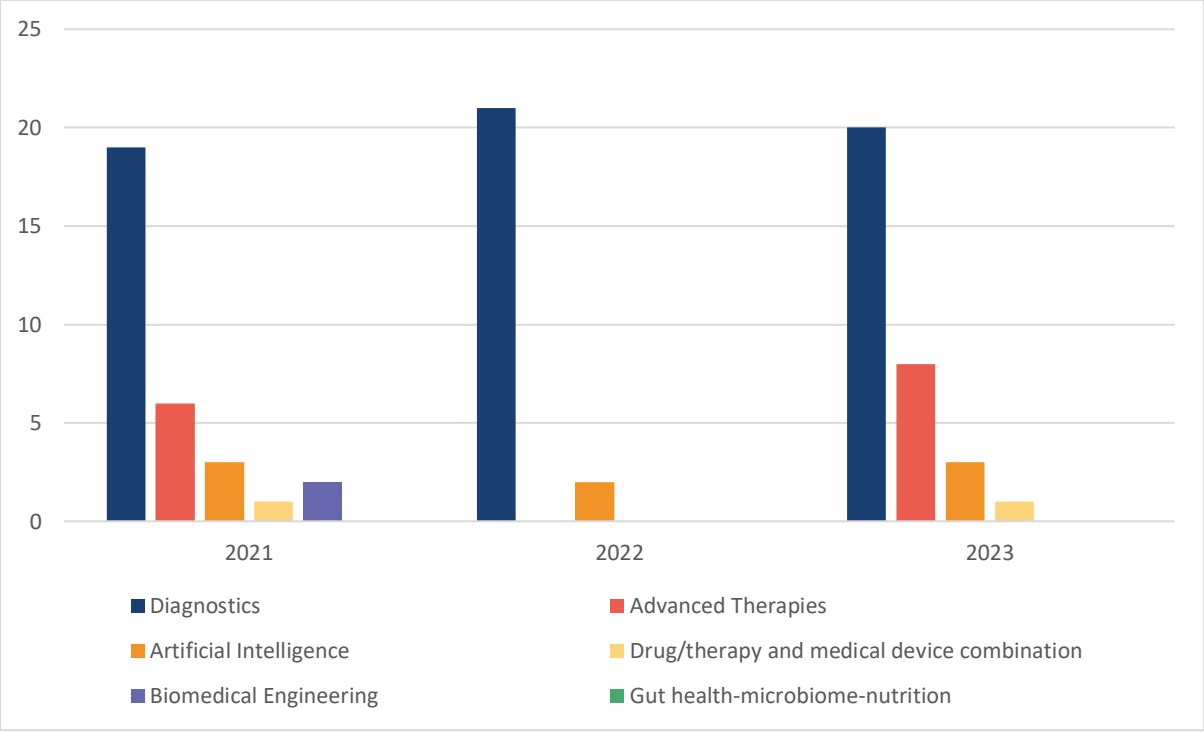

Figure 17. Bar chart representing number of CRUK awards per remit over time

CRUK: Advanced Therapy Awards

Based on the titles of the 14 included awards related to Advanced Therapies, 4 main themes can be identified: Targeted Treatments and Immunotherapy (7 awards), Cancer Therapy and Precision Medicine (6 awards), Stem Cell Transplantation and Cellular Therapies (1 award), and Innovative Drug Delivery and Imaging Techniques (1 award).

Of the 7 awards related to Targeted Treatments and Immunotherapy, research includes targeting metabolic reprogramming, developing T- and innate-cell engagers, and improving antibody immunotherapy, indicating a strong focus on innovative and personalized treatment strategies. 6 awards focus on novel approaches to cancer therapy, including targeting specific pathways, precision medicine, and studying global novel agents in cancer treatment.

The award related to Stem Cell Transplantation and Cellular Therapies demonstrates a notable interest in understanding and improving outcomes of stem cell transplantation, particularly through identifying specific antigens targeted by T-cells.

The award relayed to Innovative Drug Delivery and Imaging Techniques is focussed on the development of new imaging probes for CAR T-cell tracking and microenvironment-remodelling synthetic cells for drug delivery, showcasing advancements in both treatment and diagnostic imaging technologies.

CRUK: Drug/Therapy and Medical Device Combination Awards

There are two awards related to drug/therapy and medical device combinations.

"A ‘top-down’ organ-on-chip approach for personalised medicine in ovarian cancer" focuses on the development of organ-on-chip technology, which is a sophisticated, microfluidic device that simulates human organ functions. This technology aims to personalize treatment strategies for ovarian cancer by creating patient-specific organ models that can be used to test the efficacy of various drugs and treatments. This approach promises to enhance the precision and effectiveness of cancer therapy, minimizing adverse effects and improving patient outcomes.

"RADAR sample collection: a randomised phase III study with a PET response-adapted design comparing ABVD+/- ISRT with A2VD +/- ISRT in patients with previously untreated stage 1A/11A Hodgkin lymphoma" centres on the implementation of response-adaptive clinical trials. This study utilizes PET imaging to adapt and tailor treatment regimens based on the patient's response. By comparing different chemotherapy combinations (ABVD vs. A2VD) with or without involved-site radiotherapy (ISRT), the study aims to optimize therapeutic strategies for Hodgkin lymphoma, potentially improving treatment efficacy while reducing unnecessary exposure to toxic therapies.

CRUK: Biomedical Engineering Awards

One of the awards related to Biomedical Engineering aims to develop advanced optical tools for the early detection and diagnosis of oesophageal cancer, highlighting the potential to utilise high-precision optical technologies that offer high mechanical and chemical specificity, enabling more accurate and early diagnosis of cancer.

The other Biomedical Engineering CRUK award focuses on the biophysical design of immunomodulatory nanotherapeutics, aiming to create highly targeted and efficient therapeutic solutions using nanotechnology, particularly for modulating the immune system to treat various diseases.

CRUK: Diagnostic Awards

CRUK diagnostic research awards target a wide range of cancer types including lung, prostate, pancreatic, oesophageal, gastric, and breast cancers, indicating a broad application of diagnostic research across various malignancies (e.g., "Early detection of oesophageal adenocarcinoma (OAC) from Barrett's oesophagus" and "Prostate Cancer: High Accuracy Early Diagnosis based on Tissue Microenvironments"). Across the 60 included diagnostic awards, several key trends can be identified that focus on the early detection of cancer using a variety of innovative approaches and technologies.

- Some awards focus on the exploitation of biological systems; leveraging the immune system, lymphatic system, and circulating peripheral mitochondrial DNA to identify early biomarkers for cancer detection (e.g., "Exploiting the Immune System for Early Cancer Detection" and "Exploiting The Lymphatic System For Early Detection And Risk Stratification Biomarkers").

- There is also focus on advanced analytical techniques and utilization of sophisticated methods like single molecule mass photometry, Raman spectroscopy, infrared spectroscopy, and multi-omic approaches to improve diagnostic accuracy and early detection capabilities (e.g., "Single molecule mass photometry for the early detection of cancer" and "Ultrafast 2D-IR analysis of liquid biopsies for cancer detection").

- There is some emphasis on non-invasive techniques and biomarker detection such as liquid biopsies, blood biomarker isolation, and breath analysis to detect cancer markers early, reducing the need for more invasive diagnostic procedures (e.g., "Nanotechnology-enabled multi-omic liquid biopsies in non-small cell lung cancer" and "Vocs-box breathomics: early detection and diagnosis of mesothelioma").

- Awards also refer to the development of new diagnostic tools and devices like smart hydrogels, intelligent toilets, and advanced ultrasound imaging systems to facilitate early cancer detection and diagnosis (e.g., "IntelligentToilet" and "Smart Hydrogels and Devices for Early Detection of Cancer").

- Awards often combine different scientific disciplines and methodologies, such as proteomics, genomics, metabolomics, and nanotechnology, to create comprehensive diagnostic platforms (e.g., "EARLY DIAPAC: EARLY DIAgnosis of PAncreatic Cancer by combined proteomics and genomics testing of pancreatic cyst fluid").

- Some awards aim to prepare healthcare providers and the public for the implementation of these new diagnostic technologies, targetting equitable access and understanding (e.g., "Preparing healthcare providers and the public for Multi Cancer Early Detection (MCED) blood tests").

CRUK: Artificial Intelligence Awards

AI research awards highlight a strong trend towards leveraging artificial intelligence to improve early cancer detection, enhance screening accuracy, support clinical decision-making, and integrate innovative AI tools into everyday clinical practice.

The overarching goal is to improve patient outcomes through more precise, efficient, and non-invasive diagnostic methods. The titles of awards reveal several key trends: early detection and screening, clinical prediction and decision support, integration into clinical pathways and non-invasive diagnostics.

- Multiple awards focus on the early detection of various cancers, such as hepatocellular carcinoma, lung cancer, prostate cancer, myeloproliferative neoplasms, and cervical cancer. These awards propose to utilise AI to enhance existing screening methods, such as redox-proteomics, ultrasound PSA-density measurement, and smartphone applications.

- AI is being developed for clinical prediction models and decision support systems. This includes considerations for sample sizes in oncology studies, the use of chatbots to support informed decision-making in bowel cancer screening, and novel decision support interventions for cervical screening.

- There is an emphasis on integrating AI-based detection and assessment tools into routine clinical workflows, particularly for conditions like myeloproliferative neoplasms and rectal cancer. This includes proposals for developing AI-based classifiers to determine molecular behaviour and treatment response.

- The development of non-invasive AI-based classifiers, such as radiomic classifiers for rectal cancer, indicates a trend towards reducing the need for invasive procedures in cancer diagnosis and treatment monitoring.

Funding Calls: UK

Calls for future funding opportunities in the UK with deadlines starting from 2024 were identified via ResearchConnect, revealing a total of 234 individual calls[2]. 226 calls have deadlines of 2024, 8are 2025.

The average maximum funding amount available per call from 2024 onwards stands at £701,228, indicating substantial financial support across identified opportunities. In aggregate, the cumulative maximum available funding totals £77.13 million.

In total, 82 distinct funding bodies were identified. Among these, the Medical Research Council (MRC) led with 31 grants, followed by EUREKA with 19 grants, the Wellcome Trust with 17 grants, and the Biotechnology and Biological Sciences Research Council (BBSRC) with 12 grants.

When examining the highest individual funding amount offered by specific funders, the Global Innovation Fund offered the largest single grant of £11 million, followed closely by the Wellcome Trust with £10 million spread across 17 grants. The Engineering and Physical Sciences Research Council (EPSRC) also contributed significantly, offering a total of £6 million across 8 grants (Figure 18).

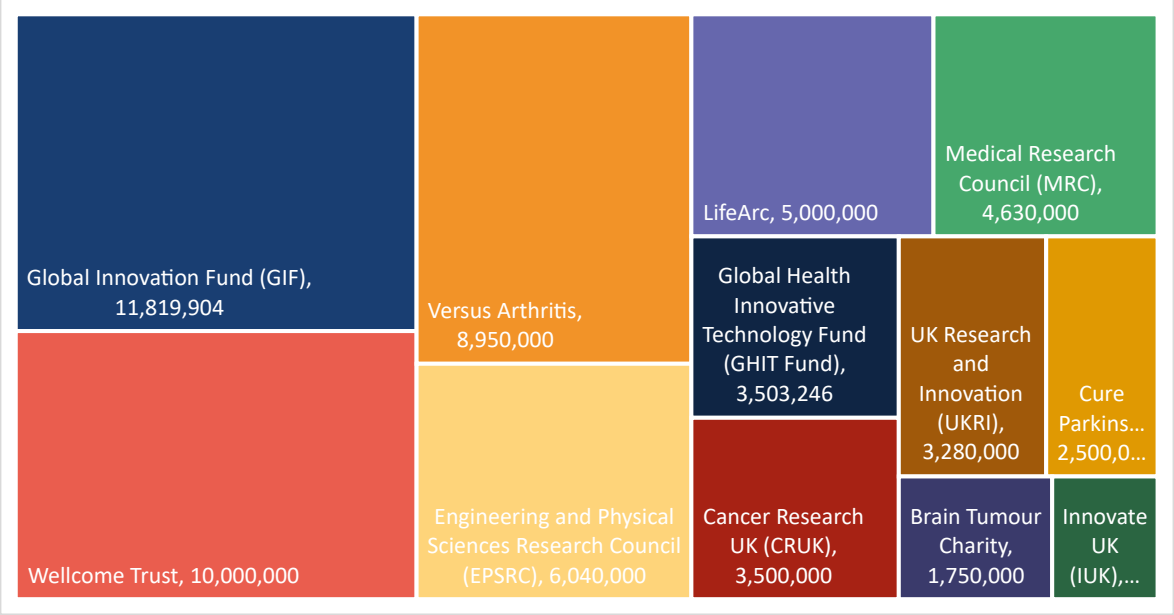

Figure 18. Hierarchy chart representing cumulative amount of funding in £ for UK funding calls 2024-2025

[2] These funding calls are intentionally broad, designed to encompass a diverse array of categories to attract a wide range of potential applicants. However, due to the nature of these calls, the same calls often appear duplicated across multiple remits. To ensure a comprehensive analysis, the entire dataset was analysed.

UK Funding Calls 2024

Calls ending in 2024 cover diverse disciplines and thematic areas:

- There are calls for glaucoma research in the UK and Ireland, emphasizing improvements in patient care and advancing scientific understanding, while other calls target understanding and treating motor neurone disease.
- There are also calls to stimulate research on spinal cord injury regeneration and recovery processes, encouraging both new investigators and established researchers to explore this area.
- Other calls support gene therapy, arthritis research, and kidney disease studies.
- Cancer research is also a prominent area with grants targeting primary bone cancer, head and thyroid cancer among other types. In cancer research, multidisciplinary UK projects gain long-term backing. Similarly, there are multiple funding streams supporting diabetes research, ranging from hypothesis-driven projects to those addressing specific priority topics for up to five years.
- In cardiovascular health, funding is directed towards the development of novel technologies aimed at prevention, treatment, and cures.
- Opportunities exist to explore bioscience-based ideas for commercial viability, as well as in addressing urological diseases and disorders.
- UK-Canada biotech partnerships advance therapeutic technologies. Several initiatives focus on fostering collaborations between academia, industry, and research institutions, facilitating the development of technological products, processes, or services with potential global impact.
- Global collaborative projects, supported by UK programs, focus on technological advancements across industries and universities, aim to develop impactful products and services through grants for digital research skills networks, and AI-driven healthcare solutions.

UK Funding Calls 2025

Of those calls ending in 2025, funding opportunities include support for the integration of AI, engineering biology, and quantum technologies in biomedical R&D, and for addressing knowledge gaps in human disease causes, progression, and treatments through human trials. Support is provided for international collaborative R&D projects between industry, research organizations, and universities aimed at developing new technological products, processes, or services. There are also grants dedicated to advancing the understanding and treatment of head, neck, or thyroid cancer.

Funding Calls: US

Calls for applications for future funding opportunities in the US with a deadline from 2024 onwards were identified via ResearchConnect. 503 calls were identified[3]. 339 calls had deadlines in 2024, 79 in 2025, 74 in 2026, and 11 in 2027.

In total, the cumulative maximum available funding amounts to £112.78 million. The average maximum funding amount available per call from 2024 onwards is £1.12 million.

A total of 85 different funding bodies were identified as offering funding opportunities. Among them, the National Institutes of Health offered the largest number of grants, totalling 337.

Despite the high number of grants, the total funding allocated by the National Institutes of Health amounts to 0.2% of available funding (£266,825), highlighting the varying scales of financial support provided by different funding bodies within the US research landscape (Figure 19).

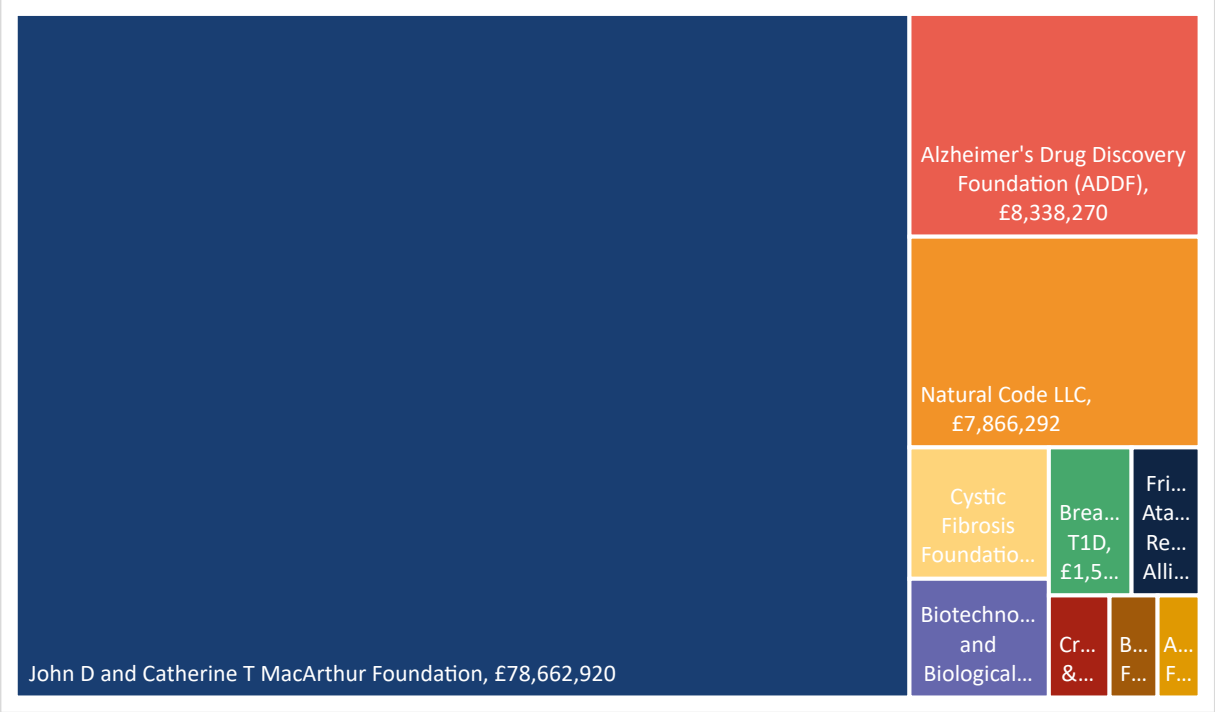

Figure 19. Hierarchy chart representing cumulative amount of funding in £ for US funding calls 2024-2027

[3] These calls are intentionally broad to encompass various categories, aiming to attract diverse applicants. However, due to overlapping coverage across different funding categories, many grants were duplicated across remits. To ensure comprehensive analysis, the entire dataset was subject to analysis.

- Several 2024 funding opportunities prioritize Advanced Therapies, particularly in cancer research. These calls aim to advance drug development for ultra-rare cancers by incentivizing studies in areas lacking commercial interest. They encourage research on repurposing discontinued drugs and characterizing unique cancer proteins.

- The NIH supports early-phase clinical trials through its FOA, emphasizing cancer diagnostics and therapeutics.

- Additionally, the AACR, in collaboration with Novocure, funds research on Tumour Treating Fields (TTFields) in cancer, focusing on TTFields' mechanisms and potential in combination therapies. Research areas include cancer signalling pathways, metabolic effects, Omics data analysis, and immunotherapy combinations.

- Other funding opportunities target advancements in drug delivery technologies, such as in HIV and substance use disorder research, supporting projects on new delivery tools, nano formulations, and strategies for enhancing blood-brain barrier permeability.

- There is a focus on gene repair and replacement, as well as optimizing nucleotide therapies.

- There is also significant funding available for Artificial Intelligence and Data Science research. There are grants targeting development of informatics tools to analyze and integrate brain research data, user-friendly informatics technologies for early-stage cancer research across cancer domains, and computational genomics, data science, statistics, and bioinformatics research aimed at enabling genomics research across diseases and biological systems.

- One prominent theme is the exploration of microbial influences on health, such as the microbiome's impact on anti-tumour immune responses and potential cancer prevention targets through specific microbes or metabolites.

- Another thematic focus is on addressing complex health conditions associated with HIV/AIDS, including metabolic disorders and organ-specific complications like gastrointestinal and kidney diseases, aiming to elucidate pathophysiological pathways and interactions.

- In funding of neurological disorders, calls emphasize the discovery of novel compounds for treating nervous system disorders and the development of brain stimulation devices beyond current FDA-approved methods, aiming for enhanced precision and effectiveness.

- Concurrently, collaborative efforts between academia and industry are encouraged to develop bioengineering tools that tackle biomedical challenges, while bioengineering tools and technologies are developed for kidney, urologic, and hematologic diseases to advance diagnostics and therapies.

- Neuroscience remains a robust area of interest, with funding calls focussing on cell type-specific molecular tools for brain circuit studies.

- Additionally, high-resolution structural and functional imaging technologies for the human inner ear are being developed to visualize inner ear structures with precision in awake patients, advancing diagnostic capabilities.

- Cancer research initiatives encompass diverse approaches, including the investigation of microbial-based therapies, synthetic vulnerabilities in cancer therapy, and precision approaches in radiation therapy combinations.

- Infectious diseases research continues to be a critical area, with initiatives supporting the development of HIV vaccines and exploring co-infections' roles in cancer development.

- One prominent theme is leveraging existing datasets for innovative inquiries, exemplified by the National Heart, Lung, and Blood Institute's R21 grants for secondary analyses without new data generation.

- Similarly, the National Library of Medicine supports biomedical informatics and data science projects, aiming to enhance data-driven approaches in healthcare with substantial funding over four years.

- Another thematic focus is on collaborative, multi-disciplinary studies, such as clinical investigations in mental health genetics and biomarkers.

- There are also grants in genomic data analysis for dental, oral, and craniofacial biology and initiatives in radioligand development for PET/SPECT imaging in mental disorders which seek to elucidate pathophysiology and therapeutic targets over five years.

- The National Cancer Institute (NCI) prioritizes research on incretin mimetics' impact on cancer risk, exploring GLP-1 and dual GLP-1/GIP-1 receptor agonists. Interdisciplinary studies on genetic and non-genetic factors influencing complex traits underscore NCI's commitment to personalized health informatics.

- Funding initiatives also address trained immunity mechanisms, alcohol-related cancer risks, and the development of brain-targeted chemical probes. Special attention is given to improving cancer care for sexual and gender minority survivors and exploring ethical issues in neuroscience under the BRAIN Initiative. NCI grants also support the discovery of novel small molecules for cancer treatment, emphasizing primary screening and hit validation processes.

- Further opportunities in 2026 encompass research in HIV/AIDS, human cell-derived systems for nervous system studies, advancements in neuroscience technology and precision medicine focusing on drug mechanism understanding and therapeutic development.

- Funding also supports mobile health interventions in low- and middle-income countries, encouraging innovative projects that leverage mobile and wireless technologies to improve health outcomes.

- The National Cancer Institute (NCI) is soliciting proposals for early phase investigator-initiated clinical trials focusing on cancer-targeted diagnostics and therapeutics under its Division of Cancer Treatment and Diagnosis (DCTD) and Office of HIV and AIDS Malignancies (OHAM). These trials, encompassing Phase 0, I, and II stages, must align with the research interests of several NCI programs, including Cancer Therapy Evaluation, Imaging, Diagnosis, Radiation Research, Complementary and Alternative Medicine, and HIV/AIDS Malignancies. Projects can integrate clinical trials with other research aims and span up to five years, with annual direct costs capped at $499,999.

- Similarly, the NCI invites applications for investigator-initiated clinical trials aligned with the Division of Cancer Prevention and Division of Cancer Control and Population Sciences. These trials should innovate in early cancer detection, screening, prevention, and healthcare delivery, aiming to enhance clinical practice and public health outcomes. There are no budget limits, but proposals must justify their funding needs for up to five years, following a triannual submission schedule.

- Additionally, funding is available for multidisciplinary research advancing brain activity measurement across the lifespan, promoting innovations in neurodevelopmental studies. The BRAIN Initiative encourages research into novel tools for complex circuit analysis, focusing on cell-type and circuit-level specificity across multiple species. The initiative allocates approximately $8 million for 6-9 awards, with flexible budgets and project durations.

Funding Calls: Asia

ResearchConnect was also searched for funding calls since 2024 in Asia. The findings revealed a very small number of available opportunities (n=2), highlighting the scarcity of funding calls in the region submitted to ResearchConnect. the low numbers of funding calls from Asia in UK funding call databases like ResearchConnect are likely due to a combination of regional focus, database coverage limitations, cultural differences, and the prioritization of UK-centric opportunities. This suggests the need for a more targeted approach to searching, specifically focusing on research funding repositories affiliated with Asian research institutions.

Comparing UK and US Research Funding Calls

Advanced Therapies

UK: Significant funding is directed towards advanced therapies, including targeted treatments, immunotherapy, gene therapy, and precision medicine. Research in areas like cancer, diabetes, cardiovascular health, and neurological disorders is emphasized, with multidisciplinary projects encouraged.
US: Advanced therapies also feature prominently, with a strong focus on cancer research, including drug development for ultra-rare cancers, immunotherapy, gene repair, and nucleotide therapies. There is a notable emphasis on early-phase clinical trials and translational research.

Diagnostics

UK: Funding supports a broad range of diagnostic research across various cancers, using innovative technologies like liquid biopsies, mass photometry, and AI. There is a focus on early detection and non-invasive techniques.
US: There is substantial investment in developing new diagnostic tools and imaging technologies, including PET/SPECT imaging, radioligand development, and AI-driven diagnostic methods for various diseases, particularly cancer.

Artificial Intelligence

UK: AI research targets healthcare applications, including the development of diagnostic tools, clinical decision support systems, and the integration of AI in clinical workflows.
US: AI and data science research are prioritized for improving diagnostics, healthcare delivery, genomics, and bioinformatics. There are specific calls for developing AI tools for brain research data analysis and integrating AI in cancer diagnostics.

Biomedical Engineering and Bioengineering:

UK: Research in biomedical engineering focuses on developing optical tools for early cancer detection and biophysical design of immunomodulatory nanotherapeutics.
US: Bioengineering research supports developing innovative tools for diagnosing and treating diseases, including kidney, urologic, and hematologic diseases, and the development of brain stimulation devices.

Collaborative and Interdisciplinary Research:

UK: Calls encourage collaborations between academia, industry, and research institutions, focusing on technological advancements and translational research to create impactful products and services.
US: Similar emphasis on interdisciplinary research, particularly in areas like bioengineering, neuroscience, and infectious diseases. Collaborative efforts between different sectors are encouraged to address complex biomedical challenges.

Similarities

1. **Focus on Advanced Therapies and Precision Medicine:** Both UK and US funding bodies prioritize advanced therapies, including targeted treatments, gene therapy, and precision medicine. There is a strong emphasis on cancer research in both countries.
2. **Investment in AI and Data Science:** Both countries are investing heavily in AI and data science for healthcare applications, particularly in diagnostics, clinical decision support, and data integration.
3. **Encouragement of Interdisciplinary and Collaborative Research:** Funding calls in both countries emphasize the importance of collaboration across different sectors and disciplines to drive innovation and address complex health challenges.
4. **Support for Early-Stage Research and Translational Projects:** There is substantial support for early-phase clinical trials and translational research aimed at bringing new therapies and diagnostic tools from the lab to the clinic.

Differences

1. **Funding Scale and Distribution:**
   UK: The average maximum funding per call is £701,228, with a total of £77.13 million available. The Wellcome Trust and MRC are prominent funders, with substantial individual grant amounts.
   US: The average maximum funding per call is higher at £1.12 million, with a total of £112.78 million available. The NIH dominates the funding landscape, offering a large number of grants, albeit with varying financial scales.
2. **Specific Research Priorities:**
   UK: There is a diverse range of research priorities, including specific calls for glaucoma, motor neurone disease, spinal cord injury, and diabetes. Multidisciplinary projects and long-term backing for cancer research are highlighted.
   US: Specific research areas include microbial influences on health, HIV/AIDS-related conditions, brain stimulation devices, and synthetic vulnerabilities in cancer therapy. There is also a focus on leveraging existing datasets for innovative inquiries.

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Appendix A

Screening of Awarded Grants

Of 9106 records retrieved from GtR database, 1211 were identified as MRC grants. 599 of these records were manually screened for eligibility by members of the project team and, as applicable, categorised by remit of interest identified by the NIHR in their request: 'Gut health-microbiome-nutrition', 'Diagnostics', 'Drug/therapy and medical device combination ', 'Artificial intelligence', 'Advanced Medical Therapies', and 'Biomedical engineering'.

In-house IO automation methods were used to re-order the list of remaining records (MRC, Innovate, BBSRC, NC3Rs), to prioritise the most likely records relevant for each remit. This record prioritisation algorithm works in a similar fashion to the well-known active-learning algorithms in the field of systematic review automation.[5] However, these algorithms commonly work on titles and abstracts of journal articles; while the IO's version is flexible and customisable to handle heterogeneous data such as trial registry entries or funding information. Our approach is based on the semantic similarity between text fields such as grant titles or short summaries, using a neural network that was pre-trained on a large corpus of scientific literature.

Manually-labelled relevant MRC references for each remit were used as a pool to teach the algorithm to prioritise unscreened likely relevant awards across UK funders. When prioritisation and re-ordering of screened records for each remit was complete, records were screened manually in order of priority until the 100 most likely relevant records per remit were identified.

For each remit, we used all manually assigned MRC documents to evaluate the performance of the automatic prioritisation. For a given remit, we simulated the manual screening phase in a fashion similar to the evaluation of systematic review tools.[5] Using the records marked as includes for each remit as positive labels (and all other records as negative), we were able to show that the prioritisation approach would have led to positively identifying all relevant records after screening less than 50% of the dataset. Given that the algorithm was quickly able to pick up relevant references, we were confident that screening 'most relevant' records in order of priority and reporting the top 100 most likely relevant records per remit would lead to analysis of a satisfactory amount of relevant records.

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