



South Australian Cancer Research Strategy



2016-2021

Cancer Council SA is committed to funding and conducting research in all aspects of cancer, including prevention and early detection, better and more effective treatments, and understanding and improving the wellbeing of people affected by cancer.

The **Research Unit** at Cancer Council SA conducts strategic research in the areas of population monitoring, applied research and strategic evaluation in the field of cancer control and undertakes a range of research activities to reduce the impact of cancer. The **Research Unit** provides advice and services in relation to factors affecting: (1) cancer research investment; (2) cancer prevention and early detection; (3) quality information and support, and (4) survivorship. The Research Unit partners with key organisations and institutions in order to optimise cancer outcomes for the community across the cancer control spectrum.

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- SA Cancer Service
- Transforming Health
- Country Health SA
- Cancer Voices
- South Australian Health and Medical Research Institute
- Health Industries SA
- The University of Adelaide (including the Robinson Research Institute)
- Flinders University
- The University of South Australia (including the Centre for Cancer Biology)
- Royal Adelaide Hospital
- Flinders Medical Centre and Flinders Centre for Innovation in Cancer
- The Queen Elizabeth Hospital
- Lyell McEwin Hospital
- Women's and Children's Hospital
- SA Pathology
- SA NT Datalink

In addition, the steering committee would like to thank the cancer research community for providing written responses to the annual cancer researcher survey which informed the development of this strategy.

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Acronyms

AIHW	Australian Institute of Health and Welfare
CAGR	Compound Annual Growth Rate
CSO	Common Scientific Outline
DALY	Disability Adjusted Life Year
FCIC	Flinders Centre for Innovation in Cancer
GDP	Gross Domestic Product
KPI	Key Performance Indicator
NHMRC	National Health and Medical Research Council
RCI	Relative Citation Impact
SA AHSTC	South Australian Academic Health Science and Translation Centre
SACCC	South Australian Comprehensive Cancer Consortium
SAHMRI	South Australian Health and Medical Research Institute
SCCP	Statewide Cancer Control Plan
SNIP	Source-Normalised Impact per Publication

Foreword

The Australian Institute of Health and Welfare (AIHW) indicates that cancer incidence will increase at a rate that will outstrip population growth. Advances in health and medical research mean that more people are now surviving cancer. This presents a significant challenge, as well as a significant opportunity for South Australia to address this issue through investment in cancer research.

The state and national-level commitment to investing in our health education and health care sectors means that South Australia provides an excellent setting for undertaking high quality cancer research. Supporting this, the South Australian Cancer Research Collaborative has been responsible for the implementation of the Beat Cancer Project – South Australia’s leading cancer research funding initiative.

Indeed, the South Australian government, along with the three state universities, have invested a significant amount in cancer research infrastructure, workforce and projects in recent years. The Flinders Centre for Innovation in Cancer was the first step in this process. Since this time, the establishment of the South Australian Health and Medical Research Institute (SAHMRI) has supported development of a hub of health and medical research activity in the North Terrace precinct of Adelaide. Collocation of the new Royal Adelaide Hospital, as well as new buildings including The Medical School of The University of Adelaide and the Health Innovation Building of the University of South Australia, and a proposed Flinders University building alongside SAHMRI, will strengthen an already highly collaborative cancer research culture in South Australia.

As this Research Strategy will show, South Australian cancer researchers are world leaders. However, this research does not happen in isolation. There are opportunities for South Australia to be a focal point for internationally leading cancer research; to be a coordinator of national and international collaboration; to attract health industry partnerships and pave the way for new treatment therapies and clinical applications; and to embrace a strong mentoring, career progression and leadership culture that supports our best and brightest new talent.

Yet, the challenge of ‘beating cancer’ lies largely ahead of us and much work still needs to be done. For an increasing proportion of the population cancer is a chronic disease, but unfortunately for some in the South Australian community, cancer is still seen as a death sentence and is evidence of inequity of access to culturally appropriate services. This presents new challenges including new areas for research discovery, but also opportunities where our leading researchers can work in close collaboration with the health care sector to ensure we are best able to support people who have been affected by cancer.

The future is bright for cancer control in South Australia. Building upon the strong foundations set by the Cancer Clinical Network, SA Cancer Service (SACS) is South Australia’s peak body for quality cancer control, providing coordinated leadership and the provision of world class cancer and haematology care. Complementing this, the Transforming Health Initiative aims to maximise health outcomes for the South Australian population and aligns with SA Health’s strategic priorities of research, education and service delivery. These initiatives are integral to facilitating high quality cancer control outcomes and consequently continue to be supported by a strong cancer research community.

This Research Strategy provides the vision and structure to optimise South Australian cancer research. It identifies tangible areas where the cancer research community and its key partners can strengthen their collaboration and ways we can ensure that the unifying environment required to foster a dynamic and inspiring place to conduct cancer research is happening here, in South Australia.

But most of all, this Strategy aims to ensure that South Australian cancer research has a lasting impact on cancer control outcomes and the health and prosperity of the South Australian community.



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Executive Summary

South Australia is committed to ongoing collaborative investment in cancer research to reduce the burden of cancer on the community. In 2006, South Australia's Cancer Clinical Network, in collaboration with Cancer Council SA developed the first Statewide Cancer Control Plan. This plan laid the foundations for the South Australian Cancer Research Collaborative – a joint venture between SA Health, Cancer Council SA, The University of Adelaide, Flinders University and the University of South Australia. Finalised in 2011, the Collaborative was the most significant change in cancer research strategy in South Australia's recent history and oversaw the implementation and management of state-level funding from 2011 to 2016; the Cancer Council Beat Cancer Project.

Building upon this, Cancer Council SA has led the development of this, the 2016-2021 South Australian Cancer Research Strategy, in partnership with SA Health and South Australia's research institutions; The University of Adelaide, Flinders University, the University of South Australia and the South Australian Health and Medical Research Institute (SAHMRI).

The Strategy was developed in response to a need to ensure that the South Australian cancer research enterprise continues to grow its strong foundations and competitiveness, and is well placed to adapt to and take advantage of the growing health and medical research and health services infrastructure in South Australia. A project plan was approved in June 2015 (Figure A1, Appendix A), a discussion paper was distributed in July 2015 to a targeted list of leading researchers, clinicians, consumers and policy makers, and a data acquisition process commenced to identify South Australian cancer research performance, as well as seek feedback from cancer researchers in South Australia. A steering committee with representation from key stakeholders provided strategic oversight and input into the Strategy development process, and feedback on the report.

Key findings from the consultation and review process

The burden of cancer on the South Australian community is growing

The South Australian population is predicted to reach 2 million people between 2025 and 2030. With this, will come an increasing median age of the population and increasing proportion of the population aged 65 years and over.¹ In Australia, cancer primarily occurs in people aged 65 and over, with approximately 50% of all people in this age group expected to be diagnosed with cancer in their remaining lifetime.² In 2011, it was estimated that there will be 10,456 new cases of cancer (excluding non-melanoma skin cancer) by 2014,³ which is predicted to increase at an annual average rate of 1.9% to reach 11,722 cases by 2024.⁴

Cancer represents a significant cost to the health care system

Assuming the current trend continues, state and federal healthcare costs are projected to grow at an unsustainable rate. South Australian government health expenditure is projected to increase from 28.6% of total expenditure in 2009-10 to 43.7% in 2049-50⁵. In 2008-09, cancer accounted for 7% (\$4,526 million) of the \$65,129 million spent for all chronic diseases in Australia, making cancer the sixth highest in terms of total health system expenditure.⁶ Expenditure on cancer increased considerably with age, with expenditure for those aged 65 and over totalling \$2,448 million or 54.1%.⁷ Health and medical research is set to play a key part in optimising cancer care expenditure through technological, pharmaceutical and health services innovation; minimising wastage; and addressing disparities among high risk populations.

¹ Department of Planning and Local Government, Government of South Australia, Population projections for South Australia and statistical divisions, 2006-36, 2010: Adelaide, SA.

² Australian Institute of Health and Welfare 2012. Cancer incidence projections: Australia, 2011 to 2020. Cancer Series no. 66. Cat. No. CAN 62. Canberra: AIHW.

³ SACR. Cancer in SA in 2011 with projections to 2014.

⁴ Australian Institute of Health and Welfare 2014. Radiation oncology areas of need: cancer incidence projections 2014-2024. Cancer series no. 85. Cat. no. CAN 82. Canberra: AIHW

⁵ Deloitte Access Economics. An Intergenerational Report for the States: health and aged care expenditure, prepared for the Business Council of Australia, 2012.

⁶ Australian Institute of Health and Welfare, Australian Government, Health system expenditure on cancer and other neoplasms in Australia, 2008-09, 2013: Canberra, ACT.

⁷ Department of Health and Ageing. Better health through research: Strategic review of health and medical research; Final Report. February 2013. Australian Government: Canberra.

Health and medical research is a fast-growing economic and health service multiplier

Seventy-three percent of Australians support additional federal funding being directed towards health and medical research. Health and medical research has underpinned growth in medicinal and pharmaceutical exports, which has become Australia's largest manufacturing export category, overtaking the motor vehicles industry in 2009. The Australian health and medical research sector consists of over 23,000 research professionals⁸ who support a broader medicines industry of over 40,000 employees.⁹ The sector continues to grow and plays a vital role in supporting a highly-skilled labour force, which helps to retain professionals in Australia, attract outstanding talent from overseas, and drives a strong export industry.

Evidence suggests that cancer research produces return on investment of approximately 3 to 1 (i.e., for every \$1 invested in cancer research, there is a health benefit return of \$3).^{10,11} The primary benefits are gained in wellbeing measured as disability adjusted life years (DALYs). Other significant benefits are the value of avoiding direct health system expenditure, the value of avoiding indirect costs and commercial returns.

The South Australian Government is investing in infrastructure to support a 'smart industry'

The South Australian Government, with support from the Federal Government, universities and commercial industry, are investing in a strong foundation for future research in South Australia. The 2008 review of health and medical research in South Australia supported the development of SAHMRI and the new North Terrace health precinct. This precinct includes the new Royal Adelaide Hospital, as well as other planned or currently under construction university buildings including The Medical School of The University of Adelaide and the Health Innovation Building of the University of South Australia, and is in close proximity to the Thebarton bioscience precinct. The new Tonsley Park precinct, and its close association with Flinders University, Flinders Centre for Innovation in Cancer (FCIC) and Flinders Medical Centre provides another concentration of 'smart industry' activity. This significant investment can be further optimised through infrastructure networking and a collaborative research enterprise focused on transdisciplinary research and clinical care.

Complementing these precincts are a number of features in South Australia that provide it with a competitive advantage to undertake high quality cancer research. These include: (i) a stable, representative and centralised population base; (ii) a highly centralised concentration of research and health services; (iii) SA Cancer Service; (iv) a Statewide Cancer Control Plan; (v) a collaborative cancer research culture; and (vi) The South Australian Academic Health Science and Translation Centre.

South Australia has a productive cancer research community

South Australia received the third highest amount of cancer research funding per capita from 2006-2011, behind Victoria and New South Wales. However, relative to its population size (7.4% of the national population), South Australia is underperforming; receiving only 6% of national funding. Victoria and New South Wales are the only two states to have an increased proportion of funding in recent years – potentially driven by state-level investment to grow and maintain a stable cancer research community.¹²

Cancer research categories¹³ receiving the greatest proportion of funding in South Australia include biology; early detection, diagnosis and prognosis; and treatment research. However, leading international funders tend to fund a greater proportion of cancer aetiology, prevention, treatment and cancer control research than South Australia.¹⁴ South Australia has a highly collaborative research community, and given that collaboration is an indicator of national funding performance, South Australia is well-placed to expand its attraction of national funding over the forthcoming years.

South Australia has produced a high number and proportion of cancer-related publications over time and account for a high proportion of the top 1% and 5% of publications internationally, relative to its population size – 11.2% of publication output compared with 7.4% of the national population. It is evident that South Australia is relatively strong in prevention research, and cancer control, survivorship, and outcomes research.¹⁵

⁸ ASMR, Planning the Health and Medical Research Workforce 2010-2019, prepared for ASMR by Dr Deborah Schofield, 2009, p.4.

⁹ Submission 108, Medicines Australia.

¹⁰ Glass P, Pezzullo ML, Cutler H, Yates K, Tracey E, Welberry H, Catanzariti A, Bishop J. The Health Returns on Investment in Cancer Research. Cancer Institute NSW, May 2008.

¹¹ Deloitte Access Economics, Returns on NHMRC funded research and development. Report prepared for the Australian Society for Medical Research, 2011: Canberra, ACT.

¹² Cancer Australia. Cancer Research in Australia: an overview of funding to cancer research projects and research programs in Australia, 2006 to 2011. 2014.

¹³ Based on the Common Scientific Outline (CSO) categorisation system; defined in greater detail later in this report.

¹⁴ Cancer Australia. Cancer Research in Australia: an overview of funding to cancer research projects and research programs in Australia, 2006 to 2011. 2014.

¹⁵ Elsevier's Scopus citation index. Data sub-licensed through the Victorian Comprehensive Cancer Centre, 2015.

A South Australian Cancer Research Strategy

The South Australian Cancer Research Strategy is a five year plan designed to build a sustainable cancer research enterprise in South Australia, optimise use of available resources and build strongly on the successes of the first five years of the Beat Cancer Project. The Strategy will be in place from 1 July 2016 to 30 June 2021. Critical to the success of the strategy, a vision has been set for the future of South Australian cancer research, along with guiding principles and high-level objectives, that if achieved will accelerate South Australian cancer research performance and impact on the community. These are identified on pages 39 of this report.

The resulting recommendations have been grouped into three Key Result Areas, namely:

- 1) Supporting South Australia's strategic health priorities;
- 2) Optimising economic growth in the North Terrace Health Precinct; and
- 3) Building on the success of the Beat Cancer Project.

These recommendations are supported by evidence from the broad literature and evidence base used to inform the development of this Strategy, as well as feedback received from the South Australian cancer research and health services community. If progressed, these recommendations will contribute towards realising the vision of this Strategy.

A detailed explanation of each recommendation can be found in section 7 of this report. A link to each page where the recommendation is located in section 7 can be found alongside each recommendation box in this executive summary.

Supporting South Australia's strategic health priorities

Integration and translation of research with state cancer control and health services initiatives

South Australia, through the Cancer Clinical Network and the SA Cancer Service, has successfully implemented two Statewide Cancer Control Plans (SCCPs). These plans are an asset to the state by helping to support important cancer control initiatives and complementing cancer research by outlining the broader cancer control agenda for South Australia. This is of importance to all areas of research including biomedical, clinical, population health and health services research. Long-term security of infrastructure that supports these research areas and service delivery (e.g., cancer registries, biobanks) is vital for these activities, as is ensuring that they feed into cancer surveillance, and quality and safety monitoring.

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Recommendation 1: Establish sustainable cancer surveillance and cancer quality and safety monitoring to support cancer control service providers.

Target: Funding for core cancer surveillance infrastructure is secured by July 2016. In collaboration, SA Cancer Service, SA Health and Cancer Council SA, to identify and develop a cancer care quality monitoring and surveillance framework that strengthens the role of core infrastructure in South Australia.

Complementing the SCCP, the Transforming Health Initiative aims to maximise the health benefit gained by all sectors of the South Australian population from available health budgets. In line with this initiative, stakeholder feedback noted that optimisation of state-based cancer research relies on consultation and communication with health services providers and policy makers. Cancer research has a vital role to play in supporting the Transforming Health initiative and optimising health outcomes.

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Recommendation 2: Review and identify more effective methods for the implementation of research evidence into practice and policy.

Target: Pathways and an implementation plan for translating research evidence into practice and policy in place at commencement of Year 6 of Beat Cancer Project in July 2016.

Focused translational research is effective at reducing the time delay of discoveries transitioning between the highly specialised areas of cancer research and into clinical care, service delivery and policy. It is also an effective mechanism for providing governments with evidence-based strategies to adopt the most efficient and cost effective care for the community. The South Australian Academic Health Science and Translation Centre (SA AHSTC) will be critical to driving translational research at a population level.

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Recommendation 3: Develop new translational research projects.

Target: Implement two, four year translational research packages from July 2017 to June 2021 to be conducted with strategic oversight by the SA AHSTC.

Priority-driven cancer research to address the growing burden of disparities in cancer

There are a number of emerging areas of priority for cancer control, especially in population health and health services research. Research has identified that Aboriginal and Torres Strait Islander people, people from rural and remote areas, and people of higher socio-economic disadvantage have poorer cancer outcomes. There is also a growing number of cancer survivors in the community who will require various levels of physical and psychosocial support for the duration of their life. With increasing health budget pressure, effective and efficient use of resources is important for addressing inequities, reducing gaps and improving quality of life.

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Recommendation 4: Develop targeted calls for research to address health inequities in priority areas in South Australia.

Target: 10% of Beat Cancer Project funding is secured for funding research to address gaps and reduce inequities in cancer outcomes in priority areas.

Embedding the consumer voice into cancer research

Consumers have an important role to play in cancer research, in that they are supporters of research, participants in our studies, and ultimately, the beneficiaries of our investment. Consumers want to be genuinely engaged in the research process, especially as it relates to clinical practice and survivorship. Consumers also want to see better use of publicly-funded data like cancer registries, data collected as part of research projects and clinical trials, and expect that consumer representative bodies can play a key role in advocating for more effective use of publicly funded resources.

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Recommendation 5: Promote greater consumer involvement in implementing the research strategy.

Target: Consumer representation is documented as part of all grant funding from commencement of Year 6 of Beat Cancer Project and Cancer Council SA to develop a research advocacy agenda in collaboration with consumer groups by December 2016 for actioning across the remaining years of the Strategy.

Evaluating and communicating our performance

Monitoring, evaluating and benchmarking research is critical for identifying success or otherwise of funded projects, people support and infrastructure. Research metrics are focused on traditional Inputs and Outputs. Recent developments in research strategy include looking beyond traditional metrics towards downstream Outcomes and Impacts. Software solutions are currently available that are designed to streamline data collection related to Inputs, Outputs and Outcomes associated with grant funding and can also be utilised for monitoring and evaluation of research performance. Given the relatively small number of Administering Institutions in South Australia, we are well placed to integrate a suitable solution as part of an ongoing research strategy evaluation framework.

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Recommendation 6: A research strategy evaluation framework is established that includes routine, periodic benchmarking of KPIs with leading states.

Target: A cost-effective evaluation framework that is in line with national and international best practice is developed by December 2016 and an appropriate software platform is utilised to manage cancer research grants administration by June 2017. This platform is utilised as part of ongoing monitoring, evaluation, benchmarking and reporting of cancer research performance.

Funding of cancer research is consistently ranked as one of the most important reasons for people to donate to a cancer charity. It is also a key driver for increasing community financial support. Hence, alongside contemporary governance arrangements, increasing communication back to key stakeholders will be crucial for transparency of funding decisions and for demonstrating to donors and consumers where their money is going and how it is being administered.

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Recommendation 7: The research strategy is accompanied by a communications plan.

Target: A communications plan is developed by June 2016 and rolled out in line with priorities.

Optimising economic growth in the North Terrace Health Precinct

Taking advantage of our unique features for high impact, innovative research

South Australia has a number of unique features that provide it with a competitive advantage when trying to attract new researchers, collaborations, and interstate and international funding and investment. South Australia's population size and distribution, its high quality cancer services, world-class research platforms and university and industry linkages, and highly coordinated cancer control planning, together, set in place key building blocks for undertaking innovative research and development programs with the potential to stimulate economic growth, increase efficiency and reduce waste, and ultimately improve health outcomes. This has importance for high-tech biomedical and biotechnology research and development.

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Recommendation 8: Identify and support high impact, innovative research that is in line with our state's unique features.

Target: Mechanisms to support high impact, innovative research are identified by December 2016 and integrated into future strategic planning and funding.

Networking our research infrastructure and research platforms

South Australia, through competitive and non-competitive funding, has invested in a sizeable quantum of research infrastructure and platforms. Optimising use of this infrastructure and these research platforms should be a priority for all institutions to reduce wastage and free up funding for other applications. Examples of optimisation include networking platforms to minimise overlap, address the barriers to access by introducing access protocols, monitoring access and throughput, and mapping infrastructure and platform availability.

42

Recommendation 9: Review of access, functionality and optimisation of research platforms.

Target: Mapping, networking and optimisation process led by SAHMRI in collaboration with universities; to be completed by December 2017 and maintained as an ongoing function.

Strategic investment and support for clinical trials

Clinical trials are identified as a core component in the provision of quality health care. Cancer Research UK's report, 'every patient a research patient', identifies the current recruitment rate to clinical trials is approximately 20%. Clinical trials are also an important source of funding for cancer research. South Australia, given its size and centralised health and research sectors, has optimal defaults for growing a strong, state-wide clinical trials network. The culture among the leading teaching hospitals is one of collaboration. However, the South Australian cancer clinical trials network is still lagging behind leading interstate examples that have established greater infrastructure and support. These barriers are surmountable however, with modest application of resources and time on behalf of key stakeholders.

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Recommendation 10: Expand Cancer Clinical trials in both number and impact.

Target: A clinical trials strategy and action plan is developed with the view to develop an optimised state-wide cancer clinical trials network. This is established and benchmarked against other states by June 2018 with targets to approach every person diagnosed with cancer to participate in a clinical trial and a minimum of 1 in 5 of these people participating in clinical trials.

Strengthening links to industry

Australian universities have a track record of successful development of medical patents, commercialisation of health and medical technologies and links to industry. Health Industries SA was established by the South Australian health department to utilise the North Terrace health precinct along with other precincts like Thebarton Technology Hub and Tonsley Park to build South Australia's reputation in health care, research and academia, and to attract health industry partners like pharmaceutical and medical imaging companies. Key to Health Industries SA's success will be ensuring that South Australia has the optimal environment for undertaking research with commercial viability.

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Recommendation 11: Partnering with Health Industries SA to maximise industry engagement.

Target: A health industries action plan is developed in 2016 and is rolled out over the remaining four years of the research strategy.

Building on the success of the Beat Cancer Project

Strategic alignment of governance of cancer research

The Beat Cancer Project has been successfully administered through SAHMRI’s research administration office and the overarching governance structure that is in place. Recent health-system developments (e.g., establishment of the SA AHSTC and the South Australian Comprehensive Cancer Consortium (SACCC)) and increasing requirement for research to be closely linked to health service outcomes requires that the current governance be closely

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Recommendation 12: The Beat Cancer Project be funded for a further 5 years with transitioning of governance to support close integration with recent developments that support linkages between research and health services.

Target: Governance processes and revised deliverables for the Beat Cancer Project are finalised prior to commencement of Year 6 of the Beat Cancer Project in July 2016.

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Recommendation 13: Refresh the SACCC with greater stakeholder representation and engagement, and use the SACCC to drive the Beat Cancer Project and Statewide Cancer Research Strategy.

Target: Refreshment of the SACCC is finalised prior to commencement of Year 7 of the Beat Cancer Project in July 2017, as part of the transition in governance processes.

A new funding model to support clinical research growth

The Beat Cancer Project was considered to be the most important direction for South Australia to take to rectify declining research competitiveness. Its success at leveraging funding from outside the two main funders, Cancer Council SA and SA Health, is commendable, and supportive of maintaining a collaborative funding arrangement.

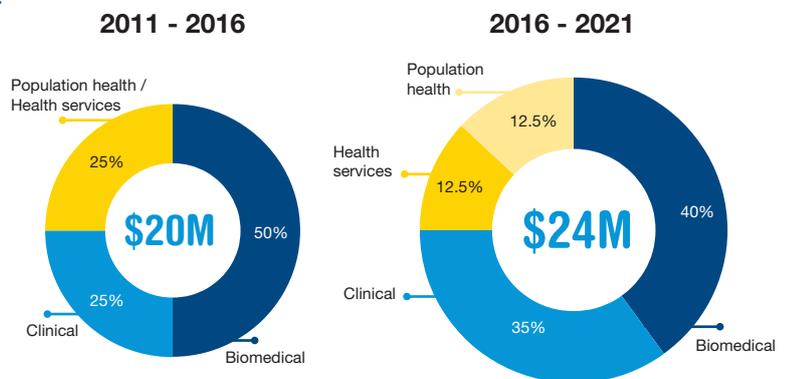
45

Recommendation 14: The Beat Cancer Project to continue as the Flagship Program for South Australian funded Cancer Research.

Target: Five year funding allocation model in place by 30 June 2016 and rolled out over the next five years of Beat Cancer Project. Cancer Council SA’s other external research funding to be incorporated into the new funding model.

Review of research funding performance indicates that South Australian cancer research is not too dissimilar to other jurisdictions, but is noticeably lean in treatment-based research. This distribution is potentially indicative of a current weakness in the state, and one where some initial seed funding, as well as strategy and leadership will assist with redressing this imbalance. In addition, South Australia’s strong health services research¹⁶ pillar requires formal recognition within the funding allocation model. Finally, consideration needs to be given as to an appropriate mechanism to leverage state government funds for partnership and linkage grants.

Funding by research pillar



¹⁶ Health services research is a multidisciplinary field that examines how people access health care practitioners and services, how much care costs, and the outcomes as a result of this care.

46

Recommendation 15: Redistribute the proportion of funding to better support clinical and health services pillars of research.

Target: Beat Cancer Project funding for clinical research is increased to 35% and population health / health services research is formally split in the funding model. A total of 5% of Beat Cancer Project funding per annum is reserved for partnership and linkage grant applications, and an appropriate mechanism is determined for administration and auspicing of these funds to maintain suitable governance while ensuring leveraging capabilities are maintained.

47

Recommendation 16: Increased funding for workforce and capacity building.

Target: Funding increased to 55% for workforce at commencement of Year 6 of Beat Cancer Project in July 2016 and maintained over its duration. Increase funding for early and mid-career researchers as part of workforce funding.

47

Recommendation 17: SA Health and SAHMRI collaborate with the universities to continue funding for Research Chair and Fellow positions, and build formal mentoring capacity.

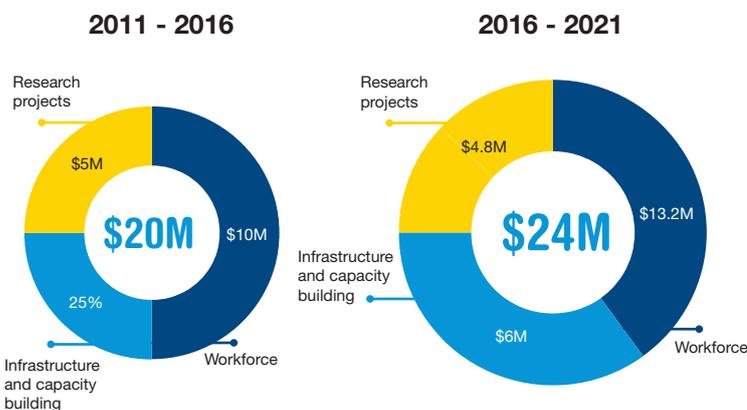
Target: Maintain funding for university Research Chair and Fellow positions and implement a formal mentoring program by December 2016.

Maintaining support for our workforce

South Australia has a history of developing and supporting world-class cancer researchers. These researchers have established roots in South Australia. It is important to back our leaders to maintain their capacity and support them to attract external funding, as well as to build a pipeline of the next wave of researchers through mentoring. Furthermore, a long-term, sustainable research program relies upon providing the necessary support for early and mid-career researchers to advance and excel, and ultimately, succeed as the next wave of leading researchers. An increased proportion of funding to workforce will ensure that our best researchers have the resources available to focus on their research endeavours. In addition, career development strategies could include formal mentoring programs to better support early and mid-career researchers.

As part of the strategic review process, it was noted that South Australia does not currently have leadership capacity across all areas of cancer research. In addition, South Australia does not have a great presence of clinician-scientists, or an emphasis on research as part of clinical training and practice. While this may be representative of a broader global trend, it is in contrast to best practice where leading comprehensive cancer centres place an emphasis on supporting the clinician-scientist model. Hence, few clinical positions currently exist with 'protected time' for research and there is no evidence of a systematic structure in place to foster new talent. These positions align closely with supporting the pillars of research, education and service

Funding by research sector



48

Recommendation 18: Research people capacity gap analysis be performed to strengthen cancer research leadership.

Target: Review completed by June 2017; plan implemented based on outcomes of review.

Reviews by leading international research institutions consistently conclude that women are at a disadvantage in establishing strong academic careers and representation in senior positions. The South Australian cancer research community can take a leading position in minimising disadvantage for women in cancer research by providing support in line with national health and medical research council policy, which will redress this imbalance, and in turn benefit our health, social and economic return.

48

Recommendation 19: A plan for gender equality that leverages universities and institutional plans be developed.

Target: Implementation plan in place by December 2016; progress monitored annually.

Fostering a collaborative research culture

Collaboration is becoming increasingly important in attracting large national and international grants. For the period 2006-2011, the proportion of cancer research projects and research programs that received more than \$600,000 was two-fold higher for research with multiple named collaborators than no named collaborators. Given this pattern, South Australian grant funding should support and drive researchers to collaborate beyond their own institution, beyond state and national boundaries, and indeed, beyond their traditional academic disciplines to be successful in attracting significant external funding.

48

Recommendation 20: Collaboration mechanisms be strengthened.

Target: A new grant evaluation model that incorporates scoring for high quality collaborations to more effectively deliver outcomes is developed and adopted prior to commencement of Year 6 of the Beat Cancer Project in July 2016 to better support research collaboration.

The vision for cancer research in South Australia

A vision for cancer research in South Australia has been set:

A collaborative, unified and targeted approach across research, education, health care and government systems to support cancer research discovery and implementation that optimises strengths, addresses gaps in cancer control and builds South Australia's profile as an international leader in cancer research and translation.

We will achieve this through effective governance of cancer research, encouraging strong research partnerships, investing in our workforce and securing comprehensive research platforms and data systems into the future.

The vision describes a future for cancer research in South Australia that is designed to foster a highly collaborative research enterprise. This enterprise will be interlinked with and support our health services sector, support critical research infrastructure, build future capacity through mentoring and our tertiary education sector, grow the pool of funding available, support innovative and strategic research of high impact, and leverage industry partnerships to grow a future 'smart state' economy. Through these functions, the vision is designed to fast track scientific discovery to impact on the health of the South Australian community.

South Australia is committed to ongoing investment in cancer research to reduce the burden of the disease on the community. Given the context of other large state-wide initiatives including the development of the New Royal Adelaide Hospital and North Terrace health and medical research precinct, the biotechnology and Tonsley Park 'smart industry' campuses, development of the 2016-2020 Statewide Cancer Control Plan, and the Transforming Health Initiative, the time is right for the South Australian research community to embrace a state-wide, data-informed, evidence-based cancer research strategy which will build a robust, unifying framework. This framework will drive funding decisions aimed at bolstering our current and future competitive strengths, filling essential gaps in research, addressing workforce and infrastructure, attracting and developing new talent, reinforcing collaboration, focusing investment and aligning each sector to form an integrated pipeline from research discovery, through translation, to improved health.

The following report is for researchers and research institutions, health services, government and non-government organisations and consumers alike. The report outlines the evidence-base for the cancer research strategic direction for the state. It draws upon numerous sources including census data, cancer registry data, Australian Institute of Health and Welfare reports, peer-reviewed literature, cancer research performance indicators and health research economic analysis reports. To guide this report and ensure it outlines a direction that is important for South Australia numerous stakeholders were engaged to provide input into the document. The report describes:

- the growing burden of cancer in South Australia and its associated predicted cost;
- the economic impact on continuing to invest significantly in the State's health and medical research sector and the advantages of South Australia as a place to undertake cancer research; and
- South Australian cancer research performance.

Finally, the report outlines a five-year cancer research strategy for South Australia. It is evident that South Australia has a history of leading world-class cancer research, but history dictates that translation of primary research into long-term impact takes many years. Hence, the strategy is designed around a long-term vision and for building a sustainable cancer research community, the outcomes of which have a demonstrable impact on cancer control and the South Australian community.

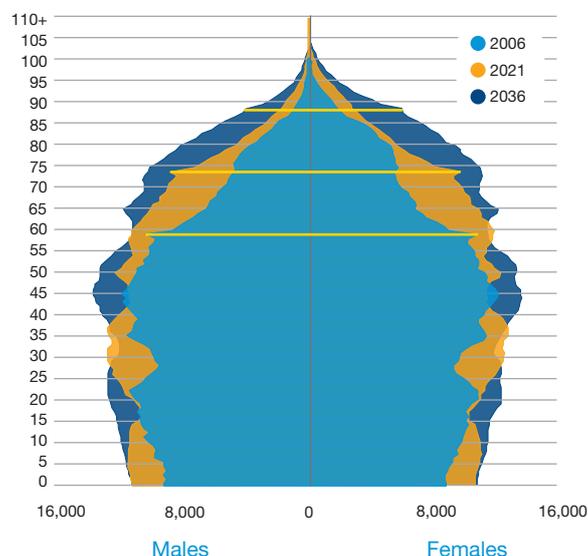
The growing burden of cancer in South Australia

Cancer is largely a disease of older age with 74% of all cancers in South Australia occurring in the 60 years and over age group. The projected incidence of cancer will outstrip the projected population growth of South Australia. The number of people living with cancer will also increase dramatically as cancer fast becomes a treatable and manageable disease. This growth is based on the changing age demographic and as our medical research community and health services continue to work together at better detecting and treating cancer.

South Australia's population growth

The South Australian population is currently 1.7 million¹⁷. It is predicted to reach 2 million people between 2025 and 2030. With this, will come an increasing median age of the population and increasing proportion of the population aged 65 years and over as the large baby-boomer cohort reaches 65 (Figure 2.1).¹⁸ The proportion of the Australian population aged 65 and over is predicted to increase to 17% by 2020, up from 13% in 2007.

Figure 2.1: South Australia projected age-sex structure



Note: based on 'medium series' projections. The yellow shading denotes the large post-war birth cohort of 1946–47 that was the beginning of the numerous baby-boom cohorts, whose survivors were aged 45–59 years in 2006 and will be aged 60–74 in 2021 and 75–89 in 2036

Source: Population Projections for South Australia and Statistical Divisions, SA Department of Planning and Local Government

The young elderly (65–84 years) population will almost double in size from 206,000 in 2006 to approximately 400,000 by mid 2036 and the elderly (85+) population is predicted to triple from approximately 30,000 in 2006 to 100,000 by 2036 (Figure 2.2a & b). This increase in population growth, as well as the changing age distribution as the 'baby-boomer' generation ages, will have an impact on cancer incidence and prevalence.

Figure 2.2a & b: Projected young elderly (65–84 years) and elderly (85+) populations, South Australia, 2006–2036

Figure 2.2a: 65-84 years

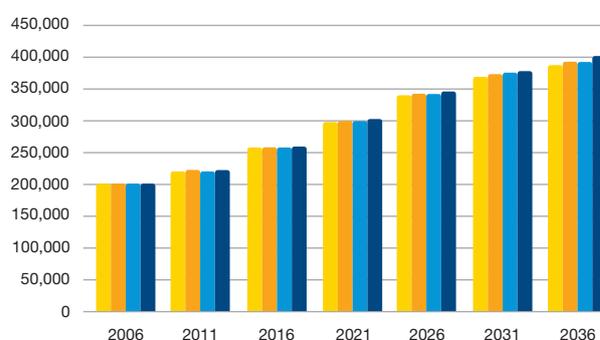
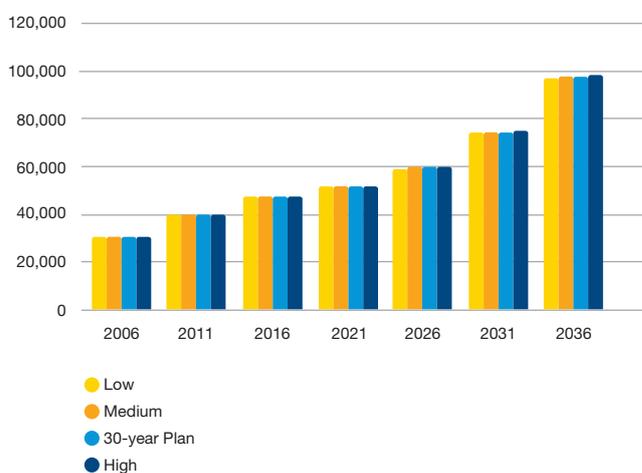


Figure 2.2b: 85+ years



Source: Adapted from Population Projections for South Australia and Statistical Divisions, SA Department of Planning and Local Government

¹⁷ Australian Bureau of Statistics. 3101.0 Australian Demographic Statistics, Table 54. Estimated Resident Population By Single Year of Age, South Australia; 2014.

¹⁸ Department of Planning and Local Government, Government of South Australia, Population projections for South Australia and statistical divisions, 2006-36, 2010: Adelaide, SA.

Cancer projections in Australia and South Australia

In Australia, approximately 50% of all people aged 65 and over are expected to be diagnosed with cancer in their remaining lifetime.¹⁹ National projections predict that for males, prostate cancer will remain the most common cancer diagnosed in 2020, followed by bowel cancer, melanoma and lung cancer. For females, breast cancer is projected to continue to be the most common cancer diagnosed in 2020, followed by bowel cancer, melanoma and lung cancer (Table 2.3).²⁰

Table 2.3: Top five cancers projected to be diagnosed in Australia in 2020, by sex

Males

Cancer site/type	Cases
Prostate	25,310
Bowel	10,800
Melanoma	10,780
Lung	7,520
Non-Hodgkin Lymphoma	3,470
All cancers	84,950

Females

Cancer site/type	Cases
Breast	17,210
Bowel	9,160
Melanoma	6,790
Lung	6,120
Uterine	2,830
All cancers	65,040

The burden of cancer in South Australia is comparable to the national average and to other western societies, noting that demographic patterns (a higher proportion of Aboriginal and Torres Strait Islander people compared with some states) or geographic patterns (a higher proportion of remote or very remote areas) may influence overall incidence, survival and mortality figures.

In 2011 there were 9,398 new cases of cancer diagnosed in South Australia, and 3,486 cancer deaths.²¹ The top five cancers accounted for up to 58% of all cancers. Figures 2.4 and 2.5 describe the incidence and mortality for the most common cancers for males and females in South Australia in 2011. It was estimated that there will be 10,456 new cases of cancer (excluding non-melanoma skin cancer) in 2014,²² which is predicted to increase at an annual average rate of 1.9% to reach 11,722 cases by 2024.²³

Figure 2.4: Most common cancers in South Australia 2011, Incidence and Mortality – Males

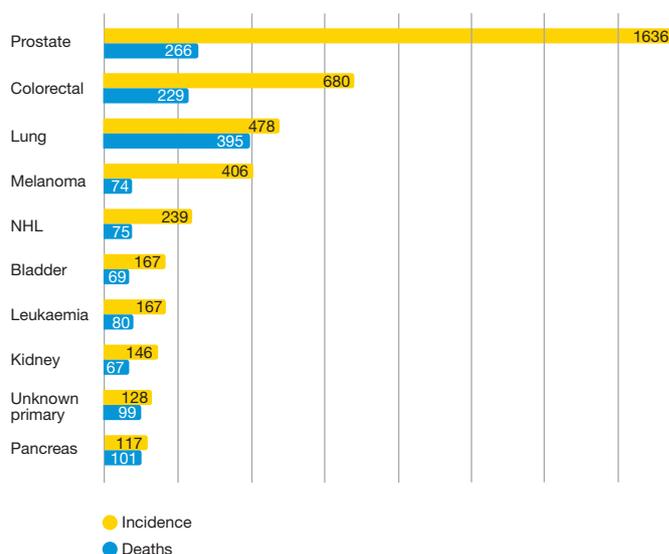
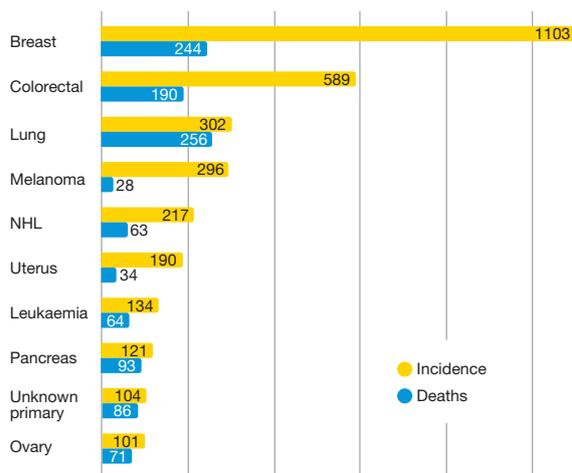


Figure 2.5: Most common cancers in South Australia 2011, Incidence and Mortality – Females



¹⁹ Note: This excludes all non-melanoma skin cancers.

²⁰ Australian Institute of Health and Welfare 2012. Cancer incidence projections: Australia, 2011 to 2020. Cancer Series no. 66. Cat. No. CAN 62. Canberra: AIHW.

²¹ This excludes all non-melanoma skin cancers.

²² SACR. Cancer in SA in 2011 with projections to 2014. SA Health: Adelaide.

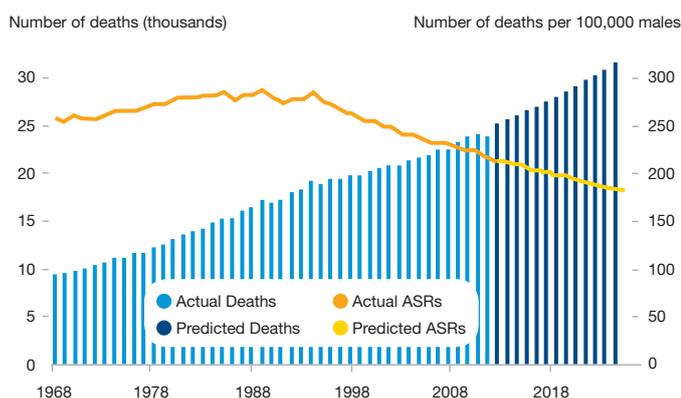
²³ Australian Institute of Health and Welfare 2014. Radiation oncology areas of need: cancer incidence projections 2014–2024. Cancer series no. 85. Cat. no. CAN 82. Canberra: AIHW.

The growing burden of cancer in South Australia

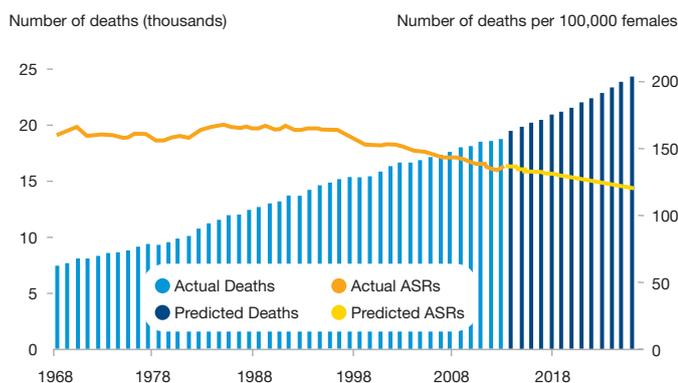
The number of deaths from all cancers combined is predicted to increase for both males (Figure 2.6) and females (Figure 2.7). In Australia in 2012, there were 43,039 cancer-related deaths, accounting for 29.3% of all deaths in that year. This is estimated to increase to 56,265 cancer-related deaths by 2025.

However, the mortality rate attributable to cancer has decreased from 199 deaths per 100,000 persons in 1968, to 167 per 100,000 in 2012 and is predicted to continue to decline. This decreasing trend is largely influenced by trends in the most commonly diagnosed cancers (bowel cancer, prostate cancer in males, breast cancer in females, lung cancer and melanoma of the skin).

Figures 2.6: Trend in number and age-standardised rate of deaths due to cancer, trend 1968–2012 and projected 2013 to 2025, males, all cancers combined



Figures 2.7: Trend in number and age-standardised rate of deaths due to cancer, trend 1968–2012 and projected 2013 to 2025, females, all cancers combined



Survival and survivorship

Survivals from cancer in South Australia are high by world standards with 5-year survivals for all cancers collectively of 61%. This is comparable to the leading United States figure of 63%, and is much higher than the 48% survival reported for Europe.²⁴ Case survivals for all cancers tend to be lower for non-metropolitan residents of South Australia, particularly for those in more remote areas, and in areas of high social disadvantage. This is likely due, in part, to more advanced stage at diagnosis, differences in co-morbidity, and potentially variations in service access.²⁵

A direct impact of these statistics is that more South Australians will be living longer with cancer and consequently there will be an increasing number of cancer survivors in the community. In South Australia a total of 51,018 people were found to be alive who had been diagnosed with invasive cancer in the previous 10-year period.²⁶ Cancer survivors experience a range of ongoing problems and decreased quality of life related to significant physical and psychosocial consequences associated with their cancer diagnosis.²⁷ These include late effects of treatment, impaired physical functioning, psychological and social issues, financial hardship, and spiritual and existential concerns. These issues tend to be compounded by late diagnosis. Psychosocial consequences may also include positive outcomes including reassessment of values and what is important, greater appreciation for life, and increased personal strength or resilience.²⁸

Aboriginal and Torres Strait Islander populations have lower cancer survival rates compared with other South Australians for all cancers except possibly lung cancer, and survival rates are particularly low in very remote areas of the state. Aboriginal and Torres Strait Islander people often experience more aggressive forms of cancer that are associated with poorer outcomes, and are diagnosed at more advanced stages. Aboriginal and Torres Strait Islander people also experience higher rates of diabetes and other co-morbidities, which limit treatment options, and have poorer access to specialist treatment services.²⁹

Source: Australian Institute of Health and Welfare, <http://www.aihw.gov.au/cancer/mortality-trends-projections/>.

²⁴ Public Health Information Development Unit. An Atlas of Cancer in South Australia: A review of the literature and South Australian evidence of difference in cancer outcomes between metropolitan and country residents, and factors that might underlie such differences. Produced for Cancer Council SA. Adelaide: The University of Adelaide, 2012.

²⁵ Sharplin G, Bannister S, Eckert M, Roder D, Wilson B. A South Australian Cancer Atlas shows important variations in cancer risk and outcomes, but can better use be made of Australian data to support the work of Cancer Councils? *Cancer Forum*, 2014, 39:2; 143-149.

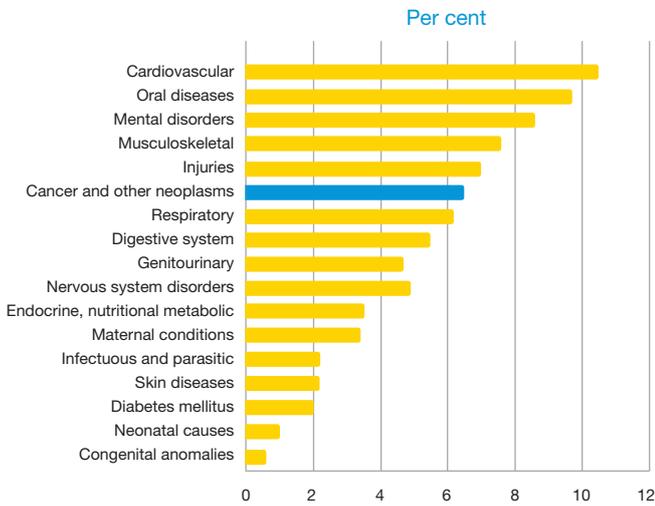
²⁶ SA Cancer Registry. Data based on figures taken on 1 January, 2013.

²⁷ Foster, C., Wright, D., Hill, H., Roffe, L., Psychosocial implications of living 5 years or more following a cancer diagnosis: a systematic review of the research evidence. *European Journal of Cancer Care*, 2009, 18(3): p. 223-247.

²⁸ Aaronson, N., et al., Beyond treatment - psychosocial and behavioural issues in cancer survivorship research and practice. *EJC Supplements*, 2014, 12: p. 54-64.

²⁹ Chong A, Roder D. Exploring differences in survival from cancer among Indigenous and non-Indigenous Australians: Implications for health service delivery and research. *Asian Pac J Cancer Prev*, 2010;11:953-61.

Figure 3.3. Proportion of health system expenditure on chronic diseases by disease group, 2008-09

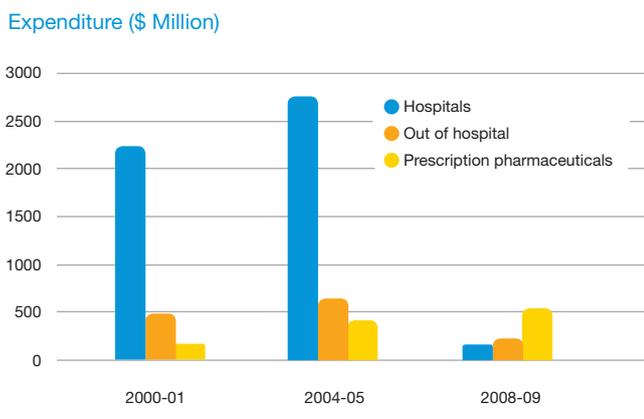


Source: AIHW disease expenditure database.

Notes: Burden of disease categories were used to allow all disease groups to be included. Percentages do not add up to 100 because not all disease groups are included.

The health-care sector with the highest level of cancer-related expenditure in 2008–09 was hospital admitted patient services including day services, accounting for 79% (\$3,566 million) of total health system expenditure for cancer. This was followed by prescription pharmaceuticals obtained outside hospital (12% or \$540 million) and out-of-hospital sector expenditure (9% or \$420 million), which included imaging, pathology and other medical services (Figure 3.4).³³

Figure 3.4: Total health system expenditure on cancer by health sector, Australia, 2000-01, 2004-05 and 2008-09



Source: AIHW disease expenditure database.

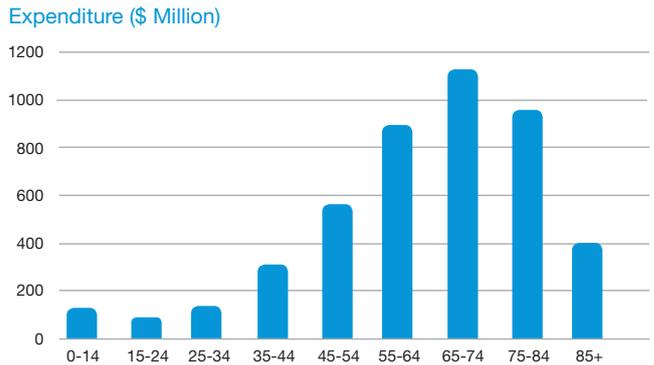
³³ Ibid.

³⁴ Ibid.

³⁵ Department of Health and Ageing. Better health through research: Strategic review of health and medical research; Final Report. February 2013. Australian Government: Canberra.

Expenditure increased considerably with age, with the highest expenditure of \$1,117 million (24.7%) for people aged 65–74. Expenditure for those aged 65 and over totalled \$2,448 million or 54.1% (Figure 3.5).³⁴

Figure 3.5: Health system expenditure on cancers by age group, 2008-09



Source: AIHW disease expenditure database.

To address this predicted cost, it is predicted that future developments in health and medical research will be driven by changes in healthcare delivery and research.³⁵ As such, there will be an increased focus on translational research and research that directly improves the health care system.

Health and economic returns on research investment

Australians value investment in Health and Medical Research because it delivers impact in the form of better health outcomes. Indeed, 73% of Australians supported additional federal funding being directed towards health and medical research.³⁶ The McKeon Review states that:³⁷

“The purpose of Health and Medical Research is to deliver better health outcomes for all Australians. It is an essential element of the broader health sector, which includes health professionals, consumers, businesses, not-for-profit organisations and governments. In the context of an uncertain economic environment and expected inflation of healthcare costs, Health and Medical Research has a vital role to play in improving health outcomes for all Australians, delivering a better health system and contributing to the national economy. Over the next 10 years, a world-class Health and Medical Research sector, fully embedded in the health system, will help build a healthy and wealthy Australia with the world’s best health system.” (p.7)

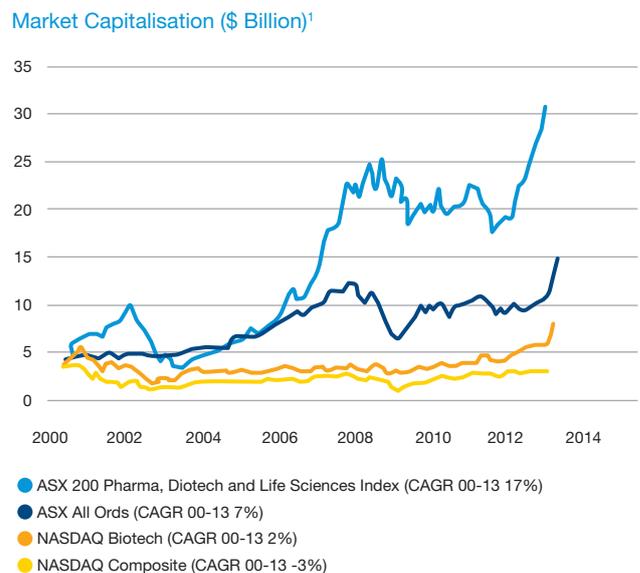
Cancer research has its foundations in the health and medical research sector. There are numerous components to health and medical research that together produce an economic benefit. The development of new infrastructure creates jobs in construction, the rising biotechnology industry attracts overseas investment and commercialisation of new technologies, and health gains improve quality of life and workforce participation and productivity from the avoidance of premature mortality and morbidity, avoided carer costs, and avoided associated indirect costs such as losses from forgone taxation revenue and welfare and disability payments. Further productivity gains follow through increases in skilled jobs at universities, academic institutions, biotechnology firms and other associated companies. All of these factors support South Australia’s continued investment in a ‘smart industry’ future.

Medical innovation and industry growth

The last 30 years have seen a shift away from traditional industries such as manufacturing and agriculture and the rise of knowledge-based industries such as healthcare services, biotechnology and research.³⁸ Health and medical research has underpinned growth in medicinal and pharmaceutical exports, which has become Australia’s largest manufacturing export category, overtaking the motor vehicles industry in 2009. Major markets for Australian medicinal exports include Asia (40%), southern Africa (20%) and Europe (16%).³⁹

Health and medical research has led to significant value creation for the economy over the last decade. The biotechnology industry in Australia now includes over 1,000 companies, with over 100 listed on the Australian Stock Exchange, and has grown at 17% per annum to a market capitalisation of \$32.6 billion as at 31 December 2012 (Figure 4.1).⁴⁰

Figure 4.1: Performance of Health and Medical Research-related sectors



Source: Bloomberg 2013

Notes: ¹ ASX200 All Ords, NASDAQ Biotech and NASDAQ Composite indices rebased to market capitalisation of S&P ASX200 Pharmaceutical, Biotechnology and Life Sciences Index

³⁶ Research Australia. Australia Speaks! 2014 Opinion Poll – views of 1000 Australians. http://issuu.com/researchaustralia/docs/ra_2014_opinion_poll_web/1?e=12222516/9009656

³⁷ Department of Health and Ageing. Better health through research: Strategic review of health and medical research; Final Report. February 2013. Australian Government: Canberra.

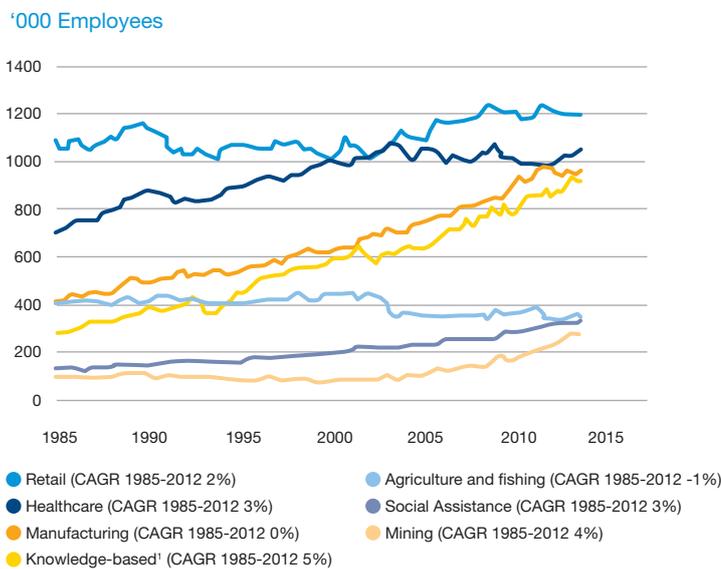
³⁸ Ibid.

³⁹ Department of Foreign Affairs and Trade, STARS Database, ABS Cat No. 5368.0, 2011.

⁴⁰ Department of Health and Ageing. Better health through research: Strategic review of health and medical research; Final Report. February 2013. Australian Government: Canberra.

The Australian health and medical research sector consists of over 23,000 research professionals⁴¹ who support a broader medicines industry of over 40,000 employees⁴² and a health sector of over one million workers.⁴³ The sector continues to grow, with the biotechnology sector (A subset of the knowledge based industry sector) growing at 4% p.a. between 2001 and 2010 (Figure 4.2). The health and medical research sector, therefore, plays a vital role in supporting high-value jobs which help to retain skilled professionals in Australia and attract outstanding talent from overseas.

Figure 4.2: Employment by industry sector



Source: Australian Bureau of Statistics, IBISWorld.

Notes: 1. Compound Annual Growth Rate

2. Comprises professional, technical and scientific services.
3. Growth of Health and Medical Research workforce not tracked – industry groups derived using 2011 split of services

This trend is not predicted to change in the near future. Trends in health and medical research are likely to be driven by broader changes in the healthcare and research sector. Major healthcare trends such as the increasing prominence of personalised and precision medicine and rising healthcare

costs will provide significant opportunities for health and medical research to contribute. The way research is being undertaken and disseminated will also drive changes in the delivery and translation of health and medical research. With increasing global collaboration, there is a need for greater integration between researchers and health service professionals.

Health and medical research return on investment

Health and medical research predominantly relies upon the generosity of the community either through government use of tax payer resources or through charitable foundations. However, because resources used for publicly and charitably funded medical research could be put to other purposes, there is an obligation to demonstrate that such investments represent good value.

Health and medical research is estimated to deliver a return on investment of around 117%, which means that a dollar invested in Australian health and medical research is estimated to return an average health benefit of \$2.17.⁴⁴ Similar evidence exists for cancer research specifically. In New South Wales improvements in cancer outcomes is estimated to have delivered \$48 billion in health benefits since 1980 and for every dollar spent on cancer research in New South Wales the return in health benefits is around \$3.43.⁴⁵ In the United Kingdom for each pound (\$2.11) invested in cancer research from 1970 to 2009 by taxpayer funding and charitable foundations generated a gross return of about 40 pence (\$1.44) per year.⁴⁶ Further, benefit-cost ratio (BCR) analysis of NHMRC investment shows that cancer research returned a BCR of 2.7 to one; i.e. for every \$1.00 invested, there was an economic benefit of \$2.70.⁴⁷ The main benefits were gains in wellbeing measured as disability adjusted life years (DALYs). Other benefits were the value of avoiding direct health system expenditure, the value of avoiding indirect costs and commercial returns.

⁴¹ ASMR, Planning the Health and Medical Research Workforce 2010-2019, prepared for ASMR by Dr Deborah Schofield, 2009, p.4.

⁴² Submission 108, Medicines Australia.

⁴³ IBIS World data request.

⁴⁴ The Australian Society for Medical Research (ASMR), Exceptional Returns: The Value of Investing in Health R&D in Australia II, prepared for ASMR by Access Economics Pty Ltd, Canberra, 2008.

⁴⁵ Glass P, Pezzullo ML, Cutler H, Yates K, Tracey E, Welberry H, Catanzariti A, Bishop J. The Health Returns on Investment in Cancer Research. Cancer Institute NSW, May 2008.

⁴⁶ Glover, M., et al., Estimating the returns to UK publicly funded cancer-related research in terms of the net value of improved health outcomes. BMC Medicine, 2014, 12(99).

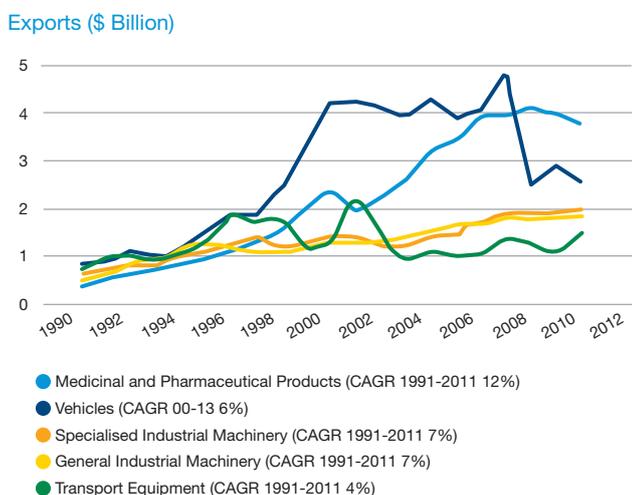
⁴⁷ Deloitte Access Economics, Returns on NHMRC funded research and development. Report prepared for the Australian Society for Medical Research, 2011: Canberra, ACT.

Health and medical research in South Australia

The South Australian government and Federal government, along with universities and commercial companies, are investing in a strong foundation for future research in South Australia. The 2008 review of health and medical research in South Australia identified the need for South Australia to establish “a new flagship Institute free of the entrenched rivalries often seen in other states where such institutes have evolved from different hospital/university environments and now compete for scarce state infrastructure funding.”⁴⁸ This recommendation led to the development of SAHMRI which officially opened in November 2013. Preceding and complementing this infrastructure to advance cancer research, the Flinders Centre for Innovation in Cancer was completed in 2011 and has been a leading exponent of collaborative cancer research in South Australia.

The decline of the large automotive manufacturing sector in Australia has seen in its replacement expansion of an enterprise-driven research and development industry (Figure 5.1).⁴⁹ Similar to the broader Australian economy, there has been a shift away from traditional industries towards knowledge-based industries such as health and medical research in South Australia.

Figure 5.1: Australian Manufactured Exports – Top Five Sectors



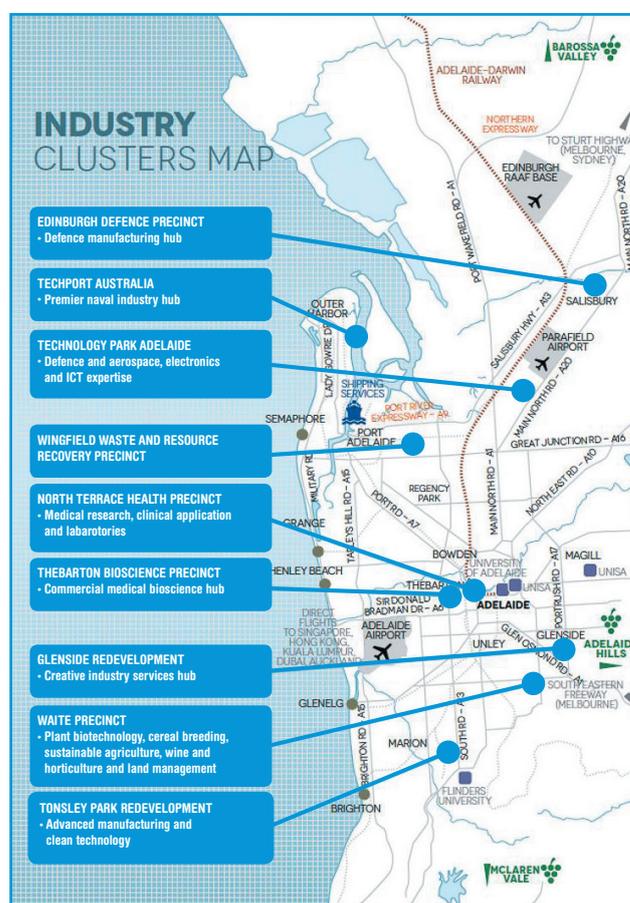
Source: Australian Bureau of Statistics. Image from McKeon review

Notes: 1. CAGR – compound annual growth rate

Three precincts that will play a major part in ensuring South Australia continues its momentum in expanding its support for knowledge-based industries, including a vibrant cancer research community, are currently undergoing significant commercial and government investment:

- the North Terrace Health Precinct, which includes SAHMRI, the new Royal Adelaide Hospital as well as other planned University structures
- the Thebarton bioscience Precinct, which houses key research platforms like pre-clinical imaging, genomics, proteomics and microscopy platforms.
- The Tonsley Park site, which identifies medical technologies as one of its four sectors specifically targeted as a focus for the Tonsley development (Figure 5.2).

Figure 5.2: Current and planned research and development industry sites of Adelaide



Source: <http://www.theleadssouthaustralia.com.au/industries/manufacturing/south-australias-vision-of-its-manufacturing-future/>

Complementing these precincts, South Australia has a number of features that make it an ideal setting for undertaking high quality cancer research. These features increase the state’s capacity to attract interstate and international interest from health industry partners, as well as attracting and retaining our research workforce.

⁴⁸ Shine J, Young A. Review of Health and Medical Research in South Australia. An independent review commissioned by the South Australian Government.

⁴⁹ Department of Health and Ageing. Better health through research: Strategic review of health and medical research; Final Report. February 2013. Australian Government: Canberra.

A stable, representative and centralised population base

Unlike larger states in Australia, South Australia has a relatively stable population base, with lower levels of net migration and low natural growth rate. The most recent estimates predict that the annual rate of population growth will peak during the first eight years of the projection period at approximately 1.4% in 2013–14 and then decrease thereafter.⁵⁰ This decrease in the rate of growth is largely driven by assumptions of overall migration intake and the aging population. In addition, South Australia has a highly centralised population, with approximately three-quarters of South Australia's population residing in the greater Adelaide metropolitan region and Adelaide hills.⁵¹ These features provide a suitable setting for health and medical research including undertaking large scale, longitudinal research, and clinical trials research, with efficient investment.

A highly centralised hub of research and health services

In line with South Australia's population distribution, our current health and medical research precincts, and associated health services, are highly centralised. As a result, barriers to communication, networking and travel are reduced, which in turn reduce overall costs. In addition, undertaking clinical, cancer control and health services research is improved by having relatively expedient access to research participants. The North Terrace precinct will be of particular importance at linking these groups together, with future developments aligning all three universities in close proximity, and a strong cancer research presence across all sites.

SA Cancer Service

SA Cancer Service (SACS) provides coordinated advice and leadership in cancer control and the provision of world class cancer and haematology care across the state including: prevention and early detection; service planning, capital investment strategy and infrastructure development; strategic workforce planning and development; service provision along the continuum of cancer care; information and data systems; and research.⁵²

SACS aims to:

- Improve health outcomes for people diagnosed with cancer through the development and coordination of patient centred, evidenced based, sustainable, effective and accessible statewide cancer services across the continuum of cancer care.
- Reduce the incidence of cancer in SA's population in collaboration with the Cancer Council SA, through the development and implementation of Statewide Cancer Control Plans.

SACS was previously established as the Cancer Clinical Network and under the auspices of its executive committee, and in partnership with Cancer Council SA, the Statewide Cancer Control Plans and the South Australian Cancer Research Collaborative were developed. These two significant initiatives have underpinned South Australia's cancer control planning, research and service delivery, and have been critical to driving coordinated care across the cancer spectrum.

A Statewide Cancer Control Plan

The World Health Organization states that “a well-conceived, well-managed cancer control programme lowers cancer incidence and improves the life of cancer patients, no matter what resource constraints a country faces.” It is designed to reduce the number of cancer cases and deaths and improve quality of life of people affected by cancer, through the systematic and equitable implementation of evidence-based strategies for prevention, early detection, diagnosis, treatment, and palliation, making the best use of available resources.⁵³

The goal of the current Statewide cancer Control Plan (SCCP) for South Australia is to implement the most cost-effective and beneficial ways to control cancer for the largest part of the population, and to reduce inequities in outcomes.⁵⁴

For research, the following recommendations are noted:

- A Cancer Research Collaborative develops high quality cancer research programs in SA across the fields of biomedical research, clinical research, population health research and health services research and evaluation
- A research translation and evaluation program is developed to ensure research findings are communicated and incorporated into service delivery and programs⁵⁵

A third Statewide Cancer Control Plan 2015-2019 is currently in draft development. This document will recommend priority

⁵⁰ Department of Planning and Local Government, Government of South Australia, Population projections for South Australia and statistical divisions, 2006-36, 2010: Adelaide, SA.

⁵¹ Australian Bureau of Statistics. Population by Age and Sex, Regions of Australia, 2012 (cat. no. 3235.0). Canberra: Australian Bureau of Statistics, 2012.

⁵² www.sahealth.sa.gov.au/wps/wcm/connect/public+content/sa+health+internet/about+us/our+statewide+services/sa+cancer+service

⁵³ www.who.int/cancer/nccp/en/

⁵⁴ South Australian Department of Health (2011). Statewide Cancer Control Plan 2011-2015. SA Health: Adelaide.

⁵⁵ Ibid.

programs and services to accelerate cancer control in South Australia, and will continue to set the agenda for linking the South Australian cancer research community with the priorities of SA Health.

In addition, this Plan will be closely linked to and support the Transforming Health initiative. Transforming Health aims to maximise extent of health benefit gained by all sectors of the SA population from available health budgets. It is intended to bring about a permanent change in systems and the culture of healthcare delivery. The vision is to deliver a quality healthcare system that provides best care, first time, every time. It has six quality principles to transform the system: patient-centred, safe, effective, accessible, efficient and equitable.⁵⁶

A collaborative cancer research culture

Collaboration is becoming increasingly important at attracting interstate and international sources of funding, and increasingly large quantum of funding.⁵⁷ In addition, it is important at the translation and implementation end of research, where partnerships with health services and policy makers are critical for testing and embedding research outcomes.

The State-wide Cancer Control Plan 2006-2009 laid the foundation for establishment of the SA Cancer Research Collaborative. The Collaborative is a partnership between Cancer Council SA, the South Australian Government through SA Health, and the three state universities and is consistent with South Australia's strategic development planning.⁵⁸ At the time of its formation, it was recognised that cancer research capacity had not increased in South Australia at the same rate as for Australia overall since 2000, due to gaps in the research workforce and local under-investment. This led to reduced competitiveness in grant applications at a national and international level. Consequently, strengthening research capacity in South Australia was critical to improving health outcomes, as well as increasing the state's competitiveness nationally and internationally. Further, South Australia would be better placed to attract and retain the best clinicians and leading cancer experts to deliver health services.

The Collaborative was considered to be the most important direction for South Australia to take to rectify this declining cancer research competitiveness and oversaw the establishment and implementation of the Beat Cancer Project. The purpose of the Collaborative is to retain and grow the South Australian cancer research workforce, strengthen cancer research infrastructure, provide evidence for clinical care and other service provision, and contribute to the State's overall health and medical research enterprise.

Full implementation of the Beat Cancer Project commenced in July 2011. The Beat cancer Project will run for five years from 1 July 2011 to 30 June 2016 with investment by Cancer Council SA and the South Australian Government totalling \$20 million, and in excess of \$10 million leveraged from South Australian universities and other external sources. Annual Reports show progress towards the deliverables (Table A2, Appendix A). In particular, leveraging funding from outside the two main funders, Cancer Council SA and SA Health, and complementary funding from national funding sources suggest that leading indicators are positive, especially given the brevity of existence of the collaborative and rollout of the funding strategy. The Collaborative has also been successful at securing and evenly distributing funding across all major institutions and hospitals (Figure A3, Appendix A).

The South Australian Academic Health Science and Translation Centre

South Australia has been awarded the South Australian Academic Health Science and Translation Centre (SA AHSTC) by the National Health and Medical Research Centre (NHMRC) for its commitment to translational research. The SA AHSTC has brought together, in a whole-of-state collaborative network, the state's academic, research and health care delivery agencies in order to advance translation of evidence into clinical care for improved health outcomes.

The vision of the SA AHSTC is to continuously enhance the rate of translation of research into health care in order to create a self-improving and high-quality health system, which is also sustainable. The partners in the SA AHSTC encompass the full breadth of health service delivery, covering the whole geography of the state and including primary health care and Aboriginal Health, as well as South Australia's peak health consumer agency, which now includes Cancer Council SA.

To extract optimal value from these components, a comprehensive State-wide cancer research strategy needs to place an emphasis on alignment and integration between cancer research and health services. Key to this will be monitoring and demonstrating its economic impact on the state, including how it can be a driver for economic productivity by building strong health industry partnerships and by reducing health system expenditure through drug discovery, improved technologies, epidemiological and behavioural research, strong clinical trials support, facilitating quality control in service delivery, and monitoring and evaluating health system performance for optimised health outcomes and use of resources.

⁵⁶ SA Health Government of South Australia, *Delivering transforming health: Summary*, 2015: Adelaide, SA.

⁵⁷ Cancer Australia, *Cancer research in Australia: an overview of funding initiatives to support cancer research capacity in Australia 2006 to 2011*, 2015: Surrey Hills, NSW.

⁵⁸ South Australian Department of Health (2007). *Statewide Cancer Control Plan 2006-2009*. SA Health: Adelaide.

South Australian cancer research performance

Information on cancer research inputs, activities and outputs is important for objectively viewing the academic drivers of success. Inputs include direct funding and leveraged funding, currently existing infrastructure and platform technologies, and human capital; activities include research projects, collaborations and mentoring; and outputs include publications and presentations, qualifications and scientific discoveries. The following information provides a summary of high-level research activity data and demonstrates South Australia's commendable cancer research performance. A detailed analysis of cancer research performance is provided in Appendices C (cancer research funding), D (cancer research publication performance) and E (cancer researcher survey feedback).

Cancer research funding

South Australia received the third highest amount of funding per capita from 2006-2011, behind only Victoria and New South Wales (Figure 6.1).⁵⁹

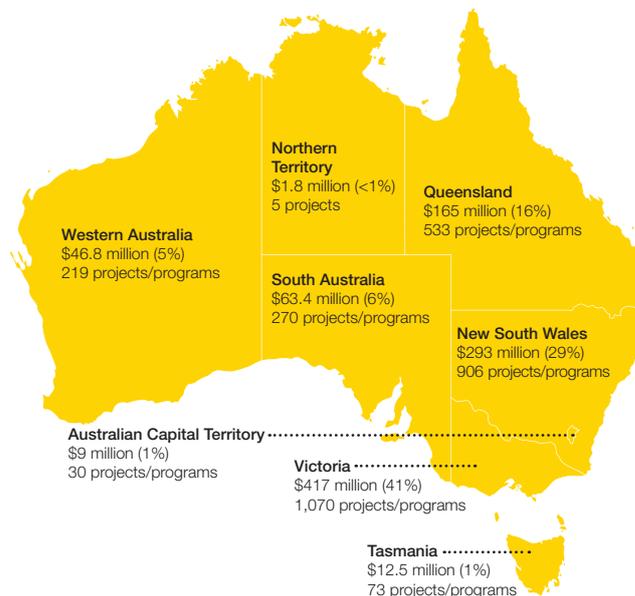
Figure 6.1: Cancer research project and research program grant funding per capita, 2006-2011



Source: Cancer Australia, 2014.

However, South Australia, relative to its population size (7.4% of the national population), is underperforming; receiving only 6% of the total funding in Australia, due largely to Victoria's dominance at attracting cancer research funding (Figure 6.2).⁶⁰

Figure 6.2: Distribution to states and territories of direct funding to cancer research projects and research programs in Australia, 2006 to 2011.



Source: Cancer Australia, 2014.

While there has been an increase in the amount of funding South Australia has received since 2003 (up from \$24.4M to \$35.7M), relative to the national total there has been a slight decrease in the relative amount South Australia has received down from 8% to 6% (Table 6.3). Victoria and New South Wales are the only states to increase over time.⁶¹

Table 6.3: Distribution of cancer research funding in each state and territory for 2003-2005, 2006-2008 and 2009-2011

State or territory	2003 - 2005	2006 - 2008	2009 - 2011
New South Wales	\$72.6 M (25%)	\$118 M (29%)	\$175 M (29%)
	379	445	627
Queensland	\$56.8 M (19%)	\$69.6 M (17%)	\$95.1 M (16%)
	264	285	359
South Australia	\$24.4 M (8%)	\$27.7 M (7%)	\$35.7 M (6%)
	135	129	179
Tasmania	\$3.6 M (1%)	\$4.8 M (1%)	\$7.8 M (1%)
	28	37	40
Victoria	\$114 M (39%)	\$168 M (41%)	\$249 M (42%)
	413	566	721
Western Australia	\$16.3 M (6%)	\$18.7 M (5%)	\$28 M (5%)
	91	113	151
Australian Capital Territory	\$3.4 M (1%)	\$5.2 M (1%)	\$3.9 M (<1%)
	18	19	19
Northern Territory	\$0.1 M (<1%)	\$0.6 M (<1%)	\$1.2 M (<1%)
	3	2	4

● Projects / programs

Source: Cancer Australia, 2014.

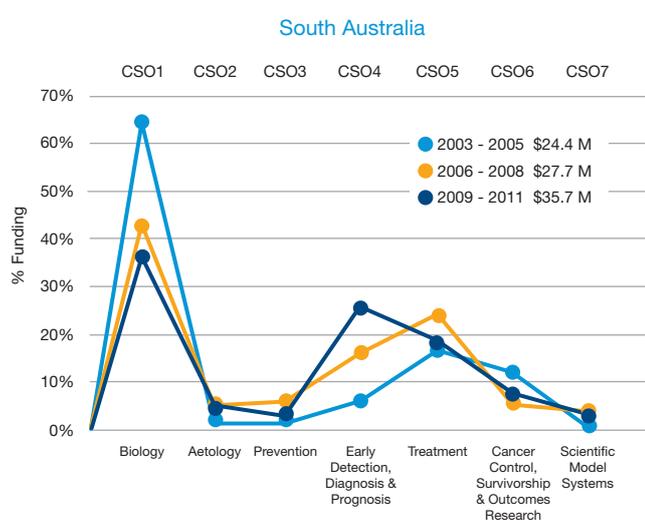
⁵⁹ Cancer Australia. Cancer Research in Australia: an overview of funding to cancer research projects and research programs in Australia, 2006 to 2011. 2014.

⁶⁰ Ibid.

⁶¹ Ibid.

Analysis of funding by Common Scientific Outline (CSO)⁶² categories demonstrates that the areas of South Australian cancer research receiving the greatest proportion of funding include biology, early detection, diagnosis and prognosis, and treatment research (Figure 6.4). However, there has been a reduction in biological and treatment research across the three triennia.

Figure 6.4: Cancer research funding in South Australia by Common Scientific Outline (CSO) category for 2003-2005, 2006-2008 and 2009-2011.



Source: Cancer Australia, 2014.

This distribution of cancer research funding is comparable to the national distribution with the exceptions of early detection, diagnosis and prognosis (an increased proportion in South Australia) and treatment (a decreased proportion in South Australia). However, the cancer research funding distribution in South Australia is not in line with other leading cancer research countries. For example, the National Institute of Health in the United States, and Canada have distributed a greater amount towards cancer aetiology, prevention, treatment and cancer control than what is current in South Australia.⁶³

Cancer research infrastructure

Research infrastructure and research platforms are required for research implementation and are critical for researchers to be successful when competing for state, national and international funding. South Australia must maintain pace with the rest of the world to ensure that we can continue to be competitive, especially in the advanced technology areas of genomics, proteomics and bioinformatics.

Monitoring access to infrastructure and platforms is important for understanding whether researchers are able to deliver on projects, and for determining if and where future resource investment should be placed. Examples of infrastructure and platforms critical to cancer research include databases (e.g., cancer registries, other cancer-related databases, bio-specimen databases); genomics, proteomics and other high technology platform; data linkage facilities; and bioinformatics and statistical services. The Beat Cancer Project measures adequacy of availability every two years through its cancer researcher survey (Figure 6.5).⁶⁴ Results indicate that there are varying levels of adequacy across the range of surveyed infrastructure and platforms, however there has been a general increase in adequacy of infrastructure and platform availability between the baseline year (2013) and the latest survey (2015).

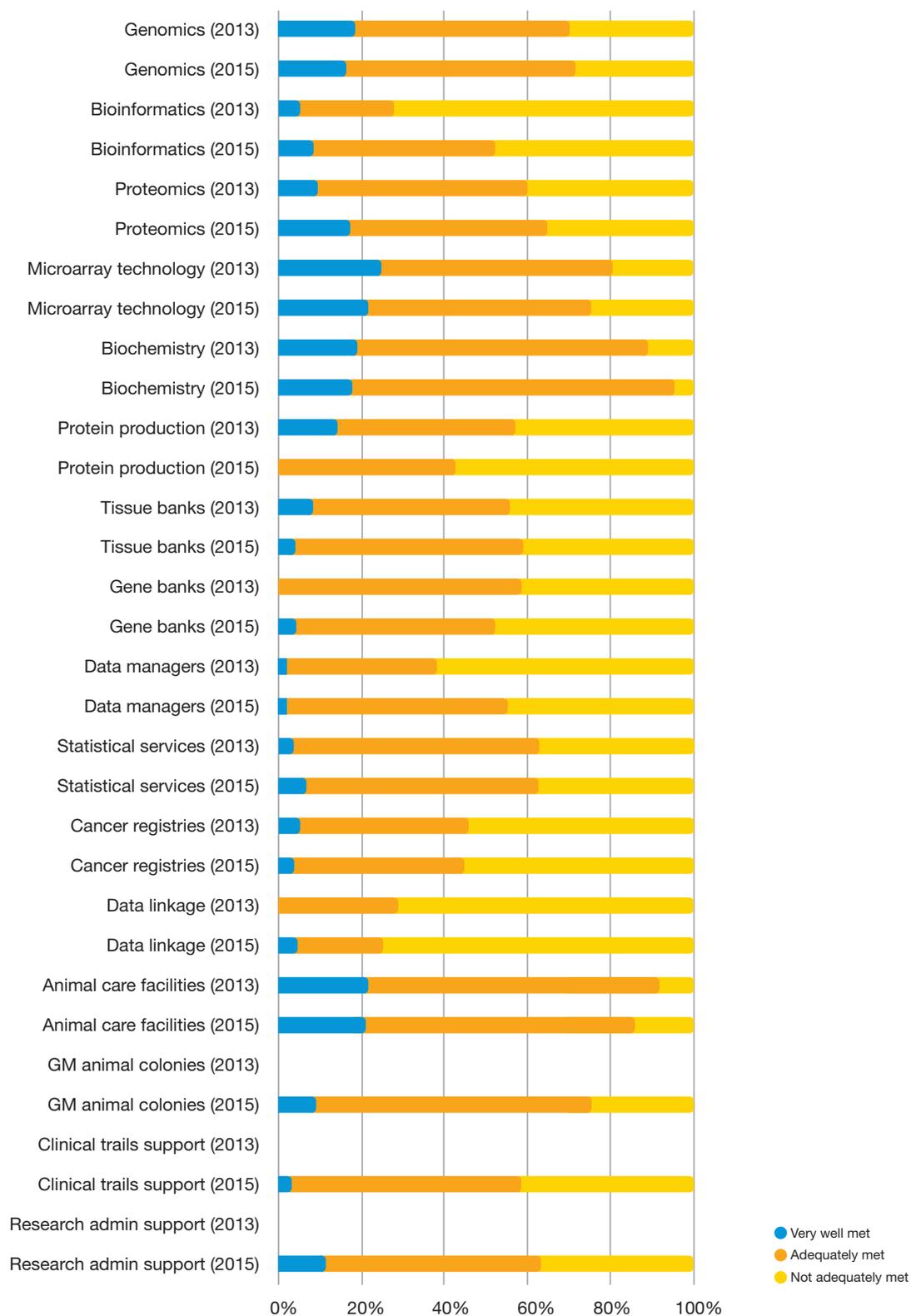
⁶² Common Scientific Outline (CSO) is a classification system organised into six broad areas of scientific interest in cancer research. The CSO is complemented by a standard cancer type coding scheme. Together, these tools lay a framework to improve coordination among research organisations, and make it possible to compare and contrast the research portfolios of public, non-profit, and governmental research agencies. The CSO is organized around seven broad areas of scientific interest in cancer research: (i) Biology; (ii) Aetiology; (iii) Prevention; (iv) Early detection, Diagnosis, and Prognosis; (v) Treatment; (vi) Cancer Control, Survivorship, and Outcomes Research; and (vii) Scientific Model Systems.

⁶³ Cancer Australia. Cancer Research in Australia: an overview of funding to cancer research projects and research programs in Australia, 2006 to 2011. 2014.

⁶⁴ Beat Cancer Project annual researcher survey, 2015. SAHMRI Research Administration Office: Adelaide.

South Australian cancer research performance

Figure 6.5: Availability of research infrastructure, 2013 (n=58) and 2015 (n=82)



Source: Beat Cancer Project annual researcher survey, 2015.

Cancer research collaboration

Comparison of successfully funded research projects and research programs by number of collaborators shows that there has been a stabilising in the total quantum of funding distributed to projects and programs with no named collaborators and an increase in both the quantum, average funding per project/program and number of projects/ programs funded where there is one or more collaborators (Table 6.6). This pattern is most marked for multiple named collaborators.

Table 6.6: Direct funding to and number of cancer research projects and research programs, and average funding per project/program, in each collaboration category in 2003–2005, 2006–2008 and 2009–2011

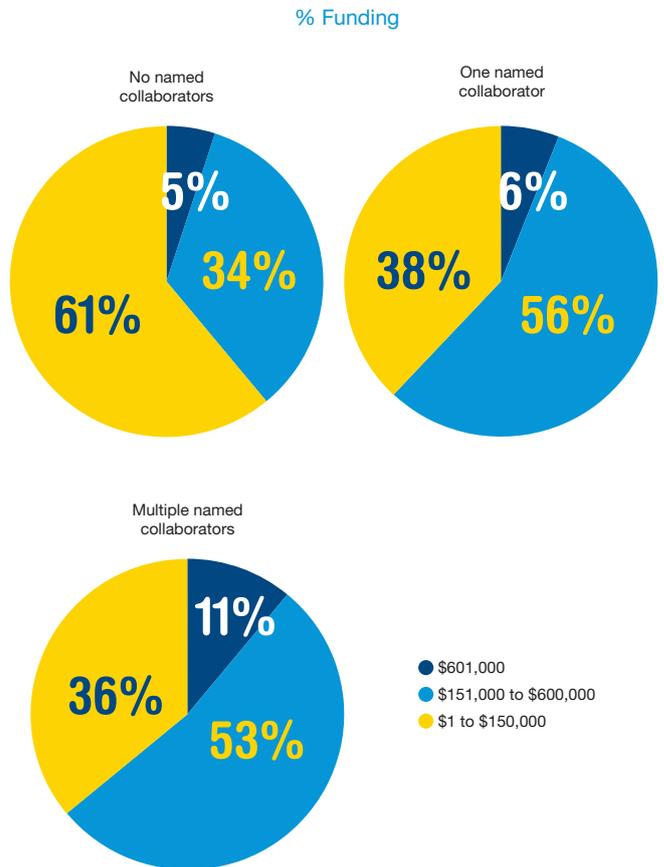
Collaboration category	2003 - 2005	2006 - 2008	2009 - 2011
No named collaborators (average funding per project / program)	\$118 M (\$211,000)	\$130 M (\$205,000)	\$129 M (\$174,000)
	558	635	742
Single named collaborator (average funding per project / program)	\$53.5 M (\$163,000)	\$77 M (\$233,000)	\$126 M (\$263,000)
	328	331	480
Multiple named collaborators (average funding per project / program) (average no. collaborators)	\$120 M (\$268,000) (3.2)	\$206 M (\$327,000) (3.4)	\$340 M (\$388,000) (3.6)
	446	630	876

● Projects / programs

Source: Cancer Australia, 2014.

Indeed, the proportion of cancer research projects and research programs that received more than \$600,000 was two-fold higher for research with multiple named collaborators. The majority (75%) of these collaborators were from the same institution, and only 9% of cancer research projects and research programs had an international, named collaborator (Figure 6.7).

Figure 6.7: The proportional split of direct funding to cancer research projects and research programs in each collaboration category in the period 2006 to 2011



Cancer publication performance

Bibliometric analysis shows that South Australia has produced a high number and proportion of cancer-related publications over time relative to its population size as a proportion of the Australian population – 11.2% of publication output compared with 7.4% of the national population. In particular, when analysing South Australian publication performance by CSO category it is evident that South Australia is relatively strong in prevention research, and cancer control, survivorship, and outcomes research (Tables 6.8).⁶⁵

⁶⁵ Elsevier’s Scopus citation index. Data sub-licensed through the Victorian Comprehensive Cancer Centre, 2015.

South Australian cancer research performance

Table 6.8 Proportion of publications for Australian states and territories in major CSO categories, 2006-2014.

	Total Publications	Biology	Aetiology	Prevention	Early detection, diagnosis and prognosis	Treatment	Cancer control, survivorship and outcomes	Scientific model systems
SA	11.2	10.1	10.0	12.5	11.2	11.6	12.4	11.4
VIC	37.5	40.9	38.4	31.8	34.6	37.1	33.1	43.2
ACT	3.1	4.1	3.0	4.5	2.5	2.4	2.8	4.6
NSW	36.0	31.1	33.0	34.6	39.1	38.4	41.4	29.5
NT	0.5	0.3	0.7	0.6	0.6	0.6	0.7	0.2
QLD	21.0	20.4	27.5	21.7	20.6	19.3	22.7	19.9
TAS	1.5	1.2	2.7	2.1	1.4	1.5	1.6	1.2
WA	9.6	8.3	11.4	10.0	10.0	9.3	11.7	7.2
Share of the world								
Australia	2.5	2.4	2.8	3.3	2.1	2.2	4.0	2.8

Source: Elsevier's Scopus citation index.

Note: Publications can be assigned to more than one category. As a result, the sum of categories will come to more than 100%.

When analysing South Australian publication performance by tumour streams from 2006-2014, data suggest that South Australia is relatively strong in the areas of colorectal,

leukaemia, head and neck, sarcoma and bone, and upper gastro-intestinal cancer research (Table 6.9).⁶⁶

Table 6.9: Proportion of publications for Australian states and territories by tumour streams, 2006-2014.

	Total	Breast	Central Nervous System	Colo-rectal	Eye	Genito-urinary	Gynaecological	Haematological	Head and Neck	Lung	Sarcoma and Bone	Skin	Thyroid and other Endocrine	Upper Gastro-intestinal
SA	11.2	9.5	8.4	14.3	19.3	10.2	9.4	10.7	15.2	10.2	15.2	5.7	10.6	13.1
VIC	37.5	38.8	39.3	39.3	32.4	41.1	38.3	45.2	27.6	34.2	34.1	27.8	36.3	34.2
ACT	3.1	2.7	1.7	2.3	5.6	1.2	2.2	4.0	1.4	1.5	1.8	1.5	1.5	3.5
NSW	36.0	40.5	40.7	39.1	39.8	39.0	39.9	30.8	34.4	35.6	34.5	43.2	41.8	40.9
NT	0.5	0.1	0.1	0.2	0.0	0.5	0.6	0.6	0.5	0.3	0.4	0.3	0.1	0.3
QLD	21.0	23.4	13.7	18.1	13.4	23.9	25.1	17.7	27.0	21.1	18.7	30.2	16.7	16.0
TAS	1.5	0.9	1.8	1.1	1.6	1.1	1.5	1.5	1.8	1.4	1.1	1.9	1.3	0.3
WA	9.6	9.7	8.4	0.0	9.6	9.8	9.4	9.6	7.2	13.5	12.9	8.6	8.5	8.8
Share of the world														
Australia	2.5	2.9	2.0	2.6	2.6	2.3	2.9	2.8	1.7	2.2	1.9	3.3	2.1	1.3

Source: Elsevier's Scopus citation index.

Note: Publications can be assigned to more than one category. As a result, the sum of categories will come to more than 100%.

⁶⁶ Ibid.

South Australian cancer research performance

South Australian cancer research publications account for a high proportion of the top 1% and 5% of publications internationally relative to its population size, indicating that the quality of our research exceeds many other states and is above the national average (Figure 6.10).

Figure 6.10: Share of Australian publications – top 1%, 5% and total 2006-2013



Source: Elsevier's Scopus citation index.

Furthermore, when analysing the data by relative citation impact and the relative journal impact, South Australian cancer publications are comparable to many other larger jurisdictions (Figure 6.11).⁶⁷

Figure 6.11: Comparison of relative citation impact and journal impact – total cancer publications, 2006-2013

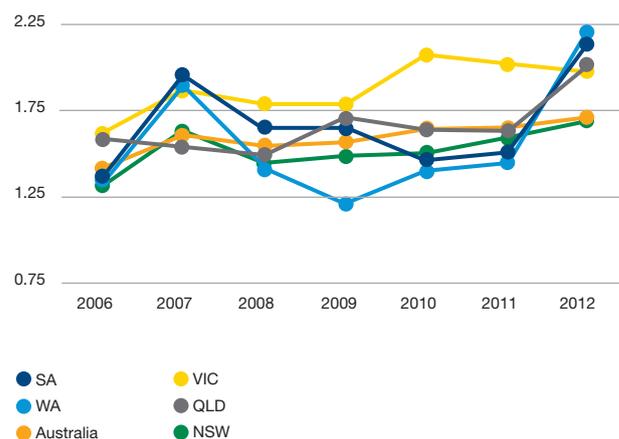


Source: Elsevier's Scopus citation index.

Notes: ¹ Source-Normalised Impact per Publication

When looking at changes in performance over time, there has been a steep increase in the relative citation impact of South Australian publications from 2011 to 2012 (Figure 6.12). This aligns with the commencement of the Cancer Council Beat Cancer Project, however, more recent data is required to see if this trend continues.

Figure 6.12: Relative citation impact (3 year citation window) of cancer publications by Australian states and territories, 2006-2012



Source: Elsevier's Scopus citation index.

⁶⁷ Ibid.

South Australian cancer research: stakeholder feedback

As part of broad consultation with the South Australian cancer research community, Cancer Council SA included a series of questions in the Beat Cancer Project annual surveys to cover four broad areas: 1) what we currently do well in cancer research in South Australia, 2) how we can further build research capacity and partnerships, 3) how to best advance high priority research and its translation to impact, and 4) barriers and enablers for improving research competitiveness.

The South Australian cancer research community identified a number of areas as opportunities for informing a statewide cancer research strategy in this state. Collaboration, either within, across disciplines or ends of the research translation pipeline, or outside of academic research to industry and health services was frequently reported in all areas. It was commented on as being a strength within disciplines, but also noted as a barrier and an opportunity for growth outside of one's immediate network or area of research focus. This included communication and consultation with consumers, and better engagement with health service providers as part of the research process.

“provide better opportunities for cross-disciplinary collaboration as well as links to clinical trial facilities and industry”

“connectivity with researchers in similar areas across states and territories”

“provide financial, administrative and academic incentives to be involved in collaborative projects”

“researchers need to be engaged better in health service planning - currently this is poor”

People support and capacity building, from increasing financial support to ensure there is a sound pipeline for academics, to building a supportive framework around staff through mentoring, student support, and assistance to reduce administrative burden, were also highlighted. Indeed, some consistent messaging was with reference to supporting early and mid career researchers through provision of kick-start funding, additional fellowships and travel scholarships.

“more funding to provide better job prospects and career progression”

“create positions that will foster their career and research interests – forming research teams that link to particular areas of strength with clear targets”

“experienced workforce from which to recruit is limited”

As a theme, research infrastructure and platforms was identified as being fundamental to South Australian research, its competitiveness and its ability to drive commercial interest. There was a strong indication that our capabilities within the biomedical, pre-clinical and drug target development area were apparent, but potentially being under-utilised in streamlining the translational process to clinical application. Of note here was also maintaining our competitiveness through investment in advanced technologies in these areas, e.g., high throughput bioinformatics capabilities. Biobanks were also identified for multiple reasons (e.g., as a strength, opportunity, barrier and area for increased competitiveness) suggesting that potentially knowledge of all biobanks throughout the state is limited, and thus first steps may be to systematise and network our capacity in this area.

“molecular pathology and functional genomics are world class in SA but underutilised. These facilities could be used better to provide personalised medicine with world class treatment for patients”

“we have the potential to make serious breakthroughs that could result in real ‘biotech’ industry”

A commonly cited area of critical need, a strength within the state and one listed as being important for expanding our competitiveness is in our cancer registries and data linkage technologies. This also closely aligns to feedback regarding South Australia having a strong health services research profile and opportunities for undertaking high quality translational research.

“long standing clinical registries”

“the opportunities exist to improve linkage of data and service delivery information systems to monitor cancer outcomes over time, and to provide a monitoring system to evaluate the progress of prevention and health system reform across the state”

As part of identifying the breadth of research across South Australia, numerous tumour streams and categories of research were listed. This suggests that at a statewide level, our capacity to undertake a comprehensive profile of research is possible, but may require ensuring that gaps are identified and addressed and networks are established, at the same time as maintaining support for those areas of strength. This requires further consideration however, given the finite resources available and may be part of a longer-term evolving planning and evaluation process.

Finally, there was a recurrent theme regarding an overly burdensome and conservative environment in SA with which to undertake innovative research of high impact. Systems and processes, including technical, administrative, governance and ethics, were commonly cited as barriers that, if addressed, would expedite the research process, increase translation and create economic stimulus.

“Research Governance Procedures - they slow research and inhibit the research environment”

“reduce bureaucracy-cut red tape”

“difficulty with ethics and process- very difficult and time consuming to gain access to public patients”

These data, along with cancer research funding, research collaboration and infrastructure data, and publication performance data suggest that there is a healthy cancer research community in South Australia. However, due to the small population size of the cancer research community, sustaining local research workforce and infrastructure investment is critical to driving positive outcomes including collaboration with multiple stakeholders, increasing national and international competitiveness, attracting economic research stimulus, and ultimately having an impact on cancer control.

A State-wide cancer research strategy for South Australia

Cancer Council SA, the South Australian research community and South Australian government are committed to ongoing investment in cancer research to reduce the burden of cancer on the community. Given the context of the growing burden of cancer, the economic benefits of sustained investment in health and medical research as a replacement for traditional industries, and other large state-wide initiatives (e.g., the North Terrace health precinct, significant investment in developing other 'smart industry' hubs, the Statewide Cancer Control Plan, and the Transforming Health Initiative), the timing is right for all key stakeholders to develop a state-wide, data-informed, evidence-based cancer research strategy.

This cancer research strategy will build a robust, unifying framework; it will drive funding decisions aimed at building economic growth, bolster our current and future competitive strengths, fill essential gaps in research, workforce and infrastructure, attract and develop new talent, reinforce collaboration, focus investment and align each sector to form an integrated pipeline from research discovery through translation to improved health outcomes. This strategy is a clear commitment by all key stakeholders to lessen the impact of cancer in our community. The Strategy will be in place from 1 July 2016 to 30 June 2021.

The vision for cancer research in South Australia

Critical to the success of the strategy, a vision has been set for the future of South Australian cancer research:

A collaborative, unified and targeted approach across research, education, health care and government systems to support cancer research discovery and implementation that optimises strengths, addresses gaps in cancer control and builds South Australia's profile as an international leader in cancer research and translation.

We will achieve this through effective governance of cancer research, encouraging strong research partnerships, investing in our workforce and securing comprehensive research platforms and data systems into the future.

To underpin this vision, the following guiding principles will be embedded as part of all activities directed at achieving the recommendations of this strategy:

- A state-wide research funding strategy will be further targeted to have the greatest impact on the South Australian population who support and are ultimately impacted by it
- A consumer-centred approach will be embedded along the research to translation pathway
- Current and future models will be optimised to best support South Australian cancer researchers to ensure long term sustainability
- Governance and communication structures will maximise equity and transparency of funding decisions and monitoring research performance

Finally, eight strategic objectives have been set that if achieved, will move the South Australian cancer research community into a leading jurisdiction of research, nationally and internationally. These objectives are:

1. Improve South Australia's cancer research impact and its competitiveness for state-wide, national and international funding, and increase its capacity to address local health problems.
2. Build better, relevant and sustainable research capacity in South Australia, with a focus on research workforce, and infrastructure and capacity building.
3. Increase the scientific excellence of research in South Australia.
4. Direct, foster and translate research discoveries towards having a positive impact on the burden of cancer in South Australia.
5. Create economic growth for South Australia, including expanding collaborations with health industry partners.
6. Optimise cancer policy, clinical practice and health services in South Australia through research.
7. Address high priority gaps in cancer research and outcomes.
8. Communicate research findings beyond traditional means to facilitate knowledge exchange.

The strategic priority areas for South Australian cancer research

As identified in previous sections of this report, the South Australian Government, the three state universities, and industry continue to make significant investment in health and medical research infrastructure in this state. Supporting this, the Beat Cancer Project has secured a sizeable tranche of funding for South Australian-based researchers to undertake research across the cancer spectrum. Research performance data suggests that these activities are having a demonstrable impact. To continue this upwards momentum a number of strategies and supporting recommendations have been identified through this review process to continue to grow cancer research performance in South Australia, and reduce the burden of cancer on the community.

These strategies can be categorised into three areas:

1. Supporting South Australia's strategic health priorities;
2. Optimising economic growth in the North Terrace Health Precinct; and
3. Building on the success of the Beat Cancer Project.

Supporting South Australia's strategic health priorities

Integration and translation of research with state cancer control and health services initiatives

Under the auspices of the Cancer Clinical Network, and subsequently SA Cancer Service, South Australia has successfully implemented two Statewide Cancer Control Plans (SCCPs). The first SCCP outlined the need for South Australia to establish the South Australian Cancer Research Collaborative, which has been the single biggest change to cancer research administration and funding in South Australia. In addition, these plans have helped to support other important cancer control initiatives including the development of cancer care pathways, maintained funding for tobacco control social marketing, and development of Aboriginal and Torres Strait Islander-specific cancer control initiatives. Hence, their ability to complement cancer research by outlining the broader cancer control agenda is an asset of South Australia.

This is of particular importance in clinical, population health and health services research where these plans facilitate pipelines for translation into policy and practice, ensure that our current services are aligned to best practice and cost-effective care, reduces inequities among different population groups, and maximise the potential for discovery research and evaluation to be integrated at a state-wide level. Long-term security of funds for infrastructure that support health services research (e.g., cancer registries, biobanks) is vital for these activities.

Recommendation 1: Establish sustainable cancer surveillance and cancer quality and safety monitoring research to support cancer control service providers.

Currently existing cancer surveillance, and quality and safety monitoring research is better embedded in, and communicated to those in direct health services delivery, and is acknowledged as fundamental to providing best-practice cancer care.

Target: Funding for core cancer surveillance infrastructure is secured by July 2016. In collaboration, SA Cancer Service, SA Health and Cancer Council SA to identify and develop a cancer care quality monitoring and surveillance framework that strengthens the role of core infrastructure in South Australia.

Complementing the SCCP, the Transforming Health Initiative aims to maximise the health benefit gained by all sectors of the South Australian population from available health budgets. It is intended to bring about a permanent change in systems and the culture of healthcare delivery. The vision is to deliver a quality healthcare system that provides best care, first time, every time. It has six quality principles to transform the system: patient-centred, safe, effective, accessible, efficient and equitable. In line with this initiative, stakeholder feedback noted that optimisation of state-based cancer research relies on consultation and communication with health services providers and policy makers. In particular, with strategic cancer-specific services that have a state-level focus.

Recommendation 2: Review and identify more effective methods for the implementation of research evidence into practice and policy.

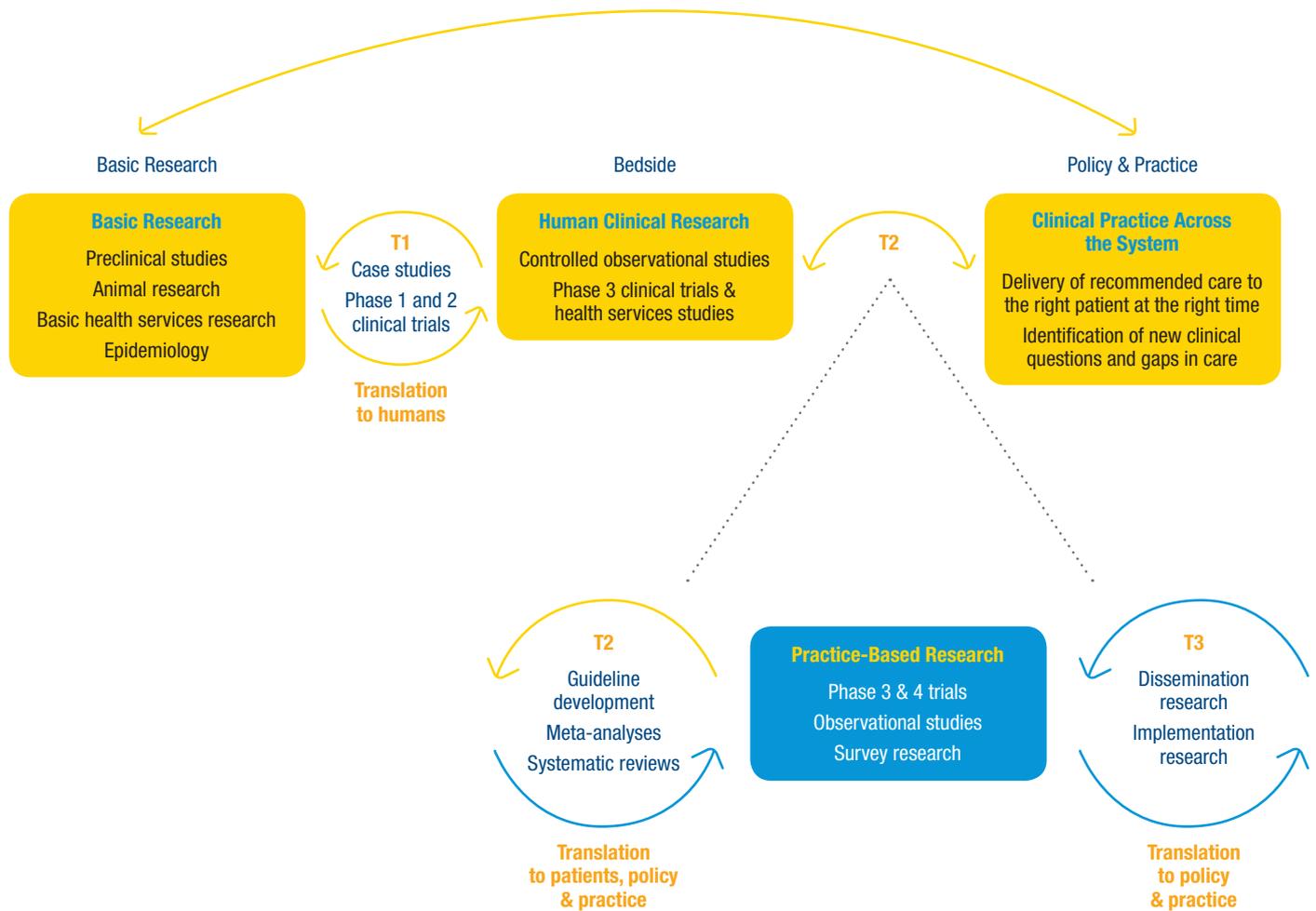
Cancer research, particularly in the areas of population health and health services research, demonstrates direct application to supporting broader health services initiatives for more effective and efficient cancer control implementation and dissemination research.

Target: Pathways and implementation plan for translating research evidence into practice and policy in place at commencement of Year 6 of Beat Cancer Project in July 2016.

A State-wide cancer research strategy for South Australia

A facilitator to integrating research into health policy and practice is to embed a translational research strategy into research. Translational research seeks to transform biomedical research 'at the bench' into clinical practice 'at the bedside' or basic health services and epidemiology research into policy and practice, through interdisciplinary collaboration, supportive infrastructure, funding and staff (Figure 7.1).

Figure 7.1: A schematic of the Translational research pipeline in cancer control



Source: Cancer Institute NSW [adapted from Westfall et al. Practice-based research – 'blue Highways' on NIH roadmap. JAMA, 2007; 297(4): 403-406. & NSW Health and Medical Research Strategic Review 2012. NSW Ministry of Health. Page 4]

Note: Translational research defined as; T1 - developing treatments and interventions. T2 - testing the efficacy and effectiveness of these treatments and interventions. T3 - dissemination and implementation research for system-wide change.

Focused translational research is effective at reducing the time delay of discoveries transitioning between the highly specialised areas of cancer research. It is also an effective mechanism for providing governments with evidence-based strategies to adopt the most effective and cost effective care for the community. While South Australian cancer research has strong pillars of research, cross-disciplinary formal communication with translational research partners is limited. Hence, appropriate 'levers' should be adopted by funding bodies to build and support a highly collaborative, translational research environment. Given the increased pressures on health care services, continuing to foster translational research hubs like the Flinders University campus, and the North Terrace precinct should be an expectation of future cancer research in South Australia. The SA AHSTC will be critical to driving translational research at a population level.

Recommendation 3: Develop new translational research projects.

The SA AHSTC to identify targeted, multidisciplinary translational research packages that address specific state priorities as part of future funding and closely monitor and review outputs and outcomes against the translational research pipeline. Partnership funding opportunities outside of Beat Cancer Project on cross-disease health research should be explored (e.g. risk factor management for the prevention of chronic disease).

Target: Implement two, four year translational research packages from July 2017 to June 2021 to be conducted with strategic oversight by the SA AHSTC.

Priority-driven cancer research to address the growing burden of disparities in cancer

There are a number of emerging areas of priority for cancer control, especially in population health and health services research. For example, Aboriginal and Torres Strait Islander people living in South Australia have a similar rate of cancers to the rest of the population, but with a different distribution of cancer types that often have poorer outcomes. This pattern reflects a general social disadvantage, often associated with raised levels of smoking, excess alcohol intake and poor diet, as well increased rates of human papillomavirus (HPV), hepatitis B and helicobacter pylori infection. This is further complicated by higher rates of diabetes and other co-morbidities, and often poorer access to specialist treatment services. More broadly, people living in rural and remote areas of South Australia face similar difficulties with accessing health services and receiving the right care, first time, every time, often resulting in poorer outcomes.

A second area of growing burden is the increasing number of cancer survivors in the South Australian community. Latest estimates predict that there are in-excess of 50,000 South Australians surviving cancer today. With this may come significant physical and psychosocial consequences resulting in decreased overall quality of life. These include late effects of treatment, impaired physical functioning, psychological and social issues, financial hardship, and spiritual and existential concerns. These issues tend to be compounded by late diagnosis and are also a growing research focus among paediatric and adolescent and young adult populations because of the late effects of cancer treatment for long term survivors.

Recommendation 4: Develop targeted calls for research to address health inequities in priority areas in South Australia.

Future state cancer research funding for population health and health services research should quarantine a proportion of funding to address priority-driven cancer control research to reduce inequities and improve quality of life.

Target: 10% of Beat Cancer Project funding is secured for funding research to address gaps and reduce inequities in cancer outcomes in priority areas.

Embedding the consumer voice into cancer research

Consumers are the end-users of the research pipeline and as such, are the ultimate beneficiaries of our investment. They are also participants in and supporters of our research programs. Furthermore, given that cancer charities funded 16% of research programs and research projects in Australia, consumers have a vested interest in where the money is distributed.

As part of this strategy development process, cancer consumer representatives were engaged to provide their perspective of cancer research in South Australia. Feedback indicated that consumers wanted to be better and more genuinely engaged in the research process, especially as it relates to clinical practice and survivorship. Consumers also wanted to see better use of publicly-funded data like cancer registries, as well as data collected as part of larger research projects and clinical trials and saw that consumer representative bodies could play a key role in advocating for improved data access and sharing. Consumers commented on the lack of their engagement in the research design and implementation process and saw that they would add value if engaged at this early stage. Furthermore, consumers were supportive of research translation as a key focus of future research endeavours.

Recommendation 5: Promote greater consumer involvement in implementing the research strategy.

Consumers are actively involved in South Australian cancer research and suitable system-driven mechanisms are implemented for consumers to review cancer research funding applications prior to submission, as well as during the grant review process. Consumer representative bodies are engaged and supported to lead advocacy initiatives to enable more efficient and effective cancer control research.

Target: Consumer representation is documented as part of all grant funding from commencement of Year 6 of Beat Cancer Project and Cancer Council SA to develop a research advocacy agenda in collaboration with consumer groups by December 2016 for actioning across the remaining years of the Strategy.

Evaluating and communicating our performance

Monitoring and evaluating research is critical for identifying success or otherwise of funded projects, people support and infrastructure. Research metrics are focused on traditional Inputs (e.g., funding quantum and distribution) and Outputs (e.g., publications, collaboration) with few deliverables focused on broader Inputs (e.g., formal collaboration) or downstream indicators of research success. Recent developments in research strategy include looking beyond traditional metrics of research Outputs to measure the downstream Outcomes and Impacts. Interest by funders in driving broader outcomes and impact from research has resulted in the development of more holistic research evaluation strategies. However, given the time taken for cancer research to have demonstrable impact (an average of 17-20 years in some reviews),⁶⁰ leading indicators of success will need to be prioritised.

Further to this, reviewing the strategic planning of other jurisdictions and benchmarking our performance against leading jurisdictions like Victoria and New South Wales will be important for monitoring the success or otherwise of this Strategy, and where shifts in focus may be required.

Software solutions are currently available that are designed to streamline data collection related to Inputs, Outputs and Outcomes associated with grant funding and can also be utilised for monitoring and evaluation of research performance. Optimising use of these solutions is dependent upon three main factors:

1. the number of grant funders using them;
2. sharing of information between funders; and
3. monitoring research outputs for a number of years after the funding cycle has ceased.

⁶⁰ Donovan, C., et al., Evaluation of the impact of National Breast Cancer Foundation-funded research. *The Medical journal of Australia*, 2014. 200(4): p. 214-8.

Given the relatively small number of Administering Institutions in South Australia, we are well placed to integrate a suitable solution as part of an ongoing research strategy evaluation framework. This will minimise burden on stakeholders, facilitate informed discussion regarding future funding cycles, and allow for informed 'course correction' depending on changes in the external cancer control or broader public health environment.

Recommendation 6: A research strategy evaluation framework is established that includes routine, periodic benchmarking of KPIs with leading states.

A working group consisting of elected representatives from South Australian Administering Institutions and Cancer Council SA to decide on appropriate evaluation framework and metrics to measure cancer research performance. This will include reviewing and identifying best practice research strategy evaluation frameworks, a suitable measurement timeframe, as well as consensus around a software platform, data sharing and reporting. Benchmarking our performance will be incorporated as part of this process.

Target: A cost-effective evaluation framework that is in line with national and international best practice is developed by December 2016 and an appropriate software platform is utilised to manage cancer research grants administration by June 2017. This platform is utilised as part of ongoing monitoring, evaluation, benchmarking and reporting of cancer research performance.

Funding of cancer research is consistently ranked as the most important reason for people to donate to a cancer charity. It is also a key driver for increasing community financial support. Hence, alongside contemporary governance arrangements, increasing communication back to key stakeholders will be crucial for transparency of funding decisions and for demonstrating to donors and consumers where their money is going and how it is being administered. In addition, it is important for funded researchers to promote their research activities to the broader community and acknowledge their funding bodies, as their part of closing this communication loop.

Recommendation 7: The research strategy is accompanied by a communications plan.

Cancer Council SA and SAHMRI to lead the development of a communication plan that identifies priorities and includes promoting the Beat Cancer Project, its governance and funding outcomes; engaging funded researchers to explain the importance of acknowledging funding sources; periodic engagement of media and promotional activities; and improve promotion of current clinical trials to clinicians and consumers. This includes maintenance of IT platforms like websites and mobile device apps.

Target: A communications plan is developed by June 2016 and rolled out in line with priorities.

Optimising growth in the North Terrace Health Precinct

Taking advantage of our unique features for high impact, innovative research

South Australia has a number of unique features that provide it with a competitive advantage when trying to attract new researchers, collaborations, and interstate and international funding and investment. South Australia's population size, its high quality cancer services capabilities, world-class research facilities and programs, and highly coordinated cancer control services, together, set in place key building blocks for undertaking innovative research and development programs with the potential to stimulate economic growth, increase efficiency and reduce waste, and ultimately improve health outcomes. Importantly, key stakeholders consistently identified South Australia's unique features and their potential. Consequently, the cancer research community is well-placed to back its areas of strength to undertake high impact, innovative research, and with it make a real difference for cancer control internationally. This has particular importance for high-tech biomedical and biotechnology research and development.

Recommendation 8: Identify and support high impact, innovative research that is in line with our state's unique features.

As part of the next iteration of the Beat Cancer Project, the state's universities, SAHMRI and SA Health identify research areas, and mechanisms for South Australia to support high impact, innovative research that is aligned to our state's investment. This may include resource-sharing arrangements and quarantining co-funding for novel platforms and research programs.

Target: Mechanisms to support high impact, innovative research are identified by December 2016 and integrated into future strategic planning and funding.

Networking our research infrastructure and research platforms

South Australia, through competitive and non-competitive funding, has invested in a sizeable quantum of research infrastructure and platforms, including laboratories, super-computers, genomics and proteomics platforms, animal houses, bioinformatics and a cyclotron. Cancer research relies upon all of these platforms to remain competitive at a national and international level. Hence, optimising use of this infrastructure and these research platforms should be a priority for all institutions to reduce wastage and free up funding for other applications. As competition for state and national infrastructure funding sources increases, grants are becoming increasingly harder to obtain. Compounding this, state and national budgets are under increasing pressure, especially in health services, and priority will be given to direct service delivery over health and medical research.

Examples of optimisation include networking platforms to minimise overlap; addressing barriers to access by introducing access protocols; monitoring access and throughput; and mapping infrastructure and platform availability. However, stakeholder feedback indicated that while they were generally supportive of these activities, they were not aware of it happening currently in any systematic sense. For example, multiple bio-banks have been established over the years, however awareness of and communication between

custodians and researchers relies upon relationships rather than formal systems and processes. That said there are examples of multiple parties collaborating to secure a critical piece of infrastructure for the state, including the Australian Cancer Research Foundation Innovative Cancer Imaging and Therapeutics Facility and SA NT Datalink. Embedding resources like SA NT Datalink in the South Australian health services context, similar to other world leading data linkage facilities (e.g., Ontario, Canada) would further optimise these financial investments and secure their future, as well as inform a data-driven health services sector.

Recommendation 9: Review of access, functionality and optimisation of research platforms.

Improve functionality of research platforms by: 1) mapping and networking within and across institutions, 2) have legal and service level agreements, access protocols, and inter-institutional sharing arrangements, and 3) maximise use of critical co-funded state research platforms (e.g., SA NT Datalink) by expanding their role as part of supporting a research-service delivery interface to optimise state resources. Consequently, future applications for infrastructure funding to identify all other pieces of infrastructure in the state, access availability, and capacity as part of demonstrating need for funding. Where large and expensive platforms are required, state and/or cross-jurisdictional collaboration should occur to increase success rates.

Target: Mapping, networking and optimisation process led by SAHMRI in collaboration with universities; to be completed by December 2017 and maintained as an ongoing function.

Strategic investment and support for clinical trials

Research drives the improvements in cancer services, from understanding how to prevent cancer, to discovering new drug treatments, new surgical techniques and optimising supportive care. Clinical trials are an important component in the provision of quality health care and are recognised by other leading peak bodies; Cancer Research UK's report 'every patient a research patient', is testament to this, where current recruitment rates to clinical trials is approximately 20% thanks to a coordinated and well-executed strategy. In line with best practice for health outcomes, the McKeon Review identifies that public hospitals should support clinical trials as part of their core business. Clinical trials are also an important source of funding for cancer research, and external funding from industry is recognised as important for supplementing the necessary support for non-industry trials (e.g., healthy lifestyle programs).

South Australia, given its size and centralised health and research sectors, has optimal defaults for growing a strong, state-wide clinical trials network. The current culture among the leading teaching hospitals is one of collaboration rather than competition including longstanding information sharing networks such as the Adelaide Clinical Trials and Education Collaborative (ACTEC). However, the South Australian cancer clinical trials scene is now lagging behind leading interstate examples that have progressed by establishing greater infrastructure and networks to support their clinical trials. Examples include better communication among site clinicians and to consumers regarding where they can access clinical trials, and addressing site-specific governance as a barrier to attracting clinical trials. These barriers are surmountable however, with modest application of resources and time on behalf of key stakeholders and, given South Australia's closely collaborative cancer clinical trials network at a State-wide level, would position it to attract and compete for high impact trials including pharmaceutical and medical imaging trials, as well as conduct larger, non-commercial trials of consumer benefit. Health Industries SA is aware of the health and economic benefit of supporting a vibrant clinical trials community and has now consequently made this one of its areas of priority. The cancer research community can take advantage of these initiatives through strategic engagement with Health Industries SA and utilising its already strong networks.

Recommendation 10: Expand Cancer Clinical trials in both number and impact.

Health Industries SA, in partnership with the state's leading hospitals, universities and SAHMRI, identify pathways and economically beneficial arrangements for attracting and supporting high impact, international cancer clinical trials including addressing barriers to attracting international pharmaceutical and imaging companies. Health and economic drivers will be fundamental to this process, as well as integration of clinical research as part of optimal routine care. Complementing this, a clinical trials communication plan is developed and actioned as part of driving increased participation rates.

Target: A clinical trials strategy and action plan is developed with the view to develop an optimised state-wide cancer clinical trials network. This is established and benchmarked against other states by June 2018 with targets to approach every person diagnosed with cancer to participate in a clinical trial and a minimum of 1 in 5 of these people participating in clinical trials.

Strengthening links to industry

Broadly speaking, Australian universities have a track record of successful development of medical patents, commercialisation of health and medical technologies and links to industry. In total, 2706 medical device inventions originated from Australia between 2001 and 2012. In particular, the Queensland and Victorian universities are particularly strong.⁶¹ However, South Australian activity in this domain has been limited. Consultation with stakeholders suggests that historically, South Australia has been restricted by its limited access to resources and infrastructure to support commercialisation of its research outputs, as well as a conservative culture that further restricts opportunities, and creation of spinoff companies.

Recognising this, Health Industries SA was established by the South Australian health department to utilise the South Australian health and biomedical precinct at the western end of North Terrace along with other precincts like Thebarton Technology Hub and Tonsley to build South Australia's reputation in health care, research and academia. Other initiatives include the recently established Centre for Nanoscale BioPhotonics at The University of Adelaide, which brings together cross-disciplinary expertise in the physical and medical science disciplines.

Health Industries SA is an identified partner in supporting the cancer research community to attract commercial investment from industries like pharmaceutical and medical imaging. Key to delivering on this attraction of investment will be ensuring that South Australia has the optimal environment for undertaking research with commercial viability (e.g., phase I clinical trials of high impact), which includes addressing current barriers like ethics committee approval time and site specific governance approval, hospital management, and clinician support to adequately maintain resources for clinical trials.

Recommendation 11: Partnering with Health Industries SA to maximise industry engagement.

The state universities, hospitals and SAHMRI to work collaboratively with Health Industries SA to address barriers and strengthen enablers to attracting Health Industry investment in South Australia. This includes access to innovation platforms, partnerships across industry hubs, barriers to industry-funded research (e.g. privacy legislation, governance), and conservatism around supporting 'spin-off' companies.

Target: A health industries action plan is developed by December 2016 and is rolled out over the remaining four years of the research strategy.

Building on the success of the Beat Cancer Project

Strategic alignment of governance of cancer research

Cancer research is expensive and hence appropriate governance and administration of its resourcing is critical for ensuring equity and rigour in funding decisions. To date, the largest pool of state-level funding of cancer research, the Beat Cancer Project, has been successfully administered through SAHMRI's research administration office and the overarching governance structure that is in place.

However, with recent health-system developments and increasing requirement for research to be closely linked to health service outcomes, governance of research funding will need to be informed by greater consultative input from service providers and consumers, evidence from the scientific literature, and local data on service need and performance. Implementation, monitoring and review of these arrangements

will need research and clinical leadership, and support from enabling structures like the new South Australian Academic Health Science and Translation Centre (SA AHSTC), SAHMRI and the South Australian Comprehensive Cancer Consortium (SACCC), to be truly representative of a Statewide cancer research strategy.

Recommendation 12: The Beat Cancer Project be funded for a further 5 years with transitioning of governance to support close integration with health services.

The next five years of the Beat Cancer Project funding to be administered by SAHMRI, with modified deliverables based on the state-wide cancer research strategy. Governance processes are transitioned to more contemporary structures that optimise transparency and communication using available existing committees, while still retaining independence for grant review processes.

Target: Governance processes and revised deliverables for the Beat Cancer Project are finalised prior to commencement of Year 6 of the Beat Cancer Project.

Recommendation 13: Refresh the SACCC for greater stakeholder representation and engagement, and use the SACCC to drive the Beat Cancer Project and Statewide Cancer Research Strategy.

The SACCC (or similar committee) be revitalised to inform cancer research strategy, receive reports on the Beat Cancer Project, and to monitor and drive progress against the statewide cancer research strategy. Beat Cancer Project funding partners provide objective review of progress through Cancer Council SA's Research Committee. In addition, the SACCC will report to the SA AHSTC as part of broader governance and oversight of research against the SA Health strategic plan.

Target: Refreshment of the SACCC is finalised prior to commencement of Year 7 of the Beat Cancer Project in July 2017, as part of the transition in governance processes.

A new funding model to support clinical research growth

The Beat Cancer Project was considered to be the most important direction for SA to take to rectify declining research competitiveness. The purpose of the Beat Cancer Project is to retain and grow the SA cancer research workforce, strengthen cancer research infrastructure, provide evidence for clinical care and other service provision, and contribute to the State's overall health and medical research enterprise.

The most recent Beat Cancer Project annual report shows strong progress towards the deliverables (Table B1, Appendix B). In particular, leveraging funding from outside the two main funders, Cancer Council SA and SA Health, as well as above parity in complementary funding from national funding sources (NHMRC, Cancer Australian, etc.) suggest that leading Input indicators are positive. These early indicators of success are commendable, given the brevity of existence of the Beat Cancer Project and rollout of the funding strategy, and are supportive of maintaining a collaborative funding arrangement.

In line with other recommendations included in this Strategy, Cancer Council SA must also be considerate of its other externally funded strategic research initiatives outside of the Beat Cancer Project that have previously been identified as a need within South Australia (e.g., a Chair in Cancer Control (Behavioural Science)), including how they align to this Strategy and potential for integration of these funding arrangements as part of future funding of the Beat Cancer Project to secure long-term strategic investment and optimised use of resources.

Recommendation 14: The Beat Cancer Project to continue as the Flagship Program for South Australian funded cancer research.

The Beat Cancer Project continues to be the leading state-funding initiative of competitive workforce, project and infrastructure grants, with a funding allocation model devised upon endorsement of this strategy. Cancer Council SA and SA Health invest \$12 million each over 5 years for a total of \$24 million with funding administered via the SAHMRI research administration office. Aim to leverage a further \$3 for every \$4 invested by Cancer Council SA and SA Health for a total minimum commitment of \$42 million over the five years. University complement of funding may support broader infrastructure and people support activities including formal mentoring. The increased contribution by Cancer Council SA will include three workforce positions currently funded outside of the Beat Cancer Project, namely the Cancer Council SA Chair in Cancer (Behavioural Science), the Cancer Council SA Research fellow in Cancer Support, and the Peter Nelson Leukaemia Research Fellow.

Target: Five year funding allocation model in place by 30 June 2016 and rolled out over the next five years of Beat Cancer Project. Cancer Council SA's other external research funding to be incorporated into the new funding model.

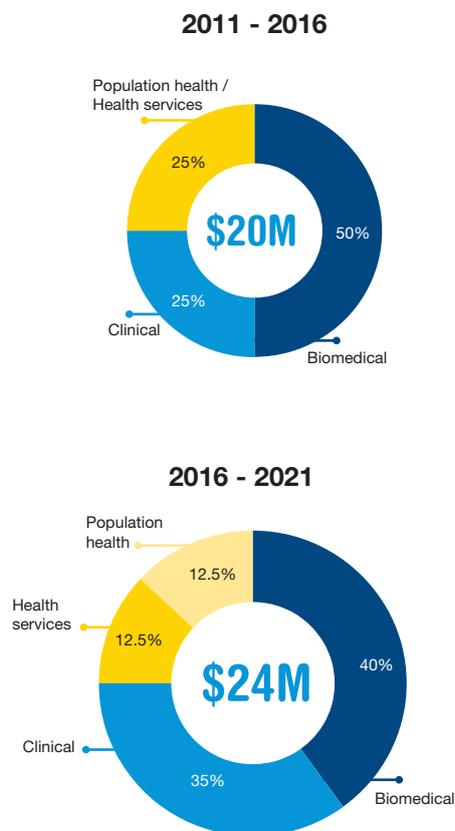
South Australian cancer research project and research program grant funding is not too dissimilar to other jurisdictions, but is noticeably lean in treatment-based research. This distribution is potentially indicative of a current weakness in the state, and one where some initial seed funding, as well as leadership will assist with redressing this balance. Treatment research has particular benefits to consumers, where availability of clinical trials allows access to the latest in drug therapies, imaging technology and treatment protocols; all of which may result in life saving outcomes. Increased injection of clinical research funding, as well as addressing other barriers to a vibrant clinical cancer research community, is required to address this balance (Figure 7.2). In addition, given the increased focus on better integrating and translating research with health service delivery, health services research⁶² requires formal funding acknowledgement and division from population health research.

⁶² Health services research is a multidisciplinary field that examines how social factors, financing systems, organisation structures and processes, health technologies and personal behaviours affect access to health care, the quality and cost of health care, and the outcomes as a result of this care. The main goals of health services research are to identify the most effective ways to organise, manage, finance and deliver high quality care (including care that is safe, accessible, equitable, effective, timely and appropriate); increase efficiency; reduce medical errors; and improve patient safety.

A concern of the research community is that as a result of SA Health committing all of its funds to the Beat Cancer Project, which is administered by SAHMRI, there is little to no funding available for the research community to leverage state government funds for partnership and linkage grants, thus reducing South Australia's competitiveness for these funding opportunities. The best method of managing a partnership and linkage grant reservation of funding requires careful consideration as part of a future funding model (e.g., Cancer Council SA to hold the funds and be directed by Beat Cancer Project administration to release funds upon a successful grant application for either Cancer Council SA or SA Health as an industry partner).

Figure 7.2: Revised Beat Cancer Project funding model, by cancer research pillar

Funding by research pillar



Recommendation 15: Redistribute the proportion of funding to better support clinical and health services pillars of research.

Increase the proportion of funding to clinical research, which is supported by a thorough review of building a sustainable clinical research culture (see sections below on links to industry and clinical trials). Differentiate population health research from health services research in the funding model and quarantine a proportion of total funding reserved for contribution towards partnership and linkage grants.

Target: Beat Cancer Project funding for clinical research is increased to 35% and population health / health services research is formally split in the funding model. A total of 5% of Beat Cancer Project funding per annum is reserved for partnership and linkage grant applications, and an appropriate mechanism is determined for administration and auspicing of these funds to maintain suitable governance while ensuring leveraging capabilities are maintained.

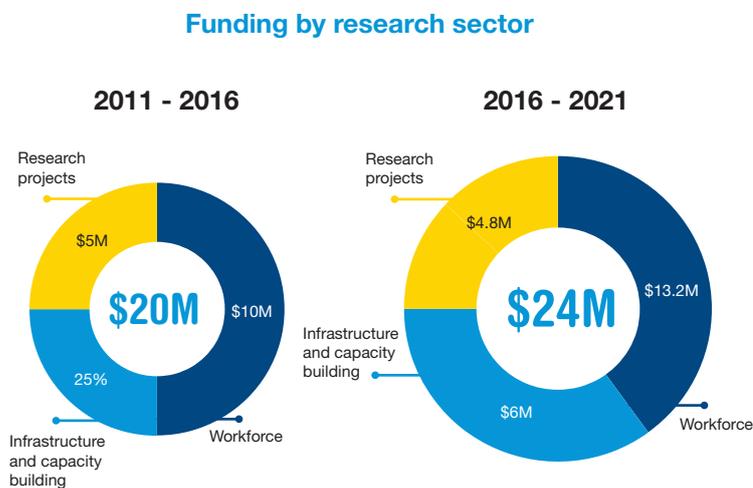
Maintaining support for our workforce

South Australia has a history of developing and supporting world-class cancer researchers. These researchers have established roots in South Australia. The importance of backing our leaders should not be underestimated, as they have a sound understanding of the local and national context, are involved in numerous high level committees that drive cancer control research and services, and have a significant role to play in supporting and mentoring the next wave of cancer research leaders.

A long-term, sustainable research program relies upon providing the necessary support for early and mid-career researchers to advance and excel, and ultimately, succeed as the next wave of leading researchers. This leap from early-career researcher funded on fellowship grant funding to contracted or tenured academic position is challenging and is not unique to the South Australian context. This was a key driver to emphasising a large distribution of Beat Cancer Project funding (50% of total funding) to workforce in order to (i) continue to support leading researchers, and (ii) provide opportunities and funding support for early and mid-career researchers. Stakeholder feedback indicated that South Australia should continue to back its leading cancer researchers and identify and support the next wave of researchers.

An increased quantum of funding to workforce will ensure that our best researchers have the resources available to focus on their research endeavours (Figure 7.3). This includes ensuring there is sufficient capacity to effectively manage and deliver the infrastructure and research platforms. Furthermore, given that a strong emphasis is placed on academic track record by funders, career development strategies could include formal mentoring programs, and identifying ways to overcome barriers for early and mid-career researchers' competitiveness on grant applications.

Figure 7.3: Revised Beat Cancer Project funding model, by research sector



Recommendation 16: Increased funding for workforce and capacity building.

Beat Cancer Project workforce funding increased to 55% with the additional 5% committed to supporting new talent through expansion of early and mid-career cancer research fellowships and one-year PhD extension grants. Administering institutions required to match 1:1 for all funded positions. Capacity building included within infrastructure funding to acknowledge need for personnel support as part of overall infrastructure requirements.

Target: Funding increased to 55% for workforce at commencement of Year 6 of Beat Cancer Project in July 2016 and maintained over its duration.

Recommendation 17: SA Health and SAHMRI collaborate with the universities to continue funding for cancer Research Chair and Fellow positions, and build formal mentoring capacity.

State universities to continue to support cancer Research Chair and Fellow positions through a competitive application process. Chair positions, in collaboration with SAHMRI and the universities, to be responsible for implementing a formal mentoring program for early and mid-career researchers with funds for a mentoring program classified as 'in kind' contribution towards the Beat Cancer Project.

Target: Maintain funding for university Research Chair and Fellow positions and implement a formal mentoring program by December 2016.

Funding the right positions will assist with driving South Australia's competitiveness for attracting large, multi-year grants, and for having an impact on cancer care delivery. As part of the strategic review process, it was noted that South Australia does not currently have leadership capacity across all areas of cancer research, with one gap noted to include a Professorial role in cancer nursing. A staggered and strategic roll out of new positions should be considered as part of future research workforce planning in line with health services redevelopment.

Furthermore, it was noted that South Australia does not have a great presence of clinician-scientists, or an emphasis on research as part of clinical training and practice. While this may be representative of a broader global trend, it is in contrast to best practice where leading comprehensive cancer centres place an emphasis on supporting the clinician-scientist model as standard. Hence, few clinical positions currently exist with 'protected time' for research and there is no evidence of a systematic structure in place to foster new talent. These positions align closely with supporting the pillars of research, education and service delivery, and hence a best practice model for current and future clinicians to receive a greater proportion of education and engage in research as part of routine clinical care will require careful planning, but will ultimately return benefits in providing best practice cancer care to consumers.

Recommendation 18: Research people capacity gap analysis be performed to strengthen cancer research leadership.

A review is undertaken to identify gaps in cancer research capacity to ensure that South Australia has the right mix of leaders to drive research and mentor new talent. A review and implementation plan is developed to increase support for training clinician-scientist through our main teaching hospitals in collaboration with partner universities. This will require leadership from multiple stakeholders including universities, hospitals, SA Cancer Service and the SA clinical senate.

Target: Review completed by June 2017; plan implemented based on outcomes of review.

Reviews by leading international research institutions consistently conclude that women are at a disadvantage in establishing strong academic careers and representation in senior positions, despite having an equitable ratio of under-graduate and post-graduate qualified males and females. Further, research indicates that there are clear aetiological factors by which women are disadvantaged in academic career. These include: gender schemas, leadership stereotyping, work-life balance (including career interruption) and the tenure process, and general under-valuing of women. This represents a significant challenge for the culture of cancer research, and the tertiary education sector, more broadly. The NHMRC has recently revised its Administering Institution policy to support the progression and retention of women in health and medical research. Consequently, South Australian cancer research community can take a leading position in the health and medical research sector to address this imbalance, which will in turn benefit our health, social and economic return and maximise investment in our entire research community.

Recommendation 19: A plan for gender equality that leverages universities and institutional plans be developed.

South Australian universities and institutions to develop an implementation and review plan based on the revised NHMRC Administering Institution policy to better support gender equity and opportunities for women in cancer research. Specific focus is given to ensuring that academic track record relative to opportunity is appropriately balanced when reviewing scholarship and fellowship applications.

Target: Implementation plan in place by December 2016; progress monitored annually.

Fostering a collaborative research culture

Collaboration is becoming increasingly important for successful national and international grants applications with an increasing proportion of cancer research projects and research programs that received more than \$600,000 having multiple named collaborators on the application. The majority of these were from the same institution, with few having an international collaborator. Stakeholder feedback identified collaboration as a leading strength of the South Australian cancer research community. Given this, South Australian Institutions should continue to support and encourage their researchers to collaborate beyond their own institution, and indeed, beyond the state and national boundaries. This will ensure South Australia remains competitive as research shifts to an increasingly collaborative world.

Further, as new technology develops and cancer research diversifies, researchers are looking beyond the traditional academic borders for collaboration opportunities. Examples include physicists, biostatisticians and health economists. SAHMRI was established to bring together this diversity of talent, and in its brief history, has demonstrated a pattern of hosting a number of lecture series. Similar activities occur at other locations like the Flinders Centre for Innovation in Cancer. This mechanism should not be underestimated, and researchers should take advantage of these opportunities to promote cross-disciplinary partnerships.

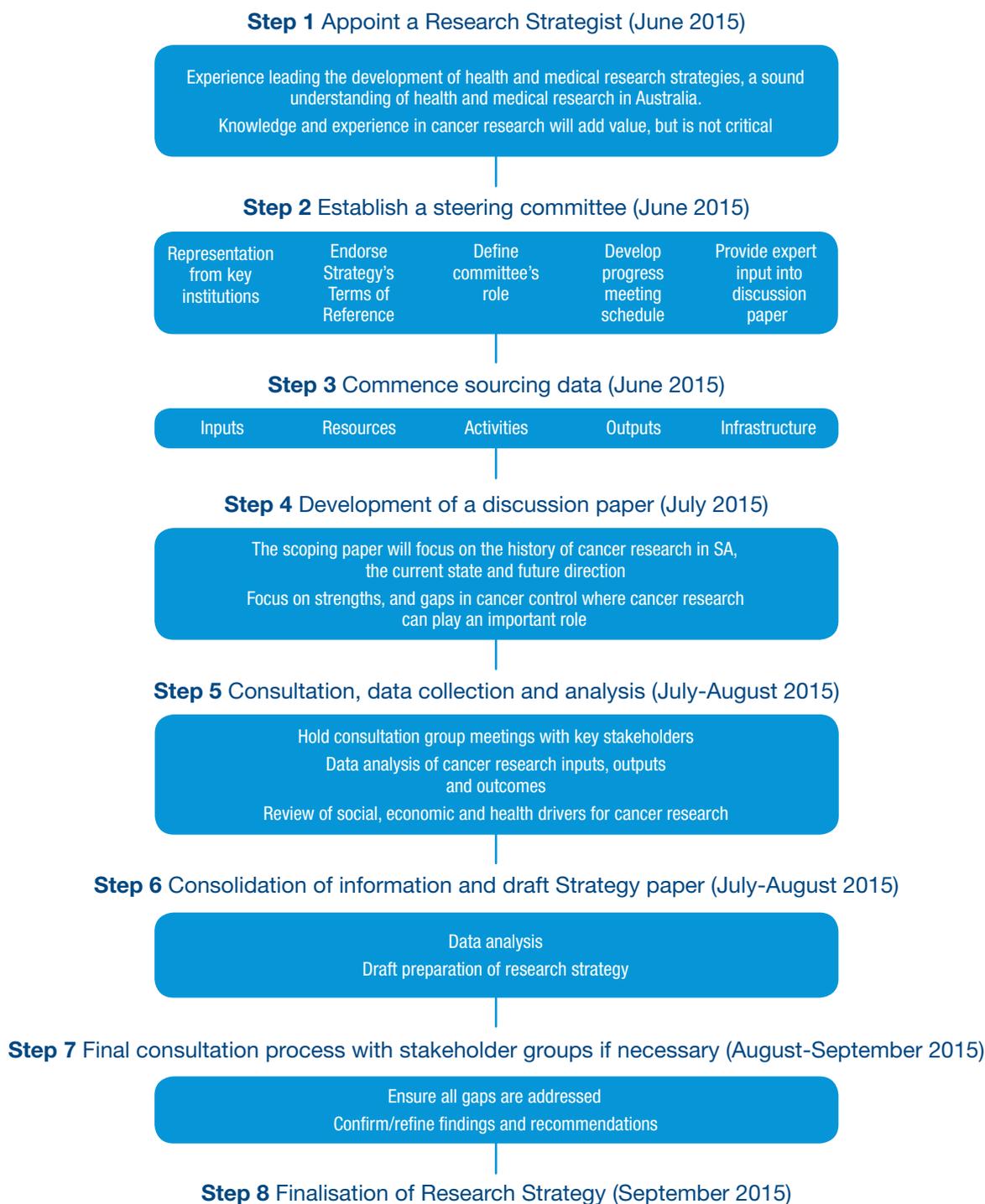
Recommendation 20: Collaboration mechanisms be strengthened.

Systemic mechanisms for supporting a collaborative research culture are identified and fostered. This includes future cancer research grants administered in South Australia driving collaboration by modifying request for applications and the review process to formally recognise its importance. (e.g., 10% of the score for a Beat Cancer Project research project grant is for formal collaboration).

Target: A new grant evaluation model that incorporates scoring for high quality collaborations to more effectively deliver outcomes is developed and adopted prior to commencement of Year 6 of the Beat Cancer Project in July 2016 to better support collaboration.

Appendix A: Strategy development plan

Figure A1: Flow diagram of State-wide Research Strategy development process



Appendix B: Beat Cancer Project performance

Table B1: Cancer Council Beat Cancer Project progress towards the deliverables – Year 4

Deliverable	Status	Comment/Activity
Funder deliverables – broad strategic objectives of the project*		
Research investment Increased cancer research funding obtained in South Australia from sources external to SA Health and Cancer Council SA, Target: >6.3% (11.5% by 2016)		Number and proportion of grants awarded from national organisations to South Australian cancer researchers are generally increasing
Infrastructure Increased availability of key cancer research infrastructure in South Australia (e.g. molecular profiling, bio-banking, genomics, clinical trials) Target: gains evident in key infrastructure availability		Cancer Council Beat Cancer Project invested over \$2.9m in infrastructure in years 1 to 4
Knowledge generation Increased knowledge generation contributing to health gain in the community e.g. number of peer reviewed publications per annum weighted by quality and citation indices Target: Greater than two-fold increase in weighted peer-reviewed publications		There has been a trend of increased number of weighted peer reviewed publications from years 1 to 4 (weighted by impact factor)
Commercial and economic benefit Increased commercial gain for South Australia, e.g. patents Target: An approximate 3-fold increase over the five year period		The benchmark for this target was established (2008-2012) and will be compared in the next five-year period
Performance targets – Beat Cancer Project team to deliver on over 5 year funding period		
Leveraged funding Research funding leveraged from sources external to SA Health and Cancer Council SA Target: At least 1 in 3 dollars leveraged from sources external to the funders in year 1; and 2 in 3 dollars leveraged by year 5		In year 3 Cancer Council Beat Cancer Project leveraged \$1.20 for every \$1 invested funders
Increasing workforce capacity Cancer research workforce increased capacity in South Australia Target: 50% of research funding allocated for research workforce support (compared to 25% for research and 25% for infrastructure)		Distribution of funding is 52% workforce, 28% research and 20% infrastructure at end Year 4
Fostering the next generation Capacity building increased for early career researchers Target: >90% of research applications demonstrate clear plans for mentoring etc., and >90% of research funding arrangements show implementation of these plans within 12 months of commencement		77-87% of workforce and project applications demonstrate plans for mentoring and career development and 66-76% have implemented these plans
Strengthening collaboration Collaboration between researchers increased (to increase research capacity) Target: 80% of research demonstrates collaboration		81% of researchers reported national collaborations, and 68% reported international collaborations
Balanced cancer research spectrum Cancer research investment across the research spectrum contributed to a balanced research funding portfolio Target: approximately 50% bio-medical, 25% clinical, 25% population health/health services research evaluation		Average investment across years 1 to 4 was 50% biomedical, 25% clinical and 25% population health/health services.
Complementary funding High quality research is maintained and complemented by an increasing proportion of proposals that gain funding through other National Funders. Target: funding through National Funders increases progressively from a baseline low of about 20% to two thirds or more in dollar terms by 2016.		\$0.90 complementary dollars per Beat Cancer Project dollar awarded in Years 1 to 4.
Research development and translation Translation of research findings into complementary research activity, health policy, practice and health increased Target: >90% of research applications demonstrate clear plans for translation; >90% demonstrate translation within two years		To date, over 70% of funding recipients reported translational application of research or plan to do so within the next two years.

Note: Funder deliverables were set as broad indicators of increased research performance in South Australia. The Beat Cancer Project administrative team are required to track but are not necessarily accountable for meeting these targets.

Appendix B: Beat Cancer Project performance

Figure B2: Distribution of Beat Cancer Project Funding, end of Year 4 (2015)



Beat cancer project

Research Project Grants

\$3,901,924

The University of Adelaide
\$1,614,813

University of South Australia
\$1,406,037

Flinders University
\$513,815

SA Pathology
\$174,891

SAHMRI
\$100,000

CSIRO
\$92,368

Workforce Grants

\$10,215,374

The University of Adelaide
\$2,731,302

University of South Australia
\$2,710,625

Flinders University
\$2,015,500

SAHMRI
\$1,590,000

The Queen Elizabeth Hospital
\$750,000

Womens' & Childrens' Hospital
\$315,000

SA Pathology
\$96,947

CSIRO
\$6,000

Infrastructure Grants

\$2,448,582

SA Pathology
\$963,500

SAHMRI
\$730,000

Repatriation General Hospital
\$174,500

Flinders University
\$143,882

Flinders Medical Centre
\$86,500

Royal Adelaide Hospital
\$85,800

Ashford Cancer Centre Research
\$67,500

University of South Australia
\$65,000

The University of Adelaide
\$45,000

The Queen Elizabeth Hospital
\$30,000

Lyell McEwen Hospital
\$17,200

Appendix C: Cancer research funding in South Australia

Introduction

Information on cancer research inputs, activities and outputs is important for objectively viewing the academic drivers for success. Inputs include direct funding and leveraged funding, currently existing infrastructure and platform technologies, and human capital; activities include research projects, collaborations and mentoring; and outputs include publications and presentations, qualifications and scientific discoveries.

In 2014 Cancer Australia released Cancer Research in Australia: an overview of funding to cancer research projects and research programs in Australia, 2006 to 2011.¹ The report included cancer research project and research program grant funding statistics. The following brief report collates and summarises information related to South Australia's cancer research project and research program grant funding from this report. Selected figures and tables are presented showing the amount of funding received by each Australian state and territory over time, as well as funding by tumour type, Common Scientific Outline (CSO) category, clinical trials and by collaboration status. South Australian data have been reported where possible, and Australia-wide data are reported where state-level data are not available.

Methods

Data were sourced from the Cancer Australia report noted above which summarised cancer research funding in Australia for cancer research projects and research programs from 2003 to 2011. For further details regarding the methodology, please see the full report.¹ Some additional South Australian specific data were sourced from Cancer Australia upon request.

Results

South Australia received the third highest amount of funding per capita from 2006-2011, behind only Victoria and New South Wales (Figure C1). However, South Australia, relative to its population size (7.4% of the national population), is not performing as well as other jurisdictions; receiving only 6% of the total funding in Australia (Figure C2).

Figure C1: Cancer research project and research program grant funding per capita, 2006-2011

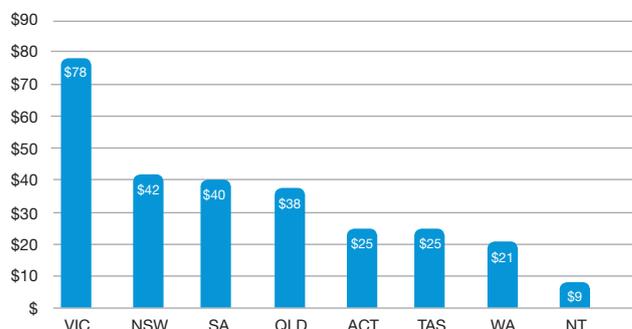
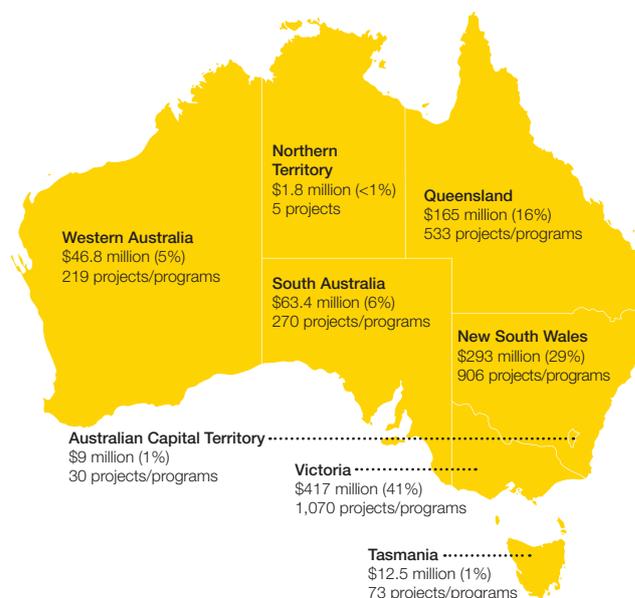


Figure C2: Distribution to states and territories of direct funding to cancer research projects and research programs in Australia, 2006 to 2011.



¹Department of Planning and Local Government, Government of South Australia, Population projections for South Australia and statistical divisions, 2006-36, 2010: Adelaide, SA.

Appendix C: Cancer research funding in South Australia

While there has been an increase in the amount of funding South Australia has received since 2003 (up from \$24.4M to \$35.7M), relative to the national total there has been a slight decrease in the relative amount South Australia has received down from 8% to 6%. Victoria and New South Wales are the only states to increase over time (Table C3).

Table C3: distribution of cancer research funding in each state and territory for 2003-2005, 2006-2008 and 2009-2011

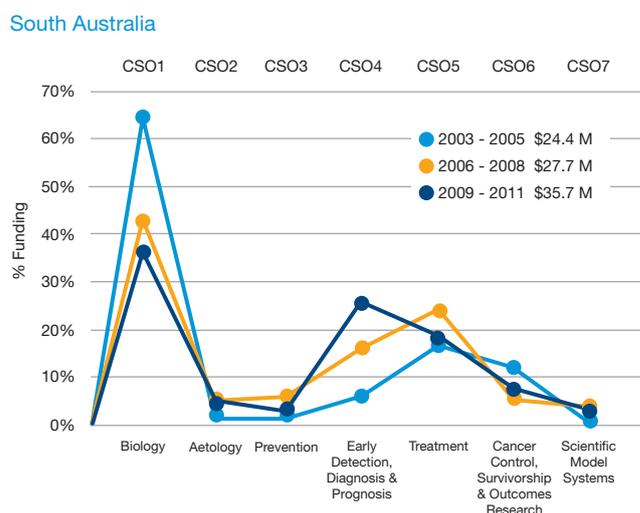
State or territory	2003 - 2005	2006 - 2008	2009 - 2011
New South Wales	\$72.6 M (25%) 379	\$118 M (29%) 445	\$175 M (29%) 627
Queensland	\$56.8 M (19%) 264	\$69.6 M (17%) 285	\$95.1 M (16%) 359
South Australia	\$24.4 M (8%) 135	\$27.7 M (7%) 129	\$35.7 M (6%) 179
Tasmania	\$3.6 M (1%) 28	\$4.8 M (1%) 37	\$7.8 M (1%) 40
Victoria	\$114 M (39%) 413	\$168 M (41%) 566	\$249 M (42%) 721
Western Australia	\$16.3 M (6%) 91	\$18.7 M (5%) 113	\$28 M (5%) 151
Australian Capital Territory	\$3.4 M (1%) 18	\$5.2 M (1%) 19	\$3.9 M (<1%) 19
Northern Territory	\$0.1 M (<1%) 3	\$0.6 M (<1%) 2	\$1.2 M (<1%) 4

● Projects / programs

Funding by research category and tumour type

Figure C4 shows the distribution of cancer research funding in South Australia by Common Scientific Outline (CSO) category for 2003-2005, 2006-2008 and 2009-2011. This distribution of cancer research funding is comparable to the national distribution with the exception of 'early detection, diagnosis & prognosis' (increased proportion in South Australia) and 'treatment' (decreased proportion in South Australia).

Figure C4: cancer research funding in South Australia by Common Scientific Outline (CSO) category for 2003-2005, 2006-2008 and 2009-2011.



Figures C5-C7 show the distribution of direct funding to tumour-type specific research projects and programs in Australia from 2006 to 2011 plotted against the top 20 cancers by: (i) incidence, (ii) mortality, and (iii) Disability Adjusted Life Years (DALYs).

Appendix C: Cancer research funding in South Australia

Figure C5. Direct funding to tumour type-specific research projects and research programs in Australia 2006 to 2011, compared with the top 20 cancers by incidence in Australia, 2009

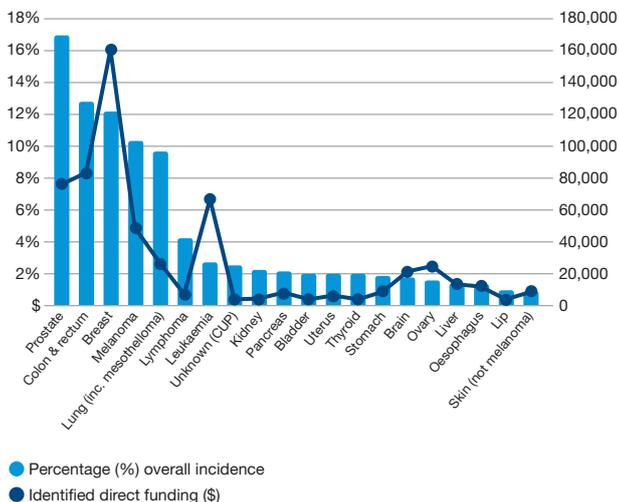


Figure C6: Direct funding to tumour type-specific research projects and research programs in Australia 2006 to 2011, compared with the top 20 cancers by mortality in Australia, 2010

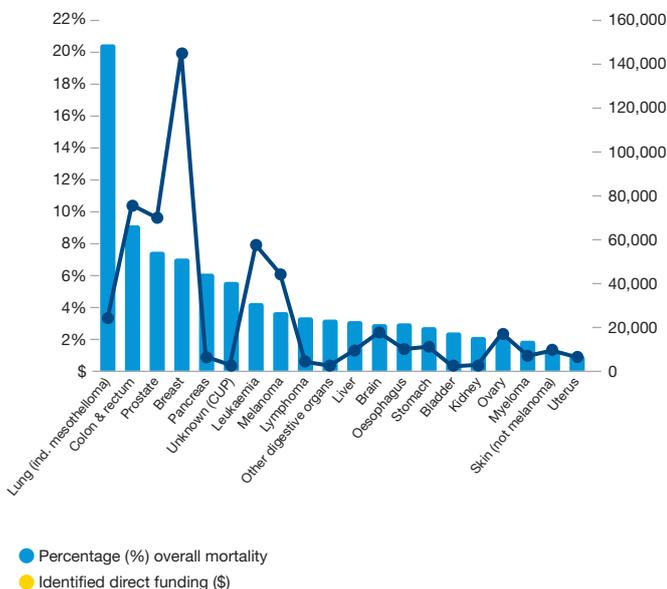
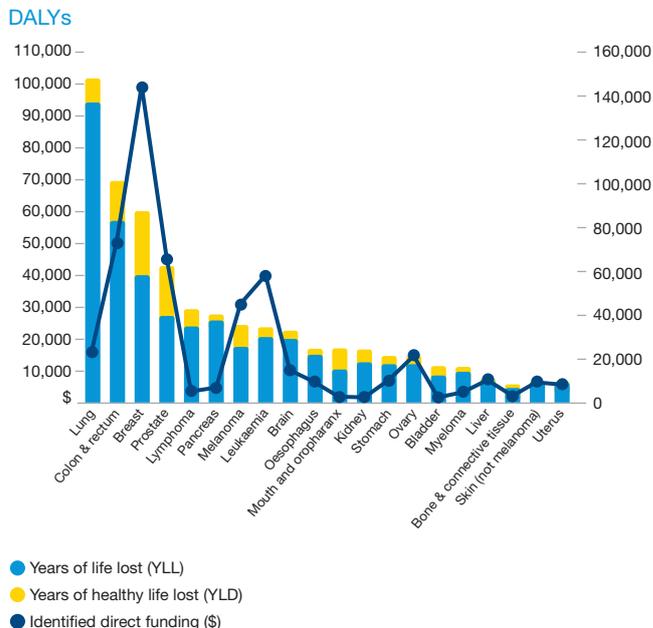


Figure C7: Direct funding to single tumour type-specific research projects and research programs in Australia 2006 to 2011, compared with the top 20 cancers by DALYs in Australia, 2012



Funding by collaborations

There has been a stabilising in the total amount of funding distributed to projects and programs with no named collaborators and an increase in both the total amount, average funding per project/program and number of projects/programs funded where there is one or more collaborators (Table C8). This pattern is most marked for multiple named collaborators.

Table C8: Direct funding to and number of cancer research projects and research programs, and average funding per project/program, in each collaboration category in 2003–2005, 2006–2008 and 2009–2011

Collaboration category	2003 - 2005	2006 - 2008	2009 - 2011
No named collaborators (average funding per project / program)	\$118 M (\$211,000)	\$130 M (\$205,000)	\$129 M (\$174,000)
	558	635	742
Single named collaborator (average funding per project / program)	\$53.5 M (\$163,000)	\$77 M (\$233,000)	\$126 M (\$263,000)
	328	331	480
Multiple named collaborators (average funding per project / program) (average no. collaborators)	\$120 M (\$268,000) (3.2)	\$206 M (\$327,000) (3.4)	\$340 M (\$388,000) (3.6)
	446	630	876

● Projects / programs

Appendix C: Cancer research funding in South Australia

When comparing South Australia with the national average in the trienniums 2006-2008 and 2009-2011, a similar pattern occurs, however there is a near doubling in the average funding per project/program in South Australia with multiple named collaborators (Table C9). For the 26 cancer research projects where South Australia was named as the host state, 9 projects listed collaborators in Victoria, 9 listed collaborators in Queensland, and 5 listed international collaborators.

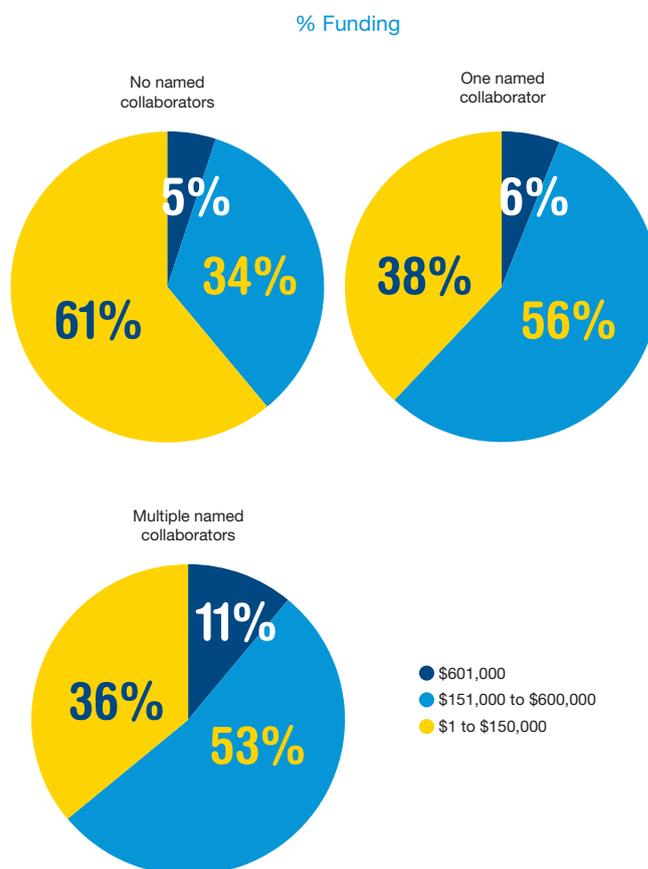
Table C9: Direct funding to and number of cancer research projects and research programs, and average funding per project/program, in each collaboration category in South Australia and Australia in 2006–2008 and 2009–2011

Collaboration category	2006 - 2008		2009 - 2011	
	South Australia	Australia	South Australia	Australia
No named collaborators (average funding per project / program)	\$13.4 M (\$275,000)	\$130 M (\$205,000)	\$12.8 M (\$175,000)	\$129 M (\$174,000)
	49	635	72	742
Single named collaborator (average funding per project / program)	\$5.3 M (\$205,000)	\$77 M (\$233,000)	\$6.9 M (\$205,000)	\$126 M (\$263,000)
	26	331	34	480
Multiple named collaborators (average funding per project / program) (average no. collaborators)	\$8.9 M (\$165,000) (3.3)	\$206 M (\$327,000) (3.4)	\$22.2 M (\$315,000) (3.4)	\$340 M (\$388,000) (3.6)
	54	630	71	876

● Projects / programs

For the period 2006-2011, the proportion of cancer research projects and research programs that received more than \$600,000 was two-fold higher for research with multiple named collaborators (Figure C10). The majority (75%) of these collaborators were from the same institution, and only 9% of cancer research projects and research programs had an international, named collaborator.

Figure C10: The proportional split of direct funding to cancer research projects and research programs in each collaboration category in the period 2006 to 2011



Conclusion

The results of this brief report indicate that South Australia received the third highest amount of funding per capita from 2006-2011, however, relative to its population size, is not performing as well as other leading jurisdictions. There has been an increase in the amount of funding South Australia has received since 2003, up to \$35.7M in the last triennium. The South Australian distribution of funding approximates that of the national distribution, with some small exceptions noted. The distribution of national funding modelled against tumour type shows that funding is not in line with incidence, mortality and burden of disease for some cancer types. However, it is important to note here that this does not include funding classified as non-tumour type specific. When comparing by collaborations, data demonstrate that there is a shift towards multiple named collaborators on successful grant applications.

References

¹ Cancer Australia. Cancer Research in Australia: an overview of funding to cancer research projects and research programs in Australia, 2006 to 2011. 2014.

Appendix D: Bibliometric review of cancer research publications, 2006 to 2014

Introduction

Bibliometric analysis of peer-reviewed publications is important for understanding the quantity and quality of this basic metric of research performance. Bibliometric analysis draws upon a database of bibliographic output and the associated coding and metric metadata that is captured for each item (e.g., author location, journal, journal impact factor, number of citations). This report presents bibliometric analyses undertaken for Cancer Council SA as part of informing the development of the South Australian cancer research strategy. The report outlines evidence of the breadth and volume of South Australian publications, including; a comparison against other states and territories, and the world; its quality as a function of top 1% and 5% citations, relative citation impact and relative journal impact; and patterns in publication over time.

It is important to note that bibliometric data is only a tool for informing a larger picture of research activity and quality. This information must be seen alongside other measures of quantity and quality, some of which are harder to capture, but nonetheless are important components of the broader research enterprise (e.g., grant and commercial funding, patents, collaborations and mentoring, committee representation, and translation of research outcomes on health care).

Methods

The analyses draw upon a database of publications from Elsevier's Scopus citation index that was developed to examine the impact of research undertaken by the Victorian Comprehensive Cancer Centre (VCCC). Agreement was reached with Elsevier and VCCC to utilise this resource for these reporting purposes. The focus of this Bibliometric analysis was a 9-year window, 2006-2014.

Cancer publications were identified via two approaches – journals and keywords. All publications appearing in cancer-specific journals were included in the dataset, along with articles identified by searching the title, abstract and keyword fields for the existence of cancer-specific keywords. Publications were subsequently coded by: (i) Common Scientific Outline (CSO) category; and (ii) tumour stream. Note that not all publications were able to be coded based on tumour stream and are consequently coded as unclassified.

The following report uses a number of metrics to assess the quality of cancer-related publications produced by each of the Australian states and territories over time. Figures and tables are presented showing the number of publications produced, distribution of high-quality publications, relative citation impact, and rate of citations per publication over time. Where applicable, information has presented for publications by CSO category, tumour stream and total publications.

Results

The results section is divided into three sections:

1. Number and proportion of cancer publications: Australian jurisdictions and the world
2. The relative Impact of Australian publications
3. Changes in Australian publication performance over time

Number and proportion of cancer publications: Australian jurisdictions and the world

Tables D1 and D2 below show the number (D1) and proportion (D2) of publications produced by each Australian state and territory, by CSO category, respectively, from 2006-2014. Data suggest that South Australian publications are relatively strong in the CSO categories of prevention research, and cancer control, survivorship, and outcomes research.

Appendix D: Bibliometric review of cancer research publications, 2006 to 2014

Table D1: Number of publications for Australian states and territories by CSO categories, 2006-2014

	Total Publications	Biology	Aetiology	Prevention	Early detection, diagnosis and prognosis	Treatment	Cancer control, survivorship and outcomes	Scientific model systems
SA	5038	1027	409	100	903	1880	704	349
VIC	16856	4170	1570	255	2781	6012	1882	1327
ACT	1387	416	123	36	199	393	158	140
NSW	16170	3171	1348	277	3143	6227	2357	905
NT	218	27	28	5	50	94	37	5
QLD	9459	2082	1122	174	1659	3136	1292	610
TAS	680	127	112	17	114	244	90	38
WA	4303	847	466	80	807	1503	668	222
Australia	44964	10197	4085	80	8036	16221	5691	3073
World	1831025	424523	147436	24637	384321	736363	142546	111275

Note: Publications can be assigned to more than one category. As a result, the total number of publications is less than the sum of publications in each category.

Table D2: Proportion of publications for Australian states and territories by CSO categories, 2006-2014

	Total Publications	Biology	Aetiology	Prevention	Early detection, diagnosis and prognosis	Treatment	Cancer control, survivorship and outcomes	Scientific model systems
SA	11.2	10.1	10.0	12.5	11.2	11.6	12.4	11.4
VIC	37.5	40.9	38.4	31.8	34.6	37.1	33.1	43.2
ACT	3.1	4.1	3.0	4.5	2.5	2.4	2.8	4.6
NSW	36.0	31.1	33.0	34.6	39.1	38.4	41.4	29.5
NT	0.5	0.3	0.7	0.6	0.6	0.6	0.7	0.2
QLD	21.0	20.4	27.5	21.7	20.6	19.3	22.7	19.9
TAS	1.5	1.2	2.7	2.1	1.4	1.5	1.6	1.2
WA	9.6	8.3	11.4	10.0	10.0	9.3	11.7	7.2
Share of the world								
Australia	2.5	2.4	2.8	3.3	2.1	2.2	4.0	2.8

Note: Publications can be assigned to more than one category. As a result, the sum of categories will come to more than 100%.

Tables D3, D4 and D5 below show the number (D3) and proportions within a jurisdiction (D4) and the proportion between jurisdictions (D5) of publications produced by each Australian state and territory, by tumour streams, respectively,

from 2006-2014. Data suggest that South Australia is relatively strong in the areas of colorectal, leukaemia, head and neck, sarcoma and bone, and upper gastro-intestinal cancer research.

Appendix D: Bibliometric review of cancer research publications, 2006 to 2014

Table D3: Number of publications for Australian states and territories by tumour streams, 2006-2014

	Total	Breast	CNS	CRC	eye	GU	Gynaecological	Haem	H&N	Lung	Sarcoma	Skin	Endocrine	Upper GI	Unclassified
SA	5038	271	138	403	135	271	291	692	182	190	265	162	127	185	2133
VIC	16856	1108	647	1107	227	1093	1186	2913	331	634	592	790	434	481	6679
NSW	16170	1156	670	1102	279	1039	1237	1985	413	661	599	1229	499	576	6157
QLD	9459	667	275	511	94	635	777	1137	324	391	325	859	199	225	3903
WA	4303	278	139	281	67	262	292	616	87	251	225	345	101	124	1673
ACT	1387	76	28	65	39	31	68	256	17	28	32	42	18	49	708
TAS	680	26	29	30	11	30	45	95	22	26	19	54	15	4	319
NT	218	4	1	7		14	19	37	6	6	7	8	1	4	119
Australia	44964	2854	1648	2817	701	2661	3097	6441	1201	1856	1738	2842	1195	1408	18251
World	1831025	98114	81389	109989	26970	115033	107242	234063	69288	85005	91952	87186	56380	105440	732645

Note: Publications can be assigned to more than one category. As a result, the total number of publications is less than the sum of publications in each category.

Table D4: Proportion of publications for Australian states and territories by tumour streams, between states and territories 2006-2014

	Total	Breast	CNS	CRC	eye	GU	Gynaecological	Haem	H&N	Lung	Sarcoma	Skin	Endocrine	Upper GI	Unclassified
SA	11.7	11.2	9.5	8.4	14.3	19.3	10.2	9.4	10.7	15.2	10.2	15.2	5.7	10.6	13.1
VIC	36.6	37.5	38.8	39.3	39.3	32.4	41.1	38.3	45.2	27.6	34.2	34.1	27.8	36.3	34.2
NSW	33.7	36.0	40.5	40.7	39.1	39.8	39.0	39.9	30.8	34.4	35.6	34.5	43.2	41.8	40.9
QLD	21.4	21.0	23.4	16.7	18.1	13.4	23.9	25.1	17.7	27.0	21.1	18.7	30.2	16.7	16.0
WA	9.2	9.6	9.7	8.4	10.0	9.6	9.8	9.4	9.6	7.2	13.5	12.9	8.6	8.5	8.8
ACT	3.	3.1	2.7	1.7	2.3	5.6	1.2	2.2	4.0	1.4	1.5	1.8	1.5	1.5	3.5
TAS	1.7	1.5	0.9	1.8	1.1	1.6	1.1	1.5	1.5	1.8	1.4	1.1	1.9	1.3	0.3
NT	0.7	0.5	0.1	0.1	0.2	0.0	0.5	0.6	0.6	0.5	0.3	0.4	0.3	0.1	0.3
Share of World															
Australia	2.5	2.5	2.9	2.0	2.6	2.6	2.3	2.9	2.8	1.7	2.2	1.9	3.3	2.1	1.3

Note: Publications can be assigned to more than one category. As a result, the sum of categories will come to more than 100%.

Appendix D: Bibliometric review of cancer research publications, 2006 to 2014

Table D5: Proportion of publications for Australian states and territories by tumour streams, within states and territories 2006-2014

	Breast	CNS	CRC	eye	GU	Gynae- cological	Haem	H&N	Lung	Sarcoma	Skin	Endocrine	Upper GI	Unclass- ified
SA	5.3	2.7	8.0	2.7	5.4	5.8	13.9	3.6	3.2	5.3	3.2	2.5	3.7	42.7
VIC	6.5	3.9	6.6	1.3	6.5	7.1	17.4	2.0	3.2	3.6	4.7	2.6	2.9	40.0
NSW	7.1	4.2	6.8	1.7	6.4	7.7	12.4	2.6	3.5	3.8	7.6	3.1	3.6	38.6
QLD	7.0	2.9	5.4	1.0	6.7	8.2	12.1	3.4	3.7	3.5	9.1	2.1	2.4	41.6
WA	6.4	3.2	6.5	1.6	6.1	6.8	14.6	2.1	4.3	5.5	5.7	2.3	2.9	40.0
ACT	5.3	2.0	4.7	2.8	2.2	4.9	18.6	1.2	1.6	2.3	3.0	1.3	3.5	51.6
TAS	3.8	4.3	4.4	1.6	4.4	6.6	14.1	3.2	2.8	2.8	7.9	2.2	0.6	47.8
NT	1.8	0.5	3.2	0.0	6.4	8.7	17.0	2.8	2.3	3.2	37	0.5	1.8	55.0
Australia	6.3	3.7	6.3	1.6	5.9	6.9	14.4	2.7	3.5	4.0	6.3	2.7	3.1	41.1
World	5.4	4.4	6.0	1.5	6.3	5.9	12.8	3.8	4.6	5.0	4.8	3.1	5.8	40.0

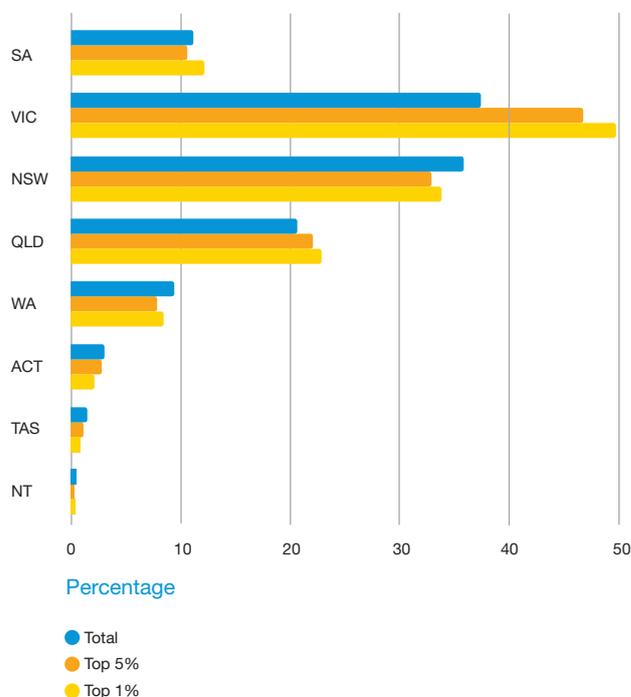
Note: Publications can be assigned to more than one category. As a result, the sum of categories will come to more than 100%.

The relative impact of Australian publications

Measuring the relative impact of publications is important for understanding the quality of the publications within the sub-fields of cancer research. The relative citation impact (RCI) for each publication is determined by a comparison of the citations it received against the world average for publications in the same field from the same year. A relative citation impact of more than 1.0 indicates a strong performance. Relative journal impact compares the average impact of the journals in which a unit's research is published to a world benchmark. The Source-Normalised Impact per Publication (SNIP) is a research field-normalised measure of relative journal impact. A relative journal impact score of more than 1.0 indicates strong performance.

Figure D6 shows the proportion of publications from Australian states and territories that place in the top 1%, 5% and total based on relative citation impact. As can be seen, South Australian publications are higher relative to their population proportion nationally (approximately 7.5%).

Figure D6: Proportional share of Australia by centiles (1%, 5% and total), based on relative citation impact



Appendix D: Bibliometric review of cancer research publications, 2006 to 2014

When correlating relative citation impact, against relative journal impact, data show that South Australian publications are performing comparably with many other jurisdictions, noting the exceptions of Victoria and the Northern Territory (Figure D7).

Figure D7: state publication performance, relative citation impact by relative journal impact



Changes in Australian publication performance over time

Monitoring publication performance over time measured using varying indices is important for tracking South Australian cancer research publication output and its impact on the broader scientific community. Figures D8, D9 and D10 show the proportion of publications in the top 10% most cited (D8) relative citation impact (D9) and mean citations per publication (D10). Results demonstrate that on average, South Australia is on par with, or outperforming the national average, and is tracking well against other larger states. There has also been a steep increase for South Australian publications from 2011 to 2012 as measured by relative citation impact and mean citations per publication.

Figure D8: % publications in top 10%, 2006-2012

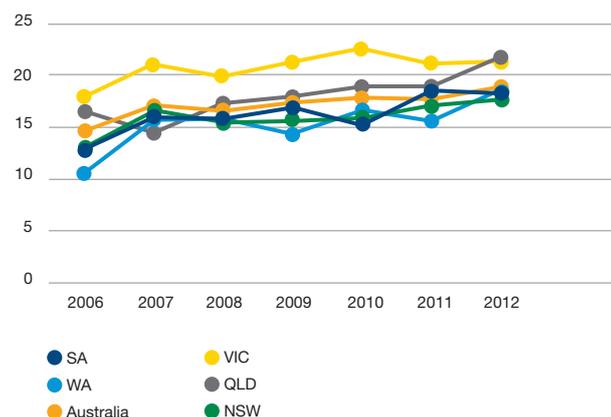


Figure D9: Relative Citation Impact, 2006-2012

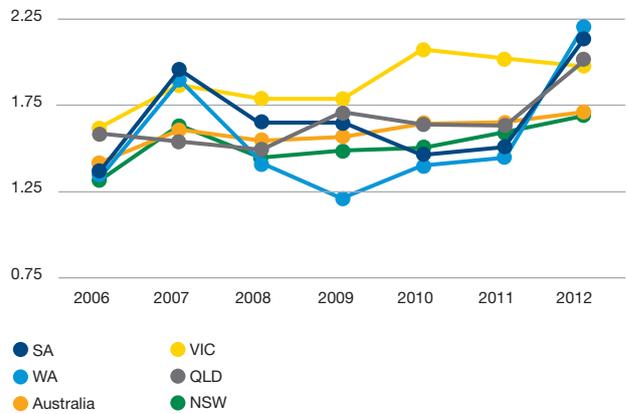
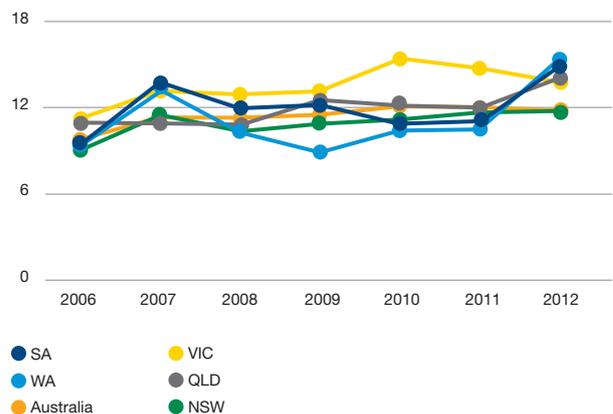


Figure D10: Mean citations per publication, 2006-2012



Conclusion

The results of this brief report indicate that South Australia has produced a high number of cancer-related publications over time relative to population size as a proportion of the Australian population. Furthermore, South Australia accounts for a high proportion of the top 1% and 5% of publications relative to South Australia's population size (approximately 7.5%). Whilst South Australia's publication output is variable across tumour streams and CSO categories, overall the relative citation impact for South Australian publications has been high over time. There are positive changes in recent research publication performance, which aligns with the commencement of the Beat Cancer Project, however, analysis of updated data, once available, is required to monitor if these patterns are sustained.

Appendix E: Cancer researcher feedback on cancer research in South Australia

Introduction

The Beat Cancer Project administers two annual surveys as part of its routine data collection to inform progress against its deliverables. The two surveys are:

1. The Beat Cancer Project funded researchers' survey:

distributed to the lead CI on all funding initiatives.

This includes workforce, infrastructure and travel grants.

This is the longer of the two surveys and includes questions related to a range of the deliverables including mentoring, collaboration, infrastructure and platform support.

2. The South Australian cancer researcher survey:

distributed to a known, non-exhaustive list of cancer researchers in South Australia. This is the shorter survey and focuses predominantly on area of research and infrastructure and platform support.

Findings from these surveys are then reported in its annual performance report to its funding bodies – Cancer Council SA and SA Health. The SAHMRI research administration office is responsible for the administration of these surveys.

As part of broad consultation with the South Australian cancer research community, Cancer Council SA included a series of questions in the Beat Cancer Project annual surveys to cover four broad areas: 1) what we currently do well in cancer research in South Australia, 2) how we can further build research capacity and partnerships, 3) how to best advance high priority research and its translation to impact, and 4) barriers and enablers for improving research competitiveness.

Methods

Data collection

A series of 11 questions were developed and divided into the four broad areas:

- What we currently do well; 3 questions
- Building research capacity and partnerships; 2 questions
- Advancing high priority research and its impact; 4 questions
- Barriers and enablers; 2 questions

Survey respondents were informed of the purpose of the questions in this section of the survey, i.e., that their feedback would be used to inform the development of a cancer research strategy. The cancer research strategy aim and objectives were described. Data were collected between 14 July 2015 and 6 September 2015. Note that only questions included by Cancer

Data analysis

Responses from both surveys were merged into a single SPSS 20.0 file and subsequently extracted into Microsoft Excel for thematic analysis. Thematic analysis was undertaken in line with the recommended methodology described by Braun and Clarke,¹ noting that higher order themes extracted were in relation to cancer research (as opposed to psychological or psychosocial phenomena). Quotes that highlight the sentiment of each theme are used as examples where applicable. Abbreviations used in quotes are expanded to increase readability.

Results

In total, 88 people responded to one of the two surveys. The results are described in line with the four broad areas as identified above. Note that, consistent with thematic analysis, numbers of respondents are not reported, but where appropriate reference is made to if the themes were frequently reported or contrasted with popular opinion.

What we currently do well in South Australia

Opportunities

Respondents were asked to identify specific research opportunities in the South Australian research context that could be strengthened to the State's cancer research benefit. The two opportunities most commonly identified were collaboration and population based health research, including opportunities for cancer registries and data linkage. Examples included collaboration between institutions, major hospitals and clinical research centres, SA Health and universities and different disciplines

"a lot of data from state-wide and national surveys could be utilised more"

"the opportunities exist to improve linkage of data and service delivery information systems to monitor cancer outcomes over time, and to provide a monitoring system to evaluate the progress of prevention and health system reform across the state"

Research platforms including genomics, metabolomics, proteomics and bioinformatics were also identified as research opportunities. This was commonly reflected in single answer responses, but on occasion greater detail was provided:

“molecular pathology and functional genomics are world class in SA but underutilised. These facilities could be used better to provide personalised medicine with world class treatment for patients”

Some participants cited research opportunities specific to areas of cancer research category or tumour stream. These included colorectal cancer research, screening, drug discovery and pre-clinical research.

“pre-clinical testing of new therapeutic drugs in mouse models of colon cancer”

“improve cancer screening technology and opportunities”

Some respondents also cited the need for increased investment, but responses varied from citing need for more grant funding opportunities to increased people capacity, which is more closely aligned to greater need for infrastructure and capacity building.

“more support for research grant writers in the form of a paid grant support person who can identify weaknesses in a grant before they are submitted”

Strengths within disciplines

Respondents were asked to list three particular strengths in SA cancer research relevant to their field of research. Two key internal strengths were identified that cut across all areas of cancer research, specifically people support and research platforms. People support was the most highly recognised internal strength and refers to collaborative efforts, researchers, mentoring and student support. Examples of how researchers were viewed as a strength included “quality researchers”, “strong clinical research leader” and “internationally renowned researchers”.

Acknowledgement of research platforms included data linkage, facilities and infrastructure, mention of specific research platforms, for example “good genomics infrastructure”, and access to patient specimens. Access to patient specimens included bio banks (e.g., tissue, tumour, blood).

In addition, specific areas of research were listed including biomedical, pre-clinical, and drug target development, as well as population health and cancer stream-specific research. The theme biomedical, pre-clinical, drug targeted development included strengths in basic biology, animal modelling, drug and pharmaceutical areas, for example “drug metabolism” and “pharmacogenomics”. Population health included “high quality behavioural research”, population data and registries and public health.

“clinical epidemiology using population data”

“long standing clinical registries”

Finally a number of respondents identified specific cancer streams as key strengths of South Australian research. Six cancer streams were acknowledged, including colorectal, blood, prostate, oesophageal, gastro-intestinal and lung cancer.

Strengths outside of discipline

When asked to identify strengths that were external to the individual's field of research, three key areas were identified. These were cancer research categories, specific cancer streams and research platforms/infrastructure.

A wide variety of cancer research areas were identified as strengths. These included prevention, screening, support, survivorship, health policy, biology, clinical research, behavioural research, chemotherapy side effects, immunology, apoptosis, epidemiology, stem cell research, drug development and targeted and new therapeutics.

Several specific cancer streams were recognised as research strengths in South Australia, many of which overlap with those listed above. These included blood, colorectal, melanoma, prostate, breast, gynaecological and bone cancer. Of these blood cancers were the most frequently identified.

Platforms and infrastructure were identified to a lesser extent. Registry data, genomics, data infrastructure and development, cancer signalling, cancer sequencing, patient specimen banks and data linkage capabilities were all identified as strengths.

Building research capacity and partnerships

Collaboration

Highlighting that state-wide, national and international collaboration is key in research competitiveness, respondents were asked to describe better ways of promoting collaboration with other researchers. Two themes that were highly cited included increased grants and funding for collaboration and increased funding and support for local conferences:

*“funding that encourages cross-disciplinary/
cross-institution collaboration”*

*“provide financial, administrative and academic
incentives to be involved in collaborative projects”*

Respondents showed interested in attracting both national and international conferences to South Australia or generating conferences from within the state, for example an “SA Cancer Conference” was suggested.

Further to this, grants and funding for travel and field specific special interest groups were commonly identified as ways of increasing access to networking and therefore better ways to promote collaboration. Providing grants to travel was seen as valuable to enable researchers to visit other labs and for networking purposes or promoting collaboration through specific interest groups:

*“fund conference travel which enables early career
researchers (and other academics) to meet/build
relationships with international colleague”*

*“develop international cluster groups to connect
researchers working in similar fields”*

*“connectivity with researchers in similar areas
across states and territories”*

Supporting early and mid-career researchers

Respondents were asked to consider better ways for SA to retain or develop early and mid-career cancer researchers in the state. The four most common suggestions were increased mentoring, providing job security, greater support and fellowships for early career researchers and mid career researchers and increasing small/start up grants. Mentoring was the most frequently made suggestion. Examples of this included “match early career researchers and mid career

researchers with successful mentors”, “cancer specific mentoring scheme” and “formal mentoring program”.

Job security encompassed creating ongoing positions, emphasising a career path and creating positions that would foster careers:

*“more funding to provide better job prospects
and career progression”*

*“create positions that will foster their career and
research interests – forming research teams
that link to particular areas of strength with
clear targets”*

Many respondents who suggested increased support and fellowships suggested more funding and access to funding in the area and a greater number of fellowships available at these levels. The suggestion of small or start up grants came in the form of a combined suggestion, such as “small start up (kick start) grants to enable early career researchers to gain preliminary data for larger funding opportunities”, start up specific, such as “early career researcher targeted grant seeding funds” or small grant specific, such as “more small grants (e.g. \$20,000) to help build experience and pilot data that is required to win NHMRC”.

Advancing high priority research and its impact

Accelerating translation of scientific discovery

In relation to translation of results to improve health outcomes as a critical component of scientific discovery, respondents were asked how the time delay between scientific discovery and its impact on the community could be reduced in their area of research. Three themes identified in these responses: engagement with the end user (promoting translation pathways), streamlining regulatory procedures and collaboration/creation of multi-disciplinary teams.

Promoting translational pathways through engagement with the end user encompassed better health service planning, performing the research needed by major health agencies and improving the engagement with SA Health:

*“researchers need to be engaged better in
health service planning - currently this is poor”*

*“undertake research needed by major health
agencies, including research into implementation
of research findings”*

Streamlining regulatory procedures encompassed reducing bureaucratic, ethics and governance barriers, for example “reducing bureaucracy in approval and registration of medical products”, making “government reforms”, “streamlining the process of therapeutic development through testing phases”, and “reduce barriers created by complex ethics and governance requirement”.

Collaboration and the development of multi-disciplinary teams were promoted between industries, between researchers, and between industry and government:

“engage researchers with expertise in community engagement (which we have in SA) to assist in knowledge translation; increase focus on multi-disciplinary teams”

“provide better opportunities for cross-disciplinary collaboration as well as links to clinical trial facilities and industry”

Supporting South Australia’s economic growth

Respondents were also asked in which ways cancer research can better support SA’s economic growth potential. The two most prominent responses were the biotechnology sector and developing a pharmaceutical focus:

“Government needs to foster biotech industries in South Australia in order to realise the economic growth potential of the fundamental cancer research being carried out in SA”

“we have the potential to make serious breakthroughs that could result in real ‘biotech’ industry”

Developing a stronger pharmaceutical focus encompassed encouraging pharmaceutical companies to set up in SA, drug development, innovation, fostering links with existing pharmaceutical companies and attracting clinical trials. An example of this was “support drug discovery research which will lead to patents and commercialisation of new therapeutics”.

Additional themes were related to promotion of cancer research outcomes and developing the stronger networks and infrastructure. For example, promoting commercialisation, promoting behavioural research (including prevention and health services outcomes), and promoting translation, and developing networks and infrastructure through; building collaboration, integration of clinical and basic science, creating better structures around intellectual property, and creating more local jobs.

Barriers and enablers for improving South Australian cancer research competitiveness

Barriers

Respondents were asked to identify high priority barriers they face (other than funding) that if addressed, would increase the efficiency and impact of their research. The most prominently identified themes were collaboration and governance. Respondents indicated that there were a number of barriers to collaborative efforts in South Australia. This included excessive competition and a lack of communication, coordination, information sharing, data linkage and access to population studies.

“more collaboration between the three universities, research institutes and SA Health”

“little opportunity for mutually beneficial collaborative opportunities nationally and internationally”

“data linkage processes need to be made easier/ encouraged, more collaboration is needed to enlarge team sizes”

The barriers around research governance included slow governance procedures, difficult and timely ethics applications, excessive “red tape”, bureaucratic barriers and poor streamlining of processes. A large proportion of respondents also identified time consuming administrative burden as being a large barrier to their efficiency.

*“Research Governance Procedures - they slow research and inhibit the research environment”,
“reduce bureaucracy-cut red tape”*

“difficulty with ethics and process- very difficult and time consuming to gain access to public patients”

Other themes identified which were common in the responses included lacking infrastructure and limited people capacity including limited numbers of quality staff and students. Lacking infrastructure also encompassed lack of access to technology and insufficient biobanking. For example a need for “Enhanced access to new technologies (esp. genomics and bioinformatics)” and “better biobanking/tissue banking” was recognised as well as a lack of “key infrastructure” and “translational infrastructure”.

It was recognised that there is a lack of high quality staff, students, fellows, experts and statisticians available in South Australia or coming to South Australia from interstate or overseas.

“very little new blood or top scientists coming to SA to be able to collaborate with”

“experienced workforce from which to recruit is limited”

Increasing competitiveness

Respondents were asked whether there were aware of any key research infrastructure in SA that is lacking and potentially reducing SA's competitiveness. A large number of respondents stated that they were not aware of any gaps in the infrastructure.

“not that would be of benefit to more than me and few colleagues”

The largest infrastructure gap identified was in the area of population research, cancer registry data and data linkage. Examples of this include identifying a need for “dedicated purpose built cancer screening research facility” or a “comprehensive data linkage system”. Finally various biomedical, pre-clinical and research infrastructure were suggested, most commonly in the areas of genomics and associated bioinformatics, proteomics and biobanks.

Respondents were asked how a State-wide Cancer Research Strategy could be utilised to best support faster translation into better health outcomes. There were two key themes which emerged from this question, facilitating communication and greater collaboration between researchers and service providers.

Facilitating communication encompassed meetings, workshops, seminars, forums, increased media coverage of research, public education and anything else which could facilitate dialogue and “honest and open collaboration”, for example “regular meetings/ workshopping/ seminars in order to share ideas and knowledge”.

Collaboration between researchers and service providers was emphasised in terms of researchers having greater involvement in the treatment process, service providers having greater involvement in developing the research agenda and a greater interaction generally between researchers and clinicians.

“greater consultation with service providers during research planning (and) greater research collaboration with service providers in all stages of research”

“more communication with clinicians to help scientists understand key clinical issues, increase collaboration between scientists and clinician”

Conclusion

The results of the is qualitative research indicate that there were a number of areas that the South Australian research community identified as opportunities for informing a statewide cancer research strategy in this state. Before commencing this discussion however, it is important to note this report is based on self-report data, and thus while every effort was made to derive honest and unbiased opinions, the findings are still subject to people's perceptions, biases and potentially limits of knowledge and awareness.

Collaboration, either within, across disciplines or ends of the research translation pipeline, was frequently reported in all areas. It was commented on as being a strength within disciplines, but also noted as a barrier and an opportunity for growth outside of one's immediate network or area of research focus. This included communication and consultation with consumers, and better engagement with health service providers as part of the research process.

People support and capacity building, from increasing financial support to ensure there is a sound pipeline for academics, to building a supportive framework around staff through mentoring, student support, and assistance to reduce administrative burden, were also highlighted. Indeed, some consistent messaging was with reference to supporting early and mid career researchers through provision of kick-start funding, additional fellowships and travel scholarships.

As a theme, research infrastructure and platforms was identified as being fundamental to South Australian research, its competitiveness and its ability to drive commercial interest. There was a strong indication that our capabilities within the biomedical, pre-clinical and drug target development

area were apparent, but potentially being under-utilised in streamlining the translational process to clinical application. Of note here was also maintaining our competitiveness through investment in advanced technologies in these areas, e.g., high throughput bioinformatics capabilities. Biobanks were also identified for multiple reasons (e.g., as a strength, opportunity, barrier and area for increased competitiveness) suggesting that potentially knowledge of all biobanks throughout the state is limited, and thus first steps may be to systematise and network our capacity in this area.

A commonly cited area of critical need, a strength within the state and one listed as being important for expanding our competitiveness is in our cancer registries and data linkage technologies. This also closely aligns to feedback regarding South Australia having a strong health services research profile and opportunities for undertaking high quality translational research.

As part of identifying the breadth of research across South Australia, numerous tumour streams and categories of research were listed. This suggests that at a statewide level, our capacity to undertake a comprehensive profile of research is possible, but may require ensuring that gaps are identified and addressed and networks are established, at the same time as maintaining support for those areas of strength. This requires further consideration however, given the finite resources available and may be part of a longer-term evolving planning and evaluation process.

Finally, there was a recurrent theme regarding an overly burdensome and conservative environment in SA with which to undertake innovative research of high impact. Systems and processes, including technical, administrative, governance and ethics, were commonly cited as barriers that, if addressed, would expedite the research process, increase translation and create economic stimulus.

References

1. Braun, V. and Clarke, V. (2006) Using thematic analysis in psychology. *Qualitative Research in Psychology*, 3 (2). pp. 77-101.



Cancer Council SA is committed to funding and conducting research in all aspects of cancer, including prevention and early detection, better and more effective treatments, and understanding and improving the wellbeing of people affected by cancer.

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