

Cancer Research Investment in Ireland (2019–2022)

A review of national cancer research
investment using the Health Research
Classification System (HRCs)



Chiara Mizzoni, Gavin Lawler
and Oonagh Ward

Research. Evidence. Action.

Dublin: Published by the Health Research Board

Grattan House, 67-72 Lower Mount Street,
Dublin 2, D02 H638

© 2024

ISBN: 978-1-903669-32-7

t 353 1 234 5000

f 353 1 661 2335

e hrb@hrb.ie

w www.hrb.ie

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Acknowledgements



The Health Research Board would like to thank and acknowledge the invaluable help provided by the participating national funding agencies and cancer research charities and all the members of the National Cancer Research Group and National Cancer Control Programme who engaged in the feedback and follow-up activities necessary to prepare this review.

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List of Acronyms



- ANP – Advanced Nurse Practitioner
- BCR – Breakthrough Cancer Research
- CAI – Conversational Artificial Intelligence
- CFNCRF – Conor Foley Neuroblastoma Cancer Research Foundation
- CTI – Cancer Trials Ireland
- CysLT – Cysteinyl/Leukotriene
- DIFA – Definitive Intervention and Feasibility Awards
- DNA – Deoxyribonucleic Acid
- DoH – Department of Health
- DSSG – Disease Specific Subgroup
- EI – Enterprise Ireland
- EU – European Union
- HC – Health Code
- HEA – Higher Education Authority
- HEI – Higher Education Institution
- HI – Host Institution
- HRB – Health Research Board
- HRCI – Health Research Charities Ireland
- HRCS – Health Research Classification System
- HSE – Health Service Executive
- ICS – Irish Cancer Society
- IRC – Irish Research Council
- MM – Multiple Myeloma
- mRNA – Messenger RNA
- MUM – Metastatic Uveal Melanoma
- NBL – Neuroblastoma
- NCCP – National Cancer Control Programme
- NCRG – National Cancer Research Group
- OEI – Organisation of European Cancer Institutes
- PPI – Public and Patient Involvement
- RA – Research Activity
- RCSI – Royal College of Surgeons in Ireland

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1. Summary



- Over the period 2019–2022, the eight participating funders invested a total of €106.5 million across 397 cancer research grants, reflecting an upward trend in investment.
- The Health Research Board (HRB) made the highest cancer-related research funding commitments of almost €42 million across 51 grants (39% of the total investment in the review period) followed by Science Foundation Ireland (SFI) with an investment of €26.7 million over 32 grants (25%).
 - National funding agencies awarded higher-value grants, but slightly fewer numbers of grants (190) than their charity counterparts. In total, participating national funding agencies made cancer-related research funding commitments of €84.5 million, which equated to 79% of total investment.
 - Cancer charities made the greatest number of individual grants (207), with investments of €22.9 million, which equated to 20.6% of the total.
- HRB investment in cancer research accounted for 22.8% of its total investment in health and social care research during the period 2019–2022. This has increased from 20.2% for the period 2010–2017.
- For the participating cancer charities, their investment represents 100% of their total research investment.
- The top three research activity areas for cancer research investment were ‘Evaluation of treatments and therapeutic interventions’ or ‘Treatment Evaluation’ (€34.8 million), ‘Development of treatments and therapeutic interventions’ or ‘Treatment Development’ (€28.8 million) and ‘Aetiology’ (€17.7 million).
- Lower levels of cancer research investment, less than €5 million (potential investment gaps), were notable across three research activity areas: ‘Underpinning research’ or ‘Underpinning’; ‘Prevention of disease and conditions, and promotion of well-being’ or ‘Prevention’; and ‘Health and social care services research’ or ‘Health Services’.
- The funding instrument through which most cancer research investment was made was ‘Projects and programmes, health system partnerships’ (€43 million). It was followed by ‘Infrastructure, platforms, and networks’ (€32 million); ‘Capacity building and leadership enhancement’ (€23 million); and lastly, ‘Interventional and commercialisation studies’ (€8 million).

- The relative focus of research activity and funding mechanism differs between funding agencies, reflecting their remit.
- Although researchers in more than 30 separate host institutions (HIs) received some cancer research investment, researchers in five HIs were awarded approximately 80.5% of funding commitments, while three HIs (Royal College of Surgeons in Ireland (RCSI); University College Dublin (UCD); and Trinity College Dublin (TCD)) received 60% of the total investment.
- Most cancer research investment was in research projects, programmes, and supporting infrastructure that are studying multiple cancer sites in the body.

2. Introduction



The *National Cancer Strategy 2017 – 2026*¹ which aims to meet the needs of cancer patients in Ireland, was published in 2017.

Given the positive impact of research activity, including clinical trials, on the care of patients, a specific section on research was included in the Strategy. In line with the Strategy vision, the National Cancer Research Group (NCRG) was established with the support of the National Cancer Control Programme (NCCP). The NCRG's remit is to monitor and influence national investment in cancer research and improve its coordination as aligned with the Strategy.

In consultation with the NCCP, the HRB as a member of the NCRG agreed to conduct a review of cancer research investments in Ireland from 2019 to 2022 using the United Kingdom (UK) Health Research Classification System (HRCS).²

The purpose of this report is to provide an analysis of the cancer research investments in Ireland to:

- Support the coordination of cancer research activities through shared learning and open exchange of information
- Facilitate a collective view of resources being invested in cancer research
- Avoid duplication of investments by respective funders
- Identify gaps in current cancer research investments
- Prioritise areas for future investment, and
- Benefit Irish patients and the public.

This report presents an analysis of the data collected as part of that review on national investment in cancer-related research projects, programmes and supporting infrastructure.

The report was made possible thanks to the contribution and engagement of participants which included four national funding agencies and four cancer research charities.³ As participation was voluntary, this analysis cannot provide a complete picture, but it does offer real insight and perspective into national investments in cancer-related research, and it creates a solid foundation for future discussion, advocacy, and recommendations by the NCRG.

3. Methodology

The review focused on national investment in cancer research over the period 2019–2022 across funders of cancer research in the Republic of Ireland.

Data are presented on research funding committed by the eight participating funders. The focus on research activity was identified through the classification of the award data provided using the UK HRCS.

For each applicable award, the total value over its lifetime was counted, i.e. the unit of measurement was funding commitments made in any given year, rather than actual expenditure in a given year.

3.1 Data collection: design

To capture the necessary data, the HRB designed a data collection template, which was subsequently issued by the NCCP to organisations identified as Irish funders of cancer research. (See Section 3.2 for further information on the sampling strategy.)

The data collection template consisted of both structured and open-ended questions. (See Appendix A for further details.)

Specific data points were requested in relation to each individual award (see Table 1).

Table 1: Data collection template data points

Template	Information points
Data Collection Template	Award reference
	Year of award
	Award title
	Total amount/value of the award
	Co-funder where relevant ⁴
	Type of award
	Lay or scientific summary/abstract
	Cancer type by site*

***Cancer type by site** was added as an additional information point following consultation with funders that opted in.

Additionally, questions relating to overall organisational cancer research investment strategy, priority investment areas, and barriers to cancer research investment completed the data collection template.

3.1.1 Inclusion and exclusion criteria

Awards that were included in this analysis were:

- Awards** related to cancer research supported by publicly funded agencies and/or charities in Ireland that opted into the review. It is acknowledged that the Health Service Executive (HSE), Higher Education Authority (HEA), Cancer Trials Ireland, and the private sector also contribute to cancer research funding in Ireland.
- All types of funding instruments, including fellowships; projects and programme funding; infrastructure, networks, and healthcare intervention studies
- Funding commitments for the period 2019–2022
- Total award funding commitments made in any given year as the unit of measurement
- All funding deemed eligible under these instruments, including salary support, dissemination, equipment, and overheads contribution.

Awards that were (not included)/excluded from this analysis were:

- Awards not classified to ‘Cancer and neoplasms’ in any proportion during the HRCS classification process.

***To make the submission process as easy as possible, funders were free to submit any awards with a health relevance which would later be narrowed down ahead of any data analysis.*

3.2 Data collection: sampling strategy

A total of 22 organisations, identified as active funders of cancer research in Ireland, including public funding agencies and cancer charities, were invited to contribute to the review. Participation was on an opt-in basis.

Of the 22 organisations, 8 agreed to participate (see Table 2), resulting in a response rate of 36.3%. Despite a 64% non-response rate, because all the larger national funding agencies and some cancer charities contributed award data, it is considered a close representation of overall Irish investment in cancer research during the period 2019–2022.

Table 2: Final participants listing

National funding agencies	Cancer research charities
Health Research Board (HRB)	Irish Cancer Society (ICS)
Science Foundation Ireland (SFI)	Breakthrough Cancer Research (BCR)
Irish Research Council (IRC)	OvaCare
Enterprise Ireland (EI)	Conor Foley Neuroblastoma Cancer Research Foundation (CFNCRF)

When considering the data in this report, it is important to understand that the remit of each of the national funding agencies is linked to different governmental strategic agendas. Therefore, a short description of the participating agencies and charities is available in Appendix B.

Of note, the HRB and cancer charities have purely health-related research portfolios. This does not apply to the other national funding agencies that operate a wider funding portfolio remit.

In the interest of transparency, the review notes specific areas of funding not captured, but which the NCRG members considered important. These areas were as follows:

1. Funding under the HEA North-South Research Programme Call 1 which provided almost €13 million in 2022 for cancer research
2. Funds utilised by Cancer Trials Ireland, which includes Irish philanthropic sources for academic trials, and which amounted to approximately €6 million during the period under analysis, and
3. Impactful cancer research carried out by dedicated breast cancer charities.

Data captured in this report do not include Irish investments made in other infrastructure and facilities that can be used to support fundamental cancer-related research; neither do they include European Union (EU) funding.

3.3 Data classification

Initial data cleaning took place once the completed data templates were received from participants. This included the standardisation of information points, such as naming HIs and terminology. The data were then classified according to the HRCS by a qualified external coder, in order to understand the focus of each award's research activity.

The HRCS was developed by the UK Clinical Research Collaboration (UKCRC) partners and is a system designed to classify and analyse biomedical and health research funding. The system has been widely adopted by UK research funders to inform research management and to undertake prospective analyses.

This system classifies awards according to both the Health category that is the focus of the research, and the type of Research activity that the researcher is undertaking along a continuum from underpinning research to applied health services research. (See Appendix C for further details on the HRCS.)

In total, there are 21 Health categories used by the HRCS that encompass all diseases, conditions, and areas of health, of which one is Cancer and neoplasms.

As shown in Table 3, Research activity is divided into eight areas.

Table 3: HRCS research activity descriptions

No.	Research activity	Summary description
1	Underpinning research	Research that underpins investigations into the cause, development, detection, treatment and management of diseases, conditions, and ill health
2	Aetiology	Identification of determinants that are involved in the cause, risk or development of disease, conditions, and ill health
3	Prevention of disease and conditions, and promotion of well-being	Research aimed at the primary prevention of disease, conditions or ill health, or promotion of well-being
4	Detection, screening and diagnosis	Discovery, development and evaluation of diagnostic, prognostic and predictive markers and technologies
5	Development of treatments and therapeutic interventions	Discovery and development of therapeutic interventions and testing in model systems and pre-clinical settings
6	Evaluation of treatments and therapeutic interventions	Testing and evaluation of therapeutic interventions in clinical, community or applied settings
7	Management of diseases and conditions	Research into individual care needs and management of disease, conditions, or ill health
8	Health and social care services research	Research into the provision and delivery of health and social care services, health policy and studies of research design, measurements, and methodologies

All the awards submitted for inclusion were classified along the two dimensions of the HRCS, as described above. The role of the coder was to identify cancer-focused awards and further classify each by research activity.

If warranted, the HRCS can assign multiple health categories and research activities to an individual award in order to classify the research more accurately and capture the main objective of the research over the lifetime of an award. A percentage is then allocated to each health category and research activity, representing a proportion of the total award value. The total percentage will always equal 100% so as to ensure no double counting of investments at later-stage analysis. For the purpose of this review, if an award was classified to 'Cancer and neoplasms' in any proportion, it was included in the final data analysis.

The final dataset was passed through Microsoft Power BI to equally split funder investment across research activity and health category codes based on the percentages assigned by the coder. This allowed overall distribution of investment to be properly analysed. Microsoft Excel was also used, and quantitative survey data were analysed using descriptive statistics.

4. Analysis of cancer research investment 2019–2022

A total of 397 awards were included for final data analysis.

A subgroup of the NCCP NCRG worked with the HRB to provide input on specific findings. All participating funding organisations and charities consented to provide their data once published in a consolidated and anonymised format.

Individual awards are not identifiable. However, a selection of case studies that illustrate important cancer research investment is included in Appendix G.

4.1 Overall cancer research investment

In total, between 2019 and 2022, the eight participants reported investments of almost €106.5 million across 397 cancer research awards.

Previous research conducted by the HRB which analysed health research investments between 2011 and 2015 found that 8 national funding agencies reported cancer investments of almost €90 million across 354 cancer research awards.⁵ As the participants in each review period were not the same, it is important to state that exact like-for-like comparison is not possible. However, it does suggest an upwardly positive trend in national investment levels into cancer-related research.

Table 4 shows, in descending order, the total investments committed by participating funders, the actual number of cancer research awards made as well as the percentage value of all awards.

Table 4: Overall investment commitments and awards made by participating funders (2019–2022)

Participating funders	Number of awards	Value (€)	% of value of all awards
Health Research Board	51	41,730,581	39.19
Science Foundation Ireland	32	26,741,344	25.11
Irish Cancer Society	128	12,563,135	11.80
Irish Research Council	97	11,509,836	10.81
Breakthrough Cancer Research	77	9,141,048	8.58
Enterprise Ireland	10	4,585,824	4.31
Conor Foley Neuroblastoma Cancer Research Foundation	1	199,485	0.18
OvaCare	1	20,000	0.02
Total amount	397	106,491,255	100

The HRB made the highest cancer-related research funding commitments of almost €42 million across 51 awards (39% of the total investment in the review period). SFI followed, with an investment of €26.7 million over 32 awards (25%).

The Irish Cancer Society (ICS) and the Irish Research Council (IRC) made funding commitments of €12.6 million and €11.5 million, respectively, across 128 and 97 awards. The ICS had the highest number of individual awards across participating funders.

Breakthrough Cancer Research (BCR) made funding commitments of just over €9 million in 77 awards. It was followed by Enterprise Ireland (EI), with total investments of almost €4.6 million across 10 awards.

The Conor Foley Neuroblastoma Cancer Research Foundation (CFNCRF) and OvaCare both made one award each, with a cumulative value of nearly €220,000.

National funding agencies made higher-value awards, but slightly fewer numbers of awards than their charity counterparts. In total, participating national funding agencies made cancer-related research funding commitments of €84.5 million across 190 awards. This accounted for 79% of total investment.

The cancer charities made investments of €22.9 million across 207 awards, which equated to 20.6% of the total.

4.1.1 Cancer research as a proportion of overall health research investment

Participants were asked to provide data in relation to their overall health research investment. However, due to the differing remits and portfolios of participants, data for this were not available in all cases; for example, EI stated that it did not have a specific health research investment spend.

Investment in cancer research forms a significant part of the HRB's overall health and social care research portfolios. HRB investment in cancer research accounted for 22.8% of its total investment in health and social care research during the period 2019–2022. This has increased from 20.2% for the period 2010–2017.

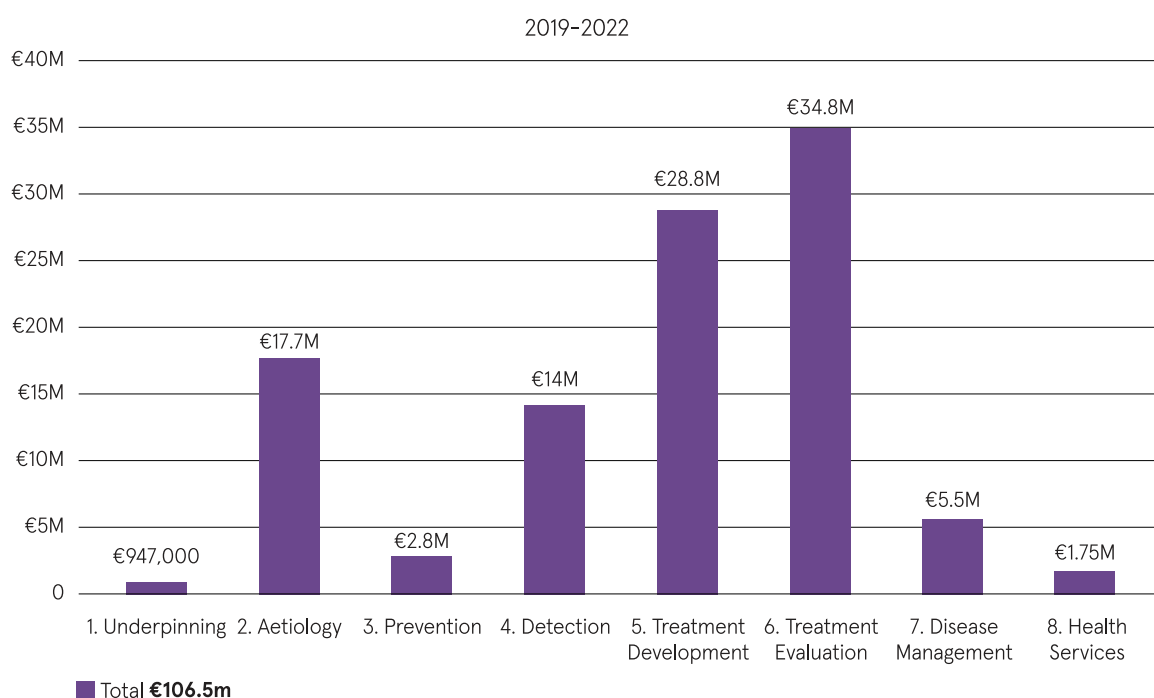
SFI allocated 24.4% of its overall research spend to the area of health and well-being, with cancer research accounting for 13% of that portfolio spend.

For the participating cancer charities their investment represents 100% of their total research investment.

4.2 Distribution of cancer research investment by HRCS research activity and subcodes

Figure 1 indicates the distribution of cancer research investment across each HRCS research activity, while Figure 2 shows the proportion split of that investment across each HRCS research activity.

Figure 1: Distribution of cancer research investment across HRCS research activity groups (2019–2022)



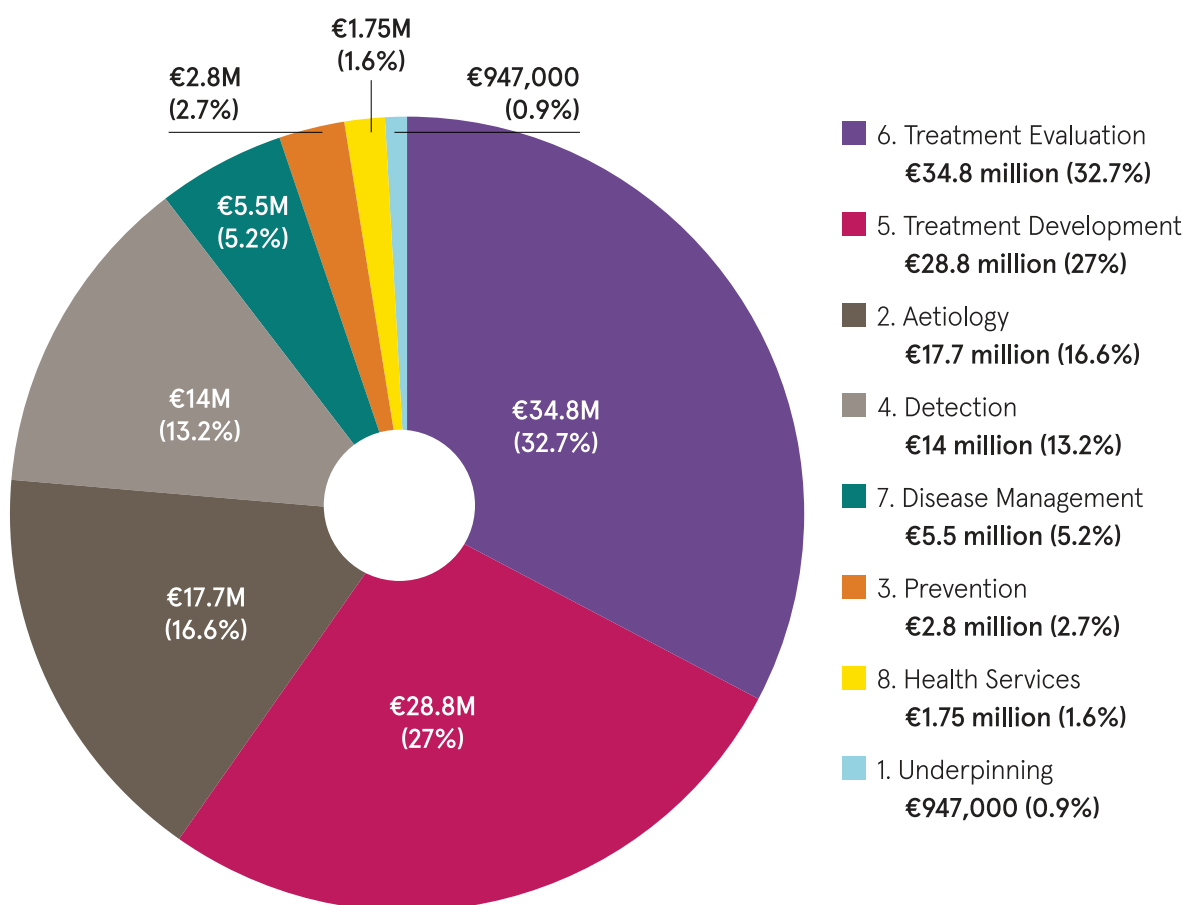
With €34.8 million in investment, ‘Treatment Evaluation’ (RA 6) captured the largest share of award funding commitments. This amounted to 32.7% of total investment.

‘Treatment Development’ (RA 5) followed, with €28.8 million or 27% of total investment, while ‘Aetiology’ (RA 2) captured €17.7 million or 16.6% of investment.

The areas of research activity that received comparatively smaller investments were:

- ‘Prevention’ (RA 3), with €2.8 million or 2.7%
- ‘Health Services’ (RA 8), with €1.75 million or 1.6%, and
- ‘Underpinning’ (RA 1), which received just under €950,000 or 0.9% of total investment.

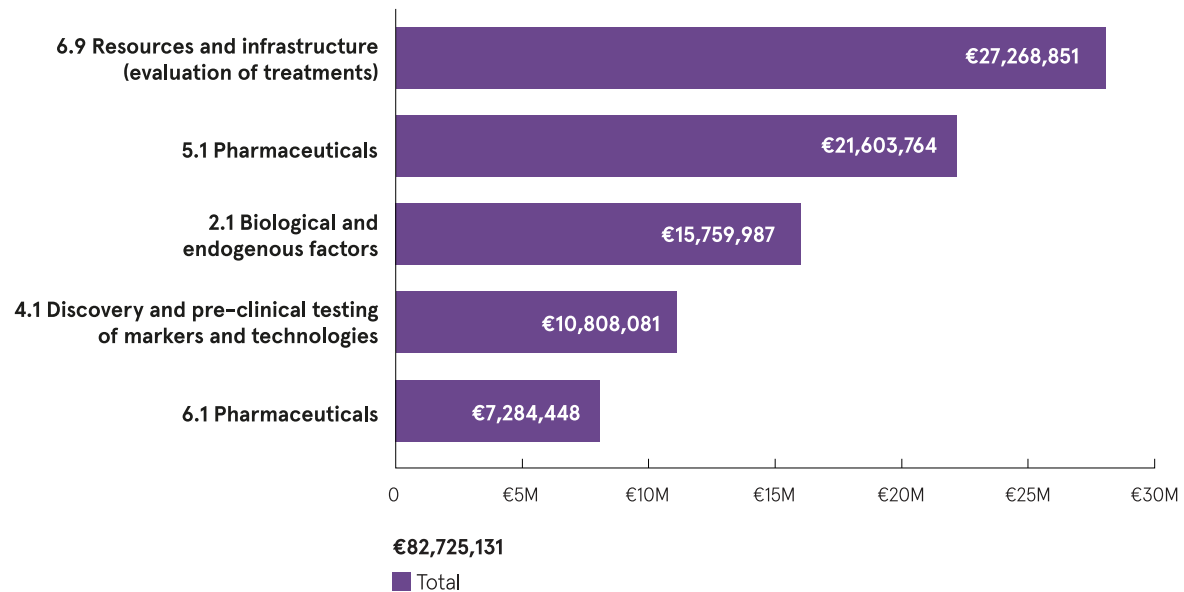
Figure 2: Proportion split of cancer research investment across HRCS research activity groups (2019–2022)



The eight overarching HRCS research activities can be further broken down into 48 subcodes. The analysis showed that a total of 37 of the 48 HRCS subcodes received some investment, while 11 did not. (See Appendix C for the full list of the HRCS subcodes.)

Of the 37 subcodes that received investment, the top five subcodes received almost 78% of the total investment. This is shown in Figure 3.

Figure 3: Top five HRCS subcodes receiving cancer research investment (2019–2022)



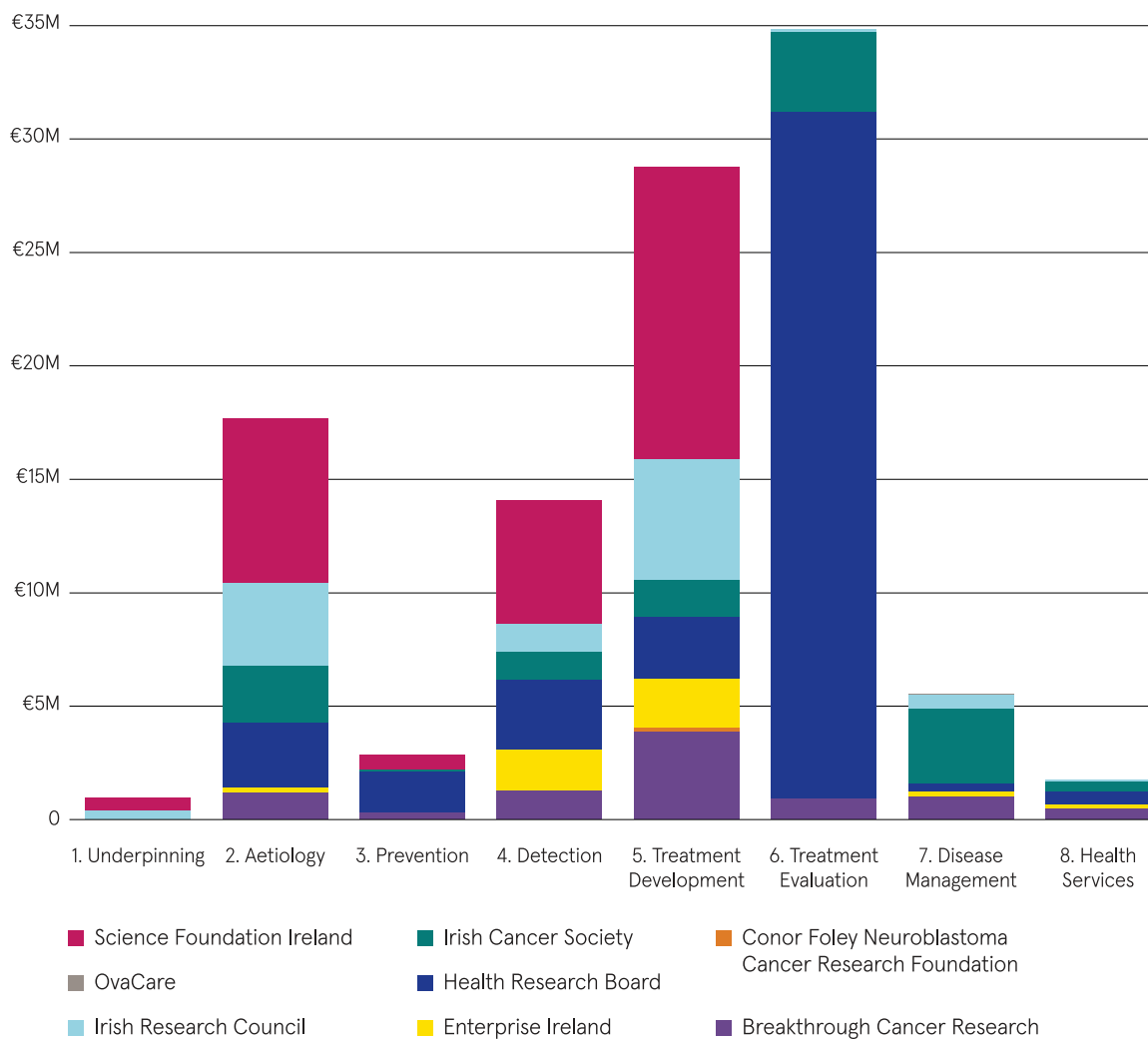
- Resources and infrastructure (subcode 6.9) within ‘Treatment Evaluation’ (RA 6) saw an investment of €27.3 million or 25.6% of the total. This was mainly due to the HRB’s sizeable investments in cancer clinical trials infrastructure.⁶
- ‘Pharmaceuticals’ (subcode 5.1) within ‘Treatment Development’ (RA 5) received €21.6 million of investment, equating to 20.3% of total investments.⁷
- ‘Biological and endogenous factors’ (subcode 2.1) within ‘Aetiology’ (RA 2) saw a €15.8 million investment, or 14.8% of total investment.⁸
- ‘Discovery and pre-clinical testing of markers and technologies’ (subcode 4.1) within ‘Detection’ (RA 4) captured €10.8 million, or 10.1% of total share.⁹
- ‘Pharmaceuticals’ (subcode 6.1) within ‘Treatment Evaluation’ (RA 6) accounts for €7.3 million of investment or 6.8%.¹⁰

When analysing the subcodes that received little to no investment, of note are those within ‘Treatment Evaluation’ (RA 6) such as ‘Pharmaceuticals’ (subcode 6.1) which received a low level of investment (6.8%) and those which received no funding, i.e. ‘Medical devices’ (subcode 6.3) and ‘Psychological and behavioural’ (subcode 6.6), despite significant investment in the area of cancer clinical trials infrastructure as a whole.

4.3 Distribution of cancer research investment by funder

Figure 4 shows the distribution of investment by research activity across all eight participating funders. This reflects the interests of individual agencies and charities.

Figure 4: Distribution of cancer research investment across HRCS research activity groups, by funder (2019–2022)



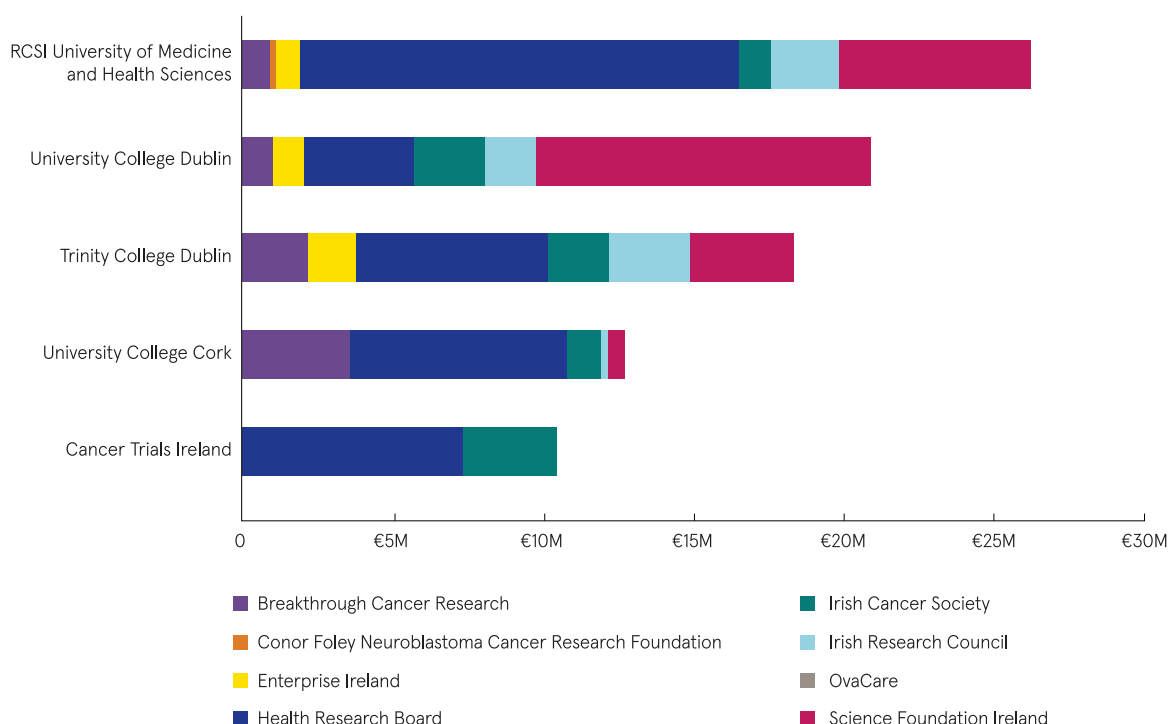
- The HRB, SFI and the IRC fund research across the full range of HRCS research activities, from ‘Underpinning’ (RA 1) to ‘Health Services’ (RA 8), although the relative focus differs between funding agencies, reflecting their remit.
 - The HRB made investments across the majority of cancer research activity areas, with the exception of ‘Underpinning’ (RA 1), reflecting a change in strategic focus in 2010, while the highest investment was in ‘Treatment Evaluation’ (RA 6), which reflects the significant HRB investment in cancer clinical trials infrastructure over the period 2019–2022.
 - Over the same period, SFI and the IRC both made significant investments in ‘Aetiology’ (RA 2). They are also investing in ‘Underpinning’ (RA 1) and although that investment is smaller, they are the primary national funders in this area.
- The majority of EI funding is in the areas of ‘Detection’ (RA 4) and ‘Treatment Development’ (RA 5), which would be anticipated given EI’s strong industry focus in the development of products and services.
- The ICS and BCR also fund research across a broad range of research activities, with the exception of ‘Underpinning’ (RA 1). Both the ICS and BCR are active in ‘Aetiology’ (RA 2). The ICS made a significant investment of €3.3 million in ‘Disease Management’ (RA 7).
- OvaCare and CFNCRF both fund research in a narrower range of research activities, which reflects their specific strategic remit.

4.4 Distribution of cancer research investment by host institution

A total of 30 separate HIs¹¹ were named within the dataset.¹² (See Appendix D for a full list of HIs referenced.)

Figure 5 shows the distribution of cancer research investment across the top five lead HIs by participating funder.

Figure 5: Distribution of cancer research investment across the top five HIs, by funder (2019–2022)



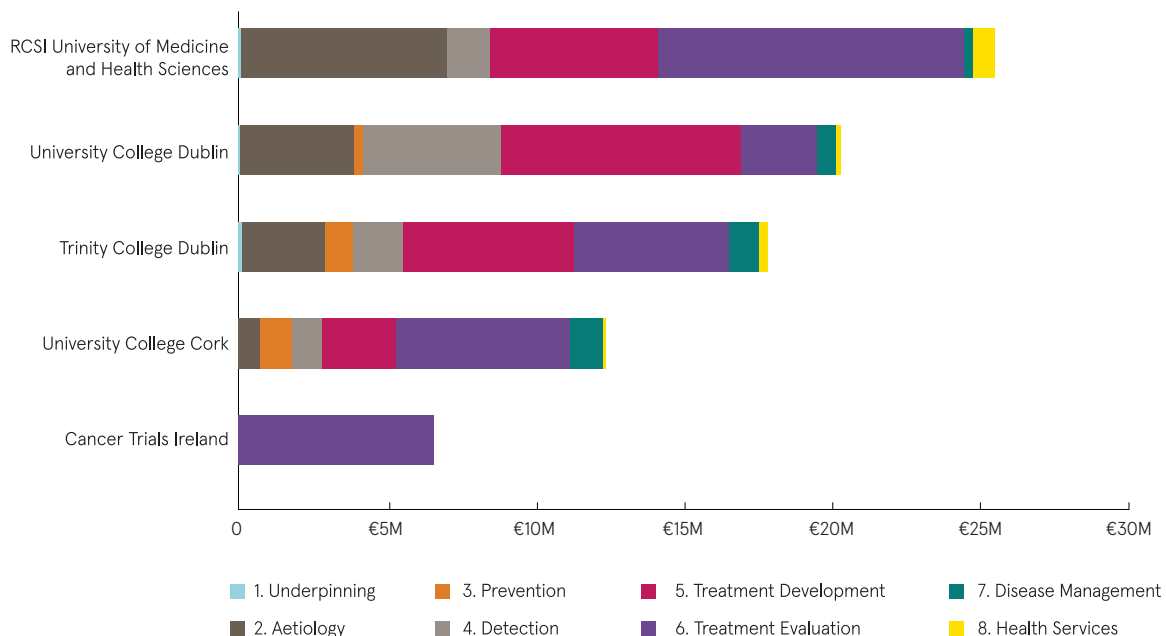
Note: Partnering institutions involved in supporting the delivery of the research activity are not included.

Researchers in the five HIs shown in Figure 5 were awarded approximately 80.5% of funding commitments. The top three HIs received 60% of the total investment.

Researchers in RCSI received the largest portion and were awarded 24% of total investments, at €25.3 million. UCD was awarded 19%, at €20.2 million, and TCD received 17% of the total, at €17.7 million. The HRB made funding commitments of €14.1 million to RCSI for cancer research. SFI made a sizeable investment of €10.7 million in funding commitments to UCD.

The analysis also examined research activity of the various HIs' cancer research awards. Figure 6 shows the distribution of cancer research investment across the top five HIs by HRCS research activity.

Figure 6: Distribution of cancer research investment across the top five HIs, by HRCS research activity group (2019–2022)



RCSI is involved across seven cancer research activity areas. It received notable investments focused on ‘Aetiology’ (RA 2, €6.9 million), ‘Treatment Development’ (RA 5, €5.6 million) and ‘Treatment Evaluation’ (RA 6, €10.3 million). UCD and TCD also had substantial investment awards exploring cancer ‘Treatment Development’ (RA 5, €8 million and €5.8 million, respectively).

4.5 Distribution of cancer research investment by award type

This section looks at how and where investment is made. Award type was an open-ended question in the data collection template and therefore participants were free to classify their own awards as they saw fit.

An award ‘type’ can be considered the overall focus of the award as funded through a particular scheme (a funding mechanism) type. Depending on its objective, the scheme or funding mechanism can also be targeted at one or more specific audiences who are best placed to deliver the desired outcomes, for example postgraduate or postdoctoral researchers, etc.

More than 60 ‘types’ of awards both singular and combination (i.e. an award classified by more than one type) were recorded in the raw data. Most cancer research investment was channelled into a few specific schemes and award types, as discussed below.

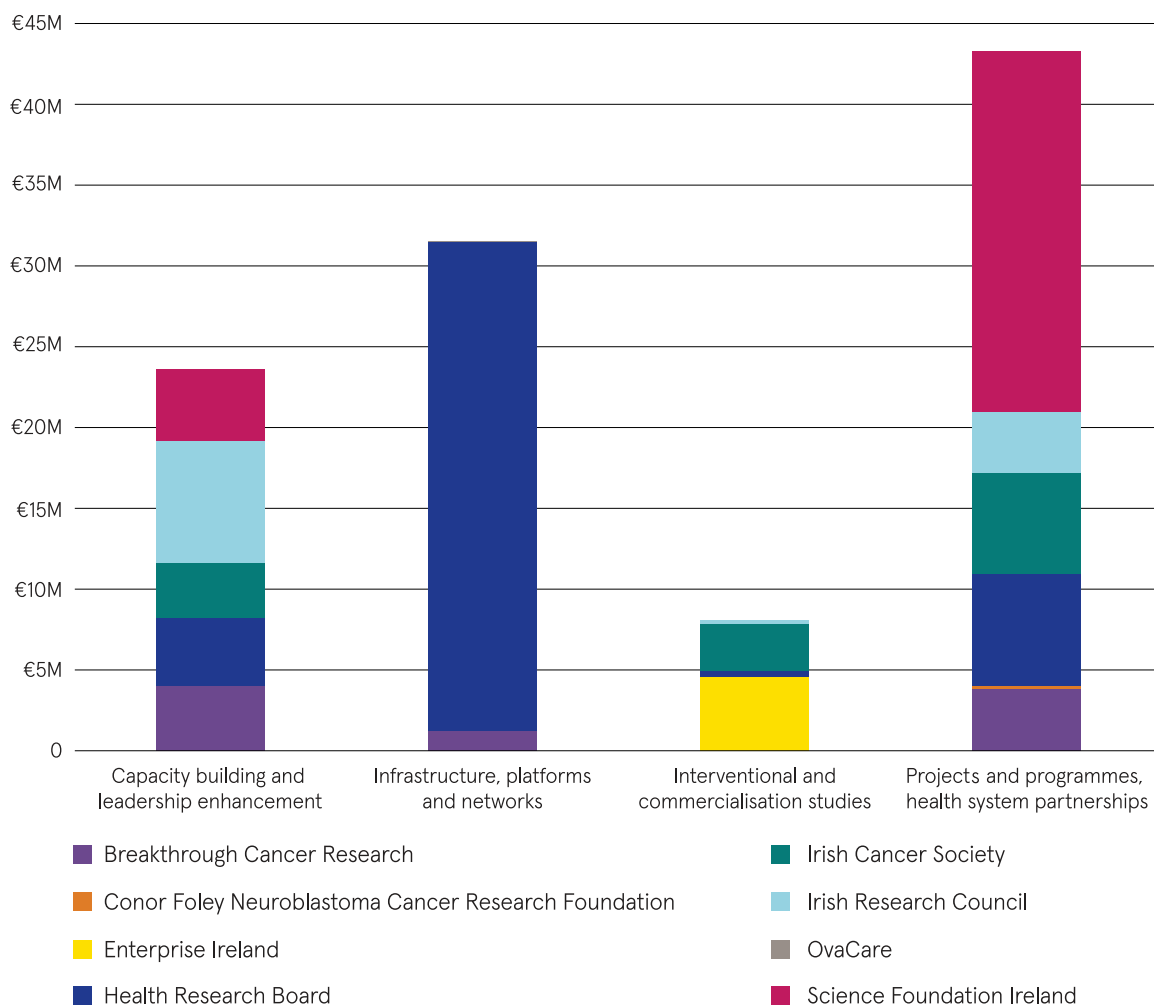
In order to better understand how and where investment is made, and the overall focus of awards, during the analysis stage the HRB categorised all award types into four overarching funding instrument types. The full list submitted by funders is available in Appendix E.

The four broad funding instrument types are described in Table 5.

Table 5: Overarching funding instrument types and their objectives and funding mechanisms

Funding instrument type	Objective	Funding mechanism examples
Capacity building and leadership enhancement	Increase capacity, capability and expertise of Irish researchers in a particular area of health research, either in academia, the healthcare system, the enterprise sector, or in policy bodies.	Clinical Fellowship Postdoctoral Fellowship Postdoctoral Enterprise Fellowship Postgraduate Scholarship Leadership Award
Projects and programmes, health system partnerships	Expand and advance knowledge and understanding in a particular area of health or disease in academia, the healthcare system, the enterprise sector, or in policy bodies.	Investigator-led projects Seed funding Cohort study Systematic review Knowledge exchange and dissemination award
Interventional and commercialisation studies	Advance testing, uptake or commercialisation of a technological innovation, product or service that benefits people's health or healthcare.	Clinical trial and healthcare interventions Proof of concept Commercialisation support Innovation development project
Infrastructure, platforms and networks	Provides the infrastructure, networks and platforms required to underpin/support a particular area of health research.	Infrastructure and resources investment Research centre Platforms and networks Technology centre

Figure 7 shows the distribution of cancer research investment by funding instrument type and by funder. In terms of distribution, the funding instrument types and awards associated with the funding agencies and the funding mechanism through which they invest reflects their strategic remits.

Figure 7: Distribution of cancer research investment, by funding instrument type and funder (2019–2022)

4.5.1 Projects and programmes, health system partnerships

During the period 2019–2022, ‘Projects and programmes, health system partnerships’ was the funding instrument through which most cancer research investment was made (€43 million). All of these projects, programmes and health system partnerships are seeking to expand and advance knowledge and understanding of cancer in some form. All funders with the exception of EI and OvaCare have active funding mechanisms to achieve these objectives. (See Appendix E for further details.)

SFI is the largest investor due to its significant investment in the following two funding mechanisms:

- **Frontiers for the Future (€15.3 million).** The purpose of this funding mechanism is to provide opportunities for independent investigators to conduct highly innovative, collaborative research with the potential to deliver impact, while also providing discrete opportunities for high-risk, high-reward research projects.

- The Strategic Partnership Programme (€7 million). Through this funding mechanism, an award of €750,000 was made to BCR. The Strategic Partnership Programme is a flexible mechanism for academic researchers to build strategic collaborations with key stakeholders such as industry, other funding agencies, charities, philanthropic organisations, higher education institutions (HEIs), or a combination of any of these. The Programme aims to support stand-alone research initiatives of scale with strong potential for delivering economic and societal impact to Ireland, in partnership with key stakeholders.

Knowledge production schemes are categorised under funding instrument type ‘Projects and programmes, health system partnerships’. Knowledge production is an area where the HRB and the ICS are particularly active and it includes the HRB Investigator-led Projects (€3.5 million). These types of schemes invest in research projects and programmes delivered by a team which positively impact on human health and well-being, provide the basis for new/improved healthcare innovations, or influence policy and practice.

4.5.2 Infrastructure, platforms and networks

The HRB, BCR and OvaCare were the only active funders under the funding instrument ‘Infrastructure, platforms and networks’, with an investment of €32 million. Although only accounting for 13 awards in total, the HRB’s investment in ‘Infrastructure, platforms and networks’ amounted to €30.3 million and was the largest investment in any one funding instrument type.

The overall aim of the HRB’s investment in cancer trials is to support an appropriate infrastructure that enables patients to access a diverse portfolio of high-quality, safe, and compliant cancer clinical trials in Ireland by providing essential support for six cancer clinical trials groups and the overarching National Cancer Clinical Trials Network. The National Cancer Clinical Trials Network ensures that the trials most relevant to cancer patients in Ireland are prioritised and supported, with results more likely to be translated into practice because of engagement with practising clinicians. The six cancer clinical trials groups are the cancer trial delivery units aligned to existing clinical trials infrastructures, hospital groups and academic institutions.

OvaCare’s single investment in an online platform for ovarian cancer patients and their families is also part of this grouping. (See Appendix G for the OvaCare case study.)

4.5.3 Capacity building and leadership enhancement

Investment in cancer research through the funding instrument ‘Capacity building and leadership enhancement’, was €23 million. These awards invest in people who can make a difference by driving changes and leading to positive health impacts in cancer. The IRC was the biggest investor in this area (€7.6 million); this figure included a substantial investment in Postgraduate Scholarships (€5.4 million). The HRB’s career development schemes featured prominently and amounted to €4.1 million. The ICS also invested in PhD scholarships (€1.5 million).

4.5.4 Interventional and commercialisation studies

The final funding instrument type through which cancer research investment is being distributed is 'Interventional and commercialisation studies' (€8 million). Unsurprisingly, given its focus on commercialisation, EI is the most significant funder in this space, with an investment of €4.6 million. The HRB has a relatively lower level of funding in this space, with just one investigator-led intervention trial (€392,000), despite significant investment made through the funding instrument 'Infrastructure, platforms and networks'.¹³

4.6 Distribution of cancer research investment by cancer type and by site (disease area)

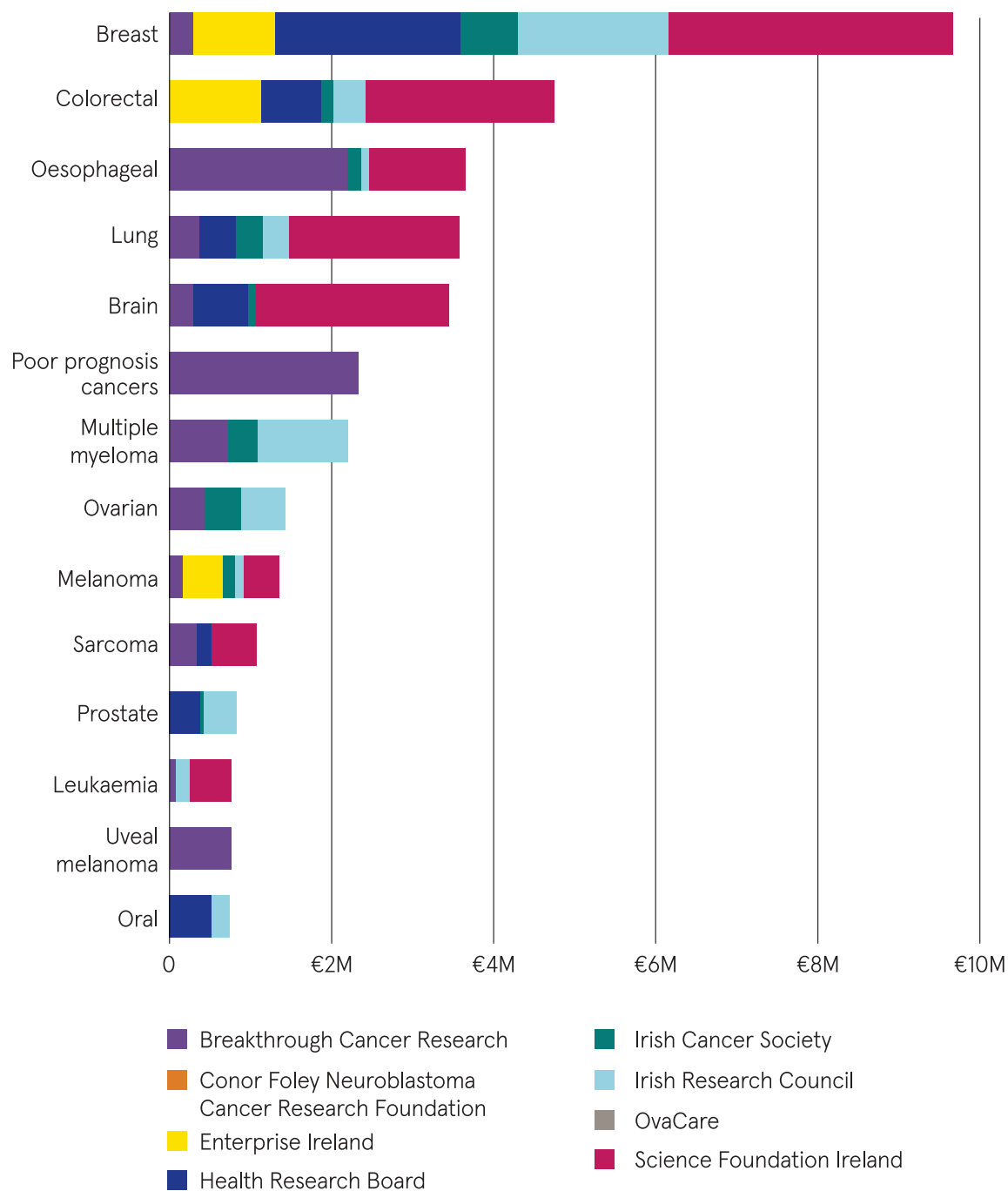
The review also analysed cancer type by site. A total of 57 cancer 'types' were represented in the data.¹⁴ (See Appendix F for the full list.)

Cancer research awards which studied multiple cancer sites in the body captured more than one-half of all funding (55% of total investment).

The next 14 cancer types by site accounted for a further 34% of all funding commitments. Within that, breast cancer accounted for 9%, colorectal cancer accounted for 4%, and oesophageal cancer accounted for 3.4% of all funding commitments. A recent study published in *The Lancet* (McIntosh *et al.*, 2023) found that the most highly funded individual cancer type globally was breast cancer, at 11.2%.¹⁵ In this review, research studying breast cancer accounted for 9%, which is broadly in line with global figures. However, if we take account of the absence of some of the breast cancer charities data, the actual percentage for breast cancer is probably slightly larger.

Other additional points of information regarding the type of cancer research being conducted were supplied by some funders. This included awards which studied cancer risk factors; survivorship; therapeutic targets, radiotherapy, or chemotherapy; and child and young adult cancers (National Cancer Control Programme, 2022).

Figure 8: Distribution of cancer research investment across cancer type, by site (top 14, excluding awards studying multiple cancer sites) and by funder (2019–2022)



5. Conclusion – national investment in cancer research

This report has presented an analysis of the data collected as part of the review on national investment in cancer-related research projects, programmes and supporting infrastructure, led by the HRB in consultation with the NCCP and the NCRG in order to:

- Support the coordination of cancer research activities through shared learning and open exchange of information
- Facilitate a collective view of resources being invested in cancer research
- Avoid duplication of investments by respective funders
- Identify gaps in current cancer research investments
- Prioritise areas for future investment, and
- Benefit Irish patients and the public.

The analysis provides a national overview of where cancer research funding is being invested across the full spectrum of research activity, from fundamental cancer-related research to health system improvement research, thus creating a solid foundation for future discussion, advocacy, and recommendations by the NCRG.

It finds that overall, cancer is a well-funded health research area in Ireland. Between 2019 and 2022, eight funders reported investment of €106.5 million across 397 cancer research grants. Moreover, given that the review does not capture all funding commitments in the space, the actual total investment figure is even greater.

Because all the larger national funding agencies contributed data, the NCRG in its consultation with the HRB has found the review to be largely representative of overall investment spend, providing an informative and valuable frame of reference from which to consider national investments in cancer-related research.

The HRB is the primary national funder for cancer-related research, with 39% of total cancer research investment. SFI is also an important funder in this area, with 25% of total cancer research investment. The HRB's investment in cancer research accounted for 22.8% of its total investment in health and social care research during the period 2019–2022. This has increased from 20.2% for the period 2010–2017 and is clear evidence of the HRB's commitment to cancer research investment in Ireland, particularly in supporting cancer clinical trials infrastructure. It is especially noteworthy as the period partly incorporated the COVID-19 pandemic, when all discretionary funding by many national funders was directed to COVID-19-related research.

Unsurprisingly, the national funding agencies awarded higher-value grants, although slightly fewer numbers of grants than their charity counterparts. In total, participating national funding agencies made cancer-related research funding commitments of €84.5 million, which equated to 79% of total investment. Cancer charities made the greatest number of individual grants, with investments of €22.9 million which equated to 20.6% of the total.

The top three research activity areas for cancer research investment were 'Treatment Evaluation', 'Treatment Development', and 'Aetiology'. Along the funding pipeline there are certain gaps that should be noted. There is a clear lack of funding generally in the research activity areas of 'Underpinning', 'Prevention', 'Disease Management' (in particular survivorship), and 'Health Services'. Although there is EU Cancer Mission funding in Ireland for the area of 'Prevention' (through screening programmes), there is no national funder studying preventive cancer medicine or research in health and social care services in a meaningful, strategically focused way. More focus on broader health and social care services research and implementation science is needed. Given that the incidence rate of cancer continues to rise and will place greater pressure on national health services, fewer people entering cancer services, alongside improved health services to treat them and better supports for growing numbers of cancer survivors, should be areas of priority for national funders and charities alike.

The HRB is providing significant levels of funding for infrastructure and networks to support clinical cancer research and trials. Despite this, overall funding support for academic cancer trials is very low, even with the addition of the funding sources not included in this review and referenced in Section 3.2 Data collection: sampling strategy. Strategies for encouraging and/or supporting investigators to avail of dedicated funding sources for investigator-initiated studies are required into the future.

It is worth noting that the analysis shows that current cancer research investment is Dublin-centric, a finding that may well need to be addressed by funders and other stakeholders. It should also be noted that awards can involve a network of HIs. However, for the period 2019–2022, only one is listed as the primary HI and recipient of funding, for financial and governance reasons. This may in turn skew some funding towards the larger Dublin universities.¹⁷

The results show that the research activities supported by the eight funding agencies and charities reflect the different remits and interests of these entities. With the exception of the HRB, none of the contributing funding agencies have a purely health research portfolio, while the cancer charities are the only participants with a wholly cancer-focused remit. It should also be noted that these charities, despite their dedicated cancer research strategies, will also be partly led by donor priorities when restrictions are placed on investment.

Understanding the outcome of this approach to cancer research reinforces the current cancer research strategy's proposal to support the NCCP through the NCRG to advance a more strategic and coordinated approach to cancer research in order to ensure that the full spectrum of research activity is covered, and to improve cancer patients' outcomes.

The real value of this exercise will be its repetition in the future, allowing trend analysis of Irish cancer research investment over time and national strategies.

6. Next steps



As a next step, the NCRG will use the insights from this report to consider a more comprehensive research section within the next iteration of the National Cancer Strategy, or indeed within a stand-alone National Cancer Research Strategy that could feed directly into the overarching National Cancer Strategy to guide a more strategic and coordinated approach to cancer research investment in Ireland.

The current National Cancer Strategy concludes in 2026.¹ Therefore, this review is timely in that the early phase of preparation for the succeeding strategy is now underway.

Appendices



Appendix A: Data collection template

AGENCY NAME:[illegible]

- a. Awards made between 2019 and 2022 (inclusive) only.
- b. For the purposes of this exercise, which looks at health categories and research activity type, the total value of the award is of interest, even where co-funded. However, to prevent double counting among agencies, please identify the co-funder.
- c. The overall focus, for example, capacity building, leadership enhancement, knowledge production project or programme, infrastructure enhancement, proof of concept, clinical or health system improvement, enterprise engagement, policy or regulatory evidence input, interdisciplinary/multidisciplinary enhancement, etc. Please feel free to provide your own categorisation.
- d. In order to correctly code each award it is critical that the HRCS coder has sufficient information on the proposed work to identify both the health category(s) and the research activity(s) that represent the 'centre of gravity' of the proposed work. The title of the award is NOT sufficient for this purpose.

Type of award ^c	Host institution	Lay or scientific summary/abstract ^d

AGENCY NAME:

Question	Answer
1 Do you have a specific health research portfolio?	
2 What criteria/framework if any, does your organisation use to prioritise the allocation of funding for cancer research?	
3 Where priority areas are identified, what are the key barriers (if any) to focussing investment on these areas of cancer research?	
4 Do you have any additional comments about cancer-related research investment that you wish to make?	

Appendix B: Review participants – Irish funders of cancer research

Participating organisation	Short description
1. Health Research Board	<p>The Health Research Board (HRB) is a State agency under the Department of Health (DoH). The HRB supports and funds health and social care research, provides evidence to inform policy and practice, and is the leading funder of health research in Ireland. It has a staff of 105, an annual budget of €52 million, and manages an investment portfolio of approximately €200 million. Its main areas of activity are the funding of research proposals and managing of awards, conducting evidence reviews to underpin decision-making in health, managing data collections in the areas of alcohol and drug treatment and deaths, disability, and psychiatric admissions and discharges.</p> <p>The HRB's Research Strategy and Funding Directorate (RSF) manages research funding and external grants and has an expansive remit which incorporates clinical research, population health research and health services/policy research. Through various funding mechanisms, the HRB funds people; projects and programmes; and research networks and infrastructure. The National Delegate role for the Horizon Europe (Health cluster) sits within the RSF and furthermore supports the DoH by performing the national focal point role for the EU4Health Programme.</p> <p>The HRB is the sole public funder of investigator-led trials and is the only funder in Ireland with a dedicated funding stream to support clinical trials and healthcare intervention studies, the Definitive Intervention and Feasibility Awards (DIFA). DIFA aims to achieve tangible benefits to patients, people's health and health services through support of studies evaluating a full-scale, definitive intervention of any appropriate design to provide high-quality evidence on the efficacy, effectiveness, cost and broad impact of the intervention. In order to achieve a pipeline of such studies, both definitive interventions and feasibility studies conducted in preparation for a future definitive intervention are also supported. Since its launch in 2017, a total of 45 awards have been made via the scheme to date, representing an investment by the HRB of approximately €32 million.</p>

Participating organisation	Short description
2. Science Foundation Ireland ^a	<p>Science Foundation Ireland (SFI) funds oriented basic and applied research in the areas of science, technology, engineering, and mathematics (STEM), which promotes and assists the development and competitiveness of industry, enterprise and employment in Ireland. SFI also promotes and supports the study of, education in, and engagement with STEM and promotes an awareness and understanding of the value it provides to society and in particular to the growth of the economy.</p> <p>SFI's vision is that Ireland will be a global innovation leader in scientific and engineering research for the advancement of Ireland's economy and society. Its mission is to fund excellent and impactful research and talent, and shape the future of Ireland through anticipating what is next and by widening engagement and collaboration. SFI achieves its mission by supporting a diverse portfolio of funding mechanisms, including investigator-led awards, challenge-based funding, strategic partnerships, education and public engagement projects, doctoral training programmes, and research centres.</p>
3. Irish Research Council ^a	<p>The Irish Research Council (IRC) is the key national funder of basic research across all disciplines, and is the only funder that supports basic research in the arts, humanities and social sciences. The IRC's focus is on ensuring that exceptional researchers are supported to develop their ideas across the key stages of their career: early-career research, principal investigator-led research, and networking and engagement awards.</p>
4. Enterprise Ireland	<p>Enterprise Ireland (EI) is the Irish Government's enterprise development agency. EI invests in and supports the development of Irish-owned companies on their journey to achieving greater scale and becoming global leaders in their field. This provides a platform for strong economic growth and creating and sustaining jobs in communities around the country. EI's teams in Ireland and across its network of 39 international offices help Irish companies to develop high-growth strategies and to enter new markets with innovative and sustainable solutions.</p>
5. Irish Cancer Society	<p>The Irish Cancer Society (ICS) is a community of patients, survivors, volunteers, supporters, health and social care professionals and researchers. Together they are transforming the experiences and outcomes of people affected by cancer through advocacy, support services and research.</p>

Participating organisation	Short description
6. Breakthrough Cancer Research	Breakthrough Cancer Research (BCR) is an Irish medical research charity focused on cancer. BCR works to significantly impact the number of children and adults who can survive this disease. It invests in world-class research in Ireland to impact the quality of life for people with cancer and save lives. It is particularly focused on improving outcomes for those cancers that are poorly served by current treatment options.
7. OvaCare	OvaCare, an ovarian cancer support charity, aims to give a voice to, and provide support for, all those affected by ovarian cancer in Ireland. Its mission is to improve diagnosis and education of ovarian cancer in Ireland through sharing global research and best practice and providing support and advocacy through its dedicated support network.
8. Conor Foley Neuroblastoma Cancer Research Foundation	<p>The Conor Foley Neuroblastoma Cancer Research Foundation (CFNCRF) is a not-for-profit organisation set up in memory of Conor Foley who died in 2015 from a rare form of childhood cancer, neuroblastoma (NBL). CFNCRF was established with the ultimate objective of finding a cure for NBL.</p> <p>CFNCRF'S aim is to secure continuous annual funding for NBL research in Ireland. With this funding, it aims to help develop an NBL research consortium to link with international research groups and collaborations.</p>

^a Taighde Éireann – Research Ireland was established on 1 August 2024 amalgamating the activities and functions of the Irish Research Council (IRC) and Science Foundation Ireland (SFI). It inherits the awards and investments referred to in this report that were made by SFI. Taighde Éireann – Research Ireland will support research and innovation in Ireland across all disciplines.

Appendix C: The Health Research Classification System

The tables below present an overview of the HRCS research activity and health category classifications and is taken directly from the HRCS website.²

(A) Research activity descriptions

No.	Research activity	Summary
1	Underpinning research	Research that underpins investigations into the cause, development, detection, treatment and management of diseases, conditions and ill health
2	Aetiology	Identification of determinants that are involved in the cause, risk or development of disease, conditions, and ill health
3	Prevention of disease and conditions, and promotion of well-being	Research aimed at the primary prevention of disease, conditions or ill health, or promotion of well-being
4	Detection, screening and diagnosis	Discovery, development and evaluation of diagnostic, prognostic and predictive markers and technologies
5	Development of treatments and therapeutic interventions	Discovery and development of therapeutic interventions and testing in model systems and pre-clinical settings
6	Evaluation of treatments and therapeutic interventions	Testing and evaluation of therapeutic interventions in clinical, community or applied settings
7	Management of diseases and conditions	Research into individual care needs and management of disease, conditions, or ill health
8	Health and social care services research	Research into the provision and delivery of health and social care services, health policy and studies of research design, measurements, and methodologies

(B) Health category classifications

Health category	Summary
Blood	Haematological diseases, anaemia, clotting (including thromboses and venous embolisms) and normal development and function of platelets and erythrocytes
Cancer and neoplasms	All types of neoplasms, including benign, potentially malignant, or malignant (cancer) growths. This includes leukaemia and mesothelioma.
Cardiovascular	Coronary heart disease, diseases of the vasculature and circulation including the lymphatic system, and normal development and function of the cardiovascular system
Congenital disorders	Physical abnormalities and syndromes that are not associated with a single type of disease or condition including Down's syndrome and cystic fibrosis
Ear	Deafness and normal ear development and function
Eye	Diseases of the eye and normal eye development and function
Infection	Diseases caused by pathogens, acquired immune deficiency syndrome, sexually transmitted infections and studies of infection and infectious agents
Inflammatory and immune system	Rheumatoid arthritis, connective tissue diseases, autoimmune diseases, allergies and normal development and function of the immune system
Injuries and accidents	Fractures, poisoning and burns
Mental health	Depression, schizophrenia, psychosis and personality disorders, addiction, suicide, anxiety, eating disorders, learning disabilities, autistic spectrum disorders and studies of normal psychology, cognitive function and behaviour
Metabolic and endocrine	Metabolic disorders (including diabetes) and normal metabolism and endocrine development and function. This includes all research on the pineal, thyroid, parathyroid, pituitary and adrenal glands.
Musculoskeletal	Osteoporosis, osteoarthritis, muscular and skeletal disorders and normal musculoskeletal and cartilage development and function

Health category	Summary
Neurological	Dementias, transmissible spongiform encephalopathies, Parkinson's disease, neurodegenerative diseases, Alzheimer's disease, epilepsy, multiple sclerosis and studies of the normal brain and nervous system
Oral and gastrointestinal	Inflammatory bowel disease, Crohn's disease, diseases of the mouth, teeth, oesophagus, digestive system including liver and colon, and normal oral and gastrointestinal development and function
Renal and urogenital	Kidney disease, pelvic inflammatory disease, renal and genital disorders, and normal development and function of male and female renal and urogenital system
Reproductive health and childbirth	Fertility, contraception, abortion, <i>in vitro</i> fertilisation, pregnancy, mammary gland development, menstruation and menopause, breastfeeding, antenatal care, childbirth and complications of newborns
Respiratory	Asthma, chronic obstructive pulmonary disease, respiratory diseases and normal development and function of the respiratory system
Skin	Dermatological conditions and normal skin development and function
Stroke	Includes both ischaemic stroke (caused by blood clots) and haemorrhagic stroke (caused by cerebral/intracranial haemorrhage)
Generic health relevance	<p>Research applicable to all diseases and conditions or to general health and well-being of individuals. Public health research, epidemiology and health services research that is not focused on specific conditions.</p> <p>Underpinning biological, psychosocial, economic or methodological studies that are not specific to individual diseases or conditions.</p>
Disputed aetiology and other	Conditions of unknown or disputed aetiology (such as chronic fatigue syndrome/myalgic encephalomyelitis), or research that is not of generic health relevance and not applicable to the top 19 specific health categories with specific pathological/physiological determinants.

(C) Research activity subcodes

Research activities shown in pink font received no investment during the period 2019–2022.

Research activity (RA) codes	Research activity subcodes
Underpinning research	1.1 Normal biological development and functioning 1.2 Psychological and socioeconomic process 1.3 Chemical and physical sciences 1.4 Methodologies and measurements 1.5 Resources and infrastructure (Underpinning research)
Aetiology	2.1 Biological and endogenous factors 2.2 Factors relating to physical environment 2.3 Psychological, social, and economic factors 2.4 Surveillance and distribution 2.5 Research design and methodologies (Aetiology) 2.6 Resources and infrastructure (Aetiology)
Prevention of disease and conditions, and promotion of well-being	3.1 Primary prevention interventions to modify behaviours or promote well-being 3.2 Interventions to alter physical and biological environmental risks 3.3 Nutrition and chemoprevention 3.4 Vaccines 3.5 Resources and infrastructure (Prevention of disease and conditions, and promotion of well-being)
Detection, screening and diagnosis	4.1 Discovery and pre-clinical testing of markers and technologies 4.2 Evaluation of markers and technologies 4.3 Influences and impact 4.4 Population screening 4.5 Resources and infrastructure (Detection, screening and diagnosis)

Research activity (RA) codes	Research activity subcodes
Development of treatments and therapeutic interventions	5.1 Pharmaceuticals 5.2 Cellular and gene therapies 5.3 Medical devices 5.4 Surgery 5.5 Radiotherapy and other non-invasive therapies 5.6 Psychological and behavioural 5.7 Physical 5.8 Complementary 5.9 Resources and infrastructure (Development of treatments and therapeutic interventions)
Evaluation of treatments and therapeutic interventions	6.1 Pharmaceuticals 6.2 Cellular and gene therapies 6.3 Medical devices 6.4 Surgery 6.5 Radiotherapy and other non-invasive therapies 6.6 Psychological and behavioural 6.7 Physical 6.8 Complementary 6.9 Resources and infrastructure (Evaluation of treatments and therapeutic interventions)
Management of diseases and conditions	7.1 Individual care needs 7.2 End-of-life care 7.3 Management and decision-making 7.4 Resources and infrastructure (Management of diseases and conditions)
Health and social care services research	8.1 Organisation and delivery of services 8.2 Health and welfare economics 8.3 Policy, ethics and research governance 8.4 Research design and methodologies (Health and social care services research) 8.5 Resources and infrastructure (Health and social care services research)

Appendix D: Full list of host institutions

	Host institutions
1	Royal College of Surgeons in Ireland University of Medicine and Health Sciences
2	University College Dublin
3	Trinity College Dublin
4	University College Cork
5	Cancer Trials Ireland
6	University of Galway
7	Dublin City University
8	Technological University Dublin
9	University of Limerick
10	Tyndall National Institute
11	Maynooth University
12	The Merrion Fertility Project
13	Children’s Health Ireland
14	Munster Technological University
15	Dublin Dental University Hospital
16	Cork University Hospital
17	National Cancer Registry Ireland
18	Letterkenny University Hospital
19	Irish Cancer Society
20	Southeast Technological University
21	Atlantic Technological University
22	Technological University of the Shannon
23	Irish Association of Cancer Research
24	Beaumont Hospital
25	Bispebjerg Hospital
26	Mater Private Hospital
27	Institute of Art and Design
28	The Economic and Social Research Institute
29	Kantar Millward Brown Ireland
30	Irish Network for Gynaecological Oncology

Appendix E: Full list of awards

Funding instrument objective	Funding mechanism/award (as assigned by participating funder)
<p>Capacity building and leadership enhancement</p> <p>Increase capacity, capability and expertise of Irish researchers in a particular area of health research, either in academia, the healthcare system, the enterprise sector, or in policy bodies.</p>	<ul style="list-style-type: none"> • Postgraduate Scholarship (IRC) • Musgrave Cancer Research PhD Scholarship (BCR) • PhD Scholarships (IRC) • IRC Enterprise Partnership Scheme (BCR) • SFI Industry RD&I Fellowship Programme (SFI) • Postdoctoral Fellowship (IRC) • Clinical Fellowship HRB Cluster (BCR) • Health Research Career Development (HRB) • SFI-IRC Pathway Programme (SFI) • President of Ireland Future Research Leaders Programmes (SFI) • Capacity building (ICS) • Starting Investigator Research Award (SFI) • BCR Cancer Research PhD Scholarship 2020 (BCR) • Enterprise engagement (IRC) • IRC Enterprise Partnership Scheme with BCR (IRC) • Summer Scholarship (BCR) • IRC Enterprise Partnership Scheme Postdoctoral with BCR (BCR) • IRC Enterprise Partnership Scheme with BCR (BCR) • Public and Patient Involvement (PPI) (ICS) • Breakthrough Education Grant (BCR) • Strategic Cancer Chair Co-Fund (BCR)

Funding instrument objective	Funding mechanism/award (as assigned by participating funder)
<p>Projects and programmes, health system partnerships</p> <p>Expand and advance knowledge and understanding in a particular area of health or disease in academia, the healthcare system, the enterprise sector or in policy bodies.</p>	<ul style="list-style-type: none"> • Capacity building (HRB) • Health System Improvement (ICS) • Project (CFNCRF) • Patient Engagement (ICS) • ICS Survivorship Grant with Breakthrough leveraged funding (BCR) • CIRF Research Fellow (Breakthrough and 5 For the Fight) (BCR) • Interdisciplinary/multidisciplinary enhancement (HRB) • Pilot study/knowledge production/policy or regulatory evidence input (ICS) • Knowledge Translation (HRB) • Breakthrough Project Grant (BCR) • SFI Strategic Partnership Programme (SFI) • Frontiers for the Future (SFI) • Knowledge production (ICS) • Fundamental PI-led Research (IRC) • Engagement (ICS) • Clinical or Health System Improvement (ICS) • New Foundations (IRC) • Research Networking (ICS) • Clinical or Health System Improvement/Knowledge Production (ICS) • Commissioned Research Study for Ovarian Cancer Consortium (BCR) • Knowledge production/policy or regulatory evidence input (ICS) • Knowledge production/capacity building (ICS) • Capacity building/knowledge production (ICS) • Strategic Cancer Chair Co-Fund (BCR) • HRCI-HRB Joint Funding Scheme 2022 (BCR) • Research programme/information gathering (ICS) • Policy or regulatory evidence input (ICS) • Pilot study/knowledge production (ICS) • Pilot study/knowledge production/policy or regulatory evidence input (ICS) • HRCI-HRB Joint Funding Scheme 2020 (BCR)

Funding instrument objective	Funding mechanism/award (as assigned by participating funder)
<p>Interventional and commercialisation studies</p> <p>Advance testing, uptake or commercialisation of a technological innovation, product or service that benefits people's health or healthcare.</p>	<ul style="list-style-type: none"> • Clinical trials (ICS) • Clinical interventions (HRB) • Clinical trials/capacity building (ICS) • Applied research-technology/innovation development and commercialisation (EI) • Proof of concept/clinical or health system improvement (ICS) • COALESCE (IRC) • Proof of concept/pilot study (ICS)
<p>Infrastructure, platforms and networks</p> <p>Provides the infrastructure, networks and platforms required to underpin/support a particular area of health research.</p>	<ul style="list-style-type: none"> • Infrastructure and network development (HRB) • Bursary (OvaCare) • Equipment and infrastructure (BCR) • AllCaN (BCR) • Strategic Cancer Chair Co-Fund (BCR)

Appendix F: Full list of cancer types

Cancer by site	Number of awards reported in these areas
Multiple cancer sites	141
Breast	33
Colorectal	14
Oesophageal	17
Lung	15
Brain	8
Poor-prognosis cancers	9
Multiple myeloma	12
Ovarian	19
Melanoma	8
Sarcoma	3
Prostate	9
Leukaemia	5
Uveal melanoma	7
Oral	4
Glioblastoma	3
Blood	8
Gynaecological	5
Renal, liver, colorectal	1
Prostate and breast	1
Hereditary	3
Mouth	1
Colorectal and ovarian	1
Pancreatic	7
Breast and brain	1
Testicular	2
Neuroblastoma	3

Cancer by site	Number of awards reported in these areas
Breast and gynaecological	2
Gastrointestinal	1
Lymphoma	3
Hepatobiliary	1
Head and neck	4
Bowel	2
Genitourinary	1
Breast and lung	1
Bone metastases	1
Colon	1
Gynaecological and breast	1
Paediatric brain	2
Endometrial	1
Breast, lung, gynaecological	1
Oesophageal and gastric	2
Cervical	1
Gastrointestinal and oesophageal	1
Paediatric	1
Hard-to-treat cancers	1
Neuroendocrine tumours	1
Oesophageal and other cancer sites	1
Blood and lymphatic	1
Oesophageal, head and neck	1
Breast, colorectal, melanoma and genitourinary	1
Melanoma and non-melanoma skin cancers	1
Breast and genitourinary	1
Breast, bowel, cervical	1
Ovarian, pancreatic, colon, rectum, appendix	2
Lynch syndrome	1
N/A	18

Appendix G: Selected examples of investment to date

Health Research Board

Health Research Board (HRB) investment in cancer clinical trials infrastructure

The HRB has built on its long-standing investment in cancer clinical trials in Ireland by further supporting/funding the National Cancer Clinical Trials Network hosted by Cancer Trials Ireland, and six cancer clinical trials groups across Ireland. This latest round of investment in cancer clinical trials infrastructure was made in 2021, with a total investment of €22 million to be made over a 5-year period. It builds on the HRB's investment in cancer clinical trials in Ireland since 2007, with more than €70 million invested.

The aim of this current HRB investment in the cancer clinical trials infrastructure system is to improve and enhance access for patients to high-quality clinical trials and improve overall health outcomes. The investment in the cancer clinical trials groups also includes for the first time Ireland's first childhood cancer and radiation therapy trial groups.

The six cancer clinical trials groups are:

1. Children's Health Ireland, led by Professor Owen Smith and hosted at University College Dublin
2. Beaumont Hospital – Royal College of Surgeons in Ireland (RCSI), led by Professor Patrick Morris and hosted at RCSI
3. Irish Research Radiation Oncology Group, led by Dr Sinead Brennan and hosted at Trinity College Dublin
4. UCC Cancer Trials Cluster, led by Professor Roisin Connolly and hosted at University College Cork
5. Ireland East Hospital Group Cancer Trials Cluster, led by Professor Catherine Kelly and hosted at University College Dublin
6. Trinity Academic Cancer Trials Cluster, led by Professor Maeve Lowry and hosted at Trinity College Dublin

HRB grants were also awarded to the Saolta University Healthcare Group and to University Hospital Limerick to enable and enhance their cancer clinical trials capacity and capability.

The investment in infrastructure in this area is supporting the people working in delivering cancer clinical trials, with large numbers of clinical research nurses, data managers, trial coordinators, regulatory and quality controllers, statisticians and methodologists among others supported through the HRB investment. These are all critical roles in the delivery of cancer trials in Ireland.

The cancer clinical trials groups are responsible for running and conducting cancer clinical trials across a diverse range of cancer disease areas and targeting different populations. The investment is resulting in an increased diversity and volume of trials opening in Ireland, with all groups active in opening trials and recruiting patients to trials. Cancer Trials Ireland (CTI) has reported that in 2023, 501 patients were recruited into interventional trials, with a further 1,772 recruited to various clinical studies. The National Cancer Clinical Trials Network within CTI is instrumental in bringing international cancer trials to Ireland, facilitating the coordination and legal requirements to open these large clinical trials in Ireland and acting as the national sponsor.

CTI links in directly with the cancer trials groups through their disease-specific subgroups (DSSGs), which are often chaired by the cancer trials groups' Principal Investigators, and all members participate. This close interaction and coordination through CTI enables trials to be efficiently coordinated and opened across multiple sites, with the recent SHAMROCK study in breast cancer an example of this, with sites in Galway, Dublin (St Vincent's University Hospital and Beaumont Hospital), Cork and Limerick.

Investment in the infrastructures of cancer trial delivery through supporting key roles and a coordinating national network is having positive effects on the cancer clinical trials system and, ultimately, is leading to better outcomes for patients.

Science Foundation Ireland

Understanding and targeting epi-genomic and epi-transcriptomic changes in breast cancer to brain metastasis

RCSI University of Medicine and Health Science

SFI is currently funding three allied research awards in the Endocrine Oncology Research Group at RCSI, each with a complementary focus on breast cancer to brain metastasis. Professor Leonie Young and Professor Arnold Hill are leading an overarching programme to deliver new diagnostic and therapeutic strategies in this area. Much prior research has focused on identifying and understanding core deoxyribonucleic acid (DNA) mutations, but this has not been successful in improving diagnosis or clinical outcomes for patients with breast cancer to brain metastasis. Epigenetic changes to DNA and ribonucleic acid (RNA) (i.e. not involving the sequence itself) are less well studied and understood in this context. The research in this project uses tumour material, liquid biopsies and disease models to obtain detailed insights into the overall epi-genomic/transcriptomic changes occurring during breast cancer to brain metastasis. The programme activities have also fed into Organisation of European Cancer Institutes (OECI) accreditation for the Beaumont RCSI Cancer Centre, supported an ongoing breast cancer proteomics and molecular heterogeneity clinical trial, and has led to the establishment of a spinout company to develop targeted treatments.

In an allied award, Dr Damir Vareslija is applying state-of-the-art approaches to understand which epigenetic changes most upregulate the overall 'metastatic potential' of breast cancer cells, and how much the local microenvironment contributes to this. Dr Daniela

Ottaviani has also been awarded an SFI-IRC Pathway award to focus on CDK12, a target identified from previous studies of primary and metastatic patient tumours undertaken in the group.

Breast cancer to brain metastasis represents a major burden on the healthcare system. It occurs in 10–30% of patients with advanced breast cancer, and their overall prognosis is poor. Treatment costs also more than double when breast cancer metastasises. Diagnostic tests and therapeutic strategies that can predict metastasis risk and inform clinical management could therefore have a major societal and economic impact.

Enterprise Ireland

eAltra – Dialogue system to improve cancer patient care

Exchanging routine clinical information with patients is an essential but challenging and time-consuming process, which is a key performance indicator of quality cancer care in most global healthcare systems. Engaging with patients through assessments such as patient-reported outcome measures, holistic needs assessments, patient concerns inventories, and delivering information from trusted sources on symptom management contribute significantly to improving health-related quality of life and health outcomes. Unfortunately, in most health systems there simply is not enough time or nursing staff available to carry out these activities to a level that achieves these improvements for patients.

eAltra is a patient-facing, sophisticated conversational artificial intelligence (CAI), custom designed and built for clinical information exchange with patients. The system can adapt its interaction style to suit the patient, using speech, text and rich media to most efficiently communicate with users with differing levels of (health) literacy, of different demographics, and at different stages of their journey.

eAltra has been developed as part of an 18-month Enterprise Ireland Commercialisation Fund award, with researchers based in the ADAPT Centre in Trinity College Dublin.

eAltra is currently being trialled with patients in the Oncology Day Ward in St James's Hospital and the Haematology Day Ward in Tallaght University Hospital in order to evaluate the usability and equivalence of the platform with nurse-led assessments. Patients are sent links to the eAltra platform 24 hours in advance of their systemic anti-cancer treatment (SACT) appointment and are directed to use the platform to complete their assessments. Preliminary results demonstrate full equivalence between information gathered using eAltra and nurse-led assessment.

Health economic benefits identified in the trial include significant reductions in nursing time and administration for associated tasks, improved patient throughput, efficiencies in hospital pharmacy time and greater utilisation of patients' time while they attend the hospital.

The Irish Cancer Society

Dr Janice Richmond – Cancer Research Nurse Award

A community-based advanced nurse practitioner-led integrated oncology care model for adults receiving oral anticancer medication

Mary Grace Kelly (clinical nurse manager 2) was a co-investigator in this study and continues to work in the oral anti-cancer clinics.

Dr Janice Richmond is an advanced nurse practitioner (ANP) in oncology focusing on clinical research and is investigating how oncology nurses can introduce evidence-based processes, interventions, or initiatives to help improve the quality of clinical care for patients.

The aim of this study was to test if patients who take oral anti-cancer tablets can be assessed by an ANP, in a community location and/or using virtual reviews, instead of having to attend the oncology day ward. The goal of the clinic was to deliver the same or improved level of care to the patient, while addressing issues of hospital overcrowding. This would mean that the cancer unit capacity would be increased to treat patients with treatments that must be given in the hospital.

The results of the pilot have been overwhelmingly positive. Interviews with patients and healthcare professionals showed enthusiasm for a change in how care is delivered to these patients. The waiting time for patients who had appointments in the pilot have been reduced significantly.

Patients expressed satisfaction with the new ANP-led model of care and their significantly shorter appointment time (i.e. no waiting) and noted that the clinic appointment system was “very efficient”. They wondered why it had “never been done before”.

Continuity of care and the option of virtual reviews for stable/well patients was also identified as being important to patients, and this is now standard practice. The ANP-led model of care has created more capacity for patients requiring acute care. An audit of the ANP prescribing of anti-cancer treatment showed that this is safe practice.

The pilot demonstrated a safe and effective new model of care that could be rolled out nationally.

Breakthrough Cancer Research

Ireland has one of the highest incidences of uveal melanoma (UM) globally. UM is an eye cancer, but up to 50% of patients develop metastatic UM (MUM) in the liver. MUM prognosis is poor, with approximately 8% of patients surviving beyond 2 years. Currently, there are no effective therapies for MUM.

Breakthrough Cancer Research (BCR) focuses its research on unmet needs and particularly on poorer prognosis or low-survival cancers. Between 2019 and 2024 BCR supported UM research in UCD through two BCR project grants, and one postgraduate and two postdoctoral awards through the Irish Research Council Enterprise Partnership Scheme, with BCR as the enterprise partner.

This research support enabled Professor Breandán Kennedy's group to start translational UM/MUM. Professor Kennedy's group have established and strengthened clinical connections with the Royal Victoria Eye and Ear Hospital, St Vincent's University Hospital, and University Hospital Waterford – all of which have been collecting primary and MUM patient bloods and tissues for research. The group have identified novel therapeutic targets for MUM. Increased levels of cysteinyl/leukotriene (CysLT) receptors in UM tumours have been shown to be associated with reduced patient survival. In pre-clinical models, the group have shown that drugs targeting CysLT receptors were seen to affect UM cell growth and other hallmarks of cancer.

This partnership has resulted in broad impacts, including establishing a public patient involvement (PPI) group, outreach through a public campaign to increase awareness of UM and MUM: "Open Your Eyes to UM"¹⁸ and a public Uveal Melanoma Awareness Month Webinar.

This research has resulted in 7 scientific publications and more than 10 research awards, including the International Poster Prize at Pharmacology 2022 in Liverpool. Importantly, the UM patients commented on how motivating it was for them to know that such research was conducted in Ireland and that they had a meaningful patient voice in research. The funding has also supported the career development of several early-stage cancer researchers, including Dr Kayleigh Slater, Clinical Scientific Expert, Novartis; Mr Kaelin Smith, who is undertaking a PhD in cancer in Germany; Dr Valentina Tonelotto, Assistant Professor, UCD; and Ms Marzia Pendino, who will shortly submit and defend her PhD.

The Conor Foley Neuroblastoma Cancer Research Foundation

Development of mRNA vaccines for children with high-risk neuroblastoma

Through the HRCI-HRB Joint Funding Scheme, the Conor Foley Neuroblastoma Cancer Research Foundation (CFNCRF) supports a research project focused on the development of mRNA vaccines for children with high-risk neuroblastoma. The research team is led by Dr Olga Piskareva (RCSI, Ireland) who partnered with Dr Miguel Segura (Vall d'Hebron Institut de Recerca (VHIR), Spain) and Professor Helen McCarthy (Queen's University Belfast, Northern Ireland) to develop new non-viral gene therapy for patients with neuroblastoma. Immunotherapies that teach the immune system to combat the tumour are gaining increasing attention in treating cancer. One of these therapies is based on nucleic acid vaccines.

These vaccines generate fewer side effects and offer long-term protection against recurrence compared to conventional chemotherapies. While this project is at its early stage, we expect that the research outputs will create an opportunity to offer neuroblastoma patients in Ireland first-hand access to new active therapeutic agents and clinical trials in the future.

OvaCare

thisisGO.ie – a platform for ovarian cancer patients and their families

Having seen the personalised platform the Living Well Cancer Programme had created for cervical cancer (thisisGO.ie), OvaCare decided to invest in thisisGO.ie to develop a similar platform for ovarian cancer patients and their families. The complexity of developing a personalised pathway was an enormous and expensive task and not something OvaCare had the resources to embark on alone.

OvaCare members and board members had the opportunity to partake in focus groups to develop the content for the site, and also had the opportunity to review the platform before it went live. Members are asked regularly to give feedback on the platform so that it can be kept up to date. This one-stop shop for accurate and reliable information for ovarian cancer patients and their partners has been an invaluable tool for the ovarian cancer community in Ireland. OvaCare is grateful to all our members who worked with the thisisGO team to deliver the content that patients and their partners want.

Irish Research Council

Tríona Ní Chonghaile, RCSI

Dynamics of ageing and cancer: a multi-functional study into apoptosis, metabolism and the microenvironment

Irish Research Laureate Award

Age is the biggest risk factor for cancer, and yet the dynamic effect age has on tumour biology and treatment responses remains poorly understood. With an ageing population, this will become an even more pressing societal challenge in the coming years. The Irish Research Council awarded Dr Tríona Ní Chonghaile €599,817 for a 4-year Consolidator Laureate Award in 2022 to investigate how ageing induces biological differences in the tumour cell and the tumour microenvironment, as well as to examine the ways in which it alters them. By taking a novel interdisciplinary approach, the project's primary aim is to lead to new horizons in age-specific personalised targeted therapy for multiple myeloma (MM) by revealing novel biology of ageing on the apoptotic and metabolic sensitivity of the tumour cell and the microenvironment.

This project is beginning to generate important academic findings, including the 2023 *Chemical Communications* article, "First-in-class metallo-PROTAC as an effective degrader of select Pt-binding proteins".

Dr Triona Ní Chonghaile's research on a new drug combination for the treatment of MM has also received a lot of media attention to date, including articles in the *Irish Independent*, *Silicon Republic*, *Science Daily*, *Medical Xpress*, and the *Irish Medical Times*. Her research was also featured in a documentary for Breakthrough Cancer Research and in a new MM patient booklet.

The findings of this project will have broad implications for cancer treatment and could lead to enhanced survival of elderly patients.

References

1. Department of Health (2017) National Cancer Strategy 2017 – 2026. Dublin. Available from: www.gov.ie/en/publication/a89819-national-cancer-strategy-2017-2026/
2. Health Research Classification System available from: <https://hrcsonline.net/>
3. Health Research Board (HRB); Science Foundation Ireland (SFI); Irish Research Council; Enterprise Ireland (EI); Irish Cancer Society (ICS); Breakthrough Cancer Research (BCR); OvaCare; Conor Foley Neuroblastoma Cancer Research Foundation (CFNCRF)
4. A separate funding organisation that contributes a pre-agreed percentage of the total value of an award.
5. Hiney M (2018) *Health Research in Ireland. A study of activity from 2011 to 2015 using the Health Research Classification System*. Dublin. Health Research Board. Available from: <https://www.hrb.ie/publication/health-research-in-ireland-a-study-of-activity-from-2011-to-2015-using-the-health-research-classification-system/>
6. Resources and infrastructure (subcode 6.9 within 'Evaluation of treatments and therapeutic interventions') main inclusion criteria: provision and distribution of resources related to clinical and applied therapeutic interventions and infrastructure support for clinical and applied research networks and trials, consortia and centres.
7. 'Pharmaceuticals' (subcode 5.1 within 'Development of treatments and therapeutic interventions') main inclusion criteria: identification and development of pharmaceutical small molecules, therapeutic vaccines, antibodies and hormones, including drug screening and development of delivery systems; mechanism of action including side effects and drug resistance; pharmacogenetics, prediction of genetic variation and responses to drugs; testing in *in vitro* and *in vivo* model systems.
8. 'Biological and endogenous factors' (subcode 2.1 within 'Aetiology') main inclusion criteria: identification and characterisation of endogenous factors known or suspected to be involved in the cause, risk or development of disease, conditions or ill health, including genes and gene products, molecular, cellular and physiological structures and functions; biological factors linked to ethnicity, age, gender, pregnancy and body weight; endogenous biological factors or pathways involved in responses to infection or damage by external factors; metastases, degenerative processes, regeneration and repair; complications, reoccurrence and secondary conditions; bioinformatics and structural studies; development and characterisation of models.

9. 'Discovery and pre-clinical testing of markers and technologies' (subcode 4.1 within 'Detection, screening and diagnosis') main inclusion criteria: discovery, development and pre-clinical testing of novel markers (that may be derived from patient samples) and technologies for use in detection, diagnosis, prediction, prognosis and monitoring including: biological and psychological markers; diagnostic and monitoring devices, imaging, scanning, predictive and diagnostic tests; development and characterisation of models; diagnostic measures and methodologies.
10. 'Pharmaceuticals' (subcode 6.1 within 'Evaluation of treatments and therapeutic interventions') main inclusion criteria: clinical application and evaluation of pharmaceutical small molecules, therapeutic vaccines, antibodies and hormones in humans including: small-scale settings and pilot studies; phase I, II, III and IV trials; assessing sensitivity, efficacy, specificity, relapse, survival, therapeutic value, pharmacokinetics, reproducibility and safety; studies monitoring response, outcome, drug resistance and side effects.
11. A host institution (HI) is a research performing organisation that is approved for the purpose of receiving and administering grant funding and is responsible for compliance with all general and specific terms and conditions of awards.
12. This total includes a category of not applicable N/A.
13. Note: philanthropic investment of approximately €6 million from Cancer Trials Ireland, the leading charity funding investigator-led cancer trials in Ireland, was not provided in time for this exercise.
14. This includes certain combinations, e.g. blood and lymphatic cancers as well as a category for not applicable (N/A).
15. McIntosh *et al* (2023) Global funding for cancer research between 2016 and 2020: a content analysis of public and philanthropic investments. *Lancet Oncol* 2023; 24: 636–45
16. National Cancer Control Programme (2022). *A Framework for the Care and Support of Adolescent and Young Adults (AYA) with Cancer in Ireland 2021–2026*. Dublin: National Cancer Control Programme.
17. In those cases, the primary HI will redistribute funding across the other participating HIs.
18. Further information about the public campaign is available from:
<https://breakthroughcancerresearch.ie/news/join-the-open-your-eyes-to-um-campaign/>

