Key drivers of funding trends for cancer research 2012–2020: Final Report

Cancer Australia

August 2024

nous

Statement of Acknowledgement

Cancer Australia acknowledges Aboriginal and Torres Strait Islander people as the Traditional Custodians of Country throughout Australia. We pay our respects to Elders, past and present. We celebrate the ongoing connections of Aboriginal and Torres Strait Islander peoples to Country, culture, community, family and tradition and recognise these as integral to health, healing and wellbeing.
Cancer Australia acknowledges great diversity among Aboriginal and Torres Strait Islander peoples, and the contribution of the many voices, knowledge systems and experiences that guide all efforts to create a culturally safe and responsive cancer system that is equitable to all.

Key drivers of funding trends for cancer research 2012-2020: Final Report was commissioned by:
Cancer Australia
Locked Bag 3 Strawberry Hills NSW 2012 Australia
Tel: +61 2 9357 9400 Fax: +61 2 9357 9477
canceraustralia.gov.au
© Cancer Australia 2024.

ISBN Online: 978-1-7636672-0-4

Recommended citation
Nous Group, 2024. Key drivers of funding trends for cancer research 2012-2020. Final report commissioned by Cancer Australia, Surry Hills, NSW.
Key drivers of funding trends for cancer research 2012-2020 can be downloaded from the Cancer Australia website: canceraustralia.gov.au.

Copyright statements

Paper-based publications
This work is copyright. You may reproduce the whole or part of this work in unaltered form for your own personal use or, if you are part of an organisation, for internal use within your organisation, but only if you or your organisation do not use the reproduction for any commercial purpose and retain this copyright notice and all disclaimer notices as part of that reproduction. Apart from rights to use as permitted by the Copyright Act 1968 or allowed by this copyright notice, all other rights are reserved and you are not allowed to reproduce the whole or any part of this work in any way (electronic or otherwise) without first being given the specific written permission from Cancer Australia to do so. Requests and inquiries concerning reproduction and rights are to be sent to the Publications and Copyright contact officer, Cancer Australia, Locked Bag 3, Strawberry Hills, NSW 2012.

Internet sites
This work is copyright. You may download, display, print and reproduce the whole or part of this work in unaltered form for your own personal use or, if you are part of an organisation, for internal use within your organisation, but only if you or your organisation do not use the reproduction for any commercial purpose and retain this copyright notice and all disclaimer notices as part of that reproduction. Apart from rights to use as permitted by the Copyright Act 1968 or allowed by this copyright notice, all other rights are reserved and you are not allowed to reproduce the whole or any part of this work in any way (electronic or otherwise) without first being given the specific written permission from Cancer Australia to do so. Requests and inquiries concerning reproduction and rights are to be sent to the Publications and Copyright contact officer, Cancer Australia,
Locked Bag 3, Strawberry Hills, NSW 2012.

Disclaimer
Cancer Australia does not accept any liability for any injury, loss or damage incurred by use of or reliance on the information. Cancer Australia develops material based on the best available evidence, however it cannot guarantee and assumes no legal liability or responsibility for the currency or completeness of the information.

Nous Group acknowledges Aboriginal and Torres Strait Islander peoples as the First Australians and the Traditional Custodians of country throughout Australia. We pay our respect to Elders past, present and emerging, who maintain their culture, country and spiritual connection to the land, sea and community.

This artwork was developed by Marcus Lee Design to reflect Nous Group's Reconciliation Action Plan and our aspirations for respectful and productive engagement with Aboriginal and Torres Strait Islander peoples and communities.

Disclaimer:

*Nous Group (**Nous**) has prepared this report for the benefit of Cancer Australia (the **Client**).*

The report should not be used or relied upon for any purpose other than as an expression of the conclusions and recommendations of Nous to the Client as to the matters within the scope of the report. Nous and its officers and employees expressly disclaim any liability to any person other than the Client who relies or purports to rely on the report for any other purpose.

Nous has prepared the report with care and diligence. The conclusions and recommendations given by Nous in the report are given in good faith and in the reasonable belief that they are correct and not misleading. The report has been prepared by Nous based on information provided by the Client and by other persons. Nous has relied on that information and has not independently verified or audited that information.

Contents

Executive summary 1
Summary of key findings 1
1 Background 3
Purpose of this report 3
2 Methodology 4
Key research questions 4
Conceptual framework 4
Desktop review 5
Stakeholder consultation 7
Scope and limitations 8
3 Key findings 9
3.1 Increased total funding for cancer research 10
Key Findings 10
Overview of key drivers 10
3.2 Increased co-funded research 13
Key Findings 13
Overview of key drivers 13
3.3 Increased proportional funding for research in Early Detection, Diagnosis and Prognosis 15
Key Findings 15
Overview of key drivers 15
3.4 Increased proportional funding for research in Treatment 18
Key Findings 18
Overview of key drivers 18
3.5 Consistently low proportional funding for Prevention 20
Key Findings 20
Overview of key drivers 20
3.6 Increasing funding for Prevention 22
Key Findings 22
Overview of key drivers 22
3.7 Funding across tumour types 24
Key Findings 24
Overview of key drivers 24
Commentary on specific tumour types 27
3.8 Increased funding for clinical trials 34
Key Findings 34
Overview of key drivers 34
3.9 Considerations for cancer research funding and future audits 36
Key Findings 36
Stakeholder perspectives 36
4 Appendices 39
5 References 51

Executive summary

Understanding the national landscape of cancer research funding is essential to inform future strategic investments and improve national cancer control. *Cancer Research in Australia: an overview of funding for cancer research projects and programs in Australia 2012 to 2020* (the Audit) is Cancer Australia's third National Audit of cancer research funding in Australia. The Audit outlines national patterns of funding provided directly to cancer research projects and programs, for the years 2012–2020.

Cancer Australia engaged Nous Group (Nous) to undertake analysis to better understand the political, economic, social, and technological drivers of the research funding patterns identified in the Audit. Specifically, the analysis focused on drivers of overall cancer research funding, co-funded research, proportional funding for research to the Common Scientific Outline (CSO) categories, and funding to tumour specific research and clinical trials. Additionally, considerations for future audits and national cancer research funding were explored.

Nous conducted the project between June 2023-October 2023 which involved analysis of over 200 documents as part of a desktop review and consultation with all organisations that contributed data to the Audit.

Summary of key findings

Overall, findings demonstrate a complex interrelationship between drivers and how they may have impacted funding for cancer research in the Audit.

There were three key drivers that were confidently linked to **increased total funding for cancer research in the Audit**. Increasing cancer incidence and projected burden meant more funding was provided for cancer research because of the increasing burden of cancer in Australia. Additionally, the Medical Research Future Fund (MRFF) targeted prioritised funding for cancer research. The NHMRC Investigator Grant scheme was a new grant scheme that began in 2018-2019 and was included in the Audit. Other drivers with lower confidence included scientific advancement and treatment breakthroughs, and celebrity advocacy.

There were two key drivers that were moderately linked to the **increased co-funded research in the Audit.** Funding schemes for international clinical trial collaborations through the MRFF International Clinical Trial Collaborations grant and NHMRC-EU Collaborative Research Grant Scheme provided additional targeted funding schemes designed to increase Australian collaboration in international clinical trials. Additionally, there was an increased number of partnerships and collaborations to conduct more impactful research, including partnerships to conduct clinical trials in rare cancers. Other drivers with lower confidence may have included an increased number of philanthropic partners providing funding for cancer research. Stakeholders consulted held differing views on the role of philanthropy.

There was one key driver that was confidently linked to **increased proportional funding for Early Detection, Diagnosis and Prognosis (CSO4) in the Audit**. This was increased funding for genomics research, a breakthrough technology that aimed to deliver better testing and diagnosis for cancer. Additionally, other drivers may have included increased funding for new melanoma screening technology and increased funding for lung cancer screening trials. Stakeholders consulted agreed with these drivers.

There were two key drivers that were confidently linked to **increased proportional funding for Treatment (CSO5) in the Audit.** The MRFF, particularly funding schemes like the Rare Cancers Rare Diseases Unmet Need Grant, Reproductive Cancers Grant, and the Australian Brain Cancer Mission, targeted funding for treatments in cancer research. Treatment breakthroughs in immunotherapy and venetoclax increased funding because organisations attempted to reduce the burden of cancer by testing promising new treatments.

The key driver that was moderately linked to **consistently low funding for Prevention (CSO3) in the Audit** was behavioural risk factors because of the difficulty conducting high-quality research on behaviour change, particularly for a condition like cancer. There was also a limited financial gain from Prevention for behavioural risk factors, which may have disincentivised researchers from pursuing this research. Most organisations agreed with behavioural risk factors and expanded on the difficulties of conducting Prevention research.

There were three key drivers identified that may **increase funding for cancer prevention research**. More advocacy through celebrities, public awareness campaigns, and organisations may increase funding through increased donations and political influence. Collaboration across health conditions may enable researchers to conduct high-quality research and increase opportunities to influence and partner with

funding organisations to create targeted funding schemes. Targeting non-behavioural risk factors may increase funding because they are easier to implement and have greater chances of success, which is more appealing for government investment.

One key driver was confidently linked to **increased funding across tumour types in the Audit**. This was government priorities and targeted funding schemes because the Australian Government prioritised funding towards tumour types that had poorer outcomes, in line with funding priorities based on disease burden. Other drivers may have included differences in cancer incidence, mortality, burden, and survival; scientific advancement and treatment breakthroughs; celebrity advocacy; foundation advocacy; social stigma; and lack of survivors for rare cancers. The combinations of these key drivers affected tumour types differently. These drivers explained why research funding increased for brain cancer, haematological cancers, melanoma, ovarian cancer, lung cancer and mesothelioma and pancreatic cancer. These drivers also provided insight into why funding for colorectal cancer and prostate cancer fluctuated across triennia and why funding for other tumour types did not increase. Stakeholders consulted held mixed views on the role of celebrity and foundation advocacy as key drivers.

The key driver of **increased funding for clinical trials in the Audit** was the MRFF (particularly the Clinical Trials Activity initiative), which targeted funding for treatments in cancer research that were tested in clinical trials. Other drivers may have included treatment breakthroughs and funding schemes for international clinical trial collaborations through the MRFF International Clinical Trial Collaborations grant and NHMRC-EU Collaborative Research Grant Scheme.

There are several considerations for cancer research funding and future Audits.

The desktop review identified two preliminary considerations. The first being that further investment in funding schemes for international collaborations may increase co-funding and international funding. Secondly, future audits could collect and report additional cancer research trends by key population demographics.

Stakeholders emphasised increasing funding for cancer research with less political and structural determinants, overarching strategies to guide research funding, the importance of strengthening data and equity in research investment, the value of targeted research investment, and a greater focus on research collaborations.

The findings from this report can inform future national cancer research funding decisions and guide Cancer Australia, other Australian Government organisations, and the wider cancer research funding community in making impactful investments in cancer research.

1 Background

Cancer Research in Australia: an overview of funding for cancer research projects and programs in Australia 2012 to 2020 (the Audit) is Cancer Australia's third National Audit of cancer research funding in Australia.[1] The Audit outlines national patterns of funding provided to cancer research projects and programs, for the years 2012–2020, allowing for trend analysis over six triennia covering the period 2003–2020. It describes research investment versus burden of disease, investment across the cancer research continuum and to specific tumour types. It also describes the extent of research collaborations and the sources of funding to cancer research in Australia.

While the Audit describes national patterns of funding for cancer research, it does not describe the drivers behind the research investment patterns. An understanding of key drivers of cancer research funding can inform future research priorities in Australia and guide Cancer Australia, other Australian Government organisations, and the wider cancer research funding community in making impactful investments in research.

Cancer Australia engaged Nous Group (Nous) to undertake a project to better understand the social, political, regulatory, and other contextual drivers of the research funding patterns identified in the Audit. Nous conducted this work from June 2023 to October 2023, which included:

- a rapid desktop review of grey literature and peer reviewed documents (202 documents) and development of a discussion paper that summarised the findings from the desktop review.
- an online survey provided to all organisations that contributed data to the Audit, including government organisations, cancer councils, universities, and philanthropic organisations. Organisations were invited to review the discussion paper and complete questions via an online survey. A total of 30 organisations responded (24% response rate): 29 completed the survey and one provided information via email.

Purpose of this report

The purpose of this report is to provide additional analysis on the possible political, economic, social, and technological key drivers of funding trends in the Audit. The findings of this analysis will guide Cancer Australia, other Australian Government organisations, and the wider cancer research funding community in making impactful investments in research.

2 Methodology

This project was delivered from June 2023 to October 2023 in three stages:

- **Stage 1**: Nous conducted a rapid desktop review of grey literature and peer reviewed articles to identify key drivers of funding for cancer research in 2012–2020. The findings from the desktop review were summarised in a discussion paper.
- **Stage 2:** The discussion paper was provided to 123 organisations that contributed data to the Audit. The organisations had the opportunity to validate and comment on the findings of the discussion paper via an online survey.
- **Stage 3:** Nous synthesised the results from the desktop review and stakeholder consultation into a final report (this document), which included a review process with Cancer Australia, all organisations that provided data for the Audit, Cancer Australia's Research and Data Advisory Group, and the Audit Working Group.

Key research questions

The research underpinning this report has been guided by six key questions:

1. What were the key drivers for the increase in total funding for cancer research in 2012–2020?
2. What were the key drivers for the increase in co-funded research in 2012–2020?
3. What were the key drivers for the increase in proportional funding for research to the Common Scientific Outline (CSO) categories of Early Detection, Diagnosis and Prognosis (CSO4) and Treatment (CSO5) in 2012–2020?
4. Why did proportional funding for Prevention (CSO3) remain low in 2012–2020? What drivers might increase funding for Prevention?
5. What were the key drivers for increased funding across tumour types in 2012–2020?
6. What were the key drivers for the increase in funding for clinical trials in 2012–2020?

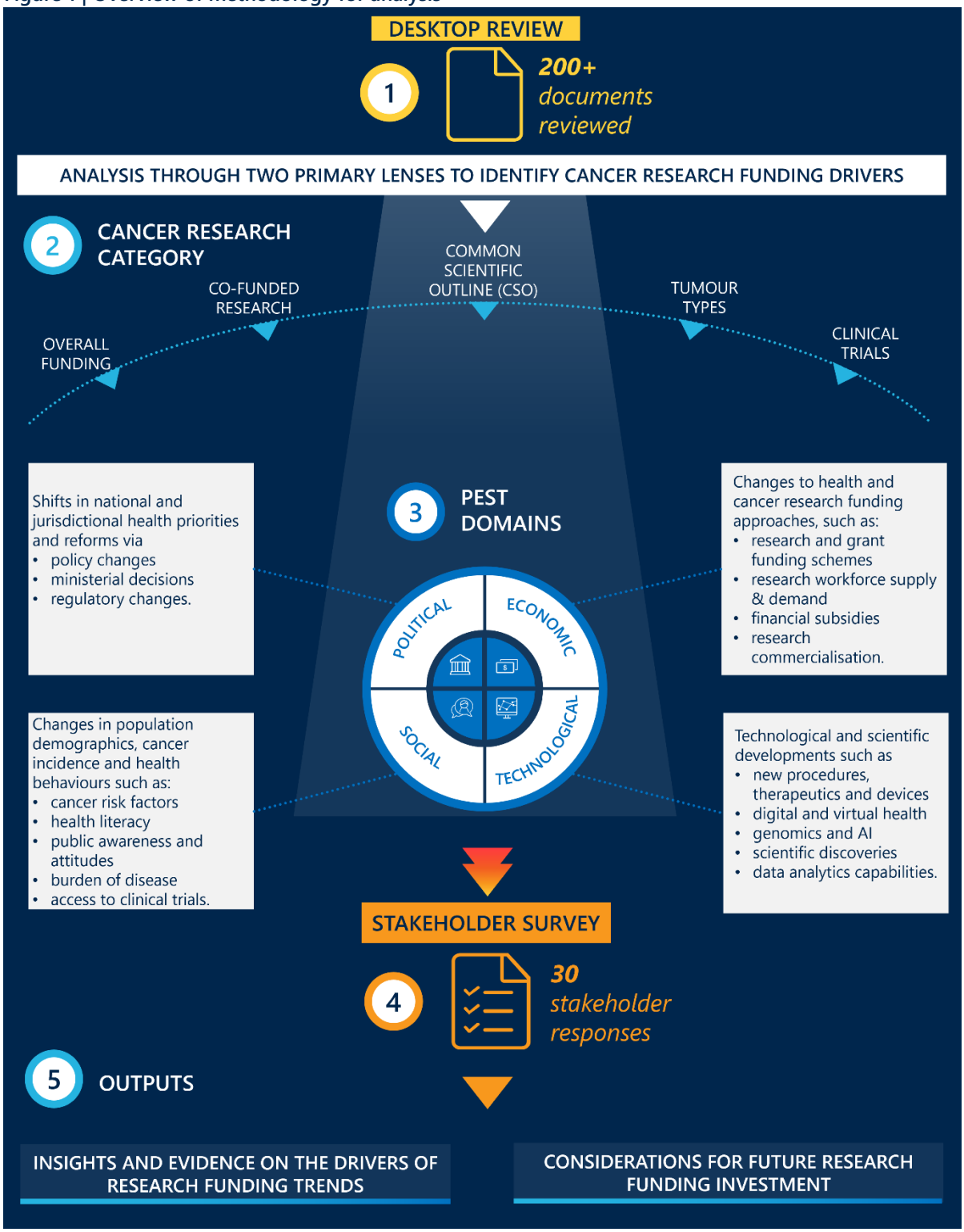
Insights on optimising cancer research funding for the future are also provided, based on the drivers identified in the desktop review and stakeholder consultation.

Conceptual framework

Key drivers were identified with a deductive thematic approach via two primary lenses (see Figure 1):

1. Cancer research categories (total funding, co-funded research, CSO, tumour types, and clinical trials)
2. Political, economic, social, and technological (PEST) domains.

Figure 1 | Overview of methodology for analysis



Desktop review

The desktop review included grey literature and select peer-reviewed articles to identify potential drivers of funding trends across 2012–2020. Nous conducted a rapid yet comprehensive search of grey literature and targeted peer-reviewed articles to identify potentially relevant reports.

Search strategy for grey literature

A range of grey literature informed the final report, including:

- reports from major cancer and research funding organisations

- ministerial announcements
- policy documents, including government budget papers
- other relevant documents (e.g., general media and news reports).

Relevant **reports from major organisations** published between 2012–2020 were identified by searching the websites of the following organisations, which collectively, funded ~90% of cancer research in Australia in the Audit:

1. National Health and Medical Research Council (NHMRC)
2. Medical Research Future Fund (MRFF)
3. Cancer Australia
4. Australian Research Council
5. Department of Health and Aged Care
6. state and territory governments
7. state and territory cancer councils
8. cancer foundations (e.g., Australian Cancer Research Foundation, National Breast Cancer Foundation, Leukaemia Foundation, Prostate Cancer Foundation of Australia)

The following organisations that contributed data to the Audit were not searched: medical research institutes, hospitals, international funders; universities; other sources (e.g., Cancer Therapeutics CRC); and philanthropic organisations. These organisations were engaged in the online survey.

Relevant **ministerial announcements** and **policy documents** published between 2012–2020 were identified by searching the websites for the Australian Government Department of Health and Aged Care, state health departments, NHMRC, and Australian Research Council.

Other relevant documents were identified through general searches of Australian news media outlets and discussions with expert colleagues, which may incidentally identify relevant documents from other sources (e.g., media releases from medical research institutes).

Search strategy for peer-reviewed articles

Google Scholar was searched for relevant peer-reviewed articles using the methodology outlined in Appendix A. The title and abstract of the first 100 articles by relevance were screened for potential inclusion. Articles deemed potentially relevant were subject to full-text examination for inclusion in the analysis.

Search strategy for additional documents

Cancer Australia provided Nous with additional documents and priority papers that were relevant to the project.

Data extraction

Data from the desktop review was extracted into a document register. It captured information on the type of publication, a summary of the findings of the documents, and the research question/s addressed.

Analysis of findings by PEST domains

Key drivers identified in the desktop review were grouped into PEST domains:

- **Political** shifts in national and jurisdictional health priorities and reforms
- **Economic** changes to health and cancer research funding approaches
- **Social** characteristics of the societal context, including demographics, cultural attitudes, literacy rates, education levels, customs, beliefs, values, lifestyles, age distribution, geographic distribution, and population mobility
- **Technological** factors such as digital communication, biotechnology, chemicals, energy, and medicine (among other fields) that have opened new areas to commercial competition. The technological component of the general environment is compounded by the impact of science and technology in produce and process innovation as well.

Key drivers could be grouped into multiple domains (e.g., political and economic).

Attribution of confidence to findings

A level of confidence was attributed to each driver identified in the desktop review regarding their impact on funding for cancer research.

- **High confidence** was attributed to drivers that could be clearly linked to funding patterns, backed by clear evidence from the Audit or the desktop review. This confidence level was generally attributed to direct sources of funding, such as funding schemes.
- **Moderate confidence** was attributed to drivers where there was some evidence from the Audit and desktop review and reasonable belief that the driver increased funding. This confidence level was generally attributed to sources of funding that may have been funding schemes or may have indicated notable progress in the direction of research. Drivers with moderate confidence may have also influenced drivers with high confidence.
- **Low confidence** was attributed to the drivers that may have impacted direct funding through other drivers like targeted funding schemes, but the relationships between these drivers and the funding trends observed in the Audit could not be clearly observed. It was difficult to demonstrate a clear causal relationship between the driver and funding patterns for cancer research.

Stakeholder consultation

The discussion paper was provided to 124 organisations that contributed data to the Audit. A list of these organisations is in Appendix B.

Organisations were invited to complete a short online survey via Microsoft Forms (see Appendix C). The online survey was open for just over two weeks (12 business days) and took approximately 15-20 minutes to complete. Two follow-up emails were sent to all organisations one week later as a reminder to complete the survey. Each organisation was requested to only complete the survey once.

The survey questions aligned to the key research questions and the PEST domains. The survey included both quantitative and qualitative responses but favoured questions with qualitative responses because this allowed the organisations to provide more nuance, context, and explanation about key drivers of funding.

All organisations were also invited to provide feedback on the draft final report, which has been incorporated into this report.

Survey response rate

A total of 30 organisations responded (24% response rate). Twenty-nine organisations completed the online survey and one organisation responded via email with a statement, which was incorporated in the findings of this report.

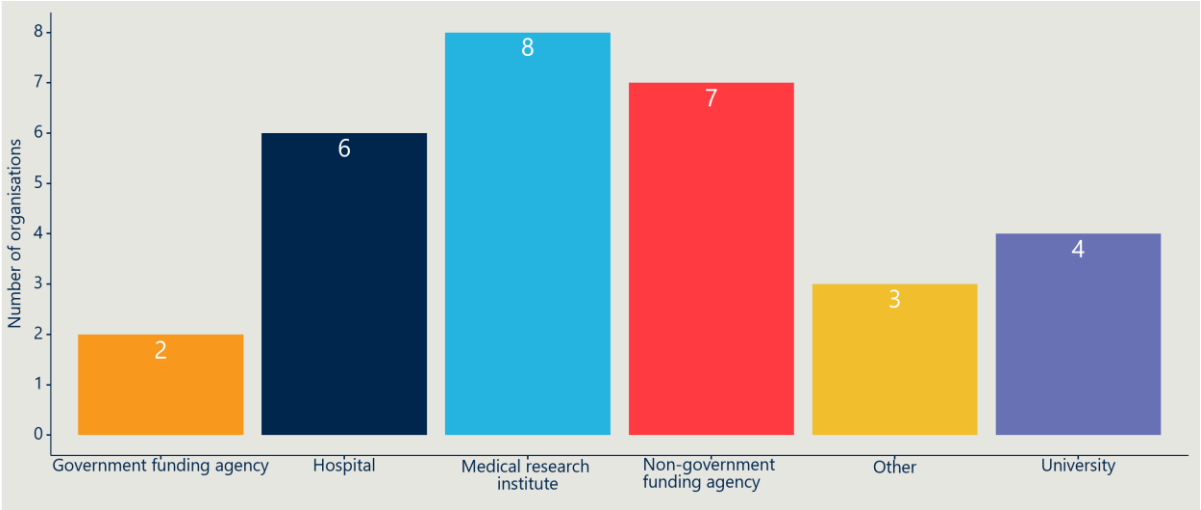
Most organisations were Australian based (29 Australian based, one international). Most organisations provided funding for multiple tumour types (25 organisations), with five organisations funding single tumour types. Organisations that funded single tumour types provided funding for:

- sarcoma
- neuroendocrine cancer
- breast cancer (x2)
- pancreatic cancer.

Various types of organisations responded (see Figure 2). Organisations that classified themselves as 'Other' included self-descriptions:

- clinical trial group and not-for-profit charity
- not-for-profit patient organisation
- clinical trial group.

Figure 2 | Organisation type of respondents



Scope and limitations

This report only considers key drivers of cancer research funding from 2012–2020 and was limited to the organisations that provided data to the Audit. Therefore, the key drivers identified are relevant to these organisations only and may not apply to other types of organisations (e.g., funding from industry). It is also possible that changes in the data landscape have occurred in the past 10 years, particularly the pandemic response and changes in data capability, that affect the findings.

The online survey was limited primarily by the low survey response rate of 24%; to account for this, a second round of stakeholder consultation was undertaken. Additional drivers suggested by organisations could not be validated with the same level of scrutiny as the findings from the desktop review. Therefore, suggestions from organisations are reported separately in the appendices of this report to minimise response bias.

3 Key findings

The key findings from this project are presented in sections aligned to the key research questions:

- **Section 3.1:** Increased total funding for cancer research in 2012–2020
- **Section 3.2:** Increased funding for co-funded research in 2012–2020
- **Section 3.3:** Increased proportional funding for research in Early Detection, Diagnosis and Prognosis (CSO4) in 2012–2020
- **Section 3.4:** Increased proportional funding for research in Treatment (CSO5) in 2012–2020
- **Section 3.5:** Consistently low proportional funding for research in Prevention (CSO3) in 2012–2020
- **Section 3.6:** Drivers that might increase funding for Prevention
- **Section 3.7:** Funding across tumour types in 2012–2020
- **Section 3.8:** Increased funding for clinical trials in 2012–2020
- **Section 3.9:** Considerations for the Audit, future analysis, and research funding investment.

Key drivers that addressed multiple research questions are repeated throughout sections for completeness. In the following sections, key findings represent evidence and insights from desktop review and include comments from the stakeholder consultation.

3.1 Increased total funding for cancer research

Key Findings

The Audit found that total funding for cancer research increased from $539 million in 2012–2014 to $934 million in 2018–2020.[a]

Five key drivers of increased total cancer research funding were identified:

- **Increasing cancer incidence and projected burden:** The incidence, burden, and cost of cancer to Australian society was projected to and did increase in the years 2012–2020. This social driver led to many organisations prioritising efforts to reduce burden and health expenditure by increasing funding for cancer research. There was high confidence this was the overarching driver for increased total funding, which influenced other drivers.
- **Medical Research Future Fund**: The Medical Research Future Fund (MRFF) was a political and economic driver that accounted for ~$112 million of increased funding in 2018–2020 via grant schemes prioritising cancer research, including the Australian Brain Cancer Mission, Rare Cancers Rare Diseases Unmet Need Grant, and Genomics Health Futures Mission. There was high confidence this was influenced by the other drivers: increasing cancer incidence and projected burden, scientific advancement and treatment breakthroughs, and celebrity advocacy.
- **NHMRC Investigator Grant scheme:** The introduction of the NMHRC Investigator Grant scheme was an economic driver that increased funding in 2018–2020. This funding scheme was included in the Audit, replacing the preceding Fellowship schemes that were not eligible in previous iterations of the Audit.
- **Scientific advancement and treatment breakthroughs:** These key technological drivers reflected scientific advancements, including in immunotherapy, venetoclax, and genomics. These advancements received substantial investment from different sources, which increased total funding for cancer research. This driver likely influenced funding provided by the MRFF, particularly in the Genomics Health Futures Mission.
- **Advocacy**: Celebrity and foundation advocacy was a likely social driver for increased total funding for cancer research. Celebrities, often those who have personal experience of cancer, use their profile to raise awareness for tumour types. Celebrities also engage heavily with foundations. Coupled with an expanded reach via social media, celebrity and foundation advocacy was likely linked to increased total funding, particularly through their contribution to raising funds for schemes like the Australian Brain Cancer Mission.

Overview of key drivers

The Audit found that total funding for cancer research projects and programs **increased from $539 million in 2012–2014 to $934 million in 2018–2020.** Five key drivers have been identified (Table 1). Organisations generally agreed with the key drivers identified in the desktop review (Appendix D). Additional suggestions from organisations are in Appendix E.

[a] The Audit did not adjust for inflation.

Table 1 | Key drivers for increased total funding for cancer research in 2012–2020

Driver	PEST domain	Confidence
Increasing cancer incidence and projected burden *More funding was provided for research because of the increasing burden of cancer in Australia.*	Social	High
Medical Research Future Fund *The Medical Research Future Fund targeted prioritised funding for cancer research.*	Political/economic	High
NHMRC Investigator Grant scheme *The NHMRC Investigator Grant scheme was a new grant scheme that was included in the Audit, replacing the preceding Fellowship schemes that were not eligible in previous audits.*	Economic	High
Scientific advancement *Scientific advancements encouraged increased funding through the MRFF and other sources that invested in research into novel treatments.*	Technological	Moderate
Celebrity advocacy *Celebrities raised money for cancer research that supported government funding schemes and provided additional sources of funding.*	Social	Low

Increasing cancer incidence and projected burden (high confidence)

Increasing cancer incidence and projected burden was a key social driver because organisations prioritised funding for cancer research to reduce burden and health expenditure. The burden and cost of cancer was projected to increase from 2011 to 2020 due to more Australians being diagnosed with cancer.[2] More Australians were also surviving cancer five years after their diagnosis, though survival trends were different across tumour types.[3] With more people being diagnosed with cancer and surviving their diagnosis, cancer had an increased burden and the cost of cancer in Australia had increased.[4] Therefore, many organisations prioritised funding for cancer research to reduce burden and health expenditure. It was likely the overarching 'macro' driver for increased total funding that influenced other drivers like the MRFF, scientific advancement and treatment breakthroughs, and celebrity advocacy.

Medical Research Future Fund (high confidence)

The MRFF explained approximately $112 million of increased total funding in 2018–2020. The MRFF was established in 2015 as an additional funding body to the National Health and Medical Research Council (NHMRC) to increase medical research investment for cure and discovery research,[5] with the first funding announced in 2017.[6] The Australian Medical Research and Innovation Strategy guided MRFF funding priorities.[7] Cancer was prioritised in the initial strategy because 'cancer control' was a National Health Priority Area in Australia due to its burden on society.[8] Therefore, the MRFF increased total funding via grant schemes that prioritised cancer research, which included:

- Clinical Trials Activity initiative (particularly the Rare Cancers Rare Diseases Unmet Need Grant; and Reproductive Cancers Grant)
- Australian Brain Cancer Mission
- Genomics Health Futures Mission (particularly ProCan: The human cancer proteome project; Projects Grant: cancers stream; and Genomics Health Futures Mission Stream 2.

The MRFF reflected the Australian Government's intent to improve the health of Australians and reduce future health expenditure, which was influenced by the social driver of increasing cancer incidence and projected burden. It also prioritised investments in new technologies and treatments, which relates to the key technological drivers of scientific advancement and treatment breakthroughs. It was also supported by co-investment from celebrities and foundations, which relates to the key social driver of celebrity advocacy.

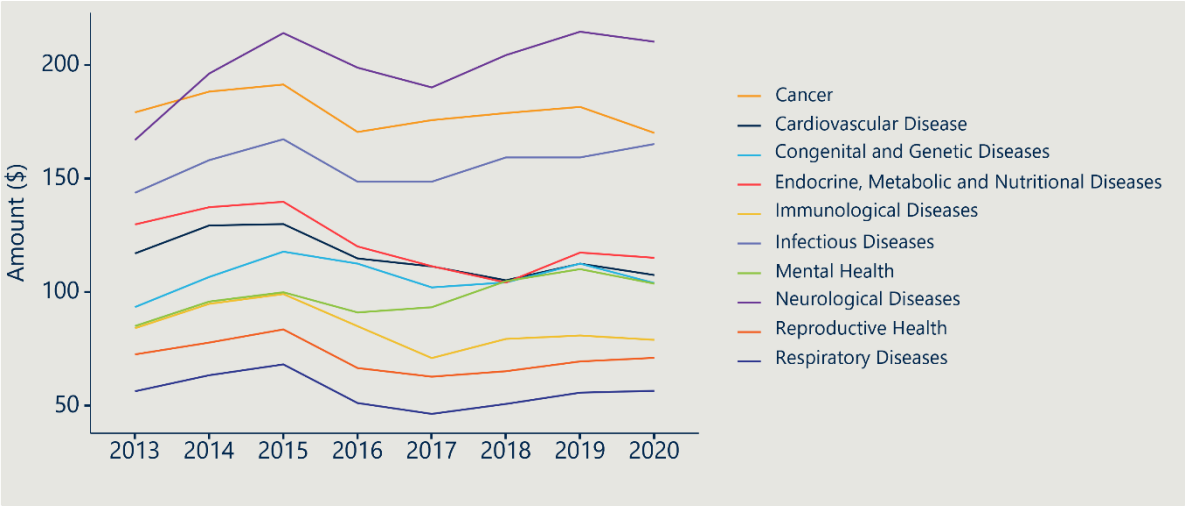
NHMRC Investigator Grant scheme (high confidence)

The NHMRC Investigator Grant scheme was a key driver for increased total funding in 2018–2020. It replaced various Fellowship schemes in 2018-2019 in the NHMRC's new grant program, which was developed as a policy response to widespread concerns that the high volume of applications for NHMRC funding was having a range of negative effects on Australian health and medical research.[9] The

Investigator Grant scheme was included in the Audit because the grants involved significant and sizeable project/program funding for specific research activities. NHMRC funding for cancer research remained stable through 2013-2020 (see Figure 3), but the preceding Fellowship scheme grants were not eligible for inclusion in previous audits conducted by Cancer Australia. [1, 10] Therefore, the NHMRC Investigator Grant scheme was a new grant scheme that was captured in the Audit and likely explained some increased total funding for cancer research.

Some organisations disagreed that the NHMRC Investigator Grant scheme was a key economic driver because the amount of funding provided for cancer research from the NHMRC's Medical Research Endowment Account has remained relatively stable, but further details were not provided. One organisation suggested the new grant program may have negatively impacted funding for cancer research but did not provide further detail on how. One organisation noted that, with the introduction of the NHMRC Investigator Grant scheme, other schemes such as the NHMRC Program Grant scheme were abolished and the NHMRC instituted a cap on the total amount of funding that any single investigator could receive, which may have impacted funding.

Figure 3 | NHMRC expenditure for disease, research and health areas 2013 to 2020 (limited to top 10 diseases by total amount)[b]



Scientific advancement and treatment breakthroughs (moderate confidence)

Scientific advancement and treatment breakthroughs were key technological drivers that may have increased total funding in two ways.

Firstly, by leading to increased funding from the MRFF: investment for cure and discovery research to improve Australians' health and reduce healthcare expenditure. [11] For example, there was growing global and political interest in genomics research as a breakthrough in precision medicine. [12] In 2018, the Australian Government announced $500 million for the Genomics Health Futures Mission, a 10-year investment into genomics research. [13] Cancer was a priority investment area because the government aimed to improve early detection and targeted treatment for the most common cancers. [14] However, as one organisation noted, the specific amount of funding provided for cancer research was not clear.

Secondly, by leading to increased total funding through other investment sources, like the Cooperative Research Centre for Cancer Therapeutics. [15] The centre was founded in 2007 and had been successful in small molecule drug discovery and development (e.g., AMP945 for the treatment of pancreatic cancer began clinical trials in 2020). [16] The centre's demonstrated success led to its continued funding because of the likelihood for high return on investment.

Scientific advancement and treatment breakthroughs were likely influenced by the overarching social driver of increasing cancer incidence and projected burden. It then increased the total funding for cancer research by influencing other key drivers (e.g., the MRFF), which aligned with the Australian Government's intent to reduce the burden of cancer and reduce future health expenditure and providing additional funding through other sources. Industry funding and research likely played a key role because several

[b] Data available from https://www.nhmrc.gov.au/funding/data-research/research-funding-statistics-and-data

scientific advancements that occurred in industry that preceded government funding; however, industry funding was largely out of scope of the Audit.

Celebrity and foundation advocacy (low confidence)

Celebrity and foundation advocacy was a key social driver that may have increased total funding in several ways.

Celebrities may have raised awareness for cancer research, leading to increased donations that were used to support cancer research funding schemes. For example, Carrie's Beanies 4 Brain Cancer and the Mark Hughes Foundation were celebrity-led foundations that raised money for brain cancer and were funding partners for the Australian Brain Cancer Mission.[17] Carrie Bickmore dedicated her Gold Logie in 2015 to her late husband Greg who died from brain cancer and started a foundation that raised money and advocated for research into brain cancer.[18] In 2017, the National Rugby League partnered with the Mark Hughes Foundation to host the first Beanie for Brain Cancer Round, a highly publicised fundraising event that coincided with the launch of the Australian Brain Cancer Mission.[19]

Celebrities may have helped to establish new cancer research foundations and centres, which led to new sources of funding. For example, clothing brand Camilla and Marc launched the Ovaries. Talk About Them. campaign, which provided a new avenue of direct funding for ovarian cancer research and may have increased funding for ovarian cancer research.[20] Similarly, Olivia Newtown-John was a key driver for establishing the Olivia Newton-John Cancer Wellness & Research Centre, which opened in 2012.[21] The public announcement of the return of Newton-John's breast cancer in 2017 may have also driven further funding.[22]

Celebrities may have influenced the use of discretionary health and medical research funds, which targeted funding towards cancer research. Some health and medical research funding and grant programs involve legislative and/or policy frameworks which provide for discretionary decision making regarding the awarding of funds. The Minister for Health for example, can award ad hoc or non-competitive grants from the MRFF.[23]

Celebrities may have increased health seeking behaviours, which possibly led to increased donations that were used to increase funding for cancer research. For example, film star Angelina Jolie's decision in 2013 to undergo risk-reducing mastectomy was linked to increased referrals to breast cancer centres in the UK, as well as increased demand for genetic testing and increased enquiries for risk-reducing mastectomy.[24] Similar increases in referrals to cancer genetic clinics were reported in Victoria, New South Wales, and South Australia.[25] This may have also extended to increased donations for breast cancer research.

3.2 Increased co-funded research

Key Findings

The Audit found that co-funded research increased from $53.1 million (9.8% of total funding) in 2012–2014 to $118 million (12.6% of total funding) in 2018–2020.

Three key drivers of increased co-funded research funding were identified:

- **Funding schemes for international clinical trial collaborations:** There was targeted funding that was designed to increase Australian collaboration in international clinical trials, through the MRFF International Clinical Trial Collaborations grant and NHMRC-EU Collaborative Research Grant Scheme. This economic and political driver may have led to increased co-funded research with targeted funding schemes and the requirement that international collaborators provide funding.
- **Partnerships and collaborations to conduct more impactful research:** There was an increased number of partnerships and collaborations. This may have increased co-funded research because organisations collaborated to conduct more impactful research, including partnerships to conduct clinical trials in rare cancers.
- **Increased philanthropic co-funding:** There was an increased number of projects with philanthropic co-funding, which may have occurred because philanthropists had personal or family experiences with cancer and wished to support cancer research.

Overview of key drivers

The Audit found that **co-funded research increased from $53.1 million (9.8% of total funding) in 2012–2014 to $118 million (12.6% of total funding) in 2018–2020.** Three key drivers have been identified (Table

2). Organisations generally agreed with the key drivers identified in the desktop review (Appendix D). Additional suggestions from organisations are in Appendix E.

Table 2 | Key drivers for increased co-funded research in 2012–2020

Driver	PEST domain	Confidence
Funding schemes for international clinical trial collaborations *Additional targeted funding schemes designed to increase Australian collaboration in international clinical trials*	Economic/political	Moderate
Partnerships and collaborations to conduct more impactful research *An increased number of partnerships and collaborations to conduct more impactful research, including partnerships to conduct clinical trials in rare cancers.*	Economic/technological/ political	Moderate
Increased philanthropic co-funding *An increased number of philanthropic partners providing funding for cancer research.*	Social/economic	Low

Funding schemes for international clinical trial collaborations (moderate confidence)

Co-funded research may have increased due to additional targeted funding schemes designed to increase Australian collaboration in international clinical trials.[26] International collaborators were required to contribute funding to ensure the success of the clinical trials, which may have led to increased co-funding. International collaboration was recommended by the Australian Government to gain input and insight from international partners to improve health for all Australians.[7] The Audit noted that the number of projects co-funded with an international organisation increased from eight in 2012–2014 to 14 in 2018–2020.[c] Some examples of these funding schemes may have included:

- The MRFF International Clinical Trial Collaborations grant required Australian research teams to conduct a single clinical trial in collaboration with international counterparts.[27]
- The NHMRC-EU Collaborative Research Grant Scheme awarded over $1 million to Australian researchers to collaborate with organisations in the European Union on cancer research.[28]

Partnerships and collaborations to conduct more impactful research (moderate confidence)

Co-funded research may have increased due to an increased number of research partnerships that intended to enable larger research programs and make more substantial impacts on cancer research. The Audit noted that several types of organisations increased the number of co-funded projects between 2012–2014 and 2018–2020,[d] including:

- Cancer foundations (95 in 2012–2014 to 129 in 2018–2020)
- Medical research institutes, hospitals and foundations (66 in 2012–2014 to 117 in 2018–2020)
- State and territory governments (14 in 2012–2014 to 42 in 2018–2020)

For example, Australian Genomics is a research partnership of nearly 80 organisations that has received more than $100 million dollars since 2014 from state and territory governments for research into genomics.[12] These partnerships may have also included industry collaborators, which are critical to many clinical trials that test new treatments.

The focus on rare and less common cancers was another possible reason for increased partnerships and co-funding because clinical trials in rare and less common cancers often require multiple interstate or international sites to recruit enough participants. There was an increase in funding for these clinical trials in the MRFF Rare Cancer Rare Diseases Unmet Needs grant scheme. This likely necessitated collaborations and partnerships, and co-funding may have been necessary to ensure these trials could be successful and impactful, aligning with the Australian Government's intentions for translational research.[29]

[c] Data supplied by Cancer Australia.
[d] Data supplied by Cancer Australia.

Increased philanthropic co-funding (low confidence)

Co-funded research may have increased due to increased philanthropic co-funding. The number of projects co-funded with philanthropy increased from zero in 2012–2014 to eight in 2018–2020.[e] Some examples may have included:

- **The Ovaries. Talk About Them. Campaign (2020)** – The University of New South Wales researcher Professor Caroline Ford and clothing brand Camilla and Marc partnered to launch the campaign to provide direct funding to A/Prof Ford's research in ovarian cancer. [20] A key driver for this partnership was the Camilla and Marc owners' personal experience with ovarian cancer; Creative Director Camilla Freeman-Topper and CEO Marc Freeman's mother died from ovarian cancer. The fashion brand owners used their celebrity advocacy to raise funds for research. However, they required a partnership with another organisation because they were not scientists.
- **University of Sydney Li Ka Shing Cell & Gene Therapy Program (2018)** - The Li Ka Shing Foundation donated $4.5 million to University of Sydney for a clinical trial of CAR T-cell therapy and to create the University of Sydney Li Ka Shing Cell & Gene Therapy Program. [30] The driver behind this donation is unknown.

3.3 Increased proportional funding for research in Early Detection, Diagnosis and Prognosis

Key Findings

The Audit found the proportion of funding for Early Detection, Diagnosis and Prognosis (CSO4) increased from 14% in 2012–2014 to 21% in 2018–2020.

Three key drivers of increased proportional funding were identified:

- **Genomics research:** There was increased funding for genomics research, a breakthrough technology that aimed to deliver better testing and diagnosis for cancer. The Australian government increased funding for genomics research to integrate genomics into the healthcare system and there were several grant schemes from the Genomics Health Futures Mission that contributed funding towards cancer genomics research.
- **Melanoma screening technology:** There was increased funding for new melanoma screening technology to improve early diagnosis, which was likely influenced by melanoma's incidence in Australia.
- **Lung cancer screening technology:** There was increased funding for lung cancer screening trials to improve early diagnosis, which was influenced by advances in lung cancer screening technology and the desire to reduce the burden of lung cancer, which is the leading cause of cancer mortality in Australia.

Overview of key drivers

The Audit found that **the proportion of funding for Early Detection, Diagnosis and Prognosis (CSO4) increased from 14% in 2012–2014 to 21% in 2018–2020.** Three key drivers have been identified (Table 3). Organisations generally agreed with the key drivers identified in the desktop review (Appendix D). Additional suggestions from organisations are in Appendix E.

Table 3 | Key drivers for increased proportional funding for research in Early Detection, Diagnosis and Prognosis in 2012–2020

Driver	PEST domain	Confidence
Investment in genomics research *Increased funding for genomics research, a breakthrough technology that aimed to deliver better testing and diagnosis for cancer.*	Technological/political	High
Melanoma screening technology *Increased funding for new melanoma screening technology, which aimed to improve early diagnosis of melanoma.*	Technological	Moderate

[e] Data supplied by Cancer Australia.

Driver	PEST domain	Confidence
Lung cancer screening *Increased funding for lung cancer screening trials, which aimed to improve early diagnosis of lung cancer.*	Technological	Low

Genomics research (high confidence)

Increased investment in genomics research was a key technological and political driver that aimed to use genome-based research to improve diagnostics and individualise treatment strategies to provide 'precision' or 'personalised' medicine, which increased funding for Early Detection, Diagnosis and Prognosis. [31]

The Australian Government increased funding for genomics research to integrate genomics into the healthcare system. [12] For example, Australian Genomics is a research partnership of 78 organisations established in 2014 that received more than $125 million from federal and state governments. [12] The Australian Government released the National Health Genomics Policy Framework in 2017, which provided direction for governments in Australia to integrate geonomics into the healthcare system, [32] and announced $500 million for the Genomics Health Futures Mission in 2018, a 10-year investment into genomics research. [13]

Several grant schemes from the Genomics Health Futures Mission contributed funding towards cancer genomics research. The Genomics Health Futures Mission aimed to save the lives of more than 200,000 Australians through genomics research. [17] It was a key driver for increased funding to Early Detection, Diagnosis and Prognosis, linked the government's priorities of improving the health of Australians and reducing health expenditure. Example grant schemes included:

- ProCan: The human cancer proteome project – $20.4 million of funding available in 2018
- Projects Grant: cancers stream – $15 million of funding available in 2019
- Genomics Health Futures Mission Stream 2 (Targeted Call for Research [into cancer]) – up to $45 million of funding available in 2020.

Several organisations agreed that knowledge gains in genomics have contributed to increased funding for Early Detection, Diagnosis and Prognosis. However, they also noted that the specific amounts of funding dedicated to cancer research were not clear.

Investment in melanoma screening (moderate confidence)

Investment in 3D imaging systems for early detection of melanoma may have been a key technological driver for increased funding. This was reflected in the Audit, which noted that proportional funding for Early Detection, Diagnosis and Prognosis in melanoma increased from 3% in 2012–2014 to 54% in 2018–2020. [1] For example, the Australian Cancer Research Foundation Australian Centre of Excellence in Melanoma Imaging and Diagnosis was established in 2018 to improve early detection of melanoma by rolling out a series of 3D imaging systems in combination with an innovative telemedicine network. [33] This additional funding was likely influenced by high melanoma's incidence in Australia. It is the most common cancer in Australians aged 15 to 40 and the Australian Government invested in technological advancements to improve melanoma outcomes and reduce healthcare expenditure. [33]

Investment in lung cancer screening (low confidence)

Additional funding for discovery and development of innovative methods for detection of lung cancer may have been a key technological driver for increased funding. This was reflected in the Audit, which noted that proportional funding for Early Detection, Diagnosis and Prognosis in lung cancer and mesothelioma increased from 22% in 2012–2014 to 37% in 2018–2020. [1] For example:

- the Australian Cancer Research Foundation Centre for Lung Cancer Early Detection was established in 2015 [34]
- several Australian sites of the International Lung Screening Trial received funding from the NMHRC and Cancer Australia [35]
- the ASPiRATION study received funding from various sources in a partnership between government, research, and academia. [36]

This additional funding was likely influenced by advances in lung cancer screening technology and the desire to reduce the burden of lung cancer, which is the leading cause of cancer mortality in Australia and has a relatively low five-year survival rate compared to other common cancers. [34, 37] In 2023, the Australian Government announced the National Lung Cancer Screening Program. [38]

3.4 Increased proportional funding for research in Treatment

Key Findings

The Audit found that the proportion of funding for Treatment (CSO5) increased from 31% in 2012–2014 to 42% in 2018–2020.

Two key drivers of increased proportional funding were identified:

- **Medical Research Future Fund:** The MRFF prioritised additional funding for Treatment because it had 'an important role to play in facilitating non-commercial clinical trials of potential significance'. Key funding schemes were the Clinical Trials Activity initiative, particularly the Rare Cancers Rare Diseases Unmet Need Grant and Reproductive Cancers Grant, and the Australian Brain Cancer Mission. The Australian Government recognised the important role of clinical trials in determining the effectiveness of treatments that could improve the health of Australians and reduce future health expenditure.
- **Treatment breakthroughs:** Organisations invested funding in treatment breakthroughs such as immunotherapy and venetoclax as they attempted to reduce the burden of cancer, which increased funding for Treatment.

Overview of key drivers

The Audit found that the **proportion of funding for Treatment (CSO5) increased from 31% in 2012–2014 to 42% in 2018–2020.** Two key drivers have been identified (Table 4). Organisations generally agreed with the key drivers identified in the desktop review (Appendix D). They suggested that increases in the proportion of funding for translational and clinical research may have been influenced by political factors such as government election cycles and the appeal of more immediate impacts, which could not be verified for this report. Additional suggestions from organisations are in Appendix E.

Table 4 | Key drivers for increased proportional funding for research in Treatment in 2012–2020

Driver	PEST domain	Confidence
Medical Research Future Fund *The Medical Research Future Fund targeted prioritised funding for treatments in cancer research.*	Political/economic	High
Treatment breakthroughs *Treatment breakthroughs encouraged increased funding because organisations attempted to reduce the burden of cancer.*	Technological	High

Medical Research Future Fund (high confidence)

The MRFF was a key political and economic driver of increased funding to Treatment. It was established to increase medical research investment for cure and discovery research,[5] and had 'an important role to play in facilitating non-commercial clinical trials of potential significance'.[7] The MRFF increased funding for Treatment via grant schemes, which included:

- Clinical Trials Activity initiative (particularly the Rare Cancers Rare Diseases Unmet Need Grant and Reproductive Cancers Grant)
- Australian Brain Cancer Mission.

The MRFF increased funding for clinical trials because the Australian Government recognised the important role that clinical trials had in determining the effectiveness of treatments that could improve the health of Australians and reduce future health expenditure. This corresponded with the Treatment CSO category receiving the most funding over the 2012–2020 period.

Treatment breakthroughs (high confidence)

Treatment breakthroughs were a key driver of increased funding for Treatment. Funding was directed towards treatment breakthroughs in immunotherapy[f] and venetoclax[g] because they demonstrated promise to improve the health of Australians and reduce future health expenditure. Therefore, funding was provided to examine treatment breakthroughs in clinical trials. For example, the success of immunotherapy in treating tumour types like leukaemia and lymphoma provided the momentum to fund a $7.5 million grant to investigate making CAR T-cell immunotherapy simpler and more affordable.[39] Funding for

[f] Immunotherapy is a biological therapy that helps the immune system to better act against cancer.
[g] Venetoclax is a targeted treatment for some types of leukaemia and lymphoma.

venetoclax clinical trials also increased in 2012–2020 because researchers tested it as a promising treatment. [40] The Australian Government announced $80 million to fund the first CAR T-cell therapy centre in Australia located at the Peter MacCallum Cancer Centre in 2019. [41] Other specific immunotherapies may also have included PD1-PDL1 inhibitors and CTLA-A4 inhibitors. These breakthroughs increased funding for Treatment because funding organisations prioritised promising treatment breakthroughs given the potential impact on reducing the burden of cancer in Australia.

3.5 Consistently low proportional funding for Prevention

Key Findings

The Audit found that the **proportion of funding for Prevention (CSO3) remained consistently low over time (decreasing from 4% in 2012–2014 to 2% in 2018–2020)**.

One key driver of consistently low funding was identified:

- **Behavioural risk factors:** Behavioural risk factors accounted for almost half of the cancer burden. However, it was difficult to conduct high-quality research on behaviour change, particularly for a condition like cancer, and there was limited financial gain from Prevention for behavioural risk factors, which may have disincentivised researchers from pursuing this research. Further, research on behavioural interventions may have been excluded from several funding schemes. Cancers that have other types of risk factors were likely to receive more funding for Prevention.

Overview of key drivers

The Audit found that the **proportion of funding for Prevention (CSO3) remained consistently low over time (decreasing from 4% in 2012–2014 to 2% in 2018–2020)**. One key driver has been identified (Table 5).

Table 5 | Key drivers that may explain low funding for Prevention

Driver	PEST domain	Confidence
Behavioural risk factors	Social	Moderate

Behavioural risk factors (moderate confidence)

Behavioural risk factors may be the reason for consistently low funding for Prevention research**.** Almost half (42%) of the cancer burden is attributable to personal and behavioural risk factors, the most common being smoking and overweight and/or obesity.[4] Behavioural risk factors receive consistently low funding for Prevention across many health conditions.[42] There are several reasons why this may have occurred.

It was very difficult to conduct high-quality research on behaviour change, particularly for a condition like cancer.

- The follow-up period to examine behavioural risk factor modification on risk of cancer incidence or cancer mortality is decades.
- Studies of behavioural risk factors require large sample sizes (likely more than 10,000 people) to have sufficient statistical power.
- Human behaviour is complex and behavioural risk factors are often inter-related. Therefore, it is difficult to firmly establish the causal relationship between the behavioural change and reduced cancer risk or burden.

Therefore, there was uncertainty that Prevention research for behavioural risk factors was a good investment of research funding, particularly when competing with other types of research.[43]

There was limited financial gain from Prevention for behavioural risk factors, which may have disincentivised researchers from pursuing this research.

Successful pharmaceutical and surgical therapeutics can be commercialised. Behavioural interventions generally do not derive financial benefit to organisations, except for governments through reduced health expenditure. When combined with the difficulty of conducting high-quality behavioural research and uncertainty about success, governments may have chosen to prioritise more promising treatments where results were more easily monitored.

Research on behaviour modification may not have been eligible for funding schemes.

Organisations highlighted that research on behavioural interventions was often not eligible for inclusion in MRFF funding streams for cancer research. The Brain Cancer Mission did include scope for research into behavioural and supportive care interventions, but other MRFF schemes such as the Million Minds scheme focused on specific aspects of mental health (e.g., suicide prevention) that excluded research on cancer-related mental health concerns, like psycho-oncology research. **Cancers that have other types of risk factors were likely to receive more funding for Prevention.** Research in Prevention in cervical cancer increased from 13% in 2012–2014 to 62% in 2018–2020. This was likely from funding for the NHMRC Centre for Research Excellence in Cervical Cancer Control (C4), which focused on improved screening for the human papillomavirus (a common cause of cervical cancer).[44] This may have been driven by

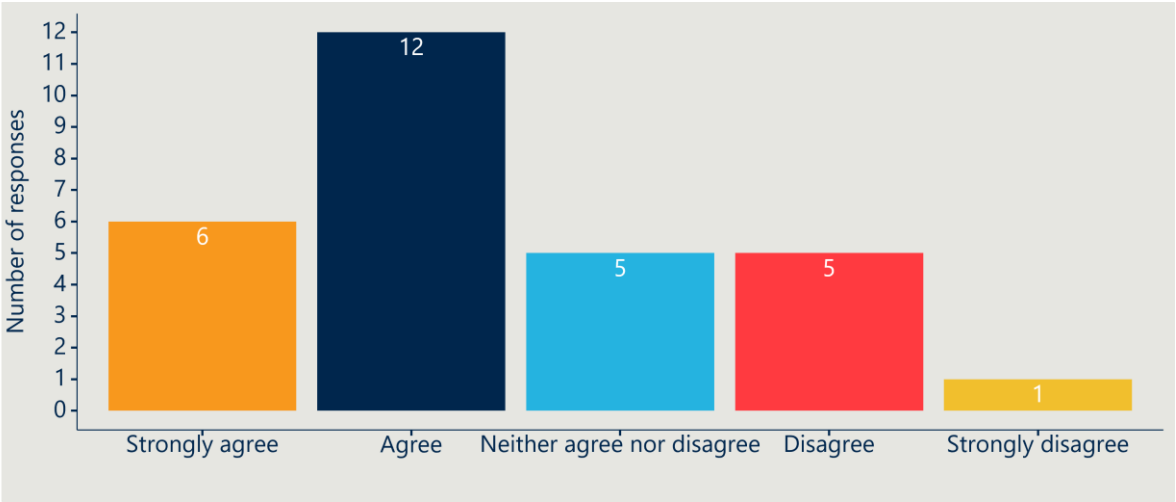
monitoring the ongoing use of Australia's cervical screening program,[45] which indicated the potential effectiveness on additional funding.

Social stigma may have also contributed to limited funding for Prevention.

Social stigma may have also played a role in the limited funding for Prevention because of the belief that changing behaviour was the responsibility of the individual and did not require substantial research funding.[46]

Most organisations strongly agreed or agreed that behavioural risk factors were the key social driver of low funding for Prevention in 2012–2020 (see Figure 4). Several organisations expanded on the difficulties of conducting Prevention research on behavioural risk factors, which are summarised in Appendix E.

Figure 4 | Responses to the online survey question about behavioural risk factors being the key social driver of consistently low funding for Prevention in 2012–2020 (n=29)



3.6 Increasing funding for Prevention

Key Findings

The project considered possible drivers to increase funding for prevention[h], in response to the low prevention funding levels in the Audit over 2012–2020.

Three social drivers may increase funding for Prevention:

- **Increased advocacy:** More advocacy through celebrities, public awareness campaigns, and organisations may increase funding for Prevention through increased donations and political influence.
- **Collaboration across health conditions:** Collaboration across conditions may enable researchers to conduct high-quality research and increase opportunities to influence and partner with funding organisations to create targeted funding schemes.
- **Focus on non-behavioural risk factors:** Targeting non-behavioural risk factors may increase funding for Prevention because they are easier to implement and have greater chances of success, which is more appealing for government investment.

Overview of key drivers

Three social drivers may explain how to increase funding for Prevention (Table 6). Additional suggestions from organisations are in Appendix E.

Table 6 | Social drivers that may explain how to increase funding for Prevention

Driver	PEST domain	Confidence
Increased advocacy *More advocacy through celebrities, public awareness campaigns, and organisations may increase funding for Prevention through increased donations and political influence.*	Social	Moderate
Collaboration across health conditions *Collaboration across conditions may enable researchers to conduct high-quality research and increase opportunities to influence and partner with funding organisations to create targeted funding schemes.*	Social	Low
Focus on non-behavioural risk factors *Targeting non-behavioural risk factors may increase funding for Prevention because they are easier to implement and have greater chances of success, which is more appealing for government investment.*	Social	Low

Increased advocacy (moderate confidence)

More advocacy through celebrities, public awareness campaigns, and organisations may increase funding for Prevention. Increased advocacy may increase donations to organisations to conduct research on Prevention. For example, the Cancer Prevention Research Centre at the University of Queensland and the WA Cancer Prevention Research Unit at Curtin University.[47, 48] Increased advocacy may also influence political priorities that lead to targeted funding schemes, which were a key driver for increased funding for other CSO categories, such as Early Detection, Diagnosis and Prognosis and Treatment.

Collaboration across health conditions (low confidence)

Increased collaboration with organisations that focus on prevention research in other health conditions may increase funding because behaviour modification is a preventative strategy across most chronic health conditions.[42] Collaboration across conditions may enable researchers to conduct high-quality research and increase opportunities to influence and partner with funding organisations to create targeted funding schemes, such as the Australian Government.

Focus on non-behavioural risk factors (low confidence)

Prevention research has been targeted towards non-behavioural risk factors, which means they are easier to implement (compared to long-term lifestyle modification through personal behaviours, like physical

[h] In this report, Prevention encompasses both preventing first occurrence and preventing recurrence, which were unable to be analyses separately.

activity or dietary changes) and have greater chances of success. For example, the human papillomavirus vaccine for cervical cancer; or screening programs for breast cancer, colorectal cancer, and cervical cancer. Targeting research programs towards Prevention via non-behavioural risk factors may increase funding for Prevention because they are more appealing for government investment. These research programs are likely to be less expensive and easier to conduct than those that focus on behavioural risk factors. There are several emerging technologies:

- Chemovaccines, including mRNA-based vaccines, may be used to prevent cancer.[49] Australia has approved the use of the human papillomavirus to prevent cervical cancer.[50] Further investment in emerging personalised vaccines may help to prevent cancer recurrence in other tumour types (e.g., melanoma), which can help to reduce cancer burden in Australia.[51]
- Further advancement in genomics and genomic profiling may enable for improved risk-stratified screening methods. Australia has engaged in DNA screening programs for high-risk hereditary diseases but further investment to expand these programs may improve cancer prevention and reduce disease burden.[52] Another growing area is integrating genomic risk with environmental risk. For example, detecting oncogenic gene mutations linked with high exposure to environmental pollution that increase the risk of lung cancer.[53]
- Artificial intelligence can be used to map large amounts of data and assist with cancer prevention. Australian researchers used artificial intelligence to map genetic and physical 15-year risk of ovarian cancer, which can identify women who require increased screening efforts and may improve prevention.[54] Similarly, Australian researchers will trial the use of artificial intelligence to reduce the risk of colorectal cancer in Australia.[55]

Prevention offers the most cost-effective long-term strategy for the control of cancer across the population. Focusing future investment on these emerging technologies allows for governments to monitor and evaluate the success of these programs, which may be an incentive for governments to improve funding for Prevention in Australia.

3.7 Funding across tumour types

Key Findings

The Audit found that direct funding increased for most tumour types between 2012–2014 and 2018–2020. However, the rate of increase was different across tumour types.

Seven interrelated key drivers of increased funding for tumour types have been identified, including government priorities and targeted funding schemes; differences in cancer incidence, mortality, burden, and survival; scientific advancement and treatment breakthroughs; celebrity advocacy; foundation advocacy; social stigma; and lack of survivors for rare cancers.

The combinations of these key drivers affected tumour types differently. Research funding for

- **brain cancer** increased because government priorities resulted in the establishment of the Australian Brain Cancer Mission, brain cancer was the leading cause of mortality in Australian children, and celebrity and foundation advocacy supported government funding schemes.
- **haematological cancers** increased due to additional funding from the MRFF through the Clinical Trials Activity initiative because of government priorities in reducing cancer burden, which was influenced by treatment breakthroughs in immunotherapy and venetoclax.
- **melanoma** increased due to additional funding from the Australian Cancer Research Foundation to research advances in 3D imaging technology that aimed to improve early detection, which was influenced by the high incidence of melanoma in Australia.
- **ovarian cancer** increased because of targeted funding schemes from the MRFF like the Rare Cancers Rare Diseases Unmet Need Grant scheme and Emerging Priorities and Consumer Driven Research initiative, and possibly an increase in celebrity and foundation advocacy, which were influenced by ovarian cancer's low survival rate.
- **lung cancer and mesothelioma** increased because of targeted funding schemes from the MRFF like the Improving Diagnosis in Cancers with Low Survival Rates Grant scheme, and scientific advancement in screening technology, which were influenced lung cancer's high incidence rate and low survival rate.
- **pancreatic cancer** increased due to targeted funding schemes from the MRFF like the Rare Cancers Rare Diseases Unmet Need Grant scheme, and possibly due to treatment breakthroughs, which was influenced by pancreatic cancer's low survival rate.
- **breast cancer** increased, but there were no clear key drivers. It may have been due to the cumulative impact of several drivers, including treatment breakthroughs and celebrity and foundation advocacy. The decrease in the proportion of funding for breast cancer research may have been due to its high levels of existing research funding and high survival rate.
- **colorectal cancer** fluctuated across triennia, but key drivers were not clear for why funding decreased in 2015–2017. Funding may have increased in 2018–2020 due to the introduction of the MRFF and additional funding from foundations.
- **prostate cancer** fluctuated across triennia. Funding may have increased in 2015–2017 due to additional funding for two large clinical trials of enzalutamide led by Australian researchers. Funding may have decreased in 2018–2020 once these trials finished recruitment.
- **other tumour types** did not increase. This may have occurred because they were not prioritised based on their incidence, mortality, burden, and survival; there were no treatment breakthroughs; they had limited support from tumour-specific organisations; and there may have been fewer researchers in these areas.

Overview of key drivers

The Audit found that direct funding increased for most tumour types between 2012–2014 and 2018–2020. However, the rate of increase was different across tumour types.

Seven key drivers of research funding have been identified (Table 7). This section provides a succinct overview of these drivers and their interrelationships. The next section details how the drivers listed in Table 7 impacted funding across tumour types. Organisations consulted generally agreed with the key drivers identified in the desktop review (Appendix D). Additional suggestions from organisations are in Appendix E.

Table 7 | Key drivers for differences in funding across tumour types in 2012–2020

Driver	PEST domain	Confidence
Government priorities and targeted funding schemes *The Australian Government prioritised funding towards tumour types that had poorer outcomes, in line with funding priorities based on disease burden.*	Political/economic	High
Differences in incidence, mortality, burden, and survival *Tumour types with higher incidence, higher mortality, higher burden, and lower rates of survival generally received more funding.*	Social	Moderate
Scientific advancement and treatment breakthroughs *Tumour types with promising or novel treatments received more funding for discovery research or clinical trials.*	Technological	Moderate
Celebrity advocacy *Celebrities raised awareness for specific tumour types, influenced the activity of foundations and research centres, and provided funding for targeted research schemes.*	Social	Low
Foundation advocacy *Tumour-specific organisations increased public awareness, donations, and lobbying for certain tumour types.*	Social	Low
Social stigma *Tumour types that were strongly associated with high-risk, stigmatised behaviours may have received less funding.*	Social	Low
Lack of survivors *Tumour types with low survival rates may have received less funding because there are fewer survivors who can act as advocates for increasing awareness and philanthropic donations. Conversely, lack of survivors due to high mortality rates may have led the Australian Government to prioritise funding to these tumour types with targeted schemes.*	Social	Low

Government priorities and targeted funding schemes (high confidence)

Government priorities and establishing targeted funding schemes were key political and economic drivers for differences in funding across tumour types. The Australian Government prioritised funding towards tumour types that had poorer outcomes, in line with funding priorities based on disease burden.[2] These priorities resulted in targeted funding schemes, for example the Australian Brain Cancer Mission and the MRFF Rare Cancers Rare Diseases and Unmet Need Initiative.[17, 56] This driver was likely influenced by differences in incidence, mortality, burden, and survival.

Several organisations suggested that ministerial advice and aims and discretionary power of government may have been a political driver that influenced funding across tumour types.

Differences in incidence, mortality, burden, and survival (moderate confidence)

Tumour types with poorer health outcomes as evidenced by higher incidence, higher mortality, higher burden, and lower rates of survival generally received more funding, but it was not clear which measure contributed to greater priority (for example, incidence or mortality). This driver likely influenced government priorities and targeted funding schemes, scientific advancement and treatment breakthroughs, celebrity and foundation advocacy, and lack of survivors.

Scientific advancement and treatment breakthroughs (moderate confidence)

Tumour types with promising or novel treatments received more funding for discovery research or clinical trials than tumour types without. These breakthroughs were likely influenced by differences in incidence, mortality, burden, and survival because researchers focused their efforts on cancers with poorer outcomes. These breakthroughs may have also influenced government priorities and targeted funding schemes because the Australian Government was invested in promising treatments to improve outcomes and reduce health expenditure.

Celebrity advocacy (low confidence)

Celebrity advocacy is often influenced by personal experience with cancer or the experience of a family member. Celebrities may have increased funding for specific tumour types by:

- Raising awareness for certain conditions and providing co-funding
- Influencing the funding priorities of research foundations and centres
- Influencing the use of discretionary health and medical research funds
- Increasing health seeking behaviours (and possibly increased donations).

Celebrity advocacy may influence foundation advocacy because celebrities may set up their own foundations or partner with established tumour-specific foundations. Celebrity advocacy may influence government priorities and targeted funding schemes by providing co-funding, which may incentivise the government to invest. For example, the Australian Brain Cancer Mission was supported by several celebrities and foundations, such as Carrie's Beanies for Brain Cancer and the Mark Hughes Foundation.[17]

Foundation advocacy (low confidence)

Advocacy from tumour-specific foundations was a key social driver and likely played a similar role to celebrity advocacy. This may directly overlap given the links between celebrity causes and foundations. The Audit noted 38 tumour-specific organisations, which may differ across tumour types in terms of number and size.[1] Research suggests that annual revenue is strongly correlated with fundraising capability and an organisation's annual expenditure on research funding.[46] Therefore, tumour-specific foundations and organisations likely influenced funding across tumour types because there were multiple, larger organisations dedicated to certain tumour types, but many tumour types had no dedicated organisations. Tumour-specific organisations may also drive increased public awareness, donations, and lobbying through events for certain tumour types such as cancer awareness months or days. These awareness events have been associated with increased engagement with healthcare services and increased communication about the specific tumour type, which may have been associated with increased funding.[57, 58] Foundation advocacy may influence government priorities and targeted funding schemes.

Twenty-four organisations (83%) commented on the role of celebrity and foundation advocacy as key drivers of funding across tumour types. These suggestions could not be validated in this report.

Several organisations that funded multiple tumour types viewed the role of celebrity and foundation advocacy in a positive light. These perceived benefits included increased media attention to and awareness of various tumour types, particularly rare cancers; an effective driver of large-scale philanthropic fundraising (including in brain cancer); positive impacts on priority driven MRFF schemes and the cancer research undertaken in Australian universities and medical research institutes.

However, several organisations that funded multiple tumour types acknowledged there was complexity in the role of celebrity and foundation advocacy. These perceived complexities included influencing funding priorities and workforce capacity in certain directions; the potential for multiple organisations dedicated to a single tumour type to draw attention, which may have confused the public; the perceived focus on "finding a cure"; the possibility that celebrity advocates reflected certain demographics in terms of socioeconomic situation, age, and cultural background; and that new philanthropic organisations and medical research institutes tended to focus on specific tumour types.

Social stigma (low confidence)

Social stigma was a key social driver because tumour types that were strongly associated with high-risk, stigmatised behaviours may have received less funding. This may have been due to the belief that reducing the burden was the responsibility of the individual.[46] It also links with other drivers because tumour types without social stigma have greater support from celebrities and tumour-specific organisations.[46]

Lack of survivors (low confidence)

Lack of survivors was a key social driver that may have played two opposing roles in funding across tumour types. First, tumour types with low survival rates may have received less funding because there are fewer survivors who can act as advocates for increasing awareness and philanthropic donations.[59] Conversely, lack of survivors is strongly influenced by differences in mortality and survival, which may have led the Australian Government to prioritise funding to these tumour types with targeted schemes. For example, the Australian Senate announced the Select Committee into Funding for Research into Cancers with Low Survival Rates in November 2016 to inquire and report on the impact of health research funding

models on the availability of funding for research into cancers with low survival rates.[59] Subsequently, the MRFF launched the Rare Cancers Rare Diseases Unmet Need Grant.

Commentary on specific tumour types

This section details how the key drivers may have impacted funding across specific tumour types.

Brain cancer

The Audit found that direct funding for brain cancer research was stable ($20.0 million in 2012–2014 and $19.8 million in 2015–2017), then increased to $54.1 million in 2018–2020.

Funding for brain cancer increased because of government priorities and targeted funding schemes, like the Australian Brain Cancer Mission. This was influenced by low social stigma of brain cancer and because brain cancer was the leading cause of cancer mortality in Australian children. It was also influenced by celebrity and foundation advocacy with multiple celebrities and organisations raising awareness and donations, which contributed towards targeted funding schemes.

The key driver for increased funding in 2018–2020 was the Australian Brain Cancer Mission, a targeted funding scheme of $136.7 million over 10 years from the Australian Government and several funding partners. It was announced in October 2017 and created because the five-year survival rate for brain cancer had remained low at 22% and had not changed significantly in the last 30 years.[4, 17] The aim of the Mission is to double the survival rates and improve the quality of life of patients with brain cancer, with the longer-term aim of defeating brain cancer. This scheme increased funding for brain cancer research in 2018–2020.

Government priorities also increased funding to brain cancer research because brain cancer was the leading cause of mortality in Australian children. The Australian Senate announced the Select Committee into Funding for Research into Cancers with Low Survival Rates in 2016.[59] The Committee was chaired by Senator Catryna Bilyk, who in 2008 was diagnosed with two benign tumours in her brain.[60] In November 2016, the Australian Government provided $20 million to support the launch of the Zero Childhood Cancer program.[61] The Australian Brain Cancer Mission was announced in October 2017, one month before the report from the Select Committee was released.[17]

Celebrity and foundation advocacy also increased funding to brain cancer research by raising awareness and donations and then contributing funds to the Australian Brain Cancer Mission as funding partners. Several celebrities started organisations that raised awareness for brain cancer (e.g., Carrie Bickmore, Mark Hughes) through events. For example, in 2017, the National Rugby League partnered with the Mark Hughes Foundation to host the first Beanie for Brain Cancer Round.[18, 19] Additionally, the Cure for Life foundation conducted the Walk for Life awareness event across Australia for the first time in 2013 and the organisation changed its name to Cure Brain Cancer Foundation in 2014, which emphasised its focus on brain cancer.[62] These organisations acted as funding partners for the Australian Brain Cancer Mission, resulting in increased direct funding to brain cancer.[17]

Low social stigma may have also been a driver for increased funding for brain cancer research because it is not associated with behavioural risk factors. Additionally, brain cancer has a higher incidence rate in children, adolescents, and young adults, and is the leading cause of cancer mortality in Australian children.[63] It is also a tumour type with consistently poor prognosis, especially in children who are impacted by high grade gliomas and diffuse intrinsic pontine glioma.[63]

Haematological cancers (leukemia, lymphoma, myeloma, other blood)

The Audit found that direct funding for haematological cancers research increased from 2012–2014 to 2018–2020:

- **Leukaemia** increased from $40.5 million in 2012–2014 to $67.9 million in 2018–2020.
- **Lymphoma** increased from $5.6 million in 2012–2014 to $15.2 million in 2018–2020.
- **Myeloma** increased from $2.6 million in 2012–2014 to $14.7 million in 2018–2020.
- **Other blood** increased from $3.1 million in 2012–2014 to $13.5 million in 2018–2020.

Funding for haematological cancers research increased because of government priorities and targeted funding schemes with a focus on clinical trials for new treatments. There was funding the MRFF and investment in new research centres, which may have been influenced by treatment breakthroughs in immunotherapy and venetoclax. Ultimately, this increased funding was influenced by the Australian Government's intent to improve the health outcomes of Australians with haematological cancers and reduce health expenditure.

Additional funding from the Australian Government for clinical trials through the MRFF was a key driver, which provided approximately $30 million to test interventions for haematological cancers in 2018–2020.[64] In addition, the government and other organisations provided funding to established research centres that focused on haematological cancers. For example, the Australian Cancer Research Foundation provided funding for the Blood Cancer Therapeutics Centre at The Alfred in 2016 and multiple organisations provided funding for the Centre of Excellence in Cellular Immunotherapy at the Peter MacCallum Cancer Centre.[64, 65] This funding was likely influenced by treatment breakthroughs in haematological cancers.

Scientific advancement and treatment breakthroughs in immunotherapy[i] and venetoclax[j] were key drivers because they demonstrated promise to reduce the burden of haematological cancers in Australia, particularly leukaemia and lymphoma. Australian interest in immunotherapy accelerated from 2011 following approval by the Therapeutic Goods Administration.[66] CAR T-cell therapies, a form of immunotherapy, have shown cure rates up to 80% in acute lymphoblastic leukaemia and 40-50% in large cell lymphoma.[67] Therefore, the success of immunotherapy in treating tumour types like leukaemia and lymphoma provided momentum for increased funding for research in these treatments, including through the MRFF.[39] Similarly, there was increased funding for clinical trials of venetoclax.[40] Promising preliminary results were first announced in 2013, with results in 2015 confirming the drug's efficacy,[68] and it was approved for use in Australia in 2016-2017.[69]

Melanoma

The Audit found that direct funding for melanoma research increased from $29.2 million in 2012–2014 to $52.3 million in 2018–2020.

Funding for melanoma research increased because of additional funding to research advances in 3D imaging technology that aimed to improve early detection, which was influenced by the high incidence of melanoma in Australia.

The key driver was increased funding for early detection of melanoma with new 3D imaging systems. The Audit reported that proportional funding for Early Detection, Diagnosis and Prognosis in melanoma increased from 3% in 2012–2014 to 54% in 2018–2020,[1] which was likely driven by scientific advancement in imaging technology for early melanoma detection. The Australian Cancer Research Foundation provided funding for the Australian Centre of Excellence in Melanoma Imaging and Diagnosis in 2018 to improve early detection of melanoma by rolling out a series of 3D imaging systems in combination with an innovative telemedicine network.[33]

Investment in this technology was driven by the high incidence of melanoma in Australia. Melanoma is the most common cancer in Australians aged 15 to 40,[33] and the Australian Government invested in promising technological advancements to improve melanoma outcomes and reduce healthcare expenditure.

Ovarian cancer

The Audit found that direct funding for ovarian cancer research increased from $16.4 million in 2012–2014 to $31.2 million in 2018–2020.

Funding for ovarian cancer research increased because of government priorities and targeted funding schemes from the MRFF like the Rare Cancers Rare Diseases Unmet Need Grant scheme, and possibly an increase in celebrity and foundation advocacy. These drivers were likely influenced by ovarian cancer's low survival rate of less than 50%.[70]

The introduction of targeted funding schemes for ovarian cancer research in the MRFF was a key driver. There were two key grant schemes that provided additional funding for ovarian cancer research.

The first was the Rare Cancers Rare Diseases Unmet Need Grant scheme and the Reproductive Cancers subcategory, which reflected an increased focus on treatments to improve ovarian cancer survival rates through the Clinical Trials Activity initiative.[71] This is reflected in the Audit, which found that the proportion of funding for the CSO category of Treatment increased from 21% in 2012–2014 to 40% in 2018–2020.[1]

The second was the Emerging Priorities and Consumer Driven Research initiative, specifically the Ovarian Cancer Research and Improving Diagnosis in Cancers with Low Survival Rates Grant subcategories.[72] This

[i] Immunotherapy is a biological therapy that helps the immune system to better act against cancer.
[j] Venetoclax is a targeted treatment for some types of leukaemia and lymphoma.

aimed to support research leading to improved diagnosis and treatment of ovarian cancer. The Australian Government likely prioritised this investment to reduce mortality from ovarian cancer, which was influenced by its low survival rate in Australia.

Increasing advocacy from celebrities and foundations may have been another key driver. There was increased awareness of ovarian cancer between 2012 and 2020 due to increasing activity from foundations, support by the Australian Government, and the introduction of new philanthropic funding sources. Ovarian Cancer Awareness Month, led by Ovarian Cancer Australia in February each year, was formally supported by the Australian Government in 2014.[73] Increased awareness may have increased donations to Ovarian Cancer Research Foundation, which has seen increased philanthropic donations, that then funded additional ovarian cancer research.[74]

In addition, several new organisations were launched during 2012 to 2020 by the family and friends of people who had died because of ovarian cancer, including:

- Rare Ovarian Cancer Incorporated launched in 2018 and raised money for research into rare ovarian cancers.[75]
- Border Ovarian Cancer Awareness Group was active between 2011 and 2022 and raised $500,000 for ovarian cancer research.[76]
- Clothing brand Camilla and Marc launched the Ovaries. Talk About Them. campaign, which raised awareness and donations for ovarian cancer research.[20]

Therefore, the increased awareness of ovarian cancer, particularly following formal support from the Australian Government, combined with the addition of new organisations, may have resulted in increased funding for ovarian cancer research between 2012–2014 and 2018–2020.

Lung cancer and mesothelioma

The Audit found that direct funding for lung cancer and mesothelioma research increased from $14.8 million in 2012–2014 to $30.9 million in 2018–2020.

Funding for lung cancer and mesothelioma research increased because of government priorities and targeted funding schemes from the MRFF, like the Improving Diagnosis in Cancers with Low Survival Rates Grant scheme, and scientific advancement in the CSO category of Early Detection, Diagnosis and Prognosis. This was likely influenced by the lung cancer's high incidence rate and low survival rate; it is the leading cause of cancer mortality in Australia and has a low five-year survival rate.[34, 37]

The introduction of targeted funding schemes for lung cancer research in the MRFF was a key driver. The Improving Diagnosis in Cancers with Low Survival Rates Grant scheme provided targeted funding for tumour types with low survival rates, such as lung cancer.[56] This funding was provided as part of the MRFF's aim to attempt to improve health outcomes and reduce health expenditure in Australia.

Increased funding for discovery and development of innovative methods for detection of lung cancer was a key driver. Proportional funding for the CSO category Early Detection, Diagnosis and Prognosis in lung cancer and mesothelioma increased from 22% in 2012–2014 to 37% in 2018–2020.[1] This reflected scientific advancement in lung cancer screening and early diagnosis. The Australian Cancer Research Foundation Centre for Lung Cancer Early Detection was established in in 2015,[34] and the Australian sites of the International Lung Screening Trial received funding from the NMHRC and Cancer Australia.[35] In 2023, the Australian Government announced the implementation of a National Lung Cancer Screening Program to improve diagnosis and health outcomes.[38]

New lung cancer-specific charities may have also influenced funding trends in 2012–2020, but this would have been limited by the tenure of the organisation. For example, organisations launched at later dates, such as in 2020 may not have played a significant role.

Pancreatic cancer

The Audit found that direct funding for pancreatic cancer research increased from $5.8 million in 2012–2014 to $17.0 million in 2018–2020.

Funding for pancreatic cancer research increased because of government priorities and targeted funding schemes from the MRFF, like the Rare Cancers Rare Diseases Unmet Need Grant scheme, which was influenced by pancreatic cancer having one of the lowest survival rates in Australia.[1] It may have also increased due to funding for treatment breakthroughs in immunotherapy.

The introduction of targeted funding schemes for pancreatic cancer research in the MRFF was a key driver. The Rare Cancers Rare Diseases Unmet Need Grant scheme targeted funding for tumour types with

low survival rates, such as pancreatic cancer.[71] This funding was provided to attempt to improve outcomes and reduce health expenditure in Australia and led to increased funding for pancreatic cancer research, which increased funding in 2018–2020.

Treatment breakthrough in immunotherapy[k] was a key driver. Proportional funding for the CSO category Treatment in pancreatic cancer increased from 29% in 2012–2014 to 70% in 2018–2020,[1] which reflected that most of the increased funding for pancreatic cancer research was used to evaluate treatments. For example, there was a $4.5 million grant to fund the first clinical trial of CAR T-cell immunotherapy for pancreatic cancer.[30] Therefore, increased funding for pancreatic cancer research may have been provided to test immunotherapies as a promising treatment to reduce the burden of pancreatic cancer in Australia.

Breast cancer

The Audit found that direct funding for breast cancer research increased from $81.7 million in 2012–2014 to $91.3 million in 2018–2020. However, the proportion of total funding for breast cancer research decreased from 24% in 2012–2014 to 17% in 2018–2020.

There were no clear key drivers for the increase in funding for breast cancer research. It may have been due to the cumulative impact of several drivers, including treatment breakthroughs and celebrity and foundation advocacy. The increase in direct funding for breast cancer research was relatively smaller than other tumour types and resulted in a decrease in the proportion of funding for breast cancer research, which was likely due to its high survival rate.

Scientific advancement and treatment breakthroughs in immunotherapy[l] may have been a driver of increased funding for breast cancer research. The Audit found that the proportion of funding for the CSO category of Treatment increased for breast cancer from 25% in 2012–2014 to 35% in 2018–2020,[1] which indicated more funding was being provided for clinical trials and research focused on treatment effectiveness. This coincided with a $9.3 million grant scheme by the National Breast Cancer Foundation for 21 research projects, nine of which were channeled to immunotherapy studies.[77] As noted earlier, immunotherapy was a promising treatment to improve health outcomes and reduce health expenditure. The funding for new treatments may have increased funding for breast cancer research.

Celebrity and foundation advocacy may have also been a driver of increased funding for breast cancer research. The Audit found that breast cancer received the largest amount of direct funding from tumour-specific funders between 2012 and 2020.[1] This likely occurred because there were multiple large organisations dedicated to breast cancer research that provided increased funding over time, such as the McGrath Foundation, Australian Breast Cancer Research, and the National Breast Cancer Foundation. Similarly, celebrity advocacy raising awareness (e.g., the Angelina Jolie effect) has been shown to influence health seeking behaviours,[24] and this may have also extended to increased donations for breast cancer research. The public announcement of the return of Olivia Newton-John's breast cancer in 2017 may have also driven funding to breast cancer research.[22]

The proportion of funding for breast cancer research decreased over time. Direct funding for breast cancer research between 2012 and 2020 increased at a slower rate than other tumour types. This may have occurred because breast cancer had high levels of existing research funding and one of the highest survival rates of all tumour types in Australia,[1] which meant priorities shifted to provide increased funding to other tumour types via government and targeted funding schemes, along with new funding organisations dedicated to other tumour types.

Colorectal cancer

The Audit found that direct funding for colorectal cancer research decreased from $36.0 million in 2012–2014 to $23.7 million in 2015–2017, then increased to $43.6 million in 2018–2020.

There were no clear key drivers for the fluctuations in direct funding for colorectal cancer research, particularly the decrease in funding between 2012–2014 and 2015–2017. There were two possibilities for increased funding in 2018–2020.

The introduction of the MRFF may have increased funding in 2018–2020, because it funded a series of new projects focused on colorectal cancer research. For example, the Rapid Applied Research Translation initiative in the MRFF funded the No Australians Dying of Bowel Cancer initiative through Health Translation SA.[78] This initiative focused on colorectal cancer mortality through four steps, including

[k] Immunotherapy is a biological therapy that helps the immune system to better act against cancer.
[l] Immunotherapy is a biological therapy that helps the immune system to better act against cancer.

increasing participation in the National Bowel Cancer Screening Program, which aligned with the expansion of the program to a greater number of Australians. Therefore, the MRFF was a new funding source that may have increased funding for colorectal cancer research in 2018–2020.

Additional funding from foundations may have increased funding in 2018–2020. In 2014, Bowel Cancer Australia established the Bowel Cancer Research Foundation Australia to increase funding for colorectal cancer research in Australia.[79] In 2018, the foundation announced $10.4 million to establish a professorial chair of bowel cancer research at the University of Sydney and increase funding for colorectal cancer research.[80] Professor Mark Molloy was the inaugural Lawrence Penn Chair of Bowel Cancer Research and the Lead Researcher of the Bowel Cancer and Biomarker Research Group, which may have been reflected in the Audit by the increase in proportional funding for the CSO category Aetiology. Proportional funding for Aetiology increased from 8% in 2015–2017 to 22% in 2018–2020, which suggested that additional funding was directed to this CSO category. Therefore, substantial contribution by Bowel Cancer Australia and may have increased funding for colorectal cancer research in 2018–2020.

Prostate cancer

The Audit found that direct funding for prostate cancer increased from $28.7 million in 2012–2014 to $41.2 million in 2015–2017, then decreased to $34.2 million in 2018–2020.

There were no clear key drivers for the fluctuations in direct funding for prostate cancer research. However, one possibility may have influenced the trend.

Additional funding for two clinical trials of enzalutamide may have increased funding in 2015–2017. Enzalutamide is the first second-generation nonsteroidal antiandrogen medication used in the treatment of prostate cancer, initially approved in the USA in 2012.[81] Two large trials of enzalutamide were led by the Australian and New Zealand Urogenital and Prostate Cancer Trials Group and the NHMRC Clinical Trials Centre at University of Sydney, funded by Astellas Scientific and Medical Affairs and other organisations:

- The ENZAMET trial recruited 1125 participants between 2014 and 2017.[82] Astellas provided $16,287,968 to support the conduct of this trial, most of which would have been provided during 2015–2017 for recruitment and treatment.[83]
- The ENZARAD trial recruited 800 participants between 2014 through 2018.[84] Astellas provided $12,178,420 to support the conduct of this trial, most of which would have been provided during 2015–2017 for recruitment and treatment.[83]

Although these trials were sponsored by industry, the funding was provided to other organisations to conduct the study that contributed data to the Audit.[1] Therefore, funding for these two large clinical trials may have increased funding for prostate cancer research in 2015–2017, and funding may have subsequently decreased in 2018–2020 when funding for these trials was no longer being used.

Tumour types with minimal or no increase in direct funding

The Audit found that several tumour types had minimal or no increase in direct funding between 2012–2014 and 2018–2020 (Table 8).

Table 8 | Tumour types that had minimal or no increase in direct funding[m]

Tumour type	2012–2014 ($ millions)	2015–2017 ($ millions)	2018–2020 ($ millions)
Liver	9.0	7.8	11.4
Neuroblastoma	9.0	6.7	10.5
Stomach	5.0	5.5	7.2
Cervix	3.1	4.5	5.5
Sarcoma	2.7	4.8	4.6
Endometrium	3.8	4.4	3.0
Oesophagus	4.5	3.9	2.8
Bone	0.8	0.2	0.2
Thyroid	0.4	0.8	No data
Kidney	1.8	0.02	1.5
Testes	1.0	1.3	0.8
Bladder	1.4	0.9	0.8

There were no clear key drivers to explain these funding trends across these tumour types. However, some general inferences can be made.

Funding may not have increased because they were not prioritised based on their incidence, mortality, burden, and survival. Funding was generally prioritised to tumour types that had higher incidence rates, higher mortality rates, or cancers that had low survival rates. Most of the tumour types in Table 8 were not in the top 10 most common cancers in Australia, except for thyroid cancer.[1] While thyroid cancer was considered one of the most diagnosed tumour types, its high 5-year survival rate may suggest it was a lower priority to receive funding. Most of the tumour types in Table 8 were also not in the top 10 most common causes of cancer mortality in Australia, except for liver cancer and oesophageal cancer.[1] There were no clear key drivers why funding did not increase for liver cancer or oesophageal cancer, given their higher mortality rates.

There may have been no treatment breakthroughs. Many tumour types received funding between 2012–2020 to support clinical trials that tested new treatments, often as part of the MRFF. Therefore, lack of scientific advancement and treatment breakthroughs across the tumour types in Table 8 may explain why funding did not increase.

There may have been limited support from tumour-specific organisations. Sarcoma was the only tumour in Table 8 that received support from a tumour-specific organisation during 2012–2020 (14% of funding). All other tumour types received less than 1% or no direct funding from tumour-specific organisations. Celebrity and foundation advocacy may have played a role in the amount of funding received by a tumour type. Therefore, tumour types with fewer celebrity and foundation advocates may have received less direct funding from tumour-specific organisations. It may have also limited the political influence that these groups may have on government priorities, as demonstrated in the section on brain cancer.

There may be limited workforce capacity in these areas. Funding provided for research generally requires funding to be sought by researchers through competitive grant schemes. The number of researchers who research each tumour type may have played a role in the amount of funding awarded. If there were fewer researchers in an area, there may have been less capacity to perform research. Fewer researchers may also have meant that they were not able to apply for as much research funding through competitive grant schemes. Therefore, the funding trends observed in the Audit may have reflected that there was limited

[m] Data obtained from the Audit.

workforce capacity in these areas who may not have applied for as much funding. Several organisations supported this finding.

3.8 Increased funding for clinical trials

Key Findings

The Audit found that funding for clinical trials increased from $48.0 million (9% of funding) for 133 projects in 2012–2014 to $194 million (21% of funding) for 261 projects in 2018–2020.

Three key drivers of increased funding for clinical trials were identified:

- **Medical Research Future Fund:** The MRFF, particularly the Clinical Trials Activity initiative, prioritised additional funding for clinical trials because it had 'an important role to play in facilitating non-commercial clinical trials of potential significance'. The Australian Government recognised the important role of clinical trials in determining the effectiveness of treatments that could improve the health of Australians and reduce future health expenditure.
- **Treatment breakthroughs:** Organisations invested funding in clinical trials to investigate treatment breakthroughs such as immunotherapy and venetoclax as they attempted to reduce the burden of cancer.
- **Funding schemes for international clinical trial collaborations:** There was targeted funding that was designed to increase Australian collaboration in international clinical trials through the MRFF International Clinical Trial Collaborations grant and NHMRC-EU Collaborative Research Grant Scheme, which was recommended by the Australian Government.

Overview of key drivers

The Audit found **that funding for clinical trials increased from $48.0 million (9% of funding) for 133 projects in 2012–2014 to $194 million (21% of funding) for 261 projects in 2018–2020.** Three key drivers have been identified (Table 9). Organisations generally agreed with the key drivers identified in the desktop review (Appendix D). Additional suggestions from organisations are in Appendix E.

Table 9 | Key drivers for increased funding for clinical trials in 2012–2020

Driver	PEST domain	Confidence
Medical Research Future Fund *The Medical Research Future Fund targeted prioritised funding for treatments in cancer research, many of which were examined in clinical trials.*	Political/economic	High
Treatment breakthroughs *Treatment breakthroughs encouraged increased funding for clinical trials because organisations investigated treatment effectiveness and attempted to reduce the burden of cancer.*	Technological	High
Funding schemes for international clinical trial collaborations *Additional targeted funding schemes designed to increase Australian collaboration in international clinical trials*	Economic/political	Moderate

Medical Research Future Fund (high confidence)

The MRFF, particularly the Clinical Trials Activity initiative, was a key political and economic driver of increased funding to clinical trials, which overlapped with its role as a key driver for increased funding for the Treatment CSO category. The MRFF increased medical research investment for cure and discovery research, [5] and had 'an important role to play in facilitating non-commercial clinical trials of potential significance'. [7] The MRFF increased funding for clinical trials because the Australian Government recognised the important role that clinical trials had in determining the effectiveness of treatments that could improve the health of Australians and reduce future health expenditure.

Treatment breakthroughs (high confidence)

Treatment breakthroughs were a key driver of increased funding for clinical trials because additional funding was used to evaluate treatment breakthroughs in immunotherapy[n] and venetoclax[o], which overlapped with its role as a key driver for increased funding for the Treatment CSO category. These

[n] Immunotherapy is a biological therapy that helps the immune system to better act against cancer.
[o] Venetoclax is a targeted treatment for some types of leukaemia and lymphoma.

breakthroughs increased funding for clinical trials as organisations tested treatments to reduce the burden of cancer in Australia.

Funding schemes for international clinical trial collaborations (moderate confidence)

Targeted funding schemes designed to increase Australian collaboration in international clinical trials may have increased funding for clinical trials.[26] International collaboration was recommended by the Australian Government to gain input and insight from international partners to improve health for all Australians.[7] Some examples of these funding schemes may have included the MRFF International Clinical Trial Collaborations grant and the NHMRC-EU Collaborative Research Grant Scheme.[27, 28]

3.9 Considerations for cancer research funding and future audits

Key Findings

The project identified considerations for future audits and national cancer research funding.
Two key future considerations were identified:

- **The value of further investment in funding schemes for international collaborations**. Increased investment in these funding schemes may attract additional international funding in cancer research conducted in Australia.
- **The inclusion of population demographic analysis in future audits.** Audits, to date, have not analysed research funding trends by population demographics. Future reports could include data on cancer research funding by priority population and where clinical trials have been conducted and how this has changed over time.

In **stakeholder consultation**, organisations suggested increasing funding for cancer research with less political and structural determinants, overarching strategies to guide funding, the importance of data and equity, the use of targeted research investment, and a greater focus on collaboration.

There are several strategic considerations for optimising future investment in cancer research and aligning to the objectives and actions of the Australian Cancer Plan.[85] Further opportunities may emerge following the release and publication of the Australian Cancer Plan.

Further investment in funding schemes for international collaborations may increase co-funding and international funding

Increased investment in funding schemes for international collaborations may bring additional funders. Currently, these schemes target clinical trials and specific locations (e.g., European Union). Future investment could add or expand schemes to fund international collaborations in other CSO categories (e.g., Prevention) and locations (e.g., Canada). This will enhance Australia's collaborative efforts with global partners and align to the recommendations in the MRFF.

Future research funding audits could collect and report additional trends

Equity is a key focus of the Australian Cancer Plan, but the Audit did not provide data on population demographics. This is an important consideration in future audits and reports, which will align priorities in the Australian Cancer Plan. For example, the Australian Cancer Plan aims to improve cancer outcomes for priority populations including Aboriginal and Torres Strait Islander people, and to increase access to clinical trials for rural populations because trials have been focused in metropolitan areas. Therefore, future reports could include data on cancer research funding by priority population and where clinical trials have been conducted and how this has changed over time.

Future reports should report data on population demographics, which means funding organisations must collect data on population demographics. Cancer Australia should advise organisations on the outcomes related to population demographics and how to measure them so that these can be incorporated into grant applications or awards. This may also include more nuanced data about types of research and career stage of recipients beyond what is captured in the current Audit methodology. Cancer Australia may also consider how CSO categories can be aligned with broader research types (e.g., Discovery versus Applied/Clinical).

Stakeholder perspectives

Organisations provided a range of considerations for future research funding investment which are outlined below but have not been validated.

The importance of increasing funding for cancer research, with less political and structural determinants

Several organisations suggested that, although funding for cancer research increased from 2012–2020, further increases in funding are required to support new researcher talent and innovation. They noted:

- The importance of strengthening researcher talent. Innovation in cancer care has been disappointing despite the large investment in cancer research in Australia.
- The benefits of diversified funding sources. Some held the view that too much research funding is funnelled to a small group of researchers.

- Australian Government expenditure on research and development is below that spent across most of the developed world and has declined by since 2010. They suggested the funds that are available should be directed towards the most innovative and impactful research which utilises Australia's highly sophisticated and skilled workforce.
- The Australian Government should continue to support all types of cancer research, regardless of government cycles.
- Consideration of quality and potential impact of the proposed research. Funding a priority area or type of research without factoring in the incremental benefit weakens public policy in the cancer research space.

Several organisations believed that political and structural issues have been key factors in cancer research funding during this period. They noted that an assessment of the effects of these issues and benefits from long-term approaches can inform change so that funding gaps can be met and there can be equity in outcomes for all.

The need for overarching strategies to guide research funding

Several organisations suggested that overarching strategies are required, including:

- a national cancer research strategy, inclusive of strategies to develop the cancer research workforce and encompassing the full cancer research pipeline
- a clear career development pathway for early/mid-career researchers
- a pipeline from discovery to clinical care and implementation/commercialisation of new cancer treatments
- incorporating evidence-based cancer control strategies to guide future funding.

Organisations also noted the importance of greater stability and predictability in funding.

The importance of strengthening access and use of data

Several organisations suggested that there was a large-scale reform required in Australia on the use of cancer related data, including:

- data linkage and common data models
- data governance
- data to measure outcomes vital to implementation of the Australian Cancer Plan, which must be population-wide to capture under-represented groups.

One organisation suggested that initiatives such as the Health Studies Australian National Data Asset is critical to Australia being a world leader in cancer research activities; however, cost and complexity of the current system is seen as prohibitive.

The importance of an equity lens in cancer research investment

Several organisations highlighted the importance of equity, based on different outcomes:

- equity of access to clinical trials and research
- equity across tumour types
- equity of survival, with the poorer prognosis cancers needing additional support.
- equity of access for Aboriginal and Torres Strait Islander people and culturally and linguistically diverse Australians.

One organisation suggested that outcomes should have wholistic benefit to society (not simply increased survival but with quality of life and patient preferences).

The value of targeted research investments

Several organisations suggested that targeted research investment can be used for:

- rare cancers and tumour types with poorer outcomes (with particular focus on clinical trials)
- tumour types receiving an appropriate priority mix of funding for CSO categories (noting the Australian Cancer Plan has emphasised tumour agnosticism)
- economic research
- discovery research
- development of enabling technologies or platform technologies that could underpin/enable the development of therapeutics to treat a range of cancers.
- cell therapies and mRNA technology
- more aggressive funding for experimental and innovative drug candidates is necessary.
- increasing the availability of biologics or RNA therapeutics may reduce the need for chemotherapy.

- advances in genomics as each tumour type increasingly diversifies into smaller distinct subtypes based on a molecular profile.

Strengthening research collaborations

Several organisations suggested that collaborations required greater focus. This spanned different areas, including:

- partnerships with health service delivery partners
- partnerships with industry
- international collaboration with the scientific community
- co-funding from government to the not-for-profit sector
- collaboration with the Medical Services Advisory Committee and Pharmaceutical Benefits Advisory Committee.
- clinical trials done in collaboration and funded by Department of Health and Aged Care to compare efficacy of different treatment strategies which could define less expensive but equally effective treatments.

Consideration of inflation

The Audit did not consider the role of inflation in funding for cancer research. One organisation suggested that future audits could consider increases in funding as:

- Below inflation: research funding has decreased in real terms
- In line with inflation: research funding has remained unchanged in real terms
- Above inflation: research funding has increased in real terms.

4 Appendices

Key search terms	Key search terms: • "Australia cancer research funding"
Date of publication	2012–2020
Search refinements	• Journal articles • Full-text articles • English language • Top 100 articles only (by relevance)
Criterion for eligibility	Criterion for eligibility: • Addresses one or more of the key lines of enquiry

Appendix A | Search strategy and criteria for Google Scholar

Appendix B | List of organisations for stakeholder consultation

1. Eastern Health Foundation
2. National Health and Medical Research Council (NHMRC)
3. Austin Medical Research Foundation
4. Menzies School of Health
5. University of Technology
6. Western Sydney Local Health District (WSLHD)
7. Australasian Society for Stem Cell Research Inc. (ASSCR)
8. Epworth Research Institute
9. Western Australia Department of Health
10. Walter and Eliza Hall Institute of Medical Research
11. University of Melbourne
12. South Australian Health and Medical Research Institute
13. University of New South Wales (UNSW)
14. University of Adelaide
15. University of Sydney
16. University of Tasmania
17. Australian Melanoma Research Foundation
18. Edith Cowan University
19. Peter MacCallum Cancer Centre
20. Garvan Institute of Medical Research
21. Harry Perkins Institute of Medical Research
22. Curtin University
23. University of Western Australia
24. Telethon Institute for Child Health Research
25. Murdoch Institute
26. Cancer Council Western Australia
27. Perron Institute
28. St Vincent's Centre for Applied Medical Research (AMR)
29. St Vincent's Clinical School
30. St Vincent's Institute of Medical Research
31. Kinghorn Cancer Centre
32. The Kids Cancer Project
33. Sir Edward Dunlop Medical Research Foundation
34. Hudson Institute of Medical Research
35. Australia and New Zealand Children's Haematology / Oncology Group (ANZCHOG)
36. Monash Children's Hospital
37. Royal Children's Hospital Melbourne
38. The CASS Foundation
39. Macquarie Foundation
40. Princess Alexandra Hospital Research Foundation
41. Chris O'Brien Lifehouse
42. University of Western Sydney
43. Queensland University of Technology
44. Monash University
45. Royal Prince Alfred Hospital
46. Queensland Institute of Medical Research
47. University of Queensland
48. Cancer Council NSW
49. University of South Australia
50. ANZAC Research Institute
51. University of Canberra
52. Cure Cancer

53. ACT Health
54. Melanoma Institute Australia
55. Charlie's Foundation for Research
56. Children's Medical Research Institute
57. Children's Cancer Australia
58. Royal North Shore Hospital
59. Kolling Institute of Medical Research
60. Lowy Cancer Research Centre
61. QIMR Berghofer Medical Research Institute
62. University of Newcastle
63. Commonwealth Scientific and Industrial Research Organisation (CSIRO)
64. Sydney Children's Hospital
65. Westmead Institute for Cancer Research
66. Ludwig Institute of Cancer Institute
67. CanToo Foundation
68. Ingham Institute of Applied Medical Research
69. South Eastern Sydney Local Health District (SLHD) - The Prince of Wales Hospital
70. SLHD - Concord Repatriation General Hospital
71. Australian Society of Gynaecologic Oncologists
72. Flinders University
73. SA Health
74. Australian Genomics
75. National Breast Cancer Foundation
76. NSW Health
77. University of New England
78. Bond University
79. Macquarie University
80. VCCC Alliance
81. Medical Research Future Fund (MRFF), Department of Health and Aged Care.
82. Griffith University
83. Cancer Council Victoria
84. Australian Research Council
85. Queensland Health
86. Royal Australasian College of Surgeons
87. National Institutes of Health (NIH)
88. James Cook University
89. Charles Darwin University
90. Department of Veterans Affairs
91. South Eastern Sydney Local Health District – St George Hospital
92. Neuroendocrine Cancer Australia
93. Australia and New Zealand Sarcoma Association (ANZSA)
94. Breast Cancer Trials (BCT)
95. World Cancer Research Fund
96. The Alfred Foundation
97. Worldwide Cancer Research
98. Maddie Riewoldt's Vision
99. Royal Australian and New Zealand College of Radiologists
100. The Hospital Research Foundation
101. Translation Research Institute
102. Victoria University
103. The Snowdome Foundation
104. Cancer Council Western Australia
105. Cancer Council Tasmania
106. Pancare

107. Raine Foundation
108. University of Notre Dame
109. La Trobe University
110. Royal Children's Hospital Foundation
111. Mark Hughes Foundation
112. GI Cancer Institute
113. University of Southern Queensland
114. Royal Hobart Hospital Foundation
115. Deakin University
116. Ovarian Cancer Australia
117. Leukemia Foundation
118. University of Wollongong
119. Cancer Council ACT
120. Clifford Craig Medical Research Foundation
121. Department of Health
122. PanKind
123. Adenoid Cystic Carcinoma Research Foundation
124. Cancer Australia's Priority-driven Collaborative Cancer Research Scheme

Appendix C | Survey questions from stakeholder consultation

The online survey was available from 31 July to 15 August via Microsoft Forms. All organisations were initially contacted by Nous Group via email, with a follow-up reminder sent on 7 August. Cancer Australia sent an additional follow-up reminder on 9 August to encourage survey responses. The survey questions are outlined on the following pages.

Survey Item / Question	Response type (notes)
1. Is your organisation Australian-based or international? (Compulsory question)	Dropdown: • Australian-based • International
2. Please select the category that best describes your organisation. (Compulsory question)	Dropdown: • Government funding agency • Non-government funding agency • University • Medical research institute • Hospital/ health service • Other (please describe)
3. Did your organisation provide research funding for multiple tumour types or primarily a single tumour type in 2012–2020? (Compulsory question)	Dropdown: • Multiple • Single
3a. If 'Single', please enter the tumour type your organisation primarily funded. * Only appears if 'Single' is selected (Compulsory question)	Free text
4. Political drivers are shifts in national and jurisdictional health priorities and reforms. Two potential key political drivers have been identified: • The Medical Research Future Fund was a key driver of increased total funding, increased funding for Treatment, and increased funding for clinical trials. • Government priorities were a key driver of disproportionate funding across tumour types.	Section head (no question)
4a. To what extent do you agree that these were key political drivers in 2012–2020?	Likert scale 1. Strongly agree 2. Agree 3. Neither agree nor disagree 4. Disagree 5. Strongly disagree
4b. Do you have other examples of political key drivers that may have impacted funding for cancer research in Australia in 2012–2020?	Free text
5. Economic drivers refer to changes to health and cancer research funding approaches. Three potential key economic drivers have been identified: • The NHMRC Investigator Grant scheme increased total funding. • Funding schemes for international clinical trial collaborations in increased co-funding and funding for clinical trials. • Partnerships and collaborations to conduct more impactful research increased co-funding.	Section head (no question)
5a. To what extent do you agree that these were key economic drivers in 2012–2020?	Likert scale 1. Strongly agree 2. Agree 3. Neither agree nor disagree 4. Disagree 5. Strongly disagree

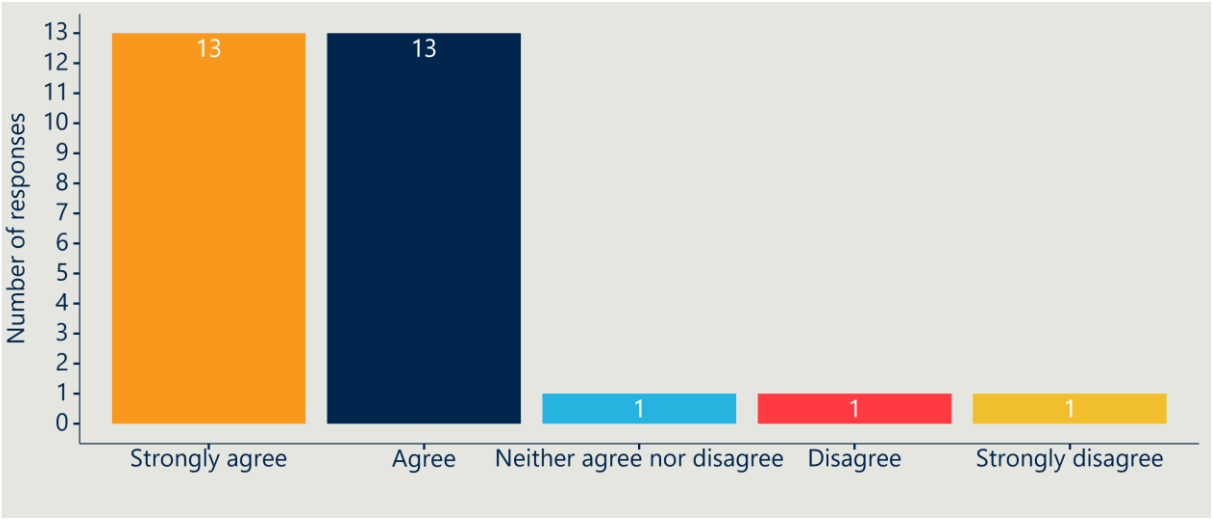
Survey Item / Question	Response type (notes)
5b. Do you have other examples of economic key drivers that may have impacted funding for cancer research in Australia in 2012–2020?	Free text
6. Social drivers relate to characteristics of the societal context includes demographics, cultural attitudes, literacy rates, education levels, customs, beliefs, values, lifestyles, age distribution, geographic distribution, and population mobility. Several potential key social drivers have been identified: • Increasing cancer incidence and projected burden, and celebrity advocacy, increased total funding. • Celebrity advocacy, foundation advocacy, disproportionate incidence across sexes, social stigma, and lack of survivors were key drivers for disproportionate funding across tumour types. • Increased philanthropy increased co-funding.	Section head (no question)
6a. To what extent do you agree that these were likely key social drivers in 2012–2020?	Likert scale 1. Strongly agree 2. Agree 3. Neither agree nor disagree 4. Disagree 5. Strongly disagree
6b. Do you have other examples of social key drivers that may have impacted funding for cancer research in Australia in 2012–2020?	Free text
7. Technological drivers relate to digital communication, biotechnology, chemicals, energy and medicine (among other fields) that have opened new areas to commercial competition. Four potential key technological drivers have been identified: • Scientific advancement and treatment breakthrough increased total funding, increased funding for Treatment and clinical trials, and was a key driver of disproportionate funding across tumour types. • Investment in genomics research, melanoma screening technology, and lung cancer screening were key drivers of increased funding for Early Detection, Diagnosis and Prognosis.	Section head (no question)
7a. To what extent do you agree that these were key technological drivers in 2012–2020?	Likert scale 1. Strongly agree 2. Agree 3. Neither agree nor disagree 4. Disagree 5. Strongly disagree
7b. Do you have other examples of technological key drivers that may have impacted funding for cancer research in Australia in 2012–2020?	Free text
8. Social drivers appeared to explain consistently low funding for Prevention and were also potential drivers to increase funding for Prevention. • Behavioural risk factors were the key driver for consistently low funding for prevention. • Increased advocacy, collaboration across health conditions, and focus on non-behavioural risk factors may be drivers to increase funding for Prevention.	Section head (no question)

Survey Item / Question	Response type (notes)
8a. To what extent do you agree that behavioural risk factors were the key social driver of low funding for Prevention in 2012–2020?	Likert scale 1. Strongly agree 2. Agree 3. Neither agree nor disagree 4. Disagree 5. Strongly disagree
8b. Do you have other examples of key social drivers of low funding for Prevention in 2012–2020?	Free text
8c. Do you have other examples of drivers that may increase funding for Prevention?	Free text
9. Do you have any further comments on key drivers of funding for cancer research in Australia in 2012–2020?	Free text
10. Optimising future investment in cancer research and alignment to the strategic objectives and actions of the Australian Cancer Plan is important. Opportunities to strengthen this alignment may include targeted research investment, increased opportunity for data linkage and collaborations nationally and internationally. Do you have any comments or additional considerations on optimising future investment in cancer research?	Free text

Appendix D | Responses to survey questions from stakeholder consultation

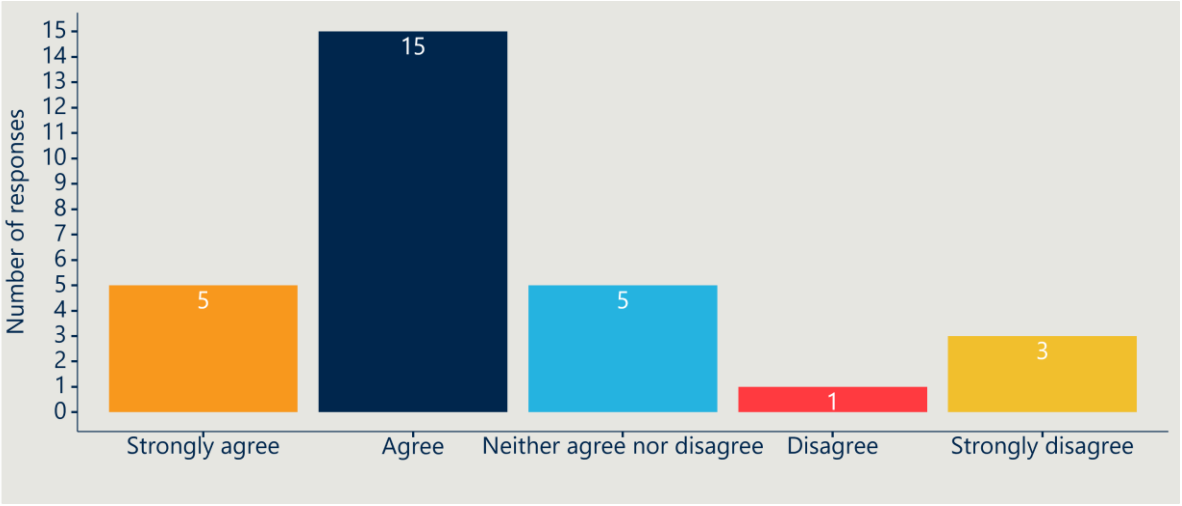
All organisations that completed the online survey responded to the question: *To what extent do you agree that these were key political drivers in 2012–2020?*

Figure 5 | Reponses to the online survey question about political drivers of funding for cancer research in 2012–2020 (n = 29)



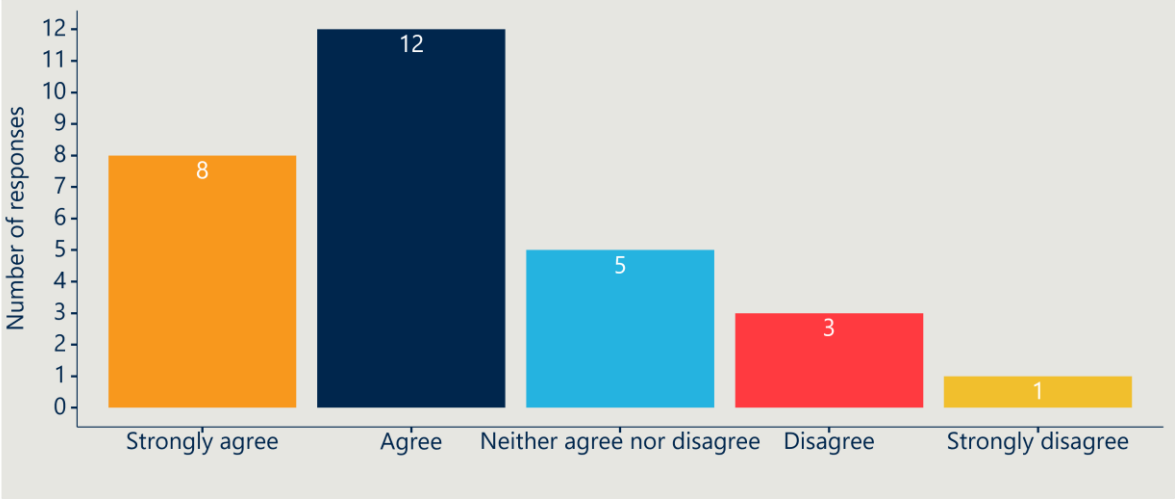
All organisations that completed the online survey responded to the question: *To what extent do you agree that these were key economic drivers in 2012–2020?*

Figure 6 | Reponses to the online survey question about economic drivers of funding for cancer research in 2012–2020 (n = 29)



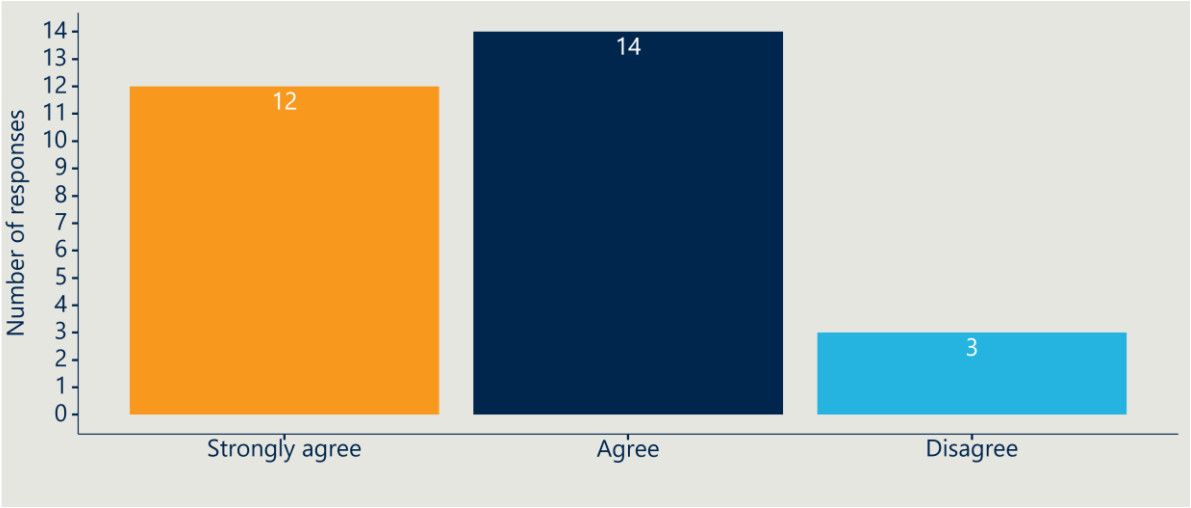
All organisations that completed the online survey responded to the question: *To what extent do you agree that these were key social drivers in 2012–2020?*

Figure 7 | Reponses to the online survey question about social drivers of funding for cancer research in 2012–2020 (n = 29)



All organisations that completed the online survey responded to the question: *To what extent do you agree that these were key technological drivers in 2012–2020?*

Figure 8 | Reponses to the online survey question about technological drivers of funding for cancer research in 2012–2020 (n = 29)



Appendix E | Summary of additional responses from stakeholder consultation

Summary of additional suggestions to key drivers of increased overall funding for cancer research.
Several organisations identified several other types of individuals or groups that may have been key political drivers of increased funding, including:

- membership of the Australian Medical Research Advisory Board
- special interest groups
- patient groups and cancer societies
- key research and consumer advocacy groups.

Several organisations identified other scientific advancements, which may have increased funding for cancer research, including:

- big data, large-scale data linkage and artificial intelligence/machine learning
- next generation sequencing for personalised medicine
- circulating tumour DNA
- CRISPR
- mRNA vaccine technology.
- Other "-omics" platforms, such as metabolomics and proteomics.

Organisations suggested that although funding had increased between 2012 and 2020, more funding was needed for cancer research. Several organisations identified broader economic factors that may have impacted funding for cancer research in Australia, including:

- lack of funding for indirect costs
- lack of career awards
- lack of job security for Australian based cancer researchers
- impact of COVID-19 on philanthropic funding
- establishment of new philanthropic organisations
- lack of funding by major funding organisations (e.g., Department of Health and Aged Care, NHMRC).

Summary of additional suggestions to key drivers of increased co-funded research.
One organisation suggested that community donors have experienced higher living costs and increased interest rates, which has affected their funding for cancer research. However, by historical standards the cash rate remained low during 2012 to 2022, and this may relate to more recent increases and cost of living pressures (outside of the Audit period). Another organisation suggested that philanthropy in Australia is a minor driver of cancer research in Australia compared to other developed countries and another that philanthropy is important in Sydney and Melbourne but has less of an impact in other locations in Australia.

Summary of additional suggestions to key drivers of increased proportional funding for research in Early Detection, Diagnosis and Prognosis.

- Big data, artificial intelligence and machine learning
- Next-generation sequencing
- Social media
- Circulating tumour DNA
- CRISPR
- Data analytic capabilities and large-scale data linkage nationally and internationally
- Consider new technologies for screening, particularly with bowel and liver cancer.

Summary of additional suggestions to key drivers of increased proportional funding for research in Treatment.
Organisations noted increases in the proportion of funding for translational and clinical research and a decrease in funding for basic research, which may have been influenced by political factors such as government election cycles and the appeal of more immediate impacts. Organisations also acknowledged that Treatment often requires greater investment due to collaboration with industry. For example, CAR T-cell therapy requires investment to obtain products from pharmaceutical companies not based in Australia. Another organisation suggested that increasing government emphasis on commercialisation also had an economic impact. For example, the Medical Research Commercialisation Fund targets significant commercial returns, which generally comes from research in Treatment.

Summary of additional suggestions to key drivers of consistently low proportional funding for research in Prevention.

- There was a lack of fit-for-purpose research funding for longitudinal, large-scale cohort studies. Traditional funding models did not align well with opportunities for cancer prevention research.
- There was low appetite from foundations and philanthropy to fund prevention research compared to funding discoveries of treatments and clinical trials and there was no compensatory government fund.
- This was a societal problem that did not seem to respond to epidemiological research.
- Research on cancer prevention was near impossible without outcome measures. Most behavioural risk factors had not been robustly validated and their effect on cancer development was negligible.
- There were an insufficient number of cancer researchers working in prevention due to the difficulty of demonstrating impact.
- The underfunding of cancer prevention meant that ambitious clinicians and researchers saw working in the prevention space as detrimental to their career.
- Specific exclusion of behavioural interventions from cancer related MRFF funding streams. For example, the Million Minds scheme did not increase psycho-oncology funding as the scope of the priorities, such as suicide prevention and acute mental health, were too specific to encompass cancer-related mental health concerns.
- Prevention research may cross all tumour types, rendering it less recognisable as a focus for potential donors.
- This research does not progress to clinical trials as funders: (a) do not perceive behaviour change innovative; and, (b) want outcome data linked to cancer prevention rather than increased healthy behaviours.

Summary of additional suggestions of key drivers to increase funding for research in Prevention.

- Rising number of patients and issues with health care services
- General awareness of prevention strategies for cancer in general
- Targeted streams of funding
- Longer funding periods
- Larger pools of funding for prevention research
- Increased government acceptance
- Simple and consistent messaging
- Preventive genomic pathology, improving genomic informatics and analysis
- The development and implementation of improved screening technologies.
- Increased focus on socioeconomic/ social based risk stratification that includes cultural issues and indigenous status.

Summary of additional suggestions to key drivers of funding across tumour types.

Some organisations stated that research funding should be informed by research funding gaps and areas with the greatest burden of disease.

Some organisations that primarily funded a single tumour type noted celebrity and foundation advocacy may have negatively impacted their funding:

- An organisation focused on sarcoma suggested tumour types that were championed experienced increased philanthropy, but tumour types that weren't championed may have experienced a decline in philanthropy. This organisation also suggested that celebrity endorsement may have influenced where donations for research funding are directed from the general community.
- some organisations noted that celebrity and foundation advocacy was a powerful tool for increasing donations to not-for-profit funding organisations. However, it was suggested that not all organisations have the luxury of celebrities or government favour and may miss out on funding.

Several organisations suggested that ministerial advice and aims and discretionary power of government may have been a political driver that influenced funding across tumour types, which aligned with the political and economic driver from the desktop review, government priorities and targeted funding schemes. There may have been a political push towards an increase in the proportion of funding for translational and clinical research and a decrease in funding for basic research. Similarly, government election cycles may have been driving quick impact stories that drive a focus on curative and treatment research, which likely benefited some tumour types more than others based on scientific advancement and treatment breakthroughs. There were also state government initiatives and priorities like state-based

cancer plans and funding for organisations such as the Victorian Comprehensive Cancer Centre and genomics consortia, which may have influenced funding across tumour types. One organisation advocated that a response to this driver may be greater transparency on grant decision making.

One organisation said that studies funded by the pharmaceutical industry have commercial drivers that disadvantaged rare cancers. It is important to note that funding from industry was not specifically included in the Audit, but also to acknowledge that scientific advancements by industry may have influenced downstream funding priorities over time.

Several organisations suggested that political lobbying may have also influenced funding across tumour types. This echoed the potential influence of celebrity and foundation advocacy that was highlighted in the desktop review, and links to their possible influence on government priorities and targeted funding schemes. Organisations identified several other types of individuals or groups that may influenced funding across tumour types, including:

- membership of the Australian Medical Research Advisory Board
- engagement of philanthropists
- special interest groups
- patient groups and cancer societies
- key research and consumer advocacy groups.

Surveyed organisations suggested that political lobbying from these individuals or groups may have influenced funding priorities, which resulted in different funding across tumour types. One organisation also suggested the advancements of social medical and social funding platforms (e.g., crowdfunding) may have also been a key technological driver to drive funding for specific tumour types. Celebrities and foundations may have also used these platforms to enhance their awareness and outreach campaigns to increase funding for specific tumour types.

Several organisations highlighted that new philanthropic organisations and medical research institutes tend to focus on specific tumour types, which possibly affected funding across tumour types. One organisation suggested that a smaller research workforce in some tumour types may have influenced the amount of research that could be conducted and may have contributed to differences in funding across tumour types. One organisation suggested that, because funding is often investigator-initiated, researcher choice may have also been a key driver.

Summary of additional suggestions to key drivers of increased funding for clinical trials.

Organisations commented on the political push towards an increase in the proportion of funding for translational and clinical research and a decrease in funding for basic research. Organisations also acknowledged that clinical trials may have required greater investment due to collaboration with industry to obtain products from pharmaceutical companies not based in Australia.

5 References

[1] Cancer Australia 2023. Cancer Research in Australia: An overview of funding for cancer research projects and programs in Australia, 2012 to 2020. Surry Hills: Cancer Australia.

[2] Australian Institute of Health and Welfare (AIHW) 2012. Cancer incidence projections, Australia 2011 to 2020. Cat. no. CAN 62. Canberra: AIHW.

[3] Australian Institute of Health and Welfare (AIHW) 2012. Cancer survival and prevalence in Australia: period estimates from 1982 to 2010. Cat. no. CAN 65. Canberra: AIHW.

[4] Australian Insitute of Health and Welfare (AIHW) 2021. Cancer in Australia 2021. Cat. no CAN 144. Canberra: AIHW.

[5] Parliament of Australia 2015. Medical Research Future Fund Bill 2015. Accessed: July 2023; https://www.aph.gov.au/Parliamentary_Business/Bills_Legislation/Bills_Search_Results/Result?bId=r5397.

[6] Research Australia 2023. Medical Research Future Fund. Accessed: July 2023; https://researchaustralia.org/reports/mrff-research-australia-perspective/.

[7] Australian Medical Research Advisory Board 2016. Australian Medical Research and Innovation Strategy 2016-2021. Canberra: Department of Health and Aged Care.

[8] Australian Institute of Health and Welfare (AIHW) 1997. First report on the national health priority areas, full report. Cat. no. PHE 1. Canberra: AIHW.

[9] National Health and Medical Research Council 2023. New grant program - Overview. Accessed July 2023; https://www.nhmrc.gov.au/funding/new-grant-program/overview.

[10] National Health and Medical Research Council 2022. Research funding statistics and data. Accessed: July 2023; https://www.nhmrc.gov.au/funding/data-research/research-funding-statistics-and-data.

[11] Hockey J 2014. Budget Speech 2014-2015. House of Representatives. Canberra: Australian Government.

[12] Stark Z, Lena D, Manolio TA, Ozenberger B, Hill SL, Caulfied MJ. et al. Integrating Genomics into Healthcare: A Global Responsibility. The American Journal of Human Genetics 2019; 104(1), 13-20.

[13] Garvan Institute of Medical Research 2018. Budget 2018: A new national genomics mission for Australia. Accessed: July 2023; https://www.garvan.org.au/news-events/news/budget-2018-a-new-national-genomics-mission-for-australia.

[14] Department of Health and Aged Care 2021. MRFF Genomics Health Futures Mission Roadmap. Accessed: July 2023; https://www.health.gov.au/resources/publications/mrff-genomics-health-futures-mission-roadmap.

[15] AusIndustry 2022. Cooperative Research Centres (CRC) Program - CRC Grants over time. Accessed: July 2023; https://business.gov.au/-/media/grants-and-programs/crc/cooperative-research-centres-over-time-pdf.ashx?sc_lang=en&hash=FA1107FB69261A59937A2BAD4B38CB3EAusIndustry.

[16] BiotechDispatch 2020. Amplia Therapeutics takes Australian cancer discovery into trials. Accessed: July 2023; https://biotechdispatch.com.au/news/amplia-therapeutics-takes-australian-cancer-discovery-into-trial.

[17] Department of Health and Aged Care 2023. Australian Brain Cancer Mission. Accessed: July 2023; https://www.health.gov.au/our-work/australian-brain-cancer-mission.

[18] Carrie's Beanies 4 Brain Cancer 2023. About us. Accessed: July 2023; https://www.carriesbeanies4braincancer.com/about-us.

[19] Mark Hughes Foundation 2023. About the MHF. Accessed: July 2023; https://markhughesfoundation.com.au/about/.

[20] Camilla and Marc 2023. Meet the research team. Accessed: July 2023; https://www.camillaandmarc.com/blogs/all/ovaries-talk-about-them.

[21] Olivia Newtown-John Cancer Wellness & Research Centre 2023. Our philosophy and vision for the future. Accessed: July 2023; https://www.onjcancercentre.org/about/a-public-hospital-with-a-difference/our-philosophy-and-vision-for-the-future.

[22] The Guardian 2020. Olivia Newton-John: 'I don't wish cancer on anyone else. But for me, it has been a gift'. Accessed: July 2023; https://www.theguardian.com/film/2020/oct/26/olivia-newton-john-i-dont-wish-cancer-on-anyone-else-but-for-me-it-has-been-a-gift.

[23] Department of Health and Aged Care 2022. Summary of MRFF grant recipients. Accessed: July 2023; https://www.health.gov.au/summary-of-mrff-grant-recipients.

[24] Evans DRG, Barwell J, Eccles DM, Collins A, Izatt L, Jacobs C. et al. The Angelina Jolie effect: how high celebrity profile can have a major impact on provision of cancer related services. Breast Cancer Research 2014, 16, 144.

[25] Sydney Morning Herald 2013. Breast cancer: Genetic testing soars after Angelina Jolie's double mastectomy. Accessed: July 2023; https://www.smh.com.au/healthcare/breast-cancer-genetic-testing-soars-after-angelina-jolies-double-mastectomy-20131112-2xelm.html.

[26] National Health and Medical Research Council 2018. Medical Research Future Fund - International Clinical Trial Collaborations Program. Accessed: July 2023; https://www.bulletpoint.com.au/wp-content/uploads/2019/05/ICTP-grant-guidelines-2018-FINAL.pdf.

[27] Bulletpoint 2018. MRFF international clinical trial collaborations program. Accessed: July 2023; https://www.bulletpoint.com.au/mrff-ictc/.

[28] Department of Health and Aged Care 2019. $7 million for international collaborative health research. Accessed: July 2023; https://www.health.gov.au/ministers/the-hon-greg-hunt-mp/media/7-million-for-international-collaborative-health-research.

[29] Department of Health and Aged Care 2022. Medical research future fund (MRFF) 1st 10-year Investment Plan (2018-19 to 2027-28). Accessed: July 2023; https://www.health.gov.au/resources/publications/medical-research-future-fund-mrff-1st-10-year-investment-plan-2018-19-to-2027-28

[30] University of Sydney 2018. $4.5m gift powers a first in cancer. Accessed: July 2023; https://www.sydney.edu.au/news-opinion/news/2018/11/27/-4-5m-gift-powers-australian-first-in-car-t-cell-immunotherapy.html.

[31] American Cancer Society 2023. Precision or personalized medicine. Accessed: July 2023; https://www.cancer.org/cancer/managing-cancer/treatment-types/precision-medicine.html.

[32] Department of Health and Aged Care 2017. National Health Genomics Policy Framework 2018-2019. Canberra: Department of Health and Aged Care.

[33] Australian Cancer Research Foundation 2023. ACRF Australian Centre Of Excellence In Melanoma Imaging And Diagnosis. Accessed: July 2023; https://www.acrf.com.au/support-cancer-research/cancer-research-projects-and-grants/acrf-australian-centre-of-excellence-in-melanoma-imaging-and-diagnosis/.

[34] Australian Cancer Research Foundation 2023. ACRF Centre For Lung Cancer Early Detection. Accessed: July 2023; https://www.acrf.com.au/support-cancer-research/cancer-research-projects-and-grants/acrf-centre-for-lung-cancer-early-detection/.

[35] Lim KP, Marshall H, Tammemägi M, Brims F, McWilliams A, Stone E et al. Protocol and rationale for the International Lung Screening Trial. Annals of the American Thoracic Society 2020; 17(40), 503-512.

[36] Australian Clinical Trials Alliance 2023. ASPiRATION lung cancer study receives support from government and industry. Accessed: October 2023; https://clinicaltrialsalliance.org.au/latest-news/aspiration-lung-cancer-study-receives-support-from-government-and-industry/.

[37] Metro North Health 2019. Turning tide on deadliest cancer. Accessed: July 2023; https://metronorth.health.qld.gov.au/news/research-snapshot-cancer.

[38] Department of Health and Aged Care 2023. National lung cancer screening program. Accessed: July 2023; https://www.health.gov.au/our-work/national-lung-cancer-screening-program.

[39] University of Sydney 2019. University of Sydney wins $7.5m funding for landmark cancer research. Accessed: July 2023; https://www.sydney.edu.au/news-opinion/news/2019/03/01/university-of-sydney-wins-7-5m-in-funding-for-landmark-cancer-re.html.

[40] Leukaemia Foundation 2017. Breakthrough cancer drug venetoclax approved for use in Australia. Accessed: July 2023; https://www.leukaemia.org.au/media/breakthrough-cancer-drug-venetoclax-approved-for-use-in-australia/.

[41] ABC News 2019. Melbourne's Peter MacCallum cancer centre to be home of 'the next great wave in treatment'. Accessed: July 2023; https://www.abc.net.au/news/2019-03-25/peter-maccallum-cancer-centre-treatment-funding/10935308.

[42] Calitz C, Pollack KM, Millard C & Yach, D. National Institutes of Health funding for behavioral interventions to prevent chronic diseases. American Journal of Preventive Medicine 2015; 48(4), 462-471.

[43] Social Finance 2019. Why Don't We Fund More Prevention? Accessed: July 2023; https://socialfinance.org/insight/why-dont-we-fund-more-prevention/.

[44] Research Data Australia 2017. Centre for Research Excellence in Cervical Cancer Control (C4) [2017-2022]. Accessed: July 2023; https://researchdata.edu.au/centre-research-excellence-control-c4/1318222.

[45] Department of Health and Aged Care 2023. National cervical screening program. Accessed: July 2023; https://www.health.gov.au/our-work/national-cervical-screening-program.

[46] Kamath SD, Kircher SM & Benson III AB. Comparison of cancer burden and nonprofit organization funding reveals disparities in funding across cancer types. Journal of the National Comprehensive Cancer Network 2019; 17(7).

[47] University of Queensland 2023. Cancer Prevention Research Centre. Accessed: September 2023; https://cprc.centre.uq.edu.au/.

[48] Curtin University 2023. Cancer prevention. Accessed: September 2023; https://research.curtin.edu.au/healthsciences/health-sciences-research/our-research/healthy-communities/cancer-prevention/.

[49] Cancer.Net 2023. What are Cancer Vaccines? Accessed: July 2023; https://www.cancer.net/navigating-cancer-care/how-cancer-treated/immunotherapy-and-vaccines/what-are-cancer-vaccines.

[50] Department of Health and Aged Care 2023. HPV (human papillomavirus) vaccine. Accessed: July 2023; https://www.health.gov.au/topics/immunisation/vaccines/human-papillomavirus-hpv-immunisation-service.

[51] Edith Cowan University 2023. Personalised vaccines may revolutionise cancer treatment. Accessed: July 2023; https://www.ecu.edu.au/newsroom/articles/news/personalised-vaccines-may-revolutionize-cancer-treatment.

[52] Department of Health and Aged Care 2022. National DNA screening could save lives for people with high-risk hereditary disease gene variants. Accessed: July 2023; https://www.health.gov.au/news/national-dna-screening-could-save-lives-for-people-with-high-risk-hereditary-disease-gene-variants.

[53] Weeden, CE, Hill, W, Lim, EL, Grönroos, E & Swanton, C. Impact of risk factors on early cancer evolution. Cell 2023;186(8):1541-1563. doi: 10.1016/j.cell.2023.03.013.

[54] University of South Australia 2021. World-first artificial intelligence study to map risks of ovarian cancer. Accessed: July 2023; https://www.unisa.edu.au/media-centre/Releases/2021/world-first-artificial-intelligence-study-to-map-risks-of-ovarian-cancer/.

[55] Hospital and Healthcare 2021. SA to trial digital intervention for those at risk of bowel cancer. Accessed: July 2023; https://www.hospitalhealth.com.au/content/technology/news/sa-to-trial-digital-intervention-for-those-at-risk-of-bowel-cancer-621340706.

[56] Department of Health and Aged Care 2023. Medical Research Future Fund (MRFF) grant recipients. Accessed: September 2023; https://www.health.gov.au/resources/publications/medical-research-future-fund-mrff-grant-recipients?language=und.

[57] Harvey JA & Strahilevitz MA. The power of pink: cause-related marketing and the Impact on breast cancer. Journal of the American College of Radiology 2009; 6(1), 26-32.

[58] Thackery R, Burton SH, Giraud-Carrier C, Rollins S, Draper CR. Using Twitter for breast cancer prevention: an analysis of breast cancer awareness month. BMC Cancer 2012; 508.

[59] Parliament of Australia 2017. Report - Select Committee into Funding for Research into Cancers with Low Survival Rates. Canberra, ACT: Commonweath of Australia.

[60] Brain Tumour Research 2017. Australia launches ground-breaking brain tumour initiative. Accessed: July 2023; https://www.braintumourresearch.org/media/news/news-item/2017/10/31/australia-launches-ground-breaking-brain-tumour-initiative.

[61] Children's Cancer Institute 2016. $20M from Federal Government for Personalised Medicine Program Zero Childhood Cancer. Accessed: September 2023; https://www.ccia.org.au/blog/20m-from-federal-government-for-personalised-medicine-program-zero-childhood-cancer.

[62] Cure Brain Cancer Foundation 2023. History. Accessed: July 2023; https://www.curebraincancer.org.au/about-us/history.

[63] Australian Institute of Health and Welfare (AIHW) 2022. Australia's children. Cat. No. CWS 69. Canberra: AIHW.

[64] Department of Health and Aged Care 2022. Better care and treatment for Australians with blood cancer. Accessed: September 2023; https://www.health.gov.au/ministers/the-hon-greg-hunt-mp/media/better-care-and-treatment-for-australians-with-blood-cancer.

[65] Australian Cancer Research Foundation 2016. ACRF Blood Cancer Therapeutics Centre. Available: September 2023; https://www.acrf.com.au/support-cancer-research/cancer-research-projects-and-grants/acrf-blood-cancer-therapeutics-centre/.

[66] Cancer Council 2023. Understanding immunotherapy. Accessed: July 2023; https://www.cancer.org.au/cancer-information/treatment/immunotherapy.

[67] The Age 2019. 'Basically I was cooked': Australian actor Tom Long cancer-free after medical trial. Accessed: July 2023; https://www.theage.com.au/national/victoria/basically-i-was-cooked-australian-actor-tom-long-cancer-free-after-medical-trial-20190725-p52aq8.html.

[68] Shorthand Social 2023. Venetoclax - Towards a cure for cancer. Accessed: July 2023; https://social.shorthand.com/WEHI_research/nge4mUouhGc/venetoclax.

[69] Invest Victoria 2020. Venetoclax case study. Accessed: July 2023; https://www.invest.vic.gov.au/resources/case-studies-search/case-studies/venetoclax.

[70] Cancer Australia 2023. Ovarian Cancer. Accssed: September 2023; https://www.canceraustralia.gov.au/cancer-types/ovarian-cancer.

[71] Department of Health and Aged Care 2019. Clinical trials to combat reproductive cancers. Accessed: September 2023; https://www.health.gov.au/ministers/the-hon-greg-hunt-mp/media/clinical-trials-to-combat-reproductive-cancers.

[72] Department of Health and Aged Care 2019. $20 Million for Ovarian Cancer Research. Accessed: September 2023; https://www.health.gov.au/ministers/the-hon-greg-hunt-mp/media/20-million-for-ovarian-cancer-research.

[73] Parliament of Australia 2014. The Senate - Motions - Ovarian Cancer Awareness Month. Accessed: September 2023; https://parlinfo.aph.gov.au/parlInfo/search/display/display.w3p;db=CHAMBER;id=chamber%2Fhansards%2F8c8defab-0de1-42cd-896d-390dbffc46c5%2F0082;query=Id%3A%22chamber%2Fhansards%2F8c8defab-0de1-42cd-896d-390dbffc46c5%2F0138%22.

[74] Ovarian Cancer Research Foundation 2023. OCRF-funded research. Accessed: September 2023; https://www.ocrf.com.au/our-work/ocrf-funded-research.

[75] Rare Ovarian Cancer Incorporated. About Us. Accessed: September 2023; https://www.rocinc.org.au/about-us/.

[76] ABC News 2022. Albury Wodonga Ovarian cancer group calls time on teal undies, fundraising, awareness. Accessed: September 2023; https://www.abc.net.au/news/2022-04-27/border-ovarian-cancer-group-hangs-up-teal-undies/101018904.

[77] National Breast Cancer Foundation 2019. National Breast Cancer Foundation research projects. Accessed: July 2023; https://nbcf.org.au/research/research-projects/.

[78] Health Translation SA 2023. No Australians dying from Bowel Cancer Initiative (Round 1). Accessed: September 2023; https://healthtranslationsa.org.au/projects/no-australians-dying-from-bowel-cancer-initiative/.

[79] Bowel Cancer Australia 2023. Bowel Cancer Research Foundation Australia. Accessed: September 2023; https://www.bowelcanceraustralia.org/bowel-cancer-research-foundation-australia.

[80] Bowel Cancer Australia 2023. Lawrence Penn Chair of Bowel Cancer Research. Accessed: September 2023; https://www.bowelcanceraustralia.org/lawrence-penn-chair-of-bowel-cancer-research.

[81] US Food and Drug Administration 2023. XTANDI (enzalutamide). Accessed: September 2023; https://www.accessdata.fda.gov/drugsatfda_docs/label/2018/203415s014lbl.pdf.

[82] Davis, I, Martin, A, Stockler, M, Begbie, S, Chi, K, Chowdhury, S, Coskinas, X, Frydenberg, M, Hague, W, Horvath, L, Joshua, A & Lawrence, N. Enzalutamide with Standard First-Line Therapy in Metastatic Prostate Cancer. The New England Journal of Medicine 2019; 381, 121-131.

[83] ANZUP Cancer Trials Group Limited 2023. Annual reports. Accessed: September 2023; https://anzup.org.au/annual-reports/.

[84] ANZUP Cancer Trials Group Limited 2023. ENZARAD. Accessed: September 2023; https://anzup.org.au/clinical-trial/enzarad-trial/.

[85] Cancer Australia 2023. Australian Cancer Plan. Accessed: July 2023; https://www.canceraustralia.gov.au/australian-cancer-plan.