

# *Strategic Review of Health and Medical Research:* Australian Research Council submission

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## EXECUTIVE SUMMARY

The Australian Research Council is responsible for administration of the:

- Excellence in Research for Australia (ERA) initiative; and
- National Competitive Grants Program (NCGP).

ERA evaluates the quality of research at Australian universities by discipline. Results of the first ERA evaluation conducted in 2010 indicate that many Australian universities have strengths in a range of fields of research that relate to medical and health science. In fact, of the 19 national research strengths identified by ERA 2010, seven were fields of research within the medical and health sciences. Australian universities are able to use ERA data and outcomes to attract students and staff, and promote research strengths to potential partners in industry and overseas.

The NCGP, together with the funding schemes of the National Health and Medical Research Council (NHMRC), constitute the greater part of the competitive funding arm of the dual funding model for higher education research.

While the ARC provides some research funding for projects within the broader health and medical research area, it considers the National Health and Medical Research Council to be the principal Commonwealth government agency with responsibility for managing and funding health and medical research in Australia.

The ARC aims to prevent duplication of government funding for health and medical research and does not support medical and dental research under its main funding schemes. However, the ARC does support fundamental research across all disciplines, including basic biological and physiological processes, thereby supporting research projects that may be precursors to future health and medical research outcomes. The ARC also supports medical and dental research under some ARC schemes where the project has a focus on a commercial development.

The ARC supports on-going collaboration between the ARC and NHMRC in instances where the functions of the two agencies intersect. Continued dialogue between the ARC and NHMRC in regard to coordination of activities is an important element to ensure we achieve the best outcomes for health and medical research in Australia.

## SECTION 1: INTRODUCTION

### 1.1 This submission

The ARC welcomes the opportunity to make a submission to the Strategic Review of Health and Medical Research (see terms of reference at **Attachment A**).

This submission focuses on the contribution of the ARC to:

- measuring the quality of Australia’s health and medical research sector (Section 2);
- funding health and medical research in Australia (Section 3); and
- encouraging the translation of health and medical research into better health and wellbeing (Section 4).

### 1.2 The role of the Australian Research Council

The ARC is a statutory authority within the Australian Government’s Industry, Innovation, Science, Research and Tertiary Education (IISRTE) portfolio. The ARC provides advice to the Government on research matters and manage Excellence in Research for Australia (ERA) and the National Competitive Grants Program (NCGP).

#### *Excellence in Research for Australia*

ERA identifies and promotes excellence across the full spectrum of research activity in Australian universities. ERA is a system for evaluating the quality of research. ERA assessments are undertaken by committees of internationally recognised experts. Their judgements are informed by a range of measures derived from comprehensive information about research activity submitted by universities. Its state of the art methodology provides robust data about the performance of research disciplines at Australian universities relative to world standards.

ERA provides information on discipline-specific research activities of each eligible Australian higher education institution and its contribution in that discipline to the national landscape. ERA assures the international community of the excellence of the research conducted in Australian universities. It provides details of the internationally-competitive research disciplines within individual Australian institutions and also highlights emerging areas where there are opportunities for further investment and international collaboration.

ERA ratings are based on performance indicators derived from university data and on the extensive disciplinary expertise of the reviewers. ERA information enables international students, researchers, businesses, organisations and governments to engage confidently with the Australian research community.

The outcomes of ERA 2010 were released in January 2011. A second round of ERA will take place in 2012.

### *ERA 2010 results in health and medical research*

Results of the first ERA evaluation conducted in 2010 indicate that a large number of Australian universities have strengths in a range of fields of research that relate to medical and health science. In fact, of the 19 national research strengths identified by ERA 2010 in Australian Universities, seven were fields of research within the medical and health sciences<sup>1</sup>. Australia performed 'well above world standard' across the following disciplines:

- Cardiovascular Medicine and Haematology
- Oncology and Carcinogenesis
- Immunology
- Medical Physiology
- Human Movement and Sports Science
- Clinical Sciences
- Pharmacology and Pharmaceutical Sciences

ERA data also highlight that biomedical and clinical health sciences at Australian Universities attract very high levels of national competitive grant, public sector and industry income relative to other research disciplines at universities.

The commercial outcomes derived from research in the biomedical and clinical health sciences are reflected in a high number of patents sealed and an extremely high level of commercialisation income relative to other disciplines.

The importance of the public and allied health sciences to the public health system was reflected in the relatively high level of public sector income received by these disciplines and the relatively large number of NHMRC guidelines attributed to these disciplines.

A summary of ERA 2010 results in the health and medical sciences is provided in Section 2 and **Attachment B**.

### *National Competitive Grants Program*

Through the NCGP, the ARC supports the highest quality fundamental and applied research and research training across all disciplines with the exception of clinical medicine and dentistry under its main funding schemes. Funding is allocated on the basis of a competitive peer review process.

The NCGP supports two streams of research funding:

- Discovery, under which funding is made available for investigator-initiated research and research fellowships; and
- Linkage, under which funds are awarded for research projects, infrastructure, fellowships and centres that involve research collaboration among higher education institutions, and between higher education institutions and partner organisations in the private, government and community sectors.

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<sup>1</sup> A national strength is defined as a discipline in which four or more universities are producing research at well above world standard (5).

The ARC schemes that do not explicitly support medical and dental research include Discovery Projects, Discovery Indigenous, Discovery Early Career Researcher Award (DECRA), Australian Laureate Fellowships and Centres of Excellence schemes.

For these, the ARC defines the types of research considered by the ARC to be “Medical and Dental Research” and therefore not supported by the ARC. The definition currently applied to proposals submitted under Funding Rules for funding commencing in 2013 is provided at **Attachment C**.

### *Funding for health and medical research*

While research projects that are medical and/or health outcomes focussed are more applicably supported by the NHMRC, the ARC does support the potential precursors to such research projects by funding fundamental research across all disciplines at the discovery stage, including research aimed at understanding basic physiological and biological processes.

While the ARC aims to minimise the overlap of research funding with the NHMRC, there are some projects categorised within the Fields of Research (FOR) Division 11: Medical and Health Sciences that fall within the scope of ARC funding (i.e. are not excluded by the ARC’s medical and dental research definition).

The ARC may also explicitly support projects that involve medical and dental research under some ARC schemes, where a proposal satisfies all other eligibility requirements set out in the relevant Funding Rules, including:

- Future Fellowships scheme; and
- *Special Research Initiatives* (SRIs) where a project has an emphasis on a commercial outcome.
- *Linkage Projects* scheme (from 2013 onwards) where the primary aim of the project is a commercial outcome in addition to Research and Development and the project does not include clinical trials.

A profile of ARC funding allocated to support research falling within the Medical and Health Sciences Fields of Research (FOR) division is provided at **Attachment D**.

## SECTION 2: MEASURING THE QUALITY OF AUSTRALIA'S HEALTH AND MEDICAL RESEARCH SECTOR

### 2.1 Introduction

A strong research capability in Australia will ensure that as a nation we can engage constructively with innovation systems for the benefit of Australian research, industries, the economy and the community.

The 2010 outcomes of the ERA initiative confirm that the research performance of Australian universities competes with the best in the world. This includes in areas relevant to health and medical research.

### 2.2 ERA methodology

ERA evaluates the quality of research at Australian universities by discipline. The Australian Research Council (ARC) administers ERA. The ARC selects internationally-recognised researchers to rate each research-active discipline at each university against world standards. To determine ERA ratings, these experts interpret performance indicators derived from a comprehensive collection of data about the research activities of universities. This data includes information about research staff, publications and other research outputs, competitive awards, patents and external funding (such as competitive grants awarded, contributions from industry and other end-users, and income from the commercialisation of research). ERA uses a five-point rating scale, with three being world standard and five being the highest rating for excellence.

The performance indicators are interpreted in the light of explanatory material provided by universities and the extensive disciplinary expertise of the evaluators. The set of performance indicators used to inform evaluations is designed to accommodate differences between disciplines in consultation with the research community. ERA has received international recognition as a 'state of the art' mechanism for identifying and promoting research excellence at universities.<sup>2</sup>

#### *Health and medical research disciplines at Australian Universities*

Two clusters of health and medical research disciplines were evaluated in ERA 2010: Medical and Health Sciences in Biomedical and Clinical Health Sciences; and Medical and Health Sciences in Public and Allied Health Sciences.

All these disciplines were assessed using an indicator set that included citation analysis of research publications (journal articles) as an indicator of quality. The indicator set also included

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<sup>2</sup> Australia's use of peer judgement based on indicators to evaluate research and to enhance excellence by linking evaluation outcomes to funding was recognised as 'state of the art' in the OECD publication *Performance-based funding of public research in tertiary education institutions* (2010, Chapter 1). The same publication identified 10 European countries that use national *ex post* research evaluation exercises to inform block funding, including the United Kingdom, Belgium and the Nordic countries. New Zealand also uses such an exercise to inform block funding.

guidelines endorsed by the National Health and Medical Research Council (NHMRC guidelines) and patents sealed as measures of research application.

In addition, a number of other research disciplines related to health and medical sciences were evaluated in other discipline clusters, most notably Medicinal and Biomolecular Chemistry in the Physical, Chemical and Earth Sciences Cluster. ERA 2010 also identified some gaps in relation to research activity at Australian Universities in areas related to health and medical research. For example, no university met the low volume threshold for ERA assessment in Medical Biotechnology (1004) or Complementary and Alternative Medicine (1104).

### **2.3 Summary of ERA 2010 outcomes**

#### ***Medical and Health Sciences in Biomedical and Clinical Health Sciences***

ERA 2010 data revealed a very high level of research activity in the two-digit FoR code Medical and Health Sciences in Biomedical and Clinical Health Sciences (11BCH). 11BCH accounted for more research outputs (over 45,000), more staff (over 4,500 FTE) and more external research income (\$2.1 billion) than any other two-digit FoR code assessed at Australian universities. In particular, 11BCH accounted for a very high proportion of Australian Competitive Grants Research Income (27%), Other Public Sector Research Income (23%), and Industry and Other Research Income (37%). 11BCH also attracted a much greater level of Research Commercialisation Income than any other two-digit FoR code (\$240 million, representing 67% of all such income). The number of patents sealed in 11BCH (162) was second only to the two-digit code 09 (Engineering). The level of activity in 11BCH is increasing. For example, research outputs increased 31% over the reference period (2003-2008).

ERA 2010 outcomes indicate a very high incidence of excellence in research at Australian Universities in 11BCH. Of the 155 units of evaluation assessed at the four-digit level within 11BCH, 127 were performing at or above world standard. No less than 48 four-digit units were performing at well above world standard, indicating that many researchers at Australian universities in these fields are competitive with the best in the world. Clinical Sciences (1103) was the largest four-digit field assessed in 11BCH, with 22 universities performing at world standard or above in this field. This is a very high incidence of excellence – only 5 of the 131 fields assessed in ERA were performing at world standard or above at 20 or more universities. In addition, of the 19 national strengths identified by ERA 2010, six fell within 11BCH, namely:

- Cardiovascular Medicine and Haematology;
- Clinical Sciences;
- Immunology;
- Medical Physiology;
- Oncology and Carcinogenesis;
- Pharmacology and Pharmaceutical Sciences.

#### ***Medical and Health Sciences in Public and Allied Health Sciences***

The level of activity in the two digit FoR code Medical and Health Sciences in Public and Allied Health Sciences (11PAH) was also relatively high in ERA 2010. 11PAH accounted for more than 18,000 research outputs, almost 4,000 staff (FTE) and \$873 million in external research income. In particular, 11BCH accounted for a relatively high proportion of Australian Competitive Grants Research Income (8%) and Industry and Other Research Income (11%). 11PAH accounted for a proportion of Other Public Sector Research Income (19%) that was second only to 11BCH.

Research commercialisation income is not an applied measure for these disciplines, reflecting their focus on the public provision of health services. This focus was also reflected in a relatively small patent count (8). The importance of these disciplines to public health was reflected in the relatively large number of NHRMC guidelines attributed to researchers in these disciplines (31, compared to 18 in 11BCH disciplines). These guidelines include those on population health, clinical practice and ethics. The level of activity in 11PAH is increasing very rapidly. For example, research outputs increased 61% over the reference period.

ERA 2010 outcomes indicate a high incidence of excellence in research at Australian Universities in 11PAH. Of the 82 units of evaluation assessed at the four-digit level within 11BCH, 57 were performing at or above world standard. No less than 28 four-digit units were performing at above world standard, indicating that many researchers at Australian universities in these fields are competitive internationally. One of the national strengths identified by ERA 2010 fell within 11BCH, namely, Human Movement & Sports Science. In addition, Nursing (1110) was another four-digit field that performed well in 11PAH, with 20 universities performing at world standard or above in this field. As noted above in relation to Clinical Sciences, this is a very high incidence of excellence.

Further details of ERA outcomes in the Health and Medical Sciences are provided at **Attachment B**. Full details, including the rating awarded for each health and medical research discipline assessed at each university, are available on the ARC Website at: [http://www.arc.gov.au/era/era\\_2010/outcomes\\_2010.htm](http://www.arc.gov.au/era/era_2010/outcomes_2010.htm)

## 2.4 Use of ERA outcomes

ERA outcomes guide investment in Australian higher education research. The Australian Government has drawn on ERA data to inform a research workforce strategy and to negotiate mission-based compacts with universities. The Government is incorporating ERA outcomes into public funding allocation models, including its Sustainable Research Excellence program and Research Training Scheme. ERA data will also inform the research standards that are administered by the Tertiary Education Quality and Standards Agency (TEQSA). Australian universities also use ERA data and outcomes to improve performance, attract students and staff, and promote research strengths to potential partners in industry and overseas. Businesses and other organisations can use ERA data and outcomes to locate potential R&D partners.

## SECTION 3: FUNDING FOR HEALTH AND MEDICAL RESEARCH IN AUSTRALIA

### 3.1 Introduction

The Australian research system is very diverse with multiple sources of funding across several portfolios. Within this framework, and in a country the size of Australia with limited resources, effective coordination of research activities will be essential to ensure research funding is managed successfully into the future.

The ARC and NHMRC constitute the greater part of the competitive funding arm of the dual funding model for higher education research. Both agencies are independent statutory agencies of the Australian Government, funding research on the basis of competitive peer review processes.

The ARC provides funding for research and research training across all disciplines, with the exception of clinical medicine and dentistry under its main schemes, while the NHMRC provides funding for all areas of research relevant to human health and medicine.

In addition, the ARC has responsibility for providing advice to the Government on research matters not related to health and medical research, and for delivering the ERA initiative.

### 3.2 Providing complementary support for research

The ARC aims to maximise the distribution of funding across a wide range of researchers and disciplines, within the context of a competitive research grant application process. To achieve this the ARC considers it important to clearly delineate the types of research supported by the ARC and other research funding bodies, such as the NHMRC, in order to prevent duplication of funding for similar research and opportunities for inequitable access to research funding. Therefore, the ARC does not fund medical and dental research under its main funding schemes.

In December 2011, the ARC revised its definition of Medical and Dental Research. The definition aims to ensure that research proposals geared towards clinical medicine and dentistry outcomes are not directed to the ARC.

The revisions were not aimed at excluding fundamental research aimed at understanding basic physiological or biological processes. The ARC supports such research. However, where the main purpose of a research project is a health or medical outcome, the ARC directs researchers to seek funding from the NHMRC.

Previously, medical researchers have had more opportunities to hold concurrent grants from the ARC and NHMRC than researchers in other disciplines. However, limits have now been applied to the number of grants that researchers can apply for and hold concurrently.

These changes will:

- ensure biomedical researchers do not apply for both ARC and NHMRC funding for similar clinical medical research;

- provide equitable access to ARC funding;
- ease pressure on the peer review system; and
- prevent researchers from taking on an unrealistic grant loads.

### 3.3 Working together

Where the functions of the ARC and NHMRC intersect, the ARC supports a collaborative approach to support the best management and funding of research in Australia in recent years. The ARC and NHMRC have collaborated in a number of ways, including those outlined below.

#### *Funding programs/initiatives*

In 2004 the ARC established the Research Networks scheme. The ARC and NHMRC co-invested \$9.25 million in five research networks involving 820 researchers. The networks focused on the development of new biotechnology tools and new health diagnostics, childhood development and the quality of life among older populations, the control and eradication of parasites and understanding better the relationship between genes and environment.

During 2005 and 2006 the ARC and NHMRC collaborated on two funding initiatives: the *Thinking Systems* initiative and the Ageing Well Ageing Productively Research Program.

The aim of the *Thinking Systems* initiative was to address the Australian Government's National Research Priority goals of *Breakthrough Science* and Frontier Technologies under the National Research Priority *Frontier Technologies for Building and Transforming Australian Industries*. The initiative, administered by ARC, supported novel, innovative and cross-disciplinary research that would lead to the generation and application of new knowledge in the development of intelligent machines, robots and information systems. Three projects were approved for funding, representing a total commitment of \$10 million over five years (\$5 million contributed by each of ARC and NHMRC).

The aim of the Ageing Well Ageing Productively Research Program was to foster research in to ageing which crosses sectors, research disciplines and institutions to develop an authoritative evidence base to underpin more effective and well informed policy and practice. The Program was administered by the NHMRC, with six successful grant recipients awarded funding over five years, totalling \$10 million (\$5 million contributed by each of ARC and NHMRC).

#### *Australian Research Integrity Committee*

The ARIC was jointly established by the ARC and NHMRC in February 2011. It provides a review system of institutional processes to respond to allegations of research misconduct. This system is intended to ensure that institutions investigate such allegations and observe proper process in doing so. The ARIC contributes to quality assurance and public confidence regarding the integrity of Australia's research effort.

Specifically, the ARC and the NHMRC jointly administer the ARIC to:

- Review the process by which a nominated institution has managed an allegation of research misconduct;

- Provide findings and, where relevant, recommendations to the CEO of the ARC and/or the CEO of the NHMRC; and
- Publish de-identified information on its activities at least annually.

In all matters the ARIC considers whether the institution's response to the allegation of research misconduct was consistent with the framework outlined in the Code and with the institution's policies and procedures for investigating allegations of research misconduct.

### *Policies in ethics and research practice*

Along with Universities Australia, the ARC and NHMRC jointly developed *The Australian Code for the Responsible Conduct of Research (2007)* (the Code). The Code guides institutions and researchers in responsible research practices and promotes integrity in research for researchers. The Code shows how to manage breaches of the Code and allegations of research misconduct, how to manage research data and materials, how to publish and disseminate research findings, including proper attribution of authorship, how to conduct effective peer review and how to manage conflicts of interest. It also explains the responsibilities and rights of researchers if they witness research misconduct.

### *Synchrotron Science*

In 2012, the Australian Research Council (ARC) will establish a Special Research Initiative to enable the provision of \$30 million to support the Australian Synchrotron.

The primary purpose of the Special Research Initiative in Synchrotron Science will be to deliver a competitive funding program to enable researcher access to the Australian Synchrotron facilities.

The ARC will administer the Initiative, committing \$25 million with the NHMRC co-contributing a further \$5 million.

### *Seminars*

Each year, the ARC and NHMRC, in association with the Australasian Research Management Society, jointly host an ARC/NHMRC Research Administrators Seminar. The Seminar is a key event for the ARC to engage directly with research office staff from the sector about changes to funding schemes and a range of other policy and program matters.

## SECTION 4: ENCOURAGING THE TRANSLATION OF HEALTH AND MEDICAL RESEARCH INTO BETTER HEALTH AND WELLBEING

### 4.1 Introduction

The breadth and depth of excellence in research at Australian universities provides a strong platform from which to build collaborative arrangements with researchers in end-user organisations including industry.

### 4.2 ARC contribution

The ARC's Linkage funding schemes aim to encourage and extend cooperative approaches to research and improve the use of research outcomes by strengthening links within Australia's innovation system and with innovation systems internationally. By supporting the development of partnerships, the ARC encourages the transfer of skills, knowledge and ideas as a basis for securing commercial and other benefits of research.

The ARC aims to improve Australia's capacity to capitalise on its research investment by supporting the commercialisation of research, including health and medical research, through the Industrial Transformation Research Program (ITRP) and *Linkage Projects* schemes. From 2013, these two schemes will provide explicit support for medical and dental research where the primary aim of the project is a commercial outcome in addition to Research and Development and the project does not include clinical trials.

#### *Linkage Projects scheme*

The *Linkage Projects* scheme supports research and development projects which are collaborative between higher education researchers and other parts of the national innovation system, which are undertaken to acquire new knowledge, and which involve risk or innovation.

Previously, medical and dental research was not explicitly supported by the *Linkage Projects* scheme. However, the *Linkage Projects* funding rules are currently being revised to include provision to explicitly support research proposals in the area of medical and dental research where the primary aim of the project is a commercial outcome in addition to Research and Development and the project does not include clinical trials.

Proposals for funding under the *Linkage Projects* scheme must involve a Partner Organisation from outside the higher education sector. The Partner Organisation must make a significant contribution in cash and/or in kind, to the project that is equal to, or greater than, the ARC funding.

Under the *Linkage Projects* scheme, the ARC provides opportunities for postgraduate and postdoctoral researchers to engage in industry-oriented research training and enables postdoctoral researchers to pursue internationally competitive research opportunities in collaboration with industry.

Across the selection rounds conducted for funding commencing in the years 2007 to 2012, the *Linkage Projects* scheme had the largest proportion of projects (42.8 per cent) nominated as

falling within the Medical and Health Sciences FOR Division. A total of 62.4 per cent of these projects fell within the area of Public Health and Health Services.

### *Industrial Transformation Research Program*

The Industrial Transformation Research Program (ITRP) supports quality R&D partnerships that will help transform Australian industries. The Program will:

- focus on research areas that are vital for Australia’s future economic prosperity—such as engineering, materials science and nanotechnology, communications, chemical engineering and biotechnology;
- support Industrial PhD students and researchers to gain ‘hands-on’, practical skills and experience in these important areas; and
- foster important partnerships between business and universities.

The Program has two key components—Industrial Transformation Research Hubs and Industrial Transformation Training Centres.

As part of the centres component, the Government will award up to 600 industrial PhDs to embed students in industry settings, establishing new career paths and directly harnessing research capability to address industry needs.

The ITRP funding rules are currently under development and will include explicit support for research proposals in the area of medical and dental research where the primary aim of the project is a commercial outcome from research and development and where the project does not include clinical trials.

## ATTACHMENT A

### ADDRESSING TERMS OF REFERENCE

The Panel is calling for written submissions on the following questions:

- Why is it in Australia's interest to have a viable, internationally competitive health and medical research sector?  
(Terms of Reference 1 and 6)
- How might health and medical research be best managed and funded in Australia?  
(Terms of Reference 2, 3 and 7)
- What are the health and medical research strategic directions and priorities and how might we meet them?  
(Terms of Reference 5, 12 and 13)
- How can we optimise translation of health and medical research into better health and wellbeing?  
(Terms of Reference 4, 8, 9, 10 and 11)

### Matters for Review

The review will take into account broader Government policy, including the Government's fiscal strategy, and will focus on optimising Australia's capacity to produce world class health and medical research to 2020, including reference to the following matters:

1. The need for Australia to build and retain internationally competitive capacity across the research spectrum, from basic discovery research through clinical translation to public health and health services research.
2. Current expenditure on, and support for, health and medical research in Australia by governments at all levels, industry, non-government organisations and philanthropy; including relevant comparisons internationally.
3. Opportunities to improve coordination and leverage additional national and international support for Australian health and medical research through private sector support and philanthropy, and opportunities for more efficient use, administration and monitoring of investments and the health and economic returns; including relevant comparisons internationally.
4. The relationship between business and the research sector, including opportunities to improve Australia's capacity to capitalise on its investment in health and medical research through commercialisation and strategies for realising returns on Commonwealth investments in health and medical research where gains result from commercialisation.
5. Likely future developments in health and medical research, both in Australia and internationally.
6. Strategies to attract, develop and retain a skilled research workforce which is capable of meeting future challenges and opportunities.
7. Examine the institutional arrangements and governance of the health and medical research sector, including strategies to enhance community and consumer

- participation. This will include comparison of the NHMRC to relevant international jurisdictions.
8. Opportunities to improve national and international collaboration between education, research, clinical and other public health related sectors to support the rapid translation of research outcomes into improved health policies and practices. This will include relevant international comparisons.
  9. Ways in which the broader health reform process can be leveraged to improve research and translation opportunities in preventative health and in the primary, aged and acute care sectors, including through expanded clinical networks, as well as ways in which research can contribute to the design and optimal implementation of these health reforms.
  10. Ways in which health and medical research interacts, and should interact, with other Government health policies and programs; including health technology assessments and the pharmaceutical and medical services assessment processes.
  11. Ways in which the Commonwealth's e-health reforms can be leveraged to improve research and translation opportunities, including the availability, linkage and quality of data.
  12. The degree of alignment between Australia's health and medical research activities and the determinants of good health, the nation's burden of disease profile and national health priorities, in particular "closing the gap" between indigenous and non-indigenous Australians.
  13. Opportunities for Australia's health and medical research activities to assist in combating some of the major barriers to improved health globally, especially in the developing world.

## ATTACHMENT B

### ERA 2010 OUTCOMES IN THE MEDICAL AND HEALTH SCIENCES AND RELATED DISCIPLINES

#### 03 Chemical Sciences (Physical, Chemical and Earth Sciences)

FoR Code	Discipline	Assessed	≥ world standard
0304	Medicinal and Biomolecular Chemistry	9	9

#### 10 Technology (Biological Sciences and Biotechnology)

FoR Code	Discipline	Assessed	≥ world standard
1004	Medical Biotechnology	0	n/a

#### 11 Medical and Health Sciences (Biomedical and Clinical Health Sciences)

FoR Code	Discipline	Assessed	≥ world standard
1101	Medical Biochemistry and Metabolomics	4	4
1102	Cardiovascular Medicine and Haematology	11	10
1103	Clinical Sciences	30	22
1105	Dentistry	6	5
1107	Immunology	11	11
1108	Medical Microbiology	12	11
1109	Neurosciences	17	15
1112	Oncology and Carcinogenesis	12	11
1113	Ophthalmology and Optometry	7	5
1114	Paediatrics and Reproductive Medicine	14	7
1115	Pharmacology and Pharmaceutical Sciences	19	14
1116	Medical Physiology	12	12
	Total four-digit Units of Evaluation	155	127

#### 11 Medical and Health Sciences (Public and Allied Health Sciences)

FoR Code	Discipline	Assessed	≥ world standard
1104	Complementary and Alternative Medicine	0	n/a
1106	Human Movement and Sports Science	19	17
1110	Nursing	23	20
1111	Nutrition and Dietetics	13	8
1117	Public Health and Health Services	27	12

1199	Other Medical and Health Sciences	0	n/a
	Total four-digit Units of Evaluation	82	57

Note: "Assessed" = the number of universities that met the low volume threshold of research activity required for assessment in the disciplines listed.

"≥ world standard" = the number of universities that were assessed as performing at, above or well above world standard in the disciplines listed (that is, rated 3, 4 or 5).

## ATTACHMENT C

### AUSTRALIAN RESEARCH COUNCIL MEDICAL AND DENTAL RESEARCH DEFINITION

For schemes that do not support medical and dental research, the following definition is applied to assess the eligibility of proposals for ARC funding:

**Medical and Dental Research** means research and/or training primarily and substantially aimed at understanding or treating a human disease or health condition.

Proposals that are primarily and substantially aimed at understanding or treating a human disease or health condition are ineligible under ARC schemes that do not support Medical and Dental Research. This includes, but is not limited to, projects that use established protocols or research tools that involve any of the following:

- a. late pre-clinical or early human trials of a human therapeutic agent, material or diagnostic test or device; or other interventional research involving humans;
- b. using material collected from human subjects for the primary purpose of studying the underlying causes, prevalence, epidemiology or mode of inheritance of a disease or human condition; or
- c. using established animal models or established cell lines for the purpose of studying the underlying causes, prevalence, epidemiology or mode of inheritance of a human disease or human health condition.

## ATTACHMENT D

### *Profile of Australian Research Council Support for Medical and Dental Research*

#### Notes

- Up to 2012, medical and dental research excluded from ARC funding was defined as research and/or training which, in the opinion of the ARC, has a significant focus on clinical medical (including dental) outcomes. This profile of ARC-funded support for health and medical research reflects that definition.
- Up to 2012, the ARC funded a range of medical and dental research that was not considered to be covered by this exclusion. An indication of the nature of this research is provided by the research nominated as falling within the Field of Research (FOR) Division 11: Medical and Health Sciences.
- The data for 2012 are incomplete. They do not include funding for *Linkage Projects Round 2*, *Future Fellowships* and *Australian Laureate Fellowships* schemes as selection processes are still underway.
- The data tables do not include the ARC funding through the Special Research Initiatives for the Bionic Eye initiative. Stem Cells Australia is included in the dataset.

#### *Overview*

In 2011, the ARC allocated a total of \$69 million in funding to projects that fall within the Medical and Health Sciences FOR division (**Table 1**). Within this total, \$14.9 million was allocated to projects under the ARC's *Future Fellowships* scheme which explicitly funds medical and dental research.

Of the funding schemes of the NCGP, the *Linkage Projects* scheme has the largest number of projects nominated as falling within the health and medical sciences (**Table 2**).

Of the project nominated as falling within the health and medical sciences, the largest proportion fall within the discipline area of 'Public health and health services', followed by 'Neurosciences', Medical biochemistry and metabolomics' and 'Immunology' (**Table 3**). This trend is consistent across the different funding schemes of the NCGP (**Table 4**).

#### *Specific initiatives which involve health and medical research*

##### Future Fellowships scheme

In 2008, the Australian Government announced the creation of the *Future Fellowships* scheme to promote research in areas of critical national importance by giving outstanding researchers incentives to conduct their research in Australia. The *Future Fellowships* scheme aims to attract and retain the best and brightest mid-career researchers and particularly encourages proposals from researchers working in areas of national priority, including those within medical and health sciences.

Over a five-year period (2009-2013), the *Future Fellowships* scheme offers four-year fellowships of up to \$143,000 a year to 1,000 outstanding Australian and international researchers in the middle of their career. In addition, the ARC provides Administering Organisations with funding of up to \$50,000 per annum which may be used for infrastructure, equipment, travel and relocation costs directly related to the Future Fellow's research.

To date, three selection rounds have been completed under the *Future Fellowships* scheme for funding commencing in 2009, 2010 and 2011. Across these rounds, the largest proportion of funding in the medical and health sciences has been awarded in the area of 'Public health and health services' followed closely by 'Neurosciences'. A summary of the funding outcomes are provided in **Table 5** below.

The current targeted research areas of national significance for *Future Fellowships* proposals are:

- bioinformatics;
- computer system security;
- Indigenous health and wellbeing;
- managing innovation, renewable energy and green technology;
- pattern recognition and data mining;
- safeguarding Australia (especially electronic security, surveillance and detection); and
- understanding culture and communities.

### Special Research Initiatives

The ARC currently supports a number of Special Research Initiatives (SRIs) that fall within the area of health and medical research.

#### Stem Cells Australia

In June 2011, the Australian Government began funding a new collaborative research initiative to support stem cell science. Stem Cells Australia, led by internationally-renowned stem cell researcher Professor Martin Pera at the University of Melbourne, is receiving over \$21 million in funding over seven years.

Stem Cells Australia will deliver fundamental scientific breakthroughs required to seed development of innovative biotechnology approaches and medical treatments using stem cell therapies. Close ties with Australian and international clinical researchers will ensure that research outcomes are suited to rapid translation into practice, cementing Australia's reputation in this field. This will build Australia's capacity in stem cell biology and deliver significant long term health and economic benefits.

In addition to conducting leading-edge research and educating the public, Stem Cells Australia will take a leading role in encouraging public debate into the ethical, legal and public policy issues associated with stem cell science and technology.

#### Research in Bionic Vision Science and Technology

Through its response to the 2020 Summit, the Australian Government committed funding of \$50 million over four years between 2010 and 2013. In 2009, the Australian Government funded a new collaborative research initiative to develop a functional bionic eye.

The Research in Bionic Vision Science and Technology Initiative funds two projects, one at The University of Melbourne and one at Monash University, to deliver a program of activities that support the development of a functional bionic eye.

#### European Molecular Biology Laboratory

The European Molecular Biology Laboratory (EMBL) is the flagship of Europe's molecular biology research, receiving annual funding from its 21 member states to support five research facilities.

In March 2008 Australia became an Associate Member of EMBL. As an Associate Member, Australian life scientists will have access to state-of-the-art core facilities, technologies, and expertise in Europe. Associate Membership will open new opportunities for Australian scientists to forge collaborations with European research networks and institutions and to access European funding sources.

The ARC and The University of Sydney are currently supporting Australia's first recipient of an EMBL Group Leader position, Dr Marcus Heisler. Dr Heisler will spend five years from 2009 at EMBL Heidelberg, and an additional four years from 2014 at The University of Sydney.

The ARC will provide a total of \$2.5 million (AUD) covering the five year period from 2009 to 2013.

Table 1: Summary of ARC scheme funding for projects under the Medical and Health Sciences FOR division by year 2007-2012 (including Future Fellowships projects)

Scheme	2007	2008	2009	2010	2011	2012	Total
Discovery Early Career Research Award						\$7,875,000	\$7,875,000
Discovery Indigenous Researchers Development	\$165,240	\$200,000	\$415,000		\$105,756		\$885,996
Discovery Indigenous						\$735,000	\$735,000
Discovery Projects	\$9,082,913	\$10,698,312	\$11,573,923	\$13,169,346	\$17,123,075	\$13,130,754	\$74,778,323
Federation Fellowships		\$1,638,730					\$1,638,730
Australian Laureate Fellowships			\$5,317,243		\$3,050,565		\$8,367,808
Future Fellowships			\$25,458,072	\$21,131,900	\$14,857,164		\$61,447,136
Linkage Infrastructure, Equipment and Facilities	\$660,000	\$450,000	\$2,398,481	\$970,000	\$2,170,000	\$1,390,000	\$8,038,481
Linkage Projects	\$10,515,682	\$12,827,673	\$17,615,450	\$19,918,640	\$10,789,917	\$4,032,863	\$75,700,225
Linkage International	\$270,897	\$147,814					\$418,711
Special Research Initiatives					\$21,000,000		\$21,000,000
Total health and medical sciences	\$20,694,732	\$25,962,529	\$62,778,169	\$55,189,886	\$69,096,477	\$27,163,617	\$260,885,410
Grand total	\$462,854,394	\$490,580,740	\$656,177,639	\$685,145,976	\$415,652,438	\$415,652,438	
	4.5%	5.3%	9.6%	8.1%	16.6%	6.5%	

Table 2: Number of projects funded by ARC scheme under the Medical and Health Sciences FOR division by year 2007-2012 (including Future Fellowships projects)

Scheme	2007	2008	2009	2010	2011	2012	Total
Discovery Early Career Research Award						21	21
Discovery Indigenous Researchers Development	1	1	3		1		6
Discovery Indigenous						1	1
Discovery Projects	28	31	32	32	50	44	217
Federation Fellowships		1					1
Australian Laureate Fellowships			2		1		3
Future Fellowships			35	29	21		85

Linkage Infrastructure, Equipment and Facilities	3	2	6	2	5	4	22
Linkage Projects	42	52	65	58	38	16	271
Linkage International	3	2					5
Special Research Initiatives					1		1
Grand Total	77	89	143	121	117	86	633

Table 3: Summary of total ARC funding for each of the FOR groups under the Medical and Health Sciences FOR division by year 2007-2012. (including *Future Fellowships* projects)

	2007	2008	2009	2010	2011	2012	Grand Total
CARDIOVASCULAR MEDICINE AND HAEMATOLOGY	\$158,688		\$3,052,800	\$3,016,768	\$2,202,653	\$1,125,000	\$9,555,909
CLINICAL SCIENCES	\$1,028,760	\$703,287	\$13,438,702	\$4,268,564		\$1,545,445	\$20,984,758
COMPLEMENTARY AND ALTERNATIVE MEDICINE					\$173,826	\$280,000	\$453,826
DENTISTRY						\$375,000	\$375,000
HUMAN MOVEMENT AND SPORTS SCIENCE	\$550,272	\$629,000	\$683,000	\$897,851		\$679,794	\$3,439,917
IMMUNOLOGY	\$396,000	\$1,967,750	\$6,181,400	\$4,267,059	\$5,826,102	\$1,900,000	\$20,538,311
MEDICAL BIOCHEMISTRY AND METABOLOMICS	\$120,000	\$255,000	\$1,636,400	\$240,000	\$23,469,746	\$1,520,000	\$27,241,146
MEDICAL MICROBIOLOGY	\$185,334		\$2,235,200	\$1,519,744	\$2,154,528	\$2,045,000	\$8,139,806
MEDICAL PHYSIOLOGY	\$1,079,810	\$824,500	\$686,400	\$561,000			\$3,151,710
NEUROSCIENCES	\$2,383,004	\$3,456,677	\$10,545,524	\$6,897,956	\$10,127,145	\$5,870,933	\$39,281,239
NURSING	\$580,998	\$843,168	\$245,531	\$140,000	\$807,178	\$1,052,343	\$3,669,218
NUTRITION AND DIETETICS		\$505,200		\$1,014,127	\$1,420,653	\$645,000	\$3,584,980
ONCOLOGY AND CARCINOGENESIS	\$164,000	\$514,076		\$1,962,744	\$1,324,528	\$550,000	\$4,515,348
OPTOMETRY AND OPHTHALMOLOGY	\$933,622	\$16,508	\$640,195	\$1,139,646	\$588,000	\$750,000	\$4,067,971
OTHER MEDICAL AND HEALTH SCIENCES	\$400,000	\$307,881	\$140,000	\$705,654	\$154,202		\$1,707,737
PAEDIATRICS AND REPRODUCTIVE MEDICINE	\$255,000	\$76,881	\$1,475,200	\$1,111,196	\$285,000	\$750,000	\$3,953,277
PHARMACOLOGY AND PHARMACEUTICAL	\$2,562,257	\$1,125,000	\$600,000	\$3,747,046	\$1,112,976	\$1,890,000	\$11,037,279

SCIENCES							
PUBLIC HEALTH AND HEALTH SERVICES	\$9,896,987	\$14,737,601	\$21,217,817	\$23,700,531	\$19,449,940	\$6,185,102	\$95,187,978
Grand Total	\$20,694,732	\$25,962,529	\$62,778,169	\$55,189,886	\$69,096,477	\$27,163,617	\$260,885,410

Table 4: Number of projects funded by ARC scheme for each of the FOR groups under the Medical and Health Sciences FOR division by year 2007-2012 (including Future Fellowships projects)

FOR Group	Discovery Early Career Research Award	Discovery Early Career Research Award	Discovery Projects	Federation Fellowships	Australian Laureate Fellowships	Future Fellowships	Discovery Indigenous	Linkage Infrastructure, Equipment and Facilities	Linkage Projects	Linkage International	Special Research Initiatives	Grand Total
CARDIOVASCULAR MEDICINE AND HAEMATOLOGY	1		3			9		2	3			18
CLINICAL SCIENCES	1		15		1	11		1	11			40
COMPLEMENTARY AND ALTERNATIVE MEDICINE			1						1			2
DENTISTRY	1											1
HUMAN MOVEMENT AND SPORTS SCIENCE			3						10			13
IMMUNOLOGY	1		16			9		4	15			45
MEDICAL BIOCHEMISTRY AND METABOLOMICS	1		6			2		3	4		1	17
MEDICAL MICROBIOLOGY	1		7			5			3			16
MEDICAL PHYSIOLOGY			7			1			1			9
NEUROSCIENCES	3		48		1	16		5	10	1		84
NURSING			2				1		14			17
NUTRITION AND DIETETICS	1		1			3			4			9
ONCOLOGY AND CARCINOGENESIS			2			3		3	2			10
OPTOMETRY AND OPHTHALMOLOGY	2		2						7	2		13
OTHER MEDICAL AND HEALTH SCIENCES			2			1		1	2			6
PAEDIATRICS AND REPRODUCTIVE MEDICINE	2		1			3			4			10
PHARMACOLOGY AND PHARMACEUTICAL SCIENCES	1		9			3		1	11	1		26
PUBLIC HEALTH AND HEALTH SERVICES	6	6	92	1	1	19		2	169	1		297
Grand Total	21	6	217	1	3	85	1	22	271	5	1	633



Table 5: *Future Fellowships* scheme funding for each of the FOR groups under the Medical and Health Sciences FOR division by year 2009-2011

FOR group	2009	2010	2011	Total
Cardiovascular medicine and haematology	\$3,052,800	\$2,716,768	\$572,653	\$6,342,221
Clinical sciences	\$5,524,100	\$2,389,263		\$7,913,363
Immunology	\$2,950,400	\$705,992	\$2,867,102	\$6,523,494
Medical biochemistry and metabolomics	\$686,400		\$707,746	\$1,394,146
Medical microbiology	\$1,475,200	\$1,519,744	\$714,528	\$3,709,472
Medical physiology	\$686,400			\$686,400
Neurosciences	\$3,608,800	\$4,051,186	\$4,297,145	\$11,957,131
Nutrition and dietetics		\$813,732	\$1,420,653	\$2,234,385
Oncology and carcinogenesis		\$1,512,744	\$714,528	\$2,227,272
Other medical and health sciences		\$705,654		\$705,654
Paediatrics and reproductive medicine	\$1,475,200	\$789,196		\$2,264,396
Pharmacology and pharmaceutical sciences		\$1,374,046	\$802,976	\$2,177,022
Public health and health services	\$5,998,772	\$4,553,575	\$2,759,833	\$13,312,180
<b>Total</b>	<b>\$25,458,072</b>	<b>\$21,131,900</b>	<b>\$14,857,164</b>	<b>\$61,447,136</b>