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DISCUSSION PAPER

Lack of Strategic Funding and Long-Term Job Security Threaten to Have Profound Effects on Cardiovascular Researcher Retention in Australia

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Background Cardiovascular disease is the leading cause of death in Australia. Investment in research solutions has been demonstrated to yield health and a 9.8-fold return economic benefit. The sector, however, is severely challenged with success rates of traditional peer-reviewed funding in decline. Here, we aimed to understand the perceived challenges faced by the cardiovascular workforce in Australia prior to the COVID-19 pandemic.

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Methods We used an online survey distributed across Australian cardiovascular societies/councils, universities and research institutes over a period of 6 months during 2019, with 548 completed responses. Inclusion criteria included being an Australian resident or an Australian citizen who lived overseas, and a current or past student or employee in the field of cardiovascular research.

Results The mean age of respondents was 42±13 years, 47% were male, 85% had a full-time position, and 40% were a group leader or laboratory head. Twenty-three per cent (23%) had permanent employment, and 82% of full-time workers regularly worked >40 hours/week. Sixty-eight per cent (68%) said they had previously considered leaving the cardiovascular research sector. If their position could not be funded in the next few years, a staggering 91% of respondents would leave the sector. Compared to PhD- and age-matched men, women were less likely to be a laboratory head and to feel they had a long-term career path as a cardiovascular researcher, while more women were unsure about future employment and had considered leaving the sector (all $p<0.05$). Greater job security (76%) and government and philanthropic investment in cardiovascular research (72%) were highlighted by responders as the main changes to current practices that would encourage them to stay.

Conclusion Strategic solutions, such as diversification of career pathways and funding sources, and moving from a competitive to a collaborative culture, need to be a priority to decrease reliance on government funding and allow cardiovascular researchers to thrive.

Keywords Cardiovascular • Workforce • Funding • Tender equity

Introduction

Cardiovascular disease (CVD) is the leading cause of death in Australia and worldwide. In Australia, CVD accounts for 30% of all deaths, causing one death every 12 minutes [1]. Major causes of death and disability include stroke, myocardial infarction and heart failure. Important risk factors for CVD, including high blood pressure, obesity and type 2 diabetes, are highly prevalent in the Australian population, but modifiable risk factors, such as smoking and hypertension, remain poorly managed [2]. CVD is Australia's second largest direct health care cost, amounting to $10.4 billion annually [3]. Similar results have been observed in the USA [4]. Despite this, there is a fallacious public perception that CVD has been 'beaten' and residual disease is primarily due to a self-induced, unhealthy lifestyle. While a poor lifestyle and ageing certainly play a role, 27% of individuals suffering a myocardial infarction have no standard risk factors [5,6], suggesting that the pathobiology of heart disease is not fully understood. Other under researched and unsolved examples include inherited forms of CVD, such as hypertrophic cardiomyopathy, which can cause sudden death in the youth [7]. Furthermore, over one million Australians aged 45–74 years have an absolute risk for a cardiovascular event in the next 5 years of 15% or greater but are not receiving optimal preventative care, and 68% of those with hypertension have unmanaged or uncontrolled blood pressure [8]. Together, this suggests that CVD continues to pose a significant individual and public health burden.

In 2014/15, CVD research received $16.8 million in research funding from non-government agencies and charities in Australia, while cancer, which is responsible for a similar number of deaths annually, received nearly 10-fold more ($160.5 million) [9]. Between 2013 and 2018, government funding for CVD in Australia has declined from $112.3 to $96.6 million, whereas cancer funding has remained stable at just under $180 million during this period [10]. This disparity in funding not only carries significant challenges for CVD researchers but also means that CVD remains a significant and unresolved societal, health and economical problem, which will only worsen with the ageing population.

The Australian Cardiovascular Alliance (ACvA) is a not-for-profit, incorporated entity, established in 2015. The ACvA aims to increase the visibility of CVD as a national health priority area, and to advocate for the importance of an integrated cardiovascular research sector to work with key stakeholders in federal and state jurisdictions towards solutions. A critical first step to improving CVD research is to understand the perceived challenges faced by the workforce. Here, we present the results of an online survey lead by the ACvA in 548 Australian cardiovascular researchers, which aimed to quantify the effect of the current research funding climate on CVD researchers in Australia.

Methods

This project was approved by the Monash University human research ethics committee (project 18123), and participants consented to take part in the study. We developed a questionnaire, which was promoted via email and social media to ACvA members, Australian cardiovascular societies and councils (e.g. High Blood Pressure Council of Australia, Cardiac Society of Australia & New Zealand, Australian Atherosclerosis Society), universities and research institutes between April and November 2019. The survey was inclusive of all discipline areas within cardiovascular research

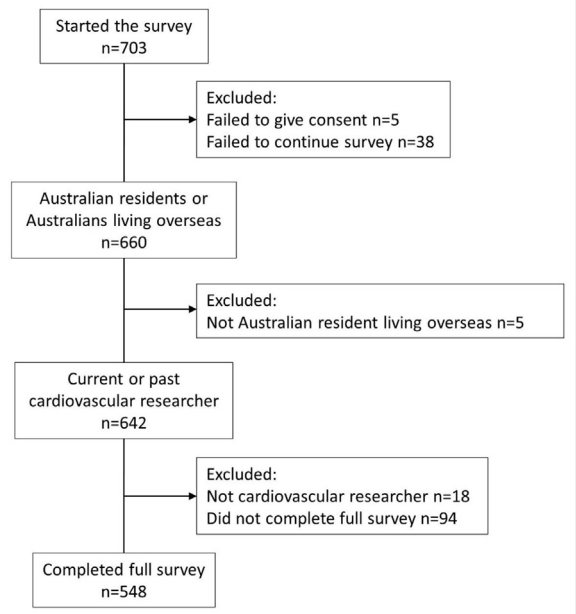

Figure 1 Flowchart of participation in the study.

(basic, clinical, public health) and professional training backgrounds (science, medical, nursing, allied health, public health). Anonymous data was collected using REDCap [11,12] (Vanderbilt University, Nashville, TN, USA), a secure online web application. Inclusion criteria included being an Australian resident or an Australian citizen who lived overseas, and a current or past student or employee in the field of CVD research. Five hundred and forty-eight (548) of the 703 participants who commenced the survey, completed and were included in the current study (80%, Figure 1).

Statistical analyses were performed using SPSS version 25 (IBM Corp., Armonk, NY, USA). Descriptive statistics and frequencies were analysed. Normal distribution was assessed using Skewness and Kurtosis tests. Gender differences were explored using Chi-square and two-tail independent sample Kruskal-Wallis (for non-parametric data), and differences tests using step-wise multiple regression analyses (enter: 0.15, removal: 0.2, variables included: age, gender, career disruption). Statistical significance was defined as $p<0.05$. GraphPad Prism (version 7) (GraphPad Software, La Jolla, CA, USA, http://www.graphpad.co/) package was used for graphing.

Results

Demographics and Cohort Characteristics

The characteristics of the respondents are shown in Figures 2A–C. The mean age of respondents was 42±13 years, 47% of were male, 85% had a full-time position, 40% were a group leader or laboratory head, and 44% worked overseas previously.

Funding

Respondent salaries were mostly awarded by their department or institutions (32%), research or training fellowships (25%) and supervisor's grants (19%) (Figure 3A). The main source of research and/or salary funding was the National Health and Medical Research Council (NHMRC, 49%), other sources (34%), and the National Heart Foundation of Australia (NHF, 16%) (Figure 3B). The majority (69%) of CVD researchers did not feel confident about the peer-review funding process of the NHMRC and the NHF, and 54% had the perception that clinical research received more funding than basic or public health research, with only 20% perceiving that they were all funded equally (Figure 3C). This was highly dependent on the field of research, with basic scientists perceiving that clinical research receives more funding (75%), while allied health scientists perceived that basic research gets more funding (42%).

Perceptions About Employment

Only 23% of participants had permanent, on-going positions, while 57% had fixed-term contracts and 5% had casual contracts (Figure 4A). Of those on fixed-term or casual contracts, 27% expired at the end of 2019. Twenty-five per cent (25%) of participants were not sure whether they had a similar employment arrangement in 2020. The majority (82%) of full-time researchers reported working more than 40 hours per week, with 17% saying they worked more than 60 hours per week (Figure 4B), but 87% received no form of compensation for over-time work (Figure 4C).

Impact on the CVD Research Sector

Sixty-eight per cent (68%) of CVD researchers considered leaving the CVD sector (Figure 4D), and 91% of respondents would leave the sector if their position could not be funded in the next few years. Sixty-one per cent (61%) said they felt they did not have a long-term career in CVD research. The main reasons for leaving included limited research funding (92%), lack of long-term job security (74%) and long hours (33%) (Figure 5A). Sixty-three per cent (63%) knew of others who had already left, 43% had considered moving overseas, 25% were currently changing research focus away from CVD research, and 27% were currently seeking alternative skills training.

Gender-Specific Issues

Amongst those with a PhD, there was no significant difference in age between genders (women 43±11 vs men 45±14 years, $p=0.183$). The following analyses were then performed comparing data of those with a PhD (n=386). Compared to men, women with a PhD were less likely to be a group leader or laboratory head (43% vs 59%, $p=0.003$), to have worked overseas in CVD research (44% vs 59%, $p=0.004$), and less likely to have considered leaving Australia to work overseas (31% vs 52%, $p<0.001$). Women were more likely than men to have had any type of career interruption (59% vs 12%, $p>0.001$), work part-time (21% vs 7%, $p<0.001$), be unsure

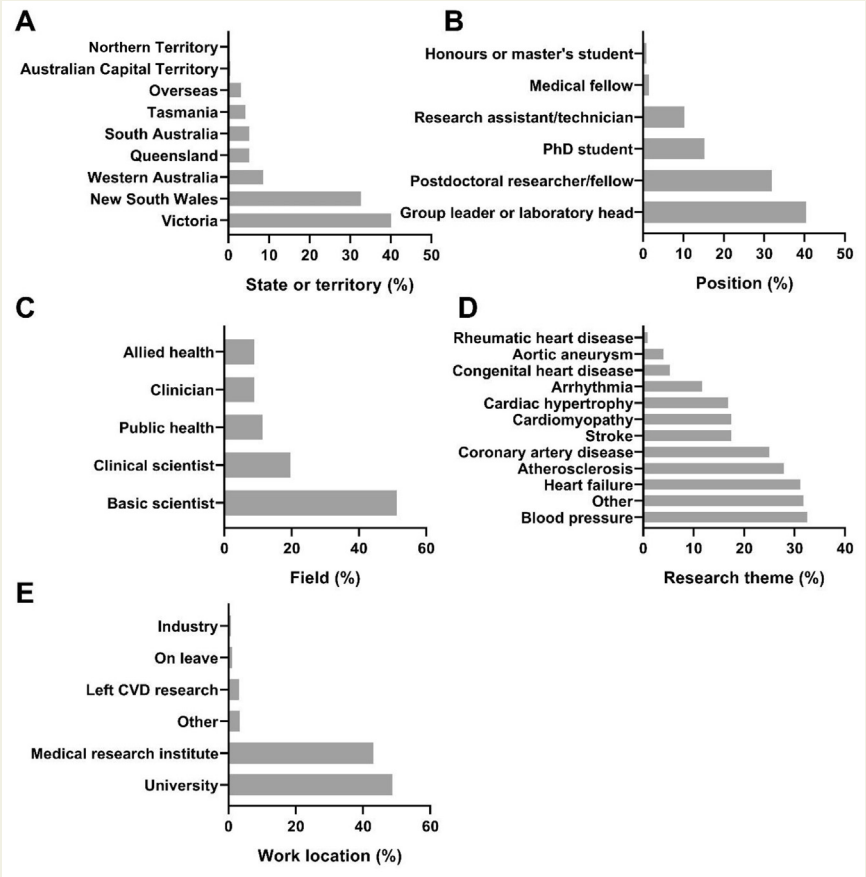

Figure 2 Characteristics of the participants who completed the survey. Showing rate (%) of response based on A. State and territory; B. Position; C. Field of research; and D. Research theme. E. Work location. Data shown as percentage of absolute numbers (n=548).

about employment in 2020 (30% vs 19%, p=0.001), have considered leaving CVD research (80% vs 66%, p=0.003) and felt they did not have a long-term career path as a CVD researcher in Australia (31% vs 46%, p=0.004). With the exception of having worked overseas, these results were validated in multiple regression analyses, even after adjustment for age and any type of career interruption (Table 1). While women were more likely to have applied for fellowship funding in the last 3 years (women 67% vs men 56%, p=0.038), there was no significant difference in the self-reported success rates of securing funding (53% vs 60%, p=0.237). Although major reasons for leaving CVD research, such as lack of job security and limited funding, were similar between men and women, women reported higher levels of poor working conditions (women 22% vs men 13%, p=0.039).

Identifying Mechanisms for Retention

Of those that had considered leaving the CVD research sector 53.3% said they would change their intention to leave if there was greater job security and 29.4% if there was improved work/life balance (Figure 5B). Women were more likely than men to change their intention to leave the sector if more professional development opportunities were available (women 25% vs men 14%, p=0.002), a healthier workplace culture was in place (26% vs 15%, p=0.002), better leadership and mentoring was available (20% vs 10%, p=0.003), there was improved work/life balance (36% vs 21%, p<0.001), a less challenging workload (23% vs 12%, p=0.002), and if onsite childcare was available (8% vs 2%, p=0.003).

Overall, the top initiatives that CVD researchers perceived would help increase retention in the sector were greater job security (76%) and investment in CVD research (72%, Figure 5C). The perception that gender equity needs to be addressed was, significantly higher in women (29%) compared to men (7%, p<0.001), as was greater job security (women 59% vs men 47%, p=0.007) and promotion (15% vs 10%, p=0.048), while men valued job mobility more (2% vs 9%, p<0.001).

Discussion

Despite the significant health and economic burden of CVD, our survey has objectively demonstrated the impact of the challenging funding conditions and lack of job security. This results in considerable pressure on the sustainability of the CVD research sector to provide innovative solutions for our

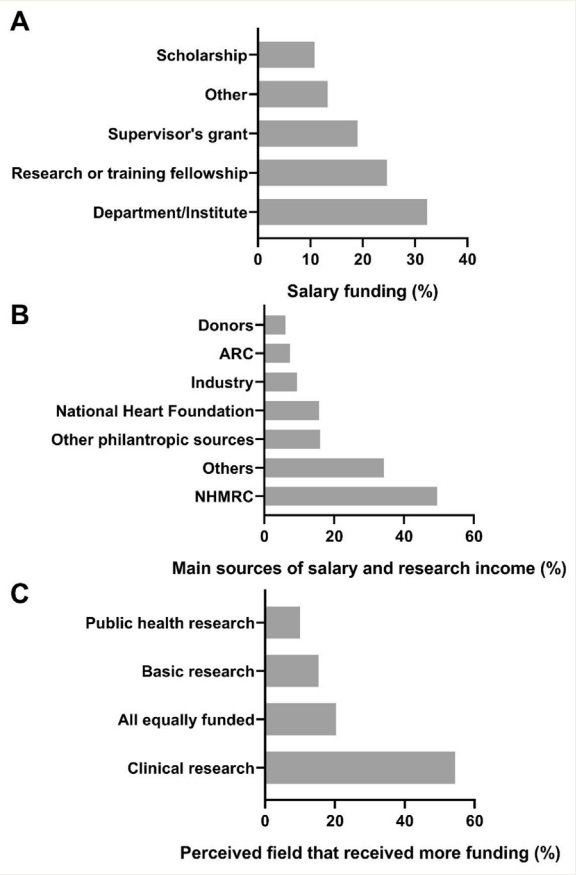

Figure 3 Funding received by Australian cardiovascular researchers. A. Salary funding origin; B. Main sources of research and salary funding; C. Perception of which field receives more funding. Data shown as percentage of absolute numbers (n=548).
Abbreviations: ARC, Australian Research Council; NHMRC, National Health and Medical Research Council.

greatest health challenges. Strategic solutions are urgently required.

Short-term contracts and consequential uncertainty about future employment, long-working hours with no compensation for overtime, and high dependence on government schemes with low success rates are driving CVD researchers away from the cardiovascular research sector, with >90% saying they would leave the sector if their position could not be funded in the next few years. These numbers appear significantly worse for CVD researchers compared to Australian researchers in general [13] and medical researchers overall [14]. These findings indicate that strategies to address the lack of job security and gender issues, including an injection of funding into CVD research sector in Australia, are urgently required. As a consequence, this would increase the capacity of the cardiovascular workforce. Ultimately, this would result in critical findings that would decrease rates of CVD in our community, expand the life quality and expectancy of those living with CVD, and have a sizable economic impact on the Australian economy.

Significant gender specific issues emerged in our survey, and it appears that the limited research funding is having a greater impact on female CVD researchers. Women were less likely than men to be in leadership positions, whilst more likely to be unsure about future employment and to consider leaving the sector. Strategies to improve retention in the Australian CVD research sector highlighted by female participants included increased professional development opportunities, a healthier workplace culture, better leadership and mentoring, improved work/life balance, and availability of onsite childcare. These, however, would not benefit only CVD researchers. National programs, such as the Athena SWAN Science in the UK [15] and the Science in Australia Gender Equity (SAGE) in Australia [16], are now in place to address the gender inequity across science, technology, engineering, mathematics, medicine (STEMM) fields. Alongside long-term job security and further strategic investment in research funding, gender equality needs to be made a priority in the CVD sector in Australia.

The cardiovascular sector needs to work with government and community stakeholders to address the challenges identified in this survey. Whilst the Australian Government funded $1,309 million dollars in health and medical research grants in 2019–2020, this equates to only 0.7% of total health expenditure (~$185 billion) [17–19]. Increasing the overall investment in health and medical research in Australia to 3% of total health expenditure would result in $58 billion in health and economic benefits and create 60,000 new jobs [14]. This is a conservative estimate based on overall health and medical research data. However, the benefit-cost ratio of investment in CVD research is estimated to be more than double the average economic returns for medical research (which is already high), with $9.80 returned for every dollar invested [20]. This is on top of the impressive return on investment that is seen in regard to direct health benefits, outperforming any other sector in medical research, and without taking into account opportunity costs (i.e., foregone benefits) that not investing in CVD research would generate. For example, reducing 2% of the direct costs of CVD through innovative approaches to primary and secondary prevention would result in a yearly $173 million saving [9]. This could be invested in innovation pipelines generating further savings for the health care system and new sources of technological, economic growth and prosperity. Thus, there is considerable opportunity to work with both federal and state government to demonstrate this impact.

The Australian government has recently invested $220 million in the 10-year Mission for Cardiovascular Health, recognising the potential of Australian cardiovascular researchers to have transformative impact on cardiovascular health [21,22]. The goals of the Mission are ambitious: to create a "world class sustainable eco-system underpinned by excellence, collaboration, innovation, consumer engagement and commercialisation, embedded in the health care

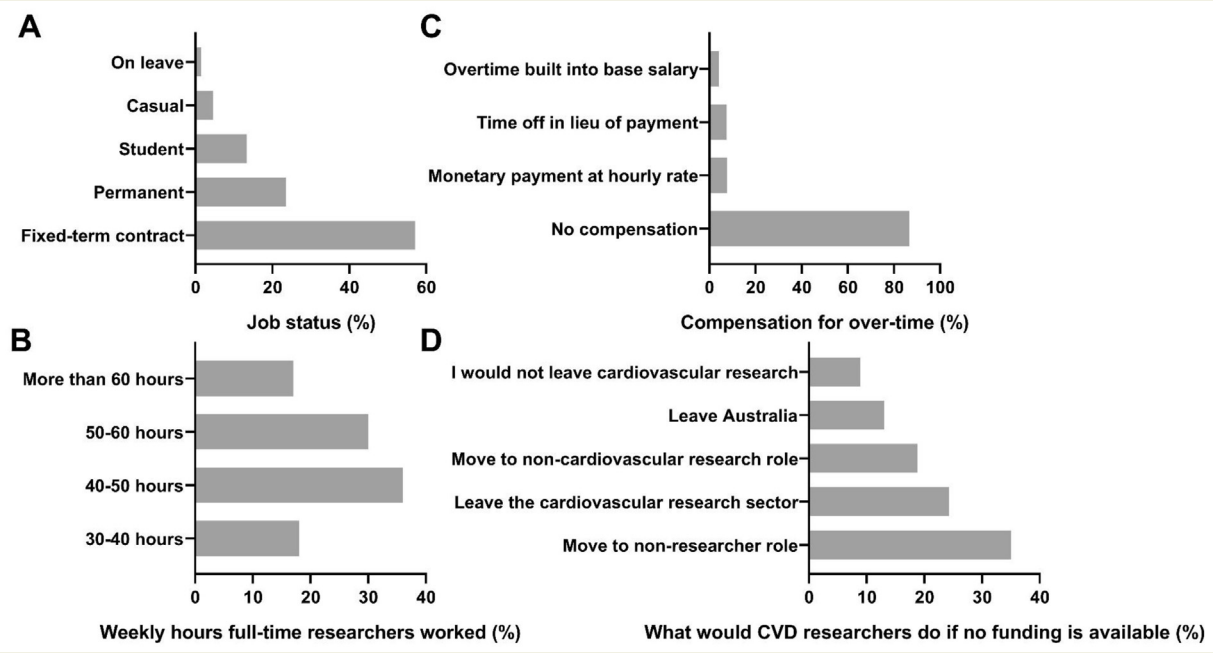

Figure 4 Employment and sector continuity of Australian cardiovascular researchers. A. Employment status; B. Number of hours worked by full-time researchers per week (n=455); C. Compensation for over-time work (n=455); D. Career path participants would take if their position could not be funded in the next years. Data shown as percentage of absolute numbers (n=548 unless stated otherwise).

system". The New South Wales (NSW) government had preceded this committing $150 million to building capacity in cardiovascular research in partnership with the collaborative platform of the NSW Cardiovascular Research Network [9]. These investments and the leadership shown by both governments have the potential to help reduce the challenges faced by CVD researchers, and support capacity in a much-needed area. Our findings, however, highlight critical issues requiring systemic changes to the current funding structure, such as diversification of research income, longer-term contracts, more permanent positions, longer funding cycles, and the development of long-term national collaborations to improve the translation of research findings. Complex and highly important problems requiring urgent attention to decrease the burden of CVD in our community need long-term continuity of funding and of expertise to facilitate discovery, translation and implementation of findings. Diversifying reliance on governmental funding bodies, increasing university and institute support funding, and strengthening relationships with industry may help to lessen the burden on an already strained system, as well as increase the impact of research [23]. Strategies include embedding whole-of-pipeline research teams in state and federal health departments, building platforms that are attractive to domestic and global industry with commercial outputs, and improving the community message to build a larger component of philanthropic funds [9]. These would enhance capacity building and reverse the brain drain identified by our survey. These are all opportunities that are being pursued by the ACvA [23], working closely with its researchers as well as its government, health, industry, and consumer members. A similar roadmap was highlighted in the 'Call to Action' by the American Heart Association [24].

It is important to highlight that the survey data was collected prior to the COVID-19 pandemic. Considering the increased burden on female researchers due to primary carer responsibilities and the economic distress of Australian universities and research institutes, issues highlighted here such as job insecurity and gender imbalances are likely to be further exacerbated now. Strategies to support researchers, particularly primary carers, during this period have been discussed elsewhere [25]. Considering also that patients with pre-existing CVD complications are more likely to die from COVID-19 compared to healthy individuals [26], the immediate need for investment in cardiovascular research and awareness is even more eminent.

While the survey was promoted via email to most Australian institutes and social media, there is a possibility that some groups of researchers were missed and did not complete the survey. Secondly, survey completion bias may have influenced our results as those most affected by the current funding situation may have been more inclined to complete the survey. That said, 73% of the respondents did have confirmed employment contracts for 2020 at a minimum. The survey options relating to current position were unclear for some respondents. For example, there was no option in the survey to select retired or higher positions than laboratory head. The distinction between group leader and

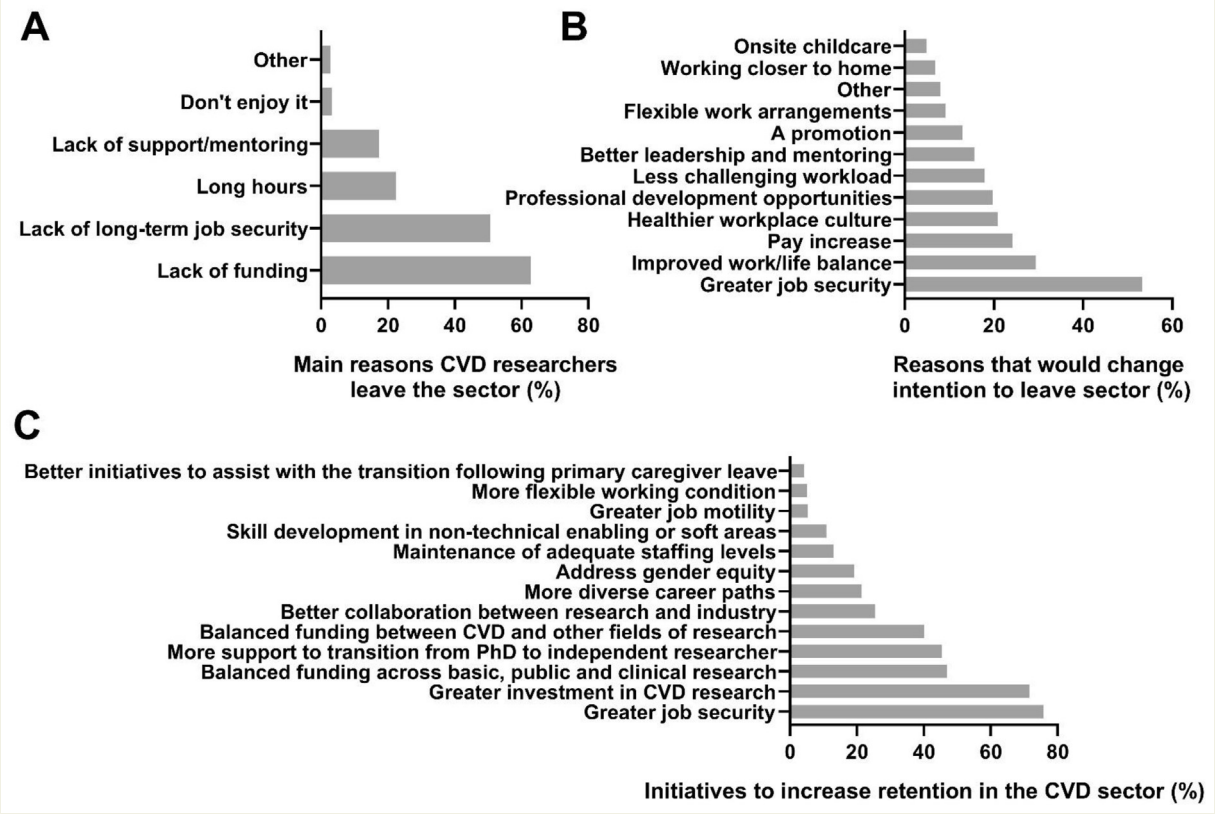

Figure 5 Solutions to improve retention of Australian cardiovascular researchers in the sector. A. Main reasons why researchers consider leaving; B. Strategies that would make them change their mind about leaving; C. Initiatives that researchers perceived would help increase retention in the sector. Data shown as percentage of absolute numbers (n=548). Abbreviation: CVD, cardiovascular disease.

Table 1 Differences between genders – results of multiple regression analyses.

Variable	P-value	β[a]	95% Confidence Interval
Be a group leader or laboratory head	<0.001	−0.82	1.74–5.95
Have had a career interruption**	<0.001	−2.43	0.05–0.15
Have considered leaving CVD research	0.003	−0.69	0.32–0.80
Work full-time	<0.001	0.96	1.19–5.52
Have considered leaving Australia to work overseas	<0.001	0.86	1.44–3.93
Uncertainty about a long-term career in CVD research	0.004	0.61	1.2–2.80

Total sample size: n=386, of which 198 were women and 188 were men.
Legend: Multiple regression analyses were adjusted for age and career interruption, with exception of ** which was only adjusted by age.
Abbreviation: CVD, cardiovascular disease.
[a]positive β indicates men were more likely and negative β indicates women were more likely (i.e. β = −0.82 indicates that women were less likely to be a group leader or laboratory head), P-value for gender.

laboratory head is unclear in some institutions, and thus we combined the two positions when analysing the data. We also did not ask any questions regarding unemployment.

Conclusion

Our study suggests that inadequate research funding and lack of long-term job security is likely to cause the CVD research workforce to shrink at a critical time, and to become increasingly siloed, reactive and dis-coordinated. Diverse and sustainable funding avenues are required to permit strategic leadership, collaboration, and long-term programs of research. Overall, increased strategic investment into the CVD research sector would allow for Australia's talented CVD researchers to drive solutions that will bring health, and as a result, economic benefits.

Competing Interests

All the authors are members of the Australian Cardiovascular Alliance board and/or Emerging Leaders Committee.

Conflict of Interest

There are no conflicts of interest to disclose.

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