An Australian Government Initiative

Women in STEM Ambassador

Gender differences in Australian research grant awards, applications, amounts, and workforce participation

RESEARCH BRIEF

UNSW SYDNEY

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EXECUTIVE SUMMARY

Our research examined gender differences in Australian government-funded competitive research grants. Specifically, we examined twenty years (2000–2020) of awarded grants and funding amounts according to the gender of the lead investigator. We also explored if observed gender differences in awarded grants mirrored application rates and/or research workforce participation by gender. The dataset contained 46,912 grants awarded by the Australian Research Council (ARC) and the National Health and Medical Research Council (NHMRC). We incorporated grant application data and research workforce data. We accounted for factors such as the career seniority of the lead investigator and the field of research.

KEY FINDINGS

We found that fewer awarded grants were led by women than by men. Overall, success rates of grant applications did not vary according to the gender of the lead investigator. There were fewer women than men in the research workforce. The award rate (the number of awarded grants relative to workforce participation) was slightly higher for women than men. Most of the gender differences were largest at senior-career levels.

Together these patterns yield a research ecosystem in which fewer women in the research workforce and leading grant applications likely result in fewer awarded grants led by women than by men. This pattern emerges despite a disparity in award rates favouring women.

Gender differences in awarded grants reduced over time. This trend over time differs by career seniority.

Gender differences in awarded grants varied by field of research. Proportionally fewer awarded grants were led by women in chemical sciences, mathematical sciences, earth sciences, engineering, technology, and physical sciences. These gender differences broadly mirror differences in application rates and workforce participation rates within each field of research.

Funding amounts per awarded grant did not vary by the gender of the lead investigator. Cumulative funds awarded to women-led grants were lower ($7.4 billion) than cumulative funds awarded to men-led grants ($19 billion) – an outcome driven by numerically fewer awarded grants being led by women.

CONCLUSIONS

Gender differences in awarded Australian competitive government grants mirror unequal workforce participation.

To resolve these differences, barriers to women's entry and, more critically, retention and progression in the research workforce need to be addressed. The responsibility to remove barriers rests with several entities. We offer recommendations for higher education and research institutions, government, and research funders.

INTRODUCTION

Worldwide, gender differences in the outcomes of competitive grant programs exist, though the evidence is mixed, and the nature and source of these differences remain unclear.

Research has found women are less likely to apply for grants[1-3], are awarded fewer grants[1-4], and receive lower funding amounts per grant than men[3-6, i].

Gender differences, however, are not always observed. At least in some areas, women's success rates are comparable to those of men[3,7,8] — particularly for early career and first-time applicants[2]. In some cases, gender differences favouring women are observed[9]. Other factors influence the allocation of research grants, such as applicant institutional affiliation[10], career seniority[11,12] and field of research[13], which may intersect with gender to compound differences[14].

WHY WE DID THIS STUDY

We aimed to bring clarity to the mixed evidence on gender differences in research grants, specifically in Australian government-funded competitive research grants. The goal was to examine gender differences in research grant awards and applications. We also aimed to explore whether observed differences mirrored application rates or research workforce participation by gender.

We examined twenty years (2000–2020) of grants awarded by the Australian Research Council (ARC) and the National Health and Medical Research Council (NHMRC). We examined gender differences in awarded grants according to lead investigator gender against gender differences in grant application rates and research workforce participation rates. We also examined gender differences in funding amounts. We accounted for other factors, such as the academic level of the lead investigator (as a proxy for career seniority), the field of research and the research intensity of the host organisation[ii].

i In relation to existing research findings, we use the term 'women' for findings about female or women researchers and 'men' for findings about male or men researchers, in line with the language used in the reporting of that research. We acknowledge the limitations of binarising gender.

ii The research intensity of a host organisation is based on whether it is a member of Australia's Group of Eight leading, research-intensive universities (The Group of Eight, 2008).

ABOUT US

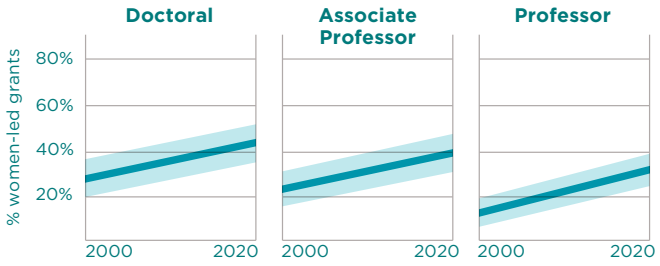
The Women in STEM Ambassador initiative was launched by the Australian Government in 2018 with the appointment of the inaugural ambassador, Professor Lisa Harvey-Smith. The Women in STEM Ambassador and her team conduct research, create resources and engage with stakeholders, including government, industry leaders, students, educators and research funding bodies. The work of the Ambassador supports and informs the STEM sector to make coordinated, research-backed efforts to improve equity.

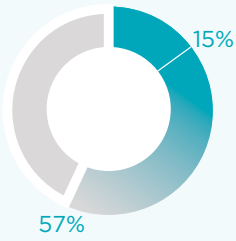
SUMMARY AT A GLANCE

The Office of the Australian Government's Women in STEM Ambassador conducted a study examining gender differences in Australian research grants over 20 years. The findings point to a complex issue that extends beyond granting systems: fewer women researchers mean fewer women applicants, leading to fewer women receiving grants. This pattern is particularly evident at senior levels and within certain fields of research. While there's been progress toward gender parity over time, gender differences remain.

GENDER GAP IN GRANTS:

Women led fewer grants, especially at senior career levels. But there's hope: the percentage of women-led grants increased across all career levels from 2000 to 2020.





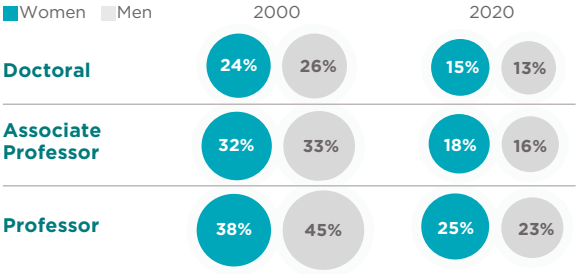
% of grant led by women varied by field

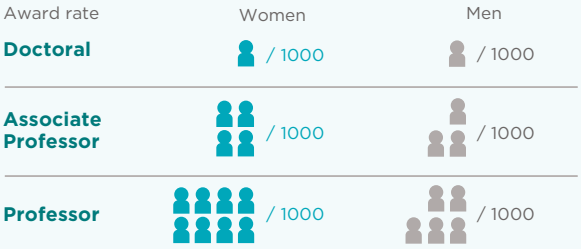
GRANTS BY RESEARCH FIELD:

In research fields like chemical and mathematical sciences, women led only 15% of grants. The gender gap in awarded grants varied across 22 different fields.

APPLICATION AND SUCCESS RATES:

Fewer women applied for grants, but success rates were equivalent for women and men. However, success rates have roughly halved for everyone over the past 20 years.





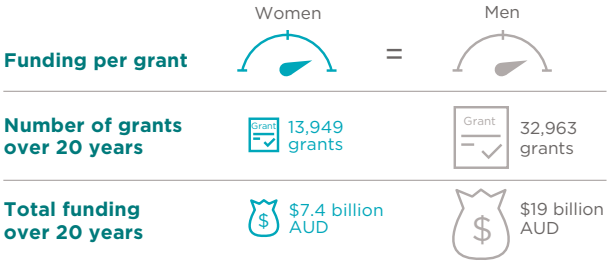
WORKFORCE PARTICIPATION RATES:

There are fewer women in the research workforce, especially at senior levels. Interestingly, women's award rates* were higher than men's, especially at senior career levels.

* The number of awarded grants relative to workforce participation

FUNDING EQUALITY WITH A TWIST:

Women and men received the same amount of funding per grant. But the overall difference accumulated, with fewer women-led grants resulting in a large gap in total funds.



The sector needs collaborative efforts to break down barriers to women's entry and, more critically, retention and progression in the research workforce.

In relation to the study data, we use the term 'women' for gender data classified as female and 'men' for gender data classified as male. We acknowledge the limitations of binarising gender.

WHAT WE DID

ABOUT THE DATA

The awarded grants dataset comprised existing data records sourced from the Australian Research Council (ARC) and the National Health and Medical Research Council (NHMRC) spanning twenty years (2000–2020). The dataset included grants awarded to projects, fellowships, and centres for research. The awarded grants dataset did not include investigators' self-identified gender (unavailable publicly and not shared by the ARC or NHMRC due to privacy concerns). We thus inferred the likely gender of each lead investigator as 'woman' or 'man' [iii] based on their first name using the *genderize.io*[15] application.

We acknowledge the limitations of inferring gender based on first name, including the binarisation of a nonbinary construct and risks of misgendering investigators[16]. However, we argue that this method is suitable for the purposes of this research, which examines potential disparities stemming from the *perceived* gender of an investigator by grant application assessors[17,18]. Our method does not exclude nonbinary investigators but instead captures potential bias involving them due to the likely assumption of *binary* gender on the basis on name by grant application assessors[19].

After data processing, the final dataset, including inferred gender and academic level of the lead investigator, the project field of research, and the research intensity of host organisation, contained 46,912 awarded grants (ARC = 28,211; NHMRC = 18,701).

The application rates dataset was sourced from the ARC (2002-2020) and NHMRC (2010-2021). The application rates aggregated and processed dataset included the self-reported gender and academic level of the lead investigator, and the project's field of research.

The research workforce participation dataset was sourced from the Excellence in Research for Australia (ERA) 2015 and 2018 National Reports, with background data supplied by the ARC. The research workforce dataset included self-reported gender and academic level of academic staff by field of research.

iii In relation to the analysed data, we use the term 'women' for gender data classified as female and 'men' for gender data classified as male. We acknowledge the limitations of binarising gender, as mentioned in the 'About the data' section of this report.

HOW WE ANALYSED THE DATA

We analysed the data using a regression approach; a given outcome was predicted by several key variables[iv].

For awarded grants, the model predicted the likelihood of an awarded grant being led by a woman vs. a man according to year, academic level, and field of research. The analysis of application and research workforce rates included the same predicting variables.

For funding amounts, the model predicted the awarded grant amount by lead investigator gender, year, academic level, field of research, and research intensity of the host institution.

All procedures undertaken in this research were approved by the UNSW Sydney Human Research Ethics Committee (Approval HC3468).

iv For awarded grants (by gender) and funding amounts, a pre-analysis model identified the variables that significantly predicted the outcome on a subset of the data. Then, an analysis model assessed whether those selected variables predicted the outcome on the remaining data. This process yielded a different set of predictors for each of the two outcomes. Note funding body (ARC vs. NHMRC) was not a significant unique predictor of awarded grants or amounts.

RESULTS

The results reported below are all estimates from our modelling, which accounts for the key variables outlined above; they are not raw percentages. We present raw numbers related to applications and workforce participation in break-out boxes for context. We describe statistically significant effects ($p < .05$) in terms of differences or changes (for trends over time) and describe statistically non-significant effects in terms of equivalence.

GENDER DIFFERENCES IN AWARDED GRANTS

Gender differences in awarded Australian competitive research grants exist, especially among senior-career researchers. Fewer awarded grants were led by women than by men. This gender difference increased with increasing career seniority.

The estimated percentage of grants led by women, accounting for other variables in the model and by academic level, is[v]:

- 36% among doctoral-level researchers
- 30% among associate professors
- 21% among professors.

GENDER DIFFERENCES IN AWARDED GRANTS OVER TIME

The percentage of women-led grants rose over time across the 20-year period of 2000–2020.

This trend over time differed by career seniority. Our model estimated that the percentage of awarded grants led by women over the last two decades rose:

- from 29% in 2000 to 42% in 2020 among doctoral-level researchers
- from 21% in 2000 to 40% in 2020 among associate professors
- from 14% in 2000 to 30% in 2020 among professors.

Even in 2020, the percentage of awarded grants led by women at each academic level still remained well below gender parity.

v In relation to the analysed data, we refer to academic levels A-C as 'Doctoral', level D as 'Associate Professor', and level E as 'Professor'.

GENDER DIFFERENCES IN AWARDED GRANTS RELATIVE TO APPLICATION RATES

The gender differences in awarded grants found in this study broadly reflect gender differences in the lead investigators of grant applications. We report the results of this model in terms of success rates (i.e., the rate of awarded grants relative to the rate of applications, by gender).

Overall, applications led by women had roughly equivalent success rates to those led by men. Overall, success rates roughly halved for all researchers over the 20-year period. The degree of decline varied by career seniority and gender. Model estimated success rates declined:

- from 24% in 2000 to 15% in 2020 for women-led applications, and from 26% in 2000 to 13% in 2020 for men-led applications among doctoral-level researchers
- from 32% in 2000 to 18% in 2020 for women-led applications, and from 33% in 2000 to 16% in 2020 for men-led applications among associate professors
- from 38% in 2000 to 25% in 2020 for women-led applications, and from 45% in 2000 to 23% in 2020 for men-led applications among professors.

These results suggest that gender differences in awarded grants do not stem from differences in success rates. Fewer awarded grants were led by women because fewer grant applications were led by women.

Fewer grant applications were led by women (raw numbers)

Across 2000-2020, there were 63,639 fewer grant applications led by women, comprising:

- **21,988 fewer applications led by women among doctoral-level researchers**
- **11,758 fewer applications led by women among associate professors**
- **29,893 fewer applications led by women among professors.**

GENDER DIFFERENCES IN AWARDED GRANTS RELATIVE TO WORKFORCE RATES

Award rates (the number of awarded grants relative to workforce participation) were higher for women than men, though this pattern varied by career seniority.

The gender disparity in award rates favouring women was particularly strong among senior career researchers, with estimated award rates per year:

- 1/1000 for women and 1/1000 for men among doctoral-level researchers
- 4/1000 for women and 3/1000 for men among associate professors
- 8/1000 for women and 5/1000 for men among professors.

Despite the disparity in award rates favouring women, fewer women in the research workforce and leading grant applications likely resulted in fewer awarded grants led by women.

Fewer women in the workforce (raw numbers)

There were 16,799 fewer women than men in the research workforce*, comprising:

- **2,804 fewer women than men doctoral-level researchers**
- **4,358 fewer women than men associate professors**
- **9,637 fewer women than men professors.**

*averaged across both available years of data: 2014 and 2017

GENDER DIFFERENCES IN AWARDED GRANTS BY FIELD OF RESEARCH

Gender differences in awarded grants varied by field of research. The percentage of awarded grants led by women for each field of research, in order of disparity starting with the largest disparity against women, is:

- 15% for chemical sciences
- 15% for mathematical sciences
- 16% for earth sciences
- 16% for engineering
- 16% for technology
- 17% for physical sciences
- 18% for agricultural and veterinary sciences
- 19% for information and computing sciences
- 22% for environmental sciences
- 24% for built environment and design
- 25% for economics
- 26% for biological sciences
- 31% for commerce, management, tourism, and services
- 32% for philosophy and religious studies
- 33% for unclassified NHMRC grants (missing field of research)
- 36% for medical and health
- 39% for psychology and cognitive sciences
- 45% for studies in human society
- 48% for history and archaeology
- 50% for language, communication, and culture
- 50% for education
- 54% for studies in creative arts and writing
- 57% for law and legal studies

These gender differences in awarded grants broadly match differences in application and workforce participation rates within each field of research.

GENDER DIFFERENCES IN FUNDING AMOUNTS

Our model estimated that women-led grants were awarded the same amount of funding per grant as men-led grants. Funding amounts of women-led and men-led grants did not differ within a given academic level or over time. Irrespective of the gender of the lead investigator, funding amounts per grant increased with increasing seniority of the lead investigator. Specifically, our model estimated that:

- women-led grants received 90% [vi] of the yearly scheme median.
- men-led grants received 91% of the yearly scheme median.

Despite an overall pattern of equivalent funding amounts per grant within a scheme and year, there is a large disparity in cumulative funding amounts over two decades. Of the $26.4 billion awarded by the ARC and NHMRC from 2000 to 2020, $7.4 billion was awarded to women-led projects and $19 billion to men-led projects. The accumulated difference across 20 years was $11.6 billion less awarded to women-led projects, $5.9 billion of which was among professors. Fewer women than men in the research workforce and leading grant applications, especially at the highest levels of seniority, contributed to this large cumulative gender difference in funding.

vi We standardised funding amounts per scheme per year. Values represent the average (%) funding amount relative to the scheme yearly median received in an average year.

CONCLUSION

Fewer women than men in the research workforce and leading grant applications may drive fewer awarded grants led by women. This pattern emerges despite a disparity favouring women in award rates. Therefore, gender differences in awarded Australian competitive government research grants mirror unequal workforce participation.

Bold, coordinated action will likely yield the most impact in dismantling entrenched gender inequity in research. Only when the whole sector comes together to contribute solutions across the research ecosystem will we see genuine, sustainable progress towards gender equity.

RECOMMENDED ACTIONS

Our findings show that fewer awarded grants led by women reflect fewer women than men in the research workforce.

To resolve these gender differences, women's entry and, more critically, retention and progression in the research workforce need to be addressed. Barriers to women's entry, retention, and progression have been extensively documented[20]. The responsibility to remove barriers rests with several entities, including higher education and research institutes, government and research funders.

HIGHER EDUCATION AND RESEARCH SECTOR

Higher education and research institutes have social and legal responsibilities to provide environments where all researchers have an equal opportunity to excel. We recommend that institutions implement evidence-based workplace gender equity initiatives, such as inclusive recruitment practices[21,22], gender-equal hiring at all levels[23], extending recruitment shortlists to include more women candidates[24, 25], retention targets of gender-equal departures relative to cohorts[23], appointment targets for women to senior positions[23], and organisational structures that embed accountability, authority and expertise (*e.g.,* equity action plans, diversity committees and departments)[26]. Combining initiatives is likely to accelerate outcomes[23].

One important action that higher education and research institutes can take is to seek gender equity accreditation from programs such as the Athena SWAN Charter[27] (established in the UK, Australia, Ireland, the US and Canada). The Athena SWAN Charter provides a framework to identify and address inequities[28,29] and can accelerate the increase of women in leadership positions[30].

RESEARCH FUNDING BODIES

We recommend that research funding bodies strengthen employer accountability by incentivising gender equity initiatives. They can require applicants and/or applicants' institutions to provide gender equity and diversity plans or require relevant gender equity accreditation as funding eligibility criteria, an approach with documented success in increasing the number of women in mid-level leadership positions and the proportion of funding awarded to women[31].

Research funding bodies can also introduce mechanisms to counter the systemic disadvantage faced by women, non-binary people and people from other underrepresented groups in workplaces. These measures include requiring institutions to submit equal numbers of applications led by women and men, implementing women-only grant programs, funding additional high-quality 'near-miss' research applications led by women, and setting gender quotas. An example is the gender quota implemented by the NHMRC in 2022 to award half of its mid-career and senior-career fellowships to women and non-binary applicants.

Funding should be allocated for research to develop and assess the impacts of interventions addressing barriers to women's entry into, and retention and progression in, research careers. Predictive modelling[23] could help estimate future outcomes of specific interventions to inform decision-making and strategic investment.

GOVERNMENT

We recommend that governments implement policies that reinforce employer accountability for their social and legal responsibilities to provide safe, equitable working environments. Governments can require universities, medical research institutes and publicly funded research agencies to achieve gender targets and/or minimum relevant accreditation as eligibility criteria to receive government funds. Governments can continue to strengthen pay gap legislation[vii] and action to support wage equality, workplace safety initiatives to eliminate workplace sexual harassment, and family-work support policies such as gender-neutral paid parental leave entitlements, flexible work and childcare funding[viii].

vii Legislation such as the Australian Workplace Gender Equality Amendment (Closing the Gender Pay Gap) Bill 2023 (https://www.aph.gov.au/Parliamentary_Business/Bills_Legislation)

viii Policies such as those outlined in the Australian Government Budget 2023-24: Women's Budget Statement on 9 May 2023 (https://budget.gov.au/content/womens-statement/index.htm)

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