Contemporary (post-Wills) survey of the views of Australian medical researchers: importance of funding, infrastructure and motivators for a research career

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ABSTRACT

Objectives: To investigate the perceptions of Australian health and medical researchers 4 years after the Wills Report recommended and led to a substantial increase in health and medical research funding in Australia.

Design, setting and participants: A telephone poll of 501 active health and medical researchers, conducted between 28 April and 5 May, 2003.

Main outcome measures: Researchers' views on the adequacy of funding, infrastructure and support, salary, community recognition, the excitement of discovery and research outcomes such as publication and patenting in research.

Results: Research funding was the most important concern: 91% of researchers (455/498) viewed funding as "very" or "extremely" important to their role, but only 10% (52/500) were "very" or "extremely" satisfied with the level of funding. Research infrastructure and support were seen as "very" or "extremely" important by 90% of researchers (449/501), while only 21% (104/501) were "very" or "extremely" satisfied. Researchers in medical research institutes were significantly more likely to be satisfied (27% [56/205] "very" or "extremely" satisfied) with the level of infrastructure and support than those working in universities (15% [41/268] "very" or "extremely" satisfied; $P = 0.001$). Among the factors that motivate researchers, the excitement of discovery stood out in terms of both high importance and satisfaction. Publications were viewed as more important research outcomes than patenting or commercial ventures.

Conclusions: Funding and infrastructure support remain overwhelmingly researchers' greatest concerns. University-based researchers were less satisfied with infrastructure and support than those in independent medical research institutes.

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The release of Australia's Health and Medical Research Strategic Review chaired by Peter Wills (the Wills Report[1]) in May 1999 led to a commitment by the Australian Government to increase investment in medical research significantly. Over the next 6 years, annual funding for health and medical research through the National Health and Medical Research Council (NHMRC) was increased to more than double base research funding from $165 million in 1998–99 to more than $400 million in 2004–05. With this increase, it is timely to consider the views of Australian health and medical researchers.

Beyond a general measurement of job satisfaction and the assessment of workplace conditions,[2] little information exists on the broader perceptions and opinions of Australian health and medical researchers. A 2001 survey of the American Association for the Advancement of Science (AAAS) found that while there was a high level of job satisfaction among life scientists in the United States, younger scientists had concerns about career path, and a significant disparity in pay between men and women was identified.[3] More recently, a 2004 survey of scientists in North America and Europe showed that factors considered most important to their research were adequate laboratory and research facilities, and appropriate resources to meet infrastructure needs not covered by research grants.[4] In Australia, a workplace survey conducted by the Australian Society for Medical Research (ASMR) in 1999 sought to identify how Australian biomedical researchers regarded the Australian research environment, and what factors were perceived to be important to the exodus of Australian researchers to overseas research organisations.[2] Issues identified included low levels of funding, poor job security, low salaries, and reduced employment opportunities. Given the paucity of data relating to wider research considerations and outcomes in Australia, particularly after the Wills Report, Research Australia commissioned a national poll of health and medical researchers to explore researchers' attitudes and concerns on a variety of issues.[5]

METHODS

A national telephone poll was conducted by ACNielsen between 28 April and 5 May, 2003. While it is not possible to determine a representative national sample of health and medical researchers given limitations of available data, Research Australia attempted to achieve a sample across all researcher types and settings. A sample of 1049 researchers was sourced from 43 Research Australia member organisations who nominated relevant researchers who had given prior consent to participate in the survey. These researchers identified their primary organisational affiliation and type of research. Distribution targets across states and researcher type reflected NHMRC grants for the year 2001.

The interview sample of 501 researchers was randomly selected from the member sample to, as far as possible, meet state and researcher type targets. Analysis was limited to subgroups large enough to give meaningful results.

The structured telephone questionnaire consisted of 21 questions designed to encompass a broad range of issues including views on researcher motivations, research outcomes and commercialisation, international positioning and collaboration, opinions relating to funding and infrastructure for medical research, in addition to general

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demographic questions. Here, we report detailed post-hoc analyses of the survey data to explore researchers' opinions, focusing on funding, infrastructure, and the relative importance of various research outcomes. We also examined how these views varied between researcher types, organisational settings, between states and sexes. Responses on importance and satisfaction were measured on a scale of 1–5.

Statistical analysis

Comparisons of the mean response between the research organisations and between sexes were made with the independent samples *t* test. Across states and between researcher types, data were analysed by one-way analysis of variance, followed, where appropriate, by Tukey's multiple comparisons test. Analyses of organisation types were restricted to the 473 researchers (from all states) based in universities and medical research institutes because of the very small numbers from other organisation types. Similarly, state analyses were restricted to the 469 researchers from New South Wales, Victoria, South Australia and Western Australia, owing to insufficient sample sizes from other states and territories. All analyses and statistical tests were conducted using SPSS version 11.0 (SPSS Inc, Chicago, Ill, USA). A *P* value of less than 0.05 was considered statistically significant.

RESULTS

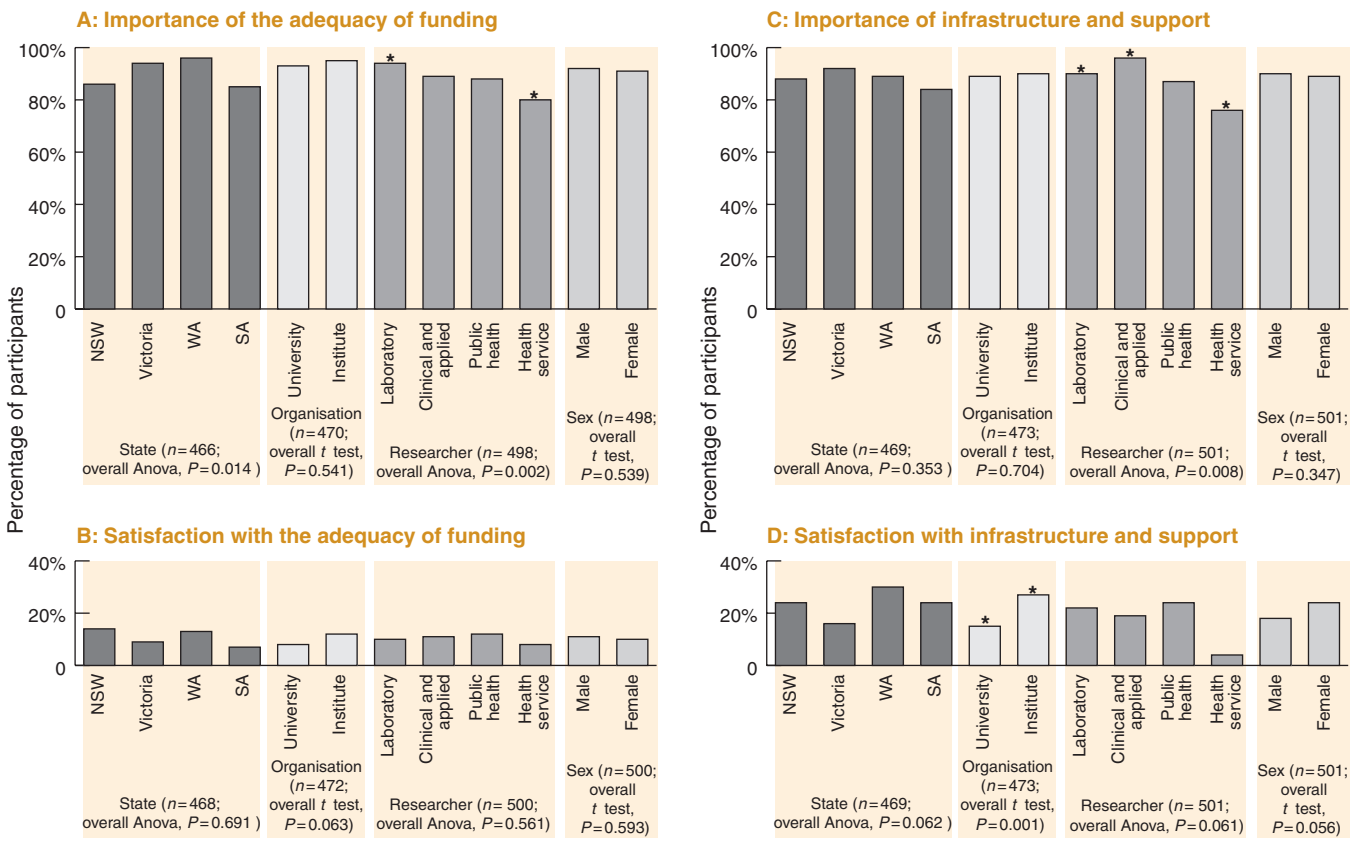
Participants

Of the 1049 researchers who had given prior consent 26 (2%) refused, 409 (39%) were unavailable at the time of the survey, and 113 (11%) appointments made were not required to meet sample targets. The 501 respondents comprised health and medical researchers from four research areas: laboratory (280, 56%); clinical and applied (96, 19%); public health (100, 20%); and health service (25, 5%). They represented a range of research organisations: universities (268, 53%); independent medical research institutes (205, 41%); hospitals (9, 2%); biotechnology companies (2, 0.4%); and pharmaceutical companies (17, 3%). Their geographic locations were: Victoria (208, 42%); New South Wales and Australian Capital Territory (139, 28%); South Australia (68, 14%); Western Australia (54, 11%); Queensland (21, 4%); Tasmania (7, 1%); and Northern Territory (4, 1%). Of the 501 respondents, 263 (52%) were female and 238 (48%) were male; 143 (29%) were aged 34 years and under, 175 (35%) were aged 35–44 years, and 183 (37%) were aged 45 years and over.

Adequacy of funding

Adequacy of funding was rated either "very" or "extremely" important by 91% of all respondents (455/498), and tended to be more important to laboratory-based researchers. Across states, the adequacy of funding tended to be more important for researchers based in Western Australia and Victoria (Box 1A). Satisfaction with the adequacy of funding for health and medical research was very low, with only 10% of all

1 Participants who rated adequacy of funding and infrastructure and support as "very" or "extremely" important, and were "very" or "extremely" satisfied with these aspects



* Denotes statistically significant difference.

NSW = New South Wales; WA = Western Australia; SA = South Australia; Anova = one-way analysis of variance. ◆

2 Respondents who rated selected motivating factors as "very" or "extremely" important to their role and those who were "very" or "extremely" satisfied with these factors*

	Excitement of discovery		Career path		Salary		Community recognition		Potential for personal wealth	
Researchers	Very/extremely important	Very/extremely satisfied	Very/extremely important	Very/extremely satisfied	Very/extremely important	Very/extremely satisfied	Very/extremely important	Very/extremely satisfied	Very/extremely important	Very/extremely satisfied
All researchers	86% (429/500)	63% (311/495)	74% (368/500)	25% (124/499)	36% (178/501)	18% (89/497)	36% (181/501)	24% (120/500)	11% (53/501)	10% (48/469)
State										
NSW	86% (119/138)	63% (85/135)	69% (96/139)	29% (40/138)	29% (40/139)	14% (20/138)	29% (41/139)	20% (28/138)	7% (10/139)	11% (14/125)
Victoria	83% (173/208)	60% (124/208)	77% (160/208)	19% (40/207)	40% (84/208)	19% (39/205)	42% (88/208)	24% (50/208)	12% (25/208)	10% (20/200)
WA	83% (45/54)	52% (28/54)	76% (41/54)	26% (14/54)	48% (26/54)	20% (11/54)	43% (23/54)	28% (15/54)	17% (9/54)	16% (8/49)
SA	91% (62/68)	78% (52/67)	67% (45/67)	31% (21/68)	24% (16/68)	19% (13/68)	26% (18/68)	24% (16/68)	7% (5/68)	5% (3/66)
	F(3, 464), 1.614; $P = 0.185$	F(3, 460), 2.780; $P = 0.041$	F(3, 464), 1.613; $P = 0.185$	F(3, 463), 0.871; $P = 0.456$	F(3, 465), 5.637; $P = 0.001$	F(3, 461), 0.569; $P = 0.636$	F(3, 465), 3.754; $P = 0.011$	F(3, 464), 0.926; $P = 0.428$	F(3, 465), 3.785; $P = 0.011$	F(3, 436), 0.425; $P = 0.735$
Organisation										
University	86% (229/267)	69% (183/264)	74% (197/268)	27% (72/266)	35% (95/268)	17% (46/267)	35% (93/268)	24% (63/268)	8% (21/268)	9% (22/249)
Research institute	87% (179/205)	57% (116/204)	75% (152/204)	22% (45/205)	34% (69/205)	17% (34/202)	40% (82/205)	27% (55/204)	14% (29/205)	11% (21/197)
	$t = -0.510$; df = 470; $P = 0.610$	$t = 3.170$; df = 466; $P = 0.002$	$t = -0.245$; df = 470; $P = 0.806$	$t = 1.044$; df = 469; $P = 0.297$	$t = -0.691$; df = 471; $P = 0.490$	$t = 0.368$; df = 467; $P = 0.713$	$t = -1.58$; df = 471; $P = 0.114$	$t = 0.083$; df = 470; $P = 0.934$	$t = -2.882$; df = 471; $P = 0.004$	$t = 0.834$; df = 444; $P = 0.404$
Researcher										
Laboratory	90% (252/280)	62% (172/278)	77% (215/279)	23% (63/280)	37% (103/280)	16% (44/278)	36% (101/280)	21% (59/279)	13% (35/280)	10% (27/273)
Clinical and applied	81% (78/96)	67% (64/95)	76% (73/96)	27% (26/96)	38% (36/96)	21% (20/96)	32% (31/96)	25% (24/96)	10% (10/96)	15% (13/87)
Public health	81% (81/100)	60% (59/98)	65% (65/100)	29% (29/99)	33% (33/100)	18% (18/99)	42% (42/100)	29% (29/100)	8% (8/100)	6% (5/89)
Health service	75% (18/24)	67% (16/24)	60% (15/25)	25% (6/24)	24% (6/25)	29% (7/24)	28% (7/25)	32% (8/25)	0 (0/25)	15% (3/20)
	F(3, 496), 5.866; $P = 0.001$	F(3, 491), 0.390; $P = 0.760$	F(3, 496), 3.489; $P = 0.016$	F(3, 495), 4.440; $P = 0.004$	F(3, 497), 0.949; $P = 0.417$	F(3, 493), 3.222; $P = 0.022$	F(3, 497), 1.179; $P = 0.317$	F(3, 496), 1.965; $P = 0.118$	F(3, 497), 10.262; $P < 0.001$	F(3, 465), 1.072; $P = 0.361$
Sex										
Male	89% (213/238)	69% (163/237)	72% (171/238)	26% (61/236)	33% (79/238)	19% (45/236)	34% (80/238)	24% (57/238)	9% (21/238)	12% (28/225)
Female	82% (216/262)	57% (148/258)	75% (197/262)	24% (63/263)	38% (99/263)	17% (44/261)	38% (101/263)	24% (63/262)	12% (32/263)	8% (20/244)
	$t = 2.386$; df = 498; $P = 0.017$	$t = 2.213$; df = 493; $P = 0.027$	$t = -1.558$; df = 498; $P = 0.120$	$t = -0.202$; df = 497; $P = 0.840$	$t = -0.680$; df = 499; $P = 0.497$	$t = 0.915$; df = 495; $P = 0.361$	$t = -1.809$; df = 499; $P = 0.071$	$t = 1.025$; df = 498; $P = 0.306$	$t = -0.819$; df = 499; $P = 0.413$	$t = 2.515$; df = 467; $P = 0.012$

* Statistical analyses are based on the full sample, not just those responding "very" or "extremely".
NSW = New South Wales; WA = Western Australia; SA = South Australia.
Respondent numbers may vary because of "don't know" responses treated as missing data.

3 Respondents who rated publications, patenting, and the creation of new businesses as "very" or "extremely" important potential research outcomes*

Researchers	Publications	Patents	New businesses
All researchers	87% (436/500)	25% (126/499)	19% (94/501)
State			
NSW	85% (118/139)	22% (30/138)	9% (13/139)
Victoria	87% (180/208)	29% (61/207)	25% (51/208)
WA	87% (47/54)	19% (10/54)	19% (10/54)
SA	91% (62/68)	24% (16/68)	24% (16/68)
	F(3, 465), 0.570; $P = 0.635$	F(3, 463), 1.054; $P = 0.368$	F(3, 465), 1.785; $P = 0.149$
Organisation			
University	90% (240/268)	18% (49/267)	13% (36/268)
Research institute	87% (178/204)	29% (60/204)	22% (45/205)
	$t = 1.896$; df = 470; $P = 0.059$	$t = -3.552$; df = 469; $P < 0.001$	$t = -2.214$; df = 471; $P = 0.027$
Researcher			
Laboratory	91% (254/279)	30% (85/280)	20% (55/280)
Clinical and applied	85% (82/96)	34% (33/96)	27% (26/96)
Public health	81% (81/100)	8% (8/99)	11% (11/100)
Health service	76% (19/25)	0 (0/24)	8% (2/25)
	F(3, 496), 5.335; $P = 0.001$	F(3, 495), 26.001; $P < 0.001$	F(3, 497), 8.550; $P < 0.001$
Sex			
Male	89% (210/237)	24% (58/238)	20% (47/238)
Female	86% (226/263)	26% (68/261)	18% (47/263)
	$t = -0.222$; df = 498; $P = 0.824$	$t = -0.143$; df = 497; $P = 0.886$	$t = -0.441$; df = 499; $P = 0.659$

* Statistical analyses are based on the full sample, not just those responding "very"or "extremely".
NSW = New South Wales; WA = Western Australia; SA = South Australia.
Respondent numbers may vary because of "don't know" responses treated as missing data. ◆

researchers surveyed (51/500) being "very" or "extremely" satisfied (Box 1B).

Infrastructure

Infrastructure and support was rated by 90% of respondents (449/501) as "very" or "extremely" important to their role as health and medical researchers (Box 1C). There were significant differences in opinion among types of researchers, with infrastructure and support rated as more important to laboratory and clinical and applied researchers than to health service researchers. While 56% of all researchers surveyed (279/501) were satisfied with the level of infrastructure and support, only 21% (104/501) were "very" or "extremely" satisfied. Researchers within independent medical research institutes were significantly more satisfied with current levels of infrastructure and support than university-based researchers (Box 1D).

Motivators for researchers

The excitement of discovery was rated as "very" or "extremely" important by 86% of all respondents (429/500), highest in male and laboratory researchers. Similarly, researchers derived high satisfaction from this aspect of their role with 63% (311/495) "very" or "extremely" satisfied. Satisfaction was higher for university, South Australian and male researchers (Box 2).

Career path was viewed as "very" or "extremely" important by 74% of all respondents (368/500) and was especially important to laboratory and clinical and applied researchers. While 63% of all researchers (316/499) were satisfied with their career path, only 25% (124/499) were "very" or "extremely satisfied". Satisfaction with career path tends to be higher for public health researchers than for laboratory-based researchers (Box 2).

Of less importance to Australian health and medical researchers was salary, with only 36% (178/501) of all respondents rating salary as "very" or "extremely important". Across states, salary tended to be more important to researchers based in Victoria and Western Australia. Researchers were generally satisfied with their level of salary with 69% of all respondents (342/497) being at least satisfied, while only 18% (89/497) were "very" or "extremely satisfied". Laboratory researchers were on average the least satisfied with their salary (Box 2).

Community recognition was "very" or "extremely important" to 36% of all respondents (181/501), particularly those based in Victorian organisations. Seventy-nine per cent of all respondents (393/500) were satisfied with the level of community recognition they received (Box 2).

While the potential for personal wealth arising from commercialisation was considered to be of low importance by 65% of all respondents (328/501 answered "unimportant" or "very unimportant"), it tended to be more important to researchers from Victoria, to laboratory and clinical and applied researchers, and to researchers based in independent medical research institutes. Male researchers tended to be more satisfied with the potential for personal wealth creation than their female colleagues (Box 2).

Research outcomes: publications, patents and the creation of new businesses

Researchers' views of the importance of various potential research outcomes and statistical analyses are shown in Box 3. While 87% of respondents (436/500) viewed publications as a "very" or "extremely" important potential outcome of health and medical research endeavour, publication output tended to be more important to laboratory and university researchers. The patenting of research discoveries and the creation of new businesses as potential research outcomes tended to be more important to researchers based in independent medical research institutes and less important to public health and health service researchers.

DISCUSSION

The adequacy of funding and the level of infrastructure support remain the two most critical concerns for Australian health and medical researchers, despite increased research funding which followed the Wills Report. Health expenditure in Australia for

2002–03 totalled some $72.2 billion — 9.5% of gross domestic product (GDP).[6] However, Australian health and medical research expenditure as a percentage of GDP ranks well below the Organisation for Economic Co-operation and Development (OECD) average.

A key recommendation of the 2004 Investment Review of Health and Medical Research (The Grant Report)[7] was that government investment through the Wills funding package has started to deliver results, and that further increases in funding for health and medical research will yield similarly considerable health benefits and economic dividends.[8] Views on funding expressed by survey participants are consistent with those from the 1999 ASMR survey. However, the extent of researcher dissatisfaction with funding highlighted in our survey is more pronounced, given the federal government's doubling of the NHMRC budget since 1999.

While arguments for health benefits and economic return carry much weight within the research sector in Australia and offshore,[9-13] governments will require strong support from tax payers to maintain this investment growth. Opinion polls show that there is strong public support for increased government investment in health and medical research. Further, many Australians would prefer to have surplus government funds invested in health and medical research rather than receive a tax cut.[14] A 2005 opinion poll shows that nearly all of those surveyed believe that federal government funding for health and medical research should exceed the 0.12% of GDP allocated in 2003.[15] This finding lends further support to the Grant Report recommendation to increase government investment to the OECD average of 0.2% of GDP, thereby increasing overall government investment to $1.8 billion by 2008–09.[7]

As more public money is spent on research, there is increasing emphasis on documenting research outcomes, on research performance benchmarking, and on the adequacy of research governance.[16] There are warning signs that research funding might not always increase,[17] and value-for-money and appropriate selectivity in research funding will be essential to justify further increases in research spending.

The second major concern for Australian health and medical researchers is the adequacy of infrastructure support. While funding has increased since 1999, there has not been a parallel proportionate increase in infrastructure support. Recent Department of Education, Science and Training reviews similarly attest to the level of concern that exists about adequate infrastructure and the further investment required.[18,19] While independent medical research institutes have argued that they are disadvantaged by not being eligible for Australian Government infrastructure funding schemes,[20,21] our findings suggest that researchers based at independent medical research institutes were more likely to feel satisfied with the level of infrastructure and support available compared with their colleagues at universities. The Grant Report urged that overall infrastructure funding be increased for both universities and medical research institutes to sufficient and effectual levels to meet the real costs of research.[7] In response, the government last year announced new infrastructure funding for medical research institutes, commensurate with funding provided to universities via the Research Infrastructure Block Grants scheme. University infrastructure funding was not adjusted at the same time.

Researchers are predominantly motivated by the excitement of discovery, rather than salary, community recognition or the potential for personal wealth from the commercialisation of their discoveries. Publications are viewed as a more important research outcome than the patenting of research findings or creation of new businesses. Presently, publications constitute 10% of the research block funding provided by the Australian Government to universities as part of its Institutional Grants Scheme and the Research Training Scheme formulae. While some observers view this component more as a measure of productivity rather than research impact,[22-24] publications have been retained as a measure of research output in funding formulae.[25] The high rating placed on publications compared with the low weighting in terms of funding suggests that researchers themselves value publications as an important output and benefit of their research careers. The slightly greater emphasis on the importance of generating publications by university researchers may, in part, reflect the fact that these form a specific component of the government funding of universities in Australia.

Our study had certain limitations. Views were sought from researchers working in organisations who were members of Research Australia, which might include certain biases. There was also relative underrepresentation of certain research types such as health service and hospital-based researchers, so that conclusions about those groups may be less reliable. In addition, interstate comparisons are limited by small numbers in some states.

A future study could explore the views of health service researchers in light of the Grant Report recommendation[7] for specific additional investment in policy and practice-focused research. The strength of our study however, is that it explores the effect of the post-Wills funding increases, through the opinions of researchers themselves, in the environments in which they conduct their research. Our study is a timely assessment as health and medical research funding increases near their completion, and future investment strategies are yet to be implemented.

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COMPETING INTERESTS

None identified.

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