CANCER RESEARCH AND FUNDING IN WESTERN AUSTRALIA

AN OVERVIEW FROM 2008 to 2010

FEBRUARY **2011**

The Cancer and Palliative Care Research and Evaluation Unit (CaPCREU)

Curtin University

ECU Edith Cowan University

The University of Western Australia
Achieving International Excellence

The Cancer research and funding in Western Australia: An overview from 2008-2010 project was jointly funded by the Western Australian Cancer and Palliative Care Network and the Cancer Council WA

Government of **Western Australia**
Department of **Health**

The Cancer and Palliative Care Research and Evaluation Unit (CaPCREU) is a collaboration between Curtin University of Technology, Edith Cowan University and The University of Western Australia and was established with funding from the Western Australian Government through the Cancer and Palliative Care Network

This report was prepared by:

Ms Nicole Shirazee
CaPCREU
School of Surgery
The University of Western Australia

Dr Toni Musiello
School of Surgery
The University of Western Australia

Winthrop Professor Christobel Saunders
CaPCREU
School of Surgery
The University of Western Australia

Assistant Professor Claire Johnson
CaPCREU
School of Surgery
The University of Western Australia

Cancer and Palliative Care Research and Evaluation Unit (CaPCREU)
School of Surgery M507
The University of Western Australia
35 Stirling Hwy
Crawley WA 6009
Ph: 08 9346 1431 Fax: 08 9346 241

TABLE OF CONTENTS

1. Executive Summary

This audit was commissioned by the Cancer Council Western Australia (CCWA) and the Western Australian Cancer and Palliative Care Network (WACPCN) to obtain a snapshot of cancer research and funding in WA for the years 2008, 2009 and 2010. The aim of the audit was to identify strengths and gaps in cancer research in WA and inform cancer research funding policies and priorities, as well as future State Cancer Control Plans.

The audit was conducted by the Cancer and Palliative Care Research and Evaluation Unit (CaPCREU). Data was requested from organisations that either awarded or administered cancer research project funding, and from individuals known to be involved in cancer research, in WA.

The audit identified $37.8m in cancer research funding (249 grants) for the period 2008-2010. Most of this was competitive funding ($28.5m), half of which was awarded by the National Health and Medical Research Council (NHMRC). Cancer Councils (largely CCWA) also provided a significant portion of the identified overall funding ($5m or 14%). The WA State Government contributed 3% of competitive funding.

A total of $7.3m in non-competitive funding was identified. The greatest proportion of non-competitive funding was awarded by the State Government (79%); most of this funding was in the form of one-off grants, and does not represent recurrent funding.

When classified by Common Scientific Outline (CSO) codes, most identified competitive research funding was allocated to biology (40%), treatment (23%) and cancer control, survivorship and outcomes (12%). Early detection, diagnosis and prognosis; prevention; etiology; and scientific model systems all received 8% or less of total competitive funding. Compared to their burden of disease (measured by the potential number of life years lost), myeloma and cancers of the liver, oesophagus, ovary, pancreas, stomach and kidney cancers received relatively lower levels of cancer research funding.

The current audit has produced a thorough overview of current cancer research funding in WA, including its strengths and potentials gaps in terms of domains of research and tumour sites covered. These results can inform the future State Cancer Control Plan, and funding policies and priorities for cancer research. It is recommended that a similar audit is repeated in five years to maintain an up-to-date overview of cancer research and funding in WA.

Future WA cancer research audits should take into account the potential limitations of the current audit. These include possible underrepresentation of funding awarded by smaller organisations, and of funding for infrastructure, equipment, and scholarships and fellowships; lack of information received regarding collaboration across states and territories; and lack of available information on funding for clinical trials.

2. Introduction

2.1 Background to the audit

Cancer research in Western Australia (WA) is funded by a broad cross section of organisations which include the National Health and Medical Research Council (NHMRC), the Australian Research Council (ARC), the Government of Western Australia, and a variety of charitable and philanthropic organisations, commercial companies (including pharmaceutical companies), hospitals and universities. The majority of research funding is administered through universities and hospital based research groups.

In 2007, Cancer Australia conducted a national audit of cancer research funded in Australia by the major national and international funding organisations between 2003 and 2005. Out of a total of $291.5 million in cancer research funding in Australia, it was estimated that WA received $16.3 million (6%) compared to $24.4 million (8%) in South Australia and $114.2 million (39%) in Victoria. The majority of funding was supplied by the Australian Government (66%) through the NHMRC and ARC. State Governments supplied approximately 2% of funding compared to 9% from State and Territory Cancer Councils.[1]

The national audit classified funding according to the internationally recognised Common Scientific Outline (CSO)[2] a system that classifies cancer research into specific research areas. The CSO classification codes are easily understood and are used nationally and internationally. Thus, they provide a useful system for accurate comparison of data. Australia wide, the majority of funding was spent on research in biology (51%) and treatment (19%), with lesser amounts being spent on cancer control, survivorship and outcomes (9%) and prevention (5%). When the audit data was analysed by disease site codes, the highest levels of funding by cancer site went to breast cancer, leukaemias, colorectal cancer, prostate cancer and melanoma. Compared to burden of disease, lung cancer, mesothelioma, pancreatic cancer, lymphoma, and cancers of the bladder, brain and of unknown primary were under funded. In WA, the national audit suggested that funding was spread more broadly across CSO classifications. The largest proportion of funding went to biological research (33.5%), followed by cancer control, survivorship and outcomes (22.5%), aetiology (15%) and treatment (13.5%).[1]

Several limitations of the Cancer Australia audit have been identified. A survey of cancer research from 2004-2006 conducted in NSW by the Cancer Institute NSW identified research funded by numerous sources not included in the National Audit. Furthermore, 28 out of 99 funding organisations in Australia and overseas that were approached for funding details either failed to provide details or had not provided relevant cancer research funding during the research period. The National Audit also failed to collect information about funding for infrastructure, equipment, training, and scholarships, fellowships and chairs.

Whilst the national report provided a snap-shot of Australian cancer research and WA's involvement in it, there is no detailed record of research conducted in WA since that time. Attempts were made in 2005 to audit cancer research in WA, however, numerous difficulties encountered by the company contracted to undertake the audit resulted in the project being abandoned before any meaningful results were achieved.

As a consequence, this audit was undertaken to obtain a snapshot of cancer research and funding in WA, for the years 2008, 2009 and 2010. At this point in time there is little coordination of the provision of cancer research funding either at a State or National level. The results of this research will help inform cancer research funding policy and future funding priorities for the Cancer and Palliative Care Research and Evaluation Unit (CaPCREU), Western Australian Cancer and Palliative Care Network (WACPCN), and the Cancer Council

WA – co-sponsors of the audit. Most importantly it will provide information on the strengths and gaps in cancer research in WA, and therefore the results can be used to inform future State Cancer Control Plans.

2.2 Aims of the audit

The overall aim of this audit was to provide an overview of cancer research projects undertaken in WA for the years 2008 to 2010. Specific objectives include:

1. To determine the funding source(s) of such research
2. To determine the type of funding allocated
3. To classify the research using the Common Scientific Outlines (CSO)
4. To classify the pattern of funding across tumour sites
5. To examine the distribution of funding across tumour sites and cancer research categories (CSO)

3. Methods

3.1 Approach to the audit and sources of data

In order to successfully capture the majority of data, 'top-down' and 'bottom-up' approaches to data collection were used. As part of the 'top-down' approach, information on cancer research projects were obtained from organisations that fund cancer-related research projects. These included the National Health and Medical Research Council (NHMRC), Cancer Council WA (CCWA), Australian Research Council (ARC), National Breast Cancer Foundation (NBCF), Leukaemia Foundation (LF), Cancer Australia (CA), and the Department of Health (DoH) funding supplied under the WA State Health Research Advisory Council (SHRAC).

In addition, information was obtained from organisations that administer cancer-related research projects. Organisations approached included the main WA Universities: The University of Western Australia (UWA); Curtin University; Edith Cowan University; Murdoch University; and The University of Notre Dame. Hospitals were also approached as organisations administering cancer-related research projects. Research project information was requested from Sir Charles Gairdner Hospital (SCGH), Royal Perth Hospital (RPH), Fremantle Hospital, and private hospitals, St John of God (SJOG), and the Mount Hospital. The information was either downloaded from the organisation's website or, when the required information was not publicly available, requested specifically from the organisation's research office. Due to the small number of childhood cancers diagnosed each year in WA (N=60), the 'top down' approach was not taken with Kind Edward Memorial Hospital (KEMH) or Princess Margaret Hospital (PMH). Rather key individuals working in the area of childhood cancers were approached for details in the 'bottom up' methodology approach.

The 'bottom-up' approach involved directly contacting individuals known or thought to be involved in cancer research to ask them for information on their relevant research projects. The names of potential cancer researchers were obtained in a number of ways, from annual reports or lists of successfully funded projects that were published on funding organisations' websites, to direct contact with prominent researchers asking them to provide names of other researchers they knew working in oncology. In addition, the Australian New Zealand Clinical Trials Registry (ANZCTR)[3] was asked for names of chief investigators of all cancer-related trials registered during 2008-2010. Prominent researchers in WA were also asked to provide names of individuals they knew were likely to be involved in cancer research.

Ethics approval was obtained from the University of Western Australia (RA/4/1/4428) prior to the commencement of data collection.

3.2 Approach to data collection and overall response

For both individuals and institutions, details were requested for each funded cancer research project undertaken during any of the calendar years 2008, 2009 and 2010. The details requested are as follows:

- Title of project
- Name of chief investigator
- Names and locations of collaborators
- Common Scientific Outline code
- Main tumour site studied
- Administering institution
- Amount of funding allocated for each year (2008, 2009, 2010)
- Source of funding
- Type of grant (i.e. Research grant; tender; non-competitive funding; infrastructure funding; equipment funding; or training and people support)

3.2.1 Top-down approach data collection and response

Audit data was collected from September to November 2010. Researchers contacted each of the research offices of the universities and hospitals detailed above, as well as individual medical and radiation oncology departments within the public hospitals. These research offices were invited to provide in database format details of cancer-related research grants administered through their institutions (Appendix 1).

All universities responded and provided details of individual cancer research studies administered through their institutions during 2008-2010. Two private hospitals were approached- one reported that it did not receive direct funding for cancer research studies, whilst the other provided names of researchers who had been involved in cancer research at their institution. These individuals were then followed up individually. Of the three public hospitals, one provided information for all cancer research projects it administered during 2008-2010. Another provided research information from their radiation oncology and medical oncology departments only. Despite repeated attempts to obtain this information from the last public hospital, this hospital did not provide any research data to inform the audit.

For projects where details regarding the amount of funding received were incomplete or not provided at all, the chief investigators were contacted and asked for this information. Chief investigators of cancer related trials identified by the ANZCTR were also contacted for information concerning the funding of their projects.

Details of competitive funding granted to cancer research projects during 2008-2010 were also obtained from publicly available databases from the NHMRC, ARC, SHRAC, and CC WA.

3.2.2. Bottom-up approach data collection and response

In order to inform this phase of the data collection, 48 prominent cancer researchers in WA were contacted by telephone or email and asked to provide names of individuals they knew or believed to be working in an oncology research capacity. Of these 48 researchers, 13 (27%) responded with a list of recommended names to follow up. Additional names were also obtained from University research profiles, successful projects published on funding organisations' websites, annual project reports, and the ANZCTR. Once this list was

completed, two prominent cancer researchers who are well established in WA were asked to review the list and add any individuals who were omitted.

This approach resulted in a master list of 285 individuals. These individuals were contacted via phone and/or email (Appendix 2) and asked if they had been involved in cancer research during 2008-2010. If so, they were asked to provide the relevant information. Researchers were given a number of options for returning the requested information. They could complete the information table(s) provided in the email (Appendix 3). Alternatively they could email their CV or other document containing a list of their funded research grants for manual extraction of the required data by the audit team. The audit investigators also offered to obtain this information over the telephone, or to arrange to visit individuals personally to collect their data. Those who did not respond to the initial email or phone contact after four weeks, were contacted again by email or phone to stress the importance of the audit and request the required information. Prior to the termination of the data collection phase, the chief investigators (CI) reviewed the list of non-responders. Any prolific cancer researchers who had not provided data were highlighted and directly contacted by the lead project CI (CS) with a final request to provide the necessary data.

3.3 Coding and classification – use of the Common Scientific Outlines (CSO)

Each research project was classified according to specific parameters: tumour stream; Disease Site Code; and the Common Scientific Outline (CSO) code. These coding systems are internationally recognised and were used by Cancer Australia in the 2003 – 2005 national audit of cancer research. The CSO defines seven broad areas of cancer research:

- Biology
- Etiology
- Prevention
- Early detection, diagnosis and prognosis
- Treatment
- Cancer control, survival and outcomes
- Scientific model systems.

The biology code includes categories such as normal functioning of biological systems and genes, cancer initiation (e.g. abnormal chromosome number) and cancer progression and metastasis (e.g. Latency, promotion, and regression of malignant cells). The etiology code incorporates studies covering external factors such as the environment (e.g. air pollution), and lifestyle factors such as smoking or physical activity. Internal factors such as genes known or suspected of being involved in familial cancer syndromes, and the interactions of genes are also included in the etiology code. The prevention code includes categories such as interventions to prevent cancer, preventative vaccines, nutritional science and the discovery, development, and testing of complementary/alternative prevention approaches. Early detection, diagnosis and prevention includes categories such as discovery of markers (e.g., proteins, genes), and/or technologies (such as fluorescence, nanotechnology, etc.) that are potential candidates for use in cancer detection, staging, diagnosis, and/or prognosis, and the evaluation and testing of such markers or technologies. The treatment code includes categories such as localised and systemic cancer therapies. This may include studies investigating surgical interventions or radiotherapy agents, or the discovery and testing of new systemic hormonal treatments for cancer. Cancer control, survival and outcomes research includes patient care and survivorship (e.g. psychological impact of cancer survivorship), surveillance (e.g. Epidemiology and End Results Reporting (e.g., SEER)), behaviour (e.g. attitudes and belief systems and their influence on behaviors related to cancer control) and health care delivery (e.g. Interventions to increase the quality of health

care delivery). The final category, scientific model systems covers development and application of model systems. Model systems may include: Computer-simulation model systems and computer software development; or *In vitro*, cell culture, organ/tissue or animal models systems.

All of the seven broad codes include categories of resources and infrastructure relative to each individual code. Within the overarching CSO classification scheme, each of these codes is subdivided, resulting in a total of 38 more specific CSO codes. However, for the purposes of this study, only the seven broad codes indicated above in the bullet list were used to classify the audit data.

The disease site and CSO were defined by either the researchers who provided information on each of their own studies, or, if this information was missing, by one of the audit investigators.

3.4 Which data are not included in the audit?

3.4.1. Details of collaborators

Research offices that provided information in database form did not include the names and locations of project collaborators as they reported that this information was not readily available. Individuals who completed the information table/s generally provided all required information; however where researchers provided their CV instead, this information was typically not included. As information on project collaborators was unreliable and not deemed to be essential for informing the project main aims and objectives, this information has not been included in the audit data analysis.

3.4.2. Clinical trials

The level of detail received for clinical trials varied greatly between the institutions/ individuals providing the information. Some researchers involved in clinical trials research were unable to provide specific information on funding due to confidentiality, or difficulties in estimating the amount of funding their involvement in each trial attracted. However much of this information was available from online trial registries. For most clinical trials conducted in WA, the coordinating institution responsible for the administration of grants awarded to the trial are located outside of WA. Funds received by WA institutions for involvement in trials are typically on a per patient basis and largely used to fund the salaries of data managers/ coordinators. Therefore the nature of funding attracted by clinical trials research in WA is fundamentally different from that awarded to other types of research. For this reason, information on clinical trials is analysed separately to the rest of the data. Due to difficulty in obtaining information on the amount of funding allocated to clinical trials, information on the proportion of trials per disease site/ CSO, is provided but specific funding details are omitted.

Due to the difficulty in obtaining specific details for clinical trials from individual researchers, information on clinical trials was obtained from the WA Cancer Clinical Trials Registry (WACCTR) established by the Cancer Council WA and the WA Clinical Oncology Group. The WACCTR is aimed directly at patients and is a regularly updated online register of cancer clinical trials currently recruiting in WA hospitals. More information on the WACCTR can be obtained from: http://www.cancerwa.asn.au/patients/making-decisions-about-treatment/clinical-trials/wa-clinical-trials-registry/.

3.4.3. MHRIF Funding

The Medical and Health Research Infrastructure Fund (MHRIF) is an infrastructure funding scheme implemented by the State Government to reward WA's medical and health researchers who have most success in category one competitive funding. The scheme

provides these researchers with additional infrastructure funding to support their research programs. Due to the unique nature of the funding conditions, in that researchers must secure at least $400,000 in competitive funding in the previous three calendar years in order to be eligible to apply, MHRIF funding was not included in the data generated for the report.

The Department of Health (DoH) Research Development Unit provided the audit investigators with a brief analysis of the grants under the Medical and Health Research Infrastructure Fund (MHRIF). Table 1 shows the infrastructure allocations to researchers who coded their research as "Oncology and Carcinogenesis".

Table 1. MHRIF Infrastructure allocations for oncology and carcinogenesis grants for the years 2008, 2009 & 2010

MHRIF Round	Researchers with 'Oncology and Carcinogenesis' coded grants		Amount of MHRIF ($)
	No	Annual Grant amounts	
11 (2008)	5	690,001	108,734
12 (2009)	5	579,754	77,712
13 (2010)	7	967,755	114,614
Total for 3 years	**17**	**2,237,510**	**301,060**

Whilst the numbers above are relatively small, it is likely that some cancer-related research coded to other categories, e.g. "Biochemistry and Cell Biology" or "Nursing" are not included. Therefore the amounts of funding provided above are likely to under-estimate MHRIF funding for all cancer-related research in WA.

3.5 Other data considerations

3.5.1. Representativeness of data

The response rate to the invitation for individuals to provide information about their funded cancer research projects was 32%. Whilst this is relatively low, it is possible that many of those contacted may not have been involved in active cancer research for the audit period (2008, 2009 & 2010). Or, this may be a result of the time consuming demands of research work, or the voluntary nature of opting to participate in the audit. Consequently it is possible that specific details concerning individual research projects and wider funding sources may be under-represented. As the details of the NHMRC, CCWA, ARC and some competitive state government awarded grants were all accessible, it is possible that funding awarded by these groups is over-represented in the current data set. However these groups are the major sources of cancer research funding within Australia, so it is unlikely that the representativeness of the data collected deviates too far from the reality.

The Medical and Health Research Infrastructure Fund (MHRIF) is an infrastructure funding scheme implemented by the State Government in 1997 to reward WA's best medical and health researchers with funding to support their research programs.

3.5.2. Breakdown of funds per year

While information on the total amount of funding awarded per project was received for all projects, the breakdown of funds awarded to each of the calendar years 2008, 2009 and 2010 was not provided for 25 out of the 247 individual grants identified. In these cases, the total grant value was divided by the number of years for which the grant was awarded to obtain an estimate of the amount of funds awarded to each calendar year. Given that the number of estimated figures is relatively small, they have been incorporated into the final data analysis.

3.5.3. Competitive vs. non-competitive grants

Individual researchers and research institutions were asked for details on all funded cancer research projects. In the original request, no distinction was made between competitive or non-competitive grants. However, the information tables provided to researchers included the option of indicating whether the grant was non-competitive or not. During data analysis, it became clear that researchers were less likely to provide information on non-competitive grants, consequently this information was less accessible. While some individuals and institutions did provide details on non-competitive funding, it is likely that some may not have regarded such grants as true 'research funding', and thus failed to report them. Given the information on non-competitive grants seems limited and is likely to be biased, the information presented in Section 3.3. should be treated with caution.

3.5.4. Adult vs. paediatric cancer

For the purposes of this audit, information on grants awarded to projects investigating childhood cancers and information on grants for projects investigating adult cancers were not analysed separately.

4. Results

4.1 Overview

The main purpose of this audit was to provide an overview of cancer research projects funded in WA for the years 2008, 2009 and 2010. Overall, 92 individuals responded to the request for data. Fourteen individuals were not involved in funded cancer research during the study period. Two individuals, whilst supportive of the audit, were unable to provide information on their cancer research projects due to circumstances out of their personal control. In total 72 researchers provided relevant research information to inform the audit results.

Data was collected for a total of 242 distinct research projects funded during this time frame. Of these, six projects were awarded additional grants to deliver the research project: Five projects received funding from two different funding bodies, and one project received funding from three different funding bodies. This meant that a total of 249 grants were awarded for a total of 242 individual research projects. The value of funding awarded for each research project ranged from $1,058 to $4 million. Table 2 shows the total funding awarded for each calendar year.

Table 2. Annual funding to cancer research projects in WA 2008-2010

Year	Total funding ($)
2008	11,360,661
2009	12,582,685
2010	11,847,260
Total	**35,790,606**

* No adjustment for inflation in these figures has been made

As Table 2 shows, the amount of funding received in WA each year remains relatively stable, with 2009 receiving the highest funding amount and 2008 and 2010 receiving similar funding amounts. Overall WA received $35,790,606 for the three year audit period.

Table 3 shows a breakdown of the amount of identified funding and number of grants awarded by each funding source.

Table 3. Amount and proportion of funding by funding source

Funding source	Amount of funding ($)	Proportion of all funding (%)	Number of grants	Proportion of all grants (%)
NHMRC	14,236,424	40	47	19
State government body	6,721,414	19	34	14
Cancer Council	5,066,251	14	52	21
Other Australian government body	2,650,875	7	18	7
Other non-profit organisation	2,170,552	6	26	10
Multiple sources	1,903,966	5	20	8
Other	1,365,491	4	10	4
University	519,582	1	23	9
Pharmaceutical company	510,022	1	6	2
Public hospital	339,643	1	9	4
Overseas organisation	306,386	1	4	2
Total	**35,790,606**	**100**	**249**	**100**

As Table 3 demonstrates, the NHMRC contributed the majority of identified funding (40%), followed by State government bodies (19%) and Cancer Councils (14%). Much of the identified State government funding was awarded on a one-off basis and is non-recurrent. All other funding sources contributed less than 10% of all identified funding.

4.2 Competitive funding

Out of the 242 total projects identified, 219 were classified as receiving a competitive grant during 2008-2010. Four projects attracted two grants and one project attracted three grants, resulting in a total of 224 grants awarded during the study period. The amount awarded per grant ranged from $1,058 to $908,000. Table 4 shows the total amount of competitive funding awarded in WA for each calendar year.

Table 4. Annual competitive funding to cancer research projects in WA 2008-2010

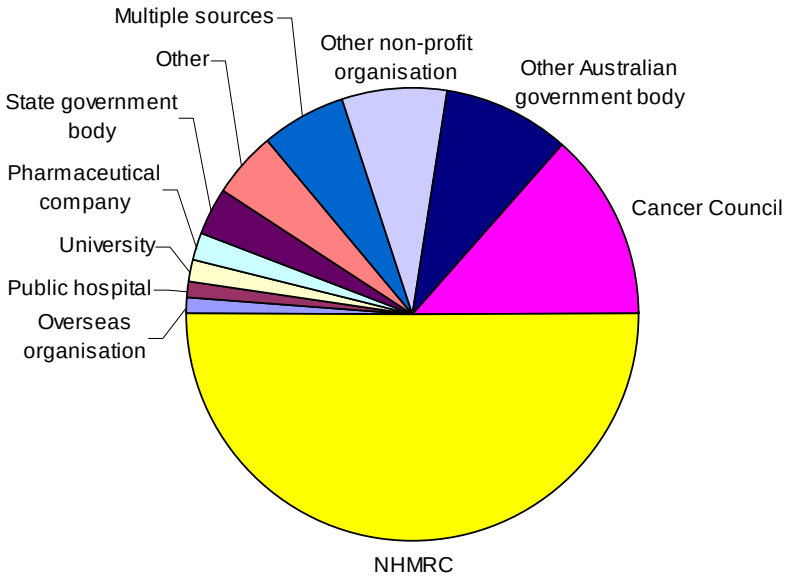
Year	Total funding ($)
2008	7,579,383
2009	9,990,017
2010	10,925,259
Total	**28,494,659**

As Table 4 shows, the amount of competitive funding received each year has gradually increased from $7,579,383 in 2008 to $10,925,259 in 2010. Overall WA received $28,494, 659 worth of competitive funding for the three year audit period.

4.2.1 Source of funding

Distribution of competitive cancer research funding was categorised by source of funding support, shown below in Figure 1.

Figure 1. Percentage of competitive funding categorised by funding source



As Figure 1 shows, the majority of competitive cancer funding received in WA is from the NHMRC (50%). Table 5 shows a further breakdown of the amount of identified competitive funding and number of identified competitive grants awarded by each funding source. Please note that pharmaceutical company funding is likely to be underrepresented due to the fact that much pharmaceutical company funding is awarded to clinical trials. These were underreported due to confidentiality concerns and the fundamentally different nature of clinical trials from "traditional" research projects

Table 5. Distribution of competitive funding and grants across funding sources

Funding source	Amount of competitive funding ($)	% of total competitive funding	% of ALL funding	Number of competitive grants	% of com-petitive grants	% of ALL grants
NHMRC	14,236,424	50	40	47	21	8
Cancer Council	3,773,751	13	11	47	21	8
Other Australian government body	2,650,875	9	7	18	8	3
Other non-profit organisation	2,161,007	8	6	24	11	4
Multiple sources	1,698,042	6	5	19	8	3
Other	1,365,491	5	4	10	4	2
State government body	968,771	3	3	19	8	3
Pharmaceutical company	510,022	2	1	6	3	1
University	484,248	2	1	21	9	4
Public hospital	339,643	1	1	9	4	2
Overseas organisation	306,386	1	1	4	2	1

As seen in Figure 1 and Table 5, the Australian Government contributed to the majority (59%) of all identified competitive funded cancer research projects in WA in 2008, 2009 and 2010. The NHMRC awarded $14.24 million or 50% of competitive funding, accounting for 47 of 224 grants. In addition to the NHMRC, other sources of Australian Government funding include the Australian Research Council and Cancer Australia (classified above as Other Australian government body).

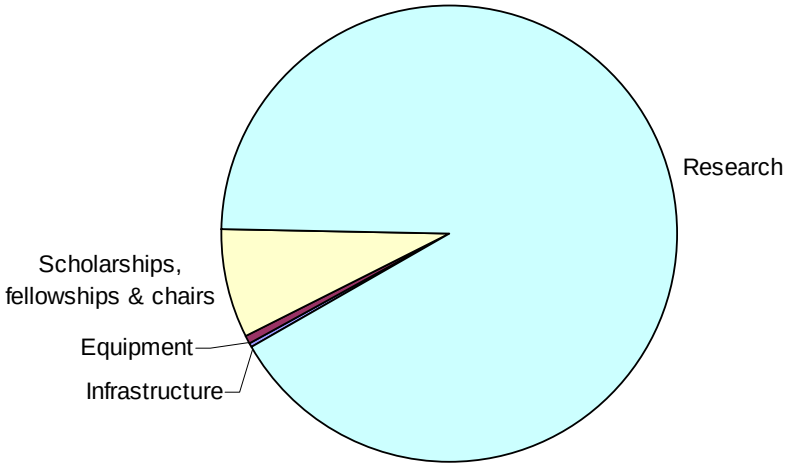
The second largest source of cancer research funding was the Cancer Council WA who contributed $3.77 million or 13% of all funding, to 47 research projects. Other non-profit organisations (e.g. Prostate Cancer Foundation of Australia) contributed $2.16 million (8% of funding) to 24 cancer research projects.

Nineteen research projects (6%), were awarded grants by more than one funding body, however the proportion of funds provided by each organisation could not be determined. These projects are described in Figure 1 as having 'multiple sources' of funding. Please note that these are distinct to the six research projects receiving multiple grants as detailed in Section 3.1, as the investigators were able to determine the exact funding sources of these six research projects. As a result these nineteen research projects have been presented separately.

4.2.2 Use of competitive funding

Cancer research grants were categorised according to how the funds were used. Figure 2 shows the proportion of total funds that were allocated to general research, infrastructure*, equipment and scholarships, fellowships or chairs.

Figure 2. Proportion of competitive funding allocated to research, infrastructure, equipment, and scholarships, fellowships and chairs.



As Figure 2 shows, the vast majority of funding was provided for research specific projects. Table 6 below shows a further breakdown of the amount of competitive funding and number of grants used for each of these purposes.

*As previously detailed this does not include MHRIF funding

Table 6. Amount of funding and number of grants categorised by use of competitive funding

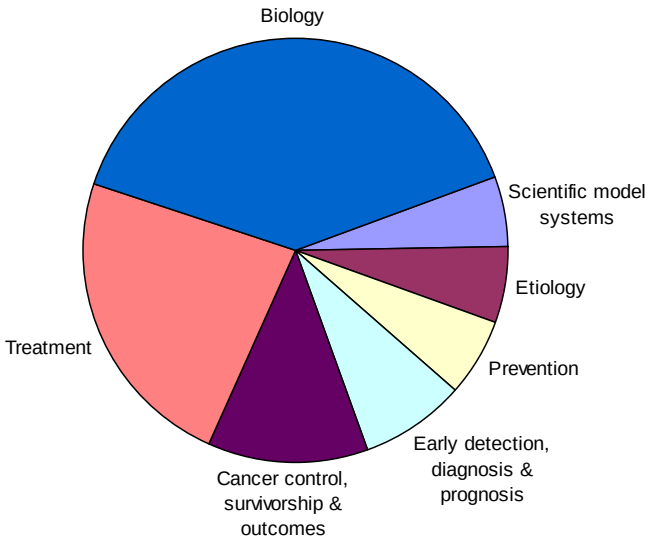
Use of funding	Amount of competitive funding ($)	Proportion of total competitive funding ($)	Number of competitive grants	Proportion of competitive grants (%)
Research	26,010,876	91	196	88
Scholarships, fellowships & chairs	2,256,098	8	21	9
Equipment	177,686	1	3	1
Infrastructure	50,000	<1	4	2

Of the identified competitive grants, 196 were specifically for research projects, 21 were used for people support (e.g. scholarships and fellowships), four were used for infrastructure and three were used for equipment purposes.

4.2.3 Classification by Common Scientific Outline (CSO)

Identified competitive cancer research projects were classified into Common Scientific Outline (CSO) categories, reflecting the primary focus of the research project. The distribution of competitive research funded grants across the seven major CSO categories is illustrated in Figure 3 below.

Figure 3. Competitive funding by main category of Common Scientific Outline



A further breakdown of the amount of funding and number of grants awarded to each CSO category is provided in Table 7. The largest proportion of competitive research funding was allocated to Biology ($11.27 million), Treatment ($6.59 million), Cancer Control, Survivorship and Outcomes ($3.50 million) and Etiology ($2.32 million). Prevention and Etiology received similar amounts of funding ($1.67 & $1.62 respectively). Scientific model systems received the least amount of funding ($1.51 million) over the audit time frame.

Table 7. Amount of competitive funding and number of grants categorised by CSO code

Common Scientific Outline	Amount of competitive funding ($)	Proportion of total competitive funding ($)	Number of competitive grants	Proportion of competitive grants (%)
Scientific model systems	1,513,820	5	6	3
Etiology	1,622,016	6	13	6
Prevention	1,677,892	6	16	7
Early detection, diagnosis & prognosis	2,322,342	8	19	8
Cancer control, survivorship & outcomes	3,495,794	12	52	23
Treatment	6,588,690	23	34	15
Biology	11,274,106	40	84	38

Given the large proportion of funding allocated to Biology, this area of research was further categorised by source of funding. Figure 4 and Table 8 (below) present a breakdown of the sources of funding for biology specific research projects.

Figure 4. Sources of competitive funding for Biology research projects

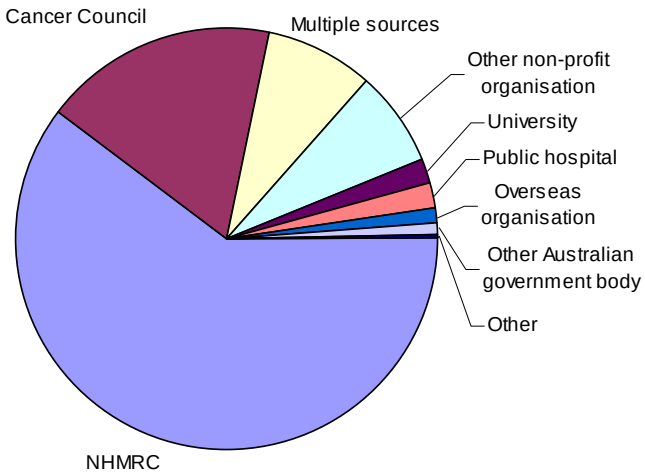


Table 8. Amount of biology-specific competitive funding and grants categorised by funding source

Funding source	Amount of competitive funding ($)	Proportion of competitive biology funding (%)	Number of competitive grants	Proportion of competitive biology grants (%)
NHMRC	6,786,888	60	22	26
Cancer Council	2,049,723	18	30	36
Multiple sources	923,000	8	3	4
Other non-profit organisation	831,750	7	10	12
University	219,535	2	10	12
Public hospital	226,926	2	5	6
Overseas organisation	112,000	1	2	2
Other Australian government body	94,284	1	1	1
Other	30,000	<1	1	1

Following a similar pattern to the overall competitive funding results, the greatest proportion of competitive funding for Biology was awarded by the NHMRC ($6.79 million), followed by the Cancer Council WA ($2.05 million). All other sources of funding each contributed less than 10% of total funding to the Biology area.

Given that the NHMRC grants make up a large proportion of cancer research funding in WA, the pattern of cancer research funded by the NHMRC was compared to the pattern of cancer research funded by all other sources (Figure 5).

Figure 5. Competitive funding awarded by NHMRC versus other funders, classified by main categories of Common Scientific Outline.

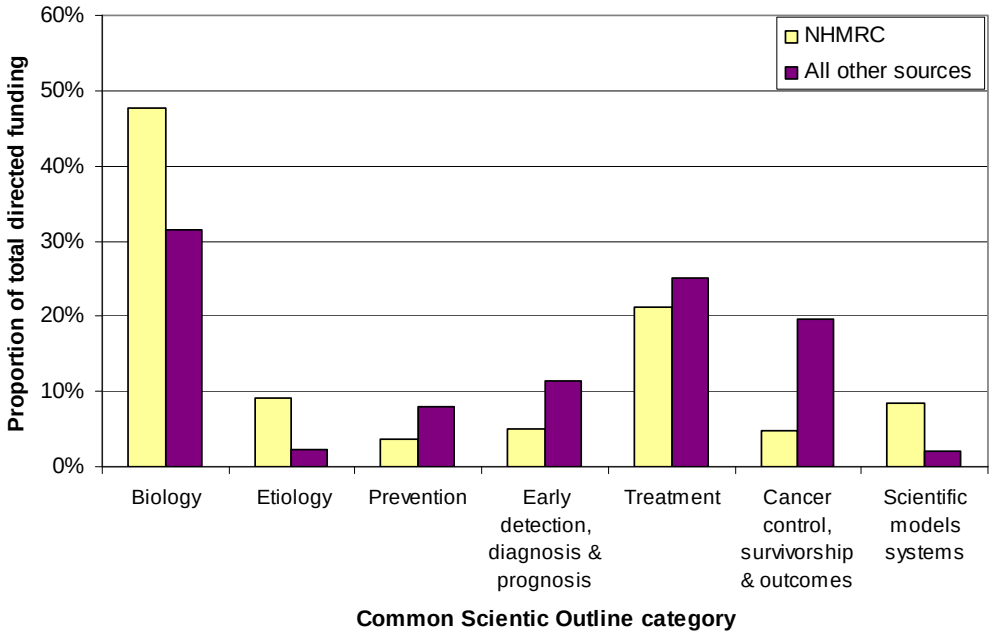
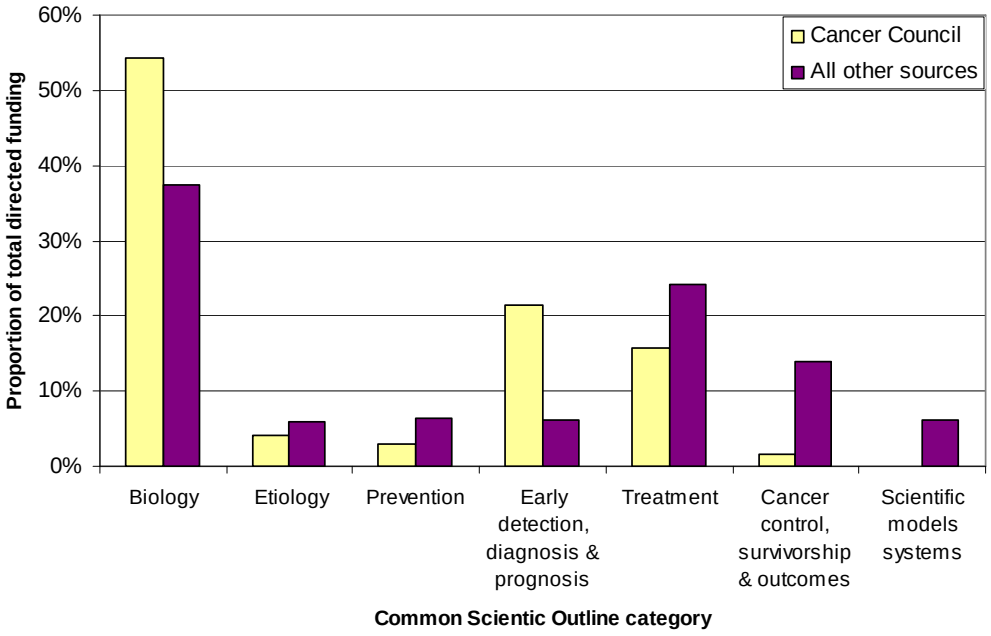


Figure 5 demonstrates that compared to all other funding bodies, the NHMRC funded a relatively greater proportion of projects in Biology (48% of all NHMRC funding compared to 31% of all other funding), Etiology (9% vs. 2%), and Scientific Model Systems (9% vs. 2%). A relatively smaller proportion of funding was directed to Early Detection, Diagnosis and Prognosis (5% vs. 11%), Prevention (4% vs. 8%), Treatment (21% vs. 25%), and Cancer Control, Survivorship and Outcomes (5% vs. 20%).

Likewise, the pattern of funding granted by Cancer Councils (mainly Cancer Council WA) across CSO codes was also examined. Figure 6 shows Cancer Council funding compared to all other sources of funding.

Figure 6. Competitive funding awarded by Cancer Council versus other funders, classified by main category of Common Scientific Outline.

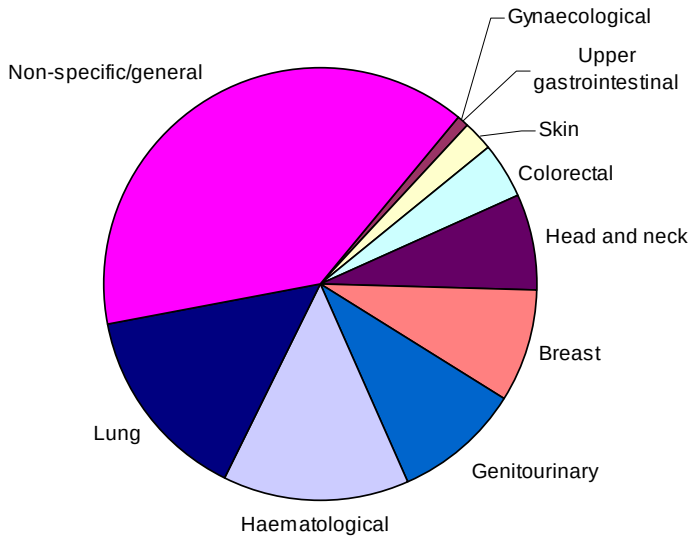


As Figure 6 shows, research projects in the Biology area (54% vs. 37%) were most likely to be funded by the Cancer Council, followed by projects examining Early Detection, Diagnosis and Prognosis (21% vs. 6%). The Cancer Council were less likely than other competitive sources to fund projects on Cancer Control, Survivorship and Outcomes (2% vs. 14%), and Scientific Models Systems (0% vs. 6%).

4.2.4 Classification by tumour stream and Disease Site Code

Cancer research project competitive funding was classified according to the general tumour stream, as well as the more specific disease site studied. Figure 7 shows the distribution of identified cancer research funding across tumour streams.

Figure 7. Competitive funding across tumour streams



As shown in Figure 7, the largest amount of funding was provided for projects that were not site-specific, or of a basic science nature. This was followed by lung and haematological cancers.

Table 9 gives a further breakdown of the amount of funding and number of grants across the tumour streams.

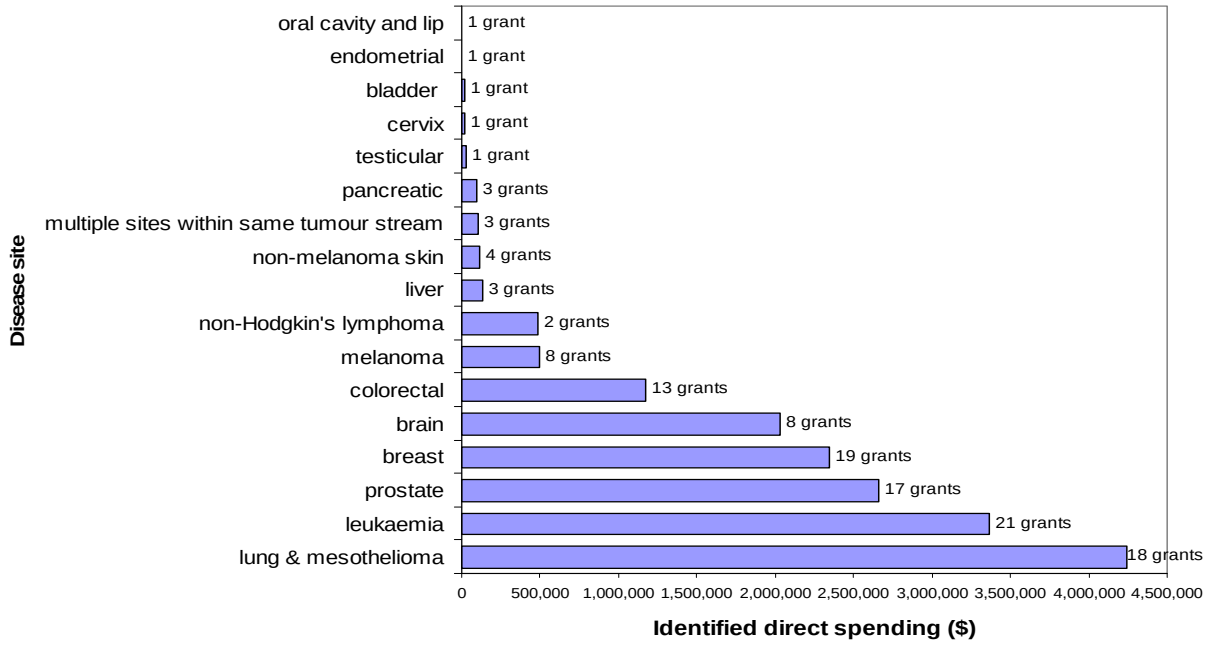
Table 9. Amount of competitive funding and number of grants categorised by tumour stream

Tumour stream	Amount of competitive funding ($)	Proportion of total competitive funding (%)	Number of competitive grants	Proportion of competitive grants (%)
Non-specific/general	11,143,866	39	100	45
Lung	4,237,559	15	18	8
Haematological	3,916,677	14	24	11
Genitourinary	2,701,325	9	19	8
Breast	2,346,066	8	19	8
Head and neck	2,094,129	7	10	4
Colorectal	1,176,829	4	13	6
Skin	674,939	2	13	6
Upper gastrointestinal	170,975	1	5	2
Gynaecological	32,295	<1	3	1

As shown in Table 9, one-hundred grants were provided for projects that were not site-specific, or of a basic science nature. These types of projects attracted nearly 40% of all identified competitive cancer research funding. When tumour streams were identifiable, the majority of funding went to lung (15%) and haematological (14%) cancers, and the least went to gynaecological (0.1%), upper GI (0.6%) and skin (2.4%) cancers.

Information on general tumour streams was then broken down to examine funding awarded to research into specific tumour types. Figure 8 presents the distribution of *site-specific* competitive funding across disease sites.

Figure 8. Competitive funding distribution of site specific disease sites.



As Figure 8 shows, the top five specific tumour types awarded competitive funding over the audit period (2008-2010) were lung cancer and mesothelioma, leukaemia, prostate cancer, breast cancer and brain cancer.

The specific amounts of competitive funding and the number of grants awarded to each disease site are further broken down in Table 10 (following page).

Table 10. Amount of competitive funding and number of grants categorised by disease site

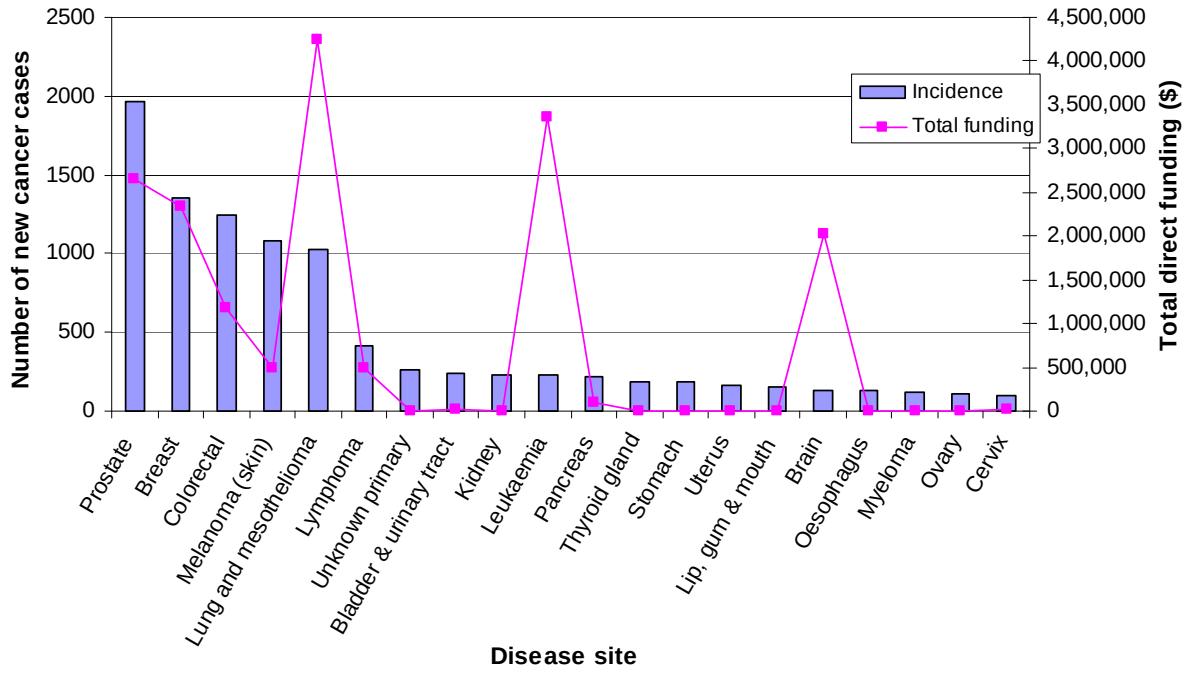
Disease site	Amount of competitive funding ($)	Proportion of competitive funding (%)	Number of competitive grants	Proportion of competitive grants (%)
Lung & mesothelioma	4,239,272	24	18	15
Leukaemia	3,369,434	19	21	17
Prostate	2,656,725	15	17	14
Breast	2,346,066	14	19	15
Brain	2,029,479	12	8	6
Colorectal	1,176,829	7	13	10
Melanoma	500,244	3	8	6
Non-Hodgkin's lymphoma	482,243	3	2	2
Liver	132,000	1	3	2
Non-melanoma skin	112,982	1	4	3
Multiple sites within same tumour stream	107,295	1	3	2
Pancreatic	98,975	1	3	2
Testicular	24,600	<1	1	1
Cervix	21,000	<1	1	1
Bladder	20,000	<1	1	1
Endometrial	5,000	<1	1	1
Oral cavity & lip	1,650	<1	1	1

As Figure 8 and Table 10 demonstrate, the greatest proportion of site-specific competitive funding was awarded to research into lung cancer and mesothelioma (24%), leukaemia (19%), prostate cancer (15%), breast cancer (14%), brain cancer (12%) and colorectal cancer (7%). Research into cancers of other sites all received less than $1 million in funding during 2008-2010.

The amount of site-specific funding allocated to different disease sites was then compared against the incidence and mortality rates of the twenty most common causes of cancer diagnoses and deaths in WA in 2008,[4] as well as the biggest contributors to potential years of life lost due (PYLL) to cancer in Australia in 2003.[5] Only an aggregated figure was available for the PYLL for lung cancer and mesothelioma; therefore the amounts of funding for projects investigating lung cancer and mesothelioma have also been combined into one figure.

Figure 9 (following page) shows the incidence rates of the twenty most frequently diagnosed cancers[4] plotted against the amount of competitive funding awarded to projects investigating cancer of these sites.

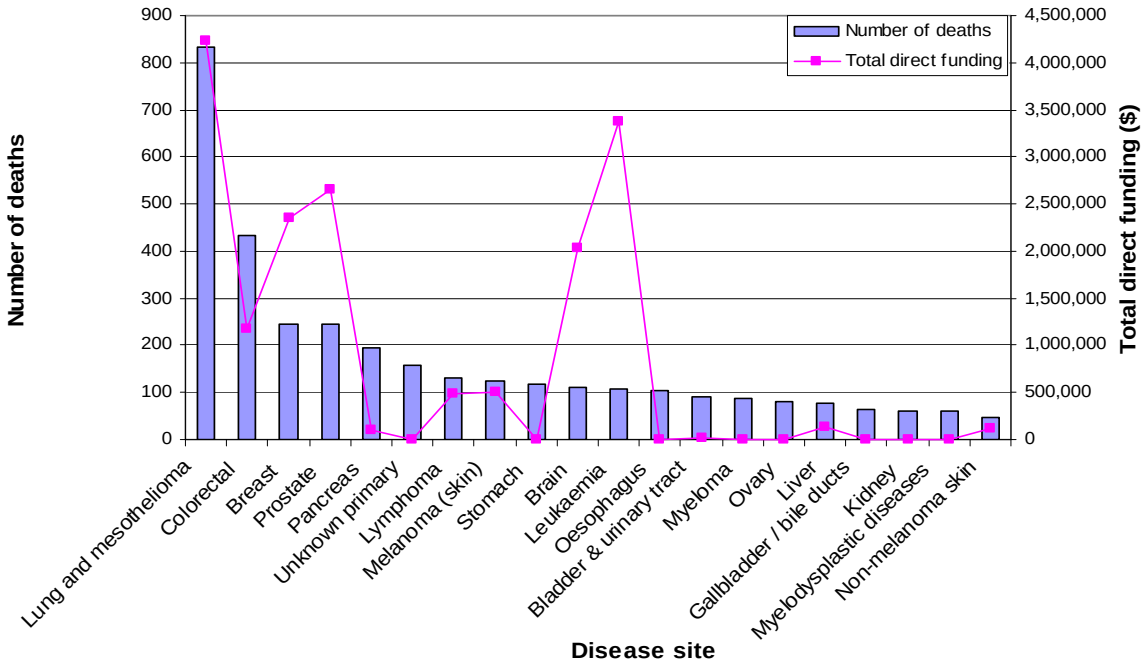
Figure 9. Incidence rates of the most frequent cancers compared to competitive funding awarded to each cancer type



As Figure 9 demonstrates, funding awarded to lung cancer and mesothelioma, leukaemia and brain cancer research for the duration of the audit period, is proportionally greater than its incidence when compared to other cancer types diagnosed in WA in 2008. The incidence of prostate, colorectal, and melanoma cancers were higher, however, these cancers proportionally received less funding when compared to the number of new cancer cases diagnosed in WA in 2008.

Figure 10, on the following page, plots mortality rates for the twenty most common causes of cancer death[4] against the amount of competitive funding awarded to projects investigating cancer of these sites.

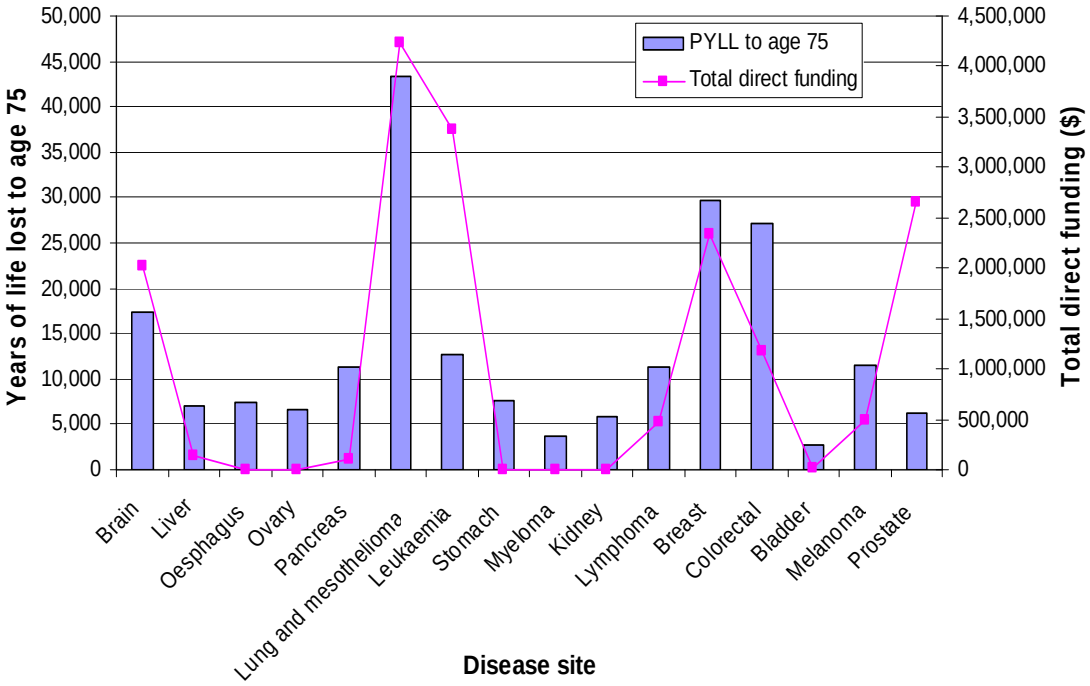
Figure 10. Mortality rates of the most common cancers compared to the amount to competitive funding awarded to each cancer type



As Figure 10 shows, colorectal, pancreas, and stomach cancers receive less competitive funding when compared to the number of deaths reported in WA in 2008. In contrast, breast, prostate, brain and leukaemia cancers receive more direct funding when compared to the number of cancer deaths in WA in 2008.

Figure 11 (on the following page), compares potential years of life lost (PYLL) for cancer specific sites in 2003[5] against the direct research funding received for each cancer site.

Figure 11. PYLL for cancer specific sites compared to the amount of competitive funding received



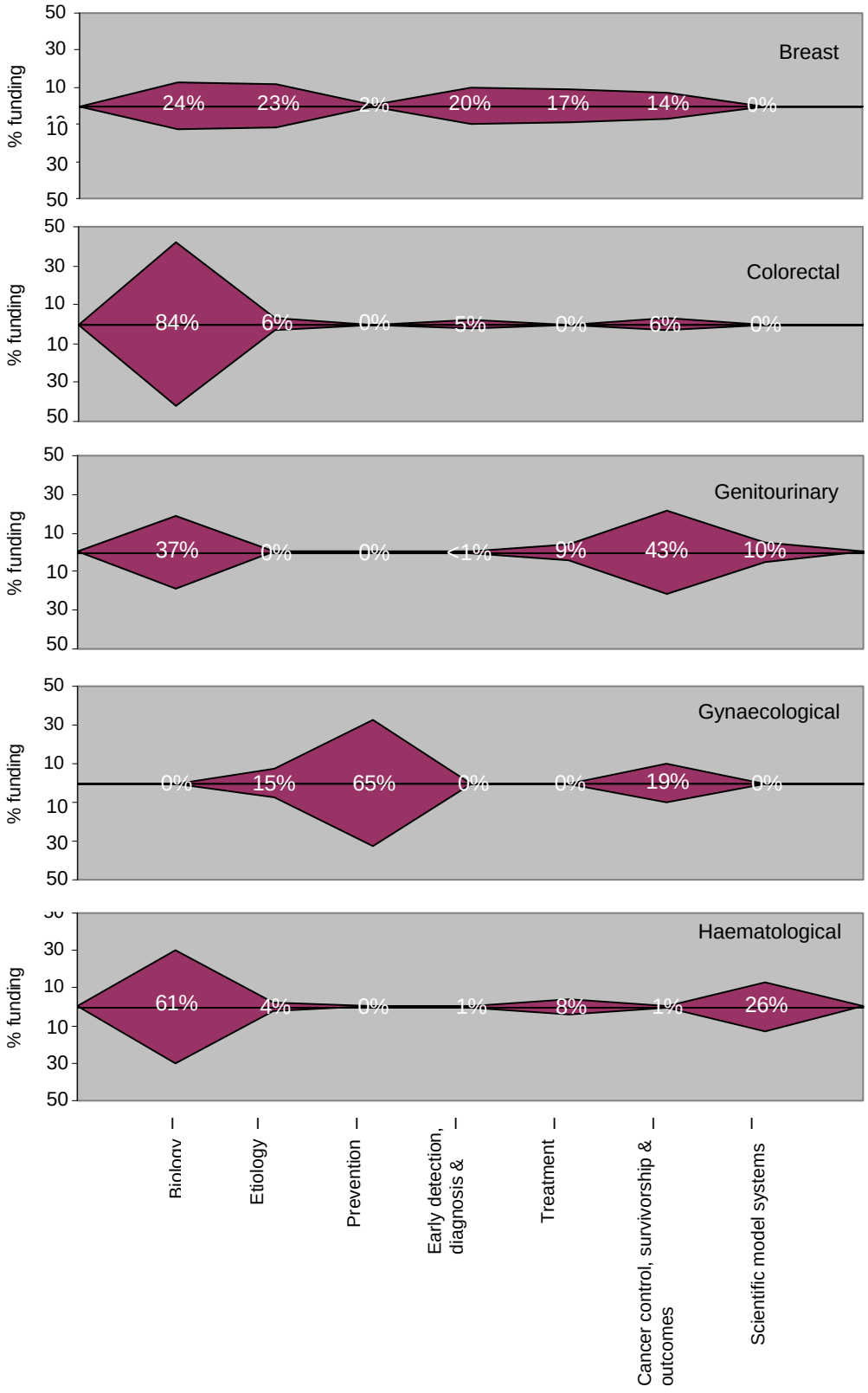
As shown in Figure 11, PYLL and the amount of direct funding for each cancer site are moderately correlated (r = 0.71). While prostate cancer is the most commonly diagnosed cancer (Figure 9), the large amount of funding awarded to prostate cancer research is relatively disproportionate to the PYLL due to prostate cancer. Leukaemia also received a relatively large proportion of cancer research funding compared to the incidence, mortality and PYLL associated with the disease. Myeloma and cancers of liver, oesophagus, ovary, pancreas, stomach and kidney are among the top twenty contributors of PYLL due to cancer, but received relatively low or no identified cancer research funding during the audit time frame.

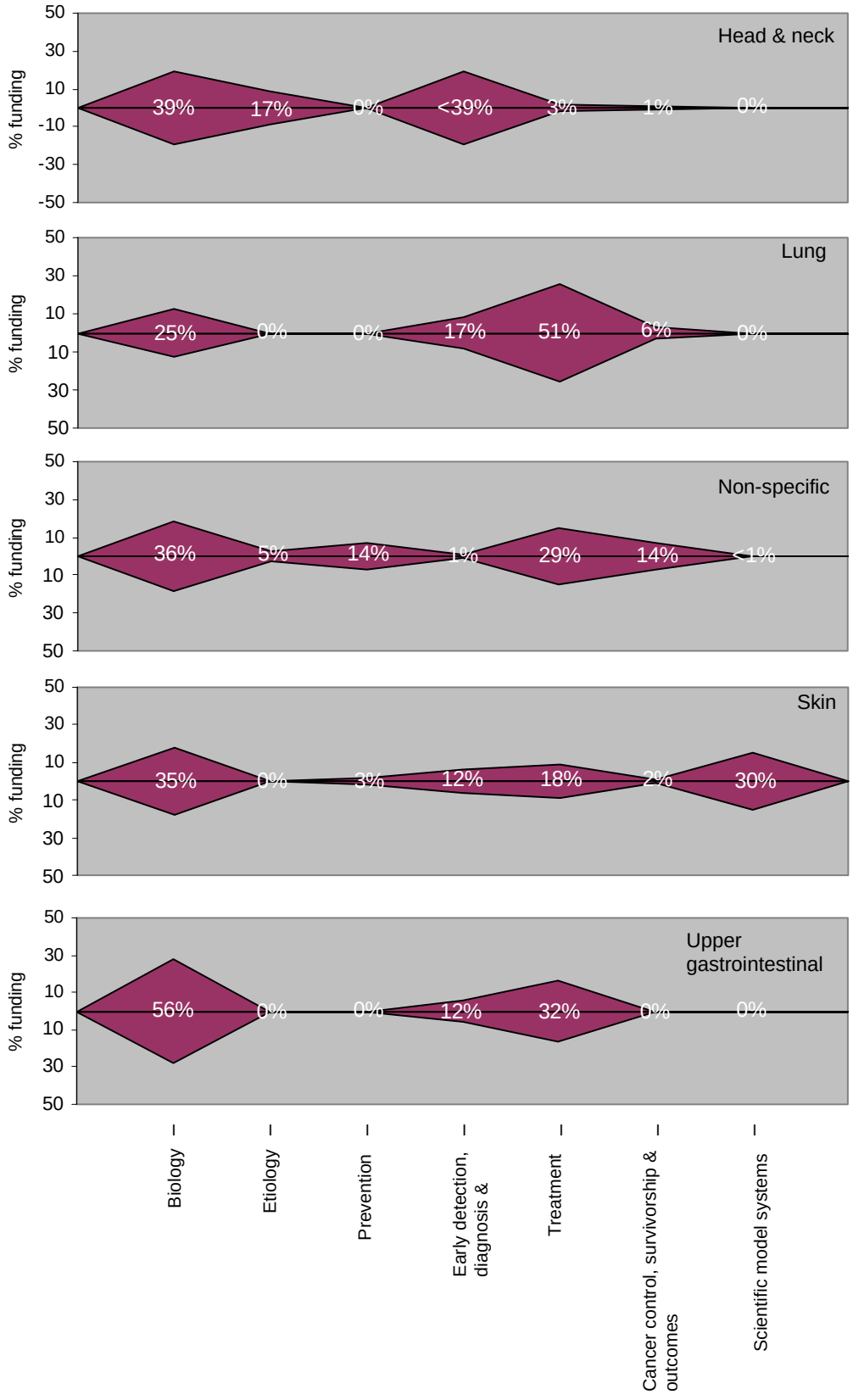
While the level of funding for lung cancer and mesothelioma appears proportionate to the PYLL caused by these cancers, separate figures for the PYLL caused by lung cancer and mesothelioma were not available. While mesothelioma usually has a poor prognosis, its incidence is relatively low; therefore it is possible that the proportion of funding that is awarded specifically to mesothelioma (included in the aggregated total directed funding amount for 'lung and mesothelioma') is disproportionate to the PYLL for this cancer.

4.2.5 Patterns of cancer research projects at specific tumour sites

The distribution of funding across the main CSO codes was plotted for each tumour stream (see Figure 12, on the following two pages).

Figure 12. Distribution of competitive funding across CSO categories for each tumour stream




Head & neck
% funding
50
30
10
-10
-30
-50
39%
17%
0%
<39%
3%
1%
0%
Lung
25%
0%
0%
17%
51%
6%
0%
Non-specific
36%
5%
14%
1%
29%
14%
<1%
Skin
35%
0%
3%
12%
18%
2%
30%
Upper gastrointestinal
56%
0%
0%
12%
32%
0%
0%
Biology
Etiology
Prevention
Early detection, diagnosis &
Treatment
Cancer control, survivorship & outcomes
Scientific model systems

As Figure 12 shows, the majority of Biology competitive funding is granted to basic science projects or projects that do not focus on a single disease site (i.e. the research is relevant to cancer of several different disease sites). Examples of these research projects include gene expression profiling and the functional role of mRNA in cancer. Haematology was the next most funded area in Biology, followed by Lung, Genitourinary, colorectal and head and neck cancers. Gynaecological cancers received no funding for biology related projects.

In terms of Prevention, most of the research projects were funded in the non-specified/ general cancer stream. This included research projects such as the role of green tea and alcohol in cancer prevention, and occupational health hazards. Other areas receiving competitive funding in the prevention areas included breast, gynaecological and skin. None of the other tumour streams received any funding in the area of prevention.

Breast cancer received the majority of competitive funding in the Etiology area, followed by non-specific/ general areas, head and neck cancers, haematology, colorectal and gynaecological cancers. All of the other tumour streams received no identified competitive funding for etiology focused research.

Head and neck cancers received the majority of competitive funding in the area of early detection, diagnosis and prognosis. This was followed by lung, breast, non specific/ general, skin, colorectal, haematological, upper gastrointestinal and genitourinary cancers. Gynaecological cancers were the only tumour stream to receive no competitive funding for projects focused on early detection, diagnosis and prognosis.

Within treatment focused research, the area to receive the most competitive funding was in the non specific/ general area. Examples of such projects include an investigation into anti-cancer drugs, and examining reasons for treatment delays in rural cancer patients. Lung cancers also received a large proportion of funding in this area. The other tumour streams received relatively small amounts of funding for treatment, with colorectal and gynaecological cancers reporting no funding for projects aimed at treatments.

Similarly to other areas, the area receiving the most competitive funding for projects focused at cancer control, survivorship and outcomes was research aimed at cancer of more than one or all sites (e.g. projects investigating grief, or factors associated with decision making in people with any type of cancer). Genitourinary cancers received the next largest amount of funding, followed by smaller amounts to breast and lunch cancers. All of the other tumour streams received minimal amounts of funding, apart from Upper GI cancers which received no funding for this area.

In terms of scientific models, haematological cancers received the most competitive funding for research projects in this area. This was followed by genitourinary and skin cancers. One grant was awarded to a project on a scientific model system which was not specific to any one cancer. Projects on scientific model systems were not identified for any further tumour streams.

4.3 Non-competitive funding

A total of 23 projects were identified as having received a non-competitive grant during 2008-2010, with the amount awarded ranging from $2,000 to $4 million. Two of these projects received more than one grant, resulting in a total of 25 identified grants being awarded to 23 projects.

Table 11 shows the total amount of non-competitive funding awarded during each calendar year.

Table 11. Annual non-competitive funding to cancer research projects in WA 2008-2010

Year	Total funding ($)
2008	3,781,278
2009	2,592,668
2010	922,001
Total	**7,295,947**

As explained in Section 2.5.3, the information gathered on non-competitive funding is unlikely to be complete and should therefore be interpreted with caution.

4.3.1 Source of funding

Figure 13 shows the reported non-competitive cancer research project grants as categorised by source of funding support.

Figure 13. Non-competitive funding to cancer research projects by funding source

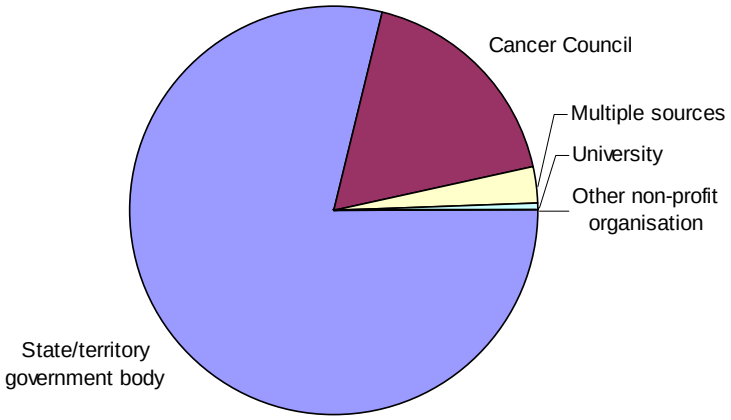


Figure 13 shows that the greatest amount of non competitive data came from State/ Territory/ Government bodies. Table 12 (below) further explains this and shows the breakdown of funding amount and number of grants across funding sources.

Table 12. Distribution of non-competitive funding and grants across funding sources

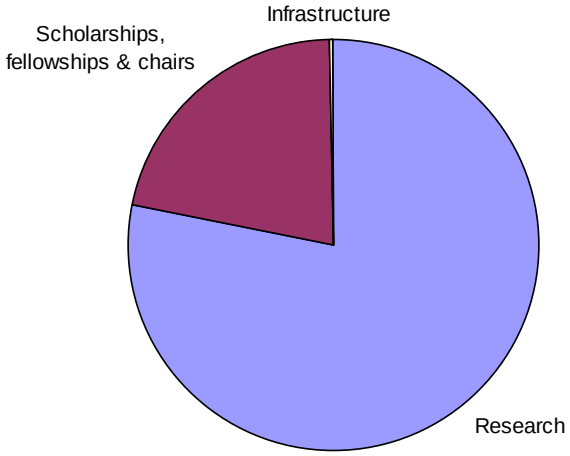
Funding source	Amount of non-competitive funding ($)	% of non-competitive funding	% of ALL funding	Number of non-competitive grants	% of non-competitive grants	% of ALL grants
State/territory government body	5,752,643	79	16	15	60	6
Cancer Council	1,292,500	18	4	5	20	2
Multiple sources	205,924	3	1	1	4	<1
University	35,334	<1	<1	2	8	1
Other non-profit organisation	9,545	<1	<1	2	8	1

As seen in Table 12, the majority of non-competitive grants (15 out of 25) were provided by WA state government bodies, accounting for $5.75 million of all identified funding. One of these projects, which involved the development of the Cancer and Palliative Care Research and Evaluation Unit (CaPCREU), was awarded $4 million dollars during 2008-2010, accounting for a significant portion of non-competitive funding awarded during this period. It should be noted that a significant proportion of this funding has been re-directed to competitive grants, via the small grants scheme and the clinical trials scheme. Furthermore, this funding represents a one-off payment which was the result of a pre-election funding commitment, and is unlikely to be repeated. Universities, Cancer Councils and other non-profit organisations contributed the remainder of the identified non-competitive funding.

4.3.2 Type of funding

Non-competitive grants were further categorised according to how the funds were used. Figure 14 shows a graphical representation of this breakdown.

Figure 14. Non- competitive funding classified according to how the funds were utilised.



As Figure 14 shows, non competitive funding was mainly spent on specific cancer research projects and schemes.

Table 13 provides a further breakdown of the areas non competitive funding monies were utilised for.

Table 13. Distribution of non-competitive funding based on how the funds were utilised.

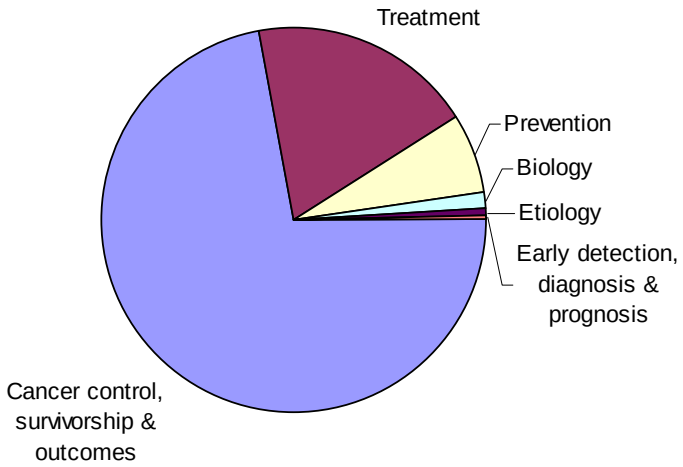
Use of funding	Amount of non-competitive funding ($)	Proportion of non-competitive funding (%)	Number of non-competitive grants	Proportion of non-competitive grants (%)
Research	5695514	78	21	84
Scholarships, fellowships & chairs	1570433	21	3	12
Infrastructure	30000	<1	1	4

As Table 13 shows, the proportion of total non competitive funds was allocated to general research ($5,695,514), infrastructure ($30,000) and scholarships, fellowships and chairs ($1,570,433). The majority of non-competitive funding was awarded to general research projects ($5.7 million). No non-competitive funding for equipment during the study period was identified.

4.3.3 Classification by Common Scientific Outline

Identified non competitive funded cancer research projects were classified into Common Scientific Outline (CSO) categories. The distribution of identified non-competitive funded cancer research projects across the seven major CSO categories is illustrated in Figure 12.

Figure 12. Non-competitive funding by main category of Common Scientific Outline (CSO)



As Figure 12 demonstrates, the majority of funding ($5,262,113) was allocated to Cancer Control, Survivorship and Outcomes. Scientific Model Systems received no non-competitive funding for the years 2008, 2009 and 2010.

A further breakdown showing the amount of funding and number of grants by CSO category is provided in Table 14.

Table 14. Distribution of non-competitive funding by main category of Common Scientific Outline (CSO)

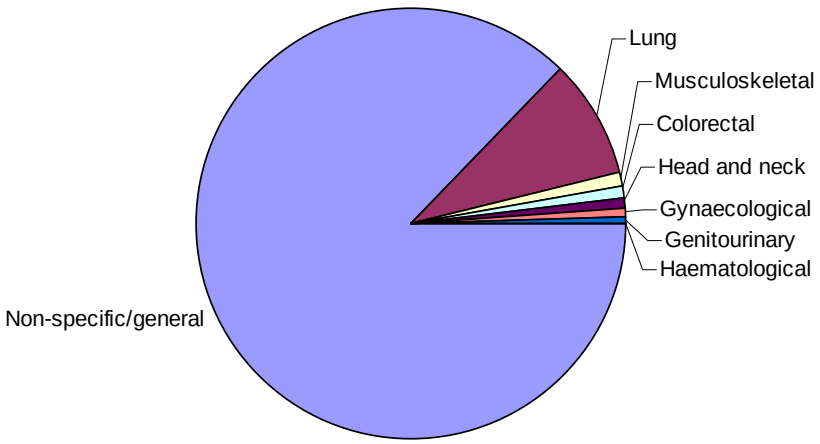
Common Scientific Outline	Amount of non-competitive funding ($)	Proportion of non-competitive funding (%)	Number of non-competitive grants	Proportion of non-competitive grants (%)
Cancer control, survivorship & outcomes	5262113	72	14	56
Treatment	1390000	19	3	12
Prevention	488500	7	4	16
Biology	92000	1	2	8
Etiology	33334	<1	1	4
Early detection, diagnosis & prognosis	30000	<1	1	4

Table 14 shows that Cancer, control, survivorship and outcomes focused research and treatment focused research received the most non competitive funding over the audit period.

4.3.4 Classification by tumour stream and disease site

Non-competitive funded projects were also classified according to the tumour stream that was the main focus of the projects, as shown in Figure 13 below.

Figure 13. Non-competitive funding across tumour streams



Similarly to the competitive funding results, Figure 13 shows that the largest proportion of non competitive funding was provided to support research in the non-specific/ general cancer areas.

The amount of funding and number of grants awarded to each tumour stream was also examined and is presented in Table 15.

Table 15. Distribution of non-competitive funding across tumour streams

Tumour stream	Amount of non-competitive funding ($)	Proportion of non-competitive funding (%)	Number of non-competitive grants	Proportion of non-competitive grants (%)
Non-specific/general	6364068	87	15	60
Lung	641000	9	2	8
Musculoskeletal	90000	1	1	4
Colorectal	66000	1	1	4
Head and neck	62000	1	2	8
Gynaecological	33334	<1	1	4
Genitourinary	30000	<1	1	4
Haematological	9545	<1	2	8

As Table 15 shows, eighty-seven percent of non-competitive funding was allocated to general cancer research that was not site-specific. Examples of such research include investigating outcomes for rural cancer patients, or the psychosocial needs of patients with various types of cancers.

The distribution of *site-specific* funding across disease sites is illustrated in Figure 14 below, and Table 16 (following page).

Figure 14. Non-competitive funding across site specific tumour types

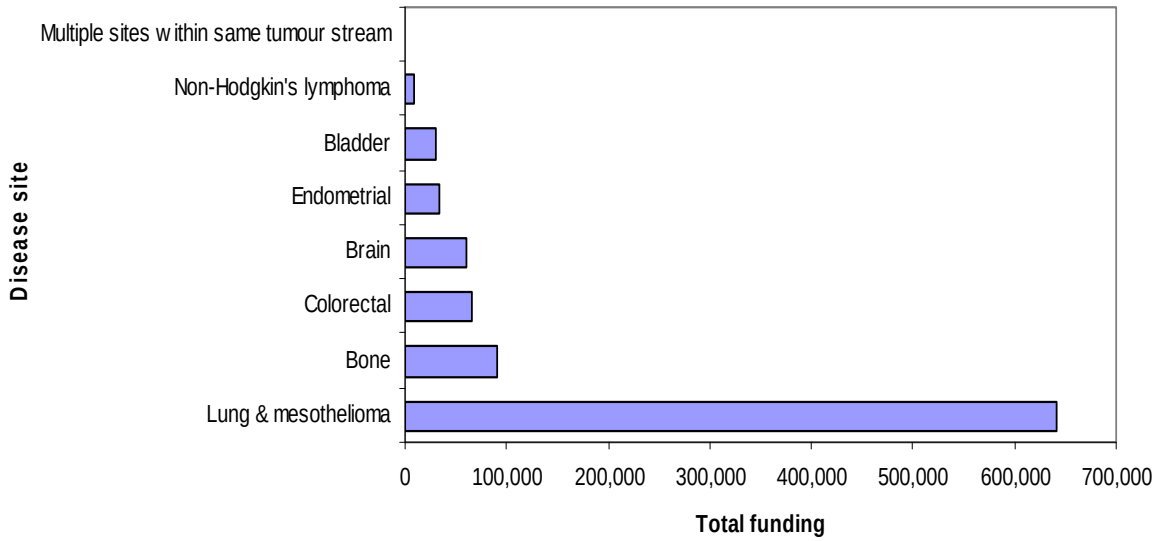


Figure 14 shows that most non competitive funding was awarded in lung cancer and mesothelioma, followed by bone, colorectal and brain cancers.

Table 16 shows a further breakdown of non competitive funding across the specific tumour types.

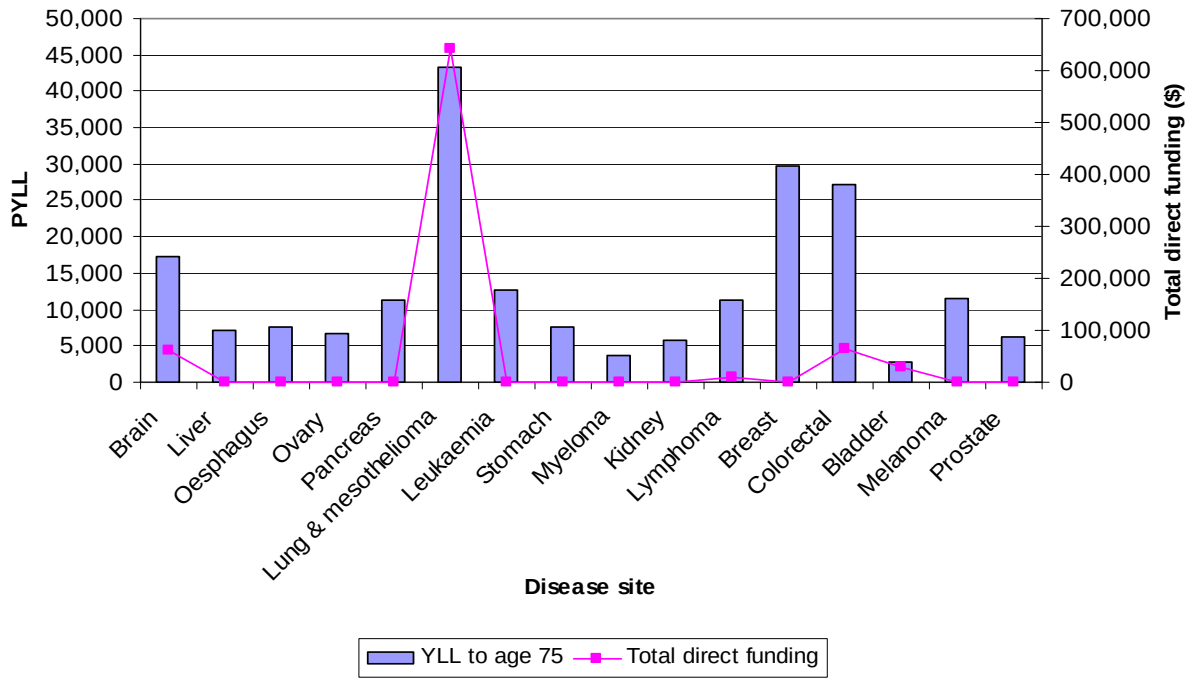
Table 16. Distribution of non-competitive funding across specific tumour types

Disease site	Amount of non-competitive funding ($)	Proportion of competitive funding ($)	Number of non-competitive grants	Proportion of non-competitive grants
Lung & mesothelioma	641,000.00	69	2	20
Bone	90,000.00	10	1	10
Colorectal	66,000.00	7	1	10
Brain	60,000.00	6	1	10
Endometrial	33,334.00	4	1	10
Bladder	30,000.00	3	1	10
Non-Hodgkin's lymphoma	9,545.00	1	2	20
Multiple sites within same tumour stream	2,000.00	<1	1	10
TOTAL	**931,879.00**	**100**	**10**	**100**

As Table 16 shows, the majority of non-competitive funding was for lung cancer and mesothelioma. However, only two grants made up this total and much of this funding was awarded in a single grant for research supporting mesothelioma research projects.

Figure 15 shows the potential years of life (PYLL) lost due to death from cancer of various disease sites in Australia in 2003, compared to the amount of non-competitive funding awarded to research in these areas.

Figure 15. PYLL for cancer specific sites compared to the amount of non-competitive funding received



As can be observed in Figure 15, the amount of funding allocated to each tumour type is moderately associated with the potential years of life lost due to these tumour types (r =

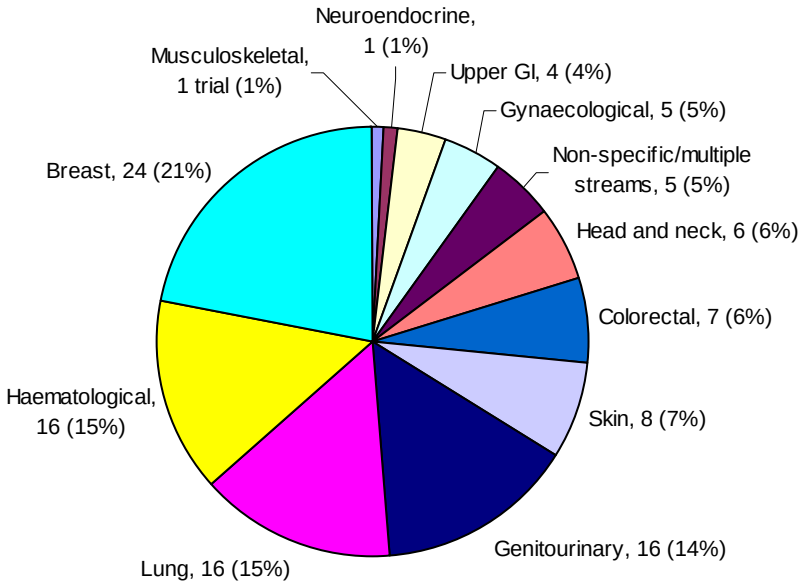
0.76). As acknowledged in Figure 11, separate estimates of the PYLL for lung cancer and mesothelioma were not available, so whether the level of funding for these two cancers was proportionate to their PYLL is not known.

4.4 Clinical trials

As of September 2010, there were 110 cancer clinical trials open in WA hospitals listed on the WA Cancer Clinical Trials Registry (WACCTR). More information can be obtained from: http://www.cancerwa.asn.au/patients/making-decisions-about-treatment/clinical-trials/.

The distribution of clinical trials across tumour streams can be seen in Figure 16.

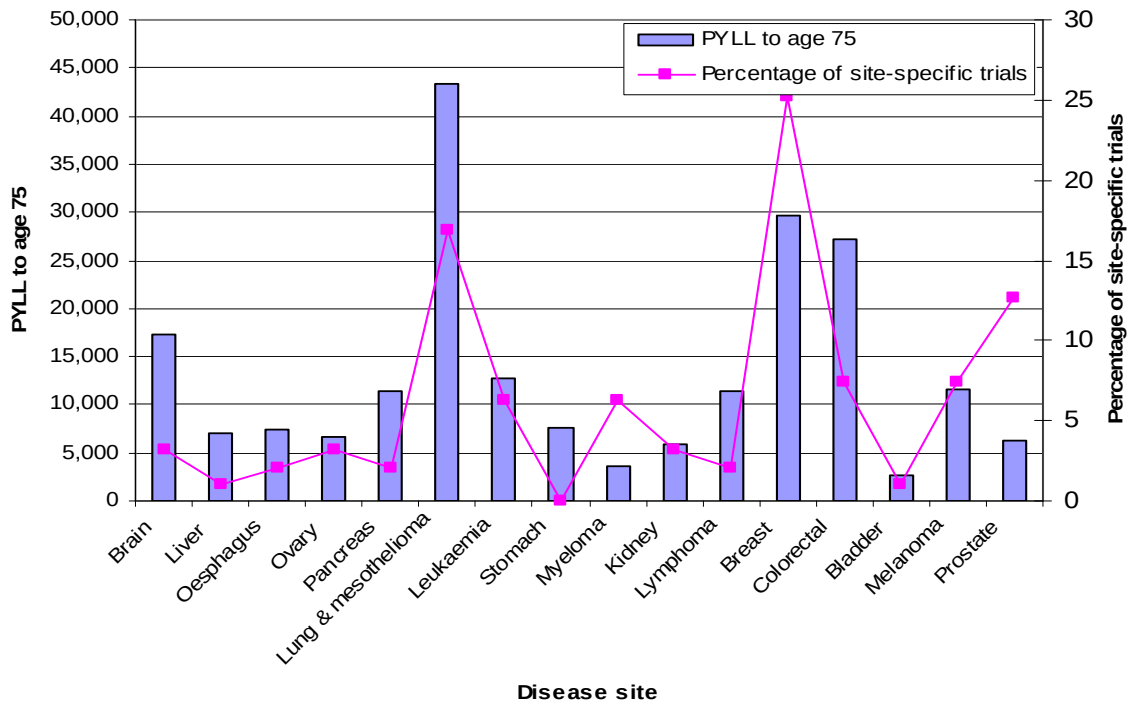
Figure 16. Number of trials (and percentage of total trials) conducted across tumour streams



As Figure 16 shows, the majority of clinical trials were in breast cancer (24), followed by haematological (16), lung and mesothelioma (16) and genitourinary cancers (16).

The number of currently open cancer clinical trials (as obtained from WACCTR) were categorised according to disease site and compared with the PYLL lost from the 16 leading causes of PYLL due to cancer in Australia (see Figure 17).

Figure 17. PYLL for cancer specific sites compared to the number of clinical trials currently open



As Figure 17 shows, the number of cancer clinical trials for each disease site was moderately correlated (0.70) with the PYLL due to cancer at each of these disease sites. Compared to PYLL due to cancer at that site, there was a relatively large proportion of clinical trials for prostate cancer, melanoma and breast cancer, and a relatively small proportion of trials for lymphoma, and brain, liver, pancreatic, stomach and colorectal cancers. As acknowledged in Figure 11s and 15, separate estimates of PYLL for lung cancer and mesothelioma were not available, so whether the level of funding for these two cancers was proportionate to their PYLL is not known.

5. Discussion

The results of this audit provide a snapshot of cancer research projects taking place in WA for the years 2008, 2009 and 2010. It is not known how many individual agencies fund cancer research in WA, consequently it is impossible to quantify the percentage of research projects and research funding agencies that were represented in this audit.

The methodology used, in terms of both a 'top down' and 'bottom up approach' aimed to encapsulate the majority of funding and research projects taking place in WA over the 3 year audit period. However, due to the very nature of this method, it is likely that not every research project or possible funding body is represented in this audit. This will be commented on in greater detail in Section 4.3 of this report.

There are some organisations and data which are not represented in this WA audit. Reasons behind this are multitude and include: reliance on individuals to provide us with details of their specific funded research projects; individuals and/ or organisations not carrying out or funding cancer research over the years 2008, 2009 and 2010; individuals/ organisations not being able to provide enough details of specific research projects; and projects or funding which did not directly and explicitly support cancer research.

However as all major funding organisations, including NHMRC, Cancer Council WA, ARC, and the Department of Health (DoH) SHRAC scheme contributed data to this audit, it is likely that this audit provides a robust and relatively broad picture of cancer research occurring in WA from 2008-2010.

5.1 Pattern of results

This audit identified direct funding to WA cancer research projects and programs totalling $34,605,536 for the years 2008-2010. The NHMRC and CC funded the majority of research over this time period, with a total of 63% of funding provided by these organisations. The bulk of funding was spent on specific research projects (92%), followed by scholarships, fellowships and chairs (7%).

The results of this audit tended to reflect the general findings of the national audit completed in 2005.[1] Within the current audit, biology received the most funding with 50% of competitive research funding allocated to this area. This is similar to the findings of the national audit, which identified 51% of funding provided to projects focusing primarily on cancer biology. Treatment was the next greatest funded area in both audits, with 13% of funding allocated to this area in the WA audit, compared to 19% shown in the national audit.[1] While scientific model systems was the area least likely to receive funding in both audits, WA received greater funding (5%) in this area, when compared to the national audit (1%). For all of the other CSO areas, there was only 1% of difference in funding between the national audit and WA audit, with the exception of cancer control, survivorship and outcomes research. In this area, WA received a slightly higher proportion of funding (12%) when compared to the national audit (9%).

The majority of cancer funding was allocated to cancers that could not be identified to a particular cancer site or tumour, or projects of a basic science nature. In terms of specific tumour groups, lung, haematological, genitourinary, breast and head and neck cancers received the majority of funding in WA over the audit time frame, when compared to other tumour groups.

The results comparing cancer incidence rates with cancer funding in each area, demonstrated that mesothelioma and lung, brain and leukaemia cancers all received larger amounts of funding than their incidence rates. Breast cancer was the only cancer that showing relatively matched rates of incidence and funding. The remaining cancer types received lower levels of funding than their cancer incidence rates. In terms of mortality, lymphomas and melanomas, and possibly mesothelioma and lung cancer, were all relatively well matched in terms of rates of mortality and the amount of funding allocated. Breast, prostate, brain and leukaemia received higher levels of funding than the mortality rates for each of these cancers. In general however, the pattern of funding by disease site did generally follow the level of burden of cancer by disease site.

In terms of PYLL, the WA audit results showed some differences when compared to the national audit results[1]. For example, in the WA audit, lung and mesothelioma cancers showed relatively matched funding when compared to PYLL. However, the national audit demonstrated the opposite direction, with PYLL far greater than the direct funding for these cancers. It is important to note here that one or two large million dollar grants in specific cancer areas awarded during the study period may have the potential to skew the results obtained.

Similarly to the national audit, prostate cancer received a higher direct funding amount than PYLL. When compared to PYLL, disease sites that appear to be overrepresented in cancer research funding include prostate cancer (in competitive grants and clinical trials), leukaemia

(in competitive grants) and breast cancer (in clinical trials). Areas that appear to be underrepresented in competitive grants are melanoma, liver, oesophagus, ovary, pancreas, stomach, kidney, and colorectal cancers.

The majority of funding identified in this audit came from the Australian government (NHMRC and ARC), CCWA and other charities. The WA state government does provide some funding, but it is mainly in the non-competitive arena and is therefore limited and non-recurrent. Whilst the state government rewards successful prominent researchers through the MHRIF scheme, it does not support smaller groups or developing researchers except through very small infrastructure grants.

The most recent Cancer Institute NSW report (2010)[6], reported a total of $25,461,693 of research funding committed in NSW for the calendar year 2009. This is in contrast to the $968,771 (3%) of total competitive funding that WA received from the State Government for 2008, 2009 & 2010. These findings may be a result of underreporting from WA researchers, who for example, may not have considered funding via the MHRIF as 'true' research funding. Moreover, the research workforce in terms of absolute numbers is far greater in the Eastern states with many researchers located in NSW, providing a further explanation for the skewed results. However state government support of cancer research in WA still falls well below that of a number of larger states such as NSW[6]

The NSW state government funded Cancer Institute carried out a study examining research funding across NSW from 2004-2006. However, similarly to the National Audit, this report was unable to accurately compare WA findings to NSW findings as the NSW study did not utilise the CSO classification scheme[1]. Therefore the distribution of funding allocated to specific tumour streams or CSO categories was not able to be compared between States.

In contrast to the competitive funding distribution, the WA state government funded 79% of the non competitive research projects identified for 2008, 2009, and 2010. Most of this was on general research (78%) and in the area of cancer control, survivorship and outcomes (72%). As previously mentioned, this was a one off funding agreement as a result of a pre election funding commitment. At present there are no further State commitments for additional funding. As non-competitive funding was not explicitly collected in the national audit, the investigators were unable to compare the WA findings with the distribution of non competitive funding nationally.

5.2 Clinical trials

Of the 110 clinical trials currently open in WA, 51% of clinical trials identified from the WACCTR were in breast cancer, haematological malignancies and lung cancers. Due to the very nature of clinical trials, it was impossible to obtain the required research information for every trial for the purposes of the audit. Some trials were multi-site in nature, others were funded per patient recruited, and others were confidential; these difficulties all made it unachievable to obtain specific funding figures. Moreover, the investigators were only able to obtain information on the clinical trials currently open in WA so were not able to provide an accurate snapshot of clinical trials for the specific audit period, 2008, 2009 and 2010. For most clinical trials conducted in WA, the coordinating institution responsible for the administration of clinical trial grants were located outside of WA. Consequently the nature of funding attracted by clinical trials research in WA is fundamentally different from that awarded to other types of research.

Whilst future research examining clinical trials data may still encounter these difficulties, it may be helpful to focus on aspects of the data which can be more easily collected, such as the percentage of people diagnosed with cancer who are enrolled in a CT.

5.3 Limitations

The major limitation of this report is the reliance on individual researchers to provide us with their research data. The response rate to our initial call for information was only 32% however it is possible that a large proportion of those contacted did not reply because they were not actively involved in cancer research in WA during 2008-2010. The response rate may also reflect the demands on researchers' already limited time. It would take time for researchers to provide us with their data, and as there was no major incentive to participate, it may have not been a priority for individuals to return details of their projects in the data collection time frame. Consequently it is likely that the audit is missing data from smaller funding agencies, as the investigators were unable to obtain data from every possible funding organisation. Whilst this is likely to have occurred, the investigators did find evidence of saturation, with research project duplicates occurring in the data set towards the end of the data collection period.

The audit represents a large amount of data from the major funding agencies; whilst this is perceived as a strength of the audit it may also be considered a weakness. Smaller funding organisations are likely to be under-represented. As major cancer funders such as the NHMRC tend to fund a larger amount of biology based research projects, it may be that other CSO areas, such as cancer control, survivorship and outcomes are under-represented, whilst the biology areas may be over-represented.

Due to the lack of specific details obtained from individual researchers and organisations, and the difficulties inherent in finding information on collaborators from funding bodies' datasets, no information on collaborators was included in the audit results. This is a key flaw of this audit, as information is lacking on the type of collaboration WA researchers are involved in. For example, from the data collected, we were unable to ascertain if WA researchers are collaborating within the same institutions, same area, same state, inter-state or internationally. However, the National Audit completed in 2005 found that the vast majority of collaborations were carried out within the same institutions, city and states.[1] One could assume that similar collaborations would still be apparent within research funding from 2008-2010. Any future WA audits should attempt to capture details of specific research collaborations to accurately portray collaboration amongst cancer researchers.

As alluded to earlier, it is possible that the number of grants and amount of funding awarded for infrastructure, equipment, and scholarships, fellowships and chairs is higher than the results presented within this audit. Researchers may have been less likely to consider such funding as 'research funding' and consequently not report this type of funding for inclusion within this audit. Any future WA audits should make this distinction clear to researchers at the outset, so any data collected may accurately reflect funding obtained for infrastructure, equipment, and scholarships, fellowships and chairs.

6. Conclusions

In total, this audit identified direct funding to WA cancer research projects and programs of $34,605,536 for the years 2008, 2009 and 2010. Taking into consideration the limitations outlined in this report, this audit identified $11,060,591 of funding for 2008, $12,167,685 for 2009 and $11,432,260 for 2010. This funding supported a total of 240 individual research projects.

The majority of funding was provided by the NHMRC and CCWA for competitive funding, with only 3% by the WA State government. However the WA State government have supported some non-competitive cancer research grants, some of which has been re-

directed as competitive funding. This type of funding however is largely awarded on a “one-off” basis and thus needs a framework to be sustainable.

The pattern of funding areas as identified by the CSO classification codes generally reflected the same patterns as those demonstrated in the Cancer Australia national audit. Whilst funding was provided across the continuum of cancer control, the largest majority of funding was provided for biology and treatment related projects.

In general terms, there was funding investment in most cancers of the highest burden for the Australian population in terms of incidence, mortality and person years of life lost (PYLL). However, melanoma, liver, oesophagus, ovary, pancreas, stomach, kidney, and colorectal cancers tended to be underrepresented when these outcomes were compared with the amount of funding allocated to each cancer.

7. References

1. Cancer Australia. Cancer research in Australia: An overview of cancer research projects and research programs in Australia 2003 to 2005. Canberra; 2007. http://www.canceraustralia.gov.au/media/files/ca/publications/national_audit_of_cancer_research_projects_and_research_programs.pdf
2. International Cancer Research Portfolio (ICRP). The Common Scientific Outline. 2006 [updated Jan 2006, cited 8 June 2010]; Available from: http://www.cancerportfolio.org/cso.jsp.
3. Australian New Zealand Clinical Trials Registry (ANZCTR) [database on the internet]. Sydney (NSW): The University of Sydney (Australia); 2005 [cited 2010 November 4]. Available from http://www.anzctr.org.au].
4. Threlfall TJ & Thompson, JR. Cancer incidence and mortality in Western Australia, 2008. Statistical Series Number 87. Department of Health, Western Australia, Perth: 2010
5. Cancer Australia and Cancer Council Australia. Review of national cancer control activity in Australia. Cancer Australia, Canberra: 2010.
6. Cancer Institute. NSW Cancer Research Achievements Report. 2010

8. Appendices

Appendix 1

Dear

The Cancer and Palliative Care Research and Evaluation Unit (CaPCREU) is conducting an audit of cancer research undertaken in WA during the period 2008-2010. This audit has been commissioned by the Cancer Council Western Australia and the Western Australian Cancer and Palliative Care Network with the aim of identifying gaps in current cancer research and research funding in WA. The audit will inform the State Cancer Control Plan, as well as the funding policies and priorities of funding bodies, and help ensure WA cancer researchers are included in future funding opportunities.

We would like to know the best way to go about collecting this information for funded cancer research projects administered through (*institution name)* during 2008-2010. We have created a template in which individual researchers can input the required information and email back to us (see the table below). We are happy to contact researchers at (*institution name*) with our request directly, or for you to forward on our behalf our email to those you know are involved in cancer research. Alternatively, University research offices, including UWA and Curtin, have forwarded us the required information from their organisational database of research. Please let us know of your preference, or if you have any other suggestions for how we may best collect this information.

We would like to obtain information for all cancer research projects that received funding for any of the calendar years 2008, 2009 and 2010, and were conducted in Western Australia. We are interested in a broad range of cancer topics, including risk factors, prevention, biology and aetiology, early detection, diagnosis and prognosis, treatment, cancer control, survivorship and outcomes, and health services. The information collected will be minimal (i.e. project title/topic, collaborators, administering institutions, funding source period of funding, and total amount of funding) and will be kept strictly confidential. No identifying information will be published or disseminated to anyone, including the sponsors of this project. Data included in the audit report will be de-identified and in aggregated form, and will not report on individual projects.

If there is someone else I should be in contact with regarding this request, I would appreciate if you could forward me their details so I can contact them instead.

If you have any queries please do not hesitate to contact me on 9346 3727 or at nicole.shirazee@uwa.edu.au

Thank you for your time,

Kind regards,

Nicole Shirazee & Toni Musiello
Cancer and Palliative Care Research and Evaluation Unit (CaPCREU)
The University of Western Australia
School of Surgery, M507
Location I Level 2, M Block, QE11 Medical Centre, Nedlands WA 6009
Postal I M507, 35 Stirling Hwy, Crawley WA 6009

Appendix 2

Dear _____,

The Cancer and Palliative Care Research and Evaluation Unit (CaPCREU) is conducting an **audit of cancer research undertaken in WA during the period 2008-2010.** This project is funded by the Cancer Council Western Australia and the WA Cancer and Palliative Care Network. Professor Christobel Saunders is the lead CI on this project.

We believe that the information collected in this audit will be extremely important as it will be used to identify gaps in current cancer research, raise the profile of WA researchers for future funding opportunities, and inform a WA State Cancer Control Plan. We consider that this information is of broad interest and we would like to be able to keep the data on file for future use. If you object to this please let us know and we will remove your information once the study is complete. Please note that ONLY summary data will be presented in the project reports and therefore no individual information will be disseminated.

If you have been involved in cancer research that received funding for the calendar years 2008, 2009 or 2010, we would be grateful if you could provide us with some basic information on this research. There are 2 ways to do this: either complete the table in the email below or in the attached document (one table for each of your relevant research studies) and send back to us via return email; or alternatively you can email us your CV or list of grants.

If you prefer to provide this information over the phone or in person, please reply with your phone number and availability and we will call at a time that suits you.

Please forward this email on to anyone you know who conducts cancer research in WA and should therefore be included in the audit.

For further details on the audit please see the attached information sheet.

Kind regards,

Nicole Shirazee & Toni Musiello

Cancer and Palliative Care Research and Evaluation Unit (CaPCREU)
The University of Western Australia
School of Surgery, M507
Location I Level 2, M Block, QE11 Medical Centre, Nedlands WA 6009
Postal I M507, 35 Stirling Hwy, Crawley WA 6009

Appendix 3

Title of project
Name of lead researcher
Collaborators were (tick all that apply): From the same institution From another institution in WA National International
Project topic (tick the ONE that is most applicable): Biology Etiology Prevention Treatment Early detection, diagnosis and prognosis Cancer control, survivorship & outcomes Scientific model systems
Main disease/tumour sites studied
Host/administering/principal institution
Total amount of funding
Amount of funding allocated to each year 2008: 2009: 2010:
Source of funding
Type of funding received (tick the ONE that is most applicable): Research grants/funding Tenders Non-competitive funding Infrastructure funding Equipment funding Training & people support (ie scholarships & fellowships)