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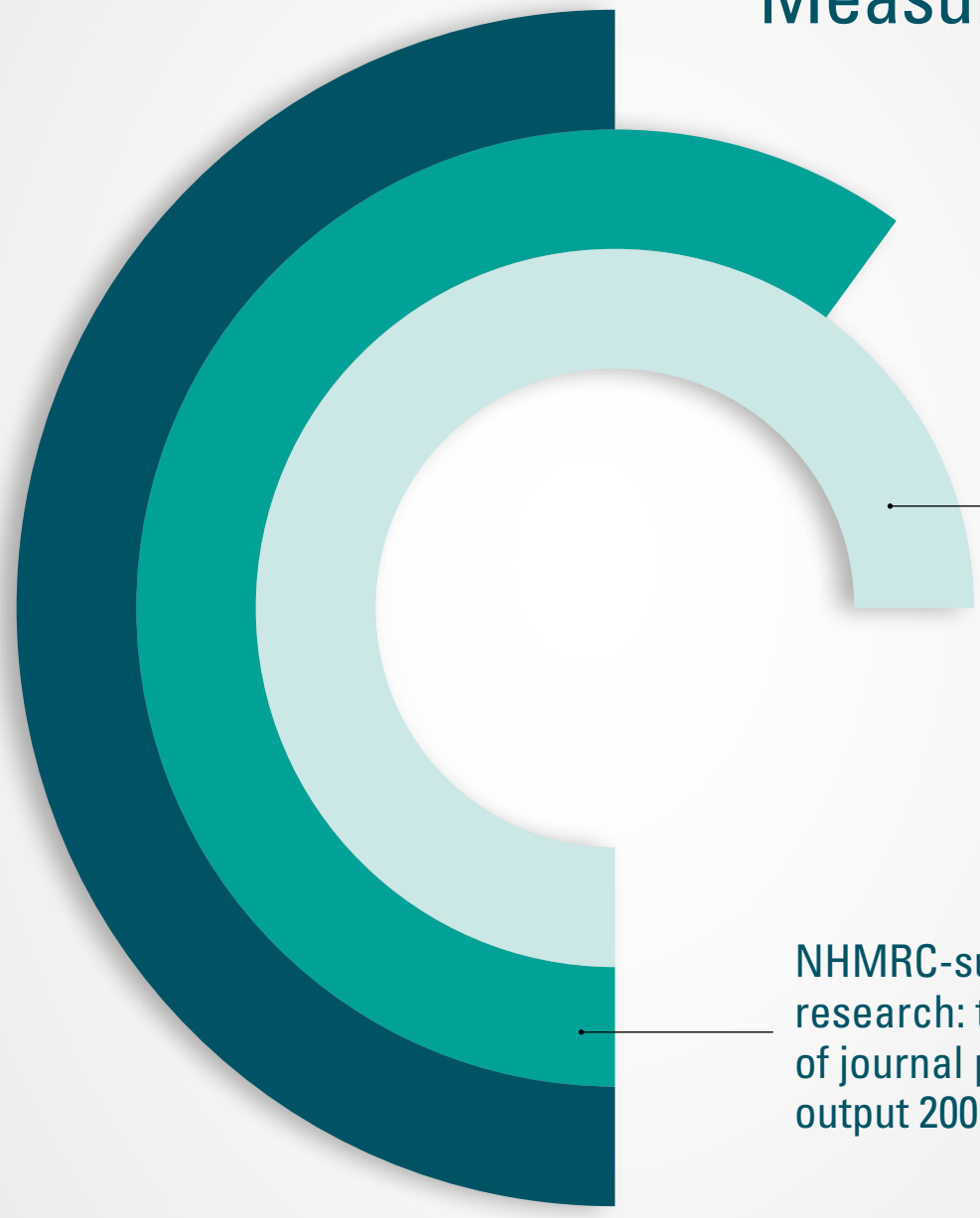
Measuring up 2013

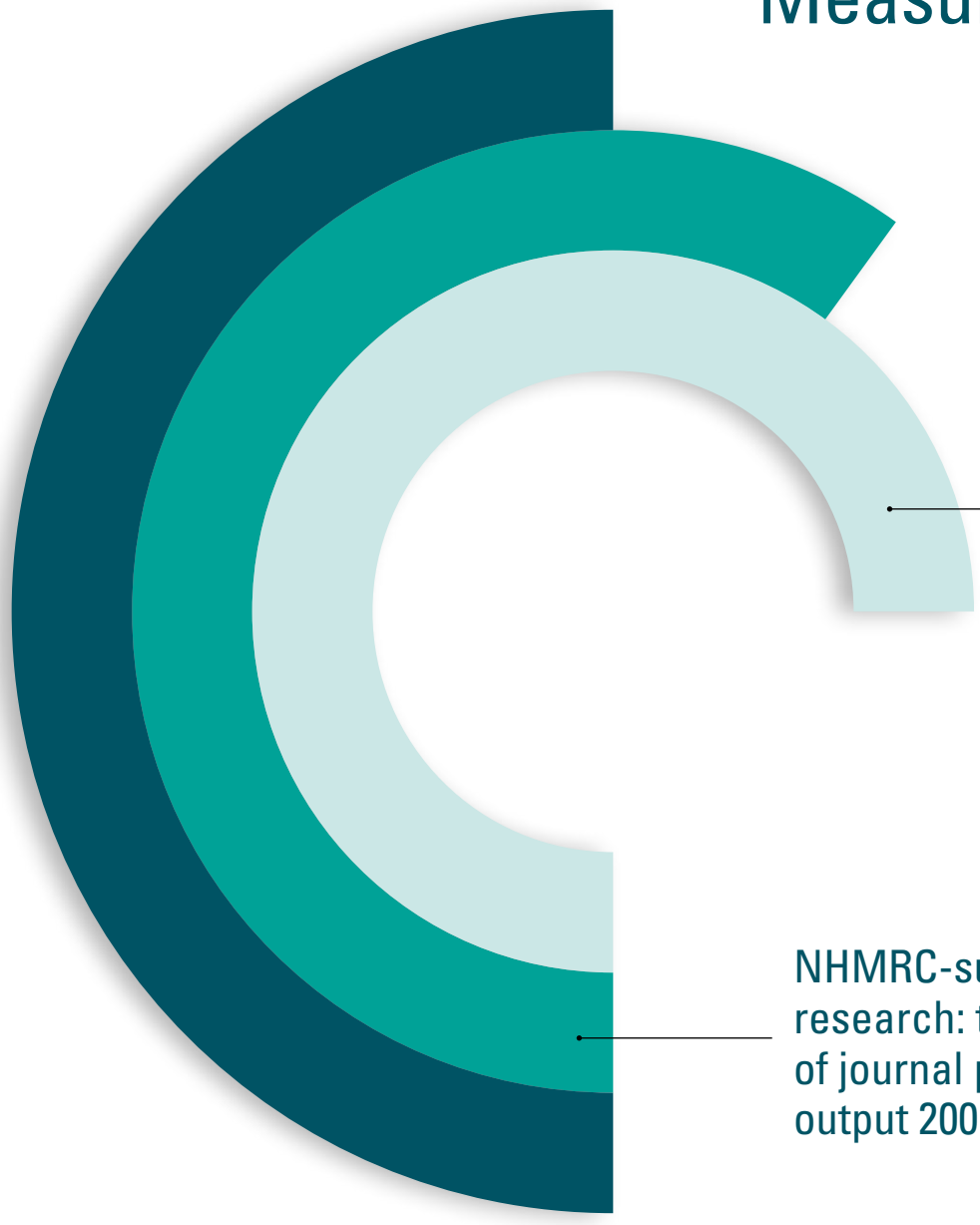


NHMRC-supported research: the impact of journal publication output 2005–2009

WORKING TO BUILD A HEALTHY AUSTRALIA

NHMRC

Measuring up 2013



NHMRC-supported research: the impact of journal publication output 2005–2009

WORKING TO BUILD A HEALTHY AUSTRALIA

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MEASURING UP 2013: BIBLIOMETRIC ANALYSIS OF NHMRC-SUPPORTED HEALTH AND MEDICAL RESEARCH PUBLICATIONS

This report measures the effectiveness of NHMRC- supported research in terms of scientific journal publications and citations. The results show that NHMRC-supported research significantly outperformed other comparable Australian research over the five-year study period (2005 – 2009).

31%

20,960 NHMRC-supported publications accounted for about 31% of all Australian health and medical research output in 2005– 2009, up from 26% in 2002–2006.

68%

The number of health and medical research publications that have NHMRC support was 68% higher in 2005–2009 than in 2002-2006, whereas the total Australian health and medical research publications increased by 44% during the same period.

60%

NHMRC-supported publications received 60% more citations than the world average. The average citation rate for Australian health and medical research publications was 17% above the world average.

48%

NHMRC funding supported nearly half of the Australian health and medical research publications that are in the top 1% of cited publications in the world.

92%

Citation impact was highest for research arising from Program Grants (92% above the world benchmark) and Research Fellowships (81% above the world benchmark).

40%

Nearly 40% of NHMRC-supported publications involved international collaborations. NHMRC-funded researchers collaborated with researchers from over 110 countries.

Executive summary

BACKGROUND

Measuring up 2013 is a five-year analysis of the scientific publication output and the citation impact of the research funded by the National Health and Medical Research Council (NHMRC) and of Australian health and medical research generally. Its aim is to measure the impact of NHMRC funding schemes in terms of published journal output.

This report is the latest in a series of bibliometric analyses that NHMRC has published since 1996.[1] The methodology and bibliometric indicators it uses largely follow those used in the previous reports. However, the 2013 report differs from its predecessors in that its main focus is to provide a comparative analysis of publications arising from NHMRC-supported research across all funding schemes with those arising from Australian research that did not receive NHMRC funding support.

The report covers all Australian publications from 2005 to 2009 in biomedical journals indexed in the Thomson Reuters Web of Science (Wos) database.[2]

MAIN FINDINGS

PUBLICATION OUTPUT

- The number of publications linked to NHMRC-supported research was 68% higher in 2005–2009 than in the previous five years. By comparison, the total number of Australian publications in the same fields rose by only 44% during the same period.

  Reasons for the higher output of NHMRC-supported research include a general increase in research publication output across relevant research fields, increased funding support, expanded grants schemes and some methodological differences between the current report and previous analyses.
- NHMRC-supported publications accounted for more than 30% of all Australian biomedical research output in 2005–2009, up from 26% in 2002–2006.
- NHMRC funding was linked to more than 40% of the total Australian publications output in five biomedical sub-fields:
  - (57%) Immunology
  - (44%) Cardiovascular Medicine and Haematology
  - (40%) Neurosciences
  - (40%) Biochemistry and Cell Biology
  - (40%) Other Medical and Health Sciences
- Almost one-third of publications from the Universities and Hospitals research sectors and more than two-thirds (68%) from the Research Institutes sector were linked to NHMRC funding.

[1] Previous reports were prepared by the Research Evaluation and Policy Project (REPP) at Australian National University. See most recent reports: L Butler and K Henadeera (2009) *Measuring Up 2009: NHMRC-supported research—the impact of journal publication output 2002–2006,* National Health and Medical Research Council, Canberra; L Butler, B Biglia and K Henadeera (2005) *NHMRC-supported research: the impact of journal publication output,* National Health and Medical Research Council, Canberra; L Butler (2003) *NHMRC-supported research: the impact of journal publication output,* National Health and Medical Research Council, Canberra; L Butler and B Biglia (2001) *Analysing the journal output of NHMRC research grants schemes,* National Health and Medical Research Council, Canberra.

[2] The term 'biomedical' as used in this report refers to publications appearing in journals classified to Web of Science subject categories that encompass the relevant research fields in medical and health sciences and in biological sciences. See Appendix D for WoS journal subject categories used in this analysis.

CITATION IMPACT

- NHMRC-supported publications had a relative citation impact well above the Australian average—60% above the world average, compared to 17% for all Australian biomedical publications.
- Nearly 50% of the most highly cited Australian publications (defined as the top 1% in the world) are attributed to NHMRC support. This is noteworthy given that NHMRC-supported publications represent only 30.5% of the total Australian publication output.
- NHMRC-supported publications received significantly more citations (60% above the world average) than Australian publications that were not supported by NHMRC funding (2% below the world average). In all fields and sub-fields, NHMRC-supported publications had a relative citation impact consistently above that of other Australian publications.
- The highest performing NHMRC schemes in terms of the citation impact of publications were Program Grants (with a relative citation impact 92% above the world benchmark) and Research Fellowships (81%).

RESEARCH COLLABORATIONS

- Nearly 40% of NHMRC-supported publications involved international collaborations, compared with 37% in the previous report. NHMRC-funded researchers collaborated with authors from over 110 countries—most often the United States, the United Kingdom, Canada, Germany or France.
- NHMRC-supported publications that only had Australian authors had a relative citation impact 25% above the world average, while those with at least one international collaborating author had a relative citation impact 115% above the world average.
- For the total Australian publication output, publications that only had Australian authors had a relative citation impact 15% below the world average, while those with at least one international collaborating author had a relative citation impact 65% above the world average.
- NHMRC-supported publications had a consistently higher proportion of cross-sectoral collaborations than other publications. For example, more than 90% of NHMRC-supported publications from the Hospitals sector had at least one author from another sector, compared to 58% for non-NHMRC publications.

METHODOLOGY

DATA USED

The analyses in this report are based on Thomson Reuters Web of Science (WoS) data for publications that appeared between 2005 and 2009 and the citations they attracted between 2005 and 2010.

Additional information on NHMRC-supported publications and grants schemes comes from NHMRC's Research Grant Management System (RGMS) and End of Grant Reports.

See Section 1.1 for the detailed methodology.

SECTORS ANALYSED

The report analyses 13 sectors. Seven of these equate to NHMRC research grants schemes, analysed as *'NHMRC schemes'*: Project Grants, Program Grants, Centres of Research Excellence, Research Fellowships, Practitioner Fellowships, Career Development Fellowships and Early Career Fellowships. The remaining six represent sites of activity in Australian health and medical research, analysed as '*research sectors*': Cooperative Research Centres, Research Institutes, Universities, Hospitals, Government and Other (that is, publications that could not be grouped into the five designated research sectors).

For the purposes of analysis, all NHMRC-supported publications have been removed from these research sectors so as to be able to identify NHMRC-funded research outputs and compare them with those produced without NHMRC funding support.

See Section 1.2 for the detailed methodology.

FIELDS OF RESEARCH ANALYSED

The report focuses on the biomedical fields and sub-fields of research. It uses WoS journal subject categories (detailed in Appendix D) to delineate fields of research relevant to this area of research.

See Section 1.5 for the detailed methodology.

BIBLIOMETRIC INDICATORS USED

The bibliometric indicators used in this report are:

- number of publications
- comparison of relative citation impact and relative journal impact
- distribution of highly cited publications
- level of collaboration.

These are detailed in Section 1.7.

LIMITATIONS OF BIBLIOMETRICS

Bibliometrics is a valuable tool for gaining insights into the research landscape. However, it is important to bear in mind that each bibliometric indicator has its own strengths and weaknesses and should not be used to draw conclusions selectively or in isolation. Only in combination with other quality measures of esteem, performance and visibility and with the testimony of expert peers can these measures provide a balanced evaluation of a body of work.

Comparison to previous report

This report follows the methodology used in the previous bibliometric report, *Measuring up 2009*, which covered publications from 2002 to 2006. However, the two studies differ in two ways: the research classification system used to delineate fields of research, and the composition of 'research sectors'.

Measuring up 2009 classified publications to a field of research on the basis of the Research Fields, Courses and Disciplines (RFCD) classification scheme.[3] The field of research classifications in the current report, on the other hand, are based on the Australian and New Zealand Standard Research Classification (ANZSRC) system,[4] which replaced the RFCD scheme. A number of research fields in the current report are not directly comparable with those in *Measuring up 2009* due to the differences between the two classification systems. However, it is still possible to compare nine research fields between the two reports.

It is important to stress that the *research sectors* in this report are delineated differently from the *comparator sectors* in previous NHMRC bibliometric reports.[5] This report aims to create comparator research sectors that have no publication overlap with NHMRC schemes. Therefore any publication that is attributed to NHMRC funding support has been removed from the research sectors, enabling readers to make the distinction between publications that were supported through NHMRC funding and those that were not. Thus the sectors analysed in this report as 'research sectors' cover only publications that were not supported, at least in part, by NHMRC funding schemes. In this respect, each research sector output analysed here is not a true reflection of the total output of that sector but is more accurately a reflection of the output funded principally through sources other than NHMRC. In previous bibliometric reports the composition of the comparator sectors included some overlap between NHMRC, Research Institutes and Cooperative Research Centres (CRCs).

Table 1 presents a comparison of publication output and relative citation impact between this report and the previous bibliometric report for total NHMRC publications by field of research. Table 2 compares the performance of individual grants schemes. Three new NHMRC funding schemes have been included in the current report, so not all of the results are direct comparators with the those in *Measuring up 2009* (Table 2).

[3] ABS (1998) Australian Standard Research Classification. Catalogue no. 1927.0, Canberra.
[4] ABS and Statistics New Zealand (2008) Australian and New Zealand Standard Research Classification (ANZSRC). Catalogue no. 1927.0, Canberra.
[5] See footnote 1, page 1.

Table 1: Changes in publication output (number of publications) and relative citation impact between *Measuring up 2009* and the current report by fields of research

Fields and sub-fields of research	Publication output			Relative citation impact (RCI)		
	Measuring up 2009 (2002–2006)	Current report (2005–2009)	% Change	*Measuring up 2009* (2002–2006)	Current report (2005–2009)	RCI change
Medical and Health Sciences	**9,861**	**17,191**	**74**	**1.58**	**1.66**	**+0.08**
Medical Biochemistry and Metabolomics	107	155	45	1.75	1.47	–0.28
Cardiovascular Medicine and Haematology‡		1,501			1.57	
Clinical Sciences‡		6,519			1.66	
Human Movement and Sports Science	137	407	197	1.43	1.79	+0.36
Immunology	1,283	1,823	42	1.62	1.51	–0.11
Neurosciences‡		2,761			1.33	
Nutrition and Dietetics‡		373			1.27	
Oncology and Carcinogenesis‡		1,142			1.28	
Optometry and Ophthalmology‡		507			1.45	
Paediatrics and Reproductive Medicine‡		1,065			1.63	
Pharmacology and Pharmaceutical Sciences	803	1,033	29	1.43	1.63	+0.20
Medical Physiology	796	882	11	1.19	1.37	+0.18
Public Health and Health Services‡		1,546			1.49	
Other Medical and Health Sciences‡		598			2.02	
General Medical and Health Sciences‡		983			2.84	
Biological Sciences General Biological Sciences*	418	706	69	1.73	1.74	+0.01
Biochemistry and Cell Biology	2,792	3,177	14	1.32	1.40	+0.08
Genetics	621	929	50	1.37	1.48	+0.11
Microbiology‡		974			1.27	
Physical Sciences Biological Physics†		311			1.26	
Engineering Biomedical Engineering†		137			1.37	
Multidisciplinary Sciences‡		277			2.07	
Total biomedical publications	**12,458**	**20,960**	**68**	**1.56**	**1.60**	**+0.04**

† Not included in Measuring up 2009. *‡ Journal composition of this field has changed due to the ANZSRC since the last report.*
** Included in* Measuring up 2009 *under Biotechnology.*

Table 2: Changes in publication output (number of publications) and relative citation impact between *Measuring up 2009* and the current report by NHMRC schemes

NHMRC schemes	Publication output			Relative citation impact (RCI)		
	Measuring up 2009 (2002–2006)	Current report (2005–2009)	% Change	*Measuring up 2009* (2002–2006)	Current report (2005–2009)	RCI change
Projects	6,156	6,278	2	1.47	1.61	+0.14
Programs	4,773	7,678	61	1.69	1.92	+0.23
Centres of Research Excellence†		3,001			1.50	
Research Fellowships	5,493	7,625	39	1.75	1.81	+0.06
Practitioner Fellowships†		1,600			1.68	
Career Development Fellowships	1,531	3,851	152	1.57	1.51	–0.06
Early Career Fellowships†		3,276			1.51	
NHMRC total	**12,458**	**20,960**	**68**	**1.56**	**1.60**	**+0.04**
Australia	**47,799**	**68,657**	**44**	**1.08**	**1.17**	**+0.09**
World	**1,622,169**	**2,237,732**	**38**			

† *Not included in* Measuring up 2009.

There was an increase (68%) in the number of publications linked to NHMRC support during the period covered by this report compared to the previous report. This is higher than the overall increase in the total Australian output (44%) during the same period and almost twice the increase in the world output (38%). The number of published outputs in the field of Medical and Health Sciences as a whole rose by 74%. However, for most sub-fields within Medical and Health Sciences a direct comparison between the two report periods is not feasible. Since *Measuring up 2009* the journal composition of Clinical Sciences and of Public Health and Health Services has significantly changed. Clinical Sciences now contains 24 Web of Science journal sets (35 previously), and Public Health and Health Services now contains eight (10 previously). Despite this reduction in journal sets, the numbers of publications classified to these fields increased during the reporting period.

The overall increase in NHMRC's total output is attributable to a number of causes, including the general increase in research publication output across biomedical research fields, increased funding support, expanded grants schemes and some methodological differences between the current report and the previous report. The current report includes three additional grants schemes (Centres of Research Excellence, Early Career Fellowships and Practitioner Fellowships) that were not part of *Measuring up 2009.* The recent improvements in publication data collection mechanisms in NHMRC's Research Grant Management System (RGMS) have enabled a larger number of NHMRC-supported publications to be captured for this report. This is clearly reflected in the increased output from the Career Development Fellowships, Program Grants and Research Fellowship schemes shown in Table 2. Nearly all the publications linked to these three grants schemes were sourced from RGMS data. In addition, publications from Project Grants included in this analysis are primarily extracted from the End of Grant Reports, which do not fully include all the publications resulting from every grant, as publications continue to be produced long after these reports are submitted. As a result the NHMRC publication output from these grants, in particular those from the Project Grants scheme, is likely to be under-represented.

In aggregate terms the relative citation impact of NHMRC-linked publications rose from 1.56 to 1.60 in the intervening period. NHMRC citation performance is 60% above the world average and 37% above overall Australian performance. Both Program Grants and Project Grants have recorded double-digit increases since the previous report. All NHMRC grants schemes remain well above the world and Australian benchmarks in terms of citation performance.

Introduction

This report is the latest in a series of publication analyses that NHMRC has conducted over the last 17 years.[6] It provides an analysis of knowledge production in terms of the number of scientific publications resulting from NHMRC-funded research, the citation impact of these publications and the level of scientific collaboration of these research outputs, both nationally and internationally. To this end, it analyses all Australian *biomedical* research publications (see footnote 2 above) published in peer-reviewed journals during 2005 to 2009 and indexed in the Thomson Reuters Web of Science database.

The report presents a comparative analysis of the scientific publications that arose from NHMRC-funded research with those that were not linked to NHMRC funding support. It does so to understand the impact of NHMRC-funded research within Australia's health and medical research sector. The analyses are presented at various levels of aggregation: the Australian research sector level (e.g. universities and medical research institutes), the NHMRC grant funding schemes level (e.g. Program Grants and Project Grants) and the research fields and sub-fields level, as well as at the higher aggregated level of biomedical research as a whole.

Health and medical research, or scientific research more broadly, can have wide-ranging benefits. Knowledge creation, one of many such benefits, is generally assessed through scientific publication outputs. Publications are one of the primary outcomes of scientific research. They are highly important as they contribute to new understanding and eventually to new products and, in the case of health and medical research, ultimately to better health outcomes for all. Assessment of the outcomes from funded research and the impact of these outcomes helps NHMRC to understand the effectiveness of its peer review processes for grant selection and support for new discoveries, and to demonstrate the accomplishments of the publicly funded research to general community.

This report has five sections:

- Section 1: *Methodology* outlines the methodology employed in the report. It covers sector identification, publication data selection, and bibliometric indicators.
- *Section 2: Australian biomedical research* provides an overview of the biomedical research and the NHMRC contribution to Australian health and medical research.
- *Section 3: Sector characteristics and performance* compares the research focus of each of the sectors covered in the report and analyses the performance of their total publication output.
- *Section 4: Collaboration in scientific research* illustrates the research collaboration patterns, with special focus on international collaborations and citation performance.
- *Section 5: Sector analysis by fields and sub-fields of research* outlines the performance of each of the sectors, where there is sufficient data, by discipline on the basis of journal sets using the ANZSRC classification scheme.

[6] See footnote 1, page 1.

1. Methodology

The methodology of this report follows from the previous bibliometric reports undertaken for NHMRC by the Research Evaluation and Policy Project (REPP) at the Australian National University.[7] While we have made some changes and refinements to the original methodology used in REPP bibliometric reports, we have retained important elements of the REPP methodology to make the findings of this report as closely comparable as possible to previous NHMRC bibliometric reports.

1.1 DATA SOURCES

The report is based on publications and citation data available in two Thomson Reuters databases: National Citation Report and Journal Performance Indicators. The version of the National Citation Report used for this report includes all Australian publications appearing in biomedical journals indexed in the Web of Science (WoS) database, together with yearly counts of citations received by each publication. While WoS does not cover all the scientific journals published, it captures a significant proportion of peer-reviewed journals in biomedical sciences.

Information on NHMRC-supported publications and grants schemes has been sourced from NHMRC's Research Grant Management System (RGMS) and End of Grant Reports, and incorporated into the publications dataset.

The publications dataset used for this report has the following criteria:

- all publications with at least one Australian address in the institution affiliation field
- appearing in biomedical journals (defined by WoS journal subject categories as shown in Appendix D)
- indexed in WoS (Science Citation Index Expanded, Social Science Citation Index)
- research articles and reviews published between 2005 and 2009
- citations received to these publications between 2005 and 2010.

Data was compiled on a publication-year basis, not a tape-year basis—that is, the year the item was published, not the year its details were entered into the WoS database.

The analysis was based on whole publication counts—that is, where more than one sector collaborated in a publication, each was given a count of one for that publication.[8]

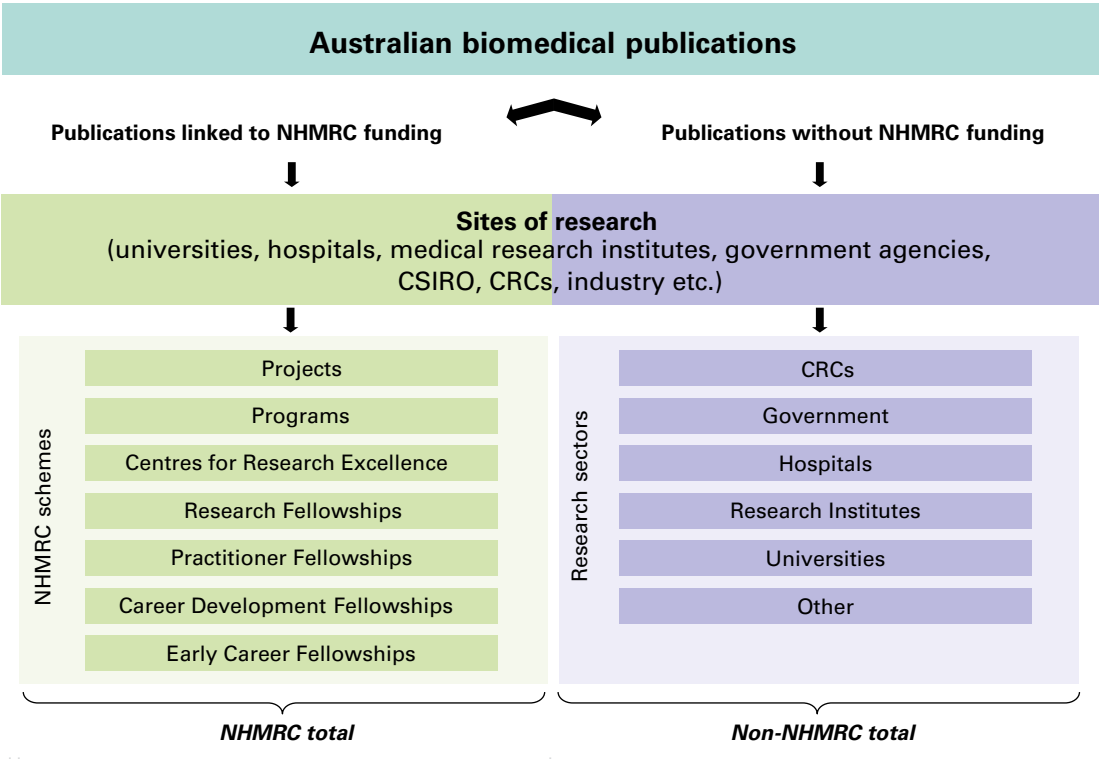
1.2 DEFINITION OF SECTORS

Australian biomedical research is carried out in many different locations: universities, hospitals, medical research institutes, government agencies, Cooperative Research Centres (CRCs) and so on. This report aims to provide a comparative analysis of publications arising from NHMRC-funded research and publications produced without NHMRC funding support. To achieve this, publications arising from Australian biomedical research carried out in different sites of research were first divided into two groups on the basis of NHMRC funding support: those that were linked to NHMRC funding and those that were not. Biomedical publications that were not linked to NHMRC funding were then sorted into six groups based on the author address of each publication, and analysed as *research sectors*. NHMRC-supported publications were grouped on the basis of the NHMRC funding scheme that provided the funding support for the research projects, and analysed as *NHMRC schemes*. Between these two groups, the report identified 13 sectors for analysis. The following diagram illustrates the relationship between these sectors and the split of biomedical research publications on the basis of NHMRC funding support.

[7] L Butler and K Henadeera (2009) *Measuring up 2009: NHMRC-supported research—the impact of journal publication output 2002–2006.* National Health and Medical Research Council, Canberra.

[8] The exception to this procedure was in the delineation of research sectors—see sections 1.2 and 1.3.

Composition of biomedical research publications into sectors



It is important to stress that the aim of the methodology used in this report was to identify NHMRC-funded research publications and their impact, and to compare them with research publications produced without NHMRC funding support. To this end, the overlap between these two main groups has been removed by excluding from the *research sectors* group any publication attributed to NHMRC funding support. Therefore the research sectors analysed in this report cover only publications that were *not supported*, at least in part, by NHMRC funding schemes. In this respect, each research sector output is not a true reflection of the total output of that sector but is more accurately a reflection of the output funded principally through sources other than NHMRC.

Details of the 13 sectors analysed in this report are presented in the following sections.

1.2.1 NHMRC SCHEMES

Research Support Schemes	
	1. Project Grants
	The Project Grants scheme supports research that is likely to be capable of solution within a relatively short time frame. Grants are commonly of three years duration but can be up to five years, and researchers usually retain teaching and/or clinical duties within their institutions.
	2. Program Grants
	Program Grants are awarded to research teams of scientific excellence working collaboratively on a number of health and medical research projects. Funding is provided for a five year period. This sector covers both the new scheme (grants starting in 2002) and a small number of grants (seven) funded under the old scheme that had publications in our reference period.
	3. Centres of Research Excellence (CREs)
	CREs provide support for teams of researchers to pursue collaborative research and develop capacity in clinical, population health and health services research. The duration of CREs is five years.

People Support Schemes	
	4. Research Fellowships
	NHMRC Research Fellowships provide five years' salary for high-calibre researchers, allowing them to undertake full-time research. The sector incorporates all publications from Research Fellowships for the portion of the reference period when they were being funded.
	5. Practitioner Fellowships
	This scheme aims to support research that results in the translation of new evidence into improved clinical practice and health policy and that delivers improvements in health and healthcare to Australians. Practitioner Fellowship holders are active clinicians and public health or health services professionals who undertake research that is linked to their practice or policy. The duration of this fellowship is five years. Practitioner Fellowships are part-time fellowships—that is, the fellowship holders are active clinicians and public health or health services professionals who are expected to devote 30–70% of their time to achieving the outcomes of the fellowship.
	6. Career Development Fellowships (CDFs)
	This scheme aims to further develop Australian health and medical researchers in their early- to mid-career stage. This four-year fellowship enables investigators to establish themselves as independent, self-directed researchers early in their research career; expand the capacity for biomedical, clinical, public health and health service delivery research, and for evidence-based policy development in Australian health systems; and encourage the translation of research outcomes into practice.
	7. Early Career Fellowships (ECFs)
	The aim of the four-year Early Career Fellowships is to enable developing health and medical researchers of outstanding ability to undertake advanced training in health and medical research either in Australia or overseas. A major objective of the scheme is to foster career development at the postdoctoral level by encouraging the beneficial experience of a different research environment.

NHMRC total

In all analyses, data is presented in aggregate for all grants schemes funded by NHMRC (sectors 1 to 7). Duplications due to cross-sector collaboration have been removed.

It must be stressed that support for the research that leads to a particular publication can come from more than one source. Publications identified as being supported by NHMRC funding (sectors 1 to 7) may well have been supported by other funding sources too.

1.2.2 RESEARCH SECTORS

8. Cooperative Research Centres (CRCs)
CRCs are collaborative partnerships between publicly funded researchers and end users. Collaborating organisations include universities and research institutions; government research agencies; governments at national, state and local levels; international partners; not-for-profit organisations; industry and community associations; and other end users. CRCs are fully funded single-focus research centres. This sector covers all relevant publications from CRCs that conduct research in health and medical sciences. A list of CRCs included in this report is in Appendix B. Any publications identified as having NHMRC support—that is, those included in sectors 1 to 7—have been removed from this sector.
9. Government
This sector covers the output (publications in biomedical journals) of full-time and part-time researchers working in federal and state government departments and agencies. In contrast to the previous report, this sector now includes the Commonwealth Scientific and Industrial Research Organisation (CSIRO), which was previously analysed under Research Institutes. It specifically excludes any publications identified as having NHMRC support—that is, those included in sectors 1 to 7.
10. Hospitals
The sector includes all relevant publications from hospitals, both public and private institutions. It covers the output of full-time and part-time researchers, funded principally through hospital general operating grants and through competitive grants obtained from other funding agencies. It specifically excludes any publications identified as having NHMRC support—that is, those included in sectors 1 to 7.
11. Universities
The sector covers the output of full-time and part-time researchers, most of whom retain teaching and administrative responsibilities, funded principally through university general operating grants and through competitive grants obtained from other funding agencies. All relevant publications from universities appearing in biomedical journals are included. It specifically excludes any publications identified as having NHMRC support—that is, those included in one or more of sectors 1 to 7.

12. Research Institutes
This sector covers independent medical research institutes employing full-time researchers, funded principally through general operating grants and through competitive grants obtained from funding agencies other than NHMRC. All the member institutions of the Australian Association of Medical Research Institutes (AAMRI) are included in this sector. The sector specifically excludes any publications identified as having NHMRC support—that is, those included in sectors 1 to 7. See Appendix C for the list of medical research institutions included in this sector.
13. Other
This sector comprises non-profit organisations, some medical research institutes (that is, non-AAMRI member institutes), biotechnology companies, medical practices and all other authors who could not be grouped into the five designated sectors (8 to 12). Data from this sector is presented only in Figure 1 and not separately analysed.

Non-NHMRC total

In addition to the individual research sectors above, data is also presented in aggregate for all research sectors (8 to 13). Duplications due to cross-sector collaboration have been removed.

Australia

This includes all data presented for sectors 1 to 13, in aggregate. Duplications due to cross-sector collaboration have been removed.

1.3 SECTOR OVERLAP

Given the collaborative nature of most research, with multi-authored papers being very common (see Figure 4), it is inevitable that there will be some double-counting between sectors in this report. Where authors from more than one sector collaborate on a publication, it is counted in full for each sector involved. The methods used to identify the relevant publications for each of the sectors resulted in some overlap within the groups of NHMRC schemes (1 to 7) and research sectors (8 to 13), but none between these two groups.

1.4 IDENTIFICATION OF PUBLICATIONS FOR EACH SECTOR

A number of methods were needed to identify NHMRC publications resulting from research funded through different grants schemes.

1.4.1 PEOPLE SUPPORT SCHEMES: RESEARCH FELLOWSHIPS, PRACTITIONER FELLOWSHIPS, CAREER DEVELOPMENT FELLOWSHIPS AND EARLY CAREER FELLOWSHIPS

Details of all the researchers' publications for the period in which they were being supported were extracted from RGMS, with a one-year time lag factored in. For example, publications were limited to 2005 and 2006 for researchers whose award finished in 2005, and publications were limited to 2008 and 2009 for researchers whose award commenced in 2007. This data was supplemented with publications from the WoS database that acknowledged NHMRC funding support and gave the relevant grant identification number.

1.4.2 RESEARCH SUPPORT SCHEMES: CENTRES OF RESEARCH EXCELLENCE AND PROGRAM GRANTS

All the publications of named chief investigators for the period in which each chief investigator was being supported were extracted from RGMS, with a one-year time lag factored in. For example, publications were limited to 2005 and 2006 for researchers whose award finished in 2005, and publications were limited to 2008 and 2009 for researchers whose award commenced in 2007. This data was supplemented with publications from the WoS database that acknowledged NHMRC funding support and gave the relevant grant identification number.

1.4.3 PROJECT GRANTS

The publications arising from Project Grants cannot be identified using the same methodology as described for the grants schemes above. Project Grants are funding for a discrete, unique research project, often with multiple investigators. Therefore only publications where the investigators have linked the funding support to a specific Project Grant in End of Grant Reports or within the publication are included for the analysis.

All End of Grant Reports that NHMRC received up to September 2011 were reviewed for relevant publications for the target period of this report (2005–2009). This resulted in 5,389 publications from 1,866 End of Grant Reports. These data were supplemented with 1,751 publications identified in the 2009 bibliometric report. In addition 1,762 publications, linked to 1,136 Project Grants, were extracted from funding acknowledgement data available from the WoS database. The final dataset for Project Grants, after removing duplications, contained 6,278 unique publications that were indexed in the WoS database. These publications were linked to 2,115 Project Grants.

COMPLETENESS OF PUBLICATION SET FOR THE PROJECT GRANTS

It must be stressed that the three methodologies used to identify Project Grants publications will not have identified all the publications that can be linked to this scheme, for two reasons. Firstly, not all researchers or groups that have publications in our reference period have completed an End of Grant Report. It is also worth noting that End of Grant Reports do not fully include all the publications resulting from every grant, as publications continue to be produced long after these reports are submitted. Secondly, while the number of publications that have acknowledged NHMRC funding support for their research has increased over recent years, there are still a large number of publications without such information. Even when a publication carries a funding acknowledgment note it is not always complete with the necessary information (e.g. the NHMRC grants scheme or the identifying number of the grant) to enable linking to a specific grant. Therefore the exact extent of under-representation in this report is not possible to calculate. This issue must be borne in mind when interpreting the results of the report but, given the large number of publications that were identified, it is unlikely to have a significant effect on the average citation rates that formed the basis of the analysis.

1.4.4 RESEARCH SECTORS: CRCS, GOVERNMENT, HOSPITALS, RESEARCH INSTITUTES AND UNIVERSITIES

All the variations of author addresses for each publication in the Australian biomedical publication dataset of WoS have been identified and standardised. This is to ensure that each publication is assigned to the correct institution and sector. All publications attributable to each of the sectors based on the standardised addresses have been identified and included in the publication dataset for the analysis.

1.5 FIELD OF RESEARCH CLASSIFICATION

Publications are analysed on the basis of the fields of research (FoR) classification scheme (part of the Australian and New Zealand Standard Research Classification—ANZSRC—system).[9] The ANZSRC was prepared by the Australian Bureau of Statistics and Statistics New Zealand for use in the measurement and analysis of research and experimental development undertaken in Australia and New Zealand. It allows comparison across sectors at a more aggregated level.

The make-up of journal sets for FoR analysis rests on WoS's classification schemes. WoS has its own descriptive classification system involving around 250 journal subject categories. NHMRC has translated these categories as closely as possible into the FoR scheme from the ANZSRC. Most WoS subject categories slot neatly into one of the FoR sub-fields. Where a single subject category had elements of two or more FoR fields in its composition, it was classified to a particular field where more than half of the journals appeared to clearly relate to that field. However, four categories could not be assigned to a single sub-field due to the diverse nature of journal composition within them. These journal sets cover a broad range of topics overlapping many sub-fields. Therefore these have been analysed as separate fields, as given below.

[9] ABS and Statistics New Zealand (2008) Australian and New Zealand Standard Research Classification (ANZSRC). Catalogue no. 1927.0, Canberra.

Assigning journal categories to fields of research

WoS subject category	*Analysed as*
Biochemical Research Methods; Biotechnology and Applied Microbiology	General Biological Sciences
Medicine, General and Internal	General Medical and Health Sciences
Multidisciplinary Science	Multidisciplinary Sciences

WoS allocates some journals to more than one subject category. This can result in some double-counting between fields and/or sub-fields.

The subject categories ascribed to each biomedical field or sub-field are shown at the start of each analysis in Section 5.

1.6 PUBLICATION VOLUME THRESHOLD

The citation distribution among publications is very skewed. While very few publications achieve high citation counts, a vast majority receive very few or no citations at all. The smaller the number of publications being analysed, the greater the effect such an item will have on the average. Therefore no citation analyses were presented for any units with fewer than 100 publications, to ensure that one or a few highly cited publications do not skew the results. Any results of smaller datasets with fewer than 200 publications should also be interpreted with caution.

1.7 BIBLIOMETRIC INDICATORS

This section gives a general description of the bibliometric indicators used in the report.

1.7.1 NUMBER OF PUBLICATIONS

The number of scientific publications produced is an indication of research outcomes and the scale of research activity. In this report, the total number of scientific journal publications attributable to each sector has been calculated for the five-year period.

The distribution of Australia's biomedical publications across different sectors for each field and sub-field provides an indication of the spread of research effort and the level of contribution by each sector (see Table 3). Likewise, the volume distribution of publications across various biomedical fields and sub-fields has been prepared in order to determine the research focus of NHMRC and individual sectors (see Table 5). This information is tabulated as a percentage distribution.

The publication volume, given as the scientific output of the sector being analysed, is to illustrate relative size—that is, the context for the analysis—but should not be taken to be the absolute scientific output of the unit for the given period. The publication volume included in this report is a subset of the total research output—that is, only publications that have been reported to NHMRC and indexed in WoS. Therefore, in addition to the absolute numbers, this report provides publication volumes in relative proportions, which allows for more meaningful comparisons between sectors.

1.7.2 RELATIVE CITATION IMPACT AND RELATIVE JOURNAL IMPACT

The research profiles—the publication mix within different fields—varies from one research group or sector to another. There is also a greater variation among different fields of research in terms of the publishing and citation patterns. Therefore raw citation counts, and even the simple citation per publication (CPP) data, are not comparable between research groups and sectors and between different research fields. The citation impact measures used in this report calculate a relative measure between the citations achieved and the expected number of citations (defined as the world average). As this ratio is calculated by taking into account the age and type of publication and the research field in which the publication appeared, it provides some level of normalisation to adjust for these differences and therefore allows broader comparisons to be made.

The assessment of relative impact in this report has two components. The *relative citation impact* compares the citation rate of the unit being analysed with the relevant world average. It is calculated by dividing the average number of citations of a publication by a research unit in a given sub-field by the average number of citations for all publications in that sub-field (that is, the world citation rate for

that sub-field). Thus a relative citation impact of more than 1.0 indicates a higher/better position than the world average for similar research, while a relative citation impact of less than 1.0 would indicate a relatively lower/poorer performance than the world average.

Likewise the *relative journal impact* compares the average citation rate of the journals in which a research unit publishes in a particular sub-field to the average citation rate of all journals classified to that sub-field. A score of more than 1.0 indicates that the unit is publishing in high-impact journals, while a score of less than 1.0 indicates that the publications are being placed in relatively low-impact journals.

The relative journal impact is not used in this report to estimate the expected impact of the publications being analysed. It provides a reference point to ascertain where the research is published and the standing of the journals in terms of citation impact. The impact/influence that individual publications had on the scientific community is better assessed by the *relative citation impact* and *percentile distribution* of these papers.

1.7.3 PERCENTILE DISTRIBUTION OF HIGHLY CITED PUBLICATIONS

Thomson Reuters provides details of the performance of each Australian article relative to all other articles in the world in the same category and same year, based on the citations received by each publication.

For each field of research in this report we have profiled the publications of NHMRC and all the other sectors, showing the number and proportion of total output in each category, classified into six bands: those amongst the 1% most highly cited in the world; those in the 2% to 5% range; those in the 6% to 10% range; those in the 11% to 20% range; those in the 21% to 50% range; and those in the bottom half of cited publications. The relative share of publications in these citation impact bands indicates how NHMRC schemes and other sectors have performed relative to each other in different fields of research. The distribution of publications across different bands can also reveal whether a high relative citation impact score is due to a large number of well-cited publications or a very few highly cited publications.

The table below illustrates how the centile profiles for each sector are presented. *Expected level* shows the average publication share expected for each centile band to be on par with the average distribution of the world share. For example, 1% share at the Top 1% band indicates average performance, while 6.0% share at the Top 1% band indicates six times the world average. A higher proportion of publication share in the top two or three bands is an indicator of strong citation performance.

Citation centile distribution (sample)

Sector	Top 1%		Top 2–5%		Top 6–10%		Top 11–20%		Top 21–50%		Bottom 50%		Total
Sector 1	7	*6.0%*	5	*4.2%*	10	*8.4%*	17	*14.3%*	30	*25.2%*	50	*42.0%*	119
Sector 2	4	*3.2%*	4	*3.2%*	5	*4.0%*	12	*9.7%*	44	*35.5%*	55	*44.4%*	124
Sector 3	8	*5.4%*	6	*4.1%*	8	*5.4%*	19	*12.9%*	39	*26.5%*	67	*45.6%*	147
Expected level		***1%***		***4%***		***5%***		***10%***		***30%***		***50%***	

1.7.4 LEVEL OF COLLABORATION

The information regarding scientific collaboration presented in the report is based on the co-authorship analysis of publications. Based on author affiliation addresses given in publications the following collaborations patterns are analysed:

- *Single author* one author only (that is, no collaboration)
- *Domestic* more than one author from Australia
- *International* at least one author from a country other than Australia

1.8 COMPARISON TO METHODOLOGIES IN PREVIOUS BIBLIOMETRIC REPORTS

There are a number of methodological differences between the current report and the previous bibliometric report, *Measuring up 2009*, which covered publications from 2002 to 2006. These differences must be taken into account when comparing the performance outcomes presented in the two reports.

1.8.1 FIELDS OF RESEARCH

Measuring up 2009 classified the publications to a field of research on the basis of the RFCD classification scheme.[10] The field of research classifications in the current report, on the other hand, are based on the ANZSRC system[11], which has replaced the RFCD scheme. Research fields were compiled by mapping WoS journal categories to relevant RFCD categories for the previous report, and to ANZSRC categories for the current report. Due to the differences in classifications between the RFCD and ANZSRC systems, a number of research fields in the current report are not directly comparable with those in the previous report.

The current report also includes four additional WoS journal categories (Biophysics, Biomedical Engineering, Biomaterials, and Virology) that were not included in *Measuring up 2009*. Three journal categories (Acoustics, Nanoscience and Nanotechnology, and Medical Ethics) are no longer included in the current report, as they now fall outside the biomedical fields it covers. The following table shows the effect of these changes in terms of the publication output attributed to NHMRC, Australia and World.

Effect of changes in journal categories on publication totals in current report

	With changes to journal categories	*Without changes to journal categories*	*Change*
NHMRC	20,960	20,687	*273*
Australia	68,657	69,073	*–416*
World	2,237,732	2,270,920	*–33,188*

1.8.2 CHANGES TO SECTORS

The current report includes three additional grants schemes—Centres of Research Excellence, Early Career Fellowships and Practitioner Fellowships—that were not part of *Measuring up 2009*. The new schemes will have contributed to the overall increase in NHMRC's publication output but are unlikely to have a noticeable impact on the overall citation performance of NHMRC.

The composition of the sectors in *Measuring up 2009* included some publication overlap between NHMRC sectors, research institutes and CRCs. However, there is no such publication overlap between NHMRC schemes and the research sectors in the current report, as outlined in Section 1.2.

Further, the composition of the Government sector has changed since the last report. In the current report CSIRO publications are included in the Government sector. Previously the relevant publications from CSIRO's Division of Health Sciences and Nutrition were analysed as part of Other Research Institutes—that is, the sector covering medical research institutes. This change explains the substantial increase in the publication output, and in particular the relative citation performance, within the Government sector in the current report.

1.8.3 IMPROVED PUBLICATION DATA COLLECTIONS

Recent improvements to publication data collection mechanisms within RGMS have enabled a large number of NHMRC-supported publications to be captured for this report. Up-to-date research publications records for each grant holder are stored within RGMS. Grant holders can link each publication to a specific grant or set of grants that supported the research project. Unlike in the past, these records can now be easily mapped against bibliometric databases such as WoS and PubMed.

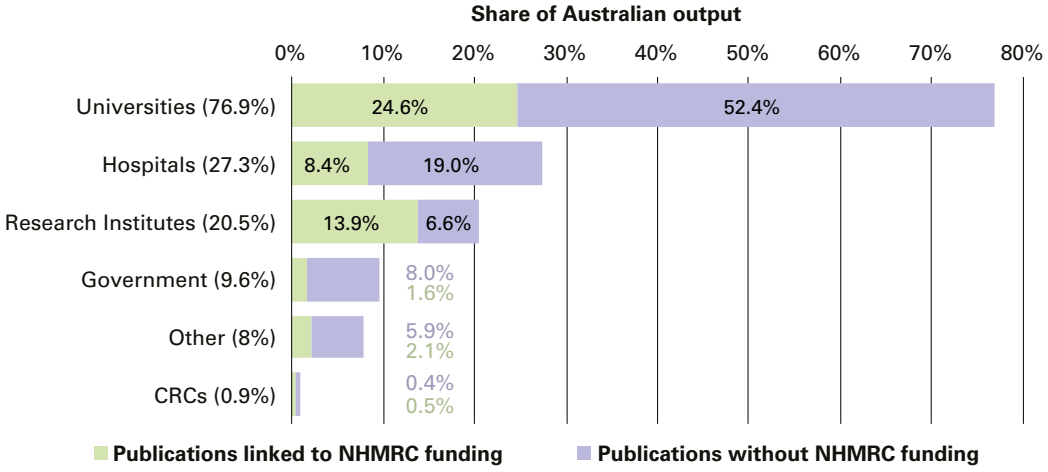
[10] ABS (1998) Australian Standard Research Classification. Catalogue no. 1927.0, Canberra.
[11] ABS and Statistics New Zealand (2008) Australian and New Zealand Standard Research Classification (ANZSRC). Catalogue no. 1927.0, Canberra.

2. Australian biomedical research

Australia's share of the world biomedical publication output indexed in the Thomson Reuters Web of Science (WoS) database is 3.1% for the period 2005 to 2009 (up from 2.9% in the previous bibliometric report for 2002–2006 publications). Biomedical research is carried out in many different research sectors such as medical research institutes, universities, hospitals, the Commonwealth Scientific and Industrial Research Organisation (CSIRO), biotechnology companies and non-profit research organisations. The level of contribution to the overall Australian publication output varies between sectors (see Figure 1). A substantial proportion of Australian biomedical publications (77%) are linked to the Universities sector (that is, at least one contributing author has a university affiliation), followed by Hospitals (27%) and Research Institutes (21%). Given the highly collaborative nature of health and medical research there is a significant overlap between sectors, in particular between Universities, Hospitals and Research institutes. Government sector publications include CSIRO and other government agencies. The Other sector comprises non-profit organisations, some medical research institutes (that is, non-AAMRI member institutions[12]), biotechnology companies, medical practices and all other authors who could not be grouped into the five designated sectors.

Also included in Figure 1 is the proportion of publications that received NHMRC funding support. Over 30% of all Australian biomedical publications are linked to NHMRC grants schemes and have received some funding support. The proportion of publications linked to NHMRC funding support is high (68% of the sector output) within the Research Institutes sector, indicating the large number of NHMRC grants this sector receives. Approximately one-third of publications in the Universities, Hospitals, and Other sectors, and over half of the CRCs sector output are linked to NHMRC funding. A detailed analysis of the distribution and the impact of NHMRC-supported publications is given in Section 3.

Figure 1: Proportion of Australian biomedical publications by sector of contributing author(s), split by NHMRC funding support, 2005–2009



Notes: Where authors from more than one sector collaborate on a publication, it is fully counted for each sector involved. Due to these cross-sector collaborations, the sum of all sectors will be greater than 100%. The total sector contribution to Australian biomedical research is given in brackets.

The importance of NHMRC to the Australian biomedical research effort is highlighted in Table 3. This table shows the distribution of all biomedical publications across the sectors as a proportion of the total Australian output in each field and sub-field of research. Any publication linked to NHMRC funding support has been excluded from the research sectors.

[12] See Appendix C for the list of AAMRI member institutions analysed in this report.

Table 3: Proportional spread of Australian biomedical research effort—distribution of publications by biomedical fields of research (as proportion of total Australian output), split by sector, 2005–2009 (%)

Fields and sub-fields of research	NHMRC schemes								Research sectors						Australian total
	Projects	Programs	Centres of Research Excellence	Research Fellowships	Practitioner Fellowships	Career Development Fellowships	Early Career Fellowships	NHMRC total	CRCs	Government	Hospitals	Research Institutes	Universities	Non-NHMRC total	
Medical and Health Sciences	8.7	11.1	5.1	10.4	2.7	5.6	5.0	**31.1**	0.4	6.0	22.4	7.1	51.0	**68.9**	100
Medical Biochemistry and Metabolomics	6.4	7.4	0.8	8.2	0.1	4.6	1.4	**19.8**		11.3	4.1	3.2	67.9	**80.2**	100
Cardiovascular Medicine and Haematology	10.5	19.8	11.7	15.6	3.5	5.9	5.3	**43.6**	0.1	2.7	30.9	8.9	29.0	**56.4**	100
Clinical Sciences	7.9	10.4	6.0	8.5	3.4	5.0	5.0	**29.6**	0.2	5.7	28.8	6.9	48.9	**70.4**	100
Complementary and Alternative Medicine	0.5	1.0	1.0	1.4			1.0	**3.8**		1.4	4.3	2.9	86.1	**96.2**	100
Dentistry	4.8	0.4	0.2	1.1		2.1	2.9	**9.6**	1.8	2.3	12.1	1.1	80.9	**90.4**	100
Human Movement and Sports Science	3.6	2.1	4.3	7.0	0.6	3.6	4.9	**18.7**		11.0	9.4	1.3	72.1	**81.3**	100
Immunology	16.8	32.6	6.0	21.1	4.1	12.7	8.8	**57.0**	0.8	6.1	10.6	7.3	30.6	**43.0**	100
Neurosciences	14.6	12.3	5.5	14.4	3.6	5.9	6.8	**40.1**	0.3	2.0	16.6	8.8	49.1	**59.9**	100
Nursing	0.3	0.5	1.1	1.0	0.2	1.3	0.9	**4.4**		11.4	23.5	1.8	87.7	**95.6**	100
Nutrition and Dietetics	5.5	6.4	5.6	7.5	1.4	7.1	5.2	**27.6**	0.1	12.8	9.8	6.0	61.8	**72.4**	100
Oncology and Carcinogenesis	9.6	18.6	1.7	17.3	1.4	7.1	4.9	**38.1**	0.1	3.8	26.5	17.5	38.2	**61.9**	100
Optometry and Ophthalmology	9.1	3.5	5.6	11.5	2.3	3.8	5.9	**28.6**	7.8	0.8	17.7	14.1	50.6	**71.4**	100
Paediatrics and Reproductive Medicine	5.7	9.1	4.0	8.5	3.7	6.3	4.1	**28.2**		3.2	42.2	9.0	46.0	**71.8**	100
Pharmacology and Pharmaceutical Sciences	12.3	7.7	3.3	10.2	1.3	4.7	3.3	**28.8**	0.3	8.9	12.9	5.4	58.1	**71.2**	100
Medical Physiology	18.5	8.0	3.2	18.4	0.7	7.8	6.5	**38.8**	0.1	6.3	6.0	4.5	55.8	**61.2**	100
Public Health and Health Services	3.9	7.9	2.7	7.4	1.1	6.6	4.9	**24.5**	0.1	9.9	10.9	5.1	64.6	**75.5**	100
Other Medical and Health Sciences	13.2	17.1	7.1	14.4	2.0	8.2	4.9	**40.3**	0.3	4.9	19.4	9.9	41.2	**59.7**	100

Fields and sub-fields of research	NHMRC schemes								Research sectors						Australian total
	Projects	Programs	Centres of Research Excellence	Research Fellowships	Practitioner Fellowships	Career Development Fellowships	Early Career Fellowships	NHMRC total	CRCs	Government	Hospitals	Research Institutes	Universities	Non-NHMRC total	
General Medical and Health Sciences	3.1	9.2	8.0	4.5	3.6	4.0	4.0	**25.4**	0.1	7.8	31.9	5.4	48.7	**74.6**	100
Biological Sciences* General Biological Sciences	8.3	7.2	1.1	8.8	0.5	3.9	2.8	**21.0**	0.4	18.7	3.4	4.0	62.4	**79.0**	100
Biochemistry and Cell Biology	16.5	16.2	1.3	21.0	0.7	8.0	5.3	**40.4**	0.5	9.3	4.2	6.5	49.7	**59.6**	100
Genetics	10.3	9.8	1.3	14.5	2.0	6.1	4.3	**28.8**	0.2	17.5	9.0	8.2	54.7	**71.2**	100
Microbiology	11.7	13.1	5.2	7.7	2.7	5.1	3.3	**31.1**	0.6	21.4	10.0	4.3	49.6	**68.9**	100
Physical Sciences* Biological Physics	11.8	11.4	1.2	14.0	0.1	5.0	3.4	**29.7**	0.5	7.5	4.7	4.2	63.4	**70.3**	100
Engineering* Biomedical Engineering	3.4	2.1	1.7	3.4	3.1	2.6	1.6	**14.3**	0.4	6.9	20.2	4.4	75.7	**85.7**	100
Multidisciplinary Sciences	7.4	14.0	0.7	13.6	0.7	4.8	5.8	**22.6**	0.1	19.6	1.3	3.1	61.2	**77.4**	100
Total—all biomedical sciences	**9.1**	**11.2**	**4.4**	**11.1**	**2.3**	**5.6**	**4.8**	**30.5**	**0.4**	**8.0**	**19.0**	**6.6**	**52.4**	**69.5**	**100**

Notes: There is some publications overlap, due to cross-sector collaborations, between NHMRC schemes, and between research sectors, but none between these two groups. As a result, the sum of component sectors will be greater than the sum of the respective totals (NHMRC total, non-NHMRC total and Australian total).

** These fields are not covered in their entirety. Only sub-fields relevant to biomedical research within these fields are analysed.*

Over half of Australia's output in Immunology (57%), and over one-third of Australia's output in Biochemistry and Cell Biology, Cardiovascular Medicine and Haematology, Neurosciences, Oncology and Carcinogenesis, Medical Physiology, and Other Medical and Health Sciences can be linked to NHMRC funding support. The Universities sector is a significant site of medical research in all sub-fields, but is particularly important for research in Biomedical Engineering, Medical Biochemistry and Metabolomics, Complementary and Alternative Medicine, Dentistry, Human Movement and Sports Science, and Nursing. The Universities sector accounts for two-thirds or more of the output in these disciplines. The Hospitals sector has its strongest presence in Paediatrics and Reproductive Medicine, Cardiovascular Medicine and Haematology, Clinical Sciences, Nursing, and General Medical and Health Sciences.

NHMRC-supported publications account for over 30% of the Australia's biomedical output. The relative proportion of NHMRC-supported publications among disciplines varies between sectors. Table 4 provides the number of publications attributed to NHMRC funding as a proportion of the sector output within each discipline. Sub-fields with 50% or more of NHMRC-supported publications have been highlighted.

Table 4: Proportion of all biomedical publications attributable to NHMRC funding support within the total field/sub-field output for each sector and Australia, 2005–2009 (%)

Fields and sub-fields of research	CRCs	Government	Hospitals	Research Institutes	Universities	Australia
Medical and Health Sciences	50.8	22.1	29.8	66.0	32.9	**31.1**
Medical Biochemistry and Metabolomics	100.0	3.3	23.8	73.1	19.7	**19.8**
Cardiovascular Medicine and Haematology	78.9	37.3	31.5	70.2	52.1	**43.6**
Clinical Sciences	55.7	23.2	27.8	64.1	33.3	**29.6**
Complementary and Alternative Medicine			10.0		4.3	**3.8**
Dentistry	37.5	24.0	8.3	52.6	10.2	**9.6**
Human Movement and Sports Science	100.0	10.1	30.5	75.2	19.4	**18.7**
Immunology	81.5	31.6	54.9	81.3	58.4	**57.0**
Neurosciences	9.1	38.7	41.9	66.1	41.9	**40.1**
Nursing		2.3	3.6	22.9	4.3	**4.4**
Nutrition and Dietetics	50.0	19.5	39.5	64.8	28.4	**27.6**
Oncology and Carcinogenesis	42.9	30.9	35.0	57.2	41.7	**38.1**
Optometry and Ophthalmology	30.5	28.6	25.6	55.9	26.7	**28.6**
Paediatrics and Reproductive Medicine	100.0	31.8	24.1	61.1	33.8	**28.2**
Pharmacology and Pharmaceutical Sciences	47.1	15.7	32.3	66.2	29.4	**28.8**
Medical Physiology	75.0	16.8	47.7	76.9	37.4	**38.8**
Public Health and Health Services	50.0	20.0	29.9	59.7	24.8	**24.5**
Other Medical and Health Sciences	73.7	35.4	38.1	68.8	42.2	**40.3**
General Medical and Health Sciences	55.6	25.2	24.4	60.9	28.9	**25.4**
Biological Sciences*						
General Biological Sciences	40.0	4.5	47.2	72.4	21.1	**21.0**
Biochemistry and Cell Biology	60.8	13.0	52.2	76.4	39.2	**40.4**
Genetics	57.9	8.7	48.6	68.5	27.8	**28.8**
Microbiology	53.7	12.1	45.5	76.1	33.8	**31.1**
Physical Sciences*						
Biological Physics	44.4	9.2	31.0	74.1	28.8	**29.7**
Engineering*						
Biomedical Engineering	20.0	10.8	18.9	51.7	13.3	**14.3**
Multidisciplinary Sciences	88.9	5.9	57.9	82.0	21.5	**22.6**
All biomedical sciences	**52.7**	**17.0**	**30.6**	**67.8**	**31.9**	**30.5**

Notes: Each cell represents the number of NHMRC-supported publications within the field or sub-field output of the sector divided by the total number of publications produced by the sector in that field or sub-field. If a sector produced 100 immunology publications, of which 40 have been attributed to NHMRC funding support, then this is shown in the table as 40.0 under Immunology for this sector.

** These fields are not covered in their entirety. Only sub-fields relevant to biomedical research within these fields are analysed.*

Among the biomedical sub-fields, 57% of all Australian Immunology publications can be linked to NHMRC funding. Further, over 80% of Multidisciplinary Sciences and Immunology publications from Research Institutes and CRCs, and well over half of Immunology publications from the Universities and Hospitals sectors are linked to NHMRC support. A substantial proportion of publications from all biomedical sub-fields, except Nursing, within the Research Institutes sector have received NHMRC support. This translates to 68% of all the biomedical publications produced by this sector having some form of NHMRC funding support.

It must be stressed that support for the research that leads to a particular publication can come from more than one source. Therefore the publications identified as being supported by NHMRC funding may well have been supported by additional funding sources.

3. Sector characteristics and performance

3.1 SECTOR RESEARCH PROFILES

The research focus of individual institutions and research units is reflected in their research profile and publication output. The research profile of each sector is in turn characteristic of the publication profiles of individual institutions and research units that make up the sector. Therefore the sectors presented in this report, including NHMRC schemes, have different research profiles. Their publication outputs are spread across a wide variety of fields of research. Different fields of research have different citation practices. Further, research sectors presented in this report include only those biomedical publications that are *not* supported, at least in part, by NHMRC funding schemes. As such, they do not represent the complete publication output of each of the research sectors. Therefore the publication profile of a sector, as represented in this report, is an essential piece of knowledge that needs to be taken into consideration when interpreting results.

Table 5 illustrates the publication profile of each sector—the spread of the journal publications for each sector across the biomedical fields and sub-fields as a proportion of the total sector output. In addition, the second column shows the average citation per publication (CPP) rates for each field and sub-field, underscoring the differences that can occur even within one field. The CPP data provide context when interpreting the citation impact of individual sectors within each field and sub-field later on in this section.

Table 5: Distribution of biomedical publications in sectors by fields and sub-fields of research as proportion of total sector output showing the research focus within individual sectors, 2005–2009 (%)

Fields and sub-fields of research	*Field/sub-field CPP average **	NHMRC schemes								Research sectors						Australian total
		Projects	Programs	Centres of Research Excellence	Research Fellowships	Practitioner Fellowships	Career Development Fellowships	Early Career Fellowships	NHMRC total	CRCs	Government	Hospitals	Research Institutes	Universities	Non-NHMRC total	
Medical and Health Sciences	*8.81*	77.0	80.2	94.3	75.7	92.6	80.4	83.8	**82.0**	84.3	61.0	95.3	86.6	78.6	**80.0**	**80.6**
Medical Biochemistry and Metabolomics	*7.55*	0.8	0.8	0.2	0.8	0.1	0.9	0.3	**0.7**		1.6	0.2	0.6	1.5	**1.3**	**1.1**
Cardiovascular Medicine and Haematology	*10.55*	5.8	8.9	13.4	7.0	7.4	5.3	5.5	**7.2**	1.4	1.7	8.2	6.8	2.8	**4.1**	**5.0**
Clinical Sciences	*7.84*	27.6	29.9	43.7	24.7	46.6	28.3	33.5	**31.1**	17.8	23.1	48.6	33.6	29.9	**32.5**	**32.0**
Complementary and Alternative Medicine	*5.06*	<0.0	<0.0	0.1	<0.0			0.1	**<0.0**		0.1	0.1	0.1	0.5	**0.4**	**0.3**
Dentistry	*5.26*	0.6	<0.0	0.1	0.1		0.4	0.7	**0.4**	5.2	0.3	0.8	0.2	1.9	**1.6**	**1.2**
Human Movement and Sports Science	*5.89*	1.3	0.6	3.1	2.0	0.9	2.1	3.2	**1.9**		4.4	1.6	0.6	4.4	**3.7**	**3.2**
Immunology	*12.36*	8.6	13.6	6.4	8.9	8.1	10.5	8.5	**8.7**	8.7	3.6	2.6	5.2	2.7	**2.9**	**4.7**
Neurosciences	*10.22*	16.0	11.0	12.7	13.0	15.3	10.5	14.2	**13.2**	7.0	2.6	8.8	13.5	9.4	**8.7**	**10.0**
Nursing	*3.20*	0.1	0.1	0.5	0.2	0.2	0.5	0.4	**0.3**		3.1	2.7	0.6	3.6	**3.0**	**2.2**

Fields and sub-fields of research	*Field/sub-field CPP average **	NHMRC schemes								Research sectors						Australian total
		Projects	Programs	Centres of Research Excellence	Research Fellowships	Practitioner Fellowships	Career Development Fellowships	Early Career Fellowships	NHMRC total	CRCs	Government	Hospitals	Research Institutes	Universities	Non-NHMRC total	
Nutrition and Dietetics	*8.27*	1.2	1.1	2.5	1.3	1.2	2.5	2.1	**1.8**	0.3	3.2	1.0	1.8	2.3	**2.1**	**2.0**
Oncology and Carcinogenesis	*12.61*	4.6	7.2	1.7	6.8	2.6	5.5	4.5	**5.4**	1.4	2.1	6.1	11.6	3.2	**3.9**	**4.4**
Optometry and Ophthalmology	*6.27*	2.6	0.8	3.3	2.7	2.5	1.8	3.2	**2.4**	48.4	0.3	2.4	5.5	2.5	**2.7**	**2.6**
Paediatrics and Reproductive Medicine	*5.63*	3.5	4.5	5.0	4.2	8.6	6.2	4.7	**5.1**		2.2	12.2	7.5	4.8	**5.7**	**5.5**
Pharmacology and Pharmaceutical Sciences	*8.09*	7.1	3.6	3.9	4.8	2.9	4.4	3.6	**4.9**	3.1	5.9	3.6	4.3	5.8	**5.4**	**5.2**
Medical Physiology	*8.80*	6.7	2.4	2.4	5.5	1.1	4.6	4.5	**4.2**	0.7	2.6	1.0	2.3	3.5	**2.9**	**3.3**
Public Health and Health Services	*6.07*	4.0	6.5	5.7	6.2	4.2	10.8	9.5	**7.4**	1.7	11.5	5.3	7.1	11.3	**10.0**	**9.2**
Other Medical and Health Sciences	*9.31*	3.1	3.3	3.5	2.8	1.8	3.2	2.2	**2.9**	1.7	1.3	2.2	3.3	1.7	**1.9**	**2.2**
General Medical and Health Sciences	*10.82*	1.9	4.7	10.3	2.3	8.6	4.0	4.7	**4.7**	1.4	5.5	9.5	4.6	5.2	**6.1**	**5.6**
Biological Sciences** General Biological Sciences	*9.08*	4.5	3.2	1.2	3.9	1.1	3.4	2.9	**3.4**	5.2	11.5	0.9	3.0	5.8	**5.6**	**4.9**
Biochemistry and Cell Biology	*13.20*	20.7	16.6	3.4	21.7	3.5	16.4	12.8	**15.2**	13.2	13.4	2.5	11.2	10.9	**9.8**	**11.5**
Genetics	*13.05*	5.3	4.1	1.4	6.1	4.1	5.1	4.3	**4.4**	2.8	10.3	2.2	5.9	4.9	**4.8**	**4.7**
Microbiology	*10.53*	5.8	5.4	5.5	3.2	5.2	4.1	3.2	**4.6**	6.6	12.3	2.4	3.0	4.3	**4.5**	**4.6**
Physical Sciences** Biological Physics	*9.35*	2.0	1.5	0.4	1.9	0.1	1.4	1.1	**1.5**	1.7	1.4	0.4	1.0	1.8	**1.5**	**1.5**
Engineering** Biomedical Engineering	*7.01*	0.5	0.3	0.5	0.4	1.9	0.6	0.5	**0.7**	1.4	1.2	1.5	0.9	2.0	**1.7**	**1.4**
Multidisciplinary Sciences	*24.94*	1.4	2.2	0.3	2.2	0.5	1.5	2.2	**1.3**	0.3	4.4	0.1	0.8	2.1	**2.0**	**1.8**
All biomedical sciences	*9.87*	100	100	100	100	100	100	100	**100**	100	100	100	100	100	**100**	**100**

Notes: Some journals are classified to more than one Web of Science (WoS) journal category. As a result some publications are included in more than one field/sub-field. Due to this overlap, the total of all the sub-fields will be greater than 100%.

** The CPP rate is calculated as the average achieved for all publications appearing between 2005 and 2009 in the journals classified to each sub-field and field of research. The CPP rates are based on world data and are not limited to Australian publications.*

*** These fields are not covered in their entirety. Only sub-fields relevant to biomedical research within these fields are analysed.*

The Medical and Health Sciences field now accounts for 82% of NHMRC publications, up from 73% in the 2002 to 2006 period, while the output in the sub-field of Biochemistry and Cell Biology has decreased to 15% (from 21%) during the same period. Also evident in the current analysis is the increased focus on Public Health and Health Services research in publications over the years. Among NHMRC funding schemes, the Career Development Fellowship (CDF) and Early Career Fellowship (ECF) schemes have the largest relative contribution to the Public Health and Health Services research.

The publication distribution within NHMRC schemes shows a relatively consistent pattern across different fields of research, except for Practitioner Fellowships and Centres of Research Excellence (CREs). Both these schemes have a stronger focus on Clinical Science and less focus on Biochemistry and Cell Biology and on General Biological Sciences. The CREs have significantly more publications in Cardiovascular Medicine and Haematology.

The research focus of individual sectors can be compared using the distribution of all Australian biomedical publications as a reference point. The biomedical research output of the Hospitals sector is very heavily concentrated in the Medical and Health Sciences field (95%), in particular the sub-fields of Clinical Science and Paediatrics and Reproductive Medicine, with a relatively weak focus on the high-impact Biological Sciences sub-fields (including Biochemistry and Cell Biology, Genetics, and Microbiology). The Government sector also differs from the other sectors in relation to the extent of its activity in Biological Sciences research and relatively less focus on Medical and Health Sciences (61%). This sector also includes biomedical publications from CSIRO. CRCs have a stronger focus on Optometry and Ophthalmology and on Immunology, mainly contributed by the Vision CRC and the CRC for Vaccine Technology respectively.

3.2 BIBLIOMETRIC PERFORMANCE OF BIOMEDICAL PUBLICATIONS

This section presents the overall performance of Australia biomedical publications. The relative citation performance for each sector is shown in Table 6. The proportion of most highly cited publications, grouped into six performance bands, is given in Table 7. For research sectors the analyses are restricted to the biomedical output not supported by NHMRC. In general, biomedical publications account for a smaller proportion of total output for the Universities and Government sectors, while for all other sectors, including NHMRC schemes, they account for a significant proportion of total output.

Table 6: Number of publications and citation measures for biomedical publications by sector, 2005–2009

Sector	Number of publications	Citations	Relative journal impact	Relative citation impact
NHMRC schemes				
Projects	6,278	97,040	2.02	1.61
Programs	7,678	140,164	2.23	1.92
Centres of Research Excellence	3,001	41,748	1.68	1.50
Research Fellowships	7,625	130,390	2.16	1.81
Practitioner Fellowships	1,600	23,887	1.83	1.68
Career Development Fellowships	3,851	51,699	1.90	1.51
Early Career Fellowships	3,276	43,444	1.90	1.51
NHMRC total	**20,960**	**315,451**	**1.90**	**1.60**
Research sectors				
CRCs	287	3,072	1.12	1.01
Government	5,459	54,106	1.33	1.03
Hospitals	13,015	110,173	1.08	0.85
Research Institutes	4,519	56,921	1.54	1.26
Universities	35,959	330,714	1.27	0.96
Non-NHMRC total	**47,697**	**458,019**	**1.26**	**0.98**
Australia	**68,657**	**773,470**	**1.46**	**1.17**
World	**2,237,732**	**22,082,052**	**1.00**	**1.00**

Notes: Where authors from more than one sector collaborate on a publication, it is counted in full for each sector. This results in double-counting within NHMRC schemes and within research sectors, but none between these two groups. As a result, totals (NHMRC total, non-NHMRC total and Australia) will be less than the sum of totals of component sectors. Relative citation impact figures for totals (NHMRC total, non-NHMRC total and Australia) are not simple averages of the component sectors but are based on citation performance of each group as a whole.

Table 7: Citation centile distribution of biomedical publications by sector, 2005–2009

Sector	Top 1%		Top 2–5%		Top 6–10%		Top 11–20%		Top 21–50%		Bottom 50%		Total publications
NHMRC schemes													
Projects	149	*2.4%*	497	*7.9%*	570	*9.1%*	1,023	*16.3%*	2,069	*33.0%*	1,958	*31.2%*	6,266
Programs	269	*3.5%*	721	*9.4%*	725	*9.5%*	1,219	*15.9%*	2,446	*31.9%*	2,280	*29.8%*	7,660
Centres of Research Excellence	88	*2.9%*	254	*8.5%*	240	*8.0%*	476	*15.9%*	948	*31.6%*	992	*33.1%*	2,998
Research Fellowships	213	*2.8%*	649	*8.5%*	683	*9.0%*	1,184	*15.6%*	2,483	*32.6%*	2,395	*31.5%*	7,607
Practitioner Fellowships	66	*4.1%*	137	*8.6%*	137	*8.6%*	241	*15.1%*	519	*32.4%*	500	*31.3%*	1,600
Career Development Fellowships	75	*2.0%*	308	*8.0%*	360	*9.4%*	598	*15.6%*	1,262	*32.9%*	1,238	*32.2%*	3,841
Early Career Fellowships	91	*2.8%*	264	*8.1%*	293	*9.0%*	501	*15.3%*	1,050	*32.1%*	1,069	*32.7%*	3,268
NHMRC total	**577**	***2.8%***	**1,650**	***7.9%***	**1,776**	***8.5%***	**3,219**	***15.4%***	**6,737**	***32.2%***	**6,958**	***33.3%***	**20,917**
Research sectors													
CRCs	1	*0.3%*	14	*4.9%*	18	*6.3%*	43	*15.0%*	97	*33.8%*	114	*39.7%*	287
Government	59	*1.1%*	198	*3.7%*	267	*5.0%*	544	*10.2%*	1,617	*30.5%*	2,624	*49.4%*	5,309
Hospitals	160	*1.2%*	529	*4.1%*	618	*4.8%*	1,207	*9.3%*	3,680	*28.3%*	6,814	*52.4%*	13,008
Research Institutes	84	*1.9%*	253	*5.6%*	309	*6.9%*	488	*10.8%*	1,468	*32.6%*	1,902	*42.2%*	4,504
Universities	425	*1.2%*	1,530	*4.3%*	1,847	*5.2%*	3,631	*10.2%*	10,610	*29.9%*	17,429	*49.1%*	35,472
Non-NHMRC total	**637**	***1.4%***	**2054**	***4.4%***	**2,399**	***5.1%***	**4,692**	***10.0%***	**13,827**	***29.4%***	**23,476**	***49.9%***	**47,085**
Australia	**1,214**	***1.8%***	**3,704**	***5.4%***	**4,175**	***6.1%***	**7,911**	***11.6%***	**20,564**	***30.2%***	**30,434**	***44.8%***	**68,002**
Expected level		***1.0%***		***4.0%***		***5.0%***		***10.0%***		***30.0%***		***50.0%***	

Notes: The count and percentage within each band is relative to the total sector publication output. The expected level indicates the world average distribution for each centile band. A higher than expected level of publications appearing in the top two to three bands indicates stronger citation performance than the world average.

For a smaller number of publications (655, equating to less than 1% of the total) percentile data is not available. As a result, the total number of publications appearing in the percentiles table is lower than the publication total in Table 6.

Table 6 and Table 7 highlight the high impact of the publications linked to NHMRC schemes, and in particular the Research Fellowships, Practitioner Fellowships and Program Grants schemes. On average, NHMRC-supported publications have achieved citations at a rate 60% above the world benchmark. In terms of individual schemes, the relative citation impact of Program Grants improved significantly since the last report (+0.23), followed by Projects (+0.14) and Research Fellowships (+0.06). All NHMRC schemes published in very high-impact journals. Among the research sectors, with any publications linked to NHMRC funding removed, the Research Institutes sector has the highest citation impact—above the Australian average—while the other sectors exhibit a relatively weak performance.

Since the period 2002 to 2006, the relative impact of the CDF scheme decreased from 1.57 to 1.51, while publication volume has increased by 152% over the same period due to the expansion of the scheme in recent years. A relatively large proportion of publications in this analysis have been attributed to more recent grants, leading to a distribution of publications that is not evenly spread over the five-year period of the analysis. As a result, the overall relative citation impact of this scheme has decreased as recent publications have had less time to attract citations.

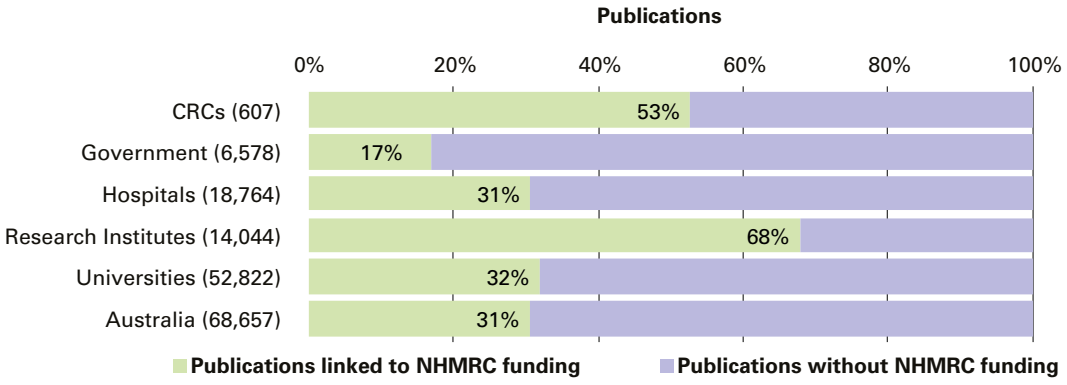
The data in Table 7 shows the number and proportion of publications that had the necessary number of citations to be placed in each of six performance bands: from those amongst the 1% most highly cited in the world to those in the bottom half of publications in terms of citation counts. A higher proportion in the top two or three bands is an indicator of strong citation performance. In this regard, the overall performance of NHMRC and its grants schemes is well above the expected level and the Australian average. While all NHMRC schemes have a consistent pattern of high performance in each band, Program Grants and Practitioner Fellowships stand out.

Nearly half (577) of the most highly cited Australian biomedical publications (the top 1% in the world) are attributed to NHMRC funding support. This proportion of highly cited publications is noteworthy given NHMRC's overall contribution (31%) to the Australian biomedical publication output.

3.3 IMPACT OF NHMRC-FUNDED BIOMEDICAL RESEARCH

As previously mentioned, approximately 31% of all Australian biomedical publications are linked to NHMRC funding support. The breakdown in Figure 2 of NHMRC-supported publications in each sector shows that more than two-thirds (68%) of publications from Research Institutes and almost one-third of publications from the Universities and Hospitals sectors have received some form of NHMRC funding support.

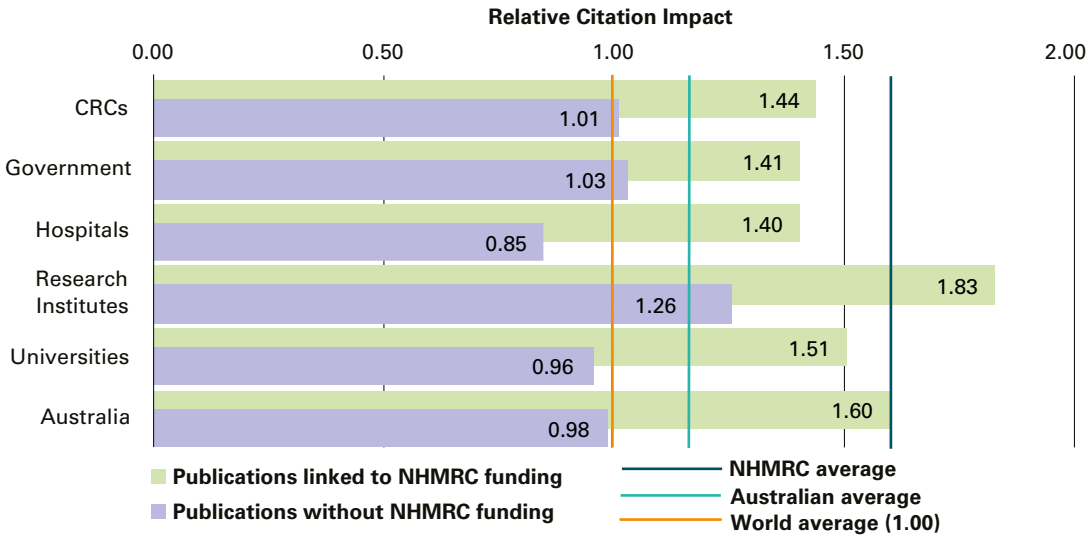
Figure 2: Proportion of biomedical publications linked to NHMRC funding support within each sector and Australian total, 2005–2009



Note: The count of total publications for each sector is shown in brackets.

Publications that received NHMRC support and those that did not are notably distinct in terms of their citation impact, as shown in Figure 3.

Figure 3: Relative citation impact of biomedical publications within each sector and Australian total, by funding support, 2005–2009



NHMRC-supported publications received significantly more citations than publications that were not linked to any NHMRC funding. This is consistent across all the sectors analysed. All NHMRC-supported publications achieved a high citation impact (1.60), well above the Australian average (1.17). By contrast, publications not linked to NHMRC funding support had noticeably lower citation performance. All the research sectors analysed, with the exception of the medical research institutes, fell below the Australian average. The relative citation impact for the Hospitals and Universities sectors was below the world benchmark. The relatively lower citation impact across all the research sectors resulted in the overall citation average for Australian publications without NHMRC funding falling just below the world average.

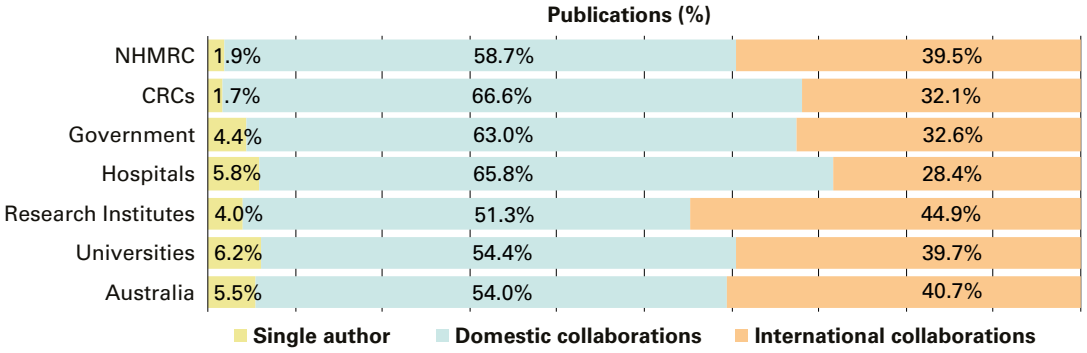
Supplementary data on biomedical publications and their relative citation impact at institution level for all universities and research institutes are provided in Appendix Table A6.

4. Collaboration in scientific research

Scientific research is a collaborative effort. Collaboration in research underpins innovation and enables researchers to contribute to the global research effort by sharing knowledge and skills and by leveraging funding, resources and risks.

The research collaboration findings presented in this report are based on analysis of co-authorship relationships in publications and of the institutions and countries of the authors. Author affiliations in Australian biomedical publications were analysed to observe the collaboration patterns of NHMRC publications and the five research sectors, and the type of collaboration: single-author papers (that is, no collaboration), domestic collaborations and international collaborations. The findings are summarised in Figure 4.

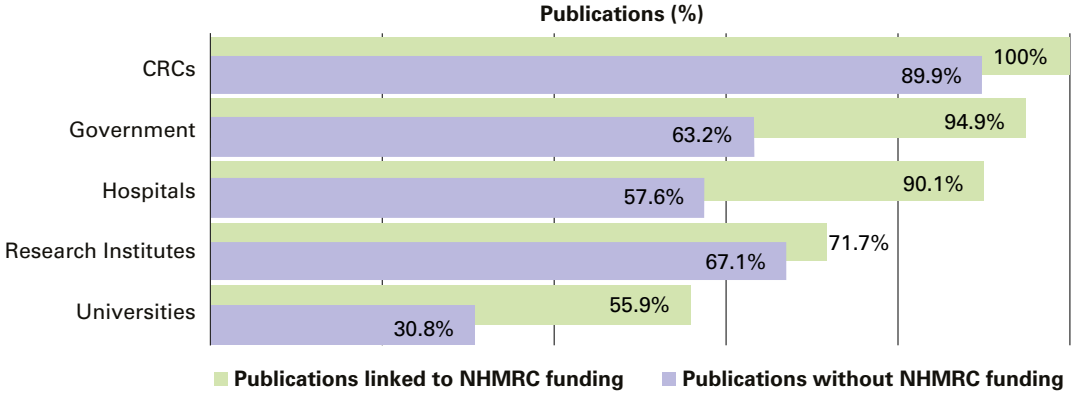
Figure 4: Level of scientific collaboration in publications, by sector and Australian total, 2005–2009 (as proportion of total sector output)



Multi-authored papers are very common in the medical and health sciences. Almost all NHMRC-supported biomedical publications (98%) during the 2005–2009 period involved two or more authors, slightly above the Australian average (95%). The number of single-author papers was higher in all the sectors except for NHMRC and CRCs.

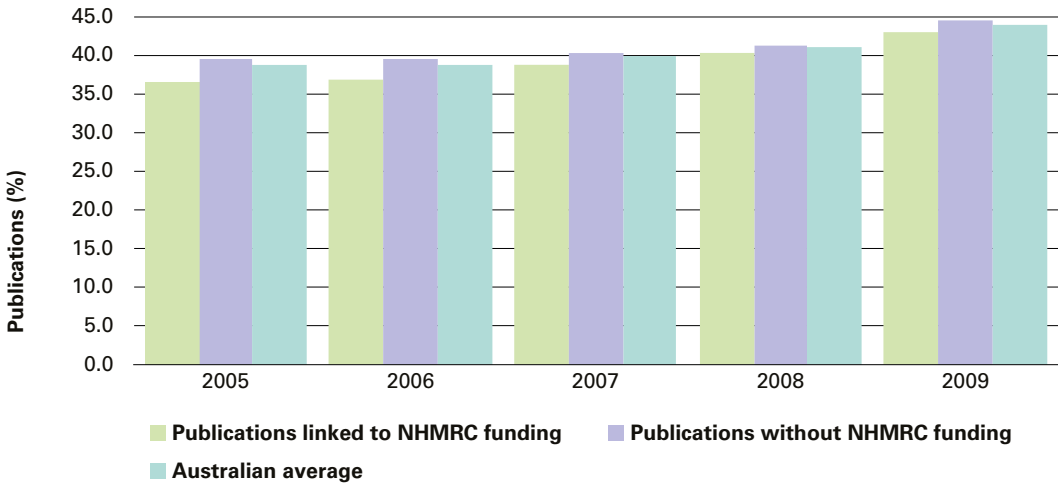
The level of domestic collaborations is slightly higher in NHMRC publications than the Australian average. Co-authorship patterns in NHMRC-supported publications also point to stronger research collaboration linkages between the five research sectors analysed in this report. The proportion of publications involving authors from more than one of these sectors is higher among NHMRC-supported publications than among those that were not linked to NHMRC funding support (see Figure 5). This trend for greater cross-sectoral collaboration in NHMRC-supported publications is consistent in all five sectors analysed. The vast majority of NHMRC-supported publications in the Government (95%) and Hospitals (90%) sectors and all in CRCs had at least one author from another sector. The rate of cross-sectoral collaborations in non-NHMRC publications is lower in the Government, Hospitals and Universities sectors than in NHMRC-supported research.

Figure 5: Proportion of publications in cross-sector collaborations, by sector and funding support, 2005–2009



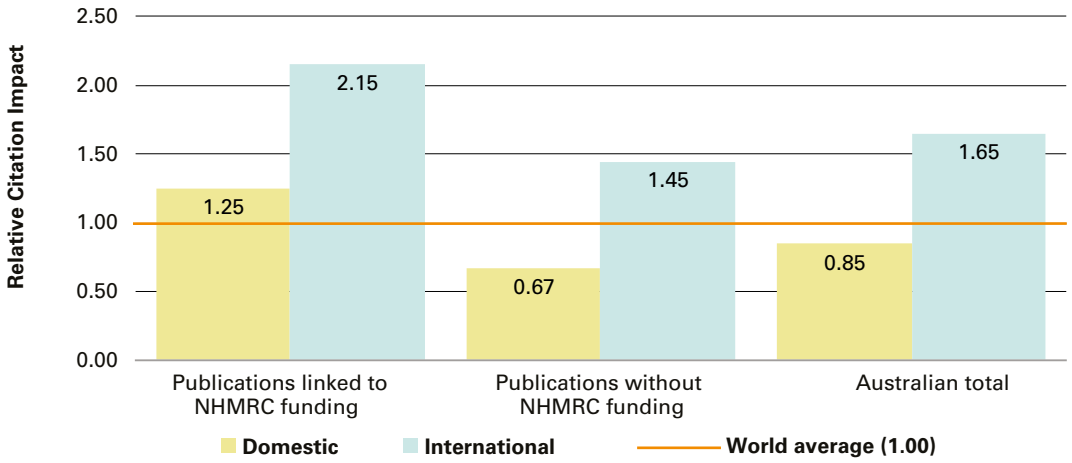
International collaborations among NHMRC publications were just under the Australian average over the period 2005 to 2009: 40% for NHMRC compared to 41% for Australia (see Figure 4). Over the years the proportion of NHMRC-supported publications with at least one international author has steadily increased—from an average of 29% for the period 1996 to 2000 to the current level which is very close to the Australian average. A closer examination of publications in the most recent five years shows that international collaboration in NHMRC publications rose to 43% in 2009 (see Figure 6). Among NHMRC schemes for 2009 the Program Grants scheme, at 46%, had the highest proportion of publications with international collaborations, followed by Research Fellowships at 45%.

Figure 6: Level of international scientific collaboration in publications, by funding support, yearly, 2005–2009 (as proportion of total annual output)



Analysis of the relationship between international collaboration patterns and relative citation impact shows a higher citation impact—well above the world average—for NHMRC-supported publications (see Figure 7). NHMRC-supported publications with at least one international collaborating author had a relative citation impact of 2.15 (115% above world average) while NHMRC-supported publications with only Australian (domestic) authors had a relative citation impact of 1.25 (25% above world average). In contrast the Australian biomedical publications that were not linked to NHMRC funding support had a lower citation impact—in particular the purely domestic publications, with a relative citation impact of 0.67 (33% below world average).

Figure 7: Relative citation impact of biomedical publications involving domestic and international collaborations, NHMRC and Australia, 2005–2009

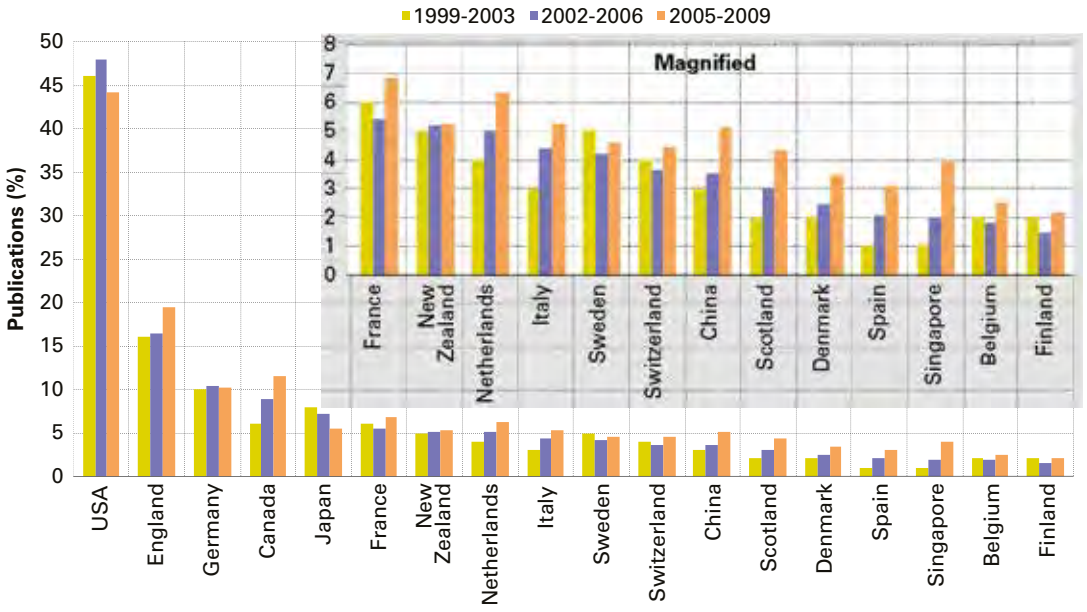


Previously published research has shown that citation impact tends, in general, to be greater in internationally co-authored publications than in purely domestic ones.[13] As can be seen in Figure 7, Australian biomedical publications with international authors had a consistently higher citation impact than domestic-only publications.

As shown in Figure 6, the proportion of NHMRC publications with international collaboration was consistently lower (though only slightly) than that seen for the total output of all other Australian publications (those not linked to any NHMRC funding) throughout the five-year period. In terms of the actual number of publications with international collaboration, this difference was even greater: 8,283 (NHMRC) compared to 19,675 (non-NHMRC). Yet the citation impact of NHMRC publications is notably higher than that of non-NHMRC publications, irrespective of international collaborations. Therefore international co-authorship in publications cannot be the sole reason for the higher relative citation rate attributed to NHMRC-supported publications—note that NHMRC-supported domestic publications had a citation impact 25% above the world average. Strong domestic collaborations, as evidenced by cross-sectoral research (see Figure 5), and the overall quality of research stemming from the rigorous peer review of grant applications also contributed to the higher relative citation impact observed in the NHMRC-funded subset of Australian biomedical publications.

NHMRC-supported research analysed in this report produced joint publications with researchers from over 110 countries. The extent of collaboration increased with nearly all the countries over the period 1999 to 2009, in particular with European countries. Figure 8 shows the change in the collaboration patterns for selected countries in the period 1999 to 2009. The highest growth in publication collaboration since the 1999–2003 period was with Singapore, followed by Spain, Scotland and Canada. On the other hand there was a modest decrease in the relative share of collaborative papers with the United States (48% to 44%) and Japan (7% to 5%) since the last report period. However, for NHMRC-supported publications the extent of collaboration with the United States was still stronger than with other countries, and well above the overall Australian average of 37%.

Figure 8: NHMRC-supported publications with one or more international collaborating author, as proportion of international collaborating papers split by countries over time, 1999–2009[14]



The trend of international collaboration for each sector is examined in detail in Table 8. All the countries with which NHMRC had 100 or more collaborative publications are included in this table. See Appendix Table A2 for the full list of countries with which NHMRC had 10 or more collaborative publications.

[13] See J Adams (2013) 'The fourth age of research', *Nature* 497: 557–560; and The Royal Society (2011) *Knowledge, networks and nations: global scientific collaboration in the 21st century*, Royal Society Policy document 03/11, The Royal Society, London.

[14] Data for 1999–2003 and 2002–2006 are from L Butler, B Biglia and K Henadeera (2005) *NHMRC-supported research: the impact of journal publication output*, National Health and Medical Research Council, Canberra; and L Butler and K Henadeera (2009) *Measuring up 2009: NHMRC-supported research—the impact of journal publication output 2002–2006*, National Health and Medical Research Council, Canberra.

Table 8: International collaborations by sector and country (as proportion of international collaborating papers within each sector), 2005–2009 (%)

Country	NHMRC schemes								Research sectors						Australia
	Projects	Programs	Centres of Research Excellence	Research Fellowships	Practitioner Fellowships	Career Development Fellowships	Early Career Fellowships	NHMRC total	CRCs	Government	Hospitals	Research Institutes	Universities	Non-NHMRC total	
USA	45.8	47.7	35.8	45.2	37.4	45.6	45.7	**44.2**	52.2	36.3	36.0	40.4	32.2	**33.7**	**36.8**
England	17.9	19.8	20.1	17.4	21.1	18.2	25.2	**19.4**	14.1	19.2	28.2	24.6	21.0	**22.9**	**21.8**
Canada	9.9	11.9	14.7	9.5	26.1	7.1	8.3	**11.5**	4.3	9.2	13.6	8.8	8.9	**9.6**	**10.2**
Germany	9.5	11.3	9.6	10.1	13.8	8.3	8.3	**10.2**	9.8	9.4	12.1	10.9	9.7	**10.3**	**10.3**
France	5.9	8.5	6.6	7.0	6.4	5.6	5.3	**6.9**	4.3	9.7	9.2	6.9	5.6	**6.8**	**6.8**
Netherlands	4.5	7.7	5.3	6.8	6.7	6.3	4.9	**6.3**	1.1	5.5	6.8	5.7	4.4	**5.1**	**5.5**
Japan	5.6	6.5	4.5	6.3	5.2	4.6	3.8	**5.5**	2.2	6.5	3.7	4.9	5.0	**5.0**	**5.2**
Italy	4.2	5.4	6.9	4.4	10.8	3.4	3.4	**5.2**	1.1	4.2	9.3	5.6	5.0	**5.8**	**5.6**
New Zealand	4.2	6.0	7.7	4.4	5.1	5.6	3.9	**5.2**	8.7	10.1	9.1	6.0	6.9	**7.0**	**6.5**
China	4.0	4.9	8.5	4.1	5.7	4.3	3.3	**5.1**	4.3	9.9	5.9	5.0	8.2	**7.8**	**7.0**
Sweden	4.8	4.4	5.1	4.9	4.9	4.4	4.5	**4.6**	2.2	3.4	4.6	3.8	4.1	**4.2**	**4.3**
Switzerland	3.4	5.5	7.9	4.2	5.6	4.1	4.3	**4.5**	3.3	4.0	6.1	5.5	4.3	**4.8**	**4.7**
Scotland	3.5	4.6	6.5	4.2	3.0	3.9	4.4	**4.3**	1.1	3.1	4.3	3.2	3.3	**3.6**	**3.8**
Singapore	3.8	2.3	4.9	6.3	3.4	2.2	2.8	**3.9**	2.2	2.3	2.4	3.9	2.7	**2.7**	**3.1**
Denmark	2.5	3.1	3.5	4.3	3.0	2.7	3.8	**3.5**		2.3	3.1	2.9	2.6	**2.7**	**2.9**
Spain	2.2	3.6	3.1	2.7	2.9	3.3	3.0	**3.1**		4.2	5.3	3.0	2.5	**3.3**	**3.2**
Belgium	1.8	2.9	4.6	2.2	3.7	1.9	1.2	**2.5**	10.9	3.0	5.2	3.2	2.6	**3.2**	**3.0**
Finland	1.7	2.3	1.9	2.9	2.2	1.6	1.5	**2.1**	2.2	2.0	1.7	2.2	1.4	**1.7**	**1.8**
Thailand	1.6	2.1	1.6	1.1	3.9	1.9	1.5	**1.7**		2.9	1.2	2.3	2.0	**1.9**	**1.8**
Austria	1.3	1.9	1.9	1.8	2.9	1.1	1.1	**1.6**	1.1	1.3	3.1	1.5	1.3	**1.8**	**1.7**
Norway	1.2	1.3	3.2	1.5	1.5	1.5	1.1	**1.5**		1.9	2.1	1.8	1.5	**1.7**	**1.6**
Brazil	1.2	1.4	0.9	1.4	3.9	1.3	0.8	**1.5**		2.0	2.5	1.5	1.8	**2.0**	**1.8**
Ireland	0.9	1.5	1.1	1.0	1.7	1.7	2.1	**1.3**	1.1	0.7	1.6	1.2	1.3	**1.4**	**1.4**

5. Sector analysis by fields and sub-fields of research

This section presents analyses detailing the publication output, relative journal impact, relative citation impact (RCI) and citation centile distribution of publications in each biomedical field and sub-field of the Australian and New Zealand Standard Research Classification (ANZSRC) for which there are at least 100 publications linked to NHMRC support. A figure showing the total sector publication output (in brackets) and the proportion of publications linked to NHMRC funding support within each sector and Australian total is provided for each field and sub-field analysed. This provides a context for interpreting the publication and citation data.

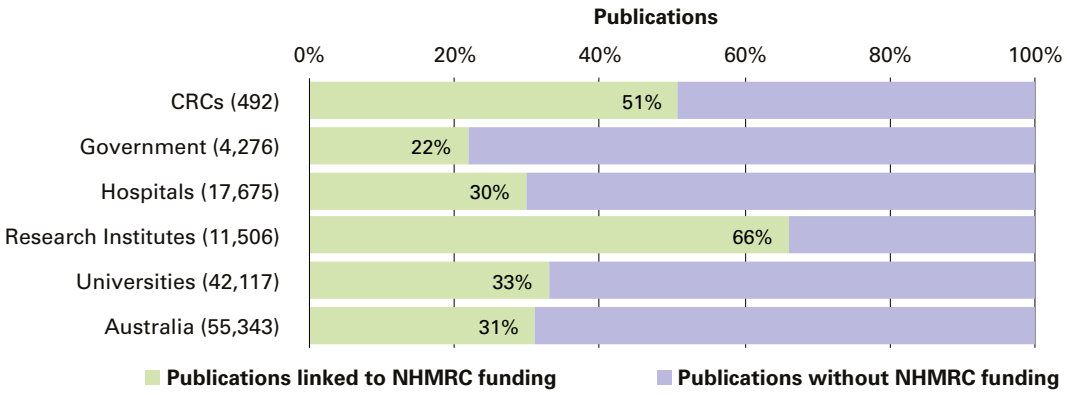
The fields covered in this section are constructed using Web of Science (WoS) journal subject categories—that is, publications are classified to a field or sub-field on the basis of the journal in which they are published. Details of the relevant translation of WoS journal subject categories into the ANZSRC fields and sub-fields of research are given at the start of each sub-section below.

Supplementary data at institution level for individual sub-fields with 100 or more publications and their RCI for all universities and research institutes are included in Appendix Table A7.

5.1 FIELD: MEDICAL AND HEALTH SCIENCES

- WoS journal subject categories analysed: Journals from all subject categories listed in sections 5.2 to 5.16 plus those in the following additional categories not analysed separately—Nursing; Nursing (SSCI); Dentistry, Oral Surgery and Medicine; Integrative and Complementary Medicine.

Figure 9: Proportion of publications linked to NHMRC funding support within each sector and Australian total, 2005–2009—Medical and Health Sciences



Note: Number in brackets is the total publication count for each sector.

Table 9: Number of publications and impact measures, 2005–2009—Medical and Health Sciences

Sector	Number of publications	Citations	Relative journal impact	Relative citation impact
NHMRC schemes				
Projects	4,835	69,727	2.05	1.68
Programs	6,154	104,282	2.26	1.99
Centres of Research Excellence	2,830	39,403	1.80	1.68
Research Fellowships	5,769	86,749	2.13	1.79
Practitioner Fellowships	1,482	22,163	1.95	1.87
Career Development Fellowships	3,095	37,500	1.88	1.53
Early Career Fellowships	2,744	32,488	1.84	1.50
NHMRC total	**17,191**	**240,634**	**1.92**	**1.66**
Research sectors				
CRCs	242	2,088	1.09	0.94
Government	3,332	25,745	1.09	0.91
Hospitals	12,406	101,887	1.14	0.92
Research Institutes	3,912	45,085	1.58	1.29
Universities	28,246	220,935	1.18	0.91
Non-NHMRC total	**38,152**	**320,190**	**1.19**	**0.97**
Australia	**55,343**	**560,824**	**1.42**	**1.18**
World	**1,715,513**	**15,121,661**	**1.00**	**1.00**

Figure 10: Relative citation impact, 2005–2009—Medical and Health Sciences

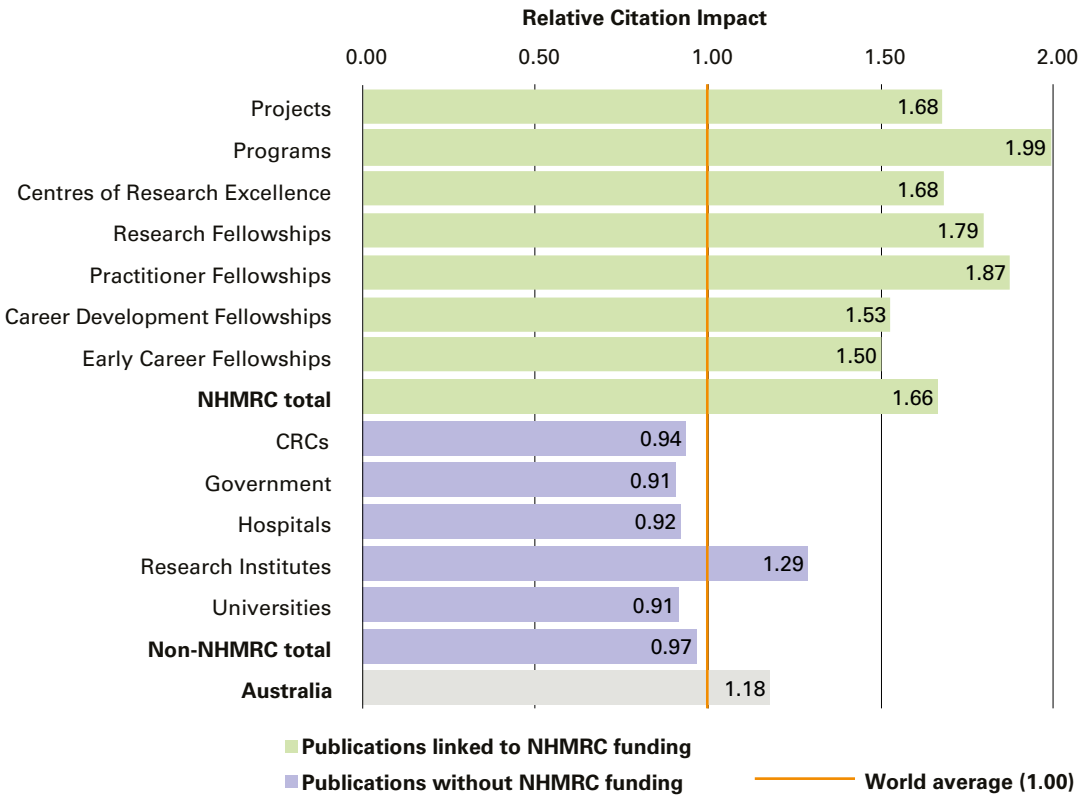


Table 10: Citation centile distribution of publications, 2005–2009—Medical and Health Sciences

Sector	Top 1%		Top 2–5%		Top 6–10%		Top 11–20%		Top 21–50%		Bottom 50%		Total publications
NHMRC schemes													
Projects	108	*2.2%*	382	*7.9%*	437	*9.1%*	788	*16.3%*	1,586	*32.9%*	1,521	*31.5%*	4,822
Programs	201	*3.3%*	570	*9.3%*	554	*9.0%*	987	*16.1%*	1,962	*32.0%*	1,856	*30.3%*	6,130
Centres of Research Excellence	85	*3.0%*	244	*8.6%*	226	*8.0%*	461	*16.3%*	883	*31.2%*	930	*32.9%*	2,829
Research Fellowships	133	*2.3%*	475	*8.3%*	490	*8.5%*	893	*15.5%*	1,914	*33.3%*	1,843	*32.1%*	5,748
Practitioner Fellowships	64	*4.3%*	125	*8.5%*	126	*8.5%*	232	*15.7%*	481	*32.5%*	451	*30.5%*	1,479
Career Development Fellowships	52	*1.7%*	242	*7.8%*	284	*9.2%*	482	*15.6%*	1,011	*32.8%*	1,016	*32.9%*	3,087
Early Career Fellowships	62	*2.3%*	214	*7.8%*	240	*8.8%*	415	*15.2%*	881	*32.2%*	926	*33.8%*	2,738
NHMRC total	**449**	***2.6%***	**1,342**	***7.8%***	**1,423**	***8.3%***	**2,650**	***15.5%***	**5,534**	***32.3%***	**5,754**	***33.5%***	**17,152**
Research sectors													
CRCs	0	*0.0%*	13	*5.4%*	15	*6.2%*	35	*14.5%*	82	*33.9%*	97	*40.1%*	242
Government	40	*1.2%*	134	*4.0%*	159	*4.8%*	323	*9.7%*	975	*29.3%*	1,700	*51.0%*	3,331
Hospitals	145	*1.2%*	499	*4.0%*	585	*4.7%*	1,140	*9.2%*	3,529	*28.5%*	6,498	*52.4%*	12,396
Research Institutes	66	*1.7%*	214	*5.5%*	265	*6.8%*	415	*10.6%*	1,288	*33.0%*	1,655	*42.4%*	3,903
Universities	313	*1.1%*	1,203	*4.3%*	1,452	*5.1%*	2,811	*10.0%*	8,371	*29.7%*	14,074	*49.9%*	28,224
Non-NHMRC total	**498**	***1.3%***	**1,653**	***4.3%***	**1,897**	***5.0%***	**3,681**	***9.7%***	**11,055**	***29.0%***	**19,337**	***50.7%***	**38,121**
Australia	**947**	***1.7%***	**2,995**	***5.4%***	**3,320**	***6.0%***	**6,331**	***11.5%***	**16,589**	***30.0%***	**25,091**	***45.4%***	**55,273**
Expected level		***1.0%***		***4.0%***		***5.0%***		***10.0%***		***30.0%***		***50.0%***	

Comments

The Medical and Health Sciences field comprises 18 sub-fields and accounts for the majority (82%) of the total Australian biomedical output. Therefore this field largely reflects the RCI of the total biomedical average.

Over 31% of Australia's health and medical research publications resulted from research funded, at least in part, by NHMRC. Within the Research Institutes sector the proportion of NHMRC-funded publications rises to 66%—two of every three publications.

NHMRC-supported publications, on average, are cited 66% more than the world average for similar research, and appear in the top three centile bands at a level well above the expected rate for NHMRC's output in this field. All NHMRC schemes have achieved very high citation impact—well above the world and Australian averages. The Program Grants scheme is particularly noteworthy, with a citation impact twice the world average and publications appearing in very high-impact journals. In contrast, Australian publications without any link to NHMRC funding show a citation impact that is just below the world benchmark (RCI 0.97).

5.2 SUB-FIELD: MEDICAL BIOCHEMISTRY AND METABOLOMICS

Field: Medical and Health Sciences

- WoS journal subject categories analysed: Chemistry, Medicinal.

Figure 11: Proportion of publications linked to NHMRC funding support within each sector and Australian total, 2005–2009—Medical Biochemistry and Metabolomics

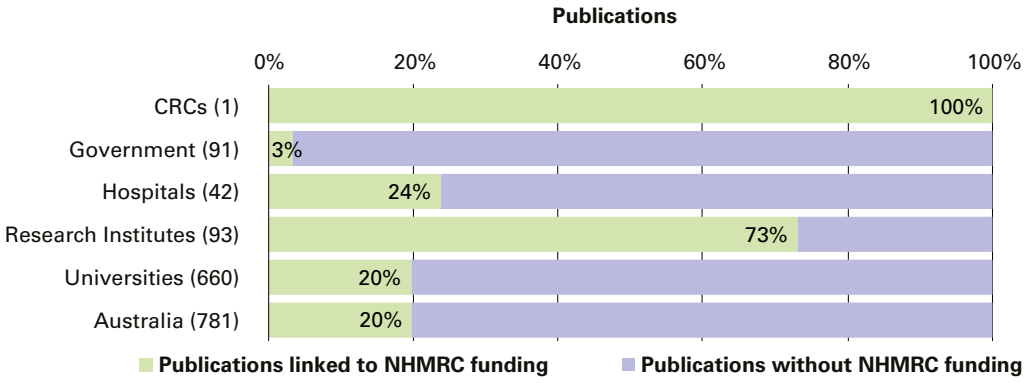


Table 11: Number of publications and impact measures, 2005–2009—Medical Biochemistry and Metabolomics

Sector	Number of publications	Citations	Relative journal impact	Relative citation impact
NHMRC schemes				
NHMRC total	**155**	**1,607**	**1.70**	**1.47**
Research sectors				
Universities	530	3,947	1.21	0.99
Non-NHMRC total	**626**	**4,772**	**1.21**	**1.01**
Australia	**781**	**6,379**	**1.31**	**1.10**
World	**47,220**	**356,554**	**1.00**	**1.00**

Figure 12: Relative citation impact, 2005–2009—Medical Biochemistry and Metabolomics

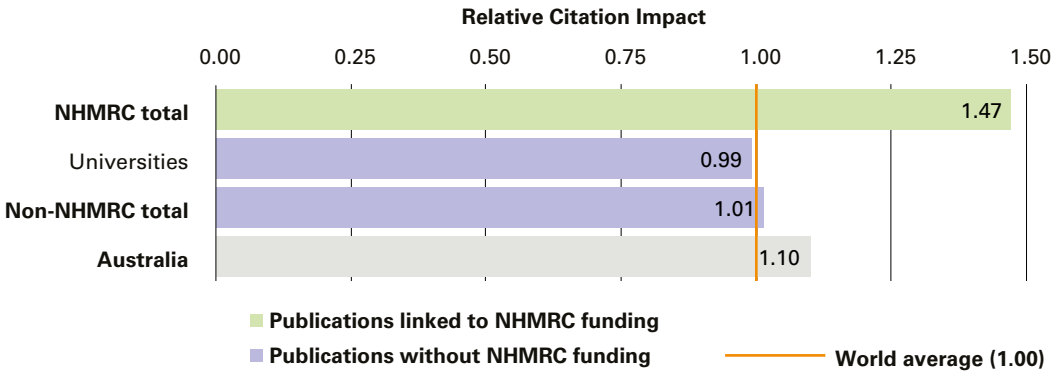


Table 12: Citation centile distribution of publications, 2005–2009—Medical Biochemistry and Metabolomics

Sector	Top 1%		Top 2–5%		Top 6–10%		Top 11–20%		Top 21–50%		Bottom 50%		Total publications
NHMRC schemes													
NHMRC total	**5**	***3.2%***	**14**	***9.0%***	**9**	***5.8%***	**29**	***18.7%***	**42**	***27.1%***	**56**	***36.1%***	**155**
Research sectors													
Universities	4	*0.8%*	32	*6.0%*	32	*6.0%*	44	*8.3%*	145	*27.4%*	273	*51.5%*	530
Non-NHMRC total	**5**	***0.8%***	**35**	***5.6%***	**38**	***6.1%***	**56**	***8.9%***	**179**	***28.6%***	**313**	***50.0%***	**626**
Australia	**10**	***1.3%***	**49**	***6.3%***	**47**	***6.0%***	**85**	***10.9%***	**221**	***28.3%***	**369**	***47.2%***	**781**
Expected level		***1.0%***		***4.0%***		***5.0%***		***10.0%***		***30.0%***		***50.0%***	

Comments

Medical Biochemistry and Metabolomics is a small field, representing approximately 1% of the Australian biomedical journal publication output.

Only 155 publications in this discpline are linked to NHMRC funding. This is an increase from 107 publications linked to NHMRC funding in the previous report. Due to insufficient output some sectors are not separately analysed.

5.3 SUB-FIELD: CARDIOVASCULAR MEDICINE AND HAEMATOLOGY

Field: Medical and Health Sciences

- WoS journal subject categories analysed: Cardiac and Cardiovascular Systems; Hematology; Peripheral Vascular Disease.

Figure 13: Proportion of publications linked to NHMRC funding support within each sector and Australian total, 2005–2009—Cardiovascular Medicine and Haematology

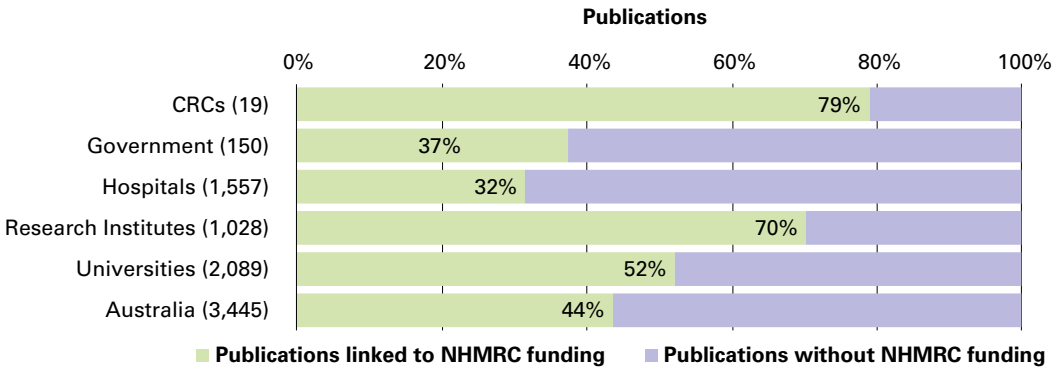


Table 13: Number of publications and impact measures, 2005–2009—Cardiovascular Medicine and Haematology

Sector	Number of publications	Citations	Relative journal impact	Relative citation impact
NHMRC schemes				
Projects	363	6,349	2.53	1.79
Programs	683	10,657	2.42	1.56
Centres of Research Excellence	402	6,255	1.88	1.42
Research Fellowships	536	8,686	2.59	1.64
Practitioner Fellowships	119	1,116	1.88	1.25
Career Development Fellowships	204	2,940	2.46	1.50
Early Career Fellowships	181	2,152	2.33	1.33
NHMRC total	**1,501**	**23,491**	**2.27**	**1.57**
Research sectors				
Hospitals	1,066	10,587	1.38	0.96
Research Institutes	306	3,877	1.77	1.16
Universities	1,000	11,278	1.52	1.11
Non-NHMRC total	**1,944**	**23,811**	**1.52**	**1.20**
Australia	**3,445**	**47,302**	**1.85**	**1.36**
World	**145,214**	**1,531,975**	**1.00**	**1.00**

Figure 14: Relative citation impact, 2005–2009—Cardiovascular Medicine and Haematology

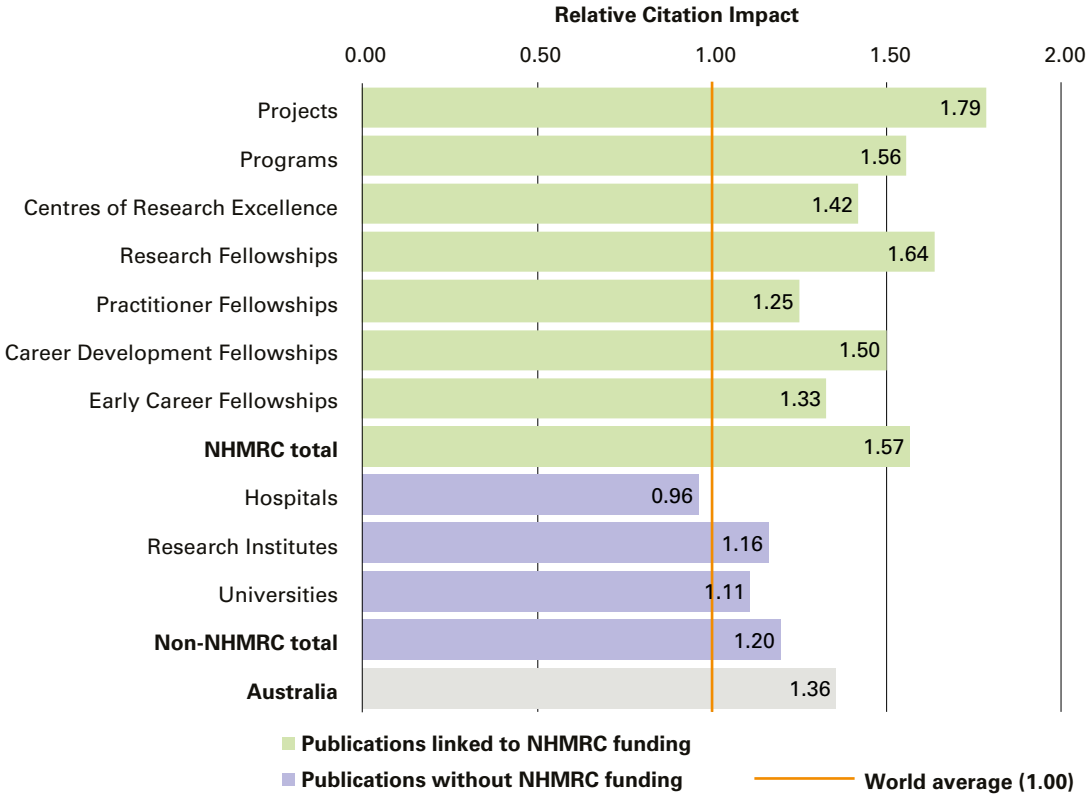


Table 14: Citation centile distribution of publications, 2005–2009—Cardiovascular Medicine and Haematology

Sector	Top 1%		Top 2–5%		Top 6–10%		Top 11–20%		Top 21–50%		Bottom 50%		Total publications
NHMRC schemes													
Projects	2	*0.6%*	24	*6.6%*	26	*7.2%*	52	*14.3%*	147	*40.5%*	112	*30.9%*	363
Programs	5	*0.7%*	51	*7.5%*	49	*7.2%*	109	*16.0%*	268	*39.2%*	201	*29.4%*	683
Centres of Research Excellence	2	*0.5%*	24	*6.0%*	25	*6.2%*	68	*16.9%*	149	*37.1%*	134	*33.3%*	402
Research Fellowships			43	*8.0%*	35	*6.5%*	89	*16.6%*	213	*39.7%*	156	*29.1%*	536
Practitioner Fellowships	2	*1.7%*	6	*5.0%*	2	*1.7%*	11	*9.2%*	55	*46.2%*	43	*36.1%*	119
Career Development Fellowships			12	*5.9%*	20	*9.8%*	24	*11.8%*	88	*43.1%*	60	*29.4%*	204
Early Career Fellowships	1	*0.6%*	9	*5.0%*	11	*6.1%*	26	*14.4%*	81	*44.8%*	53	*29.3%*	181
NHMRC total	**10**	***0.7%***	**99**	***6.6%***	**102**	***6.8%***	**232**	***15.5%***	**568**	***37.8%***	**490**	***32.6%***	**1,501**
Research sectors													
Hospitals	12	*1.1%*	25	*2.3%*	43	*4.0%*	70	*6.6%*	319	*29.9%*	597	*56.0%*	1,066
Research Institutes	3	*1.0%*	11	*3.6%*	14	*4.6%*	33	*10.8%*	95	*31.0%*	150	*49.0%*	306
Universities	8	*0.8%*	36	*3.6%*	44	*4.4%*	83	*8.3%*	311	*31.1%*	518	*51.8%*	1,000
Non-NHMRC total	**30**	***1.5%***	**69**	***3.5%***	**95**	***4.9%***	**150**	***7.7%***	**586**	***30.1%***	**1,014**	***52.2%***	**1,944**
Australia	**40**	***1.2%***	**168**	***4.9%***	**197**	***5.7%***	**382**	***11.1%***	**1,154**	***33.5%***	**1,504**	***43.7%***	**3,445**
Expected level		***1.0%***		***4.0%***		***5.0%***		***10.0%***		***30.0%***		***50.0%***	

Comments

This sub-field was analysed as part of Clinical Sciences in *Measuring up 2009* within the previous Research Fields, Courses and Disciplines (RFCD) classification.

About 44% of all Australian publications in this discipline were NHMRC-supported. These publications were in very high-impact journals and achieved an average citation impact of 57% more than the world average.

5.4 SUB-FIELD: CLINICAL SCIENCES

Field: Medical and Health Sciences

- WoS journal subject categories analysed: Anesthesiology; Critical Care Medicine; Dermatology; Emergency Medicine; Endocrinology and Metabolism; Gastroenterology and Hepatology; Geriatrics and Gerontology; Gerontology (SSCI); Infectious Diseases; Orthopedics; Otorhinolaryngology; Pathology; Psychiatry; Psychiatry (SSCI); Psychology; Radiology, Nuclear Medicine and Medical Imaging; Rehabilitation; Rehabilitation (SSCI); Respiratory System; Rheumatology; Surgery; Urology and Nephrology; Transplantation; Tropical Medicine.

Figure 15: Proportion of publications linked to NHMRC funding support within each sector and Australian total, 2005–2009—Clinical Sciences

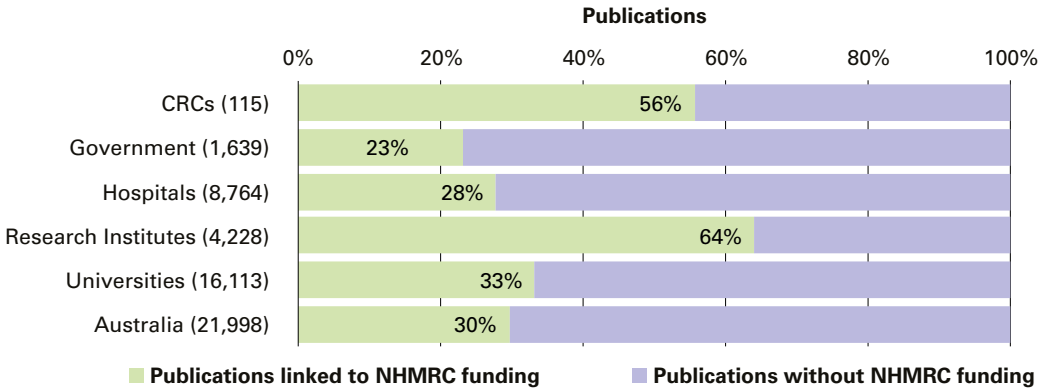


Table 15: Number of publications and impact measures, 2005–2009—Clinical Sciences

Sector	Number of publications	Citations	Relative journal impact	Relative citation impact
NHMRC schemes				
Projects	1,735	22,744	2.09	1.75
Programs	2,292	28,974	1.99	1.74
Centres of Research Excellence	1,311	16,536	1.85	1.78
Research Fellowships	1,880	23,201	2.01	1.69
Practitioner Fellowships	745	10,399	1.88	1.92
Career Development Fellowships	1,090	12,552	2.02	1.72
Early Career Fellowships	1,097	11,901	1.83	1.57
NHMRC total	**6,519**	**79,288**	**1.87**	**1.66**
Research sectors				
Government	1,259	9,623	1.27	1.00
Hospitals	6,328	46,477	1.15	0.93
Research Institutes	1,519	16,261	1.61	1.36
Universities	10,753	86,054	1.29	1.05
Non-NHMRC total	**15,479**	**124,764**	**1.25**	**1.04**
Australia	**21,998**	**204,052**	**1.44**	**1.21**
World	**711,536**	**5,577,195**	**1.00**	**1.00**

Figure 16: Relative citation impact, 2005–2009—Clinical Sciences

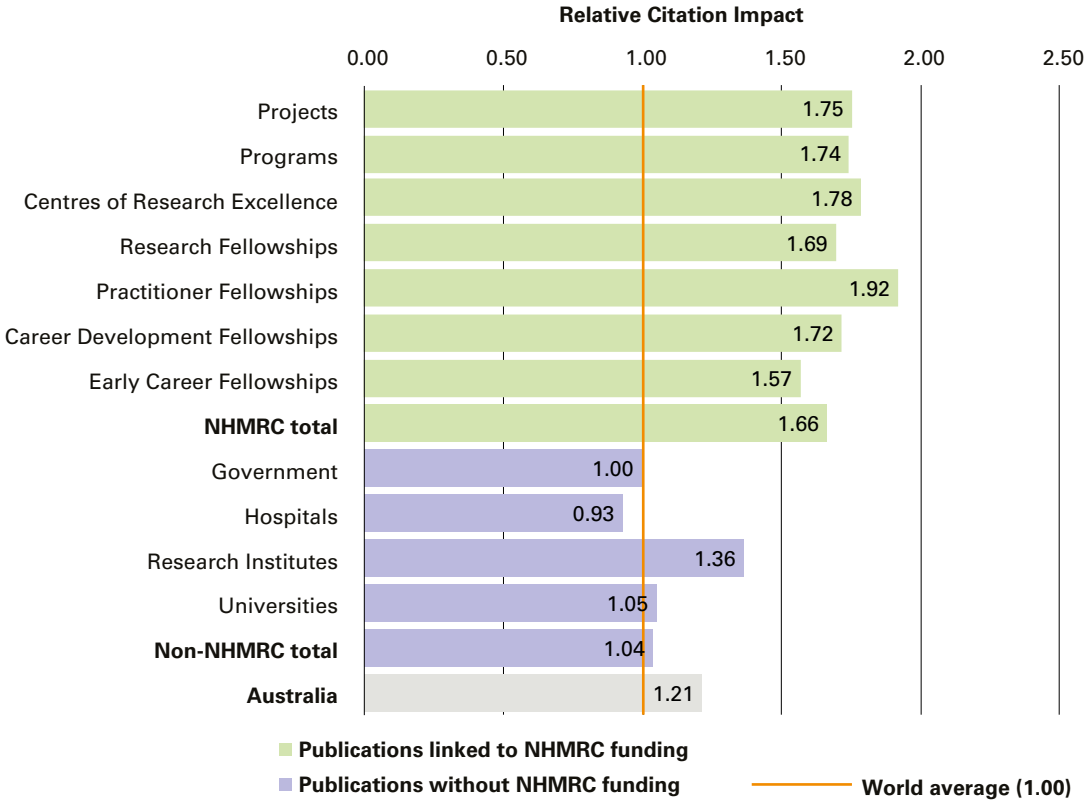


Table 16: Citation centile distribution of publications, 2005–2009—Clinical Sciences

Sector	Top 1%		Top 2–5%		Top 6–10%		Top 11–20%		Top 21–50%		Bottom 50%		Total publications
NHMRC schemes													
Projects	26	*1.5%*	134	*7.7%*	166	*9.6%*	283	*16.3%*	603	*34.8%*	523	*30.1%*	1,735
Programs	52	*2.3%*	199	*8.7%*	199	*8.7%*	353	*15.4%*	743	*32.4%*	746	*32.5%*	2,292
Centres of Research Excellence	39	*3.0%*	111	*8.5%*	101	*7.7%*	210	*16.0%*	395	*30.1%*	455	*34.7%*	1,311
Research Fellowships	32	*1.7%*	151	*8.0%*	171	*9.1%*	300	*16.0%*	623	*33.1%*	603	*32.1%*	1,880
Practitioner Fellowships	26	*3.5%*	78	*10.5%*	63	*8.5%*	113	*15.2%*	244	*32.8%*	221	*29.7%*	745
Career Development Fellowships	19	*1.7%*	81	*7.4%*	92	*8.4%*	176	*16.1%*	351	*32.2%*	371	*34.0%*	1,090
Early Career Fellowships	17	*1.5%*	86	*7.8%*	92	*8.4%*	163	*14.9%*	360	*32.8%*	379	*34.5%*	1,097
NHMRC total	**132**	***2.0%***	**494**	***7.6%***	**534**	***8.2%***	**1,000**	***15.3%***	**2,127**	***32.6%***	**2,232**	***34.2%***	**6,519**
Research sectors													
Government	15	*1.2%*	36	*2.9%*	51	*4.1%*	114	*9.1%*	355	*28.2%*	688	*54.6%*	1,259
Hospitals	67	*1.1%*	251	*4.0%*	268	*4.2%*	557	*8.8%*	1,728	*27.3%*	3,457	*54.6%*	6,328
Research Institutes	20	*1.3%*	88	*5.8%*	92	*6.1%*	143	*9.4%*	521	*34.3%*	655	*43.1%*	1,519
Universities	114	*1.1%*	472	*4.4%*	547	*5.1%*	1,084	*10.1%*	3,197	*29.7%*	5,338	*49.6%*	10,752
Non-NHMRC total	**184**	***1.2%***	**673**	***4.3%***	**729**	***4.7%***	**1,469**	***9.5%***	**4,406**	***28.5%***	**8,017**	***51.8%***	**15,478**
Australia	**316**	***1.4%***	**1,167**	***5.3%***	**1,263**	***5.7%***	**2,469**	***11.2%***	**6,533**	***29.7%***	**10,249**	***46.6%***	**21,997**
Expected level		***1.0%***		***4.0%***		***5.0%***		***10.0%***		***30.0%***		***50.0%***	

Comments

Clinical Sciences is the largest sub-field within the Medical and Health Sciences field, accounting for about 40% of the total journal output in Medical and Health Sciences. Therefore the RCI for this sub-field largely reflects the citation performance within Medical and Health Sciences as a whole.

The journal composition of this sub-field has changed since *Measuring up 2009*. It now covers 24 WoS journal subject categories (35 previously) due to the reclassification of the ANZSRC system.

The number of NHMRC-supported publications in Clinical Sciences increased by 3% and their RCI improved from 1.60 to 1.66 since the last report, despite the reduced number of journals included for this sub-field in the current report.

All NHMRC schemes have recorded a stronger citation impact in this sub-field.

5.5 SUB-FIELD: HUMAN MOVEMENT AND SPORTS SCIENCE

Field: Medical and Health Sciences

- WoS journal subject category analysed: Sport Sciences.

Figure 17: Proportion of publications linked to NHMRC funding support within each sector and Australian total, 2005–2009—Human Movement and Sports Science

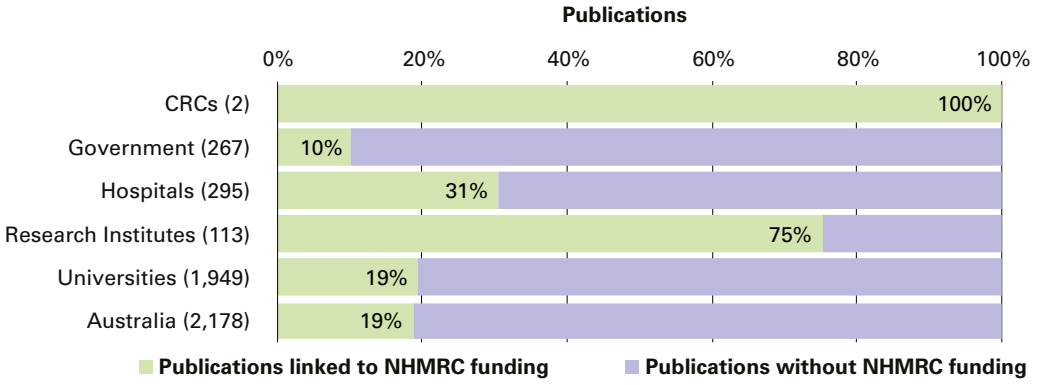


Table 17: Number of publications and impact measures, 2005–2009—Human Movement and Sports Science

Sector	Number of publications	Citations	Relative journal impact	Relative citation impact
NHMRC schemes				
Research Fellowships	153	1,279	1.84	1.55
Early Career Fellowships	106	1,078	1.69	1.64
NHMRC total	**407**	**3,978**	**1.80**	**1.79**
Research sectors				
Government	240	1,668	1.53	1.18
Hospitals	205	1,470	1.59	1.12
Universities	1,570	9,503	1.45	1.06
Non-NHMRC total	**1,771**	**10,686**	**1.45**	**1.04**
Australia	**2,178**	**14,664**	**1.52**	**1.17**
World	**30,728**	**180,952**	**1.00**	**1.00**

Figure 18: Relative citation impact, 2005–2009—Human Movement and Sports Science

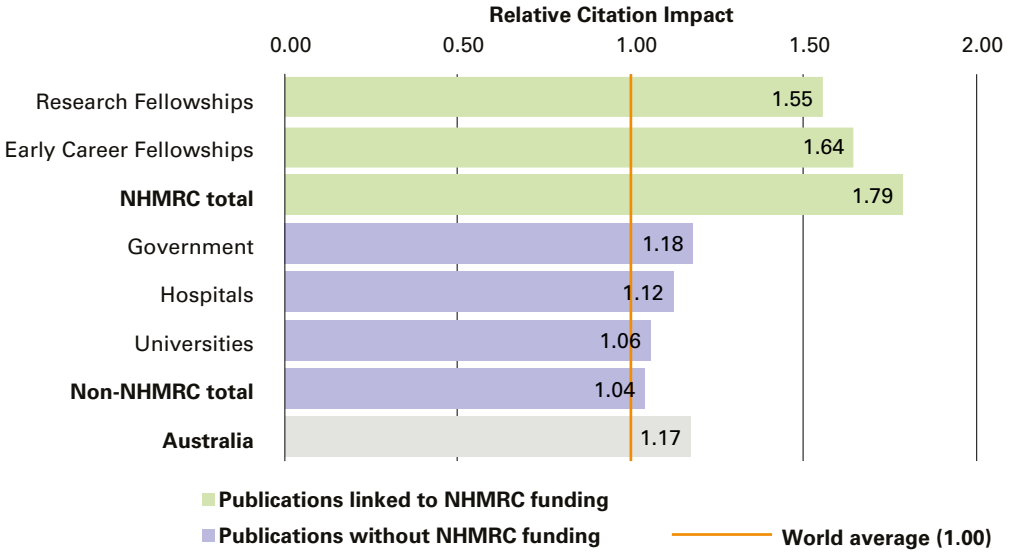


Table 18: Citation centile distribution of publications, 2005–2009—Human Movement and Sports Science

Sector	Top 1%		Top 2–5%		Top 6–10%		Top 11–20%		Top 21–50%		Bottom 50%		Total publications
NHMRC schemes													
Research Fellowships	5	*3.3%*	11	*7.2%*	9	*5.9%*	23	*15.0%*	54	*35.3%*	51	*33.3%*	153
Early Career Fellowships	4	*3.8%*	7	*6.6%*	6	*5.7%*	17	*16.0%*	32	*30.2%*	40	*37.7%*	106
NHMRC total	**13**	***3.2%***	**27**	***6.6%***	**27**	***6.6%***	**59**	***14.5%***	**132**	***32.4%***	**149**	***36.6%***	**407**
Research sectors													
Government	2	*0.8%*	9	*3.8%*	14	*5.8%*	33	*13.8%*	70	*29.2%*	112	*46.7%*	240
Hospitals			8	*3.9%*	9	*4.4%*	26	*12.7%*	75	*36.6%*	87	*42.4%*	205
Universities	15	*1.0%*	55	*3.5%*	74	*4.7%*	155	*9.9%*	491	*31.3%*	780	*49.7%*	1,570
Non-NHMRC total	**17**	***1.0%***	**57**	***3.2%***	**80**	***4.5%***	**182**	***10.3%***	**549**	***31.0%***	**886**	***50.0%***	**1,771**
Australia	**30**	***1.4%***	**84**	***3.9%***	**107**	***4.9%***	**241**	***11.1%***	**681**	***31.3%***	**1,035**	***47.5%***	**2,178**
Expected level		***1.0%***		***4.0%***		***5.0%***		***10.0%***		***30.0%***		***50.0%***	

Comments

The majority of publications in Human Movement and Sports Science are produced by the Universities sector. The proportion of NHMRC-supported publications in this discipline is relatively low, at 19%, compared with the biomedical average of 31%.

Since the previous report the volume of publications linked to NHMRC funding in this sub-field has nearly doubled and the relative citation impact of these publications has risen from 1.43 to 1.79 (+0.36). Nearly half (13 out of 30) of Australian highly cited publications in the top 1% centile band in Human Movement and Sports Science are NHMRC funded.

5.6 SUB-FIELD: IMMUNOLOGY

Field: Medical and Health Sciences

- WoS journal subject categories analysed: Allergy; Immunology.

Figure 19: Proportion of publications linked to NHMRC funding support within each sector and Australian total, 2005–2009—Immunology

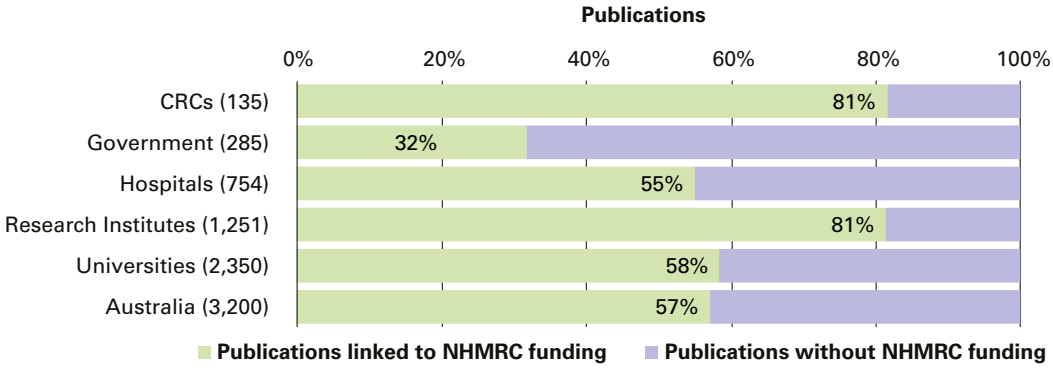


Table 19: Number of publications and impact measures, 2005–2009—Immunology

Sector	Number of publications	Citations	Relative journal impact	Relative citation impact
NHMRC schemes				
Projects	539	9,436	1.61	1.46
Programs	1,044	20,937	1.79	1.72
Centres of Research Excellence	191	2,515	1.08	1.22
Research Fellowships	676	15,720	1.91	1.90
Practitioner Fellowships	130	1,653	1.24	1.26
Career Development Fellowships	405	6,496	1.59	1.48
Early Career Fellowships	280	4,648	1.79	1.59
NHMRC total	**1,823**	**32,378**	**1.58**	**1.51**
Research sectors				
Government	195	2,049	0.98	0.83
Hospitals	340	3,931	0.98	0.92
Research Institutes	234	2,559	1.08	0.80
Universities	978	10,249	1.01	0.84
Non-NHMRC total	**1,377**	**14,810**	**1.02**	**0.85**
Australia	**3,200**	**47,188**	**1.34**	**1.21**
World	**100,765**	**1,245,905**	**1.00**	**1.00**

Figure 20: Relative citation impact, 2005–2009—Immunology

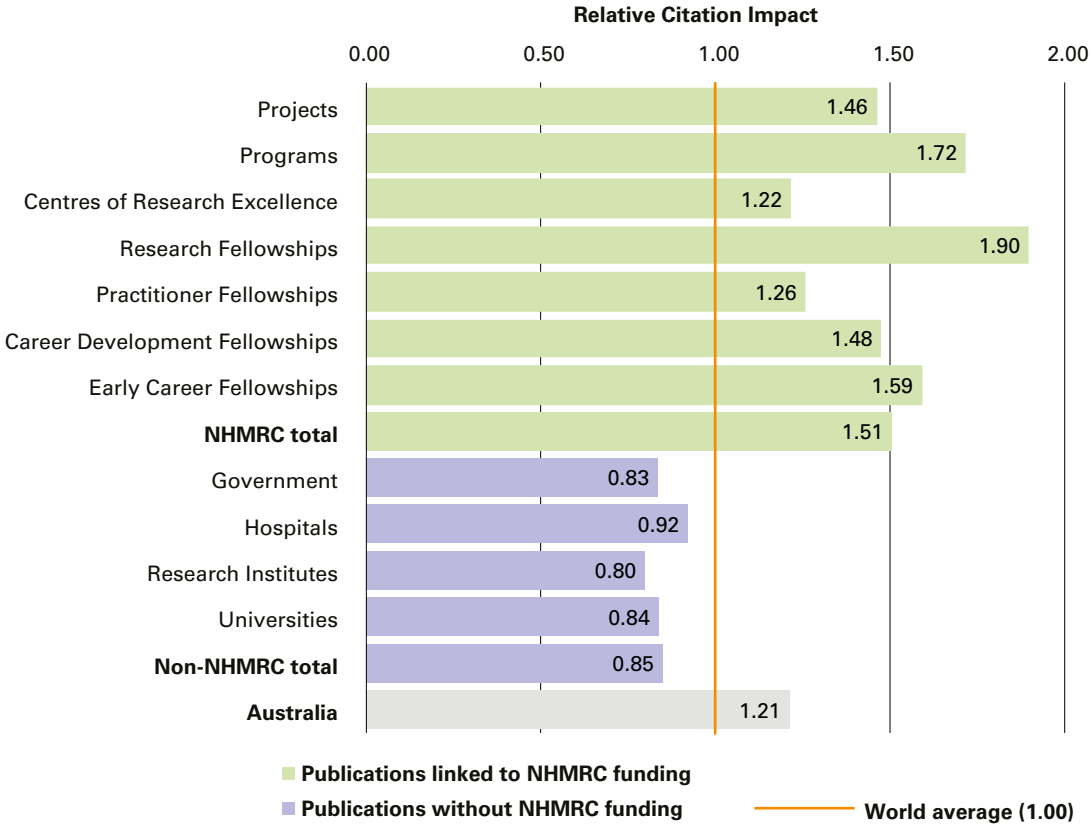


Table 20: Citation centile distribution of publications, 2005–2009—Immunology

Sector	Top 1%		Top 2–5%		Top 6–10%		Top 11–20%		Top 21–50%		Bottom 50%		Total publications
NHMRC schemes													
Projects	9	*1.7%*	34	*6.4%*	54	*10.1%*	72	*13.5%*	173	*32.5%*	191	*35.8%*	533
Programs	21	*2.0%*	86	*8.3%*	98	*9.5%*	150	*14.5%*	358	*34.6%*	323	*31.2%*	1,036
Centres of Research Excellence	1	*0.5%*	12	*6.3%*	14	*7.3%*	29	*15.2%*	48	*25.1%*	87	*45.5%*	191
Research Fellowships	18	*2.7%*	67	*10.1%*	64	*9.6%*	88	*13.2%*	232	*34.8%*	197	*29.6%*	666
Practitioner Fellowships	1	*0.8%*	6	*4.6%*	16	*12.3%*	20	*15.4%*	36	*27.7%*	51	*39.2%*	130
Career Development Fellowships	5	*1.2%*	32	*8.0%*	31	*7.7%*	56	*13.9%*	152	*37.8%*	126	*31.3%*	402
Early Career Fellowships	3	*1.1%*	22	*7.9%*	38	*13.6%*	50	*17.9%*	80	*28.7%*	86	*30.8%*	279
NHMRC total	**28**	***1.5%***	**125**	***6.9%***	**152**	***8.4%***	**254**	***14.0%***	**599**	***33.1%***	**651**	***36.0%***	**1,809**
Research sectors													
Government	1	*0.5%*	4	*2.1%*	10	*5.1%*	16	*8.2%*	53	*27.2%*	111	*56.9%*	195
Hospitals	2	*0.6%*	9	*2.6%*	20	*5.9%*	31	*9.1%*	94	*27.6%*	184	*54.1%*	340
Research Institutes	1	*0.4%*	7	*3.0%*	11	*4.7%*	15	*6.4%*	79	*33.9%*	120	*51.5%*	233
Universities	2	*0.2%*	22	*2.3%*	42	*4.3%*	89	*9.1%*	289	*29.6%*	531	*54.5%*	975
Non-NHMRC total	**4**	***0.3%***	**31**	***2.3%***	**67**	***4.9%***	**130**	***9.5%***	**404**	***29.4%***	**738**	***53.7%***	**1,374**
Australia	**32**	***1.0%***	**156**	***4.9%***	**219**	***6.9%***	**384**	***12.1%***	**1,003**	***31.5%***	**1,389**	***43.6%***	**3,183**
Expected level		***1.0%***		***4.0%***		***5.0%***		***10.0%***		***30.0%***		***50.0%***	

Comments

Fifty-seven of Australian Immunology publications are attributed to NHMRC funding support, making this by far the discipline with the highest level of NHMRC support. The number of NHMRC-supported Immunology publications increased by 42% since the period 2002–2006.

All NHMRC schemes are performing well in terms of relative citation impact—in particular Research Fellowships at 90% above the world average. Nearly all highly cited Australian Immunology publications (28 of 32) in the top 1% centile band are linked to NHMRC funding. The RCI for research sector publications—that is, those not linked to NHMRC-funded research—fell below the world and Australian average.

NHMRC funding had a stronger impact in Immunology research, as shown by the large number of NHMRC publications and their high citation impact.

5.7 SUB-FIELD: NEUROSCIENCES

Field: Medical and Health Sciences

- WoS journal subject categories analysed: Neurosciences; Clinical Neurology; Neuroimaging.

Figure 21: Proportion of publications linked to NHMRC funding support within each sector and Australian total, 2005–2009—Neurosciences

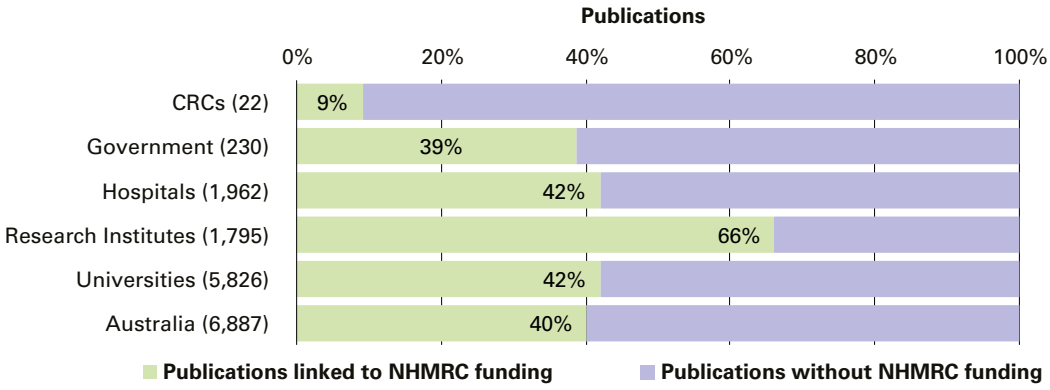


Table 21: Number of publications and impact measures, 2005–2009—Neurosciences

Sector	Number of publications	Citations	Relative journal impact	Relative citation impact
NHMRC schemes				
Projects	1,007	13,173	1.46	1.31
Programs	846	13,497	1.64	1.61
Centres of Research Excellence	380	4,927	1.56	1.43
Research Fellowships	991	12,341	1.45	1.27
Practitioner Fellowships	245	2,791	1.52	1.28
Career Development Fellowships	406	5,149	1.52	1.33
Early Career Fellowships	466	5,516	1.47	1.31
NHMRC total	**2,761**	**35,216**	**1.46**	**1.33**
Research sectors				
Government	141	1,127	0.96	0.83
Hospitals	1,140	9,015	0.91	0.78
Research Institutes	608	6,908	1.28	1.12
Universities	3,383	32,250	1.13	0.93
Non-NHMRC total	**4,126**	**38,334**	**1.10**	**0.91**
Australia	**6,887**	**73,550**	**1.25**	**1.07**
World	**224,109**	**2,289,668**	**1.00**	**1.00**

Figure 22: Relative citation impact, 2005–2009—Neurosciences

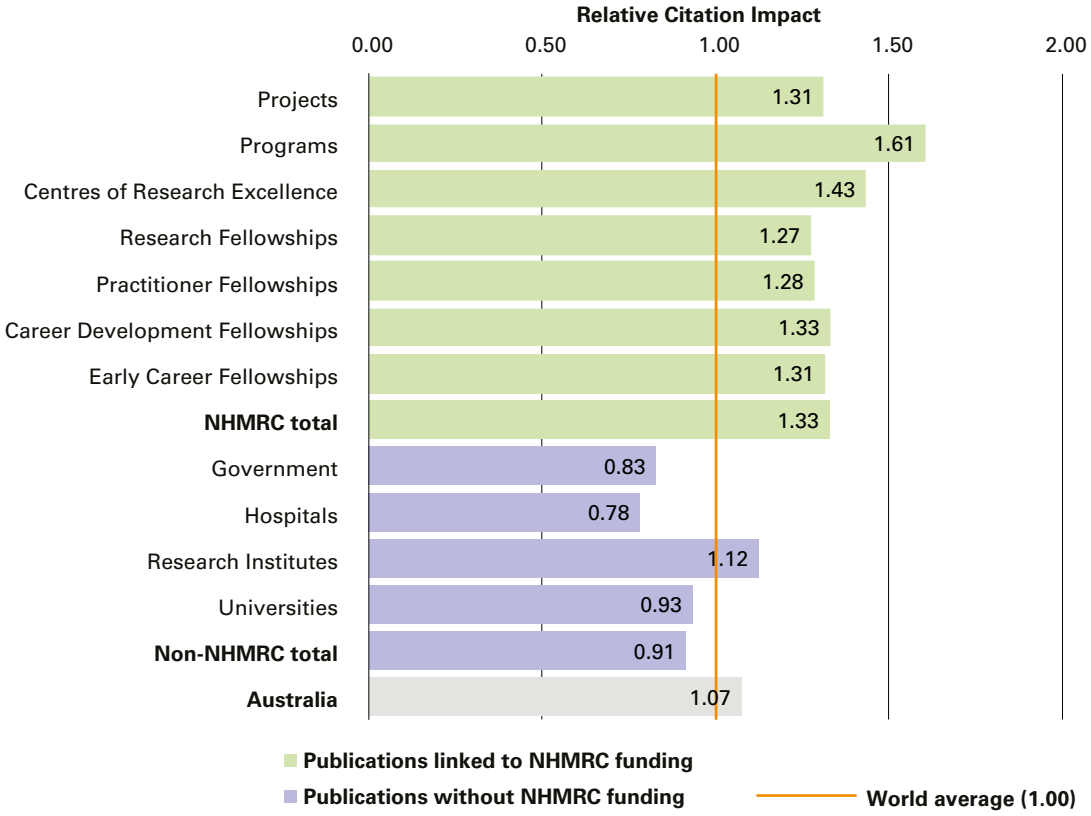


Table 22: Citation centile distribution of publications, 2005–2009—Neurosciences

Sector	Top 1%		Top 2–5%		Top 6–10%		Top 11–20%		Top 21–50%		Bottom 50%		Total publications
NHMRC schemes													
Projects	13	*1.3%*	45	*4.5%*	68	*6.8%*	140	*13.9%*	335	*33.3%*	406	*40.3%*	1,007
Programs	28	*3.3%*	71	*8.4%*	79	*9.3%*	136	*16.1%*	273	*32.3%*	259	*30.6%*	846
Centres of Research Excellence	9	*2.4%*	27	*7.1%*	30	*7.9%*	74	*19.5%*	120	*31.6%*	120	*31.6%*	380
Research Fellowships	12	*1.2%*	37	*3.7%*	58	*5.9%*	136	*13.7%*	358	*36.1%*	390	*39.4%*	991
Practitioner Fellowships	6	*2.4%*	8	*3.3%*	12	*4.9%*	48	*19.6%*	89	*36.3%*	82	*33.5%*	245
Career Development Fellowships	4	*1.0%*	18	*4.4%*	34	*8.4%*	65	*16.0%*	137	*33.7%*	148	*36.5%*	406
Early Career Fellowships	7	*1.5%*	25	*5.4%*	41	*8.8%*	66	*14.2%*	162	*34.8%*	165	*35.4%*	466
NHMRC total	**49**	***1.8%***	**143**	***5.2%***	**192**	***7.0%***	**389**	***14.1%***	**927**	***33.6%***	**1,061**	***38.4%***	**2,761**
Research sectors													
Government	1	*0.7%*	1	*0.7%*	7	*5.0%*	17	*12.1%*	41	*29.1%*	74	*52.5%*	141
Hospitals	5	*0.4%*	28	*2.5%*	62	*5.4%*	100	*8.8%*	285	*25.0%*	660	*57.9%*	1,140
Research Institutes	5	*0.8%*	17	*2.8%*	53	*8.7%*	64	*10.5%*	204	*33.6%*	265	*43.6%*	608
Universities	26	*0.8%*	109	*3.2%*	163	*4.8%*	286	*8.5%*	1,018	*30.1%*	1,781	*52.6%*	3,383
Non-NHMRC total	**30**	***0.7%***	**129**	***3.1%***	**203**	***4.9%***	**353**	***8.6%***	**1,207**	***29.3%***	**2,204**	***53.4%***	**4,126**
Australia	**79**	***1.1%***	**272**	***3.9%***	**395**	***5.7%***	**742**	***10.8%***	**2,134**	***31.0%***	**3,265**	***47.4%***	**6,887**
Expected level		***1.0%***		***4.0%***		***5.0%***		***10.0%***		***30.0%***		***50.0%***	

Comments

The journal composition of the Neurosciences sub-field has changed since the last report, and contains two additional journal sets: Clinical Neurology and Neuroimaging. Forty per cent of Neurosciences publications are attributed to NHMRC funding support. These publications, on average, have a citation impact higher than the Australian and world averages.

5.8 SUB-FIELD: NUTRITION AND DIETETICS

Field: Medical and Health Sciences

- WoS journal subject category analysed: Nutrition and Dietetics.

Figure 23: Proportion of publications linked to NHMRC funding support within each sector and Australian total, 2005–2009—Nutrition and Dietetics

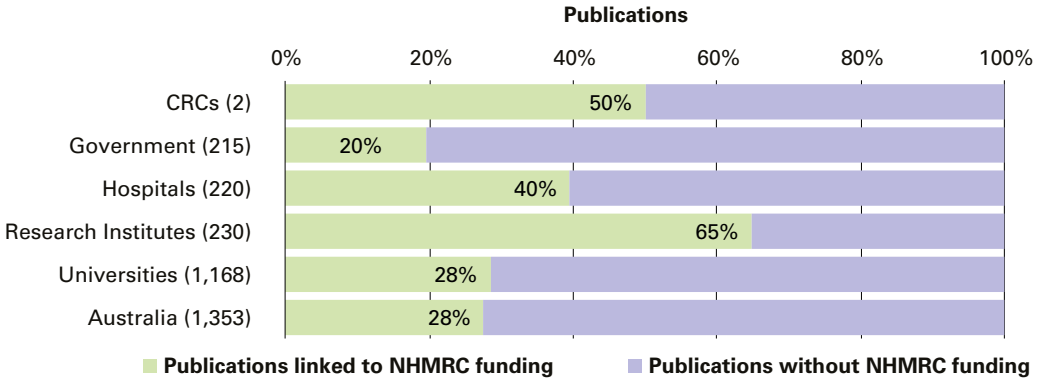


Table 23: Number of publications and impact measures, 2005–2009—Nutrition and Dietetics

Sector	Number of publications	Citations	Relative journal impact	Relative citation impact
NHMRC schemes				
Research Fellowships	101	862	1.56	1.17
NHMRC total	**373**	**3,523**	**1.55**	**1.27**
Research sectors				
Government	173	1,306	1.11	0.96
Hospitals	133	711	1.15	0.67
Universities	836	5,664	1.13	0.87
Non-NHMRC total	**980**	**6,697**	**1.14**	**0.87**
Australia	**1,353**	**10,220**	**1.26**	**0.98**
World	**35,885**	**296,846**	**1.00**	**1.00**

Figure 24: Relative citation impact, 2005–2009—Nutrition and Dietetics

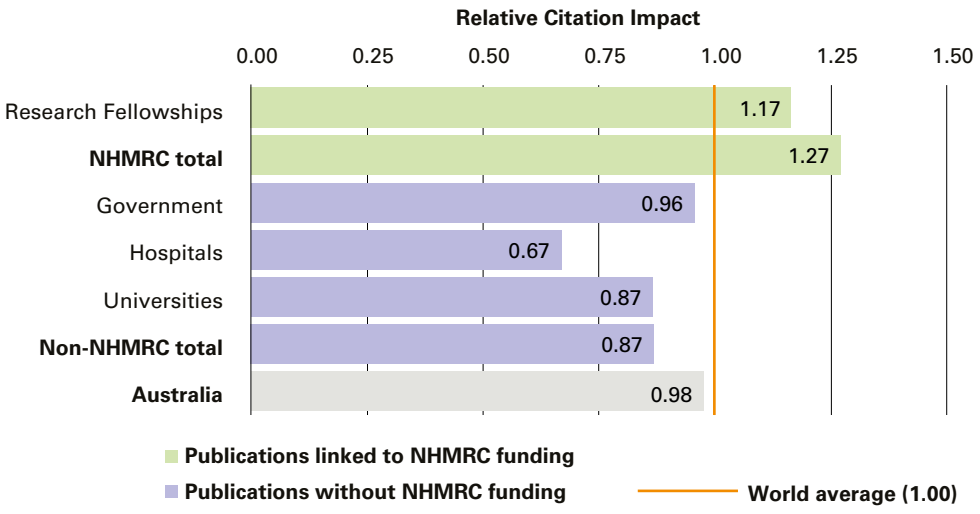


Table 24: Citation centile distribution of publications, 2005–2009—Nutrition and Dietetics

Sector	Top 1%		Top 2–5%		Top 6–10%		Top 11–20%		Top 21–50%		Bottom 50%		Total publications
NHMRC schemes													
Research Fellowships	1	*1.0%*	4	*4.0%*	6	*5.9%*	17	*16.8%*	27	*26.7%*	46	*45.5%*	101
NHMRC total	**1**	***0.3%***	**29**	***7.8%***	**24**	***6.4%***	**52**	***13.9%***	**121**	***32.4%***	**146**	***39.1%***	**373**
Research sectors													
Government			7	*4.0%*	5	*2.9%*	15	*8.7%*	54	*31.2%*	92	*53.2%*	173
Hospitals					5	*3.8%*	8	*6.0%*	30	*22.6%*	90	*67.7%*	133
Universities	4	*0.5%*	18	*2.2%*	37	*4.4%*	58	*6.9%*	248	*29.7%*	471	*56.3%*	836
Non-NHMRC total	**5**	***0.5%***	**25**	***2.6%***	**41**	***4.2%***	**72**	***7.3%***	**280**	***28.6%***	**557**	***56.8%***	**980**
Australia	**6**	***0.4%***	**54**	***4.0%***	**65**	***4.8%***	**124**	***9.2%***	**401**	***29.6%***	**703**	***52.0%***	**1,353**
Expected level		***1.0%***		***4.0%***		***5.0%***		***10.0%***		***30.0%***		***50.0%***	

Comments

Nutrition and Dietetics is analysed as a separate sub-field in this report for the first time. Previously it was included in the Public Health and Health Services sub-field.

NHMRC publications achieved an RCI of 1.27 (27% above the world average). This is lower than the NHMRC biomedical average (1.60). Only Research Fellowships met the minimum publication volume threshold to be analysed as a separate sector.

Nutrition and Dietetics in Australia has a low citation impact, with the RCI falling below the world average.

5.9 SUB-FIELD: ONCOLOGY AND CARCINOGENESIS

Field: Medical and Health Sciences

- WoS journal subject category analysed: Oncology.

Figure 25: Proportion of publications linked to NHMRC funding support within each sector and Australian total, 2005–2009—Oncology and Carcinogenesis

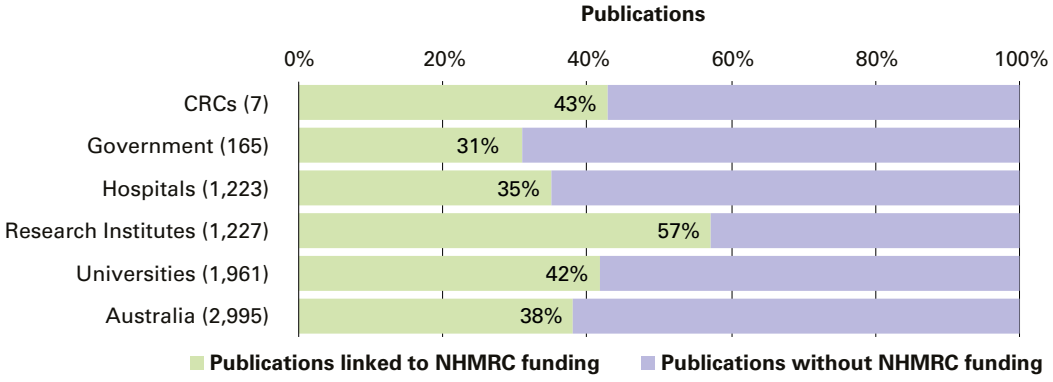


Table 25: Number of publications and impact measures, 2005–2009—Oncology and Carcinogenesis

Sector	Number of publications	Citations	Relative journal impact	Relative citation impact
NHMRC schemes				
Projects	289	4,971	1.69	1.39
Programs	556	9,464	1.56	1.37
Research Fellowships	519	9,698	1.67	1.48
Career Development Fellowships	212	2,766	1.59	1.08
Early Career Fellowships	146	2,101	1.45	1.12
NHMRC total	**1,142**	**17,815**	**1.54**	**1.28**
Research sectors				
Government	114	1,472	1.02	0.97
Hospitals	795	10,434	1.10	1.03
Research Institutes	525	7,739	1.28	1.15
Universities	1,143	13,676	1.15	0.97
Non-NHMRC total	**1,853**	**25,803**	**1.18**	**1.12**
Australia	**2,995**	**43,618**	**1.32**	**1.18**
World	**126,827**	**1,599,370**	**1.00**	**1.00**

Figure 26: Relative citation impact, 2005–2009—Oncology and Carcinogenesis

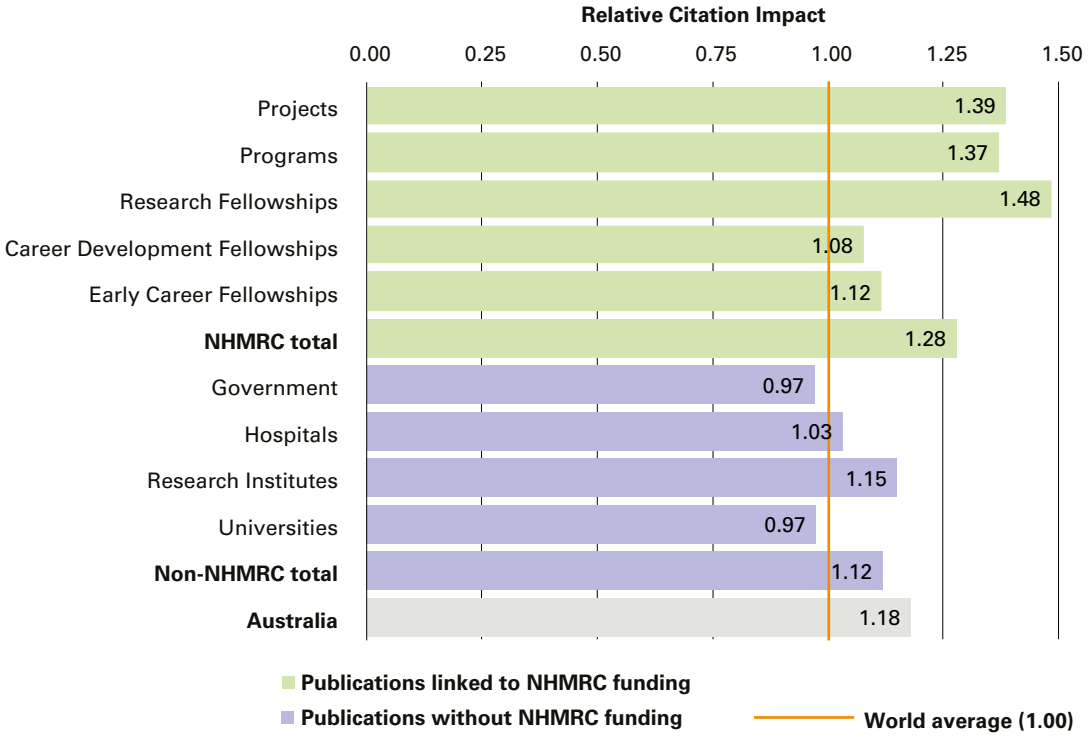


Table 26: Citation centile distribution of publications, 2005–2009—Oncology and Carcinogenesis

Sector	Top 1%		Top 2–5%		Top 6–10%		Top 11–20%		Top 21–50%		Bottom 50%		Total publications
NHMRC schemes													
Projects	6	*2.1%*	15	*5.2%*	31	*10.7%*	41	*14.2%*	96	*33.2%*	100	*34.6%*	289
Programs	7	*1.3%*	38	*6.8%*	41	*7.4%*	82	*14.7%*	187	*33.6%*	201	*36.2%*	556
Research Fellowships	9	*1.7%*	30	*5.8%*	45	*8.7%*	87	*16.8%*	176	*33.9%*	172	*33.1%*	519
Career Development Fellowships			8	*3.8%*	20	*9.4%*	27	*12.7%*	72	*34.0%*	85	*40.1%*	212
Early Career Fellowships			7	*4.8%*	10	*6.8%*	22	*15.1%*	46	*31.5%*	61	*41.8%*	146
NHMRC total	**14**	***1.2%***	**57**	***5.0%***	**93**	***8.1%***	**161**	***14.1%***	**379**	***33.2%***	**438**	***38.4%***	**1,142**
Research sectors													
Government	2	*1.8%*	4	*3.5%*	2	*1.8%*	12	*10.5%*	26	*22.8%*	68	*59.6%*	114
Hospitals	10	*1.3%*	30	*3.8%*	28	*3.5%*	55	*6.9%*	219	*27.5%*	453	*57.0%*	795
Research Institutes	8	*1.5%*	23	*4.4%*	26	*5.0%*	48	*9.1%*	177	*33.7%*	243	*46.3%*	525
Universities	7	*0.6%*	36	*3.1%*	51	*4.5%*	93	*8.1%*	351	*30.7%*	605	*52.9%*	1,143
Non-NHMRC total	**27**	***1.5%***	**76**	***4.1%***	**86**	***4.6%***	**148**	***8.0%***	**540**	***29.1%***	**976**	***52.7%***	**1,853**
Australia	**41**	***1.4%***	**133**	***4.4%***	**179**	***6.0%***	**309**	***10.3%***	**919**	***30.7%***	**1,414**	***47.2%***	**2,995**
Expected level		***1.0%***		***4.0%***		***5.0%***		***10.0%***		***30.0%***		***50.0%***	

Comments

Oncology and Carcinogenesis was analysed as part of Clinical Sciences in previous bibliometric reports. Thirty-eight per cent of publications in this sub-field are linked to NHMRC funding support. Research Fellowships, Projects and Programs stand out both in terms of their relative citation impact and in having a higher proportion of highly cited publications in the top three citation centile bands.

5.10 SUB-FIELD: OPTOMETRY AND OPHTHALMOLOGY

Field: Medical and Health Sciences

- WoS journal subject category analysed: Ophthalmology.

Figure 27: Proportion of publications linked to NHMRC funding support within each sector and Australian total, 2005–2009—Optometry and Ophthalmology

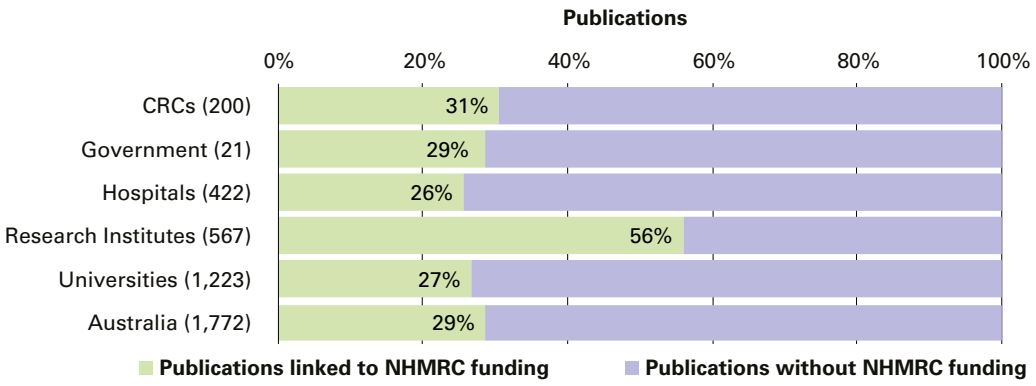


Table 27: Number of publications and impact measures, 2005–2009—Optometry and Ophthalmology

Sector	Number of publications	Citations	Relative journal impact	Relative citation impact
NHMRC schemes				
Projects	162	1,426	1.66	1.38
Centres of Research Excellence	100	707	1.34	1.42
Research Fellowships	203	1,778	1.73	1.72
Early Career Fellowships	105	758	1.39	1.30
NHMRC total	**507**	**4,266**	**1.58**	**1.45**
Research sectors				
CRCs	139	918	1.35	1.14
Hospitals	314	1,668	1.08	0.77
Research Institutes	250	2,140	1.45	1.35
Universities	897	5,361	1.28	0.95
Non-NHMRC total	**1,265**	**7,818**	**1.25**	**0.97**
Australia	**1,772**	**12,084**	**1.34**	**1.10**
World	**36,782**	**230,744**	**1.00**	**1.00**

Figure 28: Relative citation impact, 2005–2009—Optometry and Ophthalmology

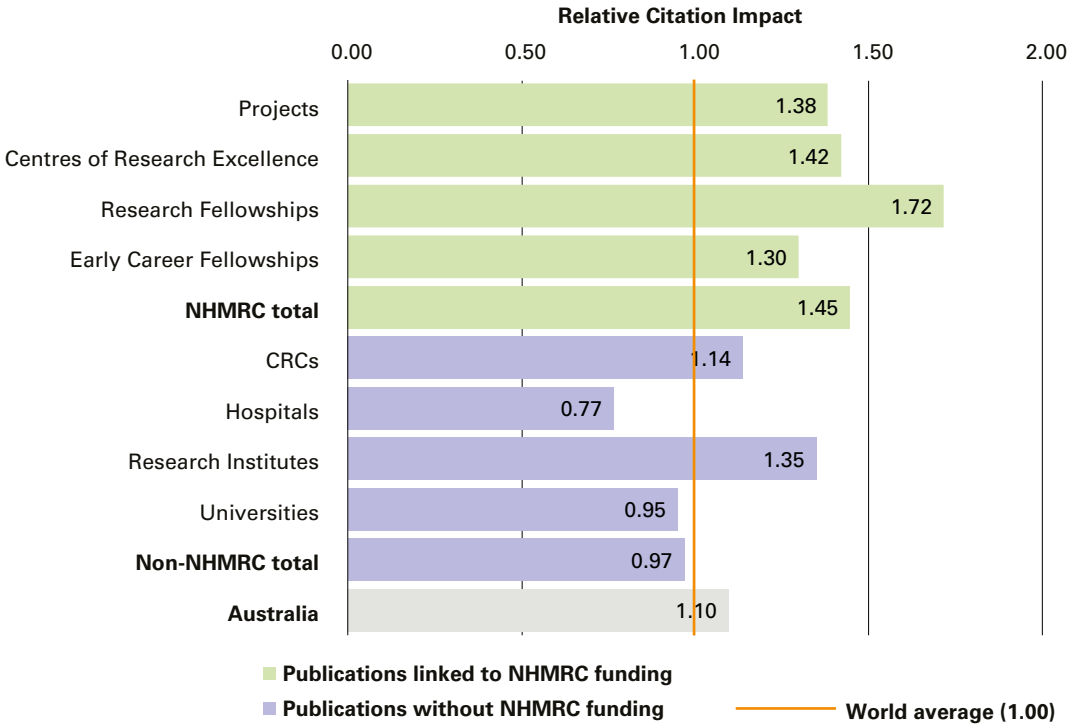


Table 28: Citation centile distribution of publications, 2005–2009—Optometry and Ophthalmology

Sector	Top 1%		Top 2–5%		Top 6–10%		Top 11–20%		Top 21–50%		Bottom 50%		Total publications
NHMRC schemes													
Projects			8	*4.9%*	17	*10.5%*	26	*16.0%*	62	*38.3%*	49	*30.2%*	162
Centres of Research Excellence	2	*2.0%*	4	*4.0%*	10	*10.0%*	13	*13.0%*	36	*36.0%*	35	*35.0%*	100
Research Fellowships	5	*2.5%*	17	*8.4%*	19	*9.4%*	22	*10.8%*	84	*41.4%*	56	*27.6%*	203
Early Career Fellowships	1	*1.0%*	6	*5.7%*	8	*7.6%*	15	*14.3%*	35	*33.3%*	40	*38.1%*	105
NHMRC total	**8**	***1.6%***	**31**	***6.1%***	**46**	***9.1%***	**66**	***13.0%***	**187**	***36.9%***	**169**	***33.3%***	**507**
Research sectors													
CRCs			5	*3.6%*	10	*7.2%*	20	*14.4%*	47	*33.8%*	57	*41.0%*	139
Hospitals			7	*2.2%*	12	*3.8%*	22	*7.0%*	91	*29.0%*	182	*58.0%*	314
Research Institutes	6	*2.4%*	12	*4.8%*	15	*6.0%*	27	*10.8%*	85	*34.0%*	105	*42.0%*	250
Universities	4	*0.4%*	25	*2.8%*	42	*4.7%*	90	*10.0%*	290	*32.3%*	446	*49.7%*	897
Non-NHMRC total	**9**	***0.7%***	**36**	***2.8%***	**58**	***4.6%***	**124**	***9.8%***	**400**	***31.6%***	**638**	***50.4%***	**1,265**
Australia	**17**	***1.0%***	**67**	***3.8%***	**104**	***5.9%***	**190**	***10.7%***	**587**	***33.1%***	**807**	***45.5%***	**1,772**
Expected level		***1.0%***		***4.0%***		***5.0%***		***10.0%***		***30.0%***		***50.0%***	

Comments

Publications from Optometry and Ophthalmology were included in Clinical Sciences in the previous report under the RFCD classification.

The Research Fellowship scheme stands out because of a strong RCI, at 1.72, and its presence in highly cited publications.

5.11 SUB-FIELD: PAEDIATRICS AND REPRODUCTIVE MEDICINE

Field: Medical and Health Sciences

- WoS journal subject categories analysed: Andrology; Obstetrics and Gynecology; Pediatrics.

Figure 29: Proportion of publications linked to NHMRC funding support within each sector and Australian total, 2005–2009—Paediatrics and Reproductive Medicine

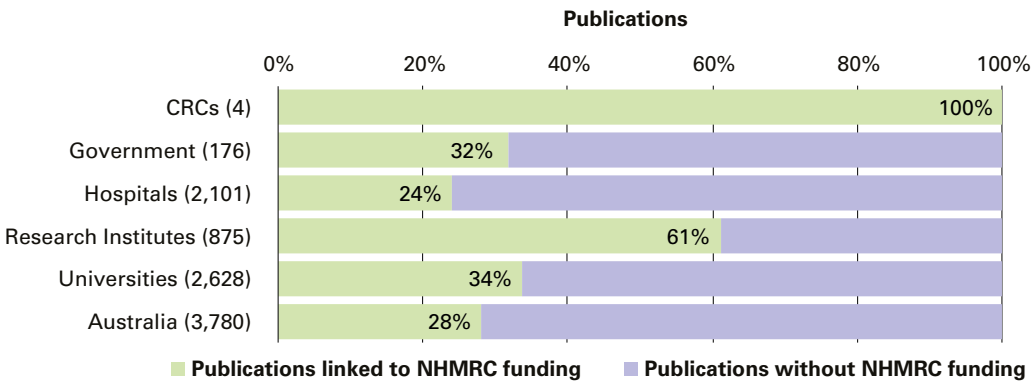


Table 29: Number of publications and impact measures, 2005–2009—Paediatrics and Reproductive Medicine

Sector	Number of publications	Citations	Relative journal impact	Relative citation impact
NHMRC schemes				
Projects	217	1,980	1.60	1.74
Programs	345	3,189	1.65	1.72
Centres of Research Excellence	151	1,434	1.60	1.78
Research Fellowships	323	2,782	1.67	1.69
Practitioner Fellowships	138	1,106	1.29	1.47
Career Development Fellowships	239	2,226	1.58	1.71
Early Career Fellowships	154	1,165	1.62	1.69
NHMRC total	**1,065**	**9,348**	**1.55**	**1.63**
Research sectors				
Government	120	635	1.10	0.90
Hospitals	1,594	9,078	1.11	0.94
Research Institutes	340	2,642	1.18	1.37
Universities	1,740	10,987	1.24	1.11
Non-NHMRC total	**2,715**	**16,902**	**1.18**	**1.06**
Australia	**3,780**	**26,250**	**1.28**	**1.21**
World	**106,410**	**598,693**	**1.00**	**1.00**

Figure 30: Relative citation impact, 2005–2009—Paediatrics and Reproductive Medicine

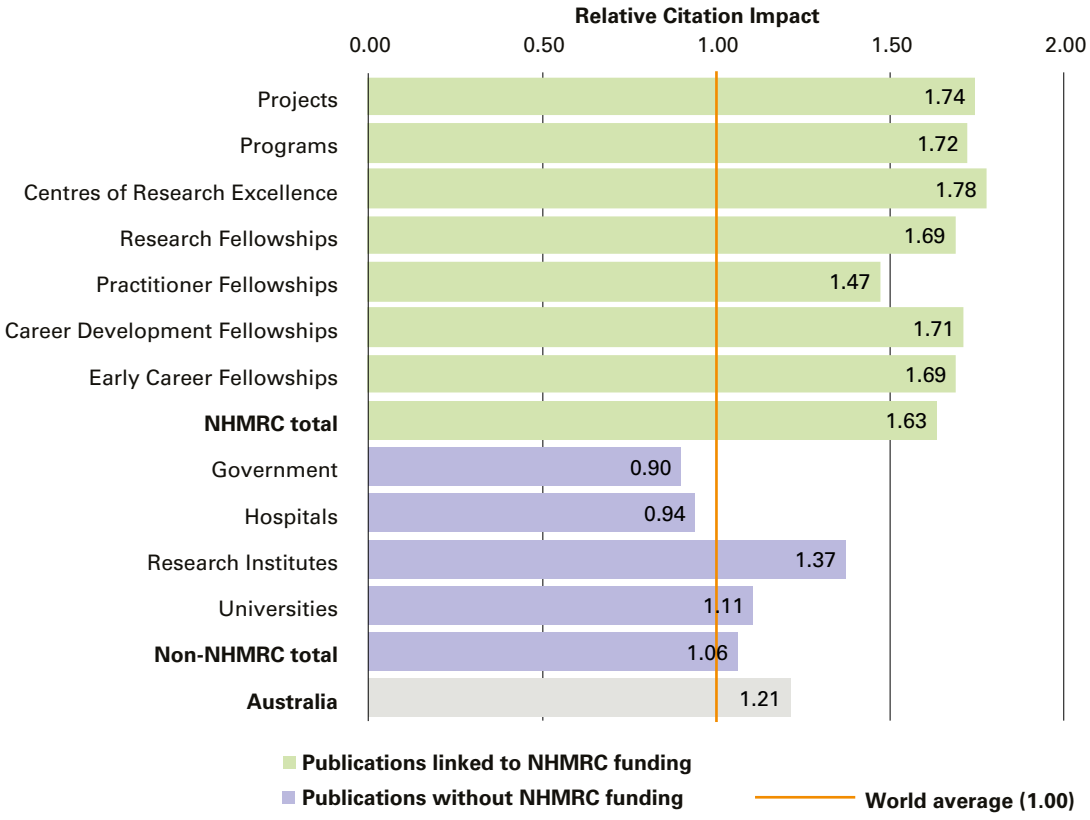


Table 30: Citation centile distribution of publications, 2005–2009—Paediatrics and Reproductive Medicine

Sector	Top 1%		Top 2–5%		Top 6–10%		Top 11–20%		Top 21–50%		Bottom 50%		Total publications
NHMRC schemes													
Projects	3	*1.4%*	22	*10.1%*	23	*10.6%*	41	*18.9%*	66	*30.4%*	62	*28.6%*	217
Programs	8	*2.3%*	24	*7.0%*	42	*12.2%*	57	*16.5%*	108	*31.3%*	106	*30.7%*	345
Centres of Research Excellence	3	*2.0%*	11	*7.3%*	15	*9.9%*	26	*17.2%*	48	*31.8%*	48	*31.8%*	151
Research Fellowships	7	*2.2%*	23	*7.1%*	35	*10.8%*	52	*16.1%*	99	*30.7%*	107	*33.1%*	323
Practitioner Fellowships	1	*0.7%*	11	*8.0%*	12	*8.7%*	19	*13.8%*	45	*32.6%*	50	*36.2%*	138
Career Development Fellowships	5	*2.1%*	18	*7.5%*	37	*15.5%*	34	*14.2%*	64	*26.8%*	81	*33.9%*	239
Early Career Fellowships	4	*2.6%*	15	*9.7%*	15	*9.7%*	27	*17.5%*	41	*26.6%*	52	*33.8%*	154
NHMRC total	**21**	***2.0%***	**80**	***7.5%***	**116**	***10.9%***	**176**	***16.5%***	**307**	***28.8%***	**365**	***34.3%***	**1,065**
Research sectors													
Government	1	*0.8%*	5	*4.2%*	3	*2.5%*	8	*6.7%*	34	*28.3%*	69	*57.5%*	120
Hospitals	10	*0.6%*	65	*4.1%*	64	*4.0%*	126	*7.9%*	455	*28.5%*	874	*54.8%*	1,594
Research Institutes	7	*2.1%*	20	*5.9%*	29	*8.5%*	41	*12.1%*	93	*27.4%*	150	*44.1%*	340
Universities	11	*0.6%*	85	*4.9%*	100	*5.7%*	167	*9.6%*	555	*31.9%*	822	*47.2%*	1,740
Non-NHMRC total	**29**	***1.1%***	**125**	***4.6%***	**135**	***5.0%***	**234**	***8.6%***	**802**	***29.5%***	**1,390**	***51.2%***	**2,715**
Australia	**50**	***1.3%***	**205**	***5.4%***	**251**	***6.6%***	**410**	***10.8%***	**1,109**	***29.3%***	**1,755**	***46.4%***	**3,780**
Expected level		***1.0%***		***4.0%***		***5.0%***		***10.0%***		***30.0%***		***50.0%***	

Comments

Paediatrics and Reproductive Medicine was analysed as part of Clinical Sciences in previous bibliometric reports. The citation impact of NHMRC-supported publications is strong in this sub-field. They are cited, on average, 63% more than the world average in this discipline. NHMRC has a large number of highly cited publications in the top three citation centile bands, well above the expected level. All NHMRC grants schemes have a consistently high RCI. The non-NHMRC publication output of Research Institutes stands out in terms of citation impact compared to other non-NHMRC sectors.

5.12 SUB-FIELD: PHARMACOLOGY AND PHARMACEUTICAL SCIENCES

Field: Medical and Health Sciences

- WoS journal subject categories analysed: Pharmacology and Pharmacy; Toxicology.

Figure 31: Proportion of publications linked to NHMRC funding support within each sector and Australian total, 2005–2009—Pharmacology and Pharmaceutical Sciences

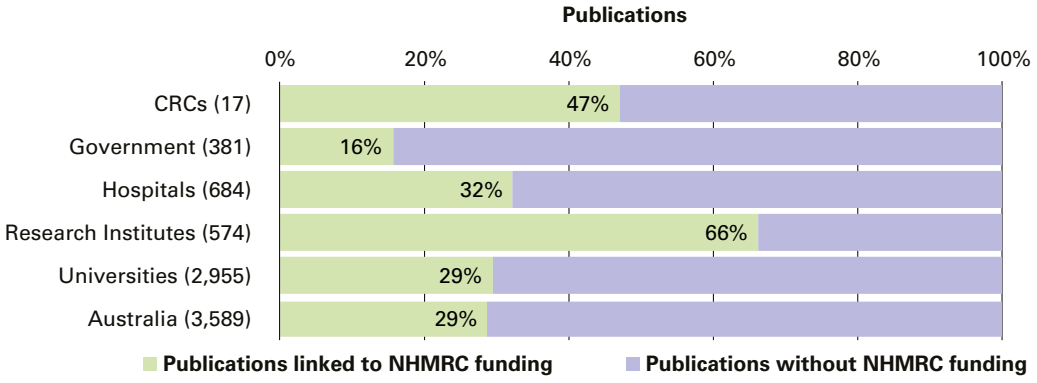


Table 31: Number of publications and impact measures, 2005–2009—Pharmacology and Pharmaceutical Sciences

Sector	Number of publications	Citations	Relative journal impact	Relative citation impact
NHMRC schemes				
Projects	443	6,263	1.69	1.73
Programs	277	3,823	1.72	1.80
Centres of Research Excellence	117	1,162	1.50	1.35
Research Fellowships	366	5,623	1.84	1.94
Career Development Fellowships	169	1,556	1.50	1.29
Early Career Fellowships	117	1,339	1.66	1.57
NHMRC total	**1,033**	**13,140**	**1.64**	**1.63**
Research sectors				
Government	321	2,732	1.10	1.07
Hospitals	463	3,331	1.13	0.93
Research Institutes	194	1,591	1.28	1.01
Universities	2,086	15,927	1.16	0.94
Non-NHMRC total	**2,556**	**20,082**	**1.15**	**0.97**
Australia	**3,589**	**33,222**	**1.29**	**1.16**
World	**177,941**	**1,440,183**	**1.00**	**1.00**

Figure 32: Relative citation impact, 2005–2009—Pharmacology and Pharmaceutical Sciences

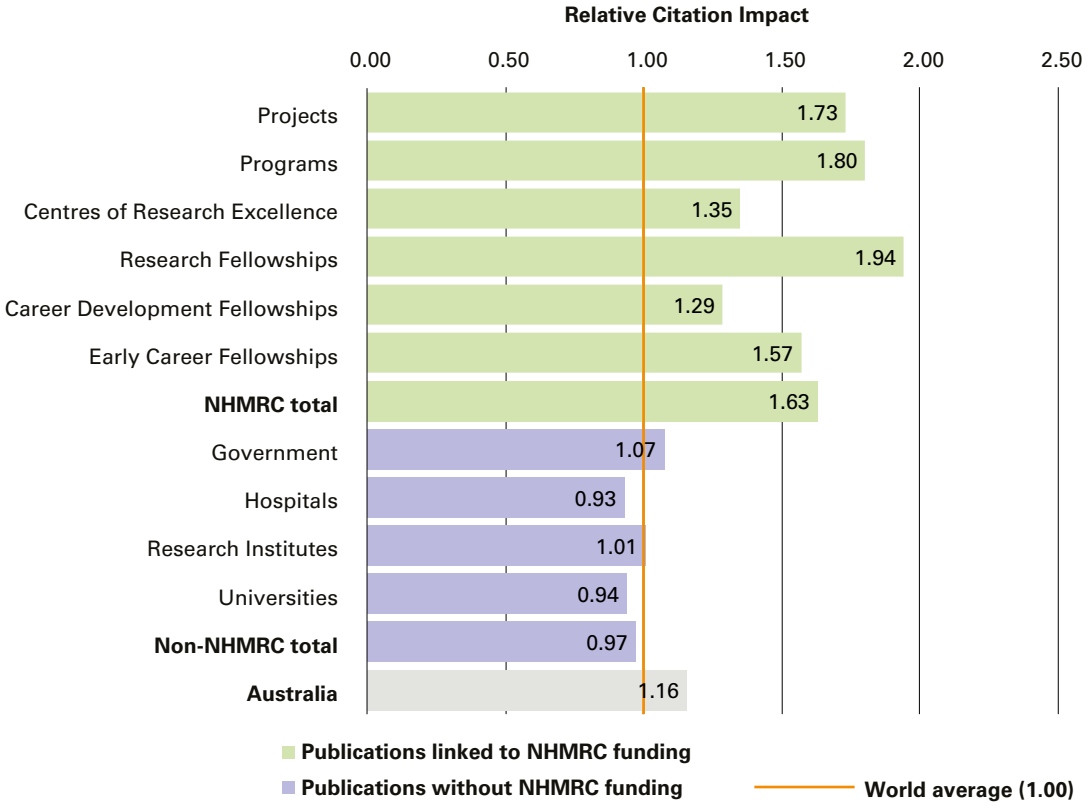


Table 32: Citation centile distribution of publications, 2005–2009—Pharmacology and Pharmaceutical Sciences

Sector	Top 1%		Top 2–5%		Top 6–10%		Top 11–20%		Top 21–50%		Bottom 50%		Total publications
NHMRC schemes													
Projects	18	*4.1%*	43	*9.7%*	29	*6.5%*	58	*13.1%*	162	*36.6%*	133	*30.0%*	443
Programs	9	*3.2%*	22	*7.9%*	22	*7.9%*	40	*14.4%*	89	*32.1%*	95	*34.3%*	277
Centres of Research Excellence	1	*0.9%*	10	*8.5%*	8	*6.8%*	14	*12.0%*	41	*35.0%*	43	*36.8%*	117
Research Fellowships	13	*3.6%*	31	*8.5%*	31	*8.5%*	59	*16.1%*	102	*27.9%*	130	*35.5%*	366
Career Development Fellowships	1	*0.6%*	8	*4.7%*	10	*5.9%*	31	*18.3%*	71	*42.0%*	48	*28.4%*	169
Early Career Fellowships	6	*5.1%*	9	*7.7%*	5	*4.3%*	16	*13.7%*	43	*36.8%*	38	*32.5%*	117
NHMRC total	**33**	***3.2%***	**80**	***7.7%***	**68**	***6.6%***	**151**	***14.6%***	**353**	***34.2%***	**348**	***33.7%***	**1,033**
Research sectors													
Government	5	*1.6%*	13	*4.0%*	16	*5.0%*	31	*9.7%*	107	*33.3%*	149	*46.4%*	321
Hospitals			19	*4.1%*	21	*4.5%*	40	*8.6%*	145	*31.3%*	238	*51.4%*	463
Research Institutes			7	*3.6%*	15	*7.7%*	19	*9.8%*	66	*34.0%*	87	*44.8%*	194
Universities	10	*0.5%*	71	*3.4%*	98	*4.7%*	210	*10.1%*	646	*31.0%*	1,051	*50.4%*	2,086
Non-NHMRC total	**14**	***0.5%***	**98**	***3.8%***	**118**	***4.6%***	**259**	***10.1%***	**790**	***30.9%***	**1,277**	***50.0%***	**2,556**
Australia	**47**	***1.3%***	**178**	***5.0%***	**186**	***5.2%***	**410**	***11.4%***	**1,143**	***31.8%***	**1,625**	***45.3%***	**3,589**
Expected level		***1.0%***		***4.0%***		***5.0%***		***10.0%***		***30.0%***		***50.0%***	

Comments

The publication output linked to NHMRC funding support increased by 29% since the last report, as did the RCI, from 1.43 to 1.63 (+0.20).

All NHMRC schemes achieved higher citation impact than the Australian average (1.16) for the sub-field.

5.13 SUB-FIELD: MEDICAL PHYSIOLOGY

Field: Medical and Health Sciences

- WoS journal subject categories analysed: Anatomy and Morphology; Physiology.

Figure 33: Proportion of publications linked to NHMRC funding support within each sector and Australian total, 2005–2009—Medical Physiology

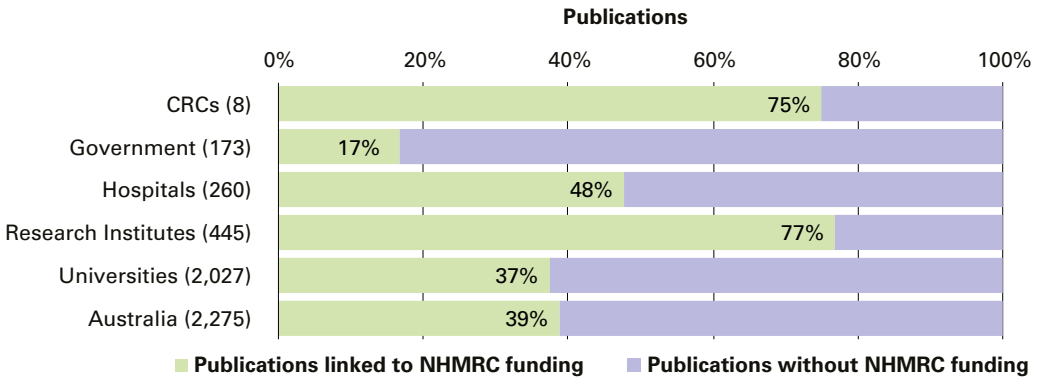


Table 33: Number of publications and impact measures, 2005–2009—Medical Physiology

Sector	Number of publications	Citations	Relative journal impact	Relative citation impact
NHMRC schemes				
Projects	422	4,857	1.49	1.32
Programs	182	2,602	1.53	1.66
Research Fellowships	419	4,700	1.39	1.32
Career Development Fellowships	177	1,998	1.27	1.42
Early Career Fellowships	147	1,635	1.30	1.44
NHMRC total	**882**	**10,356**	**1.40**	**1.37**
Research sectors				
Government	144	852	0.78	0.69
Hospitals	136	1,000	0.91	0.77
Research Institutes	103	979	1.15	1.01
Universities	1,269	8,972	0.96	0.80
Non-NHMRC total	**1,393**	**9,911**	**0.95**	**0.80**
Australia	**2,275**	**20,267**	**1.13**	**1.02**
World	**58,823**	**517,575**	**1.00**	**1.00**

Figure 34: Relative citation impact, 2005–2009—Medical Physiology

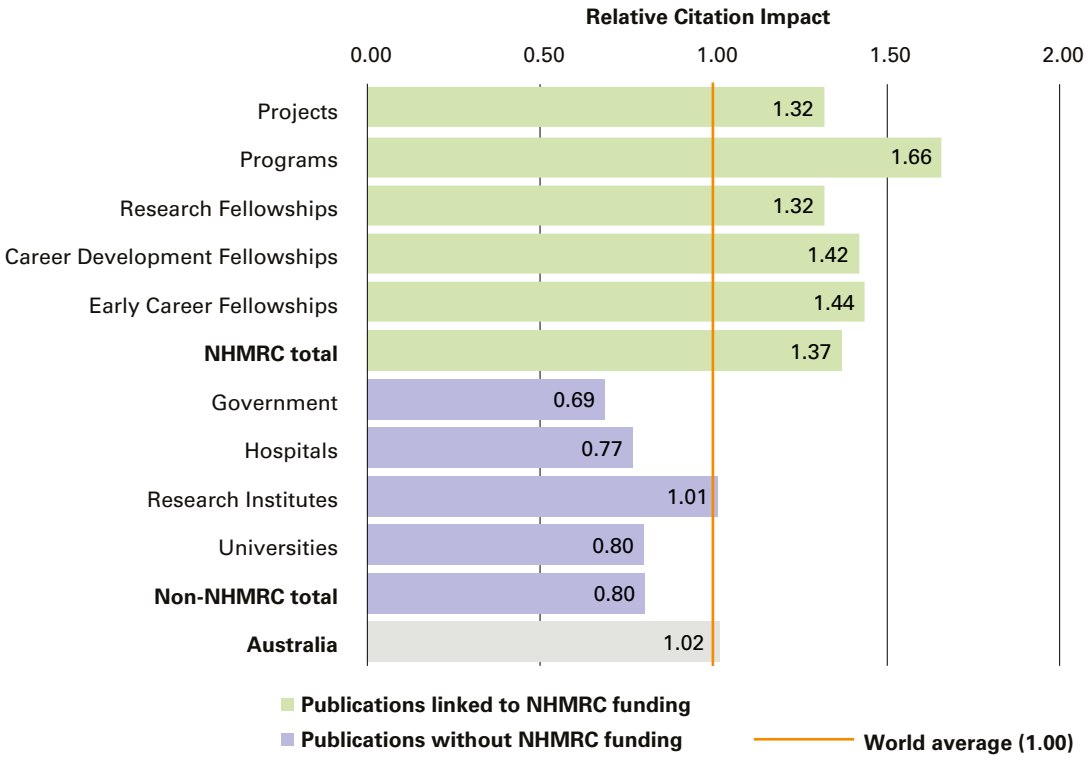


Table 34: Citation centile distribution of publications, 2005–2009—Medical Physiology

Sector	Top 1%		Top 2–5%		Top 6–10%		Top 11–20%		Top 21–50%		Bottom 50%		Total publications
NHMRC schemes													
Projects	9	*2.1%*	24	*5.7%*	27	*6.4%*	65	*15.4%*	133	*31.5%*	164	*38.9%*	422
Programs	4	*2.2%*	13	*7.1%*	12	*6.6%*	21	*11.5%*	56	*30.8%*	76	*41.8%*	182
Research Fellowships	8	*1.9%*	23	*5.5%*	31	*7.4%*	53	*12.6%*	129	*30.8%*	175	*41.8%*	419
Career Development Fellowships	3	*1.7%*	9	*5.1%*	13	*7.3%*	33	*18.6%*	62	*35.0%*	57	*32.2%*	177
Early Career Fellowships	3	*2.0%*	13	*8.8%*	9	*6.1%*	20	*13.6%*	50	*34.0%*	52	*35.4%*	147
NHMRC total	**18**	***2.0%***	**50**	***5.7%***	**56**	***6.3%***	**131**	***14.9%***	**269**	***30.5%***	**358**	***40.6%***	**882**
Research sectors													
Government			2	*1.4%*	1	*0.7%*	11	*7.6%*	38	*26.4%*	92	*63.9%*	144
Hospitals			5	*3.7%*	5	*3.7%*	8	*5.9%*	29	*21.3%*	89	*65.4%*	136
Research Institutes	1	*1.0%*	4	*3.9%*	7	*6.8%*	8	*7.8%*	30	*29.1%*	53	*51.5%*	103
Universities	5	*0.4%*	44	*3.5%*	34	*2.7%*	90	*7.1%*	306	*24.1%*	790	*62.3%*	1,269
Non-NHMRC total	**5**	***0.4%***	**49**	***3.5%***	**38**	***2.7%***	**100**	***7.2%***	**337**	***24.2%***	**864**	***62.0%***	**1,393**
Australia	**23**	***1.0%***	**99**	***4.4%***	**94**	***4.1%***	**231**	***10.2%***	**606**	***26.6%***	**1,222**	***53.7%***	**2,275**
Expected level		***1.0%***		***4.0%***		***5.0%***		***10.0%***		***30.0%***		***50.0%***	

Comments

Almost 40% of the Australian Medical Physiology publications resulted from NHMRC research funding.

The relative citation impact achieved by all Australian publications was 1.02—just above the world average. The RCI for non-NHMRC publications was only 0.80, or 20% below the world average. In contrast NHMRC publications, on average, appear in high-impact journals and are well cited. The RCI for NHMRC-supported publications as a whole increased from 1.19 in the period 2002–2006 to 1.37 in the current report period.

Eighteen of the 23 highly cited Medical Physiology publications in the top 1% centile band are linked to research funded by NHMRC.

5.14 SUB-FIELD: PUBLIC HEALTH AND HEALTH SERVICES

Field: Medical and Health Sciences

- WoS journal subject categories analysed: Ergonomics (SSCI); Health Care Sciences and Services; Public, Environmental and Occupational Health; Public, Environmental and Occupational Health (SSCI); Health Policy and Services (SSCI); Medical Informatics; Substance Abuse; Substance Abuse (SSCI).

Figure 35: Proportion of publications linked to NHMRC funding support within each sector and Australian total, 2005–2009—Public Health and Health Service

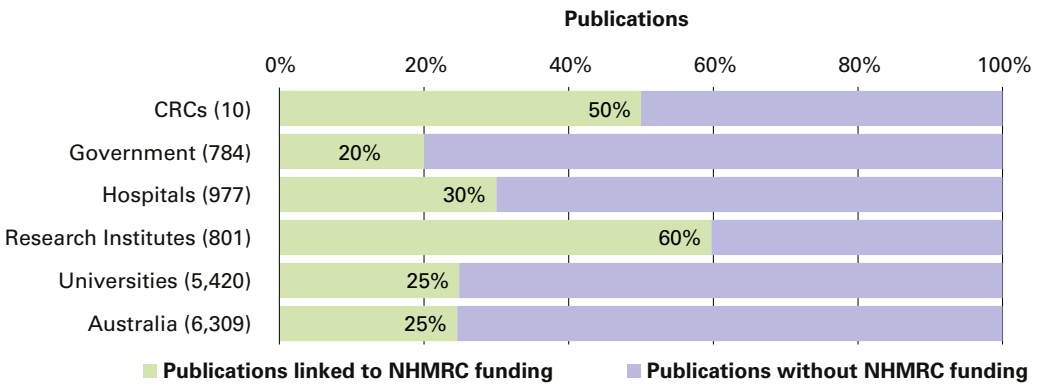


Table 35: Number of publications and impact measures, 2005–2009—Public Health and Health Services

Sector	Number of publications	Citations	Relative journal impact	Relative citation impact
NHMRC schemes				
Projects	249	2,136	1.63	1.60
Programs	498	5,620	1.75	1.70
Centres of Research Excellence	170	1,065	1.42	1.16
Research Fellowships	470	3,625	1.72	1.48
Career Development Fellowships	415	3,453	1.50	1.55
Early Career Fellowships	312	2,367	1.55	1.40
NHMRC total	**1,546**	**13,007**	**1.56**	**1.49**
Research sectors				
Government	627	3,042	1.22	0.89
Hospitals	685	3,634	1.20	0.86
Research Institutes	323	2,244	1.46	1.15
Universities	4,074	21,104	1.19	0.91
Non-NHMRC total	**4,763**	**24,563**	**1.19**	**0.89**
Australia	**6,309**	**37,570**	**1.29**	**1.04**
World	**125,186**	**760,330**	**1.00**	**1.00**

Figure 36: Relative citation impact, 2005–2009—Public Health and Health Services

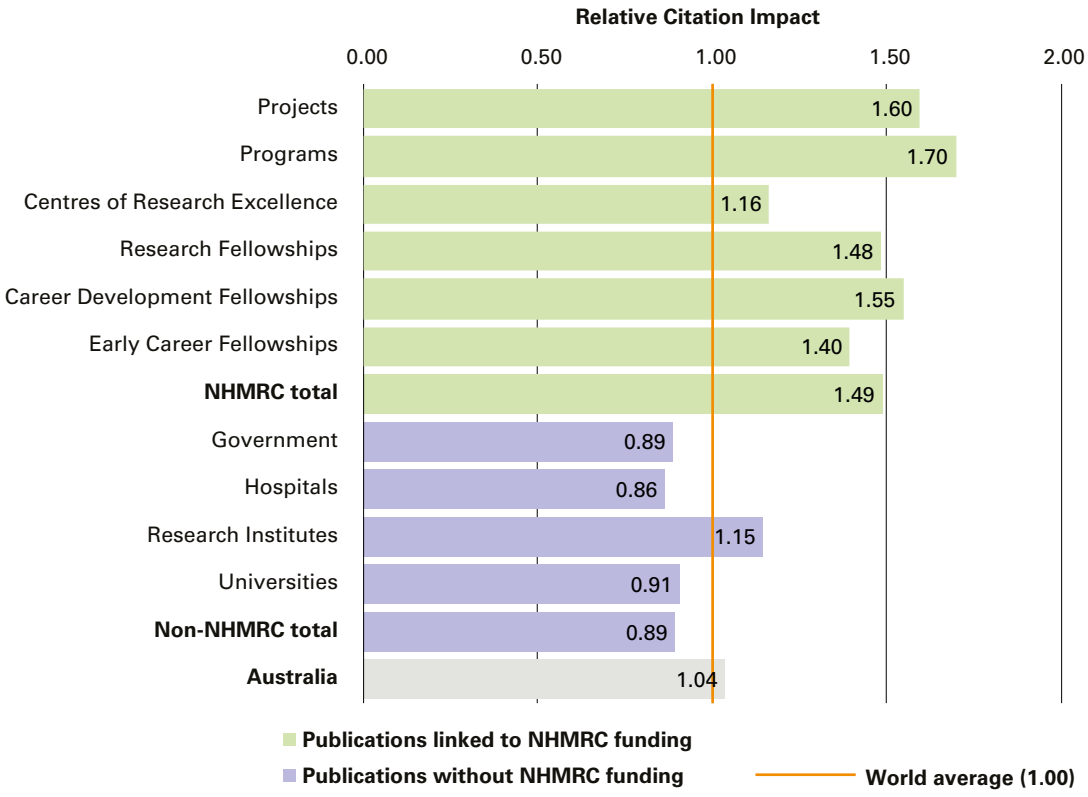


Table 36: Citation centile distribution of publications, 2005–2009—Public Health and Health Services

Sector	Top 1%		Top 2–5%		Top 6–10%		Top 11–20%		Top 21–50%		Bottom 50%		Total publications
NHMRC schemes													
Projects	5	*2.0%*	24	*9.6%*	16	*6.4%*	36	*14.5%*	81	*32.5%*	87	*34.9%*	249
Programs	10	*2.0%*	52	*10.4%*	38	*7.6%*	68	*13.7%*	163	*32.7%*	167	*33.5%*	498
Centres of Research Excellence	1	*0.6%*	10	*5.9%*	3	*1.8%*	24	*14.1%*	51	*30.0%*	81	*47.6%*	170
Research Fellowships	5	*1.1%*	37	*7.9%*	33	*7.0%*	67	*14.3%*	152	*32.3%*	176	*37.4%*	470
Career Development Fellowships	7	*1.7%*	28	*6.7%*	33	*8.0%*	55	*13.3%*	130	*31.3%*	162	*39.0%*	415
Early Career Fellowships	5	*1.6%*	17	*5.4%*	22	*7.1%*	33	*10.6%*	97	*31.1%*	138	*44.2%*	312
NHMRC total	**27**	***1.7%***	**114**	***7.4%***	**99**	***6.4%***	**205**	***13.3%***	**484**	***31.3%***	**617**	***39.9%***	**1,546**
Research sectors													
Government	4	*0.6%*	18	*2.9%*	31	*4.9%*	46	*7.3%*	158	*25.2%*	370	*59.0%*	627
Hospitals	2	*0.3%*	18	*2.6%*	25	*3.6%*	57	*8.3%*	181	*26.4%*	402	*58.7%*	685
Research Institutes	1	*0.3%*	12	*3.7%*	17	*5.3%*	45	*13.9%*	86	*26.6%*	162	*50.2%*	323
Universities	28	*0.7%*	120	*2.9%*	175	*4.3%*	344	*8.4%*	1,082	*26.6%*	2,325	*57.1%*	4,074
Non-NHMRC total	**29**	***0.6%***	**144**	***3.0%***	**200**	***4.2%***	**403**	***8.5%***	**1,257**	***26.4%***	**2,730**	***57.3%***	**4,763**
Australia	**56**	***0.9%***	**258**	***4.1%***	**299**	***4.7%***	**608**	***9.6%***	**1,741**	***27.6%***	**3,347**	***53.1%***	**6,309**
Expected level		***1.0%***		***4.0%***		***5.0%***		***10.0%***		***30.0%***		***50.0%***	

Comments

The journal composition of Public Health and Health Services research has changed since the last report. Publications in this sub-field are limited to eight WoS journal categories, compared with 10 categories used in the previous report under the RFCD classification. Despite this reduction in journal categories, the number of NHMRC publications classified to the Public Health and Health Services sub-field increased by 89% during the period 2005–2009.

NHMRC-supported publications in this sub-field had an RCI of almost 50% above the world average. Among the publications not linked to NHMRC funding, only the Research Institutes sector recorded an RCI above the world average.

It should be noted that much of the output from this sub-field also appears in journals not indexed in the WoS (e.g. professional journals and government reports).

5.15 SUB-FIELD: OTHER MEDICAL AND HEALTH SCIENCES

Field: Medical and Health Sciences

- WoS journal subject categories analysed: Medical Laboratory Technology; Medicine, Research and Experimental.

Figure 37: Proportion of publications linked to NHMRC funding support within each sector and Australian total, 2005–2009—Other Medical and Health Sciences

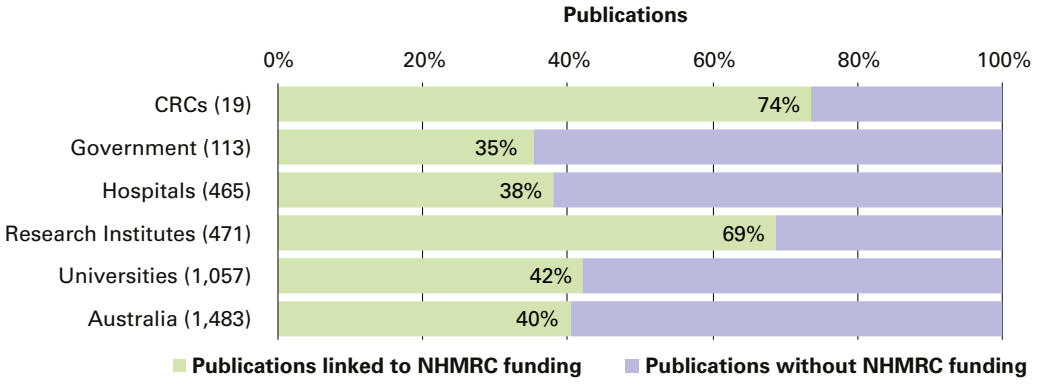


Table 37: Number of publications and impact measures, 2005–2009—Other Medical and Health Sciences

Sector	Number of publications	Citations	Relative journal impact	Relative citation impact
NHMRC schemes				
Projects	196	3,866	2.58	2.13
Programs	254	6,158	2.81	2.58
Centres of Research Excellence	106	1,048	1.38	1.12
Research Fellowships	214	5,542	3.06	2.64
Career Development Fellowships	122	2,241	2.67	2.21
NHMRC total	**598**	**10,927**	**2.30**	**2.02**
Research sectors				
Hospitals	288	2,954	1.17	1.07
Research Institutes	147	2,092	1.82	1.43
Universities	611	5,131	1.18	0.89
Non-NHMRC total	**885**	**8,426**	**1.23**	**1.00**
Australia	**1,483**	**19,353**	**1.66**	**1.40**
World	**70,551**	**656,690**	**1.00**	**1.00**

Figure 38: Relative citation impact, 2005–2009—Other Medical and Health Sciences

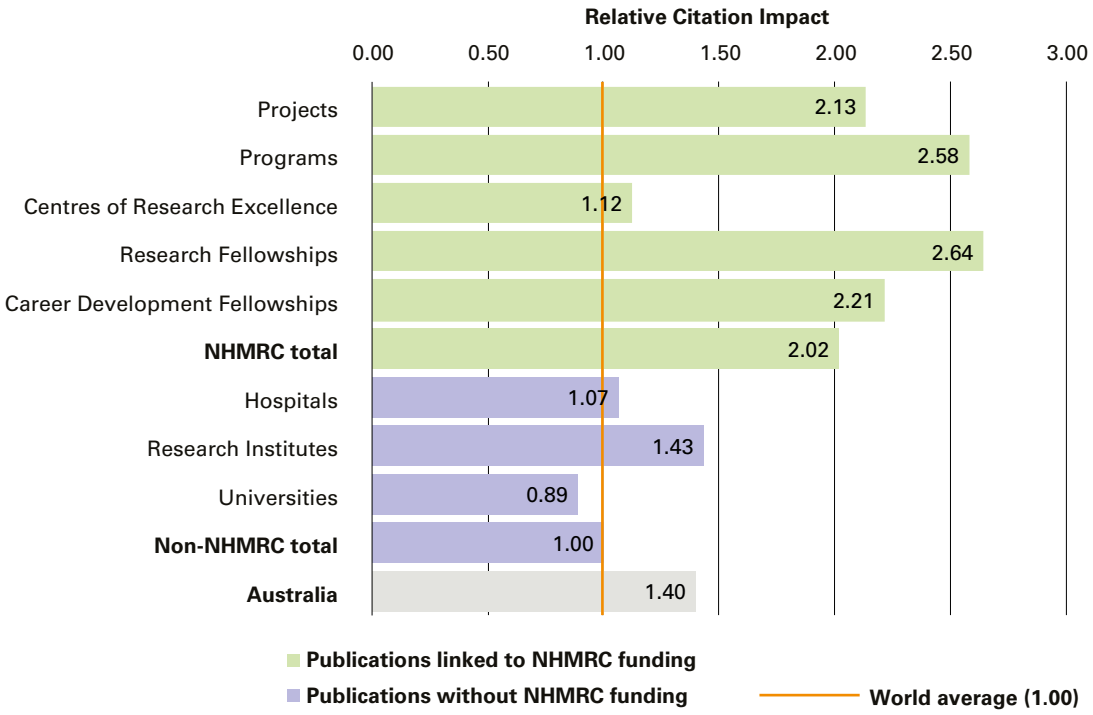


Table 38: Citation centile distribution of publications, 2005–2009—Other Medical and Health Sciences

Sector	Top 1%		Top 2–5%		Top 6–10%		Top 11–20%		Top 21–50%		Bottom 50%		Total publications
NHMRC schemes													
Projects	7	*3.8%*	22	*11.9%*	21	*11.4%*	38	*20.5%*	46	*24.9%*	51	*27.6%*	185
Programs	13	*5.4%*	29	*12.1%*	29	*12.1%*	40	*16.7%*	66	*27.6%*	62	*25.9%*	239
Centres of Research Excellence	3	*2.8%*	7	*6.6%*	7	*6.6%*	17	*16.0%*	36	*34.0%*	36	*34.0%*	106
Research Fellowships	11	*5.6%*	29	*14.8%*	18	*9.2%*	25	*12.8%*	61	*31.1%*	52	*26.5%*	196
Career Development Fellowships	4	*3.5%*	10	*8.7%*	16	*13.9%*	14	*12.2%*	37	*32.2%*	34	*29.6%*	115
Early Career Fellowships	5	*7.1%*	7	*10.0%*	10	*14.3%*	12	*17.1%*	22	*31.4%*	14	*20.0%*	70
NHMRC total	**26**	***4.5%***	**61**	***10.6%***	**51**	***8.9%***	**94**	***16.3%***	**174**	***30.3%***	**169**	***29.4%***	**575**
Research sectors													
Hospitals	7	*2.5%*	25	*8.8%*	20	*7.0%*	31	*10.9%*	75	*26.4%*	126	*44.4%*	284
Research Institutes	2	*1.4%*	10	*7.0%*	9	*6.3%*	18	*12.6%*	49	*34.3%*	55	*38.5%*	143
Universities	5	*0.8%*	37	*6.1%*	43	*7.1%*	70	*11.6%*	183	*30.2%*	267	*44.1%*	605
Non-NHMRC total	**11**	***1.3%***	**55**	***6.3%***	**61**	***7.0%***	**96**	***11.0%***	**259**	***29.7%***	**391**	***44.8%***	**873**
Australia	**37**	***2.6%***	**116**	***8.0%***	**112**	***7.7%***	**190**	***13.1%***	**433**	***29.9%***	**560**	***38.7%***	**1,448**
Expected level		***1.0%***		***4.0%***		***5.0%***		***10.0%***		***30.0%***		***50.0%***	

5.16 SUB-FIELD: GENERAL MEDICAL AND HEALTH SCIENCES

Field: Medical and Health Sciences

- WoS journal subject category analysed: Medicine, General and Internal.

A number of journals classified by WoS as Medicine, General and Internal cannot be allocated to a specific sub-field due to the diverse nature of journal composition in this field. Journals such as the *Medical Journal of Australia,* the *Lancet* and the *New England Journal of Medicine* which cover wide ranges of disciplines are included in this category. Therefore this section separately analyses this set of journals. Some of the journals classified to this sub-field are multidisciplinary in nature.

Figure 39: Proportion of publications linked to NHMRC funding support within each sector and Australian total, 2005–2009—General Medical and Health Sciences

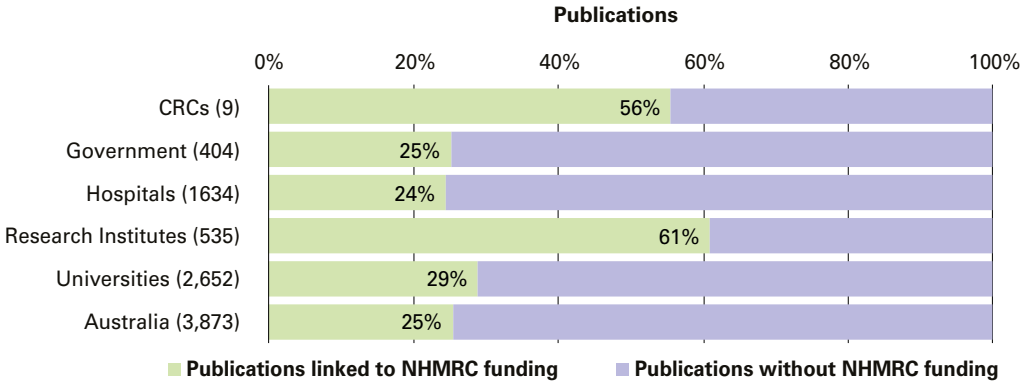


Table 39: Number of publications and impact measures, 2005–2009—General Medical and Health Sciences

Sector	Number of publications	Citations	Relative journal impact	Relative citation impact
NHMRC schemes				
Projects	119	3,286	3.51	2.69
Programs	358	16,580	4.14	4.15
Centres of Research Excellence	309	8,228	2.80	2.39
Research Fellowships	174	6,566	3.82	3.77
Practitioner Fellowships	138	5,111	4.10	3.76
Career Development Fellowships	154	2,378	1.79	1.53
Early Career Fellowships	154	2,719	2.13	1.66
NHMRC total	**983**	**29,581**	**3.10**	**2.84**
Research sectors				
Government	302	2,774	1.14	0.84
Hospitals	1,235	16,472	1.54	1.20
Research Institutes	209	4,545	2.51	1.90
Universities	1,885	23,644	1.66	1.21
Non-NHMRC total	**2,890**	**42,703**	**1.71**	**1.36**
Australia	**3,873**	**72,284**	**2.08**	**1.72**
World	**82,121**	**888,523**	**1.00**	**1.00**

Figure 40: Relative citation impact, 2005–2009—General Medical and Health Sciences

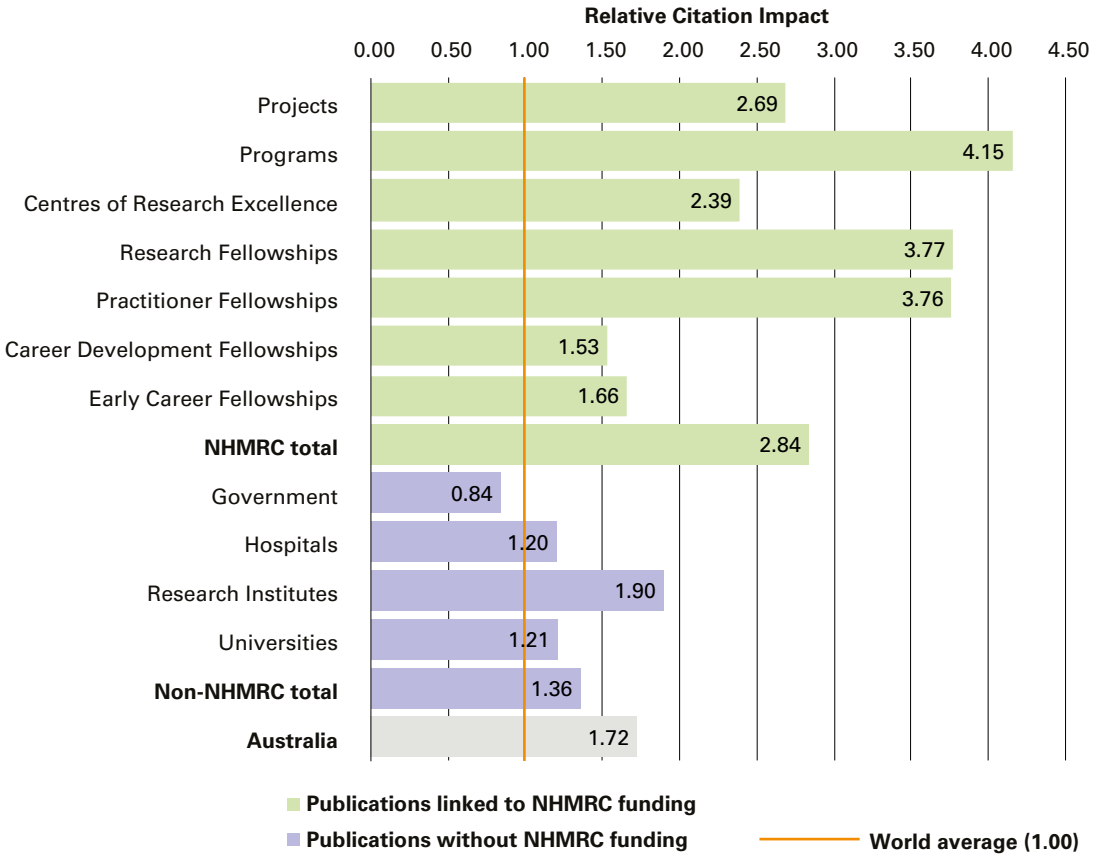


Table 40: Citation centile distribution of publications, 2005–2009—General Medical and Health Sciences

Sector	Top 1%		Top 2–5%		Top 6–10%		Top 11–20%		Top 21–50%		Bottom 50%		Total publications
NHMRC schemes													
Projects	13	*11.1%*	18	*15.4%*	21	*17.9%*	23	*19.7%*	30	*25.6%*	12	*10.3%*	117
Programs	58	*16.6%*	49	*14.0%*	40	*11.5%*	61	*17.5%*	99	*28.4%*	42	*12.0%*	349
Centres of Research Excellence	28	*9.1%*	39	*12.7%*	32	*10.4%*	51	*16.6%*	103	*33.4%*	55	*17.9%*	308
Research Fellowships	14	*8.2%*	31	*18.1%*	17	*9.9%*	35	*20.5%*	54	*31.6%*	20	*11.7%*	171
Practitioner Fellowships	22	*16.2%*	13	*9.6%*	11	*8.1%*	24	*17.6%*	35	*25.7%*	31	*22.8%*	136
Career Development Fellowships	8	*5.2%*	21	*13.7%*	19	*12.4%*	31	*20.3%*	50	*32.7%*	24	*15.7%*	153
Early Career Fellowships	9	*6.0%*	10	*6.6%*	19	*12.6%*	29	*19.2%*	50	*33.1%*	34	*22.5%*	151
NHMRC total	**101**	***10.4%***	**119**	***12.3%***	**109**	***11.3%***	**166**	***17.2%***	**299**	***30.9%***	**173**	***17.9%***	**967**
Research sectors													
Government	3	*1.0%*	20	*6.6%*	28	*9.3%*	43	*14.3%*	132	*43.9%*	75	*24.9%*	301
Hospitals	36	*2.9%*	50	*4.1%*	82	*6.7%*	170	*13.8%*	428	*34.8%*	463	*37.7%*	1,229
Research Institutes	13	*6.4%*	26	*12.7%*	13	*6.4%*	27	*13.2%*	73	*35.8%*	52	*25.5%*	204
Universities	66	*3.5%*	105	*5.6%*	145	*7.8%*	289	*15.5%*	640	*34.2%*	624	*33.4%*	1,869
Non-NHMRC total	**105**	***3.7%***	**163**	***5.7%***	**196**	***6.8%***	**392**	***13.7%***	**971**	***33.8%***	**1,044**	***36.4%***	**2,871**
Australia	**206**	***5.4%***	**282**	***7.3%***	**305**	***7.9%***	**558**	***14.5%***	**1,270**	***33.1%***	**1,217**	***31.7%***	**3,838**
Expected level		***1.0%***		***4.0%***		***5.0%***		***10.0%***		***30.0%***		***50.0%***	

5.17 SUB-FIELD: GENERAL BIOLOGICAL SCIENCES

Field: Biological Sciences

- WoS journal subject categories analysed: Biochemical Research Methods; Biotechnology and Applied Microbiology.

Journals classified to these two categories have a wide discipline coverage and cannot be allocated to a specific sub-field. Therefore this section separately analyses these journal categories as general biological sciences.

Figure 41: Proportion of publications linked to NHMRC funding support within each sector and Australian total, 2005–2009—General Biological Sciences

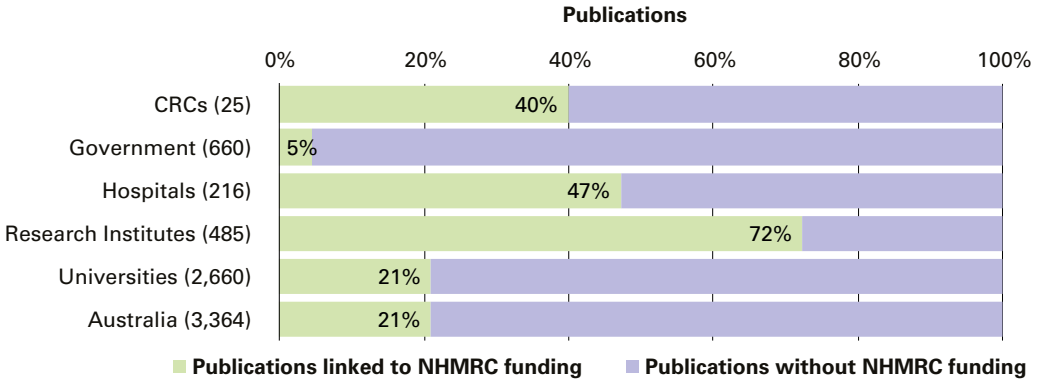


Table 41: Number of publications and impact measures, 2005–2009—General Biological Sciences

Sector	Number of publications	Citations	Relative journal impact	Relative citation impact
NHMRC schemes				
Projects	280	4,762	1.70	1.91
Programs	242	4,614	1.92	2.13
Research Fellowships	295	4,688	1.88	1.78
Career Development Fellowships	130	1,479	1.79	1.37
NHMRC total	**706**	**10,692**	**1.73**	**1.74**
Research sectors				
Government	630	5,475	1.10	0.97
Hospitals	114	780	1.19	0.70
Research Institutes	134	1,270	1.42	1.10
Universities	2,100	19,839	1.25	1.05
Non-NHMRC total	**2,658**	**24,943**	**1.23**	**1.03**
Australia	**3,364**	**35,635**	**1.34**	**1.18**
World	**156,000**	**1,415,784**	**1.00**	**1.00**

Figure 42: Relative citation impact, 2005–2009—General Biological Sciences

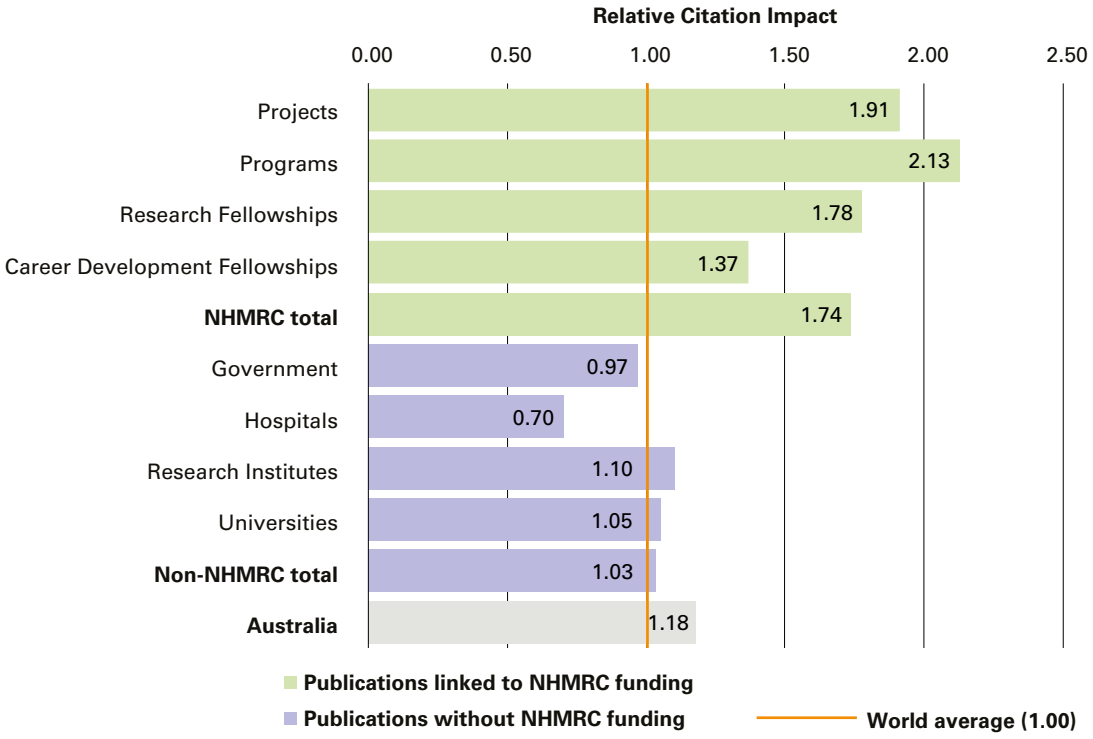


Table 42: Citation centile distribution of publications, 2005–2009—General Biological Sciences

Sector	Top 1%		Top 2–5%		Top 6–10%		Top 11–20%		Top 21–50%		Bottom 50%		Total publications
NHMRC schemes													
Projects	10	*3.6%*	32	*11.4%*	22	*7.9%*	45	*16.1%*	81	*28.9%*	90	*32.1%*	280
Programs	16	*6.6%*	16	*6.6%*	29	*12.0%*	21	*8.7%*	75	*31.0%*	85	*35.1%*	242
Research Fellowships	13	*4.4%*	25	*8.5%*	26	*8.8%*	23	*7.8%*	84	*28.5%*	124	*42.0%*	295
Career Development Fellowships	5	*3.8%*	9	*6.9%*	7	*5.4%*	14	*10.8%*	44	*33.8%*	51	*39.2%*	130
NHMRC total	**26**	***3.7%***	**56**	***7.9%***	**64**	***9.1%***	**86**	***12.2%***	**205**	***29.0%***	**269**	***38.1%***	**706**
Research sectors													
Government	3	*0.5%*	15	*2.4%*	44	*7.0%*	81	*12.9%*	212	*33.7%*	275	*43.7%*	630
Hospitals			1	*0.9%*	5	*4.4%*	8	*7.0%*	35	*30.7%*	65	*57.0%*	114
Research Institutes			13	*9.7%*	7	*5.2%*	17	*12.7%*	38	*28.4%*	59	*44.0%*	134
Universities	25	*1.2%*	84	*4.0%*	116	*5.5%*	234	*11.1%*	664	*31.6%*	977	*46.5%*	2,100
Non-NHMRC total	**28**	***1.1%***	**101**	***3.8%***	**154**	***5.8%***	**299**	***11.2%***	**839**	***31.6%***	**1,237**	***46.5%***	**2,658**
Australia	**54**	***1.6%***	**157**	***4.7%***	**218**	***6.5%***	**385**	***11.4%***	**1,044**	***31.0%***	**1,506**	***44.8%***	**3,364**
Expected level		***1.0%***		***4.0%***		***5.0%***		***10.0%***		***30.0%***		***50.0%***	

Comments

The two journal sets included in this sub-field were previously analysed as part of the Biotechnology sub-field in *Measuring up 2009*.

The number of publications linked to NHMRC funding support has increased by 69% since the last report. The NHMRC publications in this sub-field are in high-impact journals. The Program Grants scheme stands out with an RCI of more than double the world average. NHMRC's strong performance is also highlighted by the large number of highly cited publications in the top three citation centile bands.

5.18 SUB-FIELD: BIOCHEMISTRY AND CELL BIOLOGY

Field: Biological Sciences

- WoS journal subject categories analysed: Biochemistry and Molecular Biology; Cell Biology.

Figure 43: Proportion of publications linked to NHMRC funding support within each sector and Australian total, 2005–2009—Biochemistry and Cell Biology

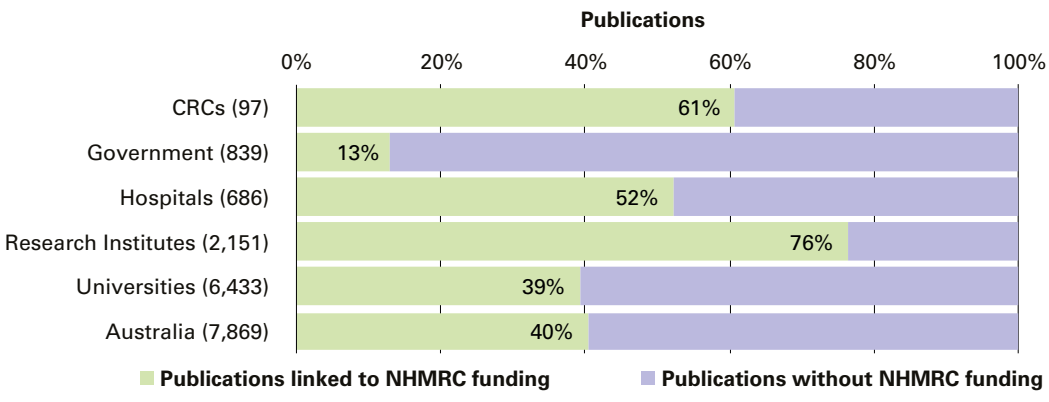


Table 43: Number of publications and impact measures, 2005–2009—Biochemistry and Cell Biology

Sector	Number of publications	Citations	Relative journal impact	Relative citation impact
NHMRC schemes				
Projects	1,302	21,935	1.40	1.34
Programs	1,272	25,410	1.48	1.60
Centres of Research Excellence	101	1,295	1.36	1.06
Research Fellowships	1,654	32,794	1.50	1.56
Career Development Fellowships	630	11,154	1.47	1.47
Early Career Fellowships	419	7,700	1.49	1.57
NHMRC total	**3,177**	**55,981**	**1.39**	**1.40**
Research sectors				
Government	730	8,121	0.99	0.87
Hospitals	328	3,529	0.98	0.80
Research Institutes	508	7,718	1.19	1.12
Universities	3,909	47,761	1.08	0.93
Non-NHMRC total	**4,692**	**58,991**	**1.08**	**0.95**
Australia	**7,869**	**114,972**	**1.21**	**1.13**
World	**311,230**	**4,106,924**	**1.00**	**1.00**

Figure 44: Relative citation impact, 2005–2009—Biochemistry and Cell Biology

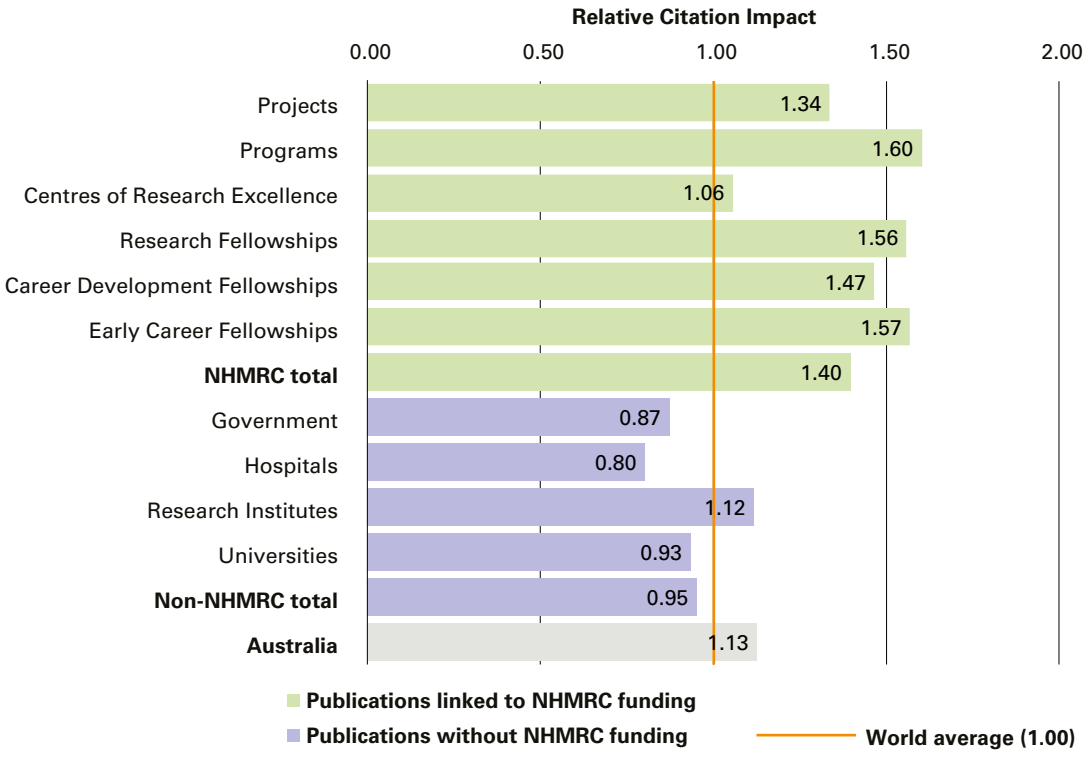


Table 44: Citation centile distribution of publications, 2005–2009—Biochemistry and Cell Biology

Sector	Top 1%		Top 2–5%		Top 6–10%		Top 11–20%		Top 21–50%		Bottom 50%		Total publications
NHMRC schemes													
Projects	13	*1.0%*	67	*5.2%*	107	*8.3%*	167	*13.0%*	469	*36.6%*	460	*35.9%*	1,283
Programs	24	*1.9%*	75	*6.0%*	106	*8.5%*	172	*13.7%*	411	*32.8%*	465	*37.1%*	1,253
Research Fellowships	35	*2.1%*	92	*5.6%*	136	*8.3%*	231	*14.2%*	556	*34.1%*	582	*35.7%*	1,632
Career Development Fellowships	6	*1.0%*	41	*6.7%*	63	*10.3%*	85	*13.8%*	219	*35.7%*	200	*32.6%*	614
Early Career Fellowships	10	*2.4%*	26	*6.3%*	25	*6.1%*	53	*12.9%*	148	*36.1%*	148	*36.1%*	410
NHMRC total	**47**	***1.5%***	**163**	***5.2%***	**237**	***7.6%***	**412**	***13.2%***	**1,072**	***34.2%***	**1,201**	***38.3%***	**3,132**
Research sectors													
Government	2	*0.3%*	17	*2.3%*	35	*4.8%*	71	*9.7%*	221	*30.3%*	383	*52.5%*	729
Hospitals	1	*0.3%*	9	*2.8%*	9	*2.8%*	31	*9.5%*	84	*25.8%*	191	*58.8%*	325
Research Institutes	5	*1.0%*	11	*2.2%*	32	*6.5%*	46	*9.3%*	171	*34.5%*	231	*46.6%*	496
Universities	27	*0.7%*	122	*3.1%*	157	*4.0%*	330	*8.5%*	1,167	*30.1%*	2,077	*53.5%*	3,880
Non-NHMRC total	**34**	***0.7%***	**143**	***3.1%***	**205**	***4.4%***	**414**	***8.9%***	**1,407**	***30.2%***	**2,451**	***52.7%***	**4,654**
Australia	**81**	***1.0%***	**306**	***3.9%***	**442**	***5.7%***	**826**	***10.6%***	**2,479**	***31.8%***	**3,652**	***46.9%***	**7,786**
Expected level		***1.0%***		***4.0%***		***5.0%***		***10.0%***		***30.0%***		***50.0%***	

Comments

This sub-field covers 3,177 journal publications—that is, about 15% of the total NHMRC output in biomedical sciences. Just over 40% of biochemistry and cell biology publications in Australia resulted from NHMRC-funded research. Since the last report the volume of publications attributed to NHMRC funding increased by 14%.

5.19 SUB-FIELD: GENETICS

Field: Biological Sciences

- WoS journal subject category analysed: Genetics and Heredity.

Figure 45: Proportion of publications linked to NHMRC funding support within each sector and Australian total, 2005–2009—Genetics

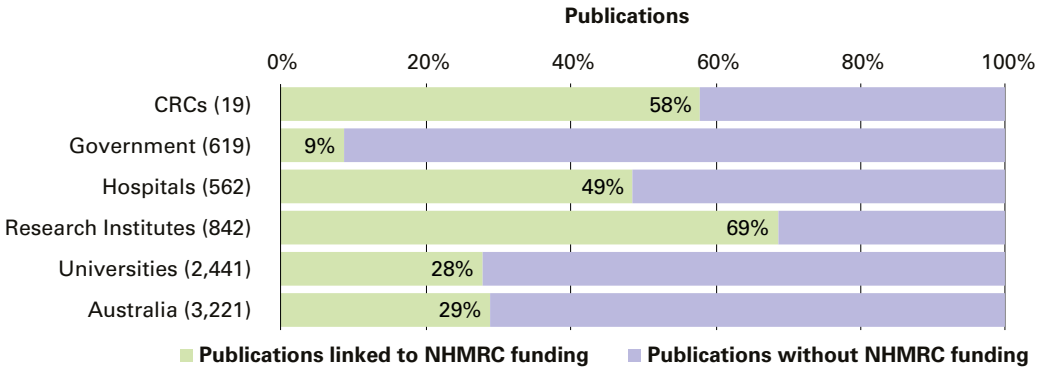


Table 45: Number of publications and impact measures, 2005–2009—Genetics

Sector	Number of publications	Citations	Relative journal impact	Relative citation impact
NHMRC schemes				
Projects	331	7,146	1.88	1.69
Programs	317	6,531	1.86	1.62
Research Fellowships	466	9,968	2.01	1.71
Career Development Fellowships	196	3,332	1.86	1.42
Early Career Fellowships	140	2,384	2.09	1.61
NHMRC total	**929**	**17,313**	**1.75**	**1.48**
Research sectors				
Government	565	5,711	0.95	0.83
Hospitals	289	3,606	1.21	0.89
Research Institutes	265	3,754	1.16	1.00
Universities	1,763	22,461	1.13	0.97
Non-NHMRC total	**2,292**	**29,580**	**1.13**	**0.98**
Australia	**3,221**	**46,893**	**1.31**	**1.12**
World	**81,247**	**1,060,409**	**1.00**	**1.00**

Figure 46: Relative citation impact, 2005–2009—Genetics

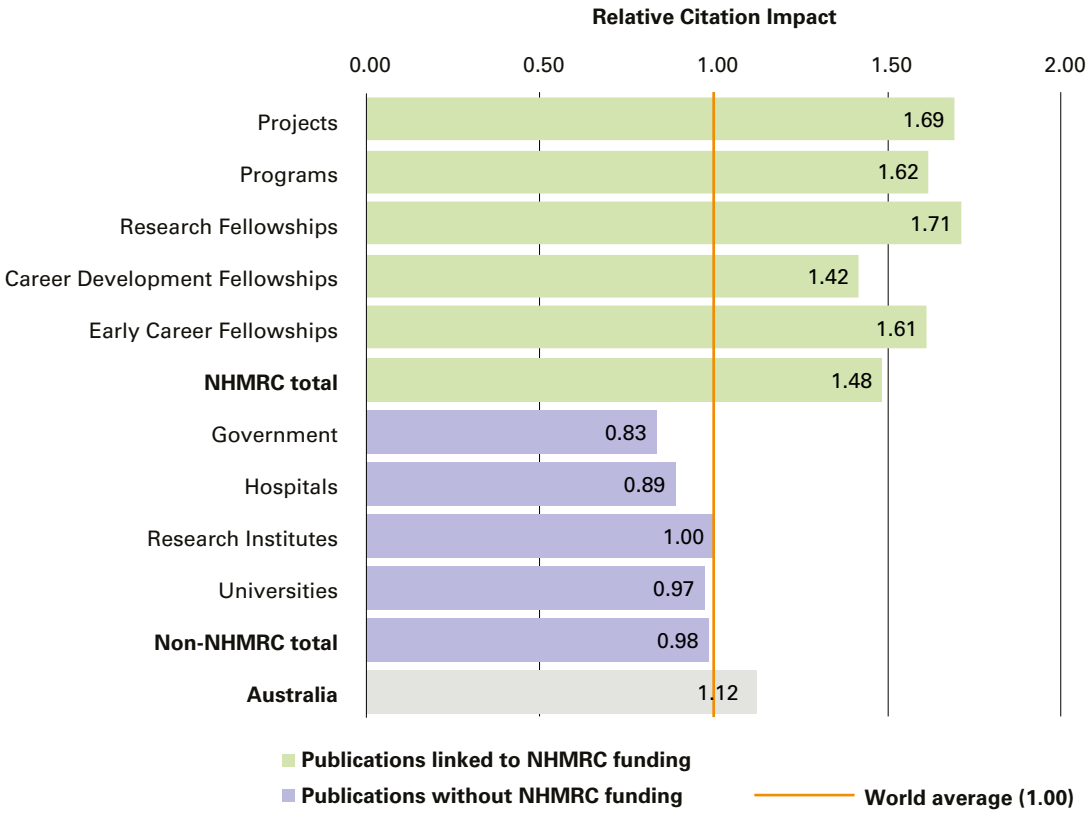


Table 46: Citation centile distribution of publications, 2005–2009—Genetics

Sector	Top 1%		Top 2–5%		Top 6–10%		Top 11–20%		Top 21–50%		Bottom 50%		Total publications
NHMRC schemes													
Projects	9	*2.7%*	33	*10.0%*	39	*11.8%*	43	*13.0%*	96	*29.0%*	111	*33.5%*	331
Programs	9	*2.8%*	26	*8.2%*	30	*9.5%*	47	*14.8%*	88	*27.8%*	117	*36.9%*	317
Research Fellowships	19	*4.1%*	41	*8.8%*	47	*10.1%*	72	*15.5%*	118	*25.3%*	169	*36.3%*	466
Career Development Fellowships	6	*3.1%*	13	*6.6%*	22	*11.2%*	18	*9.2%*	49	*25.0%*	88	*44.9%*	196
Early Career Fellowships	9	*6.4%*	9	*6.4%*	13	*9.3%*	16	*11.4%*	42	*30.0%*	51	*36.4%*	140
NHMRC total	**26**	***2.8%***	**70**	***7.5%***	**89**	***9.6%***	**121**	***13.0%***	**257**	***27.7%***	**366**	***39.4%***	**929**
Research sectors													
Government			14	*2.5%*	18	*3.2%*	59	*10.4%*	213	*37.7%*	261	*46.2%*	565
Hospitals	3	*1.0%*	11	*3.8%*	12	*4.2%*	31	*10.7%*	59	*20.4%*	173	*59.9%*	289
Research Institutes	4	*1.5%*	8	*3.0%*	14	*5.3%*	20	*7.5%*	83	*31.3%*	136	*51.3%*	265
Universities	10	*0.6%*	59	*3.3%*	78	*4.4%*	200	*11.3%*	576	*32.7%*	840	*47.6%*	1,763
Non-NHMRC total	**15**	***0.7%***	**79**	***3.4%***	**106**	***4.6%***	**260**	***11.3%***	**737**	***32.2%***	**1,095**	***47.8%***	**2,292**
Australia	**41**	***1.3%***	**149**	***4.6%***	**195**	***6.1%***	**381**	***11.8%***	**994**	***30.9%***	**1,461**	***45.4%***	**3,221**
Expected level		***1.0%***		***4.0%***		***5.0%***		***10.0%***		***30.0%***		***50.0%***	

Comments

Since the last report, genetics publications resulting from NHMRC-funded research increased by 50%, and their RCI increased from 1.37 to 1.48 (+0.11). Publications linked to NHMRC schemes were well cited. This is in contrast with non-NHMRC publications, which, at 0.98, fell below the world average.

While the proportion of NHMRC-supported publications in this discipline is about 29% of the total Australian output, this sub-field has more than half (26 out of 41) of the highly cited publications in the top 1% citation centile band.

5.20 SUB-FIELD: MICROBIOLOGY

Field: Biological Sciences

- WoS journal subject categories analysed: Microbiology; Virology.

Figure 47: Proportion of publications linked to NHMRC funding support within each sector and Australian total, 2005–2009—Microbiology

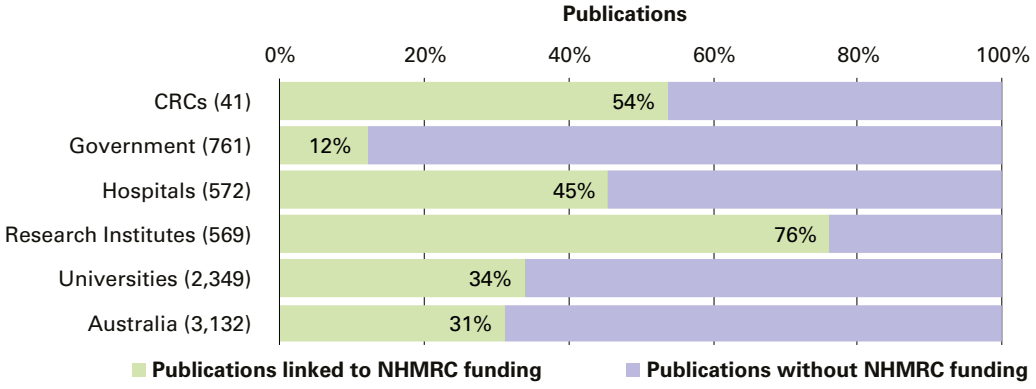


Table 47: Number of publications and impact measures, 2005–2009—Microbiology

Sector	Number of publications	Citations	Relative journal impact	Relative citation impact
NHMRC schemes				
Projects	366	4,822	1.42	1.37
Programs	411	4,993	1.58	1.28
Centres of Research Excellence	164	1,831	1.33	1.27
Research Fellowships	242	3,140	1.61	1.29
Career Development Fellowships	159	1,619	1.37	1.14
Early Career Fellowships	104	995	1.38	1.05
NHMRC total	**974**	**11,956**	**1.43**	**1.27**
Research sectors				
Government	669	7,181	1.05	0.99
Hospitals	312	4,277	1.26	1.28
Research Institutes	136	1,619	1.26	1.05
Universities	1,555	17,845	1.12	1.07
Non-NHMRC total	**2,158**	**24,485**	**1.11**	**1.05**
Australia	**3,132**	**36,441**	**1.21**	**1.11**
World	**106,505**	**1,121,361**	**1.00**	**1.00**

Figure 48: Relative citation impact, 2005–2009—Microbiology

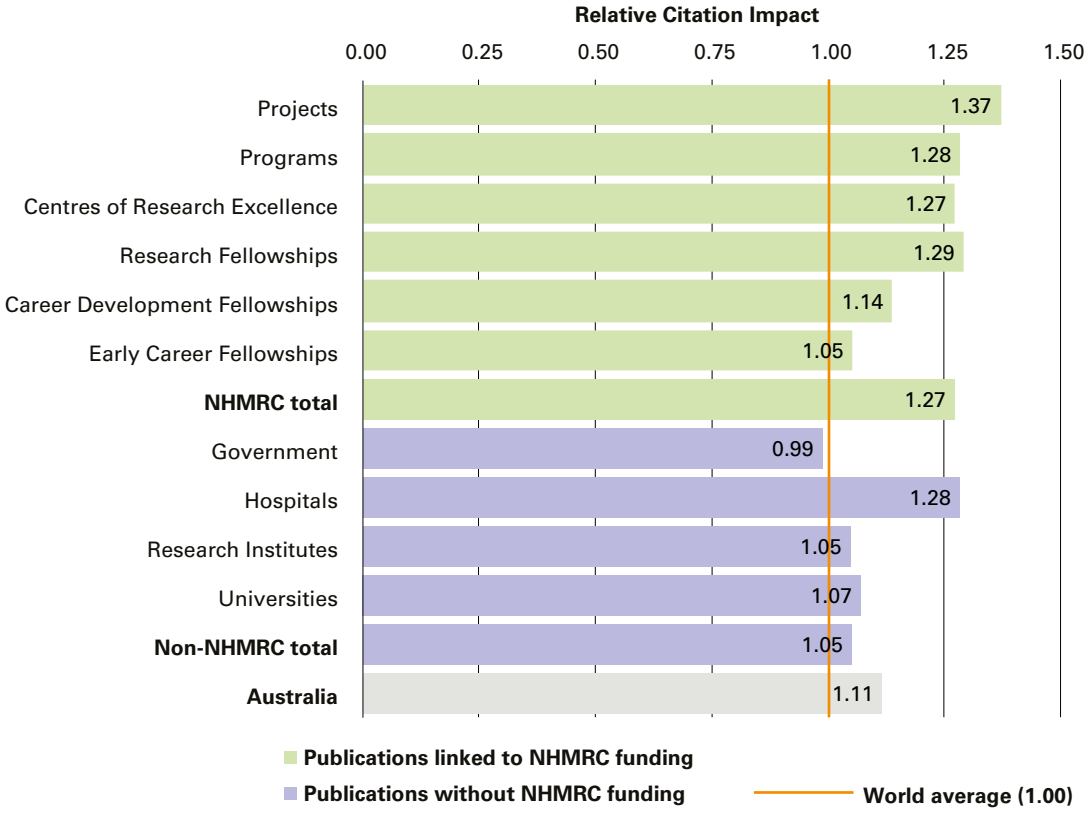


Table 48: Citation centile distribution of publications, 2005–2009—Microbiology

Sector	Top 1%		Top 2–5%		Top 6–10%		Top 11–20%		Top 21–50%		Bottom 50%		Total publications
NHMRC schemes													
Projects	7	*1.9%*	19	*5.2%*	26	*7.1%*	52	*14.2%*	107	*29.2%*	155	*42.3%*	366
Programs	6	*1.5%*	24	*5.8%*	32	*7.8%*	57	*13.9%*	152	*37.0%*	140	*34.1%*	411
Centres of Research Excellence	4	*2.4%*	8	*4.9%*	8	*4.9%*	14	*8.5%*	57	*34.8%*	73	*44.5%*	164
Research Fellowships	6	*2.5%*	11	*4.5%*	20	*8.3%*	31	*12.8%*	83	*34.3%*	91	*37.6%*	242
Career Development Fellowships	1	*0.6%*	6	*3.8%*	8	*5.0%*	28	*17.6%*	50	*31.4%*	66	*41.5%*	159
Early Career Fellowships			2	*1.9%*	7	*6.7%*	22	*21.2%*	24	*23.1%*	49	*47.1%*	104
NHMRC total	**16**	***1.6%***	**51**	***5.2%***	**60**	***6.2%***	**137**	***14.1%***	**318**	***32.6%***	**392**	***40.2%***	**974**
Research sectors													
Government	4	*0.6%*	19	*2.8%*	26	*3.9%*	72	*10.8%*	202	*30.2%*	346	*51.7%*	669
Hospitals	4	*1.3%*	16	*5.1%*	26	*8.3%*	46	*14.7%*	87	*27.9%*	133	*42.6%*	312
Research Institutes			9	*6.6%*	7	*5.1%*	14	*10.3%*	34	*25.0%*	72	*52.9%*	136
Universities	12	*0.8%*	63	*4.1%*	74	*4.8%*	179	*11.5%*	445	*28.6%*	782	*50.3%*	1,555
Non-NHMRC total	**15**	***0.7%***	**78**	***3.6%***	**106**	***4.9%***	**250**	***11.6%***	**624**	***28.9%***	**1,085**	***50.3%***	**2,158**
Australia	**31**	***1.0%***	**129**	***4.1%***	**166**	***5.3%***	**387**	***12.4%***	**942**	***30.1%***	**1,477**	***47.2%***	**3,132**
Expected level		***1.0%***		***4.0%***		***5.0%***		***10.0%***		***30.0%***		***50.0%***	

Comments

This discipline now covers two WoS journal sets. In the previous report, the coverage was limited to Microbiology only. Due to this change, the publication volume and the citation impact are not comparable between the two reports.

5.21 SUB-FIELD: BIOLOGICAL PHYSICS

Field: Physical Sciences

- WoS journal subject category analysed: Biophysics.

Figure 49: Proportion of publications linked to NHMRC funding support within each sector and Australian total, 2005–2009—Biological Physics

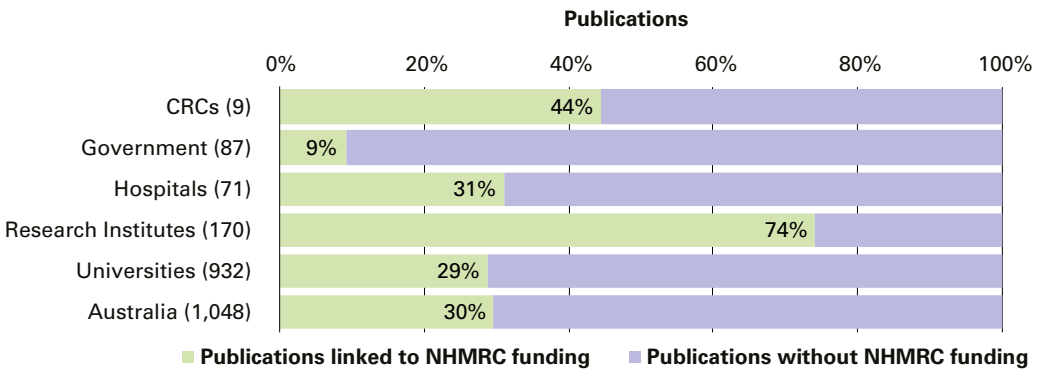


Table 49: Number of publications and impact measures, 2005–2009—Biological Physics

Sector	Number of publications	Citations	Relative journal impact	Relative citation impact
NHMRC schemes				
Projects	124	1,339	1.15	1.18
Programs	119	1,675	1.13	1.60
Research Fellowships	147	1,995	1.09	1.44
NHMRC total	**311**	**3,510**	**1.06**	**1.26**
Research sectors				
Universities	664	6,043	0.96	0.95
Non-NHMRC total	**737**	**7,075**	**0.96**	**1.01**
Australia	**1,048**	**10,585**	**0.99**	**1.08**
World	**58,155**	**544,032**	**1.00**	**1.00**

Figure 50: Relative citation impact, 2005–2009—Biological Physics

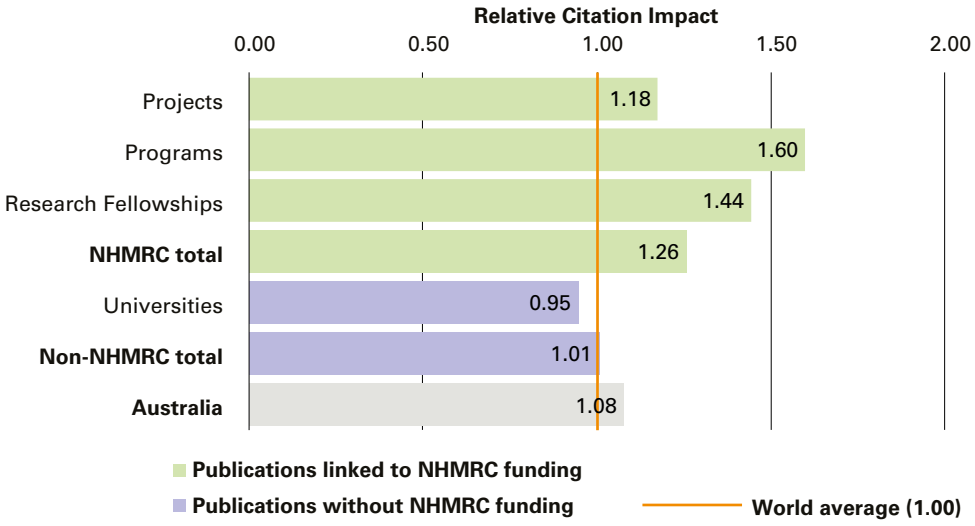


Table 50: Citation centile distribution of publications, 2005–2009—Biological Physics

Sector	Top 1%		Top 2–5%		Top 6–10%		Top 11–20%		Top 21–50%		Bottom 50%		Total publications
NHMRC schemes													
Projects	4	*3.2%*	4	*3.2%*	5	*4.0%*	12	*9.7%*	44	*35.5%*	55	*44.4%*	124
Programs	7	*5.9%*	5	*4.2%*	10	*8.4%*	17	*14.3%*	30	*25.2%*	50	*42.0%*	119
Research Fellowships	8	*5.4%*	6	*4.1%*	8	*5.4%*	19	*12.9%*	39	*26.5%*	67	*45.6%*	147
NHMRC total	**9**	***2.9%***	**12**	***3.9%***	**16**	***5.1%***	**38**	***12.2%***	**93**	***29.9%***	**143**	***46.0%***	**311**
Research sectors													
Universities	3	*0.5%*	21	*3.2%*	30	*4.5%*	61	*9.2%*	196	*29.5%*	353	*53.2%*	664
Non-NHMRC total	**5**	***0.7%***	**25**	***3.4%***	**34**	***4.6%***	**70**	***9.5%***	**216**	***29.3%***	**387**	***52.5%***	**737**
Australia	**14**	***1.3%***	**37**	***3.5%***	**50**	***4.8%***	**108**	***10.3%***	**309**	***29.5%***	**530**	***50.6%***	**1,048**
Expected level		***1.0%***		***4.0%***		***5.0%***		***10.0%***		***30.0%***		***50.0%***	

Comments

The publication output in Biophysics is analysed for the first time in this report. This is a relatively small sub-field covering about 1.5% of the total number of NHMRC publications. The relative citation impacts for both Australia and NHMRC are lower than their respective averages for biomedical sciences as a whole.

5.22 SUB-FIELD: BIOMEDICAL ENGINEERING

Field: Engineering

- WoS journal subject categories analysed: Engineering, Biomedical; Materials Science, Biomaterials.

Figure 51: Proportion of publications linked to NHMRC funding support within each sector and Australian total, 2005–2009—Biomedical Engineering

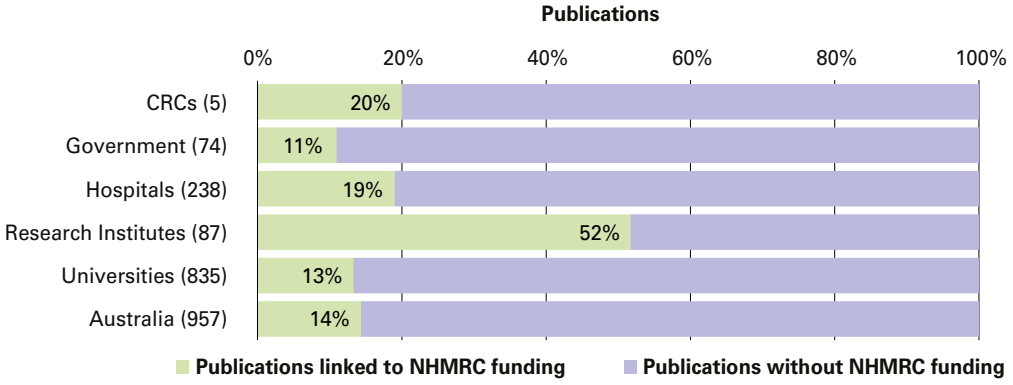


Table 51: Number of publications and impact measures, 2005–2009—Biomedical Engineering

Sector	Number of publications	Citations	Relative journal impact	Relative citation impact
NHMRC schemes				
NHMRC total	**137**	**1,268**	**1.50**	**1.37**
Research sectors				
Hospitals	193	1,007	1.11	0.73
Universities	724	4,494	1.39	0.93
Non-NHMRC total	**820**	**5,021**	**1.37**	**0.91**
Australia	**957**	**6,289**	**1.39**	**0.97**
World	**40,035**	**280,678**	**1.00**	**1.00**

Figure 52: Relative citation impact, 2005–2009—Biomedical Engineering

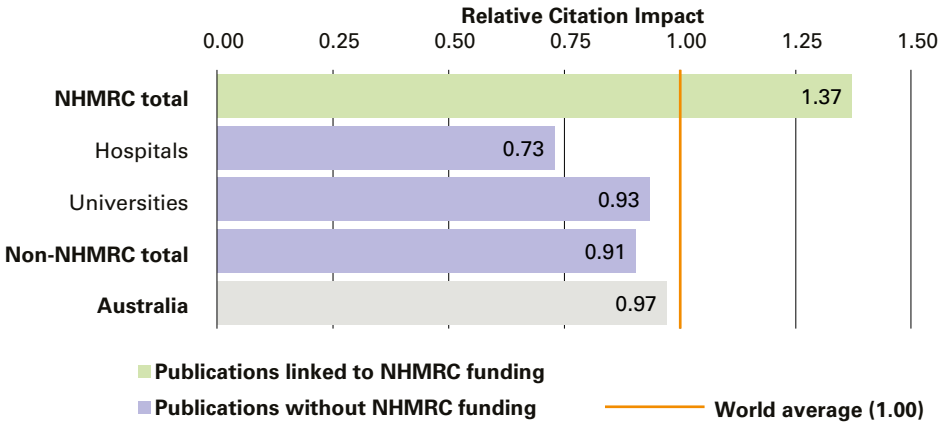


Table 52: Citation centile distribution of publications, 2005–2009—Biomedical Engineering

Sector	Top 1%		Top 2–5%		Top 6–10%		Top 11–20%		Top 21–50%		Bottom 50%		Total publications
NHMRC schemes													
NHMRC total	**2**	***1.5%***	**11**	***8.0%***	**13**	***9.5%***	**18**	***13.1%***	**43**	***31.4%***	**50**	***36.5%***	**137**
Research sectors													
Hospitals			3	*1.6%*	9	*4.7%*	16	*8.3%*	35	*18.1%*	130	*67.4%*	193
Universities	9	*1.2%*	26	*3.6%*	29	*4.0%*	70	*9.7%*	173	*23.9%*	417	*57.6%*	724
Non-NHMRC total	**9**	***1.1%***	**29**	***3.5%***	**34**	***4.1%***	**80**	***9.8%***	**182**	***22.2%***	**486**	***59.3%***	**820**
Australia	**11**	***1.1%***	**40**	***4.2%***	**47**	***4.9%***	**98**	***10.2%***	**225**	***23.5%***	**536**	***56.0%***	**957**
Expected level		***1.0%***		***4.0%***		***5.0%***		***10.0%***		***30.0%***		***50.0%***	

Comments

The publication output in Biomedical Engineering is analysed for the first time in this report. This is a relatively small sub-field covering less than 1% of the total NHMRC publications. A number of sectors were not analysed separately, as their volume was lower than the necessary 100 publications threshold.

5.23 SUB-FIELD: MULTIDISCIPLINARY SCIENCES

- WoS journal subject category analysed: Multidisciplinary Sciences.

Multidisciplinary Sciences covers a wide variety of disciplines of a very broad or general character. Therefore these journals cannot be classified to a particular field or even sub-field. This group includes research publications that appear in multidisciplinary journals such as *Nature, Science* and *Proceedings of the National Academy of Science.* As such, in this report Multidisciplinary Sciences does not refer to research of an interdisciplinary nature.

Figure 53: Proportion of publications linked to NHMRC funding support within each sector and Australian total, 2005–2009—Multidisciplinary Sciences

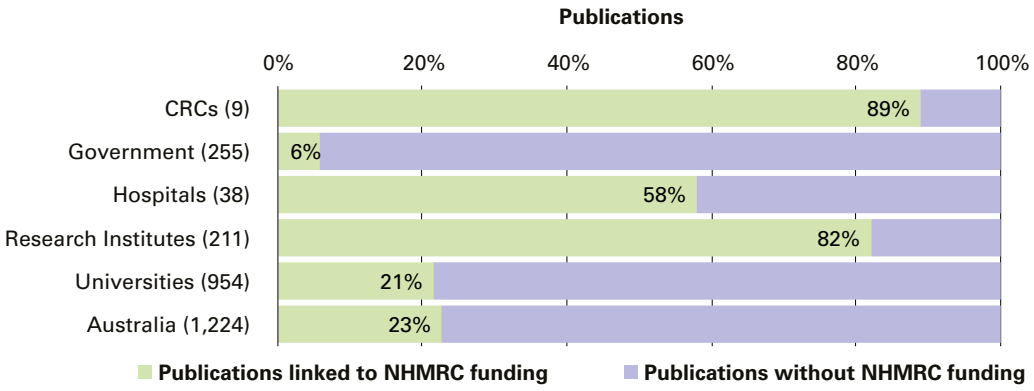


Table 53: Number of publications and impact measures, 2005–2009—Multidisciplinary Sciences

Sector	Number of publications	Citations	Relative journal impact	Relative citation impact
NHMRC schemes				
Programs	171	8,679	7.16	2.19
Research Fellowships	167	8,923	7.05	2.22
NHMRC total	**277**	**13,673**	**7.01**	**2.07**
Research sectors				
Government	240	8,984	6.84	1.45
Universities	749	27,337	6.11	1.45
Non-NHMRC total	**947**	**35,279**	**6.13**	**1.47**
Australia	**1,224**	**48,952**	**6.33**	**1.60**
World	**56,063**	**1,398,278**	**1.00**	**1.00**

Figure 54: Relative citation impact, 2005–2009—Multidisciplinary Sciences

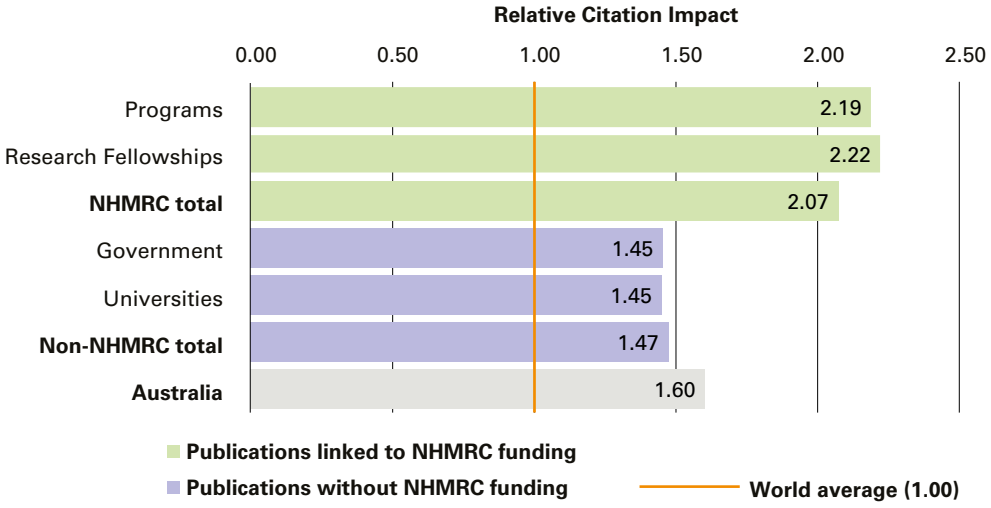


Table 54: Citation centile distribution of publications, 2005–2009—Multidisciplinary Sciences

Sector	Top 1%		Top 2–5%		Top 6–10%		Top 11–20%		Top 21–50%		Bottom 50%		Total publications
NHMRC schemes													
Programs	16	*9.9%*	43	*26.5%*	16	*9.9%*	40	*24.7%*	30	*18.5%*	17	*10.5%*	162
Research Fellowships	16	*10.1%*	43	*27.0%*	18	*11.3%*	39	*24.5%*	27	*17.0%*	16	*10.1%*	159
NHMRC total	**28**	***10.6%***	**66**	***25.1%***	**30**	***11.4%***	**60**	***22.8%***	**50**	***19.0%***	**29**	***11.0%***	**263**
Research sectors													
Universities	39	*13.3%*	30	*10.2%*	37	*12.6%*	48	*16.4%*	61	*20.8%*	78	*26.6%*	293
Non-NHMRC total	**49**	***13.1%***	**42**	***11.2%***	**44**	***11.7%***	**56**	***14.9%***	**73**	***19.5%***	**111**	***29.6%***	**375**
Australia	**77**	***12.1%***	**108**	***16.9%***	**74**	***11.6%***	**116**	***18.2%***	**123**	***19.3%***	**140**	***21.9%***	**638**
Expected level		***1.0%***		***4.0%***		***5.0%***		***10.0%***		***30.0%***		***50.0%***	

Comments

Publications in multidisciplinary journals generally attract more citations than those in non-multidisciplinary journals. This is reflected in the higher RCI for all the sectors in the data tables.

List of abbreviations

AAMRI	Australian Association of Medical Research Institutes
ABS	Australian Bureau of Statistics
ANZSRC	Australian and New Zealand Standard Research Classification
CDF	Career Development Fellowship
CPP	Citations per publication rate
CRC	Cooperative Research Centre
CRE	Centre of Research Excellence
CSIRO	Commonwealth Scientific and Industrial Research Organisation
ECF	Early Career Fellowship
FoR	Field(s) of research (part of the ANZSRC system)
NHMRC	National Health and Medical Research Council
RFCD	Research Fields, Courses and Disciplines classification system
RGMS	Research Grants Management System (NHMRC)
RCI	Relative citation impact
SSCI	Social Science Citation Index
WoS	Web of Science

Glossary

Bibliometrics	The quantitative study of scientific publications. It is commonly used to assess scientific activity, impact of research, and scientific collaboration.
Citation	A formal reference to an earlier publication, acknowledging the relevance of the earlier work. Citations are seen as an indicator of scientific significance and influence on the field and subsequent research. In this report the number of citations for a given publication is taken to be the number recorded in the Web of Science database.
Relative citation impact	A ratio that indicates the performance of a research unit relative to the world benchmark, represented by 1.00. The comparison is calculated by taking the average citation rate of the unit being evaluated and dividing it by the global citation rate for similar research worldwide (the world average).
Relative journal impact	A ratio that indicates whether a research unit is publishing in relatively high-impact journals or low-impact journals. The comparison is calculated by taking the average citation rate for journals in which the unit being evaluated publishes and dividing it by the average citation rate of all journals classified to that field.
Web of Science	Thomson Reuters online academic citation index, consisting of multiple databases (e.g. Arts and Humanities Citation Index, Social Sciences Citation Index, Science Citation Index Expanded).

Appendices

APPENDIX A: DATA TABLES

Table A1: Publications by sector and field of research, 2005–2009

	NHMRC schemes								CRCs			Government			Hospitals			Research Institutes			Universities			Australia	
Fields and sub-fields of research	**Projects**	**Programs**	**Centres of Research Excellence**	**Research Fellowships**	**Practitioner Fellowships**	**Career Development Fellowships**	**Early Career Fellowships**	**NHMRC total**	**Linked to NHMRC funding support**	**Without NHMRC funding support**	**Total publications**	**Linked to NHMRC funding support**	**Without NHMRC funding support**	**Total publications**	**Linked to NHMRC funding support**	**Without NHMRC funding support**	**Total publications**	**Linked to NHMRC funding support**	**Without NHMRC funding support**	**Total publications**	**Linked to NHMRC funding support**	**Without NHMRC funding support**	**Total publications**	**Without NHMRC funding support—total**	**Total**
Medical and Health Sciences	4,835	6,154	2,830	5,769	1,482	3,095	2,744	17,191	250	242	492	944	3,332	4,276	5,269	12,406	17,675	7,594	3,912	11,506	13,871	28,246	42,117	38,152	55,343
Medical Biochemistry and Metabolomics	50	58	6	64	1	36	11	155	1	0	1	3	88	91	10	32	42	68	25	93	130	530	660	626	781
Cardiovascular Medicine and Haematology	363	683	402	536	119	204	181	1,501	15	4	19	56	94	150	491	1,066	1,557	722	306	1,028	1,089	1,000	2,089	1,944	3,445
Clinical Sciences	1,735	2,292	1,311	1,880	745	1,090	1,097	6,519	64	51	115	380	1,259	1,639	2,436	6,328	8,764	2,709	1,519	4,228	5,360	10,753	16,113	15,479	21,998

	NHMRC schemes								CRCs			Government			Hospitals			Research Institutes			Universities			Australia	
Fields and sub-fields of research	**Projects**	**Programs**	**Centres of Research Excellence**	**Research Fellowships**	**Practitioner Fellowships**	**Career Development Fellowships**	**Early Career Fellowships**	**NHMRC total**	**Linked to NHMRC funding support**	**Without NHMRC funding support**	**Total publications**	**Linked to NHMRC funding support**	**Without NHMRC funding support**	**Total publications**	**Linked to NHMRC funding support**	**Without NHMRC funding support**	**Total publications**	**Linked to NHMRC funding support**	**Without NHMRC funding support**	**Total publications**	**Linked to NHMRC funding support**	**Without NHMRC funding support**	**Total publications**	**Without NHMRC funding support—total**	**Total**
Complementary and Alternative Medicine	1	2	2	3			2	8	0	0		0	3	3	1	9	10	0	6	6	8	179	187	200	208
Dentistry	40	3	2	9		17	24	79	9	15	24	6	19	25	9	100	109	10	9	19	76	669	745	748	827
Human Movement and Sports Science	79	46	94	153	14	79	106	407	2	0	2	27	240	267	90	205	295	85	28	113	379	1,570	1,949	1,771	2,178
Immunology	539	1,044	191	676	130	405	280	1,823	110	25	135	90	195	285	414	340	754	1,017	234	1,251	1,372	978	2,350	1,377	3,200
Neurosciences	1,007	846	380	991	245	406	466	2,761	2	20	22	89	141	230	822	1,140	1,962	1,187	608	1,795	2,443	3,383	5,826	4,126	6,887
Nursing	5	7	16	15	3	19	14	65	0	0		4	170	174	13	350	363	8	27	35	59	1,304	1,363	1,422	1,487
Nutrition and Dietetics	75	86	76	101	19	96	70	373	1	1	2	42	173	215	87	133	220	149	81	230	332	836	1,168	980	1,353
Oncology and Carcinogenesis	289	556	52	519	42	212	146	1,142	3	4	7	51	114	165	428	795	1,223	702	525	1,227	818	1,143	1,961	1,853	2,995
Optometry and Ophthalmology	162	62	100	203	40	68	105	507	61	139	200	6	15	21	108	314	422	317	250	567	326	897	1,223	1,265	1,772
Paediatrics and Reproductive Medicine	217	345	151	323	138	239	154	1,065	4	0	4	56	120	176	507	1,594	2,101	535	340	875	888	1,740	2,628	2,715	3,780

	NHMRC schemes								CRCs			Government			Hospitals			Research Institutes			Universities			Australia	
Fields and sub-fields of research	**Projects**	**Programs**	**Centres of Research Excellence**	**Research Fellowships**	**Practitioner Fellowships**	**Career Development Fellowships**	**Early Career Fellowships**	**NHMRC total**	**Linked to NHMRC funding support**	**Without NHMRC funding support**	**Total publications**	**Linked to NHMRC funding support**	**Without NHMRC funding support**	**Total publications**	**Linked to NHMRC funding support**	**Without NHMRC funding support**	**Total publications**	**Linked to NHMRC funding support**	**Without NHMRC funding support**	**Total publications**	**Linked to NHMRC funding support**	**Without NHMRC funding support**	**Total publications**	**Without NHMRC funding support—total**	**Total**
Pharmacology and Pharmaceutical Sciences	443	277	117	366	47	169	117	1,033	8	9	17	60	321	381	221	463	684	380	194	574	869	2,086	2,955	2,556	3,589
Medical Physiology	422	182	73	419	17	177	147	882	6	2	8	29	144	173	124	136	260	342	103	445	758	1,269	2,027	1,393	2,275
Public Health and Health Services	249	498	170	470	67	415	312	1,546	5	5	10	157	627	784	292	685	977	478	323	801	1,346	4,074	5,420	4,763	6,309
Other Medical and Health Sciences	196	254	106	214	29	122	73	598	14	5	19	40	73	113	177	288	465	324	147	471	446	611	1,057	885	1,483
General Medical and Health Sciences	119	358	309	174	138	154	154	983	5	4	9	102	302	404	399	1,235	1,634	326	209	535	767	1,885	2,652	2,890	3,873
Biological Sciences* General Biological Sciences	280	242	37	295	17	130	94	706	10	15	25	30	630	660	102	114	216	351	134	485	560	2,100	2,660	2,658	3,364

	NHMRC schemes								CRCs			Government			Hospitals			Research Institutes			Universities			Australia	
Fields and sub-fields of research	**Projects**	**Programs**	**Centres of Research Excellence**	**Research Fellowships**	**Practitioner Fellowships**	**Career Development Fellowships**	**Early Career Fellowships**	**NHMRC total**	**Linked to NHMRC funding support**	**Without NHMRC funding support**	**Total publications**	**Linked to NHMRC funding support**	**Without NHMRC funding support**	**Total publications**	**Linked to NHMRC funding support**	**Without NHMRC funding support**	**Total publications**	**Linked to NHMRC funding support**	**Without NHMRC funding support**	**Total publications**	**Linked to NHMRC funding support**	**Without NHMRC funding support**	**Total publications**	**Without NHMRC funding support—total**	**Total**
Biochemistry and Cell Biology	1,302	1,272	101	1,654	56	630	419	3,177	59	38	97	109	730	839	358	328	686	1,643	508	2,151	2,524	3,909	6,433	4,692	7,869
Genetics	331	317	43	466	66	196	140	929	11	8	19	54	565	619	273	289	562	577	265	842	678	1,763	2,441	2,292	3,221
Microbiology	366	411	164	242	83	159	104	974	22	19	41	92	669	761	260	312	572	433	136	569	794	1,555	2,349	2,158	3,132
Physical Sciences* Biological Physics	124	119	13	147	1	52	36	311	4	5	9	8	79	87	22	49	71	126	44	170	268	664	932	737	1,048
Engineering* Biomedical Engineering	33	20	16	33	30	25	15	137	1	4	5	8	66	74	45	193	238	45	42	87	111	724	835	820	957
Multidisciplinary Sciences	91	171	9	167	8	59	71	277	8	1	9	15	240	255	22	16	38	173	38	211	205	749	954	947	1,224
All biomedical sciences—total	**6,278**	**7,678**	**3,001**	**7,625**	**1,600**	**3,851**	**3,276**	**20,960**	**320**	**287**	**607**	**1,119**	**5,459**	**6,578**	**5,749**	**13,015**	**18,764**	**9,525**	**4,519**	**14,044**	**16,863**	**35,959**	**52,822**	**47,697**	**68,657**

** These fields are not covered in their entirety. Only sub-fields relevant to biomedical research within these fields are analysed.*

Table A2: International collaboration by sector and country, 2005–2009

	Projects		Programs		Centres of Research Excellence		Research Fellowships		Practitioner Fellowships		Career Development Fellowships		Early Career Fellowships		NHMRC total		CRCs		Government		Hospitals		Research Institutes		Universities		Non-NHMRC total		Australia	
Country	**Pubs**	**%**	**Pubs**	**%**	**Pubs**	**%**	**Pubs**	**%**	**Pubs**	**%**	**Pubs**	**%**	**Pubs**	**%**	**Pubs**	**%**	**Pubs**	**%**	**Pubs**	**%**	**Pubs**	**%**	**Pubs**	**%**	**Pubs**	**%**	**Pubs**	**%**	**Pubs**	**%**
USA	1,073	45.8	1,542	47.7	361	35.8	1,423	45.2	222	37.4	651	45.6	592	45.7	3,663	44.2	48	52.2	646	36.3	1,331	36.0	820	40.4	4,598	32.2	6,624	33.7	10,287	36.8
England	418	17.9	639	19.8	203	20.1	547	17.4	125	21.1	260	18.2	327	25.2	1,605	19.4	13	14.1	342	19.2	1,044	28.2	500	24.6	2,993	21.0	4,498	22.9	6,103	21.8
Canada	231	9.9	383	11.9	148	14.7	298	9.5	155	26.1	101	7.1	108	8.3	950	11.5	4	4.3	164	9.2	502	13.6	178	8.8	1,264	8.9	1,895	9.6	2,845	10.2
Germany	223	9.5	366	11.3	97	9.6	318	10.1	82	13.8	119	8.3	108	8.3	847	10.2	9	9.8	167	9.4	446	12.1	221	10.9	1,378	9.7	2,028	10.3	2,875	10.3
France	138	5.9	274	8.5	67	6.6	220	7.0	38	6.4	80	5.6	69	5.3	568	6.9	4	4.3	173	9.7	341	9.2	140	6.9	792	5.6	1,339	6.8	1,907	6.8
Netherlands	106	4.5	249	7.7	53	5.3	213	6.8	40	6.7	90	6.3	63	4.9	523	6.3	1	1.1	98	5.5	253	6.8	115	5.7	630	4.4	1,001	5.1	1,524	5.5
Japan	131	5.6	211	6.5	45	4.5	198	6.3	31	5.2	66	4.6	49	3.8	459	5.5	2	2.2	115	6.5	136	3.7	100	4.9	711	5.0	990	5.0	1,449	5.2
Italy	98	4.2	176	5.4	70	6.9	140	4.4	64	10.8	48	3.4	44	3.4	433	5.2	1	1.1	74	4.2	344	9.3	113	5.6	708	5.0	1,142	5.8	1,575	5.6
New Zealand	98	4.2	193	6.0	78	7.7	139	4.4	30	5.1	80	5.6	51	3.9	433	5.2	8	8.7	180	10.1	336	9.1	121	6.0	977	6.9	1,371	7.0	1,804	6.5
China	94	4.0	157	4.9	86	8.5	129	4.1	34	5.7	61	4.3	43	3.3	425	5.1	4	4.3	176	9.9	218	5.9	101	5.0	1,174	8.2	1,528	7.8	1,953	7.0
Sweden	112	4.8	142	4.4	51	5.1	153	4.9	29	4.9	63	4.4	58	4.5	380	4.6	2	2.2	60	3.4	171	4.6	77	3.8	579	4.1	830	4.2	1210	4.3
Switzerland	80	3.4	178	5.5	80	7.9	131	4.2	33	5.6	58	4.1	56	4.3	369	4.5	3	3.3	72	4.0	227	6.1	112	5.5	614	4.3	939	4.8	1,308	4.7
Scotland	82	3.5	150	4.6	66	6.5	131	4.2	18	3.0	55	3.9	57	4.4	358	4.3	1	1.1	55	3.1	159	4.3	65	3.2	471	3.3	700	3.6	1,058	3.8
Singapore	89	3.8	74	2.3	49	4.9	198	6.3	20	3.4	32	2.2	36	2.8	325	3.9	2	2.2	41	2.3	89	2.4	79	3.9	386	2.7	537	2.7	862	3.1
Denmark	58	2.5	99	3.1	35	3.5	135	4.3	18	3.0	39	2.7	49	3.8	286	3.5			41	2.3	116	3.1	59	2.9	367	2.6	531	2.7	817	2.9
Spain	52	2.2	116	3.6	31	3.1	84	2.7	17	2.9	47	3.3	39	3.0	256	3.1			74	4.2	196	5.3	60	3.0	356	2.5	642	3.3	898	3.2
Belgium	41	1.8	93	2.9	46	4.6	70	2.2	22	3.7	27	1.9	16	1.2	206	2.5	10	10.9	54	3.0	191	5.2	65	3.2	365	2.6	624	3.2	830	3.0
Finland	39	1.7	75	2.3	19	1.9	90	2.9	13	2.2	23	1.6	19	1.5	176	2.1	2	2.2	35	2.0	64	1.7	45	2.2	203	1.4	329	1.7	505	1.8
Thailand	37	1.6	67	2.1	16	1.6	34	1.1	23	3.9	27	1.9	19	1.5	137	1.7			51	2.9	46	1.2	47	2.3	290	2.0	378	1.9	515	1.8

Country	Projects		Programs		Centres of Research Excellence		Research Fellowships		Practitioner Fellowships		Career Development Fellowships		Early Career Fellowships		NHMRC total		CRCs		Government		Hospitals		Research Institutes		Universities		Non-NHMRC total		Australia	
	Pubs	%	Pubs	%	Pubs	%	Pubs	%	Pubs	%	Pubs	%	Pubs	%	Pubs	%	Pubs	%	Pubs	%	Pubs	%	Pubs	%	Pubs	%	Pubs	%	Pubs	%
Austria	31	1.3	61	1.9	19	1.9	58	1.8	17	2.9	16	1.1	14	1.1	134	1.6	1	1.1	23	1.3	115	3.1	30	1.5	191	1.3	348	1.8	482	1.7
Norway	27	1.2	42	1.3	32	3.2	47	1.5	9	1.5	21	1.5	14	1.1	126	1.5			34	1.9	76	2.1	36	1.8	214	1.5	327	1.7	453	1.6
Brazil	27	1.2	46	1.4	9	0.9	43	1.4	23	3.9	19	1.3	11	0.8	125	1.5			36	2.0	93	2.5	31	1.5	257	1.8	384	2.0	509	1.8
Ireland	22	0.9	48	1.5	11	1.1	31	1.0	10	1.7	24	1.7	27	2.1	108	1.3	1	1.1	12	0.7	59	1.6	25	1.2	184	1.3	270	1.4	378	1.4
Israel	24	1.0	53	1.6	16	1.6	35	1.1	2	0.3	14	1.0	7	0.5	98	1.2			31	1.7	76	2.1	31	1.5	182	1.3	288	1.5	386	1.4
India	9	0.4	41	1.3	20	2.0	23	0.7	6	1.0	23	1.6	15	1.2	83	1.0	6	6.5	48	2.7	68	1.8	68	3.4	209	1.5	362	1.8	445	1.6
South Korea	13	0.6	39	1.2	13	1.3	26	0.8	6	1.0	10	0.7	9	0.7	80	1.0			23	1.3	35	0.9	9	0.4	124	0.9	187	1.0	267	1.0
South Africa	24	1.0	22	0.7	15	1.5	24	0.8	8	1.3	13	0.9	9	0.7	79	1.0	2	2.2	55	3.1	57	1.5	26	1.3	255	1.8	388	2.0	467	1.7
Poland	8	0.3	35	1.1	12	1.2	29	0.9	8	1.3	17	1.2	4	0.3	76	0.9			10	0.6	88	2.4	48	2.4	125	0.9	229	1.2	305	1.1
Greece	16	0.7	20	0.6	6	0.6	21	0.7	1	0.2	16	1.1	2	0.2	58	0.7			13	0.7	46	1.2	20	1.0	78	0.5	148	0.8	206	0.7
Wales	22	0.9	10	0.3	8	0.8	16	0.5	3	0.5	14	1.0	12	0.9	54	0.7	4	4.3	24	1.3	38	1.0	23	1.1	148	1.0	213	1.1	267	1.0
Taiwan	9	0.4	23	0.7	6	0.6	13	0.4	11	1.9	6	0.4	6	0.5	46	0.6			19	1.1	47	1.3	13	0.6	176	1.2	249	1.3	295	1.1
Hungary	15	0.6	26	0.8	3	0.3	29	0.9	1	0.2	4	0.3	4	0.3	45	0.5			13	0.7	34	0.9	16	0.8	63	0.4	110	0.6	155	0.6
Czech Republic	4	0.2	12	0.4	7	0.7	23	0.7	4	0.7	4	0.3	3	0.2	44	0.5			18	1.0	51	1.4	26	1.3	111	0.8	192	1.0	236	0.8
Indonesia	4	0.2	31	1.0	1	0.1	5	0.2	23	3.9	4	0.3	3	0.2	39	0.5	1	1.1	15	0.8	14	0.4	17	0.8	96	0.7	116	0.6	155	0.6
Iran	9	0.4	12	0.4	10	1.0	17	0.5	2	0.3	6	0.4	7	0.5	37	0.4			23	1.3	32	0.9	11	0.5	138	1.0	171	0.9	208	0.7
Papua New Guinea	14	0.6	19	0.6	2	0.2	14	0.4	7	1.2	9	0.6	1	0.1	34	0.4	1	1.1	4	0.2	7	0.2	9	0.4	37	0.3	51	0.3	85	0.3
Russia	8	0.3	18	0.6	5	0.5	14	0.4			3	0.2	2	0.2	32	0.4			19	1.1	25	0.7	16	0.8	92	0.6	137	0.7	169	0.6

	Projects		Programs		Centres of Research Excellence		Research Fellowships		Practitioner Fellowships		Career Development Fellowships		Early Career Fellowships		NHMRC total		CRCs		Government		Hospitals		Research Institutes		Universities		Non-NHMRC total		Australia	
Country	**Pubs**	**%**	**Pubs**	**%**	**Pubs**	**%**	**Pubs**	**%**	**Pubs**	**%**	**Pubs**	**%**	**Pubs**	**%**	**Pubs**	**%**	**Pubs**	**%**	**Pubs**	**%**	**Pubs**	**%**	**Pubs**	**%**	**Pubs**	**%**	**Pubs**	**%**	**Pubs**	**%**
Argentina	4	0.2	20	0.6	10	1.0	6	0.2	2	0.3	5	0.4	2	0.2	31	0.4			28	1.6	68	1.8	13	0.6	82	0.6	156	0.8	187	0.7
Portugal	6	0.3	18	0.6	8	0.8	11	0.3	1	0.2	3	0.2	3	0.2	28	0.3			9	0.5	36	1.0	12	0.6	80	0.6	118	0.6	146	0.5
Malaysia	10	0.4	11	0.3	4	0.4	3	0.1	3	0.5	2	0.1	1	0.1	24	0.3			28	1.6	33	0.9	10	0.5	129	0.9	191	1.0	215	0.8
North Ireland	5	0.2	5	0.2	2	0.2	11	0.3	2	0.3	9	0.6	3	0.2	24	0.3			10	0.6	30	0.8	6	0.3	82	0.6	107	0.5	131	0.5
Mexico	2	0.1	11	0.3	3	0.3	7	0.2	6	1.0	2	0.1			23	0.3			24	1.3	29	0.8	10	0.5	104	0.7	158	0.8	181	0.6
Vietnam	3	0.1	11	0.3	2	0.2	3	0.1	4	0.7	5	0.4	1	0.1	23	0.3			19	1.1	12	0.3	10	0.5	77	0.5	95	0.5	118	0.4
Turkey	4	0.2	8	0.2	3	0.3	7	0.2	2	0.3			1	0.1	22	0.3			9	0.5	26	0.7	11	0.5	56	0.4	108	0.5	130	0.5
Philippines			11	0.3	5	0.5			8	1.3	1	0.1			21	0.3			17	1.0	13	0.4	9	0.4	74	0.5	104	0.5	125	0.4
Fiji	3	0.1	9	0.3	14	1.4	1	<0.0			5	0.4			19	0.2			4	0.2	7	0.2	2	0.1	21	0.1	27	0.1	46	0.2
Bulgaria	5	0.2	2	0.1	5	0.5	8	0.3	1	0.2	2	0.1	1	0.1	17	0.2			5	0.3	4	0.1	9	0.4	15	0.1	28	0.1	45	0.2
Iceland	3	0.1	4	0.1	1	0.1	7	0.2	3	0.5	1	0.1	1	0.1	16	0.2			4	0.2	9	0.2	3	0.1	20	0.1	38	0.2	54	0.2
Chile	4	0.2	5	0.2	3	0.3	5	0.2	1	0.2	1	0.1	2	0.2	15	0.2	1	1.1	7	0.4	10	0.3	5	0.2	50	0.4	70	0.4	85	0.3
Slovenia	1	<0.0	12	0.4			10	0.3	1	0.2	1	0.1	2	0.2	15	0.2			9	0.5	14	0.4	3	0.1	34	0.2	60	0.3	75	0.3
United Arab Emirates	4	0.2	2	0.1	2	0.2	2	0.1			2	0.1	2	0.2	12	0.1			1	0.1	6	0.2	2	0.1	16	0.1	22	0.1	34	0.1
Estonia			8	0.2			9	0.3			2	0.1	2	0.2	11	0.1			1	0.1	2	0.1	3	0.1	20	0.1	27	0.1	38	0.1
Kenya	3	0.1	6	0.2	2	0.2	4	0.1	1	0.2	4	0.3			11	0.1	1	1.1	9	0.5	3	0.1	6	0.3	34	0.2	49	0.2	60	0.2
Colombia	1	<0.0	4	0.1	1	0.1	1	<0.0	4	0.7					10	0.1	2	2.2	7	0.4	7	0.2	5	0.2	32	0.2	50	0.3	60	0.2
Slovakia	1	<0.0	4	0.1			2	0.1	1	0.2	2	0.1			10	0.1			11	0.6	9	0.2	3	0.1	19	0.1	44	0.2	54	0.2
Total	**2,341**		**3,231**		**1,008**		**3,148**		**593**		**1,427**		**1,296**		**8,283**		**92**		**1,782**		**3,699**		**2,029**		**14,260**		**19,675**		**27,958**	

Table A3: Collaboration patterns by sector, 2005–2009

Sector	Single author		Domestic		International		Total
	Number	%	Number	%	Number	%	Number
NHMRC schemes							
Projects	101	1.6	3,838	61.1	2,341	37.3	6,278
Programs	117	1.5	4,333	56.4	3,231	42.1	7,678
Centres of Research Excellence	46	1.5	1,947	64.9	1,008	33.6	3001
Research Fellowships	101	1.3	4,378	57.4	3,148	41.3	7,625
Practitioner Fellowships	24	1.5	983	61.4	593	37.1	1,600
Career Development Fellowships	52	1.4	2,374	61.6	1,427	37.1	3,851
Early Career Fellowships	43	1.3	1,941	59.2	1,296	39.6	3,276
NHMRC total	**396**	**1.9**	**12,294**	**58.7**	**8,283**	**39.5**	**20,960**
Research sectors							
CRCs	5	1.7	191	66.6	92	32.1	287
Government	240	4.4	3,440	63.0	1,782	32.6	5,459
Hospitals	754	5.8	8,565	65.8	3,699	28.4	13,015
Research Institutes	182	4.0	2,317	51.3	2,029	44.9	4,519
Universities	2,214	6.2	19,560	54.4	14,260	39.7	35,959
Australia	**3,774**	**5.5**	**37,055**	**54.0**	**27,958**	**40.7**	**68,657**

Table A4a: Cross-sector collaboration patterns, 2005–2009—publications linked to NHMRC funding

Sector	CRCs				
Government	12	**Government**			
Hospitals	57	369	**Hospitals**		
Research Institutes	187	460	2,462	**Research Institutes**	
Universities	276	962	4,632	6,212	**Universities**
Total publications	**320**	**1,119**	**5,749**	**9,525**	**16,863**
Publications in inter-sector collaborations	**320**	**1,062**	**5,181**	**6,835**	**9,430**
Publications in inter-sector collaborations (%)	**100**	**94.9**	**90.1**	**71.8**	**55.9**

Table A4b: Cross-sector collaboration patterns, 2005–2009—publications without NHMRC funding

Sector	CRCs				
Government	32	**Government**			
Hospitals	29	800	**Hospitals**		
Research Institutes	72	251	1,277	**Research Institutes**	
Universities	222	3,149	6,787	2,493	**Universities**
Total publications	**287**	**5,459**	**13,015**	**4,519**	**35,959**
Publications in inter-sector collaborations	**258**	**3,453**	**7,496**	**3,032**	**11,083**
Publications in inter-sector collaborations (%)	**89.9**	**63.3**	**57.6**	**67.1**	**30.8**

Table A5: Level of international scientific collaboration in publications, by funding support, yearly

Year	Publications linked to NHMRC funding			Publications without NHMRC funding			Australia		
	Number in international collaboration	Total output	%	Number in international collaboration	Total output	%	Number in international collaboration	Total output	%
2005	1,122	3,071	36.5	3,177	8,027	39.6	4,299	11,098	38.7
2006	1,404	3,812	36.8	3,409	8,593	39.7	4,813	12,405	38.8
2007	1,621	4,175	38.8	3,998	9,901	40.4	5,619	14,076	39.9
2008	1,963	4,859	40.4	4,401	10,649	41.3	6,364	15,508	41.0
2009	2,173	5,043	43.1	4,690	10,527	44.6	6,863	15,570	44.1

Table A6: Number of publications and relative citation impact (RCI) for biomedical publications, by institution and funding support, 2005–2009

Institution	Total publications	Publications linked to NHMRC funding			Publications without NHMRC funding		
		Number	%	RCI	Number	%	RCI
University of Melbourne	9,847	5,217	53%	1.62	4,630	47%	1.08
University of Sydney	9,231	3,475	38%	1.60	5,756	62%	1.05
University of Queensland	7,384	2,698	37%	1.48	4,686	63%	1.14
Monash University	5,836	3,056	52%	1.53	2,780	48%	1.04
University of New South Wales	5,626	2,162	38%	1.54	3,464	62%	1.06
University of Western Australia	4,337	1,645	38%	1.53	2,692	62%	1.04
University of Adelaide	3,695	1,269	34%	1.44	2,426	66%	0.95
Australian National University	2,295	738	32%	1.35	1,557	68%	1.07
University of Newcastle	1,714	455	27%	1.59	1,259	73%	1.05
Flinders University	1,609	549	34%	1.21	1,060	66%	0.88
Murdoch Childrens Research Institute	1,397	838	60%	1.44	559	40%	1.07
Queensland Institute of Medical Research	1,388	1,011	73%	1.65	377	27%	1.39
La Trobe University	1,359	374	28%	1.33	985	72%	0.89
Queensland University of Technology	1,350	284	21%	1.27	1,066	79%	0.92
Griffith University	1,264	244	19%	1.34	1,020	81%	0.97
Curtin University	1,086	264	24%	1.14	822	76%	0.80
Peter MacCallum Cancer Institute	1,075	539	50%	2.12	536	50%	1.12
Deakin University	1,043	277	27%	2.15	766	73%	1.00
University of Tasmania	1,015	289	28%	1.22	726	72%	0.86
Westmead Millennium Institute	991	698	70%	1.63	293	30%	1.33
James Cook University	970	130	13%	1.23	840	87%	0.93
Walter and Eliza Hall Institute of Medical Research	958	858	90%	2.17	100	10%	1.24
Macquarie University	917	168	18%	1.31	749	82%	0.91
University of South Australia	844	167	20%	1.26	677	80%	0.88
University of Wollongong	824	131	16%	1.44	693	84%	0.93
Baker IDI Heart and Diabetes Institute	750	609	81%	1.62	141	19%	1.04
Florey Institute of Neuroscience and Mental Health	647	574	89%	1.50	73	11%	
Garvan Institute of Medical Research	642	485	76%	2.18	157	24%	1.51

Institution	Total publications	Publications linked to NHMRC funding			Publications without NHMRC funding		
		Number	%	RCI	Number	%	RCI
RMIT University	588	87	15%		501	85%	0.89
University of Western Sydney	565	81	14%		484	86%	0.83
Neuroscience Research Australia	558	402	72%	1.62	156	28%	1.17
Edith Cowan University	521	74	14%		447	86%	1.00
Centre for Eye Research Australia	509	320	63%	1.69	189	37%	1.44
Western Australian Institute for Medical Research	496	353	71%	1.48	143	29%	1.07
University of Technology Sydney	496	67	14%		429	86%	1.03
Telethon Institute for Child Health Research	491	396	81%	1.43	95	19%	
Murdoch University	484	104	21%	1.79	380	79%	0.86
Burnet Institute	437	336	77%	1.03	101	23%	0.91
Menzies School of Health Research	413	313	76%	1.25	100	24%	1.10
The George Institute for Global Health	399	267	67%	2.93	132	33%	1.47
Charles Sturt University	395	21	5%		374	95%	0.66
Hanson Institute	390	251	64%	1.83	139	36%	0.99
Mental Health Research Institute	352	258	73%	2.08	94	27%	
Hunter Medical Research Institute	333	167	50%	1.65	166	50%	1.08
Menzies Research Institute Tasmania	314	215	68%	1.41	99	32%	
University of New England	308	19	6%		289	94%	0.79
Swinburne University of Technology	293	65	22%		228	78%	0.98
Ludwig Institute for Cancer Research	290	222	77%	1.91	68	23%	
Prince Henry's Institute of Medical Research	288	251	87%	1.46	37	13%	
St Vincent's Institute of Medical Research	282	237	84%	1.79	45	16%	
Kolling Institute of Medical Research	282	149	53%	1.49	133	47%	1.18
Southern Cross University	247	12	5%		235	95%	0.63
Victoria University	244	28	11%		216	89%	0.74
Charles Darwin University	230	105	46%	1.51	125	54%	0.69
Centenary Institute of Cancer Medicine and Cell Biology	226	167	74%	2.40	59	26%	
ANZAC Research Institute	219	105	48%	1.76	114	52%	1.66
Woolcock Institute of Medical Research	201	149	74%	1.51	52	26%	
Heart Research Institute	189	130	69%	2.66	59	31%	
Central Queensland University	183	28	15%		155	85%	0.87
University of Canberra	159	35	22%		124	78%	0.69
Children's Medical Research Institute	140	108	77%	1.73	32	23%	
Victor Chang Cardiac Research Institute	137	92	67%		45	33%	
University of Ballarat	133	34	26%		99	74%	
Children's Cancer Institute Australia for Medical Research	130	81	62%		49	38%	
Schizophrenia Research Institute	129	44	34%		85	66%	
Australian Catholic University	129	12	9%		117	91%	0.75

Institution	Total publications	Publications linked to NHMRC funding			Publications without NHMRC funding		
		Number	%	RCI	Number	%	RCI
Bond University	128	14	11%		114	89%	1.04
University of Southern Queensland	126	10	8%		116	92%	0.51
Women and Children's Health Research Institute	114	67	59%		47	41%	
Lions Eye Institute	100	73	73%		27	27%	
University of the Sunshine Coast	80	10	13%		70	88%	
Mater Medical Research Institute	79	41	52%		38	48%	
National Ageing Research Institute	77	34	44%		43	56%	
O'Brien Institute	76	47	62%		29	38%	
University of Notre Dame Australia	76	10	13%		66	87%	
Bionics Institute	74	15	20%		59	80%	
Wesley Research Institute	33	12	36%		21	64%	
Queensland Eye Institute	29	1	3%		28	97%	
Queensland Children's Medical Research Institute	12	6	50%		6	50%	
Brien Holden Vision Institute	8	2	25%		6	75%	

Notes: RCI is only calculated where 100 or more publications are present. Where authors from more than one institution collaborate on a publication, it is counted in full for each institution involved. Institutional data included in this table covers only the Universities and Research Institutes sectors.

Table A7: Number of publications and relative citation impact, by sub-field of research and funding support, 2005–2009

Sub-field of research and institution	Total publications	Publications linked to NHMRC funding			Publications without NHMRC funding		
		Number	%	RCI	Number	%	RCI
Medical Biochemistry and Metabolomics							
University of Sydney	126	19	15%		107	85%	1.03
Cardiovascular Medicine and Haematology							
University of Melbourne	502	341	68%	1.55	161	32%	0.90
University of Sydney	472	268	57%	1.37	204	43%	1.16
Monash University	417	298	71%	1.56	119	29%	0.96
University of Queensland	284	187	66%	1.41	97	34%	
Baker IDI Heart and Diabetes Institute	233	189	81%	1.47	44	19%	
University of New South Wales	223	101	45%	2.29	122	55%	1.91
University of Western Australia	219	128	58%	1.47	91	42%	
Clinical Sciences							
University of Melbourne	3,182	1,621	51%	1.70	1,561	49%	1.11
University of Sydney	3,049	1,142	37%	1.66	1,907	63%	1.10
University of Queensland	2,118	747	35%	1.56	1,371	65%	1.14
University of New South Wales	2,000	898	45%	1.71	1,102	55%	1.20
Monash University	1,986	1,000	50%	1.74	986	50%	1.12
University of Western Australia	1,378	483	35%	1.57	895	65%	1.15
University of Adelaide	1,081	354	33%	1.47	727	67%	1.07
University of Newcastle	505	123	24%	1.88	382	76%	1.03
La Trobe University	471	140	30%	1.07	331	70%	0.77
Flinders University	467	135	29%	1.32	332	71%	0.96
Australian National University	462	237	51%	1.44	225	49%	1.02
Murdoch Childrens Research Institute	435	222	51%	1.57	213	49%	0.91
Queensland University of Technology	388	77	20%		311	80%	0.84
Queensland Institute of Medical Research	380	251	66%	1.88	129	34%	1.68
Griffith University	360	54	15%		306	85%	0.95
Curtin University	325	91	28%		234	72%	0.85
Westmead Millennium Institute	325	232	71%	2.08	93	29%	
Macquarie University	297	70	24%		227	76%	0.92
James Cook University	286	50	17%		236	83%	0.87
Deakin University	282	72	26%		210	74%	1.09
Garvan Institute of Medical Research	268	183	68%	2.74	85	32%	
Peter MacCallum Cancer Institute	268	75	28%		193	72%	1.08
University of Tasmania	258	95	37%		163	63%	0.83
Baker IDI Heart and Diabetes Institute	238	195	82%	1.96	43	18%	
University of Wollongong	222	36	16%		186	84%	0.87
Neuroscience Research Australia	202	154	76%	1.95	48	24%	

Sub-field of research and institution	Total publications	Publications linked to NHMRC funding			Publications without NHMRC funding		
		Number	%	RCI	Number	%	RCI
University of South Australia	202	42	21%		160	79%	0.84
Florey Institute of Neuroscience and Mental Health	183	164	90%	1.99	19	10%	
Menzies School of Health Research	168	125	74%	1.34	43	26%	
RMIT University	142	29	20%		113	80%	0.88
Prince Henry's Institute of Medical Research	140	122	87%	1.57	18	13%	
Telethon Institute for Child Health Research	138	103	75%	1.45	35	25%	
Edith Cowan University	123	22	18%		101	82%	0.96
Walter and Eliza Hall Institute of Medical Research	121	109	90%	1.69	12	10%	
Dentistry							
University of Melbourne	208	18	9%		190	91%	1.05
University of Adelaide	197	34	17%		163	83%	0.95
University of Sydney	129	7	5%		122	95%	1.05
Human Movement and Sports Science							
University of Queensland	268	92	34%		176	66%	1.01
University of Sydney	249	56	22%		193	78%	0.99
University of Western Australia	240	34	14%		206	86%	1.27
Edith Cowan University	202	5	2%		197	98%	1.18
University of Melbourne	199	100	50%	1.68	99	50%	
Immunology							
University of Melbourne	591	474	80%	1.40	117	20%	0.67
Monash University	402	302	75%	1.42	100	25%	1.23
University of Sydney	355	192	54%	1.67	163	46%	0.68
University of Western Australia	267	192	72%	1.39	75	28%	
University of New South Wales	263	152	58%	1.51	111	42%	0.83
University of Queensland	263	140	53%	1.17	123	47%	1.01
Walter and Eliza Hall Institute of Medical Research	250	231	92%	2.25	19	8%	
Australian National University	176	106	60%	1.47	70	40%	
Queensland Institute of Medical Research	153	125	82%	1.16	28	18%	
Burnet Institute	128	109	85%	0.87	19	15%	
Neurosciences							
University of Melbourne	1,429	907	63%	1.54	522	37%	0.92
University of Sydney	1,108	497	45%	1.26	611	55%	1.04
University of New South Wales	838	458	55%	1.28	380	45%	0.92
University of Queensland	750	317	42%	1.18	433	58%	0.90
Monash University	694	404	58%	1.34	290	42%	0.96
University of Western Australia	441	161	37%	1.09	280	63%	0.98
Neuroscience Research Australia	367	254	69%	1.53	113	31%	1.07

Sub-field of research and institution	Total publications	Publications linked to NHMRC funding			Publications without NHMRC funding		
		Number	%	RCI	Number	%	RCI
University of Adelaide	300	154	51%	1.10	146	49%	0.87
Florey Institute of Neuroscience and Mental Health	267	239	90%	1.42	28	10%	
Australian National University	264	95	36%		169	64%	1.02
Flinders University	183	106	58%	0.94	77	42%	
University of Newcastle	183	78	43%		105	57%	1.01
La Trobe University	180	67	37%		113	63%	0.85
Murdoch Childrens Research Institute	180	130	72%	1.25	50	28%	
Mental Health Research Institute	169	121	72%	2.49	48	28%	
Macquarie University	151	50	33%		101	67%	0.90
Griffith University	134	34	25%		100	75%	0.83
University of Wollongong	129	15	12%		114	88%	0.87
Nursing							
University of Western Sydney	127	1	1%		126	99%	1.13
Griffith University	110	1	1%		109	99%	1.48
Nutrition and Dietetics							
University of Sydney	192	59	31%		133	69%	1.07
Deakin University	160	59	37%		101	63%	0.86
Oncology and Carcinogenesis							
University of Sydney	516	241	47%	1.11	275	53%	1.24
Peter MacCallum Cancer Institute	473	204	43%	1.63	269	57%	1.04
University of Melbourne	431	237	55%	1.46	194	45%	0.89
University of Queensland	283	162	57%	1.23	121	43%	1.43
University of New South Wales	274	109	40%	1.12	165	60%	0.95
Queensland Institute of Medical Research	223	194	87%	1.02	29	13%	
Optometry and Ophthalmology							
University of Melbourne	467	242	52%	1.47	225	48%	1.35
University of Sydney	374	169	45%	1.62	205	55%	1.12
Centre for Eye Research Australia	352	198	56%	1.64	154	44%	1.50
University of New South Wales	254	30	12%		224	88%	1.00
Westmead Millennium Institute	176	123	70%	1.83	53	30%	
Queensland University of Technology	138	14	10%		124	90%	1.01
University of Adelaide	121	5	4%		116	96%	0.55
Paediatrics and Reproductive Medicine							
University of Melbourne	647	306	47%	1.63	341	53%	1.17
University of Sydney	598	159	27%	1.33	439	73%	1.26
Murdoch Childrens Research Institute	394	223	57%	1.73	171	43%	1.35
University of Western Australia	343	156	45%	1.96	187	55%	1.01
University of Queensland	264	86	33%		178	67%	0.96
Monash University	255	165	65%	1.63	90	35%	

Sub-field of research and institution	Total publications	Publications linked to NHMRC funding			Publications without NHMRC funding		
		Number	%	RCI	Number	%	RCI
University of Adelaide	229	118	52%	1.77	111	48%	1.18
University of New South Wales	210	43	20%		167	80%	1.02
Pharmacology and Pharmaceutical Sciences							
University of Sydney	493	113	23%	1.60	380	77%	1.02
Monash University	474	245	52%	1.79	229	48%	1.10
University of Queensland	466	157	34%	1.43	309	66%	0.91
University of Melbourne	397	215	54%	2.04	182	46%	1.10
University of New South Wales	214	75	35%		139	65%	0.99
University of Adelaide	203	42	21%		161	79%	1.01
University of Western Australia	168	61	36%		107	64%	0.93
RMIT University	108	7	6%		101	94%	1.17
Medical Physiology							
University of Melbourne	320	198	62%	1.54	122	38%	0.99
University of Sydney	284	108	38%	1.47	176	62%	0.93
University of Queensland	276	100	36%	1.12	176	64%	0.90
Monash University	226	153	68%	1.26	73	32%	
University of New South Wales	209	88	42%		121	58%	0.68
University of Adelaide	188	108	57%	1.74	80	43%	
University of Western Australia	174	67	39%		107	61%	0.91
Other Medical and Health Sciences							
University of Melbourne	237	162	68%	2.14	75	32%	
Public Health and Health Services							
University of Queensland	820	282	34%	1.65	538	66%	0.99
University of Sydney	816	292	36%	1.55	524	64%	0.96
University of New South Wales	752	251	33%	1.26	501	67%	1.06
University of Melbourne	721	294	41%	1.55	427	59%	1.00
Monash University	484	158	33%	1.13	326	67%	0.86
University of Western Australia	315	140	44%	1.49	175	56%	0.79
University of Adelaide	314	65	21%		249	79%	0.89
Curtin University	311	73	23%		238	77%	0.69
University of Newcastle	285	43	15%		242	85%	1.04
Flinders University	245	43	18%		202	82%	0.80
Queensland University of Technology	244	88	36%		156	64%	0.84
Australian National University	240	86	36%		154	64%	0.84
Deakin University	217	74	34%		143	66%	1.02
La Trobe University	206	31	15%		175	85%	0.84
University of South Australia	173	13	8%		160	92%	1.02
Queensland Institute of Medical Research	158	104	66%	1.63	54	34%	
Griffith University	150	39	26%		111	74%	1.00

Sub-field of research and institution	Total publications	Publications linked to NHMRC funding			Publications without NHMRC funding		
		Number	%	RCI	Number	%	RCI
General Medical and Health Sciences							
University of Sydney	593	250	42%	3.50	343	58%	1.19
University of Melbourne	447	178	40%	3.23	269	60%	1.66
Monash University	337	129	38%	2.35	208	62%	0.77
University of New South Wales	324	99	31%		225	69%	1.05
University of Queensland	307	108	35%	2.60	199	65%	1.87
University of Western Australia	240	97	40%		143	60%	1.34
University of Adelaide	192	54	28%		138	72%	0.98
University of Newcastle	166	26	16%		140	84%	1.79
General Biological Sciences							
University of Queensland	508	129	25%	1.71	379	75%	1.38
University of Melbourne	359	149	42%	1.64	210	58%	1.13
University of Sydney	285	85	30%		200	70%	0.78
University of New South Wales	246	50	20%		196	80%	1.01
Monash University	233	100	43%	1.81	133	57%	1.31
University of Adelaide	168	37	22%		131	78%	1.02
Australian National University	146	34	23%		112	77%	1.04
Macquarie University	115	12	10%		103	90%	0.98
Biochemistry and Cell Biology							
University of Melbourne	1,224	750	61%	1.35	474	39%	0.92
University of Queensland	1,114	536	48%	1.50	578	52%	1.10
University of Sydney	936	379	40%	1.06	557	60%	0.83
Monash University	801	484	60%	1.28	317	40%	0.99
Australian National University	525	131	25%	0.90	394	75%	1.12
University of Adelaide	501	207	41%	1.31	294	59%	0.96
University of Western Australia	493	160	32%	1.14	333	68%	1.03
University of New South Wales	477	220	46%	1.42	257	54%	0.89
Walter and Eliza Hall Institute of Medical Research	330	293	89%	2.18	37	11%	
Queensland Institute of Medical Research	212	167	79%	1.76	45	21%	
La Trobe University	192	80	42%		112	58%	0.85
Griffith University	170	48	28%		122	72%	0.73
Peter MacCallum Cancer Institute	157	117	75%	1.74	40	25%	
Murdoch Childrens Research Institute	142	103	73%	1.32	39	27%	
Macquarie University	141	17	12%		124	88%	0.69
Garvan Institute of Medical Research	140	119	85%	1.83	21	15%	
James Cook University	129	11	9%		118	91%	0.88
Florey Institute of Neuroscience and Mental Health	112	100	89%	0.96	12	11%	

Sub-field of research and institution	Total publications	Publications linked to NHMRC funding			Publications without NHMRC funding		
		Number	%	RCI	Number	%	RCI
Genetics							
University of Melbourne	489	244	50%	1.41	245	50%	0.81
University of Queensland	403	149	37%	1.55	254	63%	1.37
University of Sydney	350	116	33%	1.34	234	67%	1.04
Queensland Institute of Medical Research	281	199	71%	1.73	82	29%	
University of Adelaide	275	80	29%		195	71%	1.09
University of Western Australia	251	82	33%		169	67%	1.08
Australian National University	215	42	20%		173	80%	1.02
University of New South Wales	182	68	37%		114	63%	0.82
Murdoch Childrens Research Institute	163	102	63%	1.01	61	37%	
Microbiology							
University of Queensland	405	118	29%	1.22	287	71%	1.27
University of Melbourne	371	227	61%	1.16	144	39%	1.28
University of New South Wales	329	119	36%	1.38	210	64%	1.29
University of Sydney	310	145	47%	1.11	165	53%	1.08
Monash University	280	201	72%	1.25	79	28%	
Westmead Millennium Institute	165	125	76%	1.27	40	24%	
Biological Physics							
University of Queensland	187	55	29%		132	71%	0.89
Biomedical Engineering							
University of Sydney	151	26	17%		125	83%	1.30
Multidisciplinary Sciences							
University of Melbourne	167	101	60%	2.06	66	40%	
Australian National University	150	17	11%		133	89%	1.82
University of Sydney	135	26	19%		109	81%	1.49

Notes: Publications data is provided for all the institutions with 100 or more publications in at least one of the two categories analysed ('Publications linked to NHMRC funding' and 'Publications without NHMRC funding'). RCI is only calculated where 100 or more publications are present. Where authors from more than one institution collaborate on a publication, it is counted in full for each institution involved. Institutional data included in this table covers only the Universities and Research Institutes sectors.

APPENDIX B: CORPORATIVE RESEARCH CENTRES (CRCS)

The analysis included all relevant publications from the CRCs that predominantly focus on biomedical sciences. This sector covers the following CRCs:

CRC for Aboriginal Health (formerly CRC for Aboriginal and Tropical Health)

CRC for Asthma and Airways (formerly CRC for Asthma)

CRC for Biomarker Translation (formerly CRC for Diagnostic Technologies and CRC for Diagnostics)

CRC for Biomedical Imaging Development

CRC for Cancer Therapeutics

CRC for Cardiac Technology

CRC for Cellular Growth Factors

CRC for Chronic Inflammatory Diseases

CRC for Discovery of Genes for Common Human Disease

CRC for Tissue Growth and Repair

CRC for Vaccine Technology

Oral Health CRC (formerly CRC for Oral Health Science)

The HEARing CRC (formerly CRC for Cochlear Implant and Hearing Aid Innovation)

Vision CRC (formerly CRC for Eye Research and Technology)

APPENDIX C: RESEARCH INSTITUTES

This sector covers the following 41 member institutes of the Australian Association of Medical Research Institutes, as listed at http://www.aamri.org/member as of 19 October 2011, when the analysis commenced:

ANZAC Research Institute
Baker IDI Heart and Diabetes Institute
Bionics Institute
Brien Holden Vision Institute
Burnet Institute
Centenary Institute of Cancer Medicine and Cell Biology
Centre for Eye Research Australia
Children's Cancer Institute Australia for Medical Research
Children's Medical Research Institute
Florey Institute of Neuroscience and Mental Health (formerly Florey Neuroscience Institute)
Garvan Institute of Medical Research
Hanson Institute
Heart Research Institute
Hunter Medical Research Institute
Kolling Institute of Medical Research
Lions Eye Institute
Ludwig Institute for Cancer Research
Mater Medical Research Institute
Mental Health Research Institute
Menzies Research Institute Tasmania
Menzies School of Health Research
Murdoch Childrens Research Institute
National Ageing Research Institute
Neuroscience Research Australia
O'Brien Institute
Peter MacCallum Cancer Institute
Prince Henry's Institute of Medical Research
Queensland Children's Medical Research Institute
Queensland Eye Institute
Queensland Institute of Medical Research
Schizophrenia Research Institute
St Vincent's Institute of Medical Research
Telethon Institute for Child Health Research
The George Institute for Global Health
Victor Chang Cardiac Research Institute
Walter and Eliza Hall Institute of Medical Research
Wesley Research Institute
Western Australian Institute for Medical Research
Westmead Millennium Institute
Women and Children's Health Research Institute
Woolcock Institute of Medical Research

APPENDIX D: CORRESPONDENCE BETWEEN FIELDS OF RESEARCH (ANZSRC) AND WEB OF SCIENCE JOURNAL SUBJECT CATEGORIES

The following Web of Science subject categories were mapped to the Australian and New Zealand Standard Research Classification (ANZSRC) fields and sub-fields of research for the analyses. Information on these subject categories can be found at http://science.thomsonreuters.com/mjl/scope/.

The term 'biomedical publications' as used in this report refers to publications appearing journals classified to any of the following journal subject categories from the Web of Science database.

Fields/sub-fields of research	Web of Science subject categories
Biological Physics	Biophysics
General Biological Sciences*	Biochemical Research Methods; Biotechnology and Applied Microbiology
Biochemistry and Cell Biology	Biochemistry and Molecular Biology; Cell Biology
Genetics	Genetics and Heredity
Microbiology	Microbiology; Virology
Biomedical Engineering	Engineering, Biomedical; Materials Science, Biomaterials
General Medical and Health Sciences*	Medicine, General and Internal
Medical Biochemistry and Metabolomics	Chemistry, Medicinal
Cardiovascular Medicine and Haematology	Cardiac and Cardiovascular Systems; Hematology; Peripheral Vascular Disease
Clinical Sciences	Anesthesiology; Critical Care Medicine; Dermatology; Emergency Medicine; Endocrinology and Metabolism; Gastroenterology and Hepatology; Geriatrics and Gerontology; Gerontology (SSCI); Infectious Diseases; Orthopedics; Otorhinolaryngology; Pathology; Psychiatry; Psychiatry (SSCI); Psychology; Radiology, Nuclear Medicine and Medical Imaging; Rehabilitation; Rehabilitation (SSCI); Respiratory System; Rheumatology; Surgery; Urology and Nephrology; Transplantation; Tropical Medicine
Complementary and Alternative Medicine	Integrative and Complementary Medicine
Dentistry	Dentistry, Oral Surgery and Medicine
Human Movement and Sports Science	Sport Sciences
Immunology	Allergy; Immunology
Neurosciences	Neurosciences; Clinical Neurology; Neuroimaging
Nursing	Nursing; Nursing (SSCI)
Nutrition and Dietetics	Nutrition and Dietetics
Oncology and Carcinogenesis	Oncology
Optometry and Ophthalmology	Ophthalmology
Paediatrics and Reproductive Medicine	Andrology; Obstetrics and Gynecology; Pediatrics
Pharmacology and Pharmaceutical Sciences	Pharmacology and Pharmacy; Toxicology
Medical Physiology	Anatomy and Morphology; Physiology
Public Health and Health Services	Ergonomics (SSCI); Health Care Sciences and Services; Public, Environmental and Occupational Health; Public, Environmental and Occupational Health (SSCI); Health Policy and Services (SSCI); Medical Informatics; Substance Abuse; Substance Abuse (SSCI)
Other Medical and Health Sciences	Medical Laboratory Technology; Medicine, Research and Experimental
Multidisciplinary Sciences*	Multidisciplinary Sciences

** Non-standard ANZSRC Fields of Research category. See Section for details.*

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