Australian Government

National Health and Medical Research Council

NHMRC-supported publications: An institutional and sectoral analysis

The National Health and Medical Research Council (NHMRC) regularly publishes reports of the scientific publication output and the citation impact of its research funded and of Australian health and medical research generally. The most recent report, *Measuring up 2013,* analyses all Australian biomedical research publications published in peer-reviewed journals during 2005 to 2009 and indexed in the Thomson Reuters Web of Science database.[1]

This analysis builds upon the publications and citations data used in the *Measuring up 2013* report, and presents a comparative analysis of the scientific publications at the sector and institution level, with a particular focus on universities and medical research institutes.

Methodology

Data sources
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, grants schemes, and institutional funding is from NHMRC's Research Grant Management System (RGMS) and End of Grant Reports.

Grant selection
The initial data set for this analysis consists of 5263 grants from seven grant schemes. Among these, 3853 grants (73%) had one or more reported publications in Web of Science-indexed journals, and were included in the final analysis. Grants were selected according the start year and the end year of each grant, and the availability of reported papers published between 2005 and 2009.

The following seven grant schemes are included in this analysis:
- Career Development Fellowships
- Centres for Research Excellence
- Early Career Fellowships
- Research Fellowships
- Practitioner Fellowships
- Program Grants
- Project Grants

[1] National Health and Medical Research Council (2013) *Measuring Up 2013*. Canberra: National Health and Medical Council. http://www.nhmrc.gov.au/guidelines/publications/nh164

Measures used

Publication output
This covers all the publications linked to each institution or sector.
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 may well have been supported by other funding sources too.

Relative citation impact (RCI)
The relative citation impact is a ratio that indicates the performance of a research unit, institution or sector 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). It is calculated allowing for field and size variations (i.e. field-weighted) and the age of papers (i.e. time-normalised) for institution and sector. RCI is only calculated where 100 or more publications are present.

Publications per NHMRC $100k administered
Grants selected for this analysis (and for *Measuring up 2013*) are based on the start year and end year of the grant. The start year and end year of a grant can vary from the publication period of this analysis, which is between 2005 and 2009. For example, some grants have started earlier than 2005 and some have ended after 2009. Therefore, in calculating the *publications per $100k* ratio, the funding amount has been adjusted based on the grant duration and the years of publications each grant contributed towards the publication pool of this analysis. This measure is simply based on the number of publications indexed in the Web of Science database during the study period, and does not take into account the quality or impact of those publications.

Data interpretation

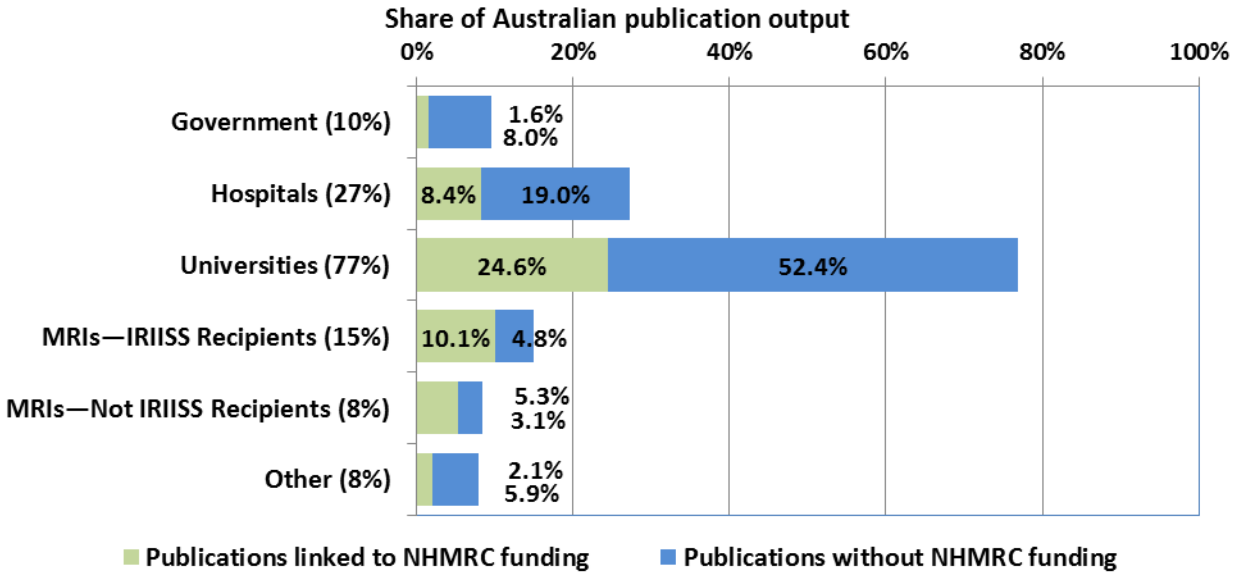
In addition to the general limitations and caveats in the use of bibliometric data, such as the skewed distribution of citations across articles, and differences in publication and citation practices between fields of research, the following are some of the factors that should be considered when interpreting these data:

- Only those publications reported as being supported by NHMRC funding and indexed in the Web of Science database were included in the analysis.
- Institutions have multiples sources of income (including competitive grants funding from NHMRC) and different administrative and cost structures. Further there are many differences among institutions in terms of the research focus and teaching priorities.
- Approximately 73% of grants administered by institutions during the study period were included in the analysis. Therefore this represents a sub-set of all the grants administered by each institution.
- Some researchers have more than one institutional affiliation, and often many MRI researchers are also affiliated with universities. Publications have been allocated to institutions in this analysis on the basis of affiliation addresses as provided by the authors, which may be different from their primary affiliation.
- Institutional names are given in this analysis as they appeared at the time of funding, and may not reflect the current status or administrative arrangements for some institutions due to name changes or mergers with other institutions.

Australian health and medical research and NHMRC funding support

Health and medical 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). Also included in Figure 1 is the proportion of publications that received NHMRC funding support within each sector.

Figure 1: Proportion of Australian health and medical publications by sector of contributing author(s), split by NHMRC funding support



Notes:

- The total sector output is shown in brackets.
- 'MRIs—IRIISS Recipients' group includes 26 MRIs that received funding under the Independent Research Institute Infrastructure Support Scheme (IRIISS).
- 'MRIs—Not IRIISS Recipients' group covers the following 18 MRIs, which are also AAMRI member institutions but did not receive IRIISS funding:
    - ANZAC Research Institute
    - Brien Holden Vision Institute
    - Children's Cancer Institute Australia for Medical Research
    - Hanson Institute
    - Hunter Medical Research Institute
    - Kolling Institute of Medical Research
    - Lions Eye Institute
    - Menzies Research Institute Tasmania
    - Menzies School of Health Research
    - National Ageing Research Institute
    - Neuroscience Research Australia
    - O'Brien Institute
    - Peter MacCallum Cancer Institute
    - Queensland Children's Medical Research Institute
    - Queensland Eye Institute
    - Telethon Institute for Child Health Research
    - Western Australian Institute for Medical Research
    - Westmead Millennium Institute

- The ‘Other’ sector comprises non-profit organisations, biotechnology companies, medical practices and all other authors who could not be grouped into the designated sectors.
- The analysis is based on the total publication count linked to each institution within each sector.
- Where authors from more than one sector collaborate on a publication, it is fully counted for each sector involved. Duplicates within each sector have been removed.
- Due to these cross-sector collaborations, the sum of all sectors will be greater than 100 per cent.

According to the *Measuring up 2013* report, NHMRC-supported publications accounted for more than 30% of all Australian biomedical research output during the 2005–2009 period. Figures 2 provides the proportion of publication output by NHMRC funding at the sector level, while this data is presented at the institution level for ‘MRIs—IRIISS Recipients’, ‘MRIs—Not IRIISS Recipients’ and universities in Figures 3-5 below.

Figure 2: Proportion of publications that received NHMRC funding support within each sector

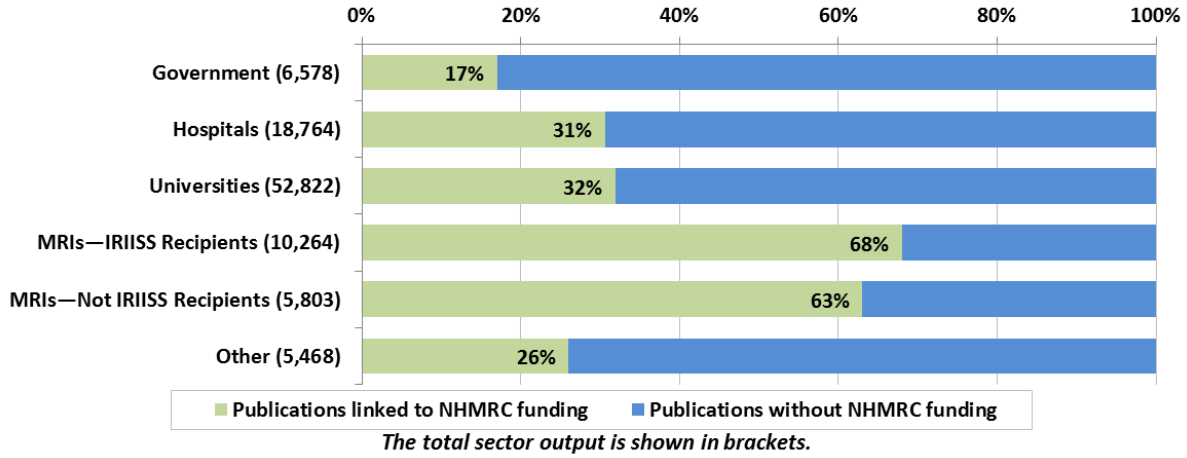
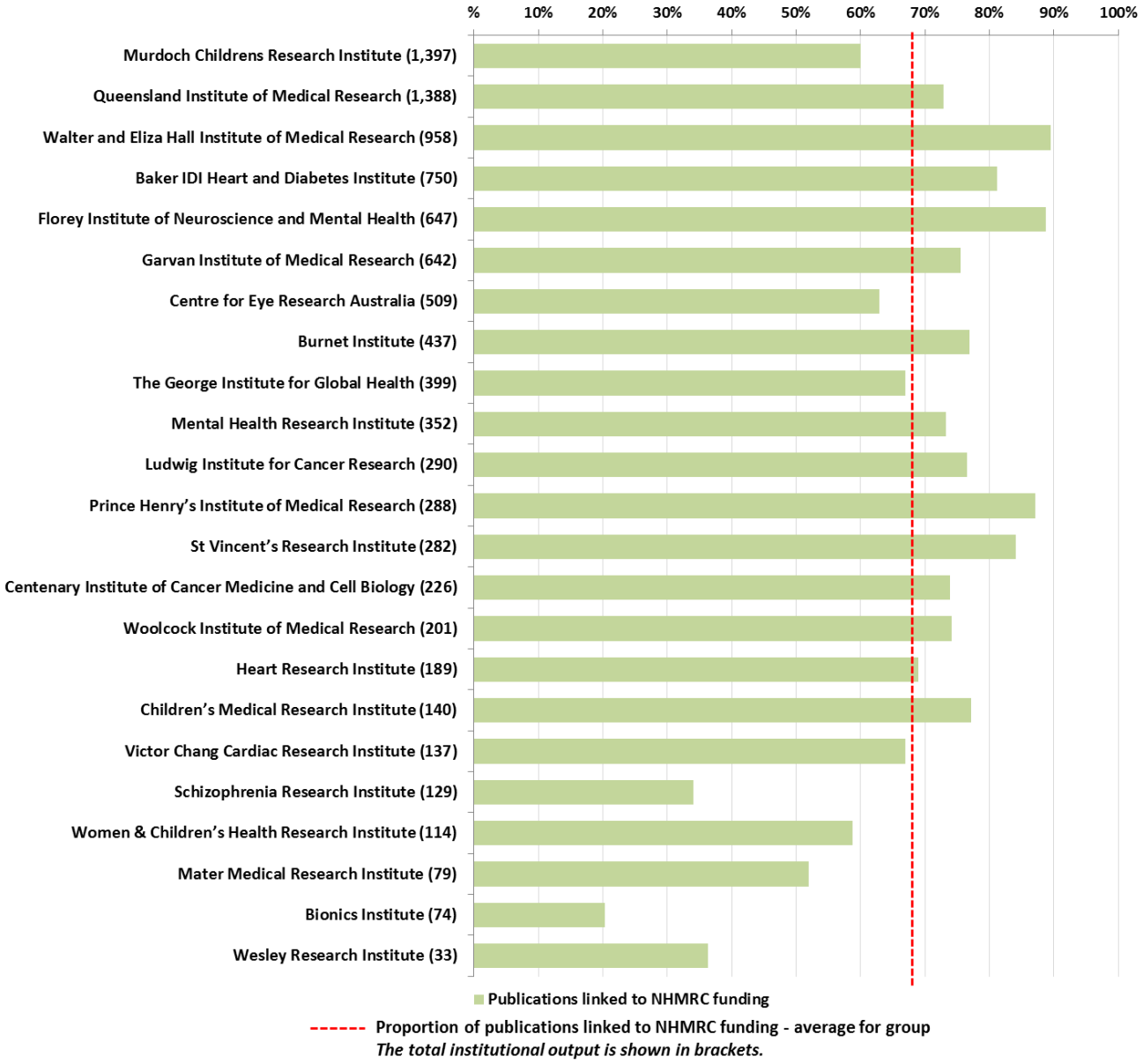
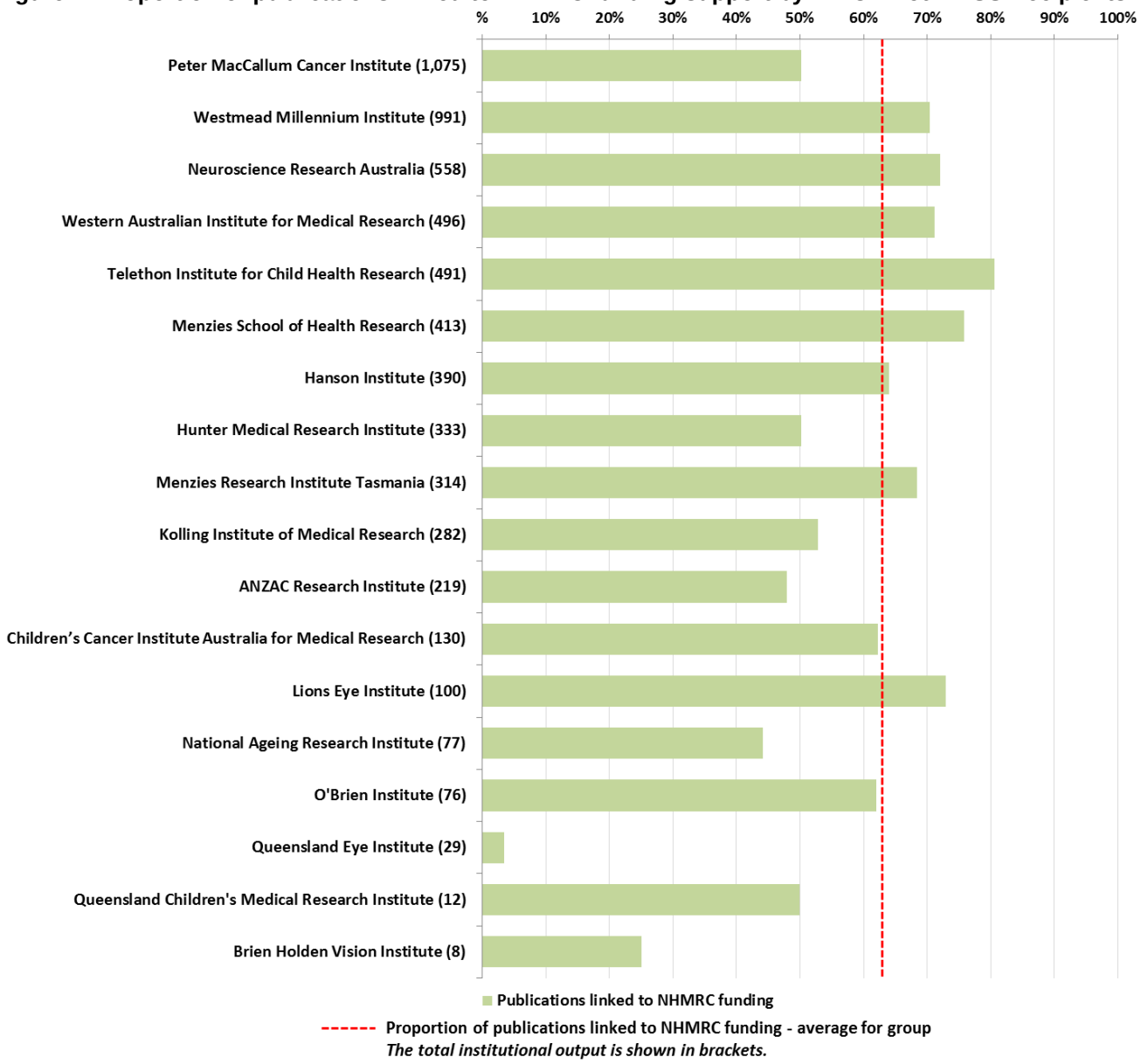


Figure 3: Proportion of publications linked to NHMRC funding support by MRIs—IRIISS Recipients



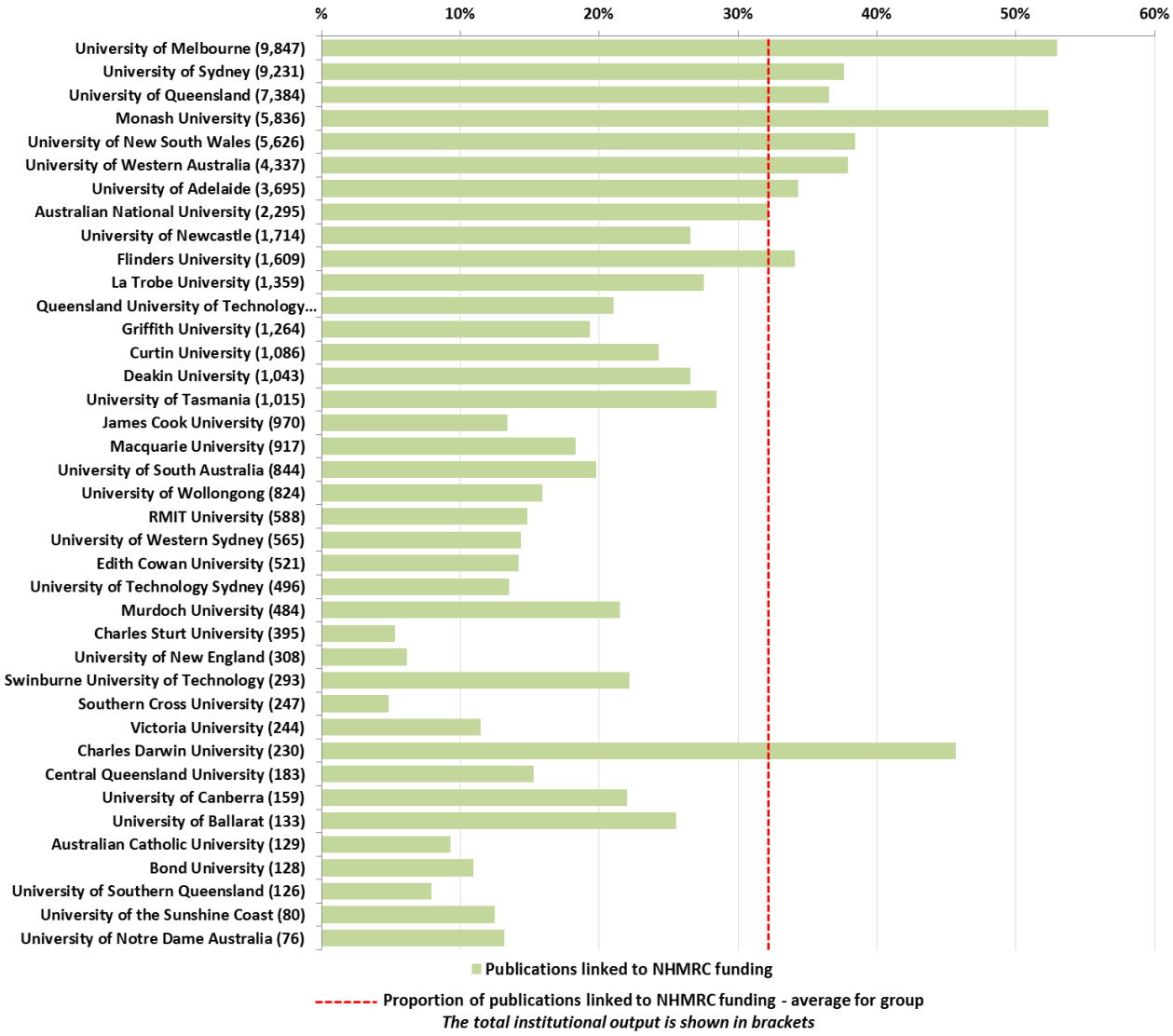
The total institutional output is shown in brackets.

Figure 4: Proportion of publications linked to NHMRC funding support by MRIs—Not IRIISS Recipients



The total institutional output is shown in brackets.

Figure 5: Proportion of publications linked to NHMRC funding support by universities



Publications and citations data for all the MRIs and universities included in the analysis are given in Table 1.

Table 1: Number of publications and relative citation impact for health and medical publications, by institution and funding support

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
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

Institution	Total publications	Publications linked to NHMRC funding			Publications without NHMRC funding		
		Number	%	RCI	Number	%	RCI
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 Research Institute	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
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.

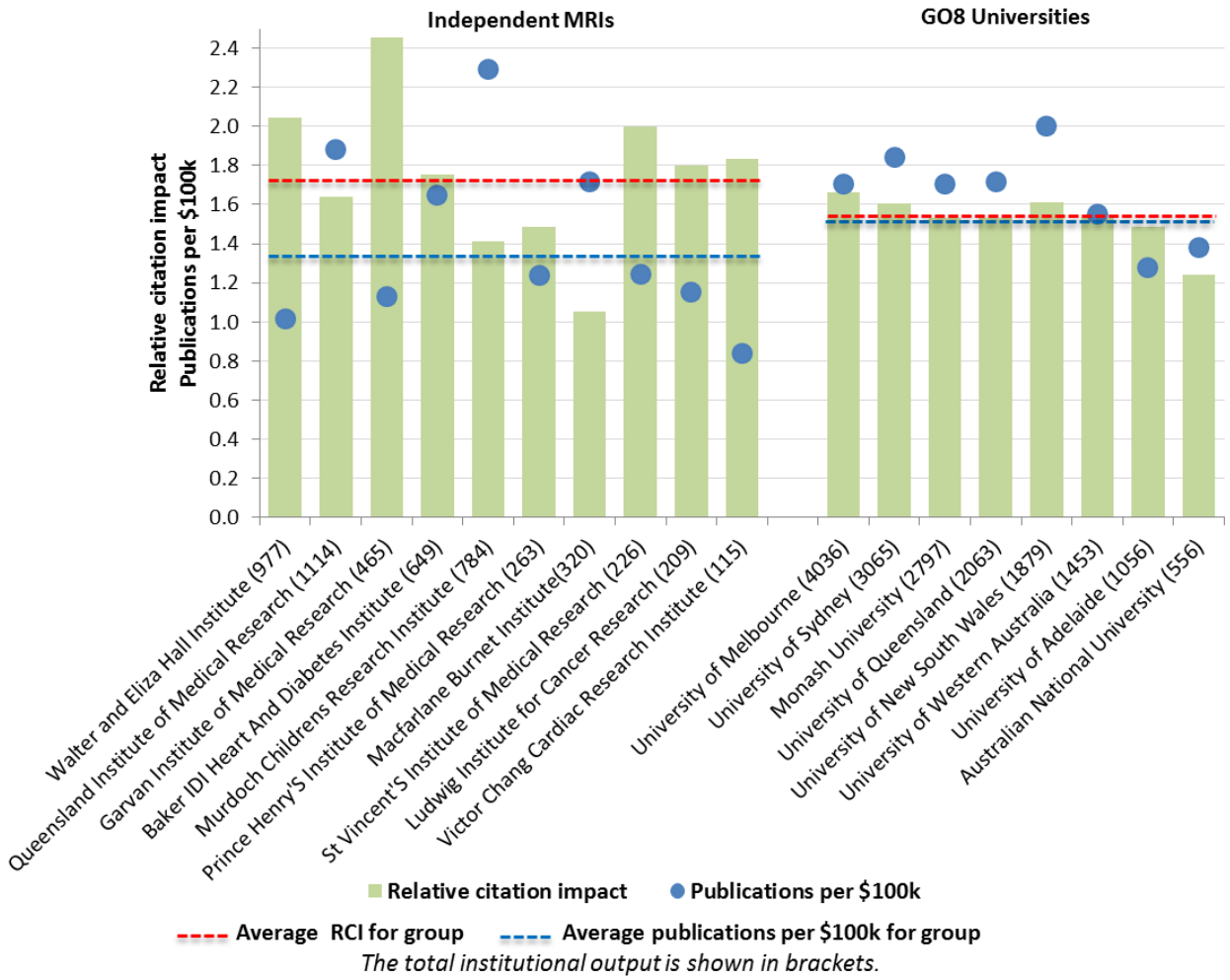
Publication output and citation impact of Administering Institutions

This section provides the publication output, relative citation impact (RCI) and the efficiency (i.e. publications per $100k administered) of Administering Institutions, based on the number of grants each administering institution received and all the publications linked to these 'administered grants'. We acknowledge that while administering institutions may be responsible for administering these grants, some research may have been conducted at different institutions.

The analysis covered a total of 88 Administering Institutions which had at least one grant in one of the seven grant schemes covered in this analysis, and focussed, in particular, on the Group of Eight Universities and the top ten independent medical research institutions (MRIs) in terms of NHMRC funding administered during the study period. The top ten MRIs also cover almost 90% of all publications resulting from administered NHMRC grants within independent MRIs.

Figure 6 provides the Publications per $100k and relative citation impact ratio for top ten independent MRIs and GO8 universities by NHMRC funding.

Figure 6: Publications per $100k and relative citation impact for NHMRC-supported publications by top ten independent MRIs and GO8 universities



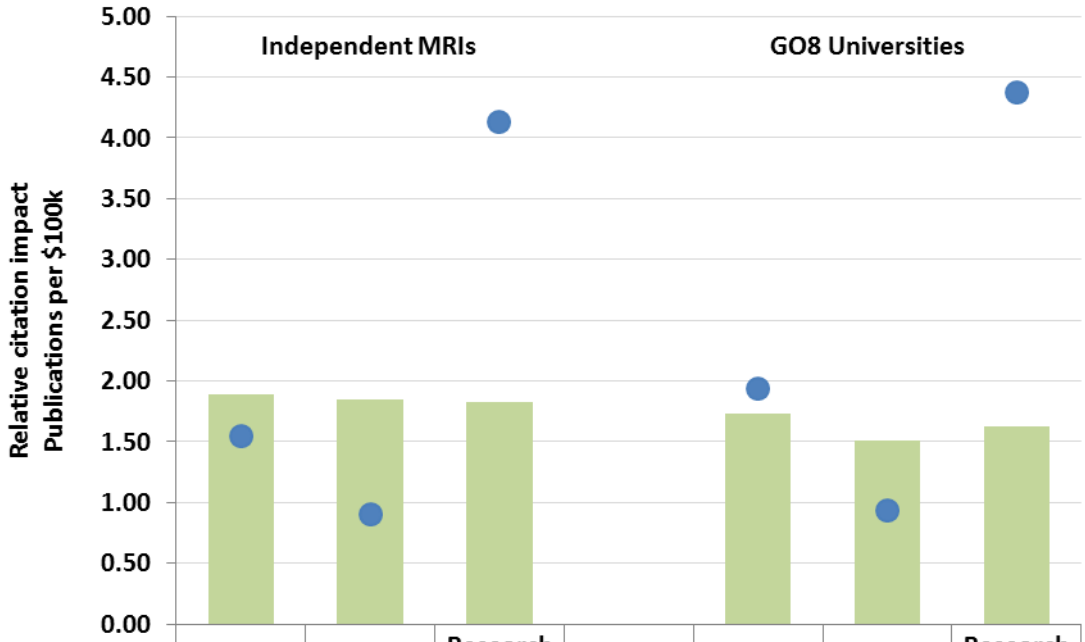
Average RCI and publications per $100k for each group as shown in Figure 6:

	Independent MRIs	GO8 Universities
Publications per $100k	1.35	1.47
Relative citation impact	1.73	1.55

Publications per $100k and relative citation impact by selected grant schemes

The publication output of a grant can be influenced by many factors such as the number of Chief Investigators, grant duration and the funding amount. *Measuring up 2013* showed that grant schemes vary in terms of the citation impact and the number of publications per grant. Therefore, this analysis looked at the number of publications per $100k and relative citation impact for the two groups split by Programs, Projects and Research Fellowships. This information is presented in Figure 7.

Figure 7: Publications per $100k and relative citation impact for NHMRC-supported publications for the top ten independent MRIs and GO8 universities, by selected grant schemes



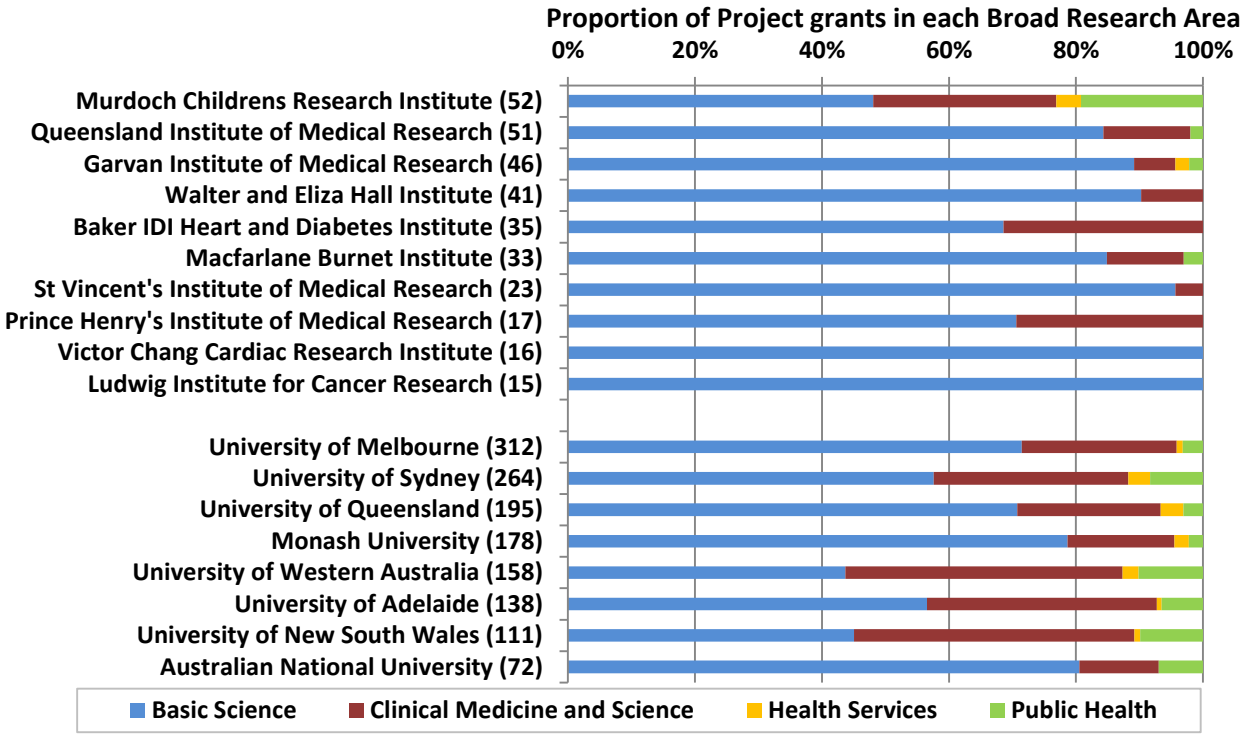
	Programs (30)	Projects (329)	Research F'ships (180)		Programs (69)	Projects (1428)	Research F'ships (339)
Relative citation impact	1.89	1.84	1.83		1.73	1.51	1.63
Publications per $100k	1.6	0.9	4.1		1.9	0.9	4.4

The number of grants is shown in brackets.

Project Grants by Broad Research Area

More than half (54%), or 1757, of administered grants in this analysis are Projects grants. This section looks at the breakdown of the Broad Research Area of administered Projects grants, which may, in part, help explain the research focus of individual or groups of institutions. Figure 8 provides the Broad Research Area split of grants at the institution level, while the average proportion of Project grants classified to each Broad Area of Research within the two groups is given in Table 2.

Figure 8: Broad Research Area of Project grants administered by each institution



The number of grants each institution received is shown in brackets.

Table 2: Proportion of Project grants administered by institution group, split by Broad Research Area

Broad Research Area	Independent MRIs	GO8 Universities
Basic Science	80%	64%
Clinical Medicine and Science	15%	29%
Health Services Research	1%	2%
Public Health	4%	6%

Research output and citation impact data for the two groups are presented in Figure 9.

Figure 9: Publications per $100k and relative citation impact for NHMRC-supported publications for the two groups, by Broad Research Area

Data and notes for Figure 9:
The number of grants is shown in brackets.

Sector	Broad Research Area	No of grants	No of publications	Publications per $100k	RCI
GO8 Universities	Basic Science	908	2,635	0.93	1.50
GO8 Universities	Clinical Medicine and Science	408	1,290	0.96	1.50
GO8 Universities	Health Services Research	29	63		
GO8 Universities	Public Health	83	355	1.11	1.57
Ind. MRIs	Basic Science	263	760	0.87	1.85
Ind. MRIs	Clinical Medicine and Science	50	166	0.99	1.49
Ind. MRIs	Health Services Research	3	9		
Ind. MRIs	Public Health	13	64		

Shaded Broad Research Areas were not analysed for RCI and Publications per $100k due to insufficient data.

The following data table contains grants and publications data for all the administering institutions that received $10 million or more in *adjusted* NHMRC grant funding during the study period. The publications per $100k ratio is to be interpreted with caution where it is based on a small number of grants and/or publications, as smaller numbers can have a greater effect on the average. Where authors from more than institution collaborate on a publication, it is counted in full for each institution involved.

Table 3: Grants data and publication performance information for administering institutions with $10 million or more in adjusted grant funding

Administering Institution	No of grants included in analysis	Adjusted NHMRC grant funding	No of NHMRC-supported papers	Publications per $100k	RCI*
University of Melbourne	572	$236,800,577	4,036	1.7	1.66
University of Sydney	405	$166,627,197	3,065	1.8	1.60
Monash University	373	$163,754,720	2,797	1.7	1.53
University of Queensland	336	$120,145,096	2,063	1.7	1.53
University of Western Australia	235	$93,744,927	1,453	1.5	1.53
University of Adelaide	219	$82,771,254	1,056	1.3	1.48
University of New South Wales	212	$93,757,417	1,879	2.0	1.61
Walter and Eliza Hall Institute	153	$96,292,006	977	1.0	2.04
Queensland Institute of Medical Research	121	$59,246,973	1,114	1.9	1.64
Australian National University	120	$40,215,634	556	1.4	1.24
Murdoch Childrens Research Institute	99	$34,222,588	784	2.3	1.41
Garvan Institute of Medical Research	98	$41,171,764	465	1.1	2.46
Baker IDI Heart and Diabetes Institute	95	$39,310,974	649	1.7	1.75
Flinders University	78	$26,191,355	357	1.4	1.41
University of Newcastle	60	$16,085,100	282	1.8	1.60
Macfarlane Burnet Institute	53	$18,630,039	320	1.7	1.05
St Vincent's Institute of Medical Research	47	$18,157,375	226	1.2	2.00
Prince Henrys Institute of Medical Research	43	$21,211,791	263	1.2	1.48
La Trobe University	37	$12,411,849	203	1.6	1.60
Menzies School of Health Research	30	$10,012,388	295	2.9	1.23
Ludwig Institute For Cancer Research	29	$18,125,318	209	1.2	1.80
Victor Chang Cardiac Research Institute	25	$13,739,405	115	0.8	1.83
University of South Australia	18	$10,223,947	175	1.7	1.19

* RCI is calculated using the total number of NHMRC-supported papers, and is not correlated with the publications per $100k ratio