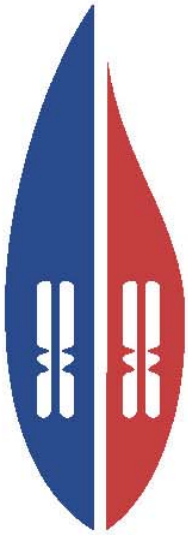
CANCER RESEARCH IN AUSTRALIA –

A survey of cancer researchers

A report by the
National Cancer Control Initiative's
Cancer Research Review
Working Group



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PREFACE

Progress in cancer research requires creativity, wisdom, money, hard work, and the cooperation of patients. But success in lifting the burden of cancer from the Australian people requires something more. In the last thirty years, we have made tremendous strides in our understanding of the molecular events that trigger cancer and that shape the course of the disease; and there have been significant advances in prevention, detection, diagnosis, and treatment. Yet all of us involved in cancer research know that there is still plenty to learn and to put into practice. What will it take for us to accelerate eradication of this disease?

Cancer research in Australia is constrained by a number of systemic problems. Take funding, for example. Research in cancer in this country is funded by a large number of charities, the State Cancer Councils, the National Health and Medical Research Council, and others. The total amount of funding is unknown, as is the distribution of funding across the various disciplines and specialties that comprise the spectrum of cancer research. Direct spending is distributed through a largely uncoordinated network of project and program grants, enabling grants, scholarships and so on. Indirect spending on infrastructure, support services and laboratory equipment comes from a different set of agencies, including various branches of federal departments, universities, hospital budgets and state governments. Inevitably, the resulting patchwork of support and spending leaves significant gaps and creates unnecessary overlaps. More significantly, however, there is no coordination, no plan, no specific goals, no timelines, and no measures of outcome to assess and guide our inroads into the disease.

With these challenges in mind, the National Cancer Control Initiative in 2001 began a process of looking critically at the field of cancer research that could ultimately lead to a strategic plan that would increase our chances of achieving pivotal advances in knowledge and in benefits for patients and those at risk for cancer. This report marks the end of the first stage in this process. The report leads to recommendations for ways to collect much better data on ongoing cancer research in Australia, to create a mechanism for coordination and sharing of funding between federal, state and other funders, and to provide a platform for the development of more detailed strategic plans for each of the discrete forms of cancer and for each section of the cancer continuum.

Thirty or more years of solid research lie behind us. Ahead of us is an unprecedented opportunity to eradicate cancer by translating a wealth of scientific discovery into new treatments and preventive strategies. We believe the recommendations of this report are both overdue and necessary if we are to achieve the significant reductions in cancer incidence and mortality that now lie elusively beyond our grasp.

Professor Joe Sambrook, Ph.D., FAA., FRS.

Chair, National Cancer Control Initiative's Cancer Research Review Working Group

SUMMARY

To determine the current scope and funding of cancer research, to identify potential strategies for the future of funding cancer research and to assess the need for a national strategy for cancer research, a questionnaire was mailed to researchers listed on the National Panel of Cancer Research Assessors' Database in April 2001. Responses were received from 471 eligible persons (42% response rate). The responding researchers were classified according to the amount of time they spent in particular areas of cancer research as laboratory scientists, clinical researchers, public health researchers or mixed researchers. The attitudes and responses of the different groups were then analysed and compared.

Results at a glance

Profile of respondents

- Respondents were classified as working predominantly in laboratory studies (n=190), clinical research (n=114), public health (n=57), or in two or three of these areas (n=71).
- Two thirds of respondents were principal investigators, chief investigators or of equivalent status.
- The main goals in their own research were: understanding cancer biology and mechanisms for laboratory scientists and mixed researchers; developing effective therapeutic regimes for clinical researchers; and developing effective preventive strategies for public health researchers.
- Over half the respondents' salaries were funded by universities or hospitals, whilst the National Health and Medical Research Council (NHMRC) and cancer charities together funded about 21% of salaries.

Collaborations

- Clinical, public health, and mixed researchers spent the majority of their time on work involving collaboration with others, while laboratory researchers spent about a third of their time in collaborative work.

Infrastructure and research

- The researchers' opinions regarding the relative importance of different types of infrastructure were similar whether applied to their own research or to the 'ideal' research to reduce the impact and frequency of cancer in Australia.
- Access to platform technologies, bioinformatics, tissue banks, data managers, statistical services, and access to and linkage of clinical cancer registries and records could be improved.
- Access to general animal care facilities and genetically modified animal colonies was adequate.

Patents and publications

- An average of 0.6 patents per respondent was filed in the five-year period between 1996 to 2001.
- Laboratory scientists, clinical researchers, public health researchers and mixed researchers published an average of 8, 8, 7, and 12 papers per researcher respectively in the three years between 1998-2000.
- Many papers published were not specific to any cancer site. Of the site-specific publications, the greatest number were in the area of breast cancer.

Funding

- There was strong support among researchers that a proportion of research funds should be reserved for investigator-initiated research, and also strong support that a proportion should be reserved for priority-driven research.
- All groups of researchers agreed that different funding bodies should work together and use a single mechanism to review and co-fund grants and awards.
- Researchers were asked their perception of the distribution of research funds amongst different areas of cancer research, and what this distribution should be if the overall aim was to reduce the impact and frequency of cancer in Australia. The researchers' perceptions and their opinions of the optimal allocation were similar. However, the actual funding distribution differed substantially from this perceived distribution.

Prioritisation of research

- All groups of researchers agreed that areas of cancer research where Australia is internationally competitive should have a high priority. However, there was little support for assigning a lower priority to research on cancers for which there are already effective preventive or therapeutic measures.

Strategies for sustainably reducing the frequency and impact of cancer in Australia

- All groups of researchers supported the idea of:
  - a national policy for cancer research
  - improving infrastructure for both basic and clinical research
  - improving coordination between different funding partners
  - encouraging multicentre research
  - developing methods to ensure cancer diagnosis and treatment are based on the best available evidence
  - improving community understanding of research

INTRODUCTION

Research underpins the prevention and treatment of disease. Given the extensive range of research endeavours and the large number of investigators and institutions that seek funding for their research, it may be prudent to have a strategic plan for funding cancer research.

Australia has no national cancer research strategy. There is no formal prioritisation of research and there is limited collaboration between the funding bodies in the process of reviewing and funding grants. Cancer research is currently funded by a variety of sources including international, federal and state, government and non-government, commercial and non-commercial organisations, and institutional block funding.

A substantive sample of cancer researchers in Australia was surveyed to determine the current scope and funding of cancer research and to solicit opinions on prioritisation of research, funding of grants and strategies for reducing the frequency and impact of cancer in Australia. This study was undertaken under the auspices of the National Cancer Control Initiative (NCCI) and was overseen by the NCCI's Cancer Research Review Working Group (Appendix 1).

METHODS

Members of the National Panel of Cancer Research Assessors' Database were considered to be a representative group of people involved in cancer research. The Research Assessors' Database comprises about 2000 scientific and medical experts, including individuals from block-funded institutes, who have agreed to review cancer research grants submitted to the Cancer Councils in Australia. The database is managed by The Cancer Council Victoria on behalf of The Cancer Council Australia.

In March 2001 an introductory letter explaining the purpose of the questionnaire was sent prior to disseminating the questionnaire. The questionnaire (Appendix 2) was designed and sent to 1337 people at the beginning of April 2001 and respondents were given over four weeks to complete the questionnaire. After two weeks a letter was sent to remind people to complete and return the questionnaire.

Analysis of results was performed on SPSS software (Version 10.0; SPSS, Inc, Chicago, IL). Ordered categorical variables were analysed using a Spearman's rho when the data was not normally distributed. A comparison of the percentage of funds provided by commercial organisations to each of the different research groups and the importance of views of different stakeholders when awarding research grants were analysed in this manner. A bivariate correlation analysis was also undertaken to determine whether the importance respondents placed on infrastructure in their own research influenced the importance rating they gave to different types of infrastructure if the aim was to reduce the impact and frequency of cancer in Australia. A Spearman's rho was once again used to measure the association between rank orders. A correlation was considered to be significant at $p < 0.05$ unless otherwise stated.

The χ^2 test was used to test for significant differences between research groups in the importance placed on different types of infrastructure and on the percentage of research that was undertaken as part of formal collaborations within the state, outside the state and internationally. The χ^2 test was also used to determine significant differences in researchers' opinions on whether a single mechanism should be used to review and co-fund different types of grants and awards. $p< 0.05$ was accepted as the level of statistical significance.

Each research grant awarded by the NHMRC and Cancer Councils in 2003 was grouped based on the grant title into the areas of (1) molecular biology, genetics, biochemistry, cell biology, (2) immunology, (3) microbiology, (4) cancer epidemiology, (5) tumour diagnosis, (6) therapy, (7) pharmacology, (8) clinical trials, (9) other clinical research, (10) psychology/behavioural, (11) health services research or (12) other research area. This grouping was used to compare researchers' perception of how much funding was allocated to the different areas of research compared to the actual allocation by the NHMRC and Cancer Councils in 2003.

RESULTS

All researchers involved in cancer research in Australia were not surveyed, however, the survey group was considered to be a representative sample of cancer researchers in this country. Of the 1337 questionnaires sent out, 203 were returned due to changed addresses or people no longer working in cancer research. From the 1134 eligible contacts, 471 completed surveys were returned, giving a response rate of 42%.

Researchers' characteristics

Profile of respondents

Responses were received from every state and territory in Australia and from researchers holding a variety of positions. Over 60% of respondents held senior positions such as senior research fellow, senior principal research fellow, senior lecturer, reader or associate professor, professor and director.

Less then one percent (n=3) of respondents were not currently involved in research and six percent (n=28) did not work in research directly related to cancer. One hundred and forty one (30%) respondents spent more than 50% of their time in research directly related to cancer. In contrast, 216 respondents (46%) spent between 1-20% of their time undertaking cancer related research. The respondents who were not involved in cancer research or who did not answer the question relating to research involvement were excluded from further analysis (n=32). The remaining 439 respondents were classified as laboratory scientists, clinical, public health, or mixed researchers. The classification of laboratory scientist was given to respondents who spent over 70% of their research time in the fields of molecular biology, genetics, biochemistry, cell biology, immunology or microbiology. Similarly, respondents were classified as clinical researchers if they spent over 70% of their research time in tumour diagnosis and progression, therapy, pharmacology, clinical trials or other clinical research. Public health researchers were likewise defined as respondents who spent over 70% of their research time in cancer epidemiology and public health, psychology or health services research related to cancer.

Mixed researchers were those respondents who were involved in several fields of cancer research and spent less than 70% of their time in one particular field. The amount of time spent in cancer research was unable to be determined for seven respondents and they were excluded from further analysis. In total, 432 respondents were grouped into the four categories. Under this classification system 190, 114, 57 and 71 respondents were classified as laboratory scientists, clinical researchers, public health and mixed researchers respectively. Table 1 shows the amount of time these groups of researchers spent in different areas of research.

Table 1 *Time spent in different areas of cancer research*

	Laboratory scientist (n=190)	Clinical researcher (n=114)	Public health researcher (n=57)	Mixed researcher (n=71)	Total All cancer researchers (n=432)
General Area	*Average amount of time spent in each area (%)*				
Molecular biology, Genetics, Biochemistry, Cell biology	76	2	0.2	30	39
Clinical trials	0.7	36	2	15	13
Immunology	17	0.6	0.1	7	9
Cancer epidemiology and Public health	0.6	2	46	9	8
Tumour diagnosis or progression	2	16	0.4	12	7
Therapy	1	16	0.2	6	6
Other clinical research	0.2	14	0.4	3	5
Psychology	0	0.8	21	4	4
Health services related to cancer	0	0.3	24	3	4
Pharmacology	0.6	5	0.3	3	2
Microbiology	0.7	0.1	0	0.6	0.4
Other area	2	6.4	5.5	6.8	4.4

Two-thirds of respondents were named as principal investigator (PI), chief investigator (CI) or equivalent status in a block-funded institute, on grants related to cancer and administered at their own place of work in Australia. Specifically, 74% of laboratory scientists, 56% of clinical researchers, 63% of public health researchers and 81% of mixed researchers were named as PI or CI on grants administered in their own workplace. In comparison, only 12% of laboratory scientists, 19% of clinical researchers, 29% of public health researchers and 26% of mixed researchers were named as PI or CI on a currently funded grant that was administered in Australia at a workplace other than their own.

Fifteen percent of laboratory scientists, 19% of clinical researchers, 18% of public health researchers and 20% of mixed researchers held grants that were administered overseas and on which they were named as a PI or CI. Overall, respondents were named as PI or CI on an average of 1.5 grants per respondent (range 0-15), 0.2 grants per respondent (range 0-10) and 0.3 grants per respondent (range 0-20) at their own workplace, at a workplace other than their own in Australia and overseas respectively.

Funding

Eighty respondents (19%) held a fellowship or award that provided salary support. Over half of the respondents (n=255) had most of their salaries funded by either universities or hospitals. Moreover, nearly 80% of researchers' salaries were derived from sources other than the NHMRC and cancer charities, who were responsible for funding 18% and 3% of salaries respectively.

The average total amount of funding awarded to principal or chief investigators for research grants related to cancer for the three years 1998, 1999 and 2000 combined, was $392 000, $219 000, $423 000 and $476 000 per laboratory scientists, clinical researchers, public health researchers, and mixed researchers respectively. Table 2 shows the percentage of these research funds received from the different funding sources. Laboratory scientists and public health researchers predominantly received funding from the NHMRC and Cancer Councils. Overall, 52% of research funds in 1998, 1999 and 2000 were provided by the NHMRC and Cancer Councils.

Table 2 *Percentage of funds received from different funding bodies in 1998, 1999 and 2000*

	Laboratory scientist (n=158)	Clinical researcher (n=75)	Public health researcher (n=36)	Mixed researcher (n=64)	Total All cancer researchers (n=333)
Funding source	*Total money received (%)*				
NHMRC	42	16	33	26	32
Cancer Councils	22	17	17	20	20
Institutional funds (including block funding)	11	19	8	13	13
Commercial organisations	5	26	3	12	11
Other cancer organisations and charities	7	4	9	12	8
Overseas granting agencies	9	6	7	7	8
Government contracts	0.1	5	16	3	3
Other	5	7	8	6	6

The percentage of funding which is derived from commercial organisations is presented in Table 3. A significantly greater percentage of clinical researchers and mixed researchers received financial support from commercial organisations than did laboratory scientists and public health researchers. Of the researchers who responded to this question, 74% of laboratory scientists and 83% of public health researchers did not receive any funding from commercial organisations. Sixty-one percent of clinical researchers and 51% of mixed researchers received some of their funding from commercial organisations. In particular, 34% of clinical researchers received between 41% and 100% of their funding from commercial organisations compared to only 16% of mixed researchers.

Table 3 *Percentage of funding derived from commercial organisations*

	Laboratory scientist (n=189)	Clinical researcher (n=114)	Public health researcher (n=57)	Mixed researcher (n=71)	Total All cancer researchers (n=431)
% of funding derived from commercial organisations			*Respondents (%)*		
0%	74	39	83	49	62
1-20%	18	18	14	25	19
21-40%	3	10	0	9	5
41-60%	3	18	0	11	8
61-80%	2	11	0	4	4
81-100%	1	5	4	1	3

Collaborations

Overall, clinical researchers, public health researchers, mixed researchers and laboratory scientists spent, respectively, 68%, 62%, 57% and 34%, of their research time on intrastate, interstate and international collaborations. Table 4 shows the percentage of respondents who spent none, 1-49% or 50-100% of their research time in intrastate, interstate and international collaborations. Using this grouping laboratory scientists, compared to the other research groups, spent a significantly lower proportion of their time in collaborative work. Sixty-six percent of clinical researchers, 59% of public health researchers and 41% of mixed researchers spent more than half of their time in collaborative work within the state, within Australia and internationally.

Table 4 *Time spent in collaborations*

	Laboratory scientist (n=189)	Clinical researcher (n=114)	Public health researcher (n=56)	Mixed researcher (n=70)	Total All cancer researchers (n=429)
Time spent in collaborations			*Respondents (%)*		
Time spent collaborating with researchers in own state					
0	30	27	25	11	25
1-49%	64	47	38	61	56
50-100%	7	25	38	27	19
Time spent collaborating with researchers in other states					
0	40	27	46	34	37
1-49%	57	49	39	56	52
50-100%	3	24	14	10	11
Time spent collaborating with researchers internationally					
0	42	33	63	39	42
1-49%	55	51	30	57	51
50-100%	4	17	7	4	8

Patents and publications

Three-quarters of respondents had not filed a patent in the last five years. Overall, an average of 0.6 patents per respondent (range 0-30) was filed from 1996 to 2001. Laboratory scientists filed the greatest number of patents (n=137). Clinical researchers filed a total of 55 patents, mixed researchers filed 46 patents and public health researchers filed only two patents over the last five years.

In the three years 1998, 1999 and 2000 laboratory scientists and clinical researchers each published an average of eight papers per researcher. Public health researchers and mixed researchers published an average of seven and twelve papers per researcher respectively. Table 5 shows the percentage of papers published relative to cancer site. A large number of 'general' cancer papers were published and of the site-specific publications, the greatest number of papers was published in breast cancer.

Table 5 *Percentage of papers published relative to cancer site*

	Laboratory scientists (n=169)	Clinical researchers (n=102)	Public health researchers (n=49)	Mixed researchers (n=66)	Total All cancer researchers (n=386)
	Papers published in each area (%)				
General – not specific to any site	28	15	20	17	21
Other	18	25	11	23	19
Breast	11	15	16	14	14
Colorectal	9	7	10	10	9
Leukaemia	12	7	2	9	9
Melanoma	6	6	9	6	6
Prostate	4	7	6	6	6
Cervical	2	4	11	5	5
Non-Hodgkin's Lymphoma	4	8	2	6	5
Lung	2	5	9	3	4
Non-melanoma	4	1	4	1	3

Goals

The goals of respondents, in terms of their own cancer research, are shown in Table 6. 'Understanding cancer biology and mechanisms' was identified as being the main goal of research undertaken by laboratory scientists. A quarter of laboratory scientists also indicated that 'developing new therapeutic agents' was an additional goal of their research. The main goal for clinical researchers was 'to develop effective therapeutic regimes' and one fifth of clinical researchers indicated that 'improving the quality of life of people living with cancer' was an additional research goal. Thirty-nine percent of public health researchers chose 'developing effective preventive strategies' as their main goal and 'improving the quality of life of people living with cancer' as an additional research goal. Most of the mixed researchers chose 'understanding cancer biology and mechanisms' as their main goal and similar numbers of respondents indicated that 'improving the quality of life of people living with cancer', 'understanding cancer biology and mechanisms', developing new therapeutic agents' and 'developing effective therapeutic regimes' were additional goals of their research.

Table 6 *Goals of respondents' own cancer research*

	Laboratory scientist (n=190)		Clinical researcher (n=112)		Public health researcher (n=57)		Mixed researcher (n=71)		Total All cancer researchers (n=430)	
	*Main goal**	*Additional goals^*	*Main goal**	*Additional goals^*	*Main goal**	*Additional goals^*	*Main goal**	*Additional goals^*	*Main Goal*	*Additional goals^*
	%	%	%	%	%	%	%	%	%	%
To improve the quality of cancer services	0	2	5	14	18	16	4	9	4	9
To improve the quality of life of people living with cancer	1	5	10	19	11	23	11	13	6	13
To understand cancer biology and mechanisms	76	9	5	13	2	4	32	14	41	11
To improve diagnosis	3	19	15	14	2	8	6	12	6	15
To develop new therapeutic agents	8	26	18	12	0	2	14	16	11	17
To identify and quantify epidemiological risk factors	0	3	0	5	18	14	3	6	3	6
To identify and quantify genetic risk factors	3	11	1	4	0	4	3	6	2	7
To develop effective preventive strategies	2	9	3	4	39	18	9	8	8	8
To develop effective therapeutic regimens	6	15	40	15	5	6	13	16	16	14
Other	1	1	3	1	7	4	6	1	3	1

* Respondents were asked to select one main goal

^ Respondents were allowed to select several additional goals

Infrastructure and research

Table 7 shows the importance of different types of infrastructure to laboratory scientists, clinical researchers, public health researchers and mixed researchers and Table 8 shows the adequacy of access to infrastructure for those researchers who classified the different types of infrastructure as important, very important or essential to their research.

Platform technologies were defined as advanced technologies that can service many different types of research, for example, DNA arrays and genomics. Platform technologies were considered to be important, very important or essential by approximately three-quarters of laboratory scientists. However, one third of these researchers considered access to be just adequate and a further 30% considered access to platform technologies to be less than adequate. Approximately 35%, 14% and 46% of clinical researchers, public health researchers and mixed researchers, respectively, considered platform technologies to be important, very important or essential to their research. Of these researchers, only between 7-18% rated their access to this type of infrastructure as being better than adequate.

For the purposes of the questionnaire, bioinformatics was defined as the use of computers in solving information problems in the life sciences including the creation and maintenance of extensive electronic databases on genomes, protein sequences, and the development and application of algorithms to retrieve information in a form useful to researchers. Bioinformatics was considered important, very important or essential to 73% of laboratory scientists, 58% of mixed researchers, 39% of clinical researchers and 23% of public health researchers. Of these laboratory scientists and mixed researchers only 41% and 10% respectively rated access to these services as better than adequate.

Tissue banks were important, very important or essential to 60% of laboratory scientists and 68% of mixed researchers. In comparison, tissue banks were important, very important or essential to less than 50% of clinical researchers and public health researchers. Of these laboratory scientists and mixed researchers, 55% and 61% rated their access to these facilities as adequate or better.

General animal care facilities were important, very important or essential to 73% of laboratory scientists and 56% of mixed researchers, but were not important to the research of clinical researchers and public health researchers. Access to general animal care facilities was adequate or better for 88% of laboratory scientists and 79% of mixed researchers.

Genetically modified animal colonies were not applicable, not important or only slightly important to over 50% of clinical researchers, public health researchers and mixed researchers. In comparison, 63% of laboratory scientists considered these colonies to be important to their research and of these researchers, three-quarters rated their access as adequate or better.

The use of data managers in research was not applicable to the research conducted by over 50% of laboratory scientists. However, 77% of clinical researchers, 70% of mixed researchers and 64% of public health researchers considered data managers to be important, very important or essential to their research. Access to data managers was rated as adequate or better by 55-62% for these researchers.

Similarly, statistical services were either not applicable or of very little importance to the research of laboratory scientists, where as between 74-98% of clinical researchers, public health researchers and mixed researchers considered this type of infrastructure to be important, very important or essential to their research. Of these researchers only between 50-69% considered access to these services to be adequate or better.

Access to and linkage of clinical cancer registries, population-based cancer registries and medical records was not important to the work of laboratory scientists, but was important to the research undertaken by clinical researchers, public health researchers and mixed researchers, with between 70-90% of these researchers indicating that access and linkage to these facilities was important, very important or essential. Only 51-58% of these researchers considered access to this type of infrastructure as adequate or better.

Table 7 *Relative importance of different types of infrastructure in respondents' own research*

	Laboratory scientist	Clinical researcher	Public health researcher	Mixed researcher	Total All cancer researchers
Type of infrastructure			*Importance (%)*		
Platform technologies	*n=188*	*n=109*	*n=52*	*n=68*	*n=417*
Very important or essential	52	18	2	27	33
Important	22	17	12	19	19
Not important or slightly important	16	28	8	24	19
Not applicable	10	37	79	31	29
Bioinformatics	*n=188*	*n=110*	*n=55*	*n=69*	*n=422*
Very important or essential	50	16	7	41	34
Important	23	23	16	17	21
Not important or slightly important	20	26	13	19	21
Not applicable	6	36	64	23	24
Tissue Banks	*n=186*	*n=111*	*n=54*	*n=69*	*n=420*
Very important or essential	40	26	11	46	34
Important	20	20	9	22	19
Not important or slightly important	25	22	7	12	20
Not applicable	16	32	72	20	28
General animal care facilities	*n=187*	*n=108*	*n=54*	*n=70*	*n=419*
Very important or essential	60	16	0	36	37
Important	13	16	7	20	14
Not important or slightly important	19	26	9	14	19
Not applicable	9	43	83	30	31
Genetically modified animal colonies	*n=187*	*n=108*	*n=54*	*n=68*	*n=417*
Very important or essential	46	8	2	21	26
Important	17	7	7	21	14
Not important or slightly important	24	34	7	25	25
Not applicable	14	51	83	34	36

Table 7 cont *Relative importance of different types of infrastructure in respondents' own research*

	Laboratory scientist	Clinical researcher	Public health researcher	Mixed researcher	Total All cancer researchers
Type of infrastructure			*Importance (%)*		
Data managers for clinical studies	*n=187*	*n=113*	*n=53*	*n=69*	*n=422*
Very important or essential	7	67	34	48	33
Important	10	10	30	22	14
Not important or slightly important	29	12	9	16	20
Not applicable	54	12	26	13	33
Statistical services	*n=186*	*n=113*	*n=56*	*n=69*	*n=424*
Very important or essential	13	61	82	52	41
Important	18	20	16	22	19
Not important or slightly important	45	14	2	17	26
Not applicable	25	4	0	9	13
Access to and linkage of clinical cancer registries, population based cancer registries and medical records	*n=184*	*n=113*	*n=56*	*n=69*	*n=422*
Very important or essential	14	55	79	44	38
Important	16	15	11	26	17
Not important or slightly important	31	20	5	20	23
Not applicable	39	10	5	10	22

Table 8 *Access to infrastructure for respondents who classified different types of infrastructure as important, very important or essential*

	Laboratory scientist	Clinical researcher	Public health researcher	Mixed researcher	Total All cancer researchers
Type of infrastructure			*Access (%)*		
Platform technologies	*n=138*	*n=38*	*n=7*	*n=31*	*n=214*
Better than adequate	32	18	14	7	25
Adequate	36	34	29	45	37
Less than adequate	30	37	14	45	33
Not applicable	1	11	43	3	5
Bioinformatics	*n=138*	*n=42*	*n=13*	*n=39*	*n=232*
Better than adequate	41	10	8	10	28
Adequate	32	29	46	49	35
Less than adequate	25	57	23	39	33
Not applicable	1	5	23	3	4
Tissue Banks	*n=111*	*n=51*	*n=11*	*n=46*	*n=219*
Better than adequate	30	24	0	26	26
Adequate	25	24	36	35	27
Less than adequate	42	53	27	37	43
Not applicable	3	0	36	2	4
General animal care facilities	*n=136*	*n=34*	*n=4*	*n=39*	*n=213*
Better than adequate	63	41	0	51	56
Adequate	25	29	0	28	26
Less than adequate	11	21	0	18	14
Not applicable	2	9	100	3	5
Genetically modified animal colonies	*n=117*	*n=16*	*n=5*	*n=28*	*n=166*
Better than adequate	47	31	0	36	42
Adequate	28	38	0	39	30
Less than adequate	24	19	20	25	24
Not applicable	1	13	80	0	4
Data managers for clinical studies	*n=31*	*n=87*	*n=34*	*n=49*	*n=201*
Better than adequate	19	33	15	20	25
Adequate	32	29	41	35	33
Less than adequate	42	38	41	45	41
Not applicable	7	0	3	0	2

Table 8 cont. *Access to infrastructure for respondents who classified different types of infrastructure as important, very important or essential*

	Laboratory scientist	Clinical researcher	Public health researcher	Mixed researcher	Total All cancer researchers
Type of infrastructure			*Access (%)*		
Statistical services	*n=57*	*n=92*	*n=55*	*n=51*	*n=255*
Better than adequate	30	14	36	20	24
Adequate	39	36	33	35	36
Less than adequate	30	50	31	45	40
Not applicable	2	0	0	0	<1
Access to and linkage of clinical cancer registries, population based cancer registries and medical records	*n=54*	*n=77*	*n=50*	*n=45*	*n=226*
Better than adequate	13	22	24	22	20
Adequate	41	29	28	36	33
Less than adequate	41	47	48	42	45
Not applicable	6	3	0	0	2

Researchers' opinions

Strategies for sustainably reducing the frequency and impact of cancer in Australia

There was general agreement amongst researchers that to sustainably reduce the impact of cancer in Australia we should: develop and implement a national policy for cancer research (64-81% agreed or strongly agreed), improve the infrastructure for basic research (51-88% agreed or strongly agreed) and improve the infrastructure for clinical research (60-89% agreed or strongly agreed), (Table 9). There was strong support from all researchers to encourage and improve coordination between different funding partners (80-89% agreed or strongly agreed with this proposition), to improve community understanding of research (83-91% agreed or strongly agreed), to encourage multicentre research (76-86% agreed or strongly agreed) and to increase the impact of research to ensure cancer diagnosis and treatment are based on the most up-to-date evidence (80%-86% agreed or strongly agreed) (Table 9). Between 47-63% of respondents felt that to sustainably reduce the impact and frequency of cancer in Australia we should not continue with the present system of funding cancer research. Over 50% of laboratory scientists and mixed researchers agreed or strongly agreed with the proposition of continuing with the present system of funding but with increased funds. No clear consensus was reached by clinical researchers or public health researchers as to whether maintaining the present system of funding, but with increased funds, would sustainably reduce the impact and frequency of cancer in Australia.

Between 65-77% of clinical researchers, public health researchers and mixed researchers agreed or strongly agreed that improving the conduct of clinical trials would sustainably reduce the impact and frequency of cancer in Australia. However, only 48% of laboratory scientists agreed with this suggestion. Similarly, although between 59-68% of clinical researchers, public health researchers and mixed researchers agreed or strongly agreed that increasing the amount of targeted research on high priority areas would reduce the impact and frequency of cancer in Australia, only 41% of laboratory scientists concurred with this proposition.

Funding

Estimates for 2003 suggest that over AUD$43 million is spent annually on grants or awards for cancer research, cancer related fellowships and training in Australia. Table 10 provides the respondents' perceptions of how this money is spent on different types of cancer research, how they would prefer to distribute the money if their aim was to reduce the impact and frequency of cancer in Australia, and the actual distribution of money for specific competitive research grants from the NHMRC and Cancer Councils in 2003. There was very little difference between respondents' perceptions of the funding distribution and their preferred distribution. Interestingly however, the actual funding for cancer research provided by the NHMRC and the Cancer Councils for 2003 differed markedly from the researchers' perceptions for particular areas of cancer research. The actual allocation of research funds in the areas of molecular biology, genetics, biochemistry and cell biology was approximately 20% greater than respondents perceived. In contrast, the amount of funds allocated for cancer epidemiology and clinical trials was less than the respondents perceived.

When different types of grants and awards were considered, the respondents' perception of the funding distribution was also similar to what they would prefer if the aim was to reduce the impact and frequency of cancer in Australia (Table 11).

Between 94-99% of researchers agreed that a percentage of funds for cancer research should be reserved for investigator-initiated research and it was suggested that an average of 30-50% of funds should be reserved for this type of research. Similarly, there was general agreement from all groups of researchers (79-94% agreement) that a percentage of funds for cancer research should be reserved for priority-driven research. It was suggested that an average of 24-35% of research funds should be reserved for priority driven research.

Table 9 *Strategies for sustainably reducing the impact and frequency of cancer in Australia*

	Laboratory scientist	Clinical researcher	Public health researcher	Mixed researcher	Total All cancer researchers
			Importance (%)		
Develop and implement a national policy for cancer research					
	n=186	n=114	n=56	n=70	n=426
Agree or strongly agree	64	81	71	77	72
Uncertain	21	11	18	9	16
Disagree or strongly disagree	15	8	11	14	12
Encourage and improve coordination between different funding partners					
	n=189	n=114	n=56	n=71	n=430
Agree or strongly agree	85	89	80	80	84
Uncertain	10	9	13	14	11
Disagree or strongly disagree	5	3	7	6	5
Continue with the present system of funding cancer research					
	n=187	n=114	n=56	n=68	n=425
Agree or strongly agree	16	7	9	13	12
Uncertain	38	30	36	34	35
Disagree or strongly disagree	47	63	55	53	53
Continue with the present system of funding cancer research but with increased funds					
	n=188	n=112	n=57	n=69	n=426
Agree or strongly agree	57	37	28	55	48
Uncertain	20	28	39	22	25
Disagree or strongly disagree	23	36	33	23	28
Improve the infrastructure for basic research					
	n=189	n=113	n=57	n=71	n=430
Agree or strongly agree	88	67	51	80	77
Uncertain	9	20	39	13	16
Disagree or strongly disagree	3	12	11	7	7
Improve the infrastructure for clinical research					
	n=189	n=114	n=57	n=69	n=429
Agree or strongly agree	66	89	60	83	74
Uncertain	24	7	33	12	19
Disagree or strongly disagree	10	4	7	6	7
Improve conduct of clinical trials					
	n=188	n=114	n=57	n=69	n=428
Agree or strongly agree	48	77	65	75	62
Uncertain	44	17	26	13	29
Disagree or strongly disagree	8	6	9	12	8

Table 9 cont *Strategies for sustainably reducing the impact and frequency of cancer in Australia*

	Laboratory scientist	Clinical researcher	Public health researcher	Mixed researcher	Total All cancer researchers
			Importance (%)		
Increase the impact of research by developing mechanisms to ensure cancer diagnosis and treatment is based on the most up-to-date evidence					
	n=189	n=113	n=57	n=70	n=429
Agree or strongly agree	83	83	86	80	83
Uncertain	11	12	7	13	11
Disagree or strongly disagree	6	5	7	7	6
Improve community understanding of research					
	n=189	n=114	n=57	n=71	n=431
Agree or strongly agree	91	83	83	85	87
Uncertain	7	9	9	11	8
Disagree or strongly disagree	2	9	9	4	5
Increase the amount of targeted research on high priority areas					
	n=187	n=113	n=57	n=70	n=427
Agree or strongly agree	41	61	68	59	53
Uncertain	32	25	19	20	27
Disagree or strongly disagree	27	14	12	21	21
Encourage multi-centre research					
	n=187	n=114	n=57	n=71	n=429
Agree or strongly agree	76	86	77	82	80
Uncertain	17	9	18	10	14
Disagree or strongly disagree	8	5	5	9	7

Table 10 *Distribution of funds for competitive research grants in 2003 – perception, proposed distribution and actual distribution*

	Researchers' perception of allocation of research funds	Proposed distribution of research funds if aim was to reduce the impact and frequency of cancer in Australia	Actual funding from NHMRC in 2003	Actual funding from Cancer Councils in 2003
			Distribution (%)	
Molecular biology, Genetics, Biochemistry, Cell biology	31	27	54	50
Immunology	11	9	14	8
Microbiology	3	3	1	1
Cancer epidemiology	12	14	1	3
Tumour diagnosis and progression	7	9	8	5
Therapy	8	9	2	7
Pharmacology	5	4	4	3
Clinical trials	12	13	3	3
Other clinical research	4	3	2	10
Psychology/ behavioral	3	3	2	6
Health Services Research	4	5	7	0
Other	<1	1	2	4
Total*	100	100	100 \$18.8Million[a♦]	100 \$8.8Million[2♦]

[a]Personal correspondence, ♦Money provided for competitive research grants, does not include money provided for fellowships, scholarships or other block-funded cancer research or activities.

Table 11 *Distribution of research funds for grants or awards*

	Current perception of allocation of research funds for grants and awards	Proposed distribution of research funds for grants and awards if aim was to reduce the impact and frequency of cancer in Australia
	Distribution (%)	
Investigator-initiated research grants	33	30
Program Grants	20	18
Large-scale clinical, genetic or epidemiological grants	18	17
Infrastructure	11	12
Training	9	11
Career support	9	12

Prioritisation of research

Opinions were divided as to whether the distribution of funds for cancer research should reflect the incidence or the social and economic costs of particular cancers in Australia (Table 12). Over 50% of laboratory scientists and mixed researchers either disagreed or strongly disagreed that the distribution of funds should reflect the incidence of particular cancers in Australia. In contrast, over 50% of clinical researchers and public health researchers either agreed or strongly agreed that the distribution of funds should reflect the incidence of particular cancers. Similarly, 58% and 74% of clinical researchers and public health researchers agreed or strongly agreed that the distribution of cancer funds should reflect the social and economic costs of particular cancers in Australia, whereas only 32% of laboratory scientists agreed with this proposed distribution. The opinions of mixed researchers were equally divided as to whether the distribution of funds for cancer research should reflect the social and economic costs of particular cancers in Australia (Table 12).

There was general disagreement that research on cancers for which there are effective, preventive or therapeutic measures should have lower priority (Table 12). However, over 60% of all researchers agreed that areas of cancer research where Australia is internationally competitive should have high priority (Table 12).

Table 12 *Distribution and prioritisation of cancer funds*

	Laboratory scientist	Clinical researcher	Public health researcher	Mixed researcher	Total All cancer researchers
			Importance (%)		
The distribution of funds for cancer research (all types) should reflect the incidence of particular cancers in Australia					
	n=189	n=114	n=57	n=70	n=430
Agree or strongly agree	34	53	53	34	42
Uncertain	12	12	18	9	12
Disagree or strongly disagree	54	35	30	57	46
Research on cancers for which there are effective preventive or therapeutic measures should have lower priority					
	n=188	n=114	n=56	n=70	n=428
Agree or strongly agree	38	33	25	39	35
Uncertain	20	21	25	14	20
Disagree or strongly disagree	42	47	50	47	45
The distribution of funds for cancer research (all types) should reflect the social and economic costs of particular cancers in Australia					
	n=188	n=113	n=57	n=70	n=428
Agree or strongly agree	32	58	74	41	46
Uncertain	15	13	11	13	14
Disagree or strongly disagree	53	28	16	46	40
Areas of cancer research where Australia is internationally competitive should have high priority					
	n=188	n=113	n=57	n=70	n=425
Agree or strongly agree	62	61	63	69	63
Uncertain	15	26	21	14	19
Disagree or strongly disagree	22	13	16	17	18

There was general agreement between all groups of researchers that different funding bodies should work together and use a single mechanism to review the following types of grants and awards; training, career support, investigator-initiated, infrastructure, large-scale clinical, genetic or epidemiological grants and program grants. The opinions of all researchers towards the review and funding of grants and awards is presented in Table 13. The review of large-scale clinical, genetic or epidemiological grants using a single mechanism received the most support (78%).

The grouped responses of researchers to the concept of different funding bodies co-funding different types of awards and grants are also presented in Table 13. Overall, there was general agreement for different funding bodies to co-fund different grants and awards (range 53-72% support). However, there was some disparity in the level of agreement expressed amongst some groups of researchers. The co-funding of large-scale clinical, genetic or epidemiological grants received the most support (72%) and approximately two-thirds of respondents agreed with the co-funding of infrastructure and program grants (Table 13).

Table 13 *Review and funding grants and awards*

All cancer researchers	Yes		No		Uncertain	
	n	*(%)*	*n*	*(%)*	*n*	*(%)*
Should different funding bodies use a single mechanism to review the following types of grants and awards?						
Training	250	(60)	131	(31)	38	(9)
Career support	259	(62)	123	(29)	36	(9)
Investigator-initiated grants	255	(61)	144	(34)	21	(5)
Infrastructure	280	(67)	104	(25)	35	(8)
Large-scale clinical, genetic or epidemiological grants	328	(78)	69	(16)	23	(6)
Program grants	301	(72)	95	(23)	21	(5)
Should different funding bodies co-fund the following types of grants and awards?						
Training	221	(53)	137	(33)	60	(14)
Career support	230	(55)	134	(32)	56	(13)
Investigator-initiated grants	229	(55)	146	(35)	44	(11)
Infrastructure	279	(67)	94	(22)	46	(11)
Large-scale clinical, genetic or epidemiological grants	304	(72)	73	(17)	43	(10)
Program grants	279	(66)	99	(24)	42	(10)

Importance of infrastructure

After rating the importance and access to different types of infrastructure in their own research, respondents were asked to rate the relative importance of different types of infrastructure to cancer research if the aim was to reduce the impact and frequency of cancer in Australia. The importance ratings are shown in Table 14. Overall, all the proposed types of infrastructure were rated as important to cancer research if the aim was to reduce the impact and frequency of cancer in Australia.

The importance ratings assigned to the different types of infrastructure were often significantly correlated with the importance rating given to different types of infrastructure in the respondents' own research. A significant association in importance ratings was found for all types of infrastructure for both clinical researchers and mixed researchers.

With the exception of data managers for clinical studies and access and linkage of clinical cancer registries, population based cancer registries and medical records, the level of importance assigned by laboratory scientists to infrastructure if the aim was to reduce the impact and frequency of cancer showed a significant association with the importance rating given to infrastructure in their research. Data managers and access and linkage to registries and records were rated as very important or essential in the research of only 7% and 14% of laboratory scientists respectively.

However, if the aim was to reduce the frequency and impact of cancer, 50% and 62% of laboratory scientists, respectively, indicated that data managers and access and linkage to registries and records was very important or essential.

A significant correlation between the importance rating assigned to infrastructure in respondents' own research and the importance rating assigned to infrastructure if the aim was to reduce the impact and frequency of cancer was seen in the group of public health researchers for all types of infrastructure except platform technologies, general animal care facilities, and genetically modified animal colonies. Platform technologies, general animal care facilities and genetically modified animal colonies were not important to the research of public health researchers, however, public health researchers considered these types of infrastructure to be relatively important if the aim was to reduce the impact and frequency of cancer. Therefore, although certain types of infrastructure were not directly important to the research of particular groups of researchers, there was understanding of the importance of other types of infrastructure for cancer research in general.

Table 14 *Importance of infrastructure to cancer research if the aim is to reduce the frequency and impact of cancer in Australia*

	Laboratory scientist	Clinical researcher	Public health researcher	Mixed researcher	Total All cancer researchers
Type of infrastructure			*Importance (%)*		
Platform technologies	*n=182*	*n=104*	*n=42*	*n=61*	*n=389*
Not applicable	1	13	31	5	8
Very important or essential	74	47	26	48	58
Important	22	28	24	38	26
Not important or slightly important	3	13	19	10	8
Bioinformatics	*n=183*	*n=105*	*n=44*	*n=62*	*n=394*
Not applicable	1	11	21	5	6
Very important or essential	74	44	27	57	58
Important	20	31	34	32	26
Not important or slightly important	5	15	18	7	9
Tissue Banks	*n=182*	*n=103*	*n=44*	*n=62*	*n=391*
Not applicable	1	11	27	3	7
Very important or essential	75	57	32	65	64
Important	18	26	32	26	23
Not important or slightly important	6	6	9	7	6
General animal care facilities	*n=183*	*n=103*	*n=44*	*n=62*	*n=392*
Not applicable	2	9	30	7	8
Very important or essential	62	31	14	52	47
Important	25	29	36	23	27
Not important or slightly important	11	31	21	19	19

Table 14 cont *Importance of infrastructure to cancer research if the aim is to reduce the frequency and impact of cancer in Australia*

	Laboratory scientist	Clinical researcher	Public health researcher	Mixed researcher	Total All cancer researchers
Type of infrastructure			*Importance (%)*		
Genetically modified animal colonies	*n=181*	*n=103*	*n=42*	*n=60*	*n=386*
Not applicable	2	12	33	7	9
Very important or essential	60	27	17	50	45
Important	28	37	26	22	29
Not important or slightly important	10	24	24	22	17
Data managers for clinical studies	*n=181*	*n=105*	*n=47*	*n=65*	*n=398*
Not applicable	7	4	4	0	5
Very important or essential	50	71	51	72	60
Important	27	19	38	22	25
Not important or slightly important	16	6	6	6	11
Statistical services	*n=182*	*n=105*	*n=49*	*n=64*	*n=400*
Not applicable	4	3	0	0	3
Very important or essential	45	69	76	66	58
Important	31	26	18	22	27
Not important or slightly important	20	3	6	13	13
Access to and linkage of clinical cancer registries, population based cancer registries and medical records	*n=177*	*n=102*	*n=47*	*n=61*	*n=387*
Not applicable	4	4	4	0	3
Very important or essential	62	75	81	75	70
Important	28	17	11	20	21
Not important or slightly important	7	5	4	5	6

Awarding research grants

There was overall agreement amongst all groups of researchers that when awarding research grants considerable importance should be placed on the views of researchers in the particular field and very little, if any, importance should be placed on the views of politicians (Table 15). Generally, clinical researchers, public health researchers and mixed researchers believed that a moderate amount of importance should be placed on the views of researchers in other fields when assigning research grants (Table 15). Only 20-23% of these researchers believed that a greater than moderate importance should be placed on the views of researchers in other fields. In contrast, 43% of laboratory scientists indicated that a greater than moderate amount of importance should be placed on the views of researchers in other fields when awarding grants. Seventy seven percent of clinical researchers believed that great or extreme importance should be placed on the opinions of clinicians dealing with cancer when awarding research grants.

Laboratory scientists, public health researchers and mixed researchers also acknowledged the relative importance of the opinions of clinicians as over three quarters of these researchers indicated that the views of clinicians should be regarded as of moderate importance, great importance or extreme importance. Overall, researchers felt that a moderate amount of importance should be placed on the views of funding bodies when awarding research grants. The views of specialised task forces when awarding research grants was considered to be of moderate or great importance by over three quarters of all researchers. Public health researchers placed a higher value on the importance of health service managers' opinions when awarding research grants than other researchers. This is likely to reflect the understanding which public health researchers have about the role of health service managers. Overall, approximately 60% of researchers indicated that the opinions of consumers should be of moderate, great or extreme importance when awarding research grants and between 39-65% of researchers considered that the views of general practitioners to be of moderate, great or extreme importance (Table 15).

Table 15 *Importance of views of different groups when awarding research grants*

	Laboratory scientist	Clinical researcher	Public health researcher	Mixed researcher	Total All cancer researchers
			Importance (%)		
Researchers in the particular field	n=188	n=113	n=54	n=70	n=425
Great importance or extreme importance	92	83	87	83	87
Moderate importance	7	16	11	17	12
No importance or slight importance	1	1	2	0	1
Researchers in other fields	n=188	n=113	n=54	n=69	n=424
Great importance or extreme importance	43	23	20	23	32
Moderate importance	38	57	57	48	47
No importance or slight importance	19	20	22	29	21
Clinicians dealing with cancer	n=188	n=113	n=52	n=70	n=423
Great importance or extreme importance	36	77	40	54	50
Moderate importance	39	19	46	31	33
No importance or slight importance	26	4	14	14	17

Table 15 cont *Importance of views of different groups when awarding research grants*

	Laboratory scientist	Clinical researcher	Public health researcher	Mixed researcher	Total All cancer researchers
			Importance (%)		
Health services managers	n=188	n=113	n=54	n=70	n=425
Great importance or extreme importance	3	4	15	7	6
Moderate importance	22	25	42	26	26
No importance or slight importance	75	71	43	67	69
Politicians	n=188	n=113	n=54	n=69	n=424
Great importance or extreme importance	2	0	0	1	1
Moderate importance	6	5	9	12	7
No importance or slight importance	92	95	91	87	92
Consumers	n=188	n=113	n=54	n= 69	n=424
Great importance or extreme importance	21	29	59	36	30
Moderate importance	26	35	26	36	30
No importance or slight importance	53	35	15	28	39
General practitioners	n=187	n=113	n=52	n=70	n=422
Great importance or extreme importance	10	19	15	20	15
Moderate importance	29	35	50	41	35
No importance or slight importance	62	46	35	39	50
Funding bodies	n=188	n=112	n=52	n=70	n=422
Great importance or extreme importance	27	25	33	24	27
Moderate importance	40	43	50	47	43
No importance or slight importance	34	32	17	29	30

Table 15 cont *Importance of views of different groups when awarding research grants*

	Laboratory scientist	Clinical researcher	Public health researcher	Mixed researcher	Total All cancer researchers
			Importance (%)		
Specialised task forces	n=187	n=110	n=50	n=69	n=416
Great importance or extreme importance	50	56	62	46	53
Moderate importance	32	31	32	29	31
No importance or slight importance	18	13	6	25	16

DISCUSSION

Characteristics of researchers surveyed

The opinions of researchers from around Australia and from a mixture of research areas are presented in this report. All surveyed researchers were from the Cancer Research Assessors' Database. This database is managed by The Cancer Council Victoria, on behalf of The Cancer Council Australia, and comprises national scientific and medical experts, including those from block-funded institutes, who are involved in the reviewing and ranking of cancer research grants for the Cancer Councils in Australia. Although there is much cancer related research which is carried out by researchers who are not members of the National Panel of Cancer Research Assessors Database, this Database was used as there was no other accessible database that would have better represented the cancer research workforce in Australia. As all respondents act as assessors for cancer research grants and over two-thirds of respondents were named as principal investigators (PIs) or chief investigators (CIs) on grants at the time of the survey, respondents were considered qualified to offer an opinion on the current mechanisms and possible changes to funding cancer research in Australia.

Infrastructure and funding

The classification of respondents into laboratory scientists, clinical researchers, public health researchers and mixed researchers allowed a detailed comparison of responses from each of these groups.

In the three years 1998-2000 clinical researchers, on average, received between $173 000 -$257 000 less funding as PIs and CIs than researchers in other groups. It remains to be determined whether the lower amount of funding provided is a result of clinical researchers' applying for research projects with smaller budgets, or whether this difference highlights a greater difficulty of clinical researchers in obtaining levels of funding that are comparable with other researchers. The source of funding may also account for the amount of funding received by clinical researchers. Compared to laboratory scientists and public health researchers, clinical researchers received a greater amount of research funding from commercial organisations. Laboratory scientists and public health researchers largely received their research funding from the NHMRC and Cancer Councils.

Over two-thirds of clinical researchers' work was undertaken as part of a collaboration. If the costs of the research project were divided amongst the collaborators then this too may account for the smaller amount of research funds received by clinical researchers. However, public health researchers undertook a comparable amount of collaborative research, yet, public health researchers' PIs and CIs received funding that was equivalent to laboratory scientists and mixed researchers. Laboratory scientists undertook the least amount of collaborative research and the reasons for this are unclear.

As was expected, the importance rating assigned to different types of infrastructure was dependent on the research group. Overall, access to platform technologies, bioinformatics, tissue banks, data managers, statistical services and access to and linkage of registries and records could be improved. In particular, access to bioinformatics, tissue banks and statistical services for clinical researchers could be improved. Of the clinical researchers who said these types of infrastructure were important to their research, 50% or greater rated their access to these types of infrastructure as less than adequate.

In the years 1998, 1999 and 2000 papers were published in all of the eight priority cancer areas[1]. The greatest number of papers published were not specific to any site and can be accounted for by the large number of laboratory scientists who responded to this questionnaire who worked in the general areas of molecular biology, genetics, biochemistry, cell biology and immunology.

In 2003, the NHMRC and the Cancer Councils provided AUD$18.8 million and AUD$8.8 million respectively towards funding competitive cancer research grants. In analysing the amount of money allocated to the different areas of cancer research, block funding provided for specific research programs, research units, and strategic research projects were not included if details regarding the distribution of funds was not available. In total in 2003, the NHMRC provided approximately AUD$23 million (personal correspondence) for research grants, fellowships and scholarships and the Cancer Councils provided over AUD$19.8 million[2] for research grants, fellowships, scholarships, research programs and other cancer related activities. The method employed in this study to classify grants is, admittedly, somewhat subjective and the estimated percentages may not be exact. However, based on the classification system employed, the NHMRC and Cancer Councils appear to allocate more funding in the areas of molecular biology, genetics, biochemistry and cell biology than researchers perceived was being funded. This result is not unexpected as these funding bodies primarily fund basic laboratory science grants. Noticeably less funding was allocated to clinical trials than was perceived or considered ideal. This discrepancy may be attributable to the fact that only research funding allocations from the NHMRC and Cancer Councils were examined and these funding bodies may not be the principal funding bodies for clinical trials. Clinical trials may receive a substantial amount of funding from the commercial health sector. Less money was allocated to cancer epidemiology than was considered ideal. Government contracts and block funding of research programs and research units by Cancer Councils may support a considerable amount of cancer epidemiology. However, such funding from Cancer Councils was not included in the analysis as specific details of the research supported by such programs and units was not available. Although there was a difference in the proportion of funds provided by the NHMRC and the Cancer Councils in particular areas of cancer research, these differences may only be reflective of the pattern of funding in 2003.

The total amount of money provided for cancer research in Australia from all funding sources is unknown. Therefore, it is not possible to accurately identify the differences between the actual proportions of funds that are allocated to the different areas of research, and the ideal proposed allocation of research funds.

Future priorities

A range of opinions was received on funding cancer in the future, prioritisation of research and strategies for sustainably reducing the frequency and impact of cancer in Australia. There was agreement amongst all researchers that in order to sustainably reduce the impact of cancer in Australia, we should develop and implement a national policy for cancer research. However, there was some uncertainty amongst researchers as to whether we should continue with the present system of funding and whether maintaining the present system of funding but with increased funds would sustainably reduce the impact of cancer in Australia. There was strong support for the continuation of funding investigator-initiated research with a proposed average of 30-50% of research funds being allocated for such funding. There was also general agreement that a percentage of research funds should be allocated for priority driven research. Overall, collaboration amongst different funding bodies to review and co-fund grants and awards was supported. In particular, the suggestion of co-funding large-scale clinical, genetic or epidemiological grants received the greatest support.

Researchers supported assigning high priority to areas of cancer research where Australia is internationally competitive. Improvements to infrastructure for basic and clinical research, encouraging and improving coordination between funding partners, improving community understanding of research, encouraging multicentre research and increasing the impact of research to ensure cancer diagnosis and treatment are based on the most up-to-date evidence, were all considered to be necessary to sustainably reduce the impact of cancer in Australia. No overall consensus was reached as to whether the distribution of funds for cancer research should reflect the incidence of particular cancers in Australia and whether the distribution of funds for cancer research should reflect the social and economic costs of particular cancers in Australia. Although clinical researchers and public health researchers were generally in favour of distributing research funds in this manner, laboratory scientists and mixed researchers were generally against allocating funds to reflect incidence, and social and economic costs. Consideration should also be given to the fact that research into more common cancers or those with high social and economic cost may not always be the best way of answering some of the basic research questions.

When awarding research grants the views of all groups of stakeholders listed in the questionnaire were considered by respondents to be of at least some importance. There was consensus that views of researchers in the particular field were of the greatest importance, the views of researchers in other fields were of moderate importance, and the views of politicians were considered to be of very little importance when awarding research grants. There appeared to be a tendency for researchers to assign higher levels of importance to the views of groups who were involved in their research or with whom they were perhaps more familiar.

The results of the survey demonstrate that researchers in the field of cancer see the value of implementing a national policy on cancer research in order to reduce the impact and frequency of cancer in Australia. Researchers acknowledged the importance of infrastructure in successful research and the report highlights the need to improve access to certain types of infrastructure. Researchers were also receptive to the concept of funding research in new ways such as priority-driven funding and supported the collaboration of funding bodies to review and co-fund grants. However, since opinions were sometimes divided on how to prioritise research, further work needs be done to investigate different priority setting processes and the acceptance of these processes to researchers.

This survey only explored the views and attitudes of a sample of cancer researchers in Australia. It would also be of value to investigate the opinions of other groups and stakeholders regarding the funding of cancer research and the need for a national strategy for cancer research.

CANCER RESEARCH – THE WAY FORWARD

There is every reason to be optimistic about progress in the ongoing fight to end cancer. We understand the complex biology of the disease better than ever before and have made revolutionary strides in our knowledge of the causes, prevention and optimal clinical management of cancer. Nevertheless, the incidence of the disease will increase as the baby boom generation moves further into their cancer-prone years. Based on incidence rates in Australia in 1999, 1 in 3 men and 1 in 4 women will be directly affected by cancer in the first 75 years of life. Cancer accounts for 29% of male deaths and 25% of female deaths in Australia[3]. In 1999, 82 185 Australians were diagnosed with cancer and 34 695 died from the disease[3]. Between 1990 and 1999, the age-standardised incidence rates for all cancers rose for both males and females by an average of 0.3% and 0.8% per year respectively[3]. If this trend continues we can expect an 11% increase in the incidence of cancers between 2000 and 2010. These figures exclude non-melanoma skin cancer, for which some 374 000 people were treated in 2002[4]. In 1996, cancer was responsible for 19.1% of the total disability-adjusted life years[3] and in 1993-1994 the total costs of cancer to the health care system were estimated at $1.9 billion or 6% of total health expenditure[5]. Indirect costs, such as loss of productivity, are unmeasured[6] and therefore, the true economic burden of the disease will far exceed the direct health care costs of $1.9 billion.

All progress in preventing, controlling and treating cancer has been drawn and will continue to spring from research, which takes many forms and ranges across many disciplines including chemistry, biology, medicine, psychology and epidemiology. None of these fields alone is alone capable of controlling cancer; conversely, none of them is dispensable. Further progress requires that all relevant fields of research must be yoked securely into a broad continuum that spans environmental, epidemiological and preventive studies, basic laboratory research, and translational and clinical research. Establishing and maintaining such a continuum remains our best hope for reducing the incidence and mortality from cancer and decreasing the direct, indirect and intangible costs associated with the disease.

In Australia, as in many countries, the majority of cancer research is supported by different government agencies (such as the NHMRC and the Australian Research Council) that fund research in general but have no specific remit to invest in cancer. In addition to governmental agencies, state Cancer Councils and other charities contribute significantly to the funding of cancer research. However, the exact number of bodies which financially support cancer research in Australia is unknown. The NHMRC and the state Cancer Councils tend to support research that is generic and relevant to all types of cancer while many smaller organisations focus their efforts on a specific tumour type (leukaemia, prostate, breast, etc).

Table 1 lists the estimated expenditure on cancer research in 2002/2003 by the principal investors in the USA, UK and Australia, along with population statistics. Although the total amounts invested in cancer research in each country are unknown, the major sources of funds can be readily identified.

The majority of cancer research in Australia is funded by the NHMRC and the State Cancer Councils, which in 2003 contributed over AUD$23 million (personal correspondence) and AUD$19.8million[2], respectively, toward cancer research.

The National Cancer Institute (NCI) in the US is the federal government's principal agency for cancer research and training, and in 2002 the NCI provided over USD$1.8 billion – approximately 45% of its budget - to research project grants[7]. Much of the rest of the NCI budget was spent on 'in-house' research at its Bethesda campus and in infrastructure support for both competitive and in-house research. The American Cancer Society invests approximately USD$124 million in cancer research per year[8] and significant amounts are also provided by the Howard Hughes Foundation, private charities and individual donors. The amount spent per head of US population on cancer research (Table 1) is therefore highly likely to be a significant underestimate.

In the UK, Cancer Research UK, the largest non-government cancer research organisation in the world[9], provided 178 772 000 pounds sterling for cancer research between April 2002 and March 2003[10].

As mentioned previously, the exact amount of funding provided in the area of cancer research in Australia is unknown. Although the NHMRC and the Cancer Councils fund a large amount of cancer research, other government organisations, non-government organisations and charities also contribute to funding this area of research. Australia's overall investment in research and development is low by OECD standards[14] and Table 1 shows that Australia's investment in cancer research is significantly less per head of population than that of the USA and UK. Even after adjusting for the slight differences in cancer incidence in the three countries, Australia suffers badly in the comparison.

Cancer research is a worldwide endeavour to which Australia is potentially a major contributor. This country has laboratory and clinical scientists and epidemiologists who are the equals of any in the world. However there are severe structural faults that vitiate cancer research endeavours in this country. Chief amongst these is the lack of a clear and coherent cancer research policy. The lack of high level strategic planning and coordination means that there is simply no mechanism to ensure that scarce research dollars are spent on areas where the need is greatest and where the chances of reducing the incidence or severity of the disease are highest. There has been an almost complete absence of strategic planning and coordination between funding agencies - both private and public, and between consumers, health service providers, the pharmaceutical industry and researchers across all areas of the continuum. The absence of consultation and planning means that policy for cancer research is set annually and by default: the policy for any given year is no more or less than the list of titles of funded grants. Little thought or energy appears to be given, for example, to the creation and maintenance of a diverse research portfolio, or to the need to support high priority areas of cancer research; nor to the maintenance of the appropriate infrastructure, or to the relevance of the research to the incidence, severity and cost of specific disorders.

In its lack of organisation and policy for cancer research, Australia again suffers badly in comparison with other countries – particularly the USA and the UK. In recent years, both countries have developed bold, imaginative and coherent cancer research policies that are tailored to particular strengths and needs. It is time that Australia did the same.

Table 1 *INVESTMENT IN CANCER RESEARCH AND INFRASTRUCTURE: COMPARISON OF AUSTRALIA, USA AND UK*

All figures are shown in Australian dollars

Country	Funding body	Funding allocated to cancer research and infrastructure	Total estimated funding	Population	Dollars invested per head of population
Australia	NHMRC State Cancer Councils	23M[a] (2003) 19.8M[reference 2] (2003)	42.8M	19M[b and reference 11]	~$2.25
USA	NCI American Cancer Society	3 982.8M[e and reference 7] (2002) 168.6M[e and reference 8]	4 151.4M	288M[c and reference 12]	~$14.41
UK	Cancer Research UK	439.8M[f and reference 10] (1/4/2002-31/3/2003)	439.8M	59.2M[d and reference 13]	~$7.43

[a] Personal correspondence
[b] 2001 Australian census information
[c] 2002 USA population estimates
[d] 2002 UK population estimates
[e] currency conversion used - 1USD=1.36AUD
[f] currency conversion used - 1GBP=2.46AUD

In Australia, as in the USA and the UK, the process of defining a policy should begin with a series of structural questions. These should include:

- what kind of decisions must be made and who should make them?
- what factors should be considered in reaching these decisions?
- how should the decisions be evaluated, implemented and monitored?

Once answers to these questions become clear, a host of other questions are drawn into focus. For example:

- should a proportion of the cancer budget be sequestered for research in large general areas e.g. fundamental biological science or epidemiology? Or, should the budget be used to emphasise specific research topics? In either case, how should these areas or topics be identified?
- should a proportion of the cancer research budget be set aside for national projects or infrastructure?
- who should set and manage such ongoing policies?

It was not within the remit of the Working Group established by the NCCI to find secure answers to these and other questions. The Working Group was asked to collect basic data on the distribution and spending of research funds, to point out problems and to suggest mechanisms by which these problems could be solved. The group is well aware that there are legitimate limits to our ability to plan science – especially in an area as broad and diverse as cancer. Any policy for cancer research that is developed in Australia should therefore neither be cast in stone nor subject to tangential repositioning year on year. Instead it should be flexible enough to seize scientific and clinical opportunities, and be sufficiently stable to encourage long-term research into difficult problems.

Proposals

With these thoughts in mind, we make three linked proposals that, if implemented, would assemble the data and machinery needed to build a balanced policy in cancer research. We have deliberately concentrated on the tasks that need to be carried out, rather than proposing specific structures. Rather than reinvent the wheel, these proposals would establish in Australia mechanisms for policy development and implementation analogous to those that have been successful in the USA and, more recently, in the UK.

1. *Establish a better system to collect data on the national portfolio of cancer research in Australia.* At present, many of the funders of cancer research do not share information on their activities. There would be many advantages in establishing a single, consolidated database of cancer research, funded by the government and private sectors. The database should use the Common Scientific Outline, the Disease Site Codes and Medical Subheadings (MeSH) established by the US National Cancer Institute and now used by public and private agencies that fund cancer research in Europe and North America.

The use of a single classification system by all cancer funding agencies in Australia would provide an accurate overview of cancer and hence would:

- allow direct comparison of the research activities of different funding organisations
- strengthen the analysis of current spending and the identification of areas of overlap and gaps
- strengthen the analysis of cancer data, particularly on burdens and costs
- provide data for the development, implementation and monitoring of research policy
- promote cooperation between researchers, policy makers and health care professionals
- improve the public understanding of cancer research

In addition, the use of a well-established and widely-accepted classification system would facilitate comparison of international research strategies, would guide the research investment of funding organisations and would, for the first time, make possible an integrated approach to cancer research in Australia.

2. *Establish an agency to provide the strategic oversight of cancer research in Australia.* The major objective would be to develop a strategic plan for cancer research, to oversee its implementation and to monitor its progress against clearly-defined benchmarks and timelines. This may be best met by establishing an Australian equivalent of the National Cancer Research Institute that was founded in the UK several years ago, either as a new body or a new cooperative venture of existing groups. Effective linkage of government and non-government groups, and of the managerial, professional and consumer sectors is essential. Essential activities would include, for example:
   - to identify under-funded areas where additional research resources are needed
   - to advise federal and state governments, and non-government agencies, on cancer research policy
   - to identify priority areas that are most likely to be fruitful and to lead, in the short and long-term, to reductions in prevalence, incidence, mortality, years of life lost, disability-adjusted life years lost or other standard measures of progress
   - to suggest readjustments to funding mechanisms and patterns

3. This agency would be required to work closely with the major funders of cancer research, both private and public. This would lead to harmonising and synchronising the investment by government and private agencies into particular areas of cancer research. In the UK and Canada this has been achieved by creating umbrella organisations of funders of cancer research, both private and public. The 'cancer research agency' could also be the umbrella organisation linking funders, or else alternative organisational models could be developed. In the UK, the Cancer Research Funders' Forum carries out this 'umbrella' function, in close association with the National Cancer Research Institute.

Conclusion

This area of policy coordination and implementation may be contentious and difficult to achieve fully, but the process should be started. It will require far better cooperation and teamwork than presently exists between the major public and private funders. Some of these organisations, such as NHMRC and the State Cancer Councils, may feel that an umbrella organisation is a threat to their autonomy and the smaller organisations may fear that they will lose their identity. However, the Cancer Research Funders' Forum in the UK has so far been a great success and has already led to a far more coherent approach to both fund-raising and spending on cancer research. There is no reason that a similar arrangement would not work in Australia.

REFERENCE LIST

1. Cancer Strategies Group. Priorities for action in cancer control 2001-2003. 1-112. 2001. Canberra, Commonwealth Department of Health and Ageing.
2. Support for research 2003. *Cancer Forum* 2003; 27(1):21-29.
3. Australian Institute of Health and Welfare and Australasian Association of Cancer Registries. Cancer in Australia 1999. AIHW cat. no. CAN 15, i-132. 2002. Canberra, AIHW (Cancer Series no. 20).
4. National Cancer Control Initiative. The 2002 national non-melanoma skin cancer survey. 1-51. 2003. Melbourne, National Cancer Control Initiative.
5. Mathers C, Vos T, Stevenson C. The burden of disease and injury in Australia. Australian institute of health and welfare, 1999.
6. Clinical Oncological Society of Australia, The Cancer Council Australia, and National Cancer Control Initiative. Optimising cancer care in Australia. 1-122. 2003. Melbourne, National Cancer Control Initiative.
7. National Cancer Institute. 2002 National Cancer Institute Fact Book. i-H-6. 2003. Bethesda, MD, National Cancer Institute Financial Management Branch. (http://www3.cancer.gov/admin/fmb/02factbook.pdf)
8. American Cancer Society. Research Update. (http://www.cancer.org/docroot/COM/content/div_Heartland/COM_7_2x_Research_Update.asp?sitearea=COM)
9. O'Toole EA, Nurse P, Radda G. An analysis of cancer research funding in the UK. *Nat Rev Cancer* 2003;**3**:139-43.
10. Cancer Research UK. Cancer Research UK annual review 2002/2003. 1-25. 2003. London, Cancer Research UK. (http://www.cancerresearchuk.org/aboutus/publications/annualreview/annual_review_complete.pdf)
11. Australian Bureau of Statistics. 2001 Census Basic Community Profile and Snapshot . (http://www.abs.gov.au/ausstats/abs%40census.nsf/ddc9b4f92657325cca256c3e000bdbaf/7dd97c937216e32fca256bbe008371f0!OpenDocument)
12. US Census Bureau. Population estimates July 1 2002. (http://eire.census.gov/popest/data/states/tables/NST-EST2003-01.php)
13. National statistics. Population. (http://www.statistics.gov.uk/cci/nugget.asp?id=6)
14. Access Economics. Exceptional returns: the value of investing in health R&D in Australia. 1-95. 2003. Canberra, Australian Society for Medical Research.

APPENDIX 1

Cancer Research Review Working Group

Representative	Affiliation	State/ territory
Dr Cleola Anderiesz	NCCI	Vic
Professor Bruce Armstrong	The University of Sydney	NSW
Professor Robert Burton	NCCI	Vic
Dr Georgia Chenevix-Trench	Queensland Institute of Medical Research	Qld
Professor Alan Coates	The Cancer Council Australia	NSW
Professor Ashley Dunn	Ludwig Institute for Cancer Research	Vic
Professor Mark Elwood	NCCI	Vic
Professor Rick Kefford (member from September 2003)	NHMRC	NSW
Associate Professor Melissa Little	The University of Queensland	Qld
Professor Elspeth McLachlan (member January- June 2001)	NHMRC	ACT
Ms Woody Macpherson	The Cancer Council Victoria	Vic
Dr Graham Mann	Westmead Institute for Cancer Research	NSW
Professor Joe Sambrook (Chair)	Peter MacCallum Cancer Centre	Vic

APPENDIX 2

Survey of Cancer Research in Australia - Questionnaire

1. In which State or Territory is your main place of work?

1 ☐ ACT
2 ☐ NSW
3 ☐ NT
4 ☐ QLD
5 ☐ SA
6 ☐ TAS
7 ☐ VIC
8 ☐ WA

2. What position do you hold? (Tick *ONE* only)

1 ☐ Research Officer or Postdoctoral Fellow
2 ☐ Senior Research Officer or Research Fellow
3 ☐ Senior Research Fellow
4 ☐ Principal Research Fellow
5 ☐ Senior Principal Research Fellow
6 ☐ Assistant Lecturer
7 ☐ Lecturer
8 ☐ Senior Lecturer
9 ☐ Reader or Associate Professor
10 ☐ Professor
11 ☐ Other (***please specify***) _____

3. Who funds *most* of your salary? (Tick *ONE* only)

1 ☐ NHMRC
2 ☐ University
3 ☐ Hospital
4 ☐ Research Institute
5 ☐ Government Department (*NOT* including NHMRC)
6 ☐ Government Research Agency (eg. CSIRO)
7 ☐ Commercial Business
8 ☐ Cancer Charity
9 ☐ Other (***please specify***) _____

4. Do you hold a Fellowship, or similar award, that provides salary support?

1 ☐ Yes 2 ☐ No

5. Approximately, what percentage of your total work time do you spend on research (<u>all types of research</u>; whether or not directly related to cancer)?

_____%

6. Approximately, what percentage of your total work time do you spend on <u>research directly related to cancer</u>?

_____%

7. What percentage of your time in <u>cancer research</u> is spent on each of the following types of research?

General Area	Approximate % of time spent in each area.
1 Molecular biology, Genetics, Biochemistry, Cell biology	%
2 Immunology	%
3 Microbiology	%
4 Cancer epidemiology and Public health	%
5 Tumour diagnosis or progression	%
6 Therapy	%
7 Pharmacology	%
8 Clinical trials*	%
9 Other clinical research	%
10 Psychology	%
11 Health services related to cancer	%
Other (***please specify and give percentage of time spent***)	
12	%
13	%

Ensure column total = 100%
and <u>*DO NOT*</u> combine categories

8. Which of the following statements best describes the goals of your cancer research?

Goals	Main Goal (Select <u>*ONE*</u> area only)	Additional Goals (May select several areas)
To improve the quality of cancer services	1 ☐	1 ☐
To improve the quality of life of people living with cancer	2 ☐	2 ☐
To understand cancer biology and mechanisms	3 ☐	3 ☐
To improve diagnosis	4 ☐	4 ☐
To develop new therapeutic agents	5 ☐	5 ☐
To identify and quantify epidemiological risk factors	6 ☐	6 ☐
To identify and quantify genetic risk factors	7 ☐	7 ☐
To develop effective preventative strategies	8 ☐	8 ☐
To develop effective therapeutic regimens	9 ☐	9 ☐
Other (***please specify***)		
1)	10 ☐	10 ☐
2)	11☐	11☐

9. Current estimates suggest that ~AU$30 million is spent annually on grants or awards for cancer research, cancer related fellowships and training in Australia.

	What is your perception of the percentage of these research funds that are currently spent on each of the following types of cancer research?	If your aim was to reduce the impact and frequency of cancer in Australia how would you distribute these funds amongst the following types of cancer research?
1 Molecular biology, Genetics, Biochemistry, Cell biology	%	%
2 Immunology	%	%
3 Microbiology	%	%
4 Cancer epidemiology and Public health	%	%
5 Tumour diagnosis or progression	%	%
6 Therapy	%	%
7 Pharmacology	%	%
8 Clinical trials*	%	%
9 Other clinical research	%	%
10 Psychology	%	%
11Health services related to cancer	%	%
Other (***please specify***)		
12	%	%
13	%	%
	Ensure column total = 100% and ***DO NOT* combine categories**	**Ensure column total = 100% and ***DO NOT*** combine categories**

10. Current estimates suggest that ~AU$30 million is spent annually on grants or awards for cancer research and cancer related fellowships and training in Australia.

	What is your perception of the percentage of cancer research funds that are currently spent on each of the following types of grants or awards?	If your aim was to reduce the impact and frequency of cancer in Australia how would you distribute cancer research funds amongst the following types of grants or awards?
1 Training	%	%
2 Career support	%	%
3 Investigator-initiated research* grants	%	%
4 Infrastructure*	%	%
5 Large-scale clinical, genetic or epidemiological grants	%	%
6 Program Grants	%	%
	Ensure column total = 100% and ***DO NOT* combine categories**	**Ensure column total = 100% and ***DO NOT*** combine categories**

11. Grade the relative importance of the following types of infrastructure in *your research*. (Tick appropriate box and please ensure *only one box* is selected for each option).

	Not applicable	Not important		Important		Essential
Platform technologies*	NA ☐	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
Bioinformatics*	NA ☐	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
Tissue banks	NA ☐	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
General animal care facilities	NA ☐	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
Genetically modified animal colonies	NA ☐	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
Data managers for clinical studies	NA ☐	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
Statistical services	NA ☐	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
Access to and linkage of clinical cancer registries, population-based cancer registries, medical records	NA ☐	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
Other (***Please specify***) _____.	NA ☐	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐

12. How satisfactory is *your access* to the following types of infrastructure? (Tick appropriate box and please ensure *only one box* is selected for each option)

	Not applicable	Not satisfactory		Adequate		Excellent
Platform technologies*	NA ☐	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
Bioinformatics*	NA ☐	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
Tissue banks	NA ☐	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
General animal care facilities	NA ☐	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
Genetically modified animal colonies	NA ☐	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
Data managers for clinical studies	NA ☐	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
Statistical services	NA ☐	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
Access to and linkage of clinical cancer registries, population-based cancer registries, medical records	NA ☐	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
Other (***Please specify***) _____.	NA ☐	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐

13. Grade the relative importance of the following types of infrastructure to cancer research if your aim was to reduce the impact and frequency of cancer in Australia. (Tick appropriate box and please ensure *only one box* is selected for each option)

	Not applicable	Not important		Important		Essential
Platform technologies*	NA ☐	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
Bioinformatics*	NA ☐	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
Tissue banks	NA ☐	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
General animal care facilities	NA ☐	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
Genetically modified animal colonies	NA ☐	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
Data managers for clinical studies	NA ☐	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
Statistical services	NA ☐	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
Access to and linkage of clinical cancer registries, population-based cancer registries, medical records	NA ☐	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
Other (***Please specify***) _____.	NA ☐	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐

_____.

14. Should different types of funding bodies (eg. Cancer Councils, NHMRC, National Breast Cancer Centre etc) work together and use a single mechanism to review the following types of grants and awards?

Training	1☐Yes 2☐No 3☐No Opinion
Career support	1☐Yes 2☐No 3☐No Opinion
Investigator-initiated* grants	1☐Yes 2☐No 3☐No Opinion
Infrastructure*	1☐Yes 2☐No 3☐No Opinion
Large-scale clinical, genetic or epidemiological grants	1☐Yes 2☐No 3☐No Opinion
Program Grants	1☐Yes 2☐No 3☐No Opinion

15. Should the following types of awards and grants be <u>co-funded</u> by the different funding bodies (eg. Cancer Councils, NHMRC, National Breast Cancer Centre etc)?

Training	1☐Yes 2☐No 3☐No Opinion
Career support	1☐Yes 2☐No 3☐No Opinion
Investigator-initiated* grants	1☐Yes 2☐No 3☐No Opinion
Infrastructure*	1☐Yes 2☐No 3☐No Opinion
Large-scale clinical, genetic or epidemiological grants	1☐Yes 2☐No 3☐No Opinion
Program Grants	1☐Yes 2☐No 3☐No Opinion

16. Approximately what percentage of your current research activities in cancer are supported by commercial organisations?

_____ %

17. Within the last five years how many <u>patents</u> relevant to cancer have you filed?

_____

18. On how many currently funded grants, related to cancer and administered in Australia, at <u>*your own place of work*</u>, are you named as Principal Investigator or Chief Investigator (or equivalent status at a block-funded institute)?

_____

19. On how many currently funded grants, related to cancer and administered in Australia, at a <u>*work place other than your own*</u>, are you named as a Principal Investigator or Chief Investigator (or equivalent status at a block-funded institute)?

_____

20. On how many grants related to cancer <u>administered overseas</u> are you named as a Principal or Co-investigator?

_____

21. Please estimate what proportion of <u>your research</u> takes place as part of a formal collaboration (bilateral project, multi-centre clinical trial, research consortium) with researchers outside your institution, your state or outside Australia.

Percentage of my research that is part of collaborations with researchers at:

1 Other institutions in my state	%
2 Australian institutions outside my state	%
3 Institutions outside Australia	%

22. What was the *<u>total amount</u>*** of funding awarded to you as a Principal Investigator or Chief Investigator (or equivalent status at a block-funded institute) for research grants related to cancer, commencing in 1998, 1999 or 2000.**

_____

23. Approximately what percentage of this money was derived from each of the following sources?

1 NHMRC	%
2 Cancer Councils	%
3 Other Cancer Organisations and Charities	%
4 Institutional Funds (including block funding)	%
5 Overseas granting agencies (NIH, Howard Hughes Medical Institute, The Wellcome Foundation etc)	%
6 Commercial organisations	%
7 Government Contracts	%
8 Others (***please specify)*** _____	%

24. In the three years 1998, 1999 & 2000 how many papers, *in total*, relevant to cancer have you had published in peer-reviewed journals?

_____

25. To which sites of cancer do these papers apply? (*Tick all that apply*)

Cancers	Please tick
Breast	1 ☐
Cervical	2 ☐
Colorectal	3 ☐
Lung	4 ☐
Prostate	5 ☐
Melanoma	6 ☐
Non-melanocytic skin cancer	7 ☐
Non-Hodgkin's Lymphoma	8 ☐
Leukaemia	9 ☐
General – not specific to any site	10 ☐
Other (***please specify***)	
1)	11 ☐
2)	12 ☐

26. Should a percentage of funds for cancer research be reserved for investigator-initiated research*?

1☐Yes _____% (***provide percentage***) 2☐No

27. Should a percentage of funds for cancer research be reserved for priority-driven research*?What do you perceive as the main general barriers in cancer research?

1☐Yes _____% (***provide percentage***) 2☐No

28. To what extent do you agree with each of the following statements:

	Strongly disagree		Uncertain		Strongly agree
The distribution of funds for cancer research (all types) should reflect the incidence of particular cancers in Australia.	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
Research on cancers for which there are effective, preventative or therapeutic measures should have lower priority.	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
The distribution of funds for cancer research (all types) should reflect the social and economic costs of particular cancers in Australia.	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
Areas of cancer research where Australia is internationally competitive should have high priority.	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐

29. To what extent do you agree with each of the following statements:
To sustainably reduce the frequency and impact of cancer in Australia, we should:

	Strongly disagree		Uncertain		Strongly agree
Develop and implement a national policy for cancer research	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
Encourage and improve coordination between different funding partners	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
Continue with the present system of funding cancer research	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
Continue with the present system of funding cancer research but with increased funds	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
Improve the infrastructure* for basic research	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
Improve the infrastructure* for clinical research	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
Improve conduct of clinical trials*	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
Increase the impact of research by developing mechanisms to ensure cancer diagnosis and treatment is based on the most up-to-date evidence	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
Improve community understanding of research	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
Increase the amount of targeted research on high priority areas	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
Encourage multi-centre research	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
Other (***please specify and grade***) _____.	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐

_____.

30. Please grade the following:

In awarding research grants, what importance should be given to the view of:

	No importance		Moderate importance		Extreme importance
Researchers in the particular field	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
Researchers in other fields	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
Clinicians dealing with cancer	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
Health services managers	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
Politicians	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
Consumers	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
General practitioners	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
Funding bodies	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
Specialised task forces	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
Other (***please specify***) _____.	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐

31. Would you like to receive a summary of the results of this study?

1☐ Yes 2☐ No

32. Contact Information (Summary results can only be sent if this section is completed):

Title: _____

Name: _____

Institute: _____

Address: _____

Phone Number: _____

Fax Number: _____

e-mail: _____

Additional Comments: _____

_____

_____

_____

33. Please provide an estimate of time taken to complete this form.

_____ minutes

Glossary

Definitions:-

Bioinformatics - The use of computers in solving information problems in the life sciences. It involves the creation and maintenance of extensive electronic databases on genomes, protein sequences, and the development and application of algorithms to retrieve information in a form useful to researchers.

Clinical trials – Design, development, execution and analysis of clinical trials comparing treatments integrated with clinical care; which includes phase 1, 2 and 3 trials.

Infrastructure – The basic facilities, services and equipment needed for research.

Investigator initiated research - Research which is initiated by the investigator and is not necessarily related to specific funding priorities or research policies set by others.

Platform technologies – Advanced technologies that can service many different types of research. eg, DNA arrays and genomics.

Priority driven research - Priority driven research has two forms – directive and fiscal.
Directive priorities, which do not really exist in this country but are common in the USA and Europe, are defined by expert groups who review progress in a particular field, identify gaps in knowledge, define overarching areas of research emphasis and chart a path towards a desired goal. The work of these review groups provides an intellectual touchstone for investigators, grant reviewers and funding agencies.
Fiscal priorities are set by granting agencies that set aside blocks of money to support research in areas of perceived need. Usually, this type of priority-driven research follows the recommendations of expert review groups and is catalysed by a call for grant applications in specified areas.
For the purposes of this questionnaire, please treat priority-driven research as the outcome of these two processes – expert review and fiscal shepherding.

NATIONAL
CANCER
CONTROL
INITIATIVE