



The Australian Health and Medical Research Workforce Audit

Department of Health and Aged Care

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Executive summary

Australia's estimated 39,690 health and medical researchers (HMR) are a key source of competitive advantage for the nation.

Understanding this workforce is crucial for its future support and development. This report provides insights into the size estimates, relative composition, employment transitions, and challenges facing the HMR workforce in Australia. The purpose of this report is not to conduct a census; rather to provide insights into segments and features of the workforce that have been poorly understood to date. The intent of this research is to supplement work that has occurred to date to support future policy development for the sector.

The HMR sector comprises both traditional and non-traditional researchers, with a small group working across both areas.

Of the total workforce, 65% work in traditional research settings such as universities and Medical Research Institutes, while 33% are employed in non-traditional research roles, such as the private sector or clinical space. A small proportion, 2%, work across both sectors. This diversity in research settings contributes to a rich ecosystem of scientific inquiry and innovation.

Additionally, there are approximately 19,700 inactive researchers who previously worked in HMR, representing a pool of experienced talent that have gone on to contribute to diverse sectors across the economy. Thirty-one per cent of inactive researchers move into roles in the public sector. Universities continue to play a substantial role, retaining 21% of inactive researchers, possibly in non-research capacities.

Victoria leads in HMR workforce concentration, whereas there is underrepresentation of researchers in regional and remote areas.

Victoria employs 30% of the traditional HMR workforce and 32% of the non-traditional HMR workforce, higher than Victoria's share of the overall national workforce. Thirteen per cent of the HMR workforce is in regional, rural, or remote areas, highlighting the sector's reach beyond major cities and the potential for research impact across diverse Australian communities, however this lags the share of the national working population that resides in regional, rural, or remote populations, suggesting additional barriers exist for regional researchers.

Gender diversity remains a critical issue in the HMR sector, particularly at senior levels.

While 52% of the HMR workforce are women, their representation declines significantly with seniority. Women are well-represented in junior roles but account for only 25% of the most senior positions. This 'leaky pipeline' phenomenon is a persistent challenge for the sector.

Career interruptions disproportionately affect women. Fifty-five per cent of women experience an interruption, compared to 27% of men. Seventy-six per cent of interruptions experienced by women are due to parental leave. This highlights the need for policies and support systems that enable researchers, particularly women, to maintain their career progression while managing family responsibilities.

The HMR workforce is highly international, contributing to Australia's global research standing.

More than 40% of researchers were born overseas, bringing diverse perspectives and international connections to the Australian research community. Non-traditional researchers are more likely to have trained overseas (30%) compared to traditional researchers (21%), suggesting that the non-traditional sector may be more effective at attracting international talent.

International mobility is particularly common among traditional researchers, with 35% moving to Australia for a research job and 44% having worked overseas at some point in their careers. This high level of international engagement enhances Australia's participation in global scientific networks and collaborations.

Employment characteristics vary significantly between traditional and non-traditional sectors.

Universities dominate the traditional research sector, while the non-traditional sector has a mix of public and private employers, including pharmaceutical companies and biotechnology firms. However, job insecurity is a significant issue in the traditional sector, with 55% of researchers on fixed-term or casual contracts, compared to 31% in the non-traditional sector. This disparity in job security may contribute to movement from the traditional academic sector to industry or overseas opportunities.

Funding sources and challenges differ between sectors, but funding instability remains a common concern.

Federal government grants are the primary source for traditional researchers, while private sector funding is most common for non-traditional researchers. The lack of funding is cited as the main reason researchers consider leaving the field, followed by job insecurity and work-life balance. This highlights the need for more stable and diverse funding mechanisms to retain talent in the sector.

Inactive researchers go on to work in a range of areas of the Australian economy.

Developing an understanding of where researchers go after they leave the health and medical research sector demonstrates the important role that the sector plays in developing talent for the broader economy. More than 60% of individuals have moved from an active research role to inactive roles. Government emerges as the top destination for inactive researchers, employing 31% of inactive researchers. This suggests a substantial migration of research talent into public sector roles. Most inactive researchers remain in healthcare and social assistance (31%) or professional, scientific and technical services (27%). Other common industries are public administration and safety, and education and training. Universities continue to play a substantial role, retaining 21% of inactive researchers, possibly in non-research capacities.

There are opportunities to support Australia's diverse health and medical research workforce

This audit identifies several opportunities to maintain Australia's competitive edge in health and medical research, and ensure a robust, diverse, and sustainable research workforce:

- Improving job security and offering longer-term contracts, particularly in the traditional research sector.
- Addressing the gender imbalance in senior roles through targeted mentoring, leadership programs, and family-friendly policies.
- Enhancing funding stability and opportunities, including exploring innovative funding models that blend public and private sources.

- Supporting career development and progression, with clear pathways for researchers in both traditional and non-traditional sectors, including communicating and fostering opportunities for researchers to enrich non-research sectors with their skills, or to support research activity, policy, or translation and commercialisation.

As no single dataset can provide a comprehensive overview and answers to the questions this audit seeks to investigate, we take a bespoke approach using three key data sources. Previous reports, including published data, allow us to build a working definition of the workforce and sense check our results. Novel microdata enables us to enrich public sources such as ABS data whilst getting broad estimates of workforce numbers, proportions and most uniquely, movements. A survey allows us to ask more detailed questions about contextual and subjective driving factors and barriers, understanding the sentiments of the workforce.

This audit is based on data collected at a point in time, with noted limitations. Recommendations for future monitoring, which would enable more comprehensive, longitudinal data collection as well as better targeting of specific groups, are provided as part of this report. Briefly, policymakers should consider developing an agreed definition of the workforce, exploring potential adjustments to ANZSCO or avenues for future regular data collection, repeating the microdata analysis (including analysis and comparison to other workforces or countries), and exploring opportunities to conduct a regular HMR workforce survey.

By tackling these challenges, Australia can strengthen its HMR workforce, drive innovation and maintain its position as a global leader in health and medical research. The nation's ability to attract, retain, and nurture diverse research talent will be crucial for addressing future health challenges and contributing to economic growth through scientific discovery and its translation into practical outcomes.

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PURPOSE AND OVERVIEW

The importance of health and medical research

Australia is facing a range of health challenges with a rise in the prevalence of chronic disease and an aging population. The COVID-19 pandemic highlighted the importance of a strong public health system, with health and medical research (HMR) at the forefront.

Health and medical research can deliver better health outcomes for Australians and support an advanced, knowledge-intensive industry that makes an important economic contribution. The HMR sector is a critical sector for sovereign capability. It is also important in achieving the government's health, education, and economic policy objectives. As a result, there are likely to be continued policy discussions regarding the future of the sector and its workforce.

There is considerable investment in the HMR sector in Australia. Around \$6.3 billion is invested by government and non-government sectors each year.¹ To ensure the investment in the sector is effective, policymakers need to understand the workforce, and work towards supporting sustainable and rewarding careers across the sector.

Guiding questions for this report

This audit was guided by a set of key questions, developed to understand the segments and features of the Australian HMR workforce that to date have been less comprehensively researched. Broadly, these included demographic features (including what constitutes our current HMR workforce, who they are and where they are employed); modalities of funding support (source, nature, and contract type); strengths and gaps in capability; diversity of training and professional development); international exchange; and diversity of research career pathways and movement.

This final topic, on pathways and movement, involved a number of key sub questions, including the range and diversity of research career pathways, the drivers and barriers for researchers moving between fields or sectors, whether there are disjointed pathways, how many leave research, why they leave research, and whether the mobility of researchers and gaining of transferable skills be acknowledged and supported. These questions were answered using three key sources of information: desktop research, novel microdata, and a survey of the sector.

Defining the health and medical research workforce

For the purposes of this audit, the HMR workforce consists of those typically considered researchers: those who perform research or support research in organisations like universities and Medical Research Institutes (MRIs). We describe this group as “traditional researchers”. We also consider those who work in less commonly surveyed areas of health and medical research, such as those in the private sector (pharmaceuticals, medical technology, and biotechnology) and those in clinical roles such as those who work as clinicians, including medical doctors, nurses, midwives, allied health workers and others, and also produce or support research. We describe this group as “non-traditional researchers”. These definitions are intended to support understanding of the sector. A precise, agreed definition for the workforce and its segments should be investigated and developed as part of the future monitoring plan.

¹ AAMRI (2021) Australia's missing link: a national health and medical research strategy

Given the dynamism of many labour markets, an important third segment of the HMR workforce is those who may have previously worked as traditional or non-traditional researchers, but now work in other roles across the economy. We describe this segment as “inactive” researchers.




We segment the workforce in this way as the traditional workforce represent the largest proportion of recipients of HMR funding and are more commonly the focus of reporting. The non-traditional and inactive segments of the workforce represent those who have been the most difficult to capture in past reports.

Figure 1: Overview of workforce segments, definitions, and example roles used in this report²

Traditional researchers

- People at universities and MRIs who work in health and medical research related fields, either conducting or supporting research
- Research support roles with University/MRI employers are included
- Includes both **student** and **non-student** researchers across fields which include but are not limited to medical sciences, human biological sciences, biochemistry, clinical sciences

Example roles include:

-  **Academics**
-  **Research students**
-  **Research technicians**






Zara - Traditional researcher
Employed at a university as a
conjoint Associate Lecturer in
biomedical science

Non-traditional researchers

- People who work in health and medical research -related fields in the private and public sector (but not within the typical university system)
- Includes both **clinical** and **non-clinical** roles, either conducting or supporting research
- Research support roles in the private sector and with non -university/MRI employers are included
- Includes people working in research in the private sector, such as in pharmaceutical, healthcare, and biotech industries and in the public sector such as in healthcare

Example roles include:

-  **Pharmaceutical researchers**
-  **Clinical researchers**
-  **Biotechnology and medical technology researchers**






Jordan - Non-traditional
researcher, employed at a major
pharmaceutical firm in a quality
assurance role

Inactive researchers

- Includes people who have at some point worked in traditional and non -traditional health and medical research, either conducting or supporting research but no longer do

Example roles include:

-  **Professionals**
-  **Engineer**
-  **Teacher**



Maya – Inactive researcher
Employed at a professional
services firm as a consultant

² Research support roles are included in all three segments and are classified based on the place of employment

Previous research

Previous research into the health and medical research workforce has prioritised and focused on different segments in order to answer different, and often very specific, sets of questions. Previous research has focused on groups such as traditional researchers, traditional researchers in MRIs, non-traditional researchers in clinical settings, and researchers with particular types of grant funding. This means that while there are estimates of the size of different segments of the workforce, there is not comprehensive view.

Figure 2: Overview of previous attempts to quantify different aspects of the health and medical research workforce³

Author (year)	Definition of health and medical workforce	Traditional		Non-traditional		Inactive
		Universities	MRIs	Clinical research	Industry	Ex-researchers
AAMRI (2022)	People working in MRIs		20,664			
NHMRC (2021)	Health professionals who self-identified as researchers in a 2019 AHPRA survey			6,639		
MTP Connect (2020)	People in the medical technology, biotechnology, pharmaceutical, and digital health sector				70,000	
ARC (2018)	Researchers employed/affiliated with higher education institutions in medical and health sciences captured under relevant Field of Research codes	23,362				
KPMG (2018)	Assumed proportion of researchers working across higher education, and research and services. People who are supported by medical research in the medical technologies and pharmaceuticals sector		32,096		78,409	
DAE (2016) ⁴	People with research funded by the NHMRC	9,777				
Schofield (2009)	Staff in MRIs and relevant university departments (not including students)	39,037				

To date, most research into the HMR workforce has used either survey data or datasets that have relatively good coverage of particular segments. For example, the historical Excellence in Research

³ Source: AAMRI (2022) The AAMRI Report 2022; NHMRC (2021) Investigating clinician researcher career pathways: Summary Report to the NHMRC Chief Executive Officer); MTPConnect and BehaviourWorks Australia (2020) A Survey of Workforce Skills and Capacity in the Medical Technology, Biotechnology, Pharmaceutical and Digital Health (MTP) Sector; ARC (2018) State of Australian University Research; DAE (2016) Australia's health and medical research workforce: Expert people providing exceptional returns; KPMG (2018) Economic Impact of Medical Research in Australia; Schofield (2009) Planning the Health and Medical Research Workforce 2010-2019; Mandala analysis. Abbreviations include: AAMRI, Association of Australian Medical Research Institutes; ARC, Australian Research Council; NHMRC, National Health and Medical Research Council; AHPRA, Australian Health Practitioner Regulation Agency; ABS, Australian Bureau of Statistics; DAE; Deloitte Access Economics. These reports were selected as they had a definition relating to the health and medical research workforce and provided an estimate of size within the last 15 years.

⁴ The figures from this report are included under traditional researchers as this represents researchers in organisations that are eligible for NHMRC funding (i.e. universities and MRIs only). The report used NHMRC funding statistics data to assume that Chief Investigators equated to workforce staff supported, which is not necessarily true.

Australia data from the Australian Research Council looked at research in Australian universities.⁵ Ideally, this workforce should be tracked consistently and comprehensively by a central agency such as the Australian Bureau of Statistics (ABS) in a manner that can be compared to other labour forces in other industries, and in longitudinal, publicly available manner. However, as with other workforces, the ABS standard for occupation classification (ANZSCO) poorly captures this workforce.

ANZSCO was initially designed and released in 2006, with subsequent updates to some occupations, and as such some occupations are poorly represented. Furthermore, for the traditional HMR workforce, many roles are captured under tertiary education roles and are indistinguishable from non-HMR academic teaching and research activities. Some information has been captured more specifically on the number of researchers in universities by field of research. However, this data does not capture or distinguish those working in MRIs. Data collection through Excellence in Research for Australia ceased in 2018 with no updated information since then.⁶ For the non-traditional workforce, there is no simple way to use ABS to distinguish which clinical workers may be performing research as a task as part of their occupation. Data on task-based analysis, rather than occupation-based analysis, is very limited. Similar issues on workforce tracking exist in other jurisdictions. In the United Kingdom, workforce tracking uses disparate tools including official labour force surveys, ad hoc surveys, and reporting from higher education institutions. The data also cover different groups with some instruments capturing the entire research workforce and others only capturing the traditional segments of the HMR workforce.

Approach in this report

To overcome some of the limitations of previous attempts to understand the workforce this project uses three distinct sources of information to estimate the key features of the HMR workforce in Australia. These include:

- Existing research and public data, which allows us to build a working definition of the workforce and sense check results.
- Novel microdata at the individual level, which allows us to enrich public data from sources such as the ABS and generate broad estimates of size, whilst also answering questions that have been almost impossible to answer to date, including proportions and movement of the workforce in a dynamic labour market.
- A bespoke survey of the workforce, which allows us to capture rich, qualitative data to understand at a more detailed and nuanced level the motivations and sentiments of the sample of the workforce that respond.

Whilst each source of information has its limitations, together these sources are critical to answering key questions about the HMR workforce. These questions can be categorised in three areas:

- **Workforce segments:** How can the workforce be segmented, how large are these segments, and what are their demographic features?
- **Workforce movement:** How often do different segments of the workforce move around the labour market? What are the common pathways for movement?

⁵ ARC (2018) State of Australian University Research

⁶ Australian Research Council (n.d.) Excellence in Research for Australia

- **Workforce motivations:** Why do workers move throughout the labour market? What is driving decision making and leading to workers to move to/from different segments or roles? What do workers consider to be the major challenges and opportunities in their previous and current roles?

Potential limitations

Without consistent, regular, and comprehensive data collection by responsible government agencies or peak bodies, any analysis will be limited to available disparate sources. This report relies on three distinct sources of information: existing research and public data, novel microdata at the individual position level, and a bespoke survey. This multi-faceted approach may not necessarily permit like-for-like comparisons against other workforces or countries unless repeated.

The workforce headcounts based on microdata are estimates that rely on point-in-time information. Our unique methodology allows us to provide estimates of the total workforce and, for the first time, understand how they move between roles and industries. Ideally, this information would be captured in a systematic, ongoing, consistent manner by an official body. However, in the absence of such information, this audit uses Revelio, a workforce intelligence provider that absorbs and standardises publicly available employment records to create an overview of company workforce dynamics, including the stock and flows of workers. It is used increasingly in research reports for a variety of topics⁷.

The dataset is at a position level (that is, more detailed than the person level), which allows us to understand transitions and better identify researchers who may hold multiple roles or honorary positions. Our definitions are based on the position history of individuals over the last five years. That is, individuals who have held a position that is defined as belonging to either the traditional or non-traditional research workforce (as described in methodology in appendix) are included in the analysis. If individuals have held only one position defined as traditional or non-traditional over the last five years, they would be included in the analysis. Individuals who concurrently hold positions defined as traditional and non-traditional are classed as both for charts displaying person-level data, or counted twice (once in each category) for charts displaying position-level data.

Any attempt to define a group of people will always result in edge cases. Our taxonomy aims to capture as many people as possible who perform or support research as a core component of their occupation, whilst not skewing the analysis with the experiences of individuals who are less likely to perform or support research as a core component of their occupation. An occupation- and employer-based approach (as opposed to a task-based approach) to defining segments of the workforce limits the ability to analyse roles that perform some research as only a task undertaken in that occupation (rather than the substantive activity of that occupation). This particularly applies to clinical roles, which may therefore be undercounted.

Other limitations of the report include unaccounted-for potential sampling bias in the survey, as a lack of standardised data limits the ability to assess bias in more detailed ways than gender, location, and overall workforce segment size. Weights to adjust for these factors are presented in the appendix accompanying this report. Some roles are likely underrepresented, particularly clinician researchers and inactive researchers. Given the number of respondents of the survey (n=2,065) and the estimated size of the workforce, the overall response rate is expected to be 5 per cent. The reliance on self-reported data in the survey may introduce subjective biases. These limitations should be considered when interpreting the results and using the findings to inform policy decisions. Future iterations of this

⁷ Cole, Jeng, Lerner, Rigol, and Roth (2022); Cai, Chen, Rajgopal et. al. (2024); Liu, Chen and Lyu (2024); Welsh and Ruda (2024)

research could address these issues by establishing more standardised and regular data collection methods across the sector. A lack of longitudinal data also limits the ability to track changes over time and understand any potential trends or the impact of historical policies.

CHAPTER 1: WORKFORCE SEGMENTS

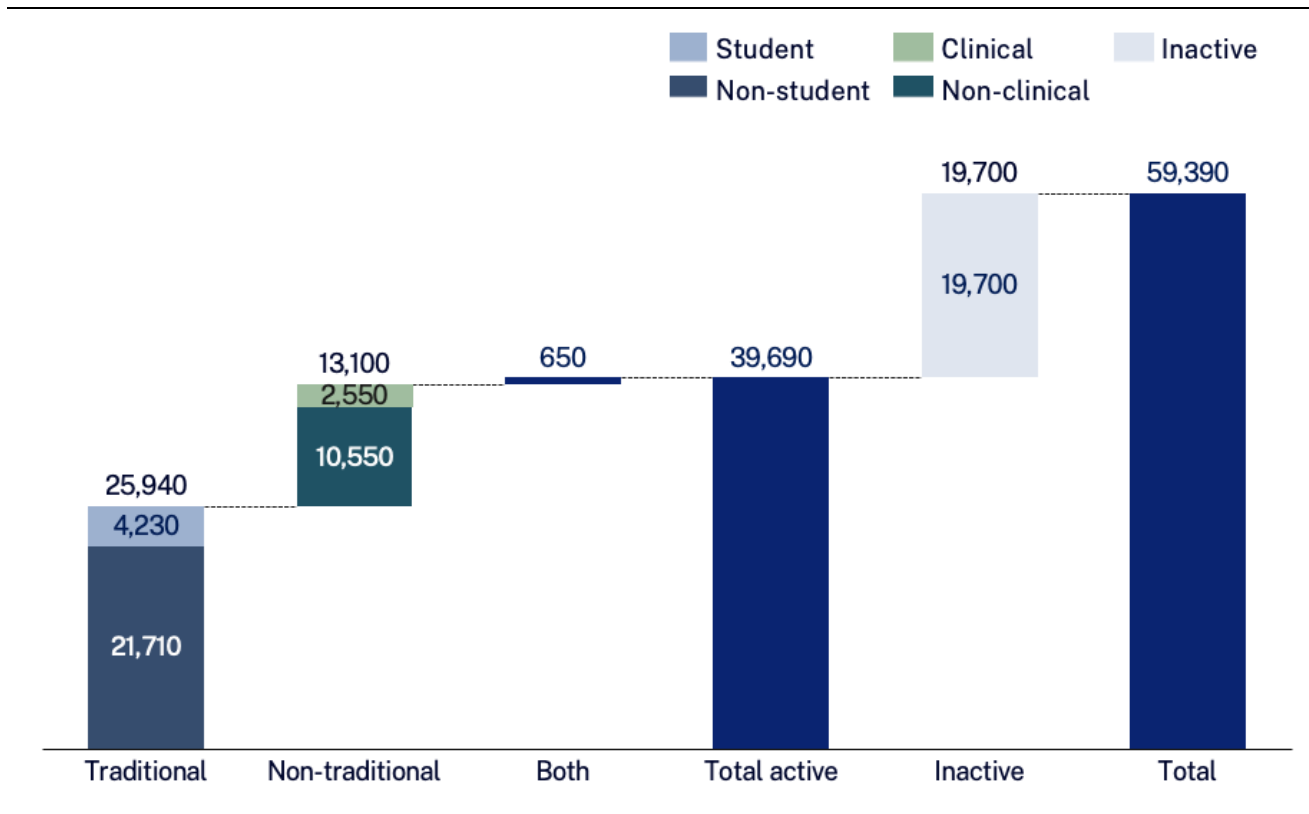
Key finding: There are 39,690 active researchers nationwide, with 65% in the traditional segment and 33% in the non-traditional segment

This chapter examines the structure and geographical distribution of Australia's health and medical research workforce. With 39,690 active researchers, the sector is divided into traditional (65%) and non-traditional (33%) segments. The traditional workforce, primarily supported by government funding, comprises 25,940 researchers in universities and Medical Research Institutes. An additional 13,100 researchers work in the non-traditional sector. Victoria emerges as a key area in HMR, employing 30% of the traditional and 32% of the non-traditional workforce, above its share of the national workforce. Gender disparities emerged in health and medical research workforce. Women make up 52% of the workforce overall but only one in four researchers at the most senior levels. Women experience higher rates of career interruptions (55% for women compared to 27% for men), predominantly due to parental leave. The international nature of the workforce is also evident, with more than 40% of researchers born overseas and 35% of traditional researchers having moved to Australia specifically for a research job, compared to only 10% of non-traditional researchers.

The overall workforce is made up of an estimated 39,690 active researchers

There are currently an estimated 25,940 researchers in the traditional research workforce, who work in universities and Medical Research Institutes. This suggests approximately 65% of the active workforce is supported in some way by government funding (grants or through university employment). An additional estimated 13,100 researchers work in the non-traditional research sector.

Figure 3: Health and medical researchers by segment (weighted person count, Australia, at June 2024)⁸



A further 650 people (2% of the total active workforce) hold multiple roles across both the traditional and non-traditional workforce. 11% of traditional researchers and 4% of non-traditional researchers hold more than one role within their respective workforce segments.

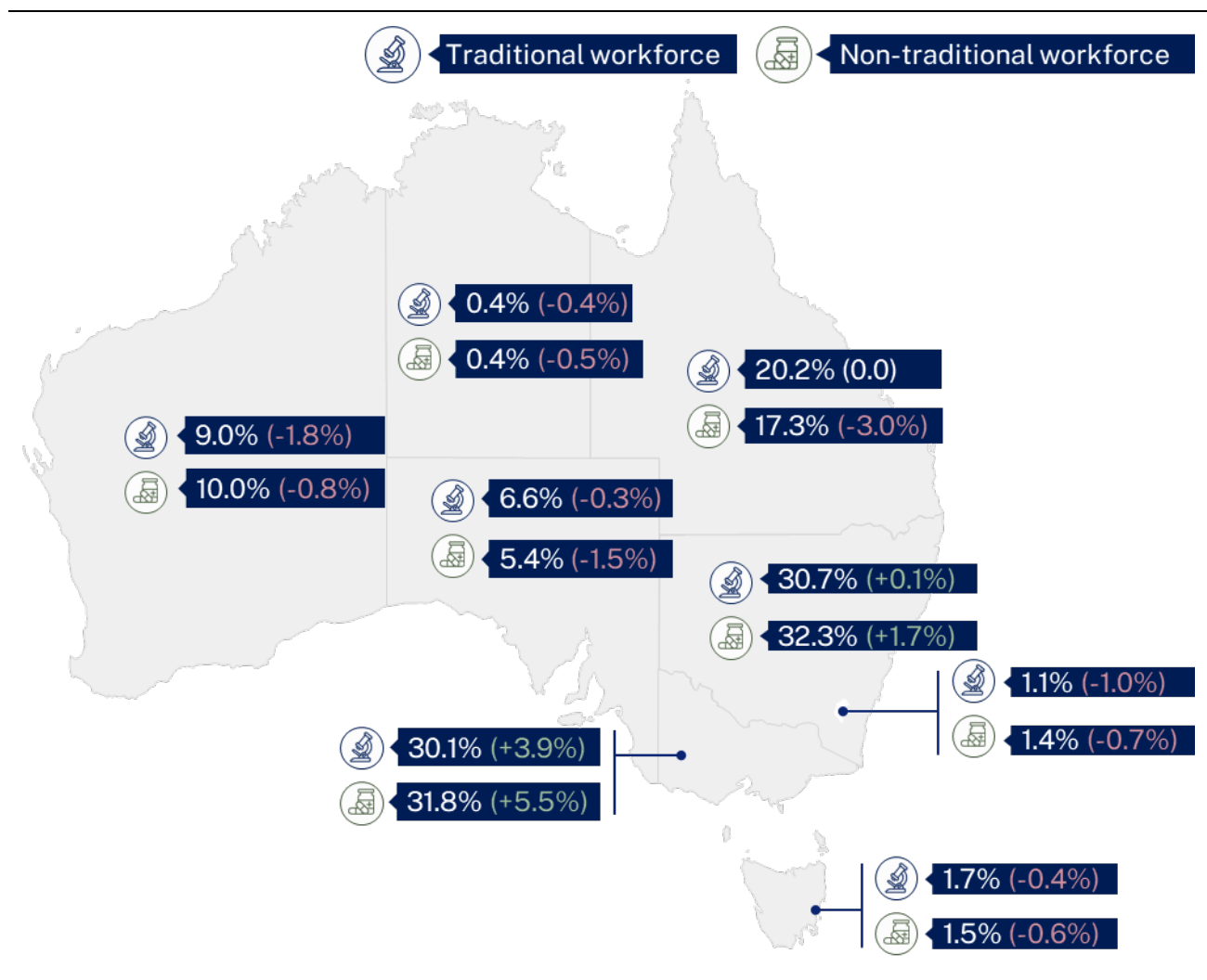
In addition to the current research workforce, there are approximately 19,700 people who previously worked in the health and medical research workforce. Clinicians, such as doctors, who may perform research as part of their role have been excluded from workforce analysis due to the occupation-based approach taken in the analysis. There may be more clinical researchers who perform research as a task as part of their occupation, however based on the information available in the microdata this is not able to be confirmed.

⁸ Revelio Labs; Mandala analysis. Figures rounded to the nearest 10. Non-student researchers in the traditional workforce are academic level A-E and technical support staff. Student researchers in the traditional workforce are PhD by research, Masters by Research and Honours students. Inactive researchers were identified as individuals who had a position as either a traditional or non-traditional researcher in the past 5 years but no longer hold a position in either traditional or non-traditional research sector. Post-stratification weightings have been applied to people based on gender and state splits of the science workforce.

Victoria has proportionally more health and medical researchers than other states and territories, whereas there are proportionally fewer researchers in regional or remote areas, compared to the national workforce

The 39,690 health and medical researchers are distributed throughout the country. Victoria is home to a strong health and medical research community, including Monash and Melbourne University which are the second and third largest employers of the traditional workforce. Victoria has a higher proportion of the national traditional workforce when compared to the overall workforce distribution in the country. Victoria employs 30% of the traditional workforce, which is 4ppt higher than the proportion of the overall workforce employed in Victoria.

Figure 4: Distribution of the health and medical research workforce (weighted proportion of workers by workforce, compared to distribution of Australian workforce, at June 2024)⁹



⁹ ABS (2024), Revelio Labs; Mandala analysis. Notes: 1,960 of the traditional workforce did not have state or territory data available. 1,226 of the non-traditional workforce did not have state or territory data available. 651 researchers work across both the traditional and non-traditional research sectors. These workers have been excluded from analysis.

In the 2023 NHMRC Grant Round, Victorian institutions submitted the highest number of applications, making up 38% of applications and receiving 42% of the total grant funding.¹⁰ Victoria is also home to the headquarters of several large non-traditional employers, including CSL and Moderna. Victoria has 32% of the total non-traditional workforce, which is 6 percentage points higher than the proportion of the overall workforce employed in Victoria.

Compared to the overall population where 27% live in regional or remote areas (26% of all employed individuals work in regional or remote locations), only 13% of the HMR workforce live in regional or remote areas.¹¹ Researchers in regional areas often raised the difficulty of accessing the same opportunities available to researchers in metropolitan locations, citing training and funding as difficult to access. We acknowledge a limitation of this study was precluding people with a primarily clinical affiliation which skews the data. For example, in rural and regional areas, research may be more likely to be performed via primarily clinical settings such as hospitals and community healthcare that are not as well represented in this report.

"I work in a regional area. It is difficult to access the same opportunities as our metro counterparts including training and funding."

From our survey, fewer than 1% of respondents identified as Aboriginal and/or Torres Strait Islander. This is 21 individuals (19 following weighting). Given the small sample detailed analysis may not be appropriate to draw conclusions from. We do note however that the Aboriginal and/or Torres Strait Islander researchers represent 1.9% of the STEM research workforce.

¹⁰ NHMRC (2023) Outcomes of funding rounds

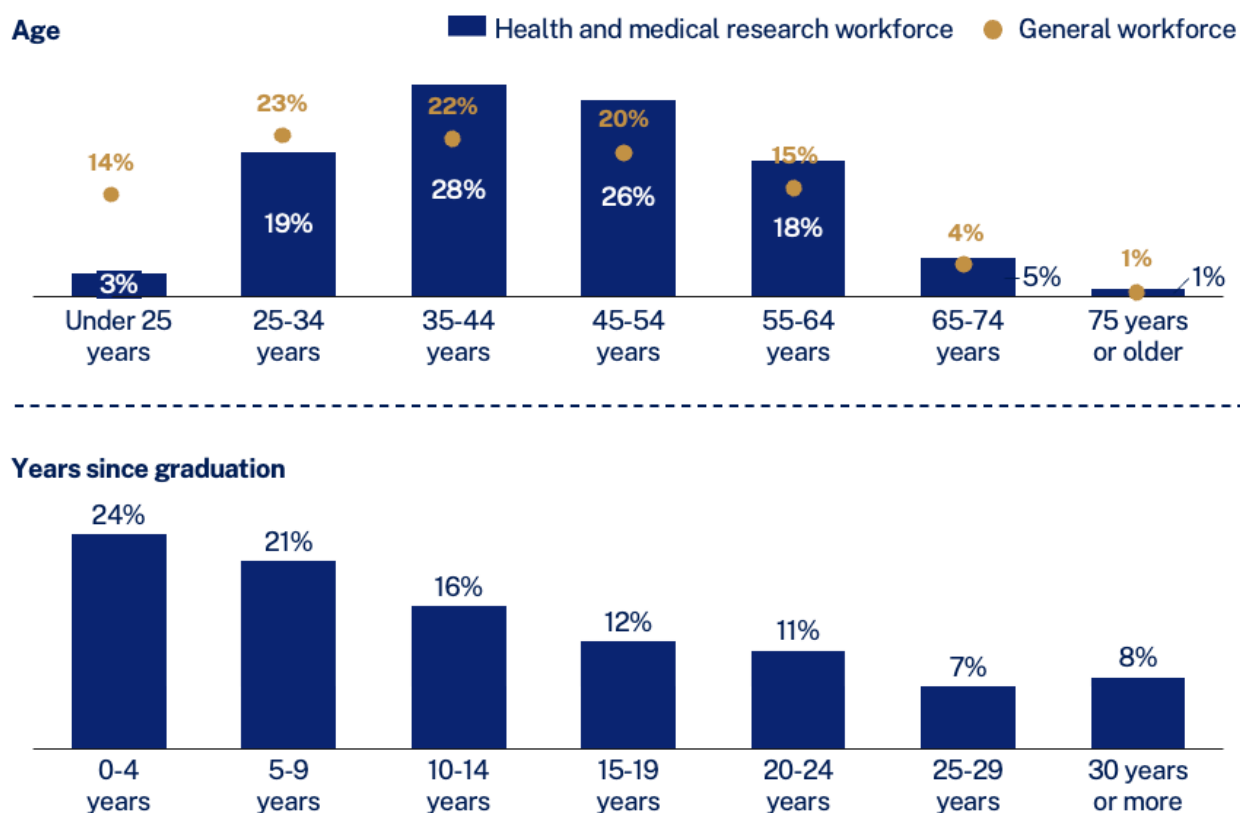
¹¹ ABS (2024), Australian Health and Medical Research Workforce Survey (2024); Mandala analysis.

50% of the health and medical research workforce are aged under 44 years, and 61% are less than 15 years post graduation

The age distribution of Australia's health and medical research workforce reveals a concentration in the middle-age brackets, with the largest proportion (28%) falling between 35-44 years old, closely followed by those aged 45-54 (26%). There is a notable representation of younger researchers, with 19% aged 25-34 and 3% under 25, indicating a healthy influx of new talent. However, the age distribution skews older compared to the general Australian workforce; with workers aged under 34 years comprising less of the health and medical research workforce (22%) than the general workforce (37%). More of the workforce is aged between 35 and 64 at 72% of all health and medical researchers, compared to 57% of the general workforce. This age profile highlights the importance of retaining mid-career researchers while also fostering the development of early-career researchers to ensure a sustainable workforce.

Examining the years since graduation provides insight into the experience levels within the workforce. The data shows a fairly even distribution across early to mid-career stages, with the highest proportion (24%) having graduated within the last 4 years, followed closely by those 5-9 years post-graduation (21%). The challenge for the sector may lie in providing adequate support and opportunities for researchers throughout their career stages to maintain this balanced distribution. 86% of respondents reported they were not currently studying, while 10% are currently studying for a PhD, 3% studying for a Master's degree, and <1% studying for a Bachelor's degree.

Figure 5: Proportion of research workforce by age (top) and years since graduation (bottom) (weighted proportion of total health and medical research workforce (total), Australia, at June 2024)¹²



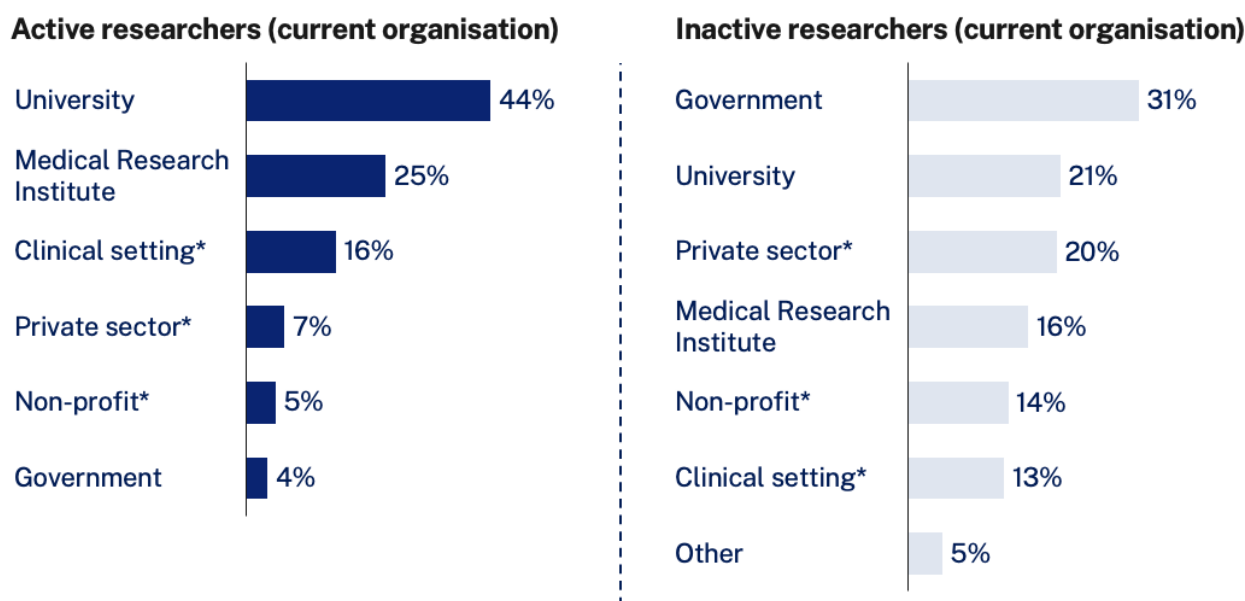
¹² Australian Health and Medical Research Workforce Survey (2024); ABS (2021) Census of Population and Housing; Mandala analysis. Responses have been weighted to align with the Revelio data on gender, state and territory and traditional and non-traditional workforce fields.

Traditional research organisations employ the majority of active researchers, while inactive researchers are more likely to work for government

Unsurprisingly, Universities lead as the primary employer for active researchers, with 44% of active researchers, followed by Medical Research Institutes at 25%. Clinical settings also play a significant role, employing 16% of the workforce. The private sector accounts for 7% of active researchers, while governments and government agencies employ 4%.

The distribution of employer organisations shifts when examining inactive researchers. Government emerges as the top destination, employing 31% of inactive researchers, suggesting a substantial migration of research talent into public sector roles. Universities remain significant, retaining 21% of inactive researchers, while Medical Research Institutes account for 16%. There is also a notable increase in researchers moving to non-profit organisations (14%) and the private sector (20%) compared to active researchers. This pattern of career transitions highlights the diverse applications of research expertise beyond traditional academic and clinical settings.

Figure 6: Proportion by employer organisation type, current (left) and inactive (right) researchers (weighted proportion of current and inactive health and medical research workforce, based on position count, Australia, at June 2024)¹³



¹³ Australian Health and Medical Research Workforce Survey (2024); Mandala analysis. Responses have been weighted to align with the Revelio data on gender, state and territory and traditional and non-traditional workforce fields. *Clinical settings may include hospitals, clinics, health service delivery, ACCHOs. Private sector includes pharmaceuticals, biotechnology and medical device technology companies, contract research organisations, and consultancy. Non-profit includes peak body/professional organisations, community/interest groups, advocacy organisations, and philanthropy. Data is based on positions and not individuals and individuals may hold more than one position. Note: for active researchers displayed totals do not sum to 100 due to rounding. To 1 decimal place these values sum to 100 (43.7, 15.9, 6.7, 24.9, 5.1, 3.7)

The health and medical research workforce is 52% women, with fewer women at the more senior levels

The health and medical research sector exhibits a gender disparity that widens at more senior levels, with systemic issues in funding and career progression contributing to the decline in participation of women in the workforce. In junior research roles, there are more women than men. There is a decline in the proportion of women in the workforce as women move into more senior roles. There is a noticeable drop once women reach the director level, or level 5. At the most senior level, women only make up one in four health and medical researchers. This trend is seen at the total workforce level, though women in the health and medical research workforce have less representation than at the Australian average. At the upper quartile of total remuneration, 35% of the workforce are women which contrasts to 26% at the highest level in the health and medical research workforce.¹⁴

The literature suggests that gender inequity impacts personal career decisions for women, particularly for mid-career researchers.¹⁵ Funding is a key area contributing to ongoing gender inequity. For example, while near-equal proportions of female and male applicants have been funded for the past 5 years for the NHMRC grant program overall, for the Investigator Grant scheme specifically, men have applied in higher numbers and a higher proportion of grant applications from men have been funded. More Investigator Grant scheme grants have been awarded to men than women (and more funding). This is due to larger proportion of male applicants at the most senior levels of the scheme.¹⁶ A lack of career progression and funding instability are contributing to the attrition of women from the workforce.¹⁷

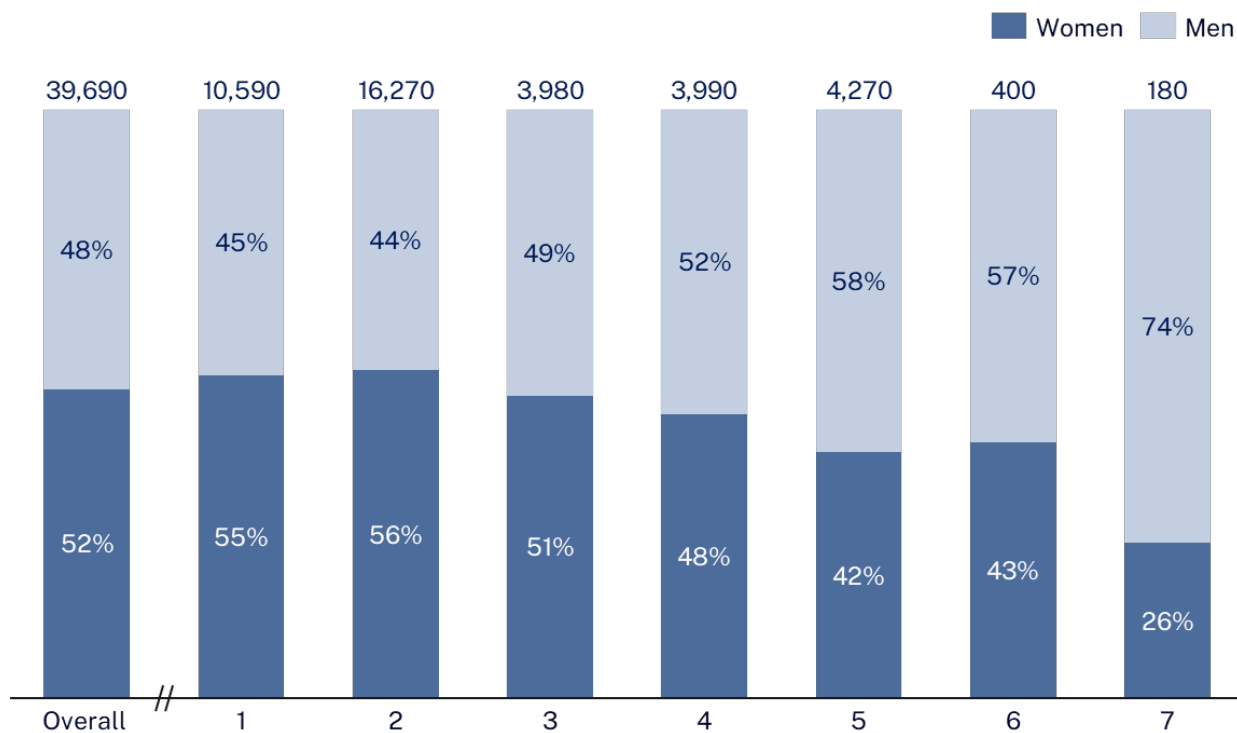
¹⁴ Workforce Gender Equality Agency (2023)

¹⁵ Association of Australian Medical Research Institutes Ltd (AAMRI) (2021) Australia's missing link: A national health and medical research strategy

¹⁶ National Health and Medical Research Council (NHMRC) (2021) Gender disparities in NHMRC's Investigator Grant Scheme

¹⁷ Australian Academy of Science (2019) Women in STEM Decadal Plan

Figure 7: Proportion of female and male researchers by seniority level (weighted proportion of total health and medical research workforce (total), Australia, at June 2024)¹⁸



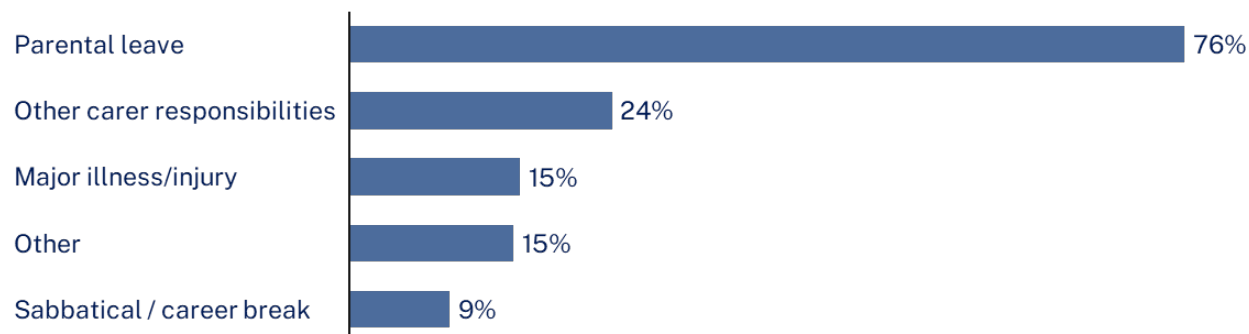
¹⁸ Revelio Labs; Mandala analysis.

48% of researchers report experiencing career interruptions, with 76% of those for female researchers due to parental leave

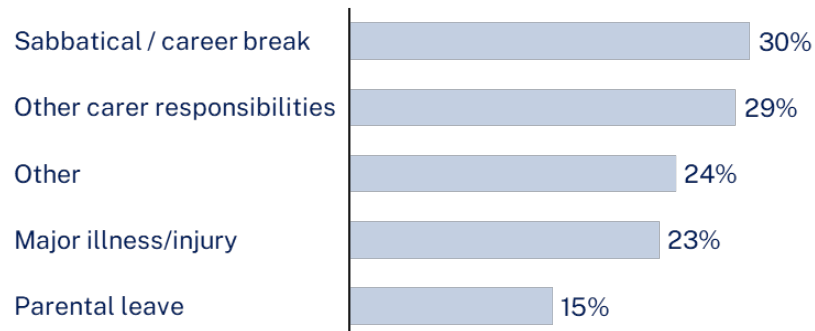
Understanding how common career interruptions are for men and women and the reasons why researchers experience career interruptions can help explain in part why the proportion of women declines with seniority. Career interruptions are experienced by 55% of women compared to 27% of men. The type of career interruption experienced varies by gender. Parental leave is the most common career interruption for women, with 76% of women who experience a career interruption report it as parental leave. Interruptions at early levels can have long lasting, knock-on effects on the later career stages, particularly when returning to the workforce following a break. For men, parental leave is the least common type of career interruption, with only 15% of career breaks for men attributable to parental leave. Across other industries, men account for 14% of the employer-funded paid primary carers leave taken in 2022/23.¹⁹ This suggests there are still barriers in place for men to take parental leave, which is key to advancing gender equity in the workplace.

Figure 8: Type of career interruption (proportion of those who had a significant career interruption, Australia)²⁰

Women



Men



¹⁹ Workplace Gender Equality Agency (2023) Australia's Gender Equity Scorecard

²⁰ Australian Health and Medical Research Workforce Survey (2024); Mandala analysis. Respondents could select more than one reason. Responses have been weighted to align with the Revelio data on gender, state and territory and traditional and non-traditional workforce fields. Respondents were asked "Have you had what you would consider a significant interruption to your career?".

“Career advancement has been challenging, I feel in part because I am female and have had career breaks due to having children earlier in my career.”

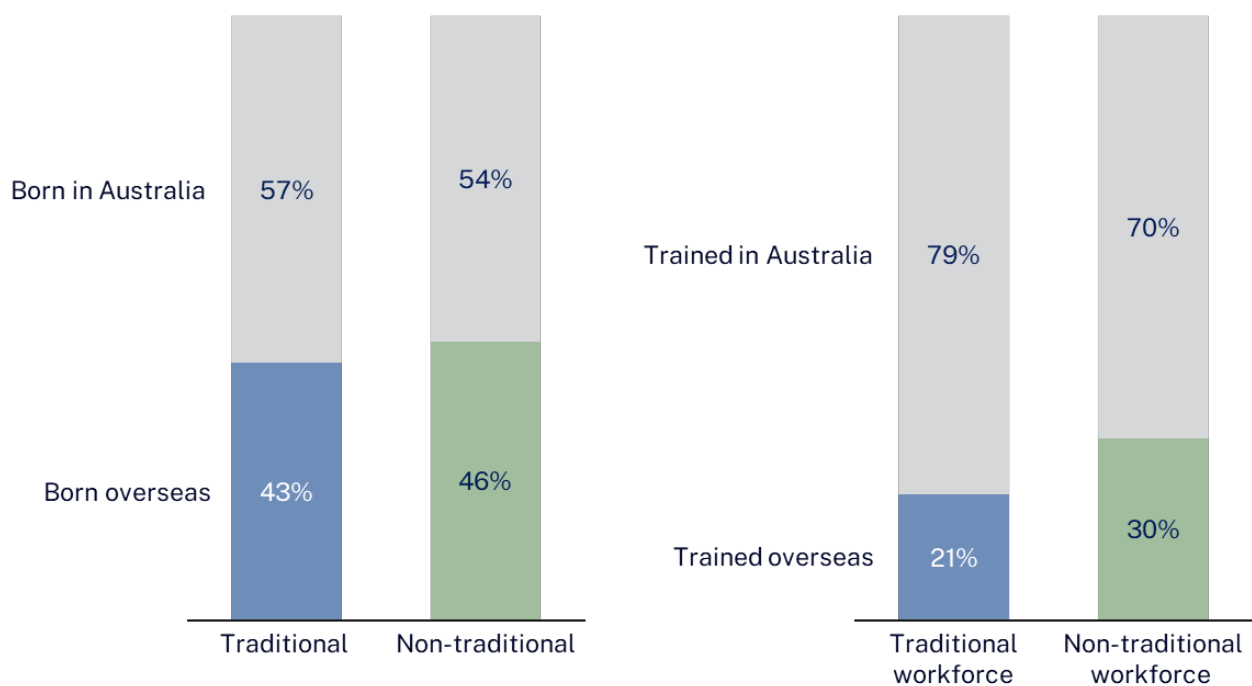
Sabbaticals or career breaks are more common for men than women. For men, almost a third of those who had a career interruption reported it was for a sabbatical or career break, compared to only 9% of women. The disproportionate number of men compared to women who take sabbaticals suggest there are barriers to women taking sabbaticals, likely due to women already having other career interruptions such as parental leave or other carer responsibilities. The most common response given for ‘other’ by male respondents relates to unemployment or funding issues or factors such as COVID-19 resulting in a career interruption.

“It is very difficult to be a mother of young children with caregiving responsibilities for elderly parents, and to be a laboratory researcher as well.”

More than 40% of the research workforce were born overseas, while 30% of non-traditional researchers trained overseas, compared to 21% of traditional researchers

Australia has a strong health and medical research sector and considerable investment from the public and private sectors. As a result, many international researchers who were either born or trained overseas move to Australia to work in health and medical research. The demographic composition of Australia's HMR workforce reflects a diverse international background. For the HMR workforce, England was the most common country of birth after Australia (6%), followed by India (3%), New Zealand (3%), USA (2%) and Malaysia (2%). This differs slightly from the top 5 countries of overseas countries of birth for the overall population which is England (4%), India (3%), China (3%), New Zealand (2%) and the Philippines (1%).²¹ The proportion of research workforce born overseas is higher than the Australian average (29.5%).²²

Figure 9: Left - Country of birth (proportion of researchers who had worked in an organisation other than their current organisation); Right - Location of training by workforce group (weighted proportion by workforce, Australia, at June 2024)²³



A larger portion of the non-traditional research workforce trained overseas, which could be explained by the international nature of many of the large non-traditional employers who may attract employee from overseas and often recruit talent globally. Many international health graduates also face barriers to

²¹ Australian Bureau of Statistics (2023) Australia's Population by Country of Birth

²² Australian Institute of Health and Welfare (2024).

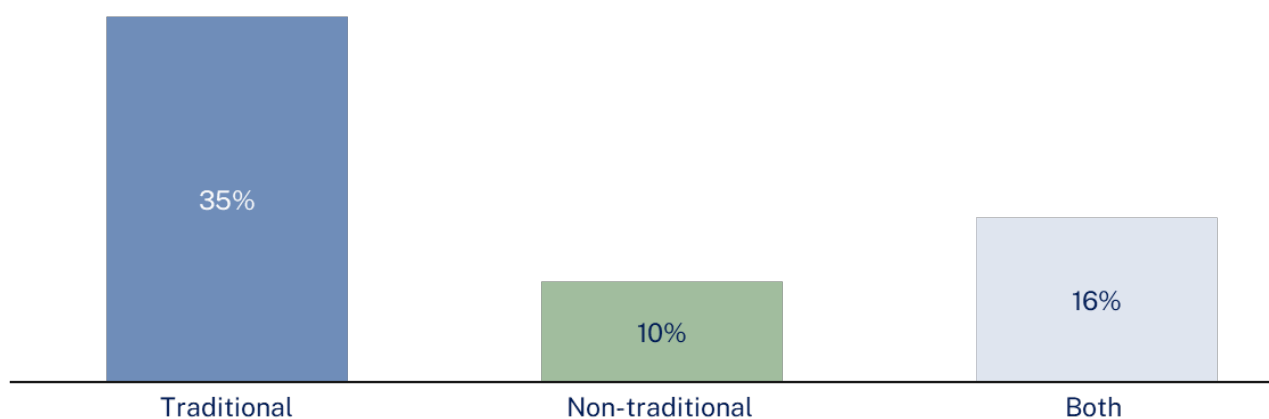
²³ Australian Health and Medical Research Workforce Survey (2024); Mandala analysis. ABS (2023) Australia's Population by Country of Birth. Responses have been weighted to align with the Revelio data on gender, state and territory and traditional and non-traditional workforce fields.

register to practice in Australia, with anecdotal evidence suggesting in the interim they often work in the clinical research space.

35% of traditional researchers moved to Australia for a research job, compared to 10% for non-traditional researchers

The international appeal of Australia's research sector is evident in the migration patterns of health and medical researchers, with variation between traditional and non-traditional researchers' motivations for relocation. Over a third of traditional researchers move to Australia for a research job, compared to 10% of non-traditional researchers. For traditional researchers who move to Australia for a research job, 32% were originally from Australia. For non-traditional researchers who moved to Australia for a research job, only 9% were originally from Australia. Other than returning to Australia, the most common reasons traditional researchers moved to Australia for a research role was for the reputation of the researcher they came to work with/for (14%) or research excellence in the topic they are interested in (13%). In contrast, the most common reason for non-traditional researchers to move to Australia was lifestyle (19%).

Figure 10: Moved to Australia for a research job (proportion of researchers who had worked in an organisation other than their current organisation)²⁴



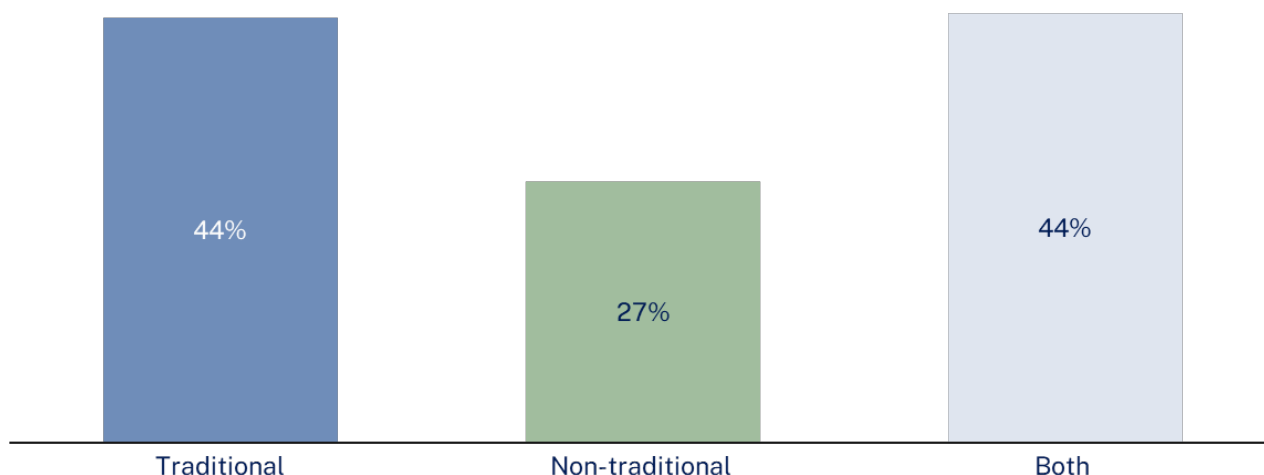
"The organisation recruiting me had world-class, enabling infrastructure for my research and translation plans."

²⁴ Australian Health and Medical Research Workforce Survey (2024); Mandala analysis. Responses have been weighted to align with the Revelio data on gender, state and territory and traditional and non-traditional workforce fields. Traditional refers to researchers (both active and inactive) who have only worked in traditional research roles in their career. Non-traditional refers to researchers (both active and inactive) who have only worked in non-traditional research roles in their career. Both refers to researchers (both active and inactive) who have at some point in their career worked in both the traditional and non-traditional research sectors.

44% of traditional researchers have worked overseas at some point, almost all moving for a research role

The international mobility of Australian health and medical research professionals is high, particularly among traditional researchers, with overseas work experiences driven primarily by the pursuit of research excellence and institutional reputation. Working overseas provides workers with the opportunity to learn from others and gain new skills and experiences. Almost half of traditional researchers have worked overseas at some point during their career. For traditional researchers, 95% of those who moved overseas moved for a research or research support role, compared to only 36% of non-traditional researchers and 68% for researchers who have worked in both sectors. The most common motivator for researchers from across the workforce to move overseas was research excellence in the topic they are interested in (30%). Reputation of the organisation they went to work for is also a key motivator for researchers to move overseas (13%).

Figure 11: Worked overseas at some point during their career (proportion of researchers who had worked in an organisation other than their current organisation)²⁵



“Working overseas was critical to my development as a researcher and my career prospects”

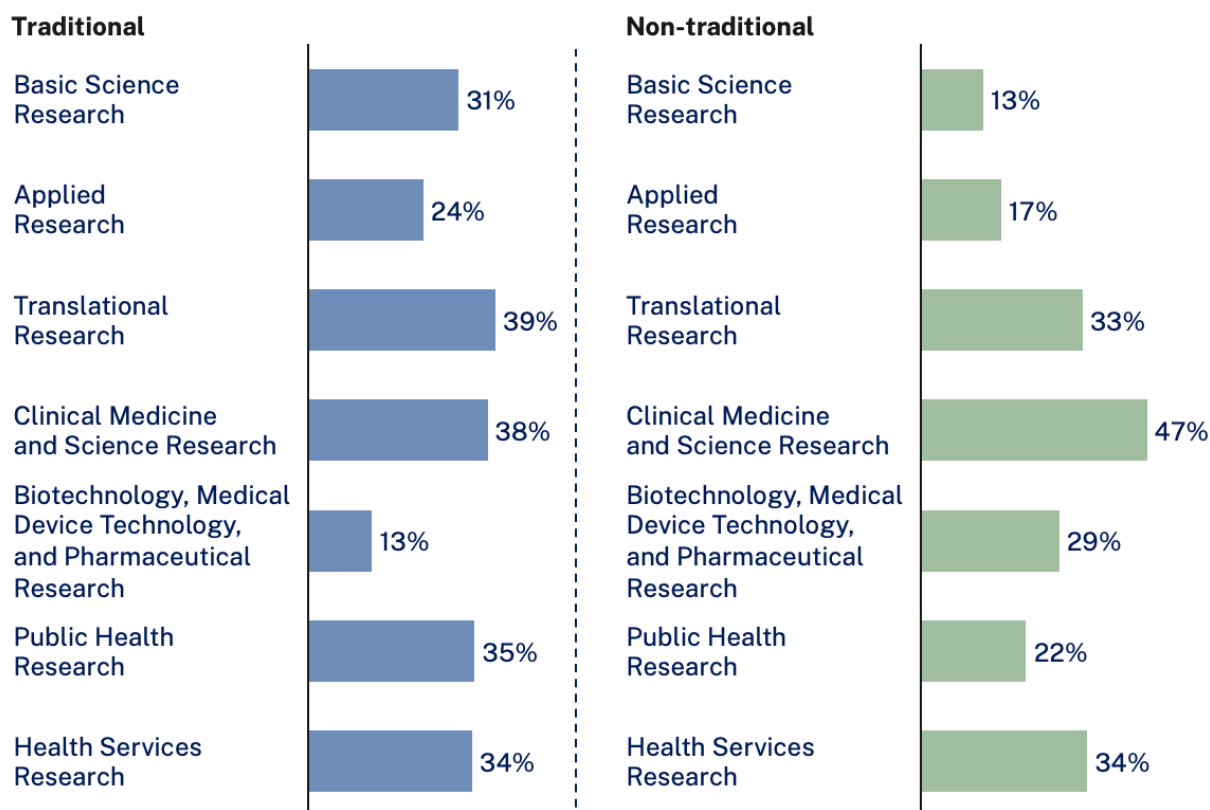
²⁵ Australian Health and Medical Research Workforce Survey (2024); Mandala analysis. Responses have been weighted to align with the Revelio data on gender, state and territory and traditional and non-traditional workforce fields. Traditional refers to researchers (both active and inactive) who have only worked in traditional research roles in their career. Non-traditional refers to researchers (both active and inactive) who have only worked in non-traditional research roles in their career. Both refers to researchers (both active and inactive) who have at some point in their career worked in both the traditional and non-traditional research sectors.

Traditional researchers are more likely to perform basic science or applied research, while non-traditional researchers are more likely to perform clinical or biotechnology, medical device technology, and pharmaceutical research

There are differences between traditional and non-traditional researchers in regard to the type of research they perform. Among traditional researchers, there is a relatively balanced distribution across various research areas, with a slight emphasis on translational research (39%) and clinical medicine and science research (38%). Basic science research and public health research also feature prominently at 31% and 35% respectively, indicating a strong foundation in fundamental scientific inquiry and population health. Applied research (24%) and health services research (34%) demonstrate the sector's commitment to practical applications and healthcare system improvements.

In contrast, non-traditional researchers show a markedly different distribution of research types. Clinical medicine and science research dominates this group at 47%, significantly higher than in the traditional sector. This is followed closely by health services research (34%) and translational research (33%), indicating a strong emphasis on research with direct clinical applications. Biotechnology, medical device technology, and pharmaceutical research are much more prevalent among non-traditional researchers (29%), more than double the proportion seen in traditional research settings.

Figure 12: Type of research performed or supported by researchers (weighted proportion by workforce, Australia, at June 2024)²⁶

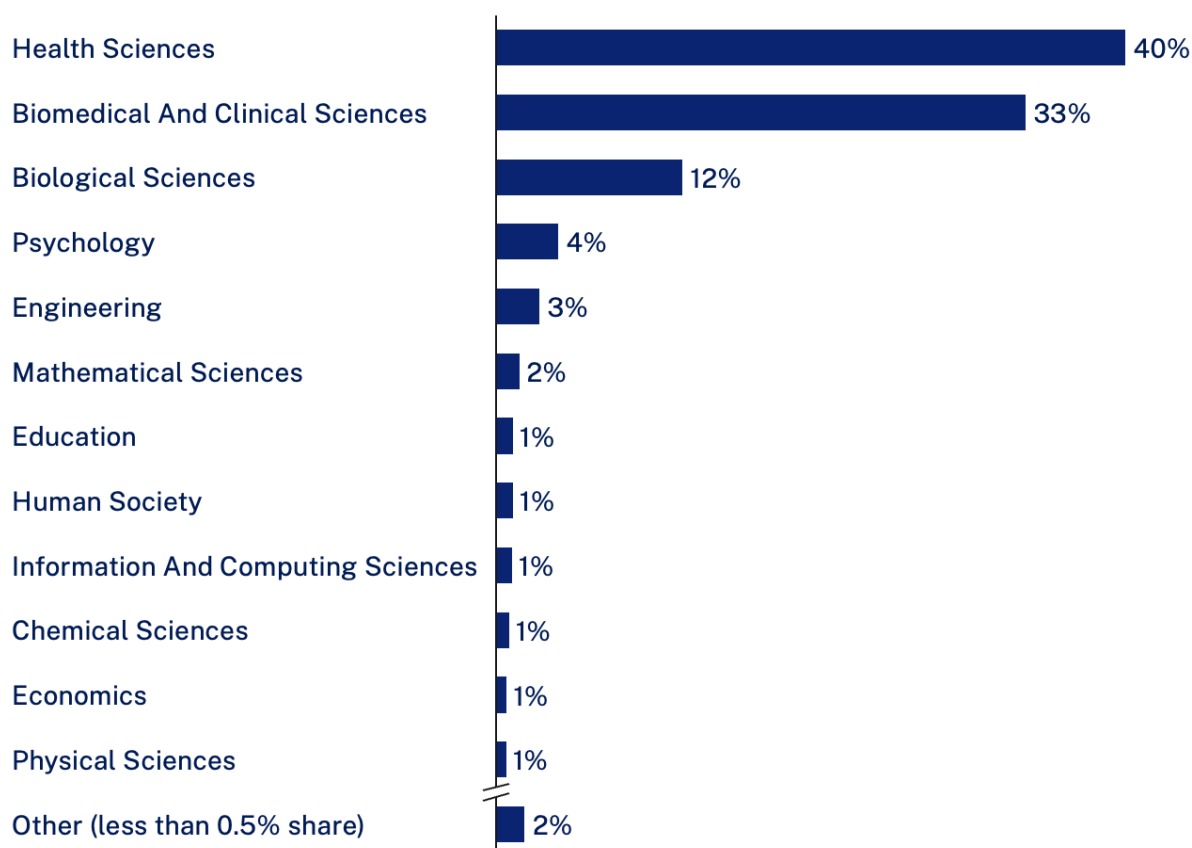


²⁶ Australian Health and Medical Research Workforce Survey (2024); Mandala analysis. Responses have been weighted to align with the Revelio data on gender, state and territory and traditional and non-traditional workforce fields. Respondents could select more than one type of research.

The largest field of research for health and medical researchers is health sciences research at 40% of all researchers

The field of research performed by health and medical researchers is concentrated in health science (40%), with a considerable proportion engaged in biomedical and clinical sciences research (33%). Within Health Science, health services and systems (52%), public health (48%) and epidemiology (28%) are the most common areas for researchers to be engaged in. For biomedical and clinical science, the most common areas are oncology and carcinogenesis (24%), clinical science (24%) and immunology (21%).²⁷ We did not collect field of research data at the 6-digit level to reduce the burden on respondents, though this can be included in future monitoring.

Figure 13: Field of research (weighted proportion of total health and medical research workforce (total), Australia, at June 2024)²⁸



The findings in this chapter provide an evidence base for the size and composition of the segments of the health and medical research workforce, not available through other sources. This evidence can be used in decision making and in the development of effective policy, especially related to gender, geographical location and international talent.

²⁷ The survey option which received the highest proportion of responses was other biomedical and clinical sciences (32%).

²⁸ Australian Health and Medical Research Workforce Survey (2024); Mandala analysis. Responses have been weighted to align with the Revelio data on gender, state and territory and traditional and non-traditional workforce fields. Respondents could select more than one type of research. Field of Research code descriptions as part of the Australian and New Zealand Standard Research Classification (ANZSRC) can be found at [ABS 2020](#).

CHAPTER 2: WORKFORCE MOVEMENT

Key finding: The health and medical research workforce are highly mobile, moving jobs every 1.6 years, often to non-research roles

This section analyses the career paths and mobility patterns within Australia's health and medical research workforce. The data reveals distinct trends in job transitions and retention rates between traditional and non-traditional research segments. Over a 5-year period, 62% of traditional researchers and 64% of non-traditional researchers exit the HMR sector entirely. Job tenure differs, with traditional researchers spending a median of 1.6 years per role, 4 months longer than their non-traditional counterparts. Amongst postdoctoral fellows, 47% leave research altogether when changing roles. The section also highlights the transferability of research skills, with 75% of researchers rating their skills as easily transferable across organisations. The findings underscore the dynamic nature of the HMR workforce, characterised by high job movement rates, varying job tenures, and the need for a diverse skill set to navigate career transitions effectively.

Over a 5-year period, researchers are more likely to leave research entirely or remain within their segments than transition across segments

Researchers from the traditional and non-traditional segments hold a range of jobs within and across the workforce segments during their career.

Figure 14: Movement of workforce between traditional and non-traditional sector (positions count, Australia, June 2019 – June 2024)²⁹



Of the 35,500 HMR roles identified with end dates, 25,400 of them belonged to the traditional workforce while 10,100 belonged to the non-traditional one.³⁰ Of the traditional researchers, 62% had a subsequent position in a non-health and medical research-based role (inactive), while 26% moved to another traditional role.

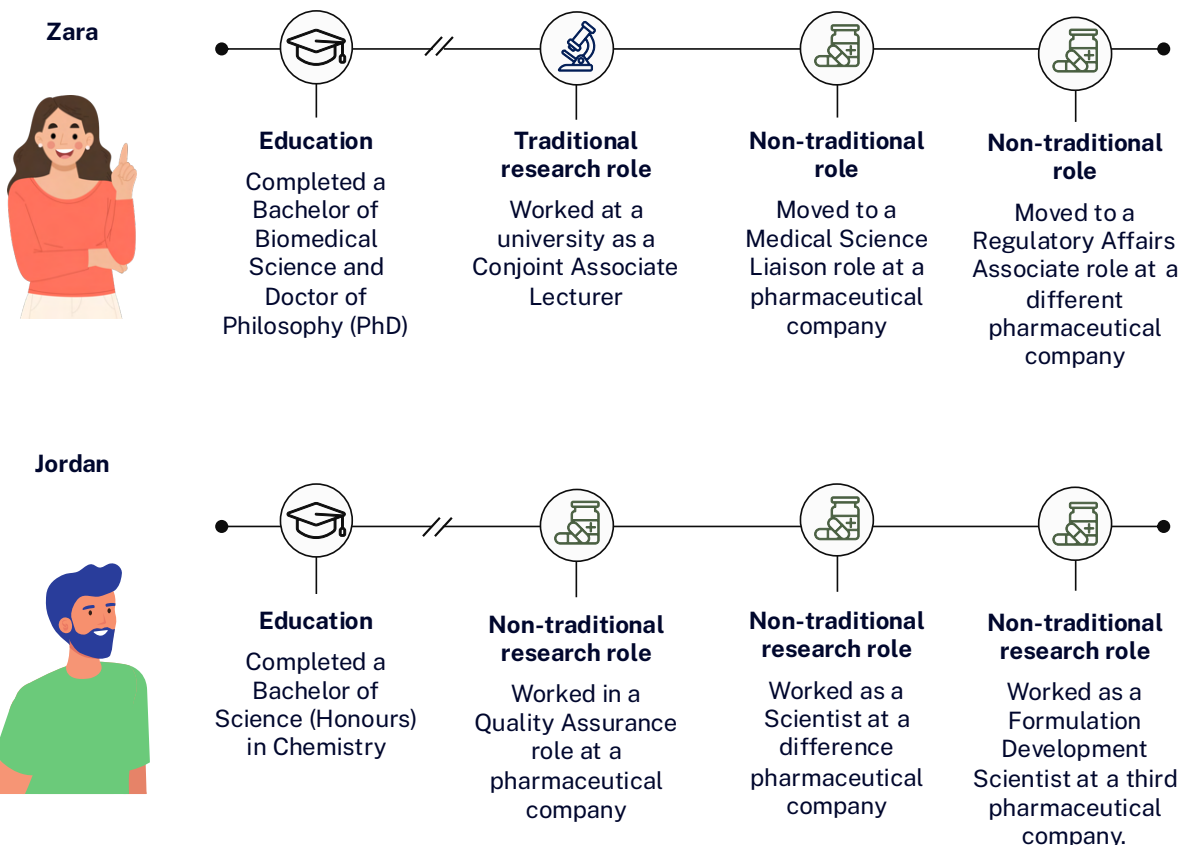
Non-traditional researchers were less likely to remain in research, with 64% becoming inactive. Non-traditional researchers are more likely to remain in the non-traditional sector, with 24% transitioning to a new role in the same segment. Only 7% of non-traditional researchers reported moving to a traditional

²⁹ Revelio Labs; Mandala analysis. Researchers who leave a traditional or non-traditional research role and move overseas have not been classified in more detail as this group was outside the scope of the LLM classifier process. Some of these positions are below the probability threshold for likelihood to be a researcher, but may still be in research-adjacent roles. Abroad indicate individuals have moved to a role that is not located in Australia and therefore not classified as either HMR or not as part of our methodology. These results do not represent attrition, which is the reduction in workforce number due to workers leaving and not being replaced.

³⁰ An end date refers to a piece of data within the microdata set which indicates when someone left a prior role. Roles without an end date indicate that an individual is still working in that role.

research role. Researchers across the traditional and non-traditional sectors hold a range of roles across their careers. They often move between a range of employers throughout their careers as well.

Figure 15: Example pathways of health and medical research workers (Australia, at June 2024)³¹



³¹ Role information has been anonymised. Revelio Labs; Mandala analysis.

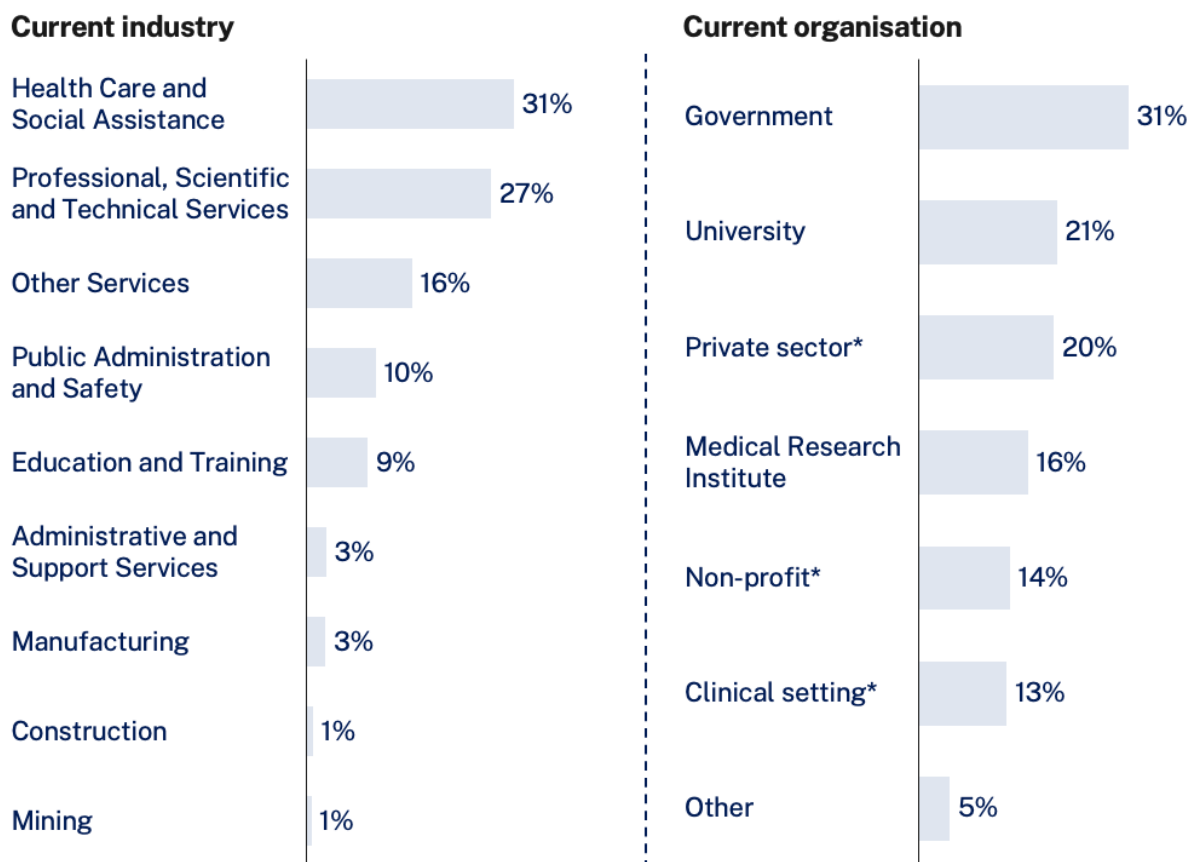
Inactive researchers remain in health and medical research-adjacent industries, often in leadership and management positions

Researchers who exit the HMR sector contribute significantly to diverse industries, with their skills and experience finding applications across various sectors of the economy. Traditional roles tend to follow more established career paths in academia, research institutions, and government agencies. Non-traditional roles often blend research skills with industry-specific knowledge or emerging fields. Both categories show a trend towards leadership and management positions, suggesting career progression from pure research to overseeing research activities. Non-traditional roles seem to focus more on bridging the gap between research and practical applications or industry needs.

Most inactive researchers remain in healthcare and social assistance (31%) or professional, scientific and technical services (27%). Other common industries are public administration and safety and education and training.

The organisational breakdown reveals a significant transition to government roles, with 31% of inactive researchers now employed in the public sector. Universities continue to play a substantial role, retaining 21% of inactive researchers, possibly in non-research capacities. Interestingly, the private sector attracts 20% of former researchers, indicating a notable shift from academic to commercial environments. Medical Research Institutes and non-profit organisations also feature prominently, employing 16% and 14% respectively, while 13% find roles in clinical settings. This diverse distribution across industries and organisations highlights the transferability of research skills and the varied career opportunities available to those leaving active research roles, with a clear trend towards health-related, government, and professional service sectors.

Figure 16: Current industries and organisations of employment for inactive traditional researchers (proportion of inactive researchers)³²



³² Responses have been weighted to align with the Revelio data on gender, state and territory and traditional and non-traditional workforce fields. *Clinical settings may include hospitals, clinics, health service delivery, ACCHOs. Private sector includes pharmaceuticals, biotechnology and medical device technology companies, contract research organisations, and consultancy. Non-profit includes peak body/professional organisations, community/interest groups, advocacy organisations, and philanthropy. Australian Health and Medical Research Workforce Survey (2024); Mandala analysis.

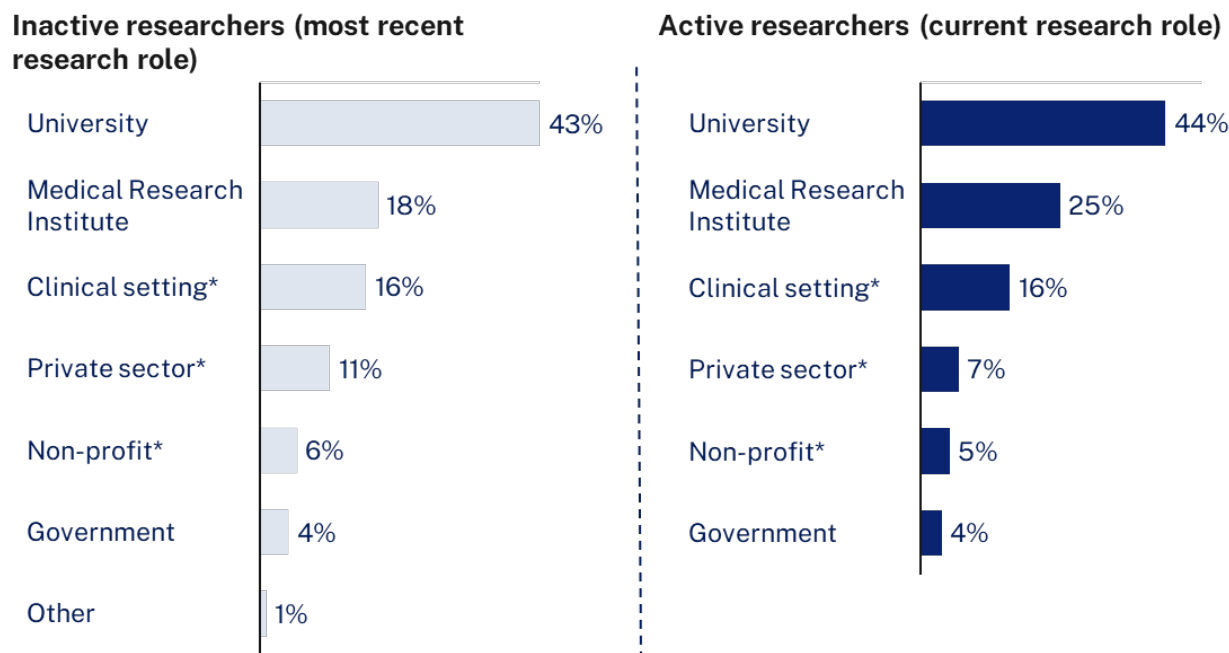
Inactive researchers were most likely to report that their most recent research role was in a traditional setting, with 43% having worked for a university and 18% for an MRI

There are some differences when comparing the final research roles of inactive researchers and the current roles of active researchers in Australia's health and medical research sector, but on the whole the distribution is roughly similar. This may suggest that choosing to leave research is largely independent on employer type.

Universities dominate both categories, accounting for 43% of inactive researchers' final roles and 44% of current active researchers, indicating a stable proportion of university-based research. However, notable differences emerge in other sectors. Medical Research Institutes employ 25% of active researchers but represent only 18% of inactive researchers' final roles, suggesting potentially better retention or career progression within these institutions. Clinical settings show consistency, accounting for 16% of both inactive and active researchers.

The private sector appears to have a higher proportion of researchers transitioning out of research, representing 11% of inactive researchers' final roles compared to only 7% of current active researchers. Non-profit organisations and government roles show slight variations, with marginally higher percentages among inactive researchers. These patterns suggest that while universities remain the primary setting for health and medical research, there are nuanced differences in researcher retention and career trajectories across different organisational types, with Medical Research Institutes showing stronger retention and the private sector potentially serving as a stepping stone to non-research roles.

Figure 17: Most recent research role (proportion of all inactive researchers, Australia, at June 2024)³³



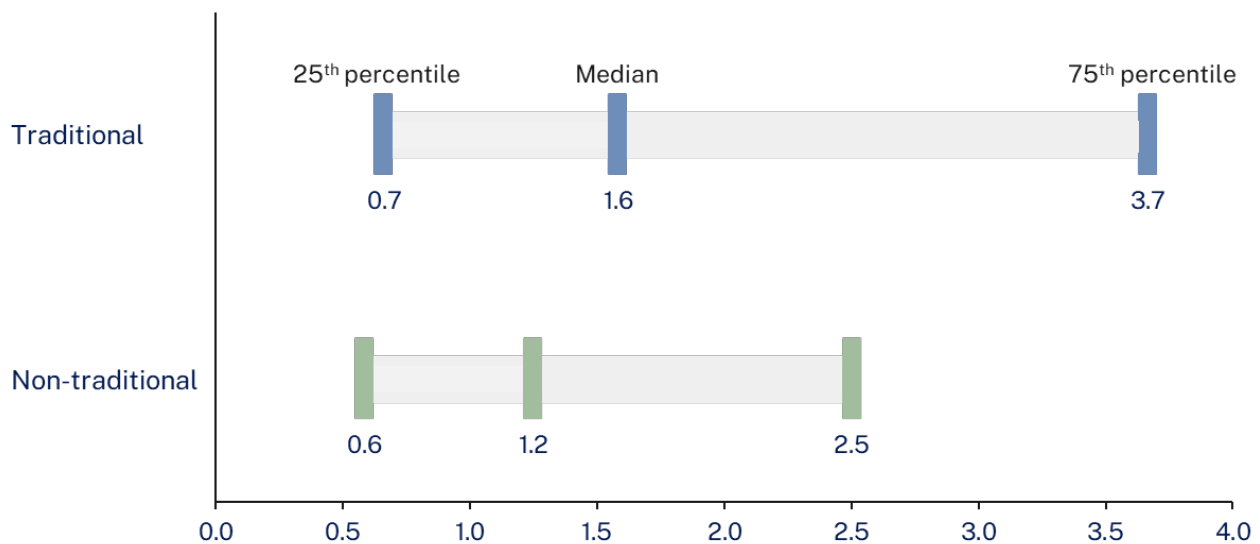
³³ Responses have been weighted to align with the Revelio data on gender, state and territory and traditional and non-traditional workforce fields. *Clinical settings may include hospitals, clinics, health service delivery, ACCHOs. Private sector includes pharmaceuticals, biotechnology and medical device technology companies, contract research organisations, and consultancy. Non-profit includes peak body/professional organisations, community/interest groups, advocacy organisations, and philanthropy. Australian Health and Medical Research Workforce Survey (2024); Mandala analysis.

Traditional researchers move jobs less frequently than non-traditional researchers, spending a median 1.6 years per role

The analysis of job tenure in the health and medical research sector shows differences between traditional and non-traditional researchers, with implications for workforce mobility and productivity. Non-traditional researchers, in the median, spend 4 months less in a job than traditional researchers. The longer duration for the traditional workforce could be explained by concerns about skills transferability.³⁴ There is a longer tail in the distribution of duration in a role for traditional researchers compared to non-traditional researchers. This means there is a segment of traditional researchers who do not move jobs as frequently. Longer duration on a role suggests less workforce mobility which has a negative impact on productivity.³⁵ This is also seen in the survey responses, where the most frequent duration in role reported is 1-3 years, with a long tail with many workers reporting working for more than 10 years.³⁶

Job stability is unevenly distributed across workers. Some workers change jobs often while a relatively large group of workers change jobs rarely. Age is a key determining factor behind this. Younger workers are more likely to change jobs more frequently.³⁷ In the research sector, insecure jobs in more junior roles are likely to add to the age effect experienced in overall workforce mobility. In the broader Australian workforce, 57.3% of workers have been in their current role for fewer than 4 years, with 18.6% less than 1 year.³⁸

Figure 18: Duration in role (Interquartile range; 25th, 50th and 75th percentile), years, June 2019 – June 2024³⁹



³⁴ MTPConnect and BehaviourWorks Australia (2020) A Survey of Workforce Skills and Capacity in the Medical Technology, Biotechnology, Pharmaceutical and Digital Health (MTP) Sector

³⁵ Andrews, D and Hansell, D (2019) Productivity-enhancing labour reallocation in Australia

³⁶ Survey respondents were asked to state how long they had been in their current role from the following options: Less than 1 year, 1-3 years, 4-6 years, 7-10 years, and More than 10 years. Revelio data captures does not capture age, which prevents specific age-based analysis of these results.

³⁷ ABS (2024) Job mobility

³⁸ ABS (2024) Job mobility

³⁹ Revelio Labs; Mandala analysis. Data is unweighted as duration in a role has been analysed at the position level.

“Positions are normally for 2-3 years maximum - this doesn't provide stability for long-term decisions, especially when you have family responsibilities.”

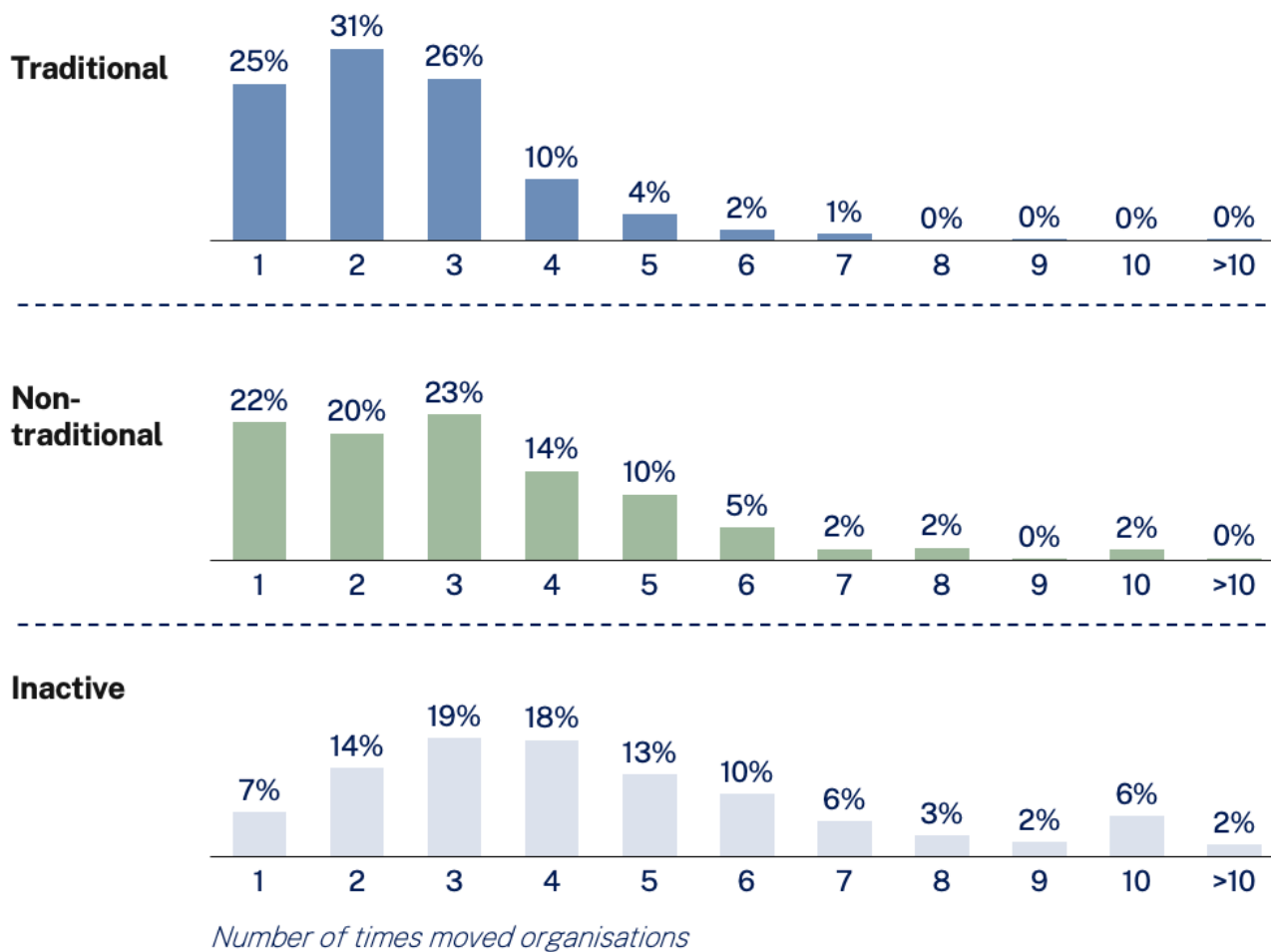
Inactive researchers report working across more organisations than traditional and non-traditional workers, with 21% of inactive researchers working in 2 or fewer organisations, compared to 56% of traditional and 42% of non-traditional researchers

Traditional researchers show a concentrated pattern of organisational moves, with the majority (82%) having moved between 1-3 times. The peak is at 2 moves (31%), closely followed by 3 moves (26%) and 1 move (25%). There's a sharp decline after 3 moves, with only 10% moving 4 times and very few moving more than 5 times. This suggests a career pattern where traditional researchers tend to settle into organisations after a few initial moves.

Non-traditional researchers display a slightly more distributed pattern of mobility. While the majority (65%) still fall within the 1-3 moves range, the distribution is more even across these categories (22%, 20%, and 23% respectively). There's a more gradual decline in percentages for higher numbers of moves, with 14% moving 4 times and 10% moving 5 times. This indicates potentially greater career fluidity in non-traditional research roles.

Inactive researchers show the most diverse pattern of organisational moves. Their distribution is relatively flat from 2 to 5 moves (ranging from 13% to 19%), with a notable 10% having moved 6 times. Interestingly, they have the highest percentages for very frequent moves, with 6% moving 10 times and 2% moving more than 10 times. This suggests that researchers who eventually leave active research roles may have more varied career paths, possibly exploring different organisations before transitioning out of research.

Figure 19: Number of times researchers report moving organisations (proportion of respondents who selected a response to the question “How many times have you moved organisations?”)⁴⁰



⁴⁰ Australian Health and Medical Research Workforce Survey (2024); Mandala analysis. Responses have been weighted to align with the Revelio data on gender, state and territory and traditional and non-traditional workforce fields..

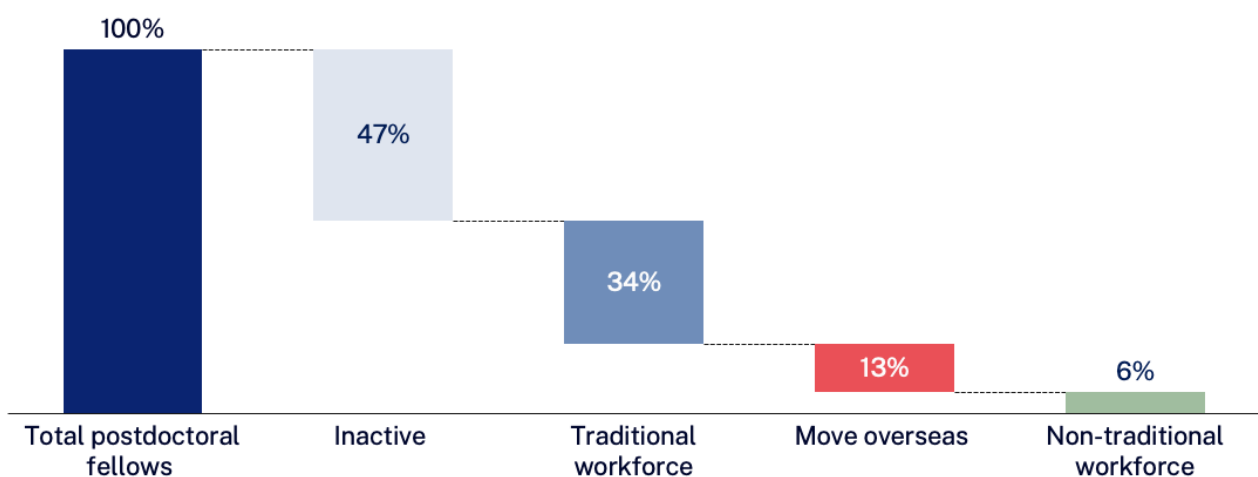
Over a 5-year period, 47% of postdoctoral fellows who change roles leave research, with 34% remaining in traditional research

As a case study of a particular type of position, we can look at the career trajectories of postdoctoral fellows in the HMR sector. This reveals a significant movement from research, with nearly half transitioning to other sectors, highlighting both challenges in retention and the broader economic impact of research training. The largest portion of postdoctoral fellows leave the research workforce all together, with 47% moving into roles in other sectors when changing jobs. Postdoctoral fellows are highly skilled in research. The high proportion who transition from active research represents the dynamic flow of highly skilled workers to other sectors in the economy. Survey data shows that for inactive researchers, 49% report being in their most recent research role for 3 years or fewer, suggesting individuals moving to other roles early in their career.

“There is a massive exodus during postdoc years from academia to industry.”

A large proportion of postdoctoral fellows remain in the traditional research sector, with 34% moving into traditional research roles. A further 13%, postdoctoral fellows move overseas. The postdoctoral fellows who move overseas have not been further classified by the sector they move into as they have left the Australian workforce. This shows the highly international nature of research and scientific collaboration. A small proportion of postdoctoral fellows move into the non-traditional research sector. Only 6% move from being a postdoctoral fellow into a non-traditional research role. Comments in the survey suggest that there is a perception that many postdoctoral fellows move into industry, but Revelio data shows that while many move into industry out of academia, very few move into research roles.

Figure 20: Pathways for movement for health and medical research postdoctoral fellows (positions count (proportion), Australia, June 2019 – June 2024 ⁴¹

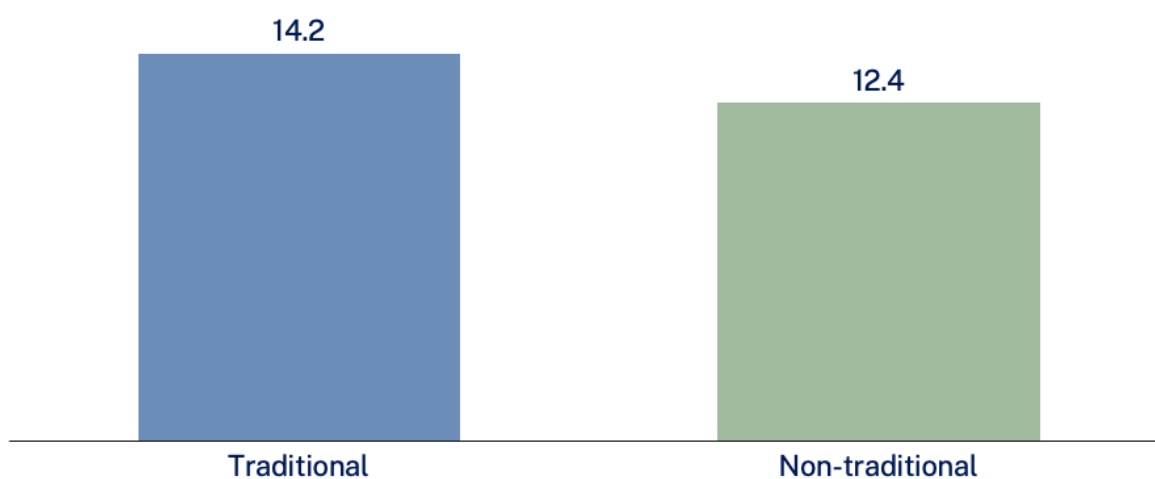


⁴¹ Revelio Labs; Mandala analysis. Researchers who leave a traditional or non-traditional research role and move overseas have not been classified in more detail as this group was outside the scope of the LLM classifier process.

Traditional researchers report a desire to remain in research for an average of 14.2 further years, longer than non-traditional researchers who average 12.4 years

Traditional researchers show a greater long-term commitment to their field, planning to continue their work for nearly two years longer on average compared to their non-traditional counterparts. Literature suggests a shorter expected duration for researchers to remain in a research role. One study found that a large portion of the workforce expects to leave the sector within five years, largely due to job insecurity and the competitive nature of grant funding.⁴²

Figure 21: Average number of years researchers desire to remain in research (average response to question “How many years do you plan to spend in research (conducting research)?”)⁴³



“I want to make a difference in people's lives, and I love research as my way of doing this”

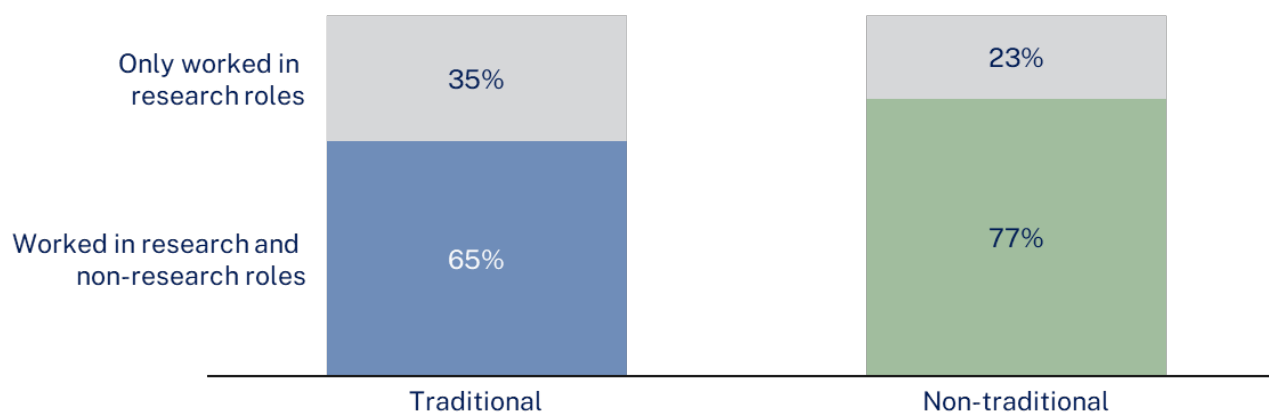
⁴² Association of Australian Medical Research Institutes Ltd (AAMRI) (2021) Australia's missing link: A national health and medical research strategy

⁴³ Australian Health and Medical Research Workforce Survey (2024); Mandala analysis. 13 respondents who reported desire to stay for more than 60 years were truncated and assigned values of 60 years for the purposes of this analysis

Many researchers find moving between organisations easy, with majority working in research and non-research roles in their career

Researchers across the traditional and non-traditional sectors find it easy to transfer between organisations and sectors. Movement between organisations was reported to be easy by 46% of researchers, with 16% reporting movement as difficult. While many researchers find their skills transferable and see opportunities for career advancement, they also face significant challenges related to administrative processes, funding continuity, and adapting to new organisational cultures. The ease of transition often depends on individual adaptability and the level of support provided by the new organisation. Non-traditional researchers are more likely to work across both research and non-research roles.

Figure 22: Researchers working in research and non-research roles (proportion of the active researchers) ⁴⁴



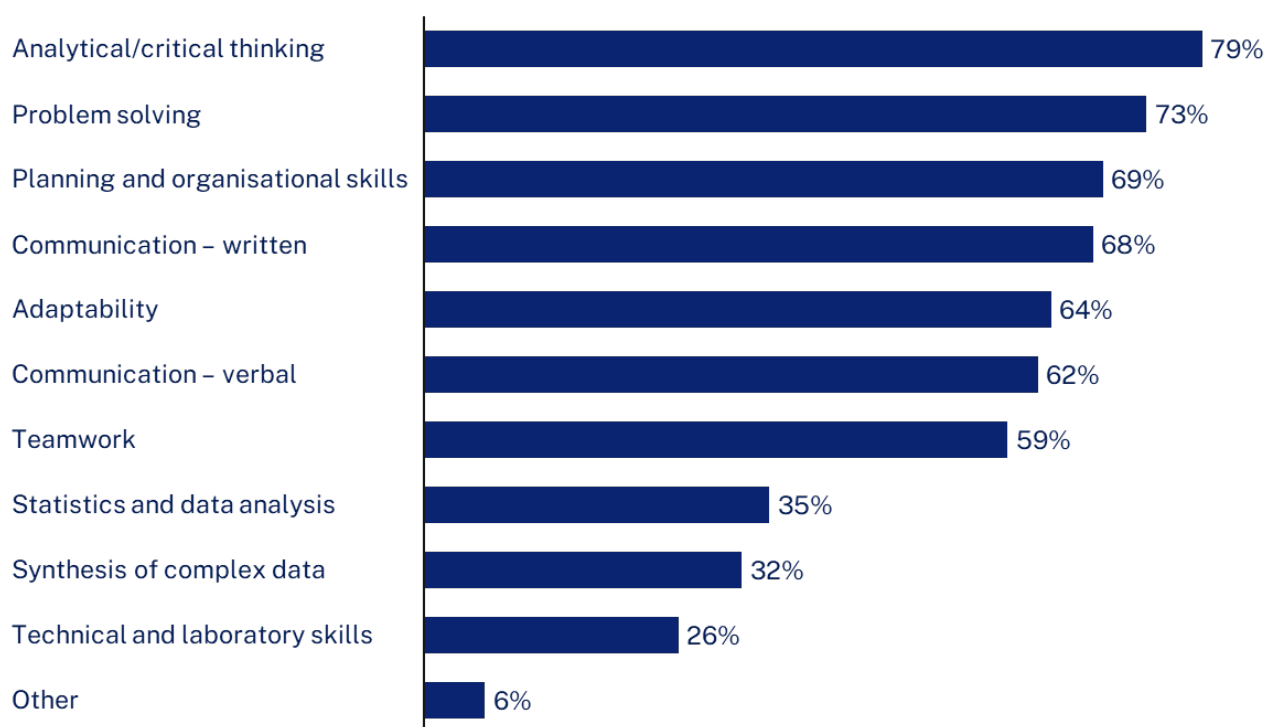
⁴⁴ Australian Health and Medical Research Workforce Survey (2024); Mandala analysis. Responses have been weighted to align with the Revelio data on gender, state and territory and traditional and non-traditional workforce fields.

Skills from research are transferable with analytical and critical thinking and problem solving the most useful skills

The high transferability of research skills across organisations highlights the HMR sector's role as an incubator for developing talent for the broader Australian workforce. When assessing the transferability of research skills, 75% of researchers said it was very easy or easy to transfer when moving across organisations. Those who have left research were more likely to say their research skills were transferable when moving across organisations. This suggests that the research sector is an important sector for developing capabilities of the broader Australian workforce.

Researchers who have moved between organisations in their career reported would they have most liked to have management or leadership skills, communication skills, statistical or data analysis skills, financial or budgeting skills and networking skills.

Figure 23: Skills from research that have been the most useful when moving across different organisations (proportion of researchers who had worked in an organisation other than their current organisation)⁴⁵



Workforce movements between and in and out of the health and medical research workforce show job and sector transitions which have not previously been mapped. Understanding the transitions allows for more effective planning and decision making. These findings also demonstrate the positive impact that the health and medical research workforce has on training individuals who go on to work in a range of areas of the Australian economy.

⁴⁵ Australian Health and Medical Research Workforce Survey (2024); Mandala analysis. Respondents could select more than one reason. Responses have been weighted to align with the Revelio data on gender, state and territory and traditional and non-traditional workforce fields.

CHAPTER 3: WORKFORCE MOTIVATIONS

Key finding: Passion for research and impact on society attract and retain researchers but funding and job security are key challenges and reasons for leaving the sector

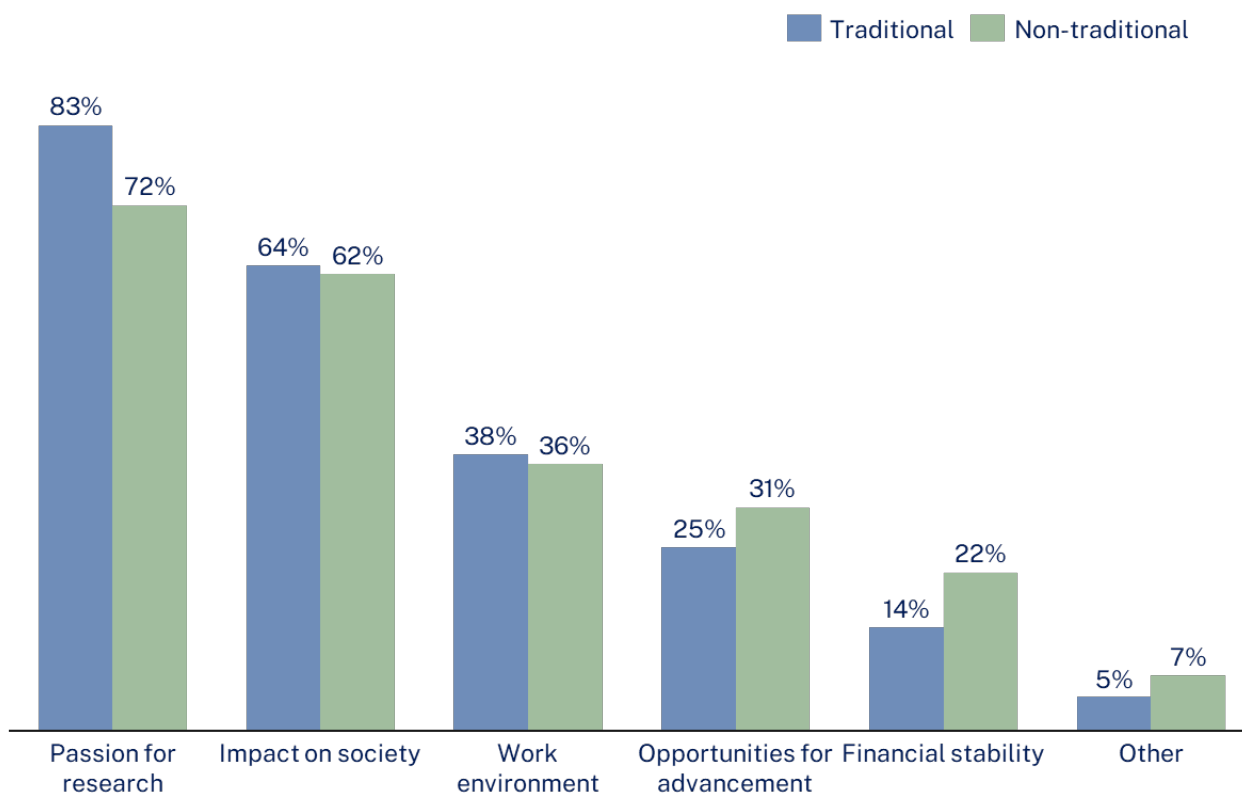
This section delves into the factors driving recruitment, retention, and attrition within Australia's health and medical research sector. Passion for research and societal impact emerge as the primary motivators, attracting 78% of traditional and 70% of non-traditional researchers to their roles. However, significant disparities in job security exist, with 55% of traditional researchers on fixed-term or casual contracts compared to 31% of non-traditional researchers. Funding sources vary between sectors, with Federal Government grants the most common for traditional researchers, while institutional and private sector funding are prominent for non-traditional researchers. This chapter covers challenges, with 72% of traditional researchers citing lack of funding as their greatest challenge, followed closely by job insecurity. These factors contribute to high potential job departure rates, with 75% of traditional and 65% of non-traditional researchers having considered leaving the field. For those who have left, career advancement opportunities (cited by over 50%) and workplace reasons were the primary drivers for traditional and non-traditional researchers, respectively.

Researchers are attracted to and remain in their roles due to a passion for research and impact on society

The primary motivators for entering and remaining in the HMR sector are intrinsic, with passion for research and societal impact driving both recruitment and retention, though some differences emerge between traditional and non-traditional researchers' priorities. Passion for research and impact on society are given as the main factors which attract individuals to a role in research. It is also the most common reason why researchers stay in research. A higher proportion of non-traditional researchers reported opportunities for advancement (31% compared to 25% for traditional researchers) and financial stability (22% compared to 14% for traditional researchers) as the factors which attracted them to their research roles.

"I love research and feel I am able to make a positive contribution to my field."

Figure 24: Factors that attracted researchers to their current role (proportion of current researchers)⁴⁶

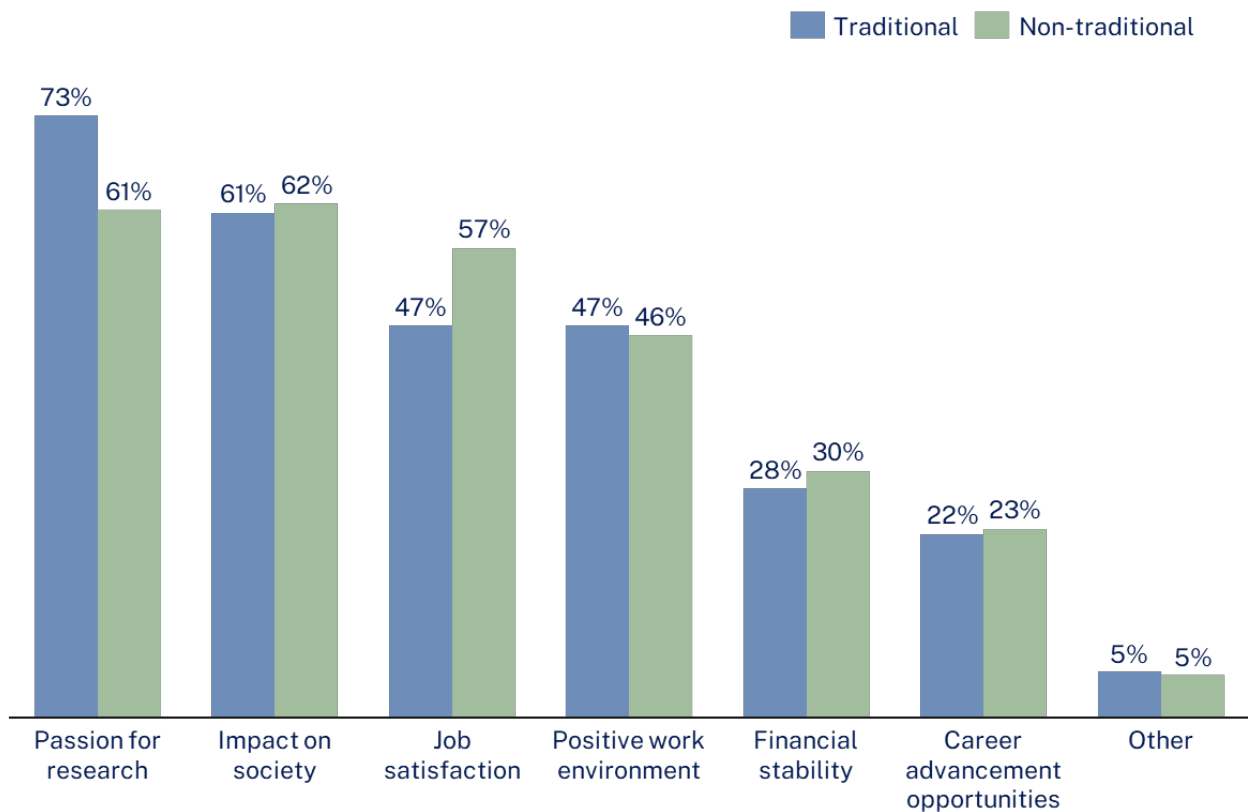


⁴⁶ Australian Health and Medical Research Workforce Survey (2024); Mandala analysis. Respondents could select more than one reason. Responses have been weighted to align with the Revelio data on gender, state and territory and traditional and non-traditional workforce fields.

Passion for research is the most common reason why traditional researchers remain in their research role. Impact on society was the most common reason given by non-traditional researchers when asked about their motivations to stay in their research role. Another notable difference in motivations between the two is that more non-traditional researchers cited job satisfaction as a motivator to stay in their role, with 57% giving it as a reason compared to 47% for traditional researchers. As is the case with the factors which attract researchers to their roles, career advancement opportunities and financial stability were the least common motivations to remain in a research role.

"It's interesting and allow me to learn at the same time, to be a better clinician and I feel like I'm indirectly helping relevant patients."

Figure 25: Motivation to stay in a research role (proportion of active researchers)⁴⁷



For those who have not considered leaving research, the general sentiment about a career in research is positive. When asked why they had not considered leaving research, passion and enjoyment was the most common theme, representing nearly half of all responses. Impact and contribution is the second most common theme, indicating that many researchers are driven by the desire to make a difference in their field or society.

⁴⁷ Australian Health and Medical Research Workforce Survey (2024); Mandala analysis. Respondents could select more than one reason. Responses have been weighted to align with the Revelio data on gender, state and territory and traditional and non-traditional workforce fields.

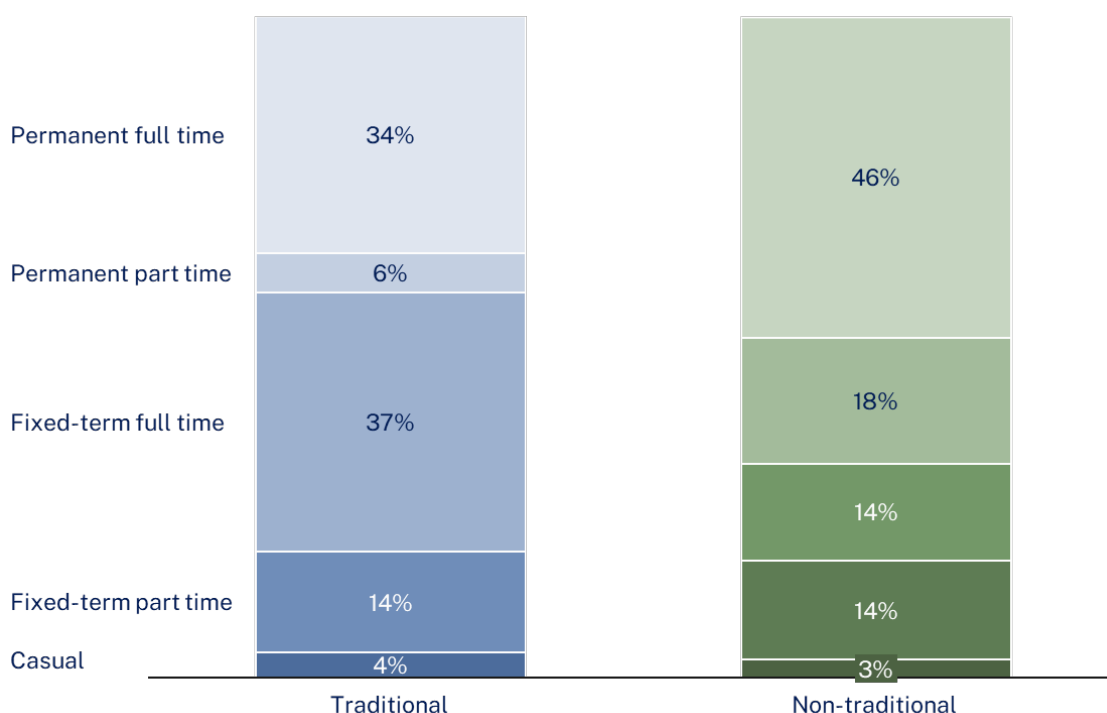
Traditional researchers are more likely to be on fixed term or casual contracts

Job insecurity, characterised by prevalent short-term contracts, emerges as a significant challenge in the HMR sector, particularly affecting traditional researchers and persisting throughout their careers. Existing literature about the health and medical research workforce has found that short-term contracts are common, with job insecurity often cited as a challenge to ongoing employment in the sector. According to Research Australia, 55% health and medical researchers are employed on contract, with 12 month contracts the most common.⁴⁸

“Temporary contracts make it difficult to attract and retain staff”

Fixed term and casual contracts are common across the workforce, especially for traditional researchers. Traditional researchers are more likely to be employed in fixed-term role, compared to non-traditional researchers. For traditional researchers, 55% are on fixed-term or casual contracts compared to 31% for non-traditional researchers. There is a lower proportion of researchers across both types on permanent full time (64%) and part time (13%) contracts compared to the professional, scientific and technical services sector.⁴⁹

Figure 26: Type of employment contract (proportion of current researchers)⁵⁰



⁴⁸ Research Australia (2021) COVID-19 Series: Report 2: The impact of Covid-19 on health and medical researchers

⁴⁹ Australian Bureau of Statistics (2023)

⁵⁰ Australian Health and Medical Research Workforce Survey (2024); Mandala analysis. Responses have been weighted to align with the Revelio data on gender, state and territory and traditional and non-traditional workforce fields.

"I have concerns for job security for women, and availability to access paid parental leave with fixed term contracts"

Researchers are also likely to remain on fixed term or casual contracts for a significant period of their career. Out of the traditional researchers who are on fixed term or casual contracts, 53% have been working in health and medical research for more than 10 years. For the traditional researchers who are on permanent contracts, 38% have under 10 years of experience in the workforce. This indicates there are a limited number of permanent contracts in traditional research roles, especially for those with fewer years' experience in the workforce.

"The unstable and stressful employment - I've been on 1-year contracts my entire career." - Female, 45-54-year-old

Across both sectors, 36% of researchers have more than one job. Holding more than one job is slightly more common for the non-traditional workforce, with 39% compared to 34% for the traditional workforce. The most common types of additional jobs for traditional researchers are academic or teaching roles. For non-traditional researchers, the most common type of additional jobs are roles in clinical practice such as a physician. It is more common for men to hold more than one job than females, with 40% of men who are active researchers holding more than one job compared to 33% of women.

Federal government grants are the most common funding for traditional researchers, with institutional funding the most common for non-traditional

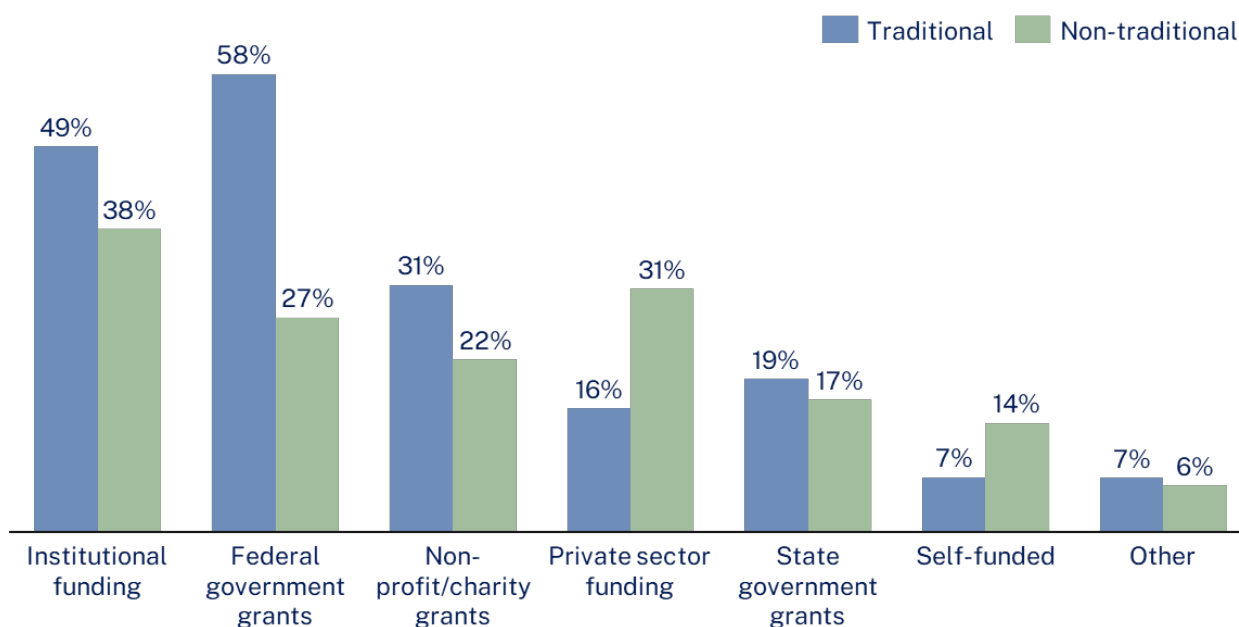
The funding landscape varies between traditional and non-traditional sectors, with government grants dominating the former and private sector and institutional funding common in the latter, while also highlighting gender disparities in grant leadership roles.

Federal Government grants are the most common source of funding for traditional researchers. This is followed by institutional funding. The top three most common federal government grants that supported traditional researchers are NHMRC (68%), MRFF (42%) and ARC (12%).⁵¹ Survey data from the MRFF suggests that each grant supports on average 7.7 positions.⁵²

Institutional and private sector funding are the most common type of funding for non-traditional researchers. Non-traditional researchers are less likely than traditional researchers to cite a lack of funding as a challenge they faced in their research role.

The primary source for on-costs, such as leave entitlements, for the traditional research sector are grants, scholarships or fellowships. For the non-traditional sector it is self-funded or private funding, with industry and pharmaceutical company funding prominent. The overall sentiment of responses related to funding on-costs is that there is a significant reliance on self-funding and private sources, which may indicate challenges in securing funding for on-costs.

Figure 27: Primary source of funding for a research position (Proportion of current researchers)⁵³



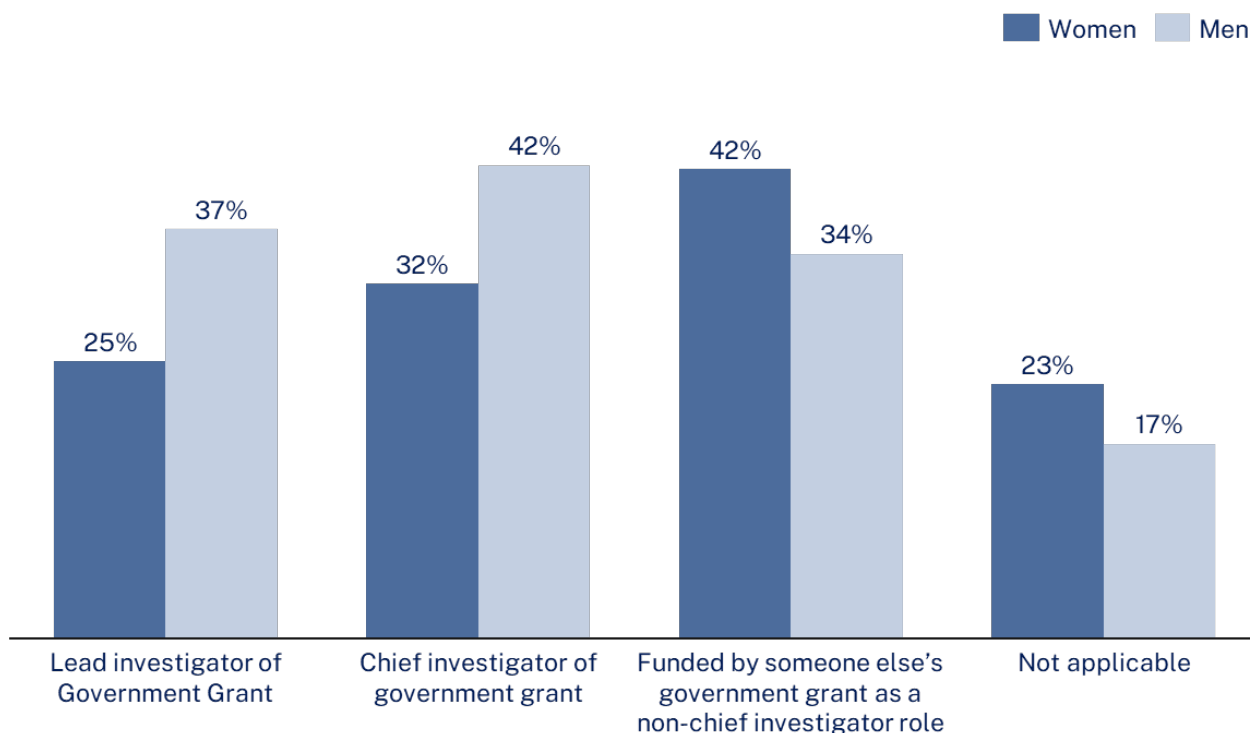
⁵¹ NHMRC - National Health and Medical Research Council. MRFF - Medical Research Future Fund. ARC - Australian Research Council

⁵² Department of Health and Age Care (2024) Medical Research Future Fund (MRFF) grant recipients

⁵³ Australian Health and Medical Research Workforce Survey (2024); Mandala analysis. Respondents could select more than one reason. Responses have been weighted to align with the Revelio data on gender, state and territory and traditional and non-traditional workforce fields.

Within the research projects which are funded through grants, men are more likely to be in more senior roles. Women are most likely to be funded by someone else's grant as a non-chief investigator role (42%). Men are Lead or Chief Investigator in 79% of cases, with more in a lead investigator (37% for men, compared to 25% for women) or chief investigator role (42% for men, compared 32% for women).

Figure 28: Whether a researcher is a lead investigator, chief investigator or funded through someone else's government grant (proportion of researchers)⁵⁴



⁵⁴ Australian Health and Medical Research Workforce Survey (2024); Mandala analysis. Respondents were asked "If applicable, are you a chief investigator (CI) on a government grant and/or are you funded by someone else's grant?". Responses have been weighted to align with the Revelio data on gender, state and territory and traditional and non-traditional workforce fields. Lead Investigator refers to Chief Investigator A (CIA) positions, while Chief investigator refers to all other named Chief Investigators (e.g. non-leading role CIB, CIC, etc).

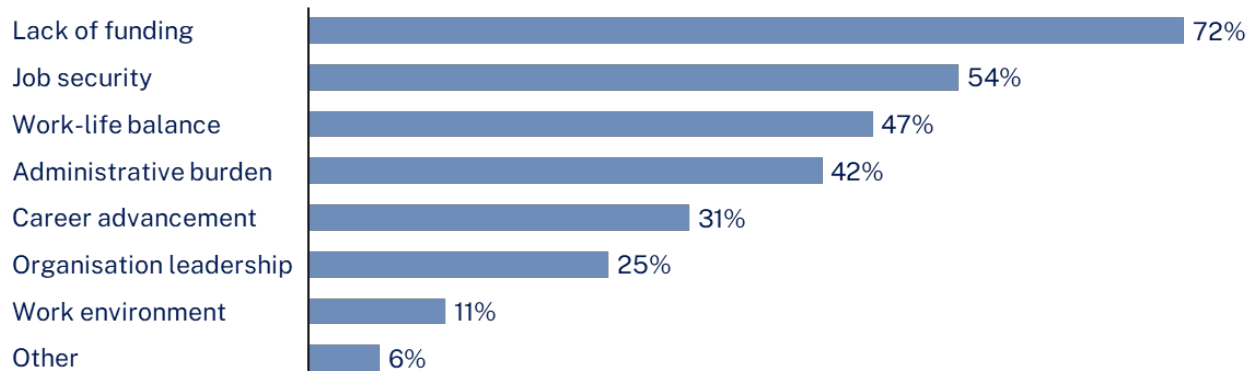
The lack of funding is the most challenging part of research, followed by job security

Researchers in the HMR sector face a variety of challenges that impact their career satisfaction and longevity, with differences between traditional and non-traditional research environments. Both traditional and non-traditional researchers reported a lack of funding as the most challenging part of their research role. More traditional researchers reported a lack of funding as a challenge (72% compared to 55%). Job insecurity is the next more common challenge for traditional researchers. With 55% of traditional researchers on fixed-term contracts, it is unsurprising that job insecurity is a key challenge for researchers. The most common challenges reported by non-traditional researchers differ with 46% reporting administrative burden as a challenging part of their role. A lower proportion of non-traditional researchers reported job security as a challenge, which aligns with more non-traditional researchers on permanent contracts (64% compared to 40% for traditional researchers).

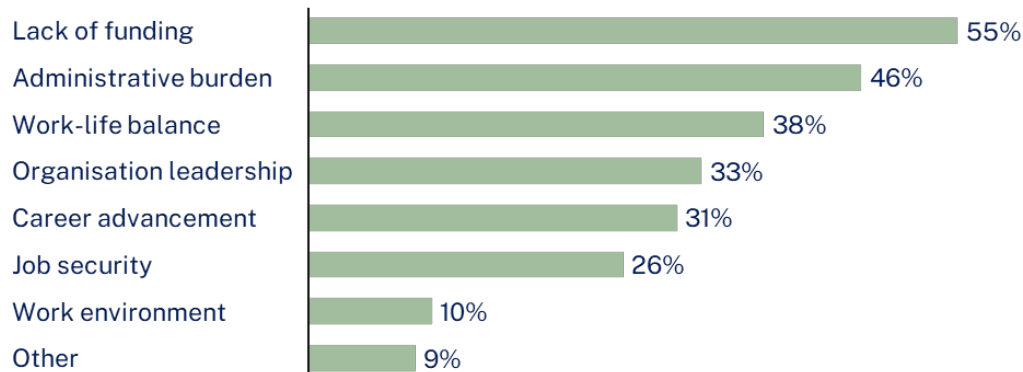
“The uncertain funding situation has pushed so many bright and brilliant researchers into different fields where financial and job stability can be guaranteed.”

Figure 29: Aspects current researchers find the most challenging about their roles (proportion of current researchers)⁵⁵

Traditional researchers



Non-traditional researchers



“The complete lack of job security as a result of limited funding availability is a major impediment to undertaking and continuing with research.”

Amongst current researchers, 75% of traditional and 65% of non-traditional researchers have considered leaving research. This is slightly lower than existing research which found that 83% of health and medical researchers have considered leaving research.⁵⁶ For those who are considering leaving, financial reasons is most common for traditional researchers with over half of respondents citing it as a reason for considering leaving. The literature supports this, with one report noting that 91% of researchers consider shortage of funding as an important factor in deciding whether to leave health and medical research.⁵⁷ For non-traditional researchers, financial reasons was still a key reason for considering leaving but was behind workplace reasons as the key reason for considering leaving research.

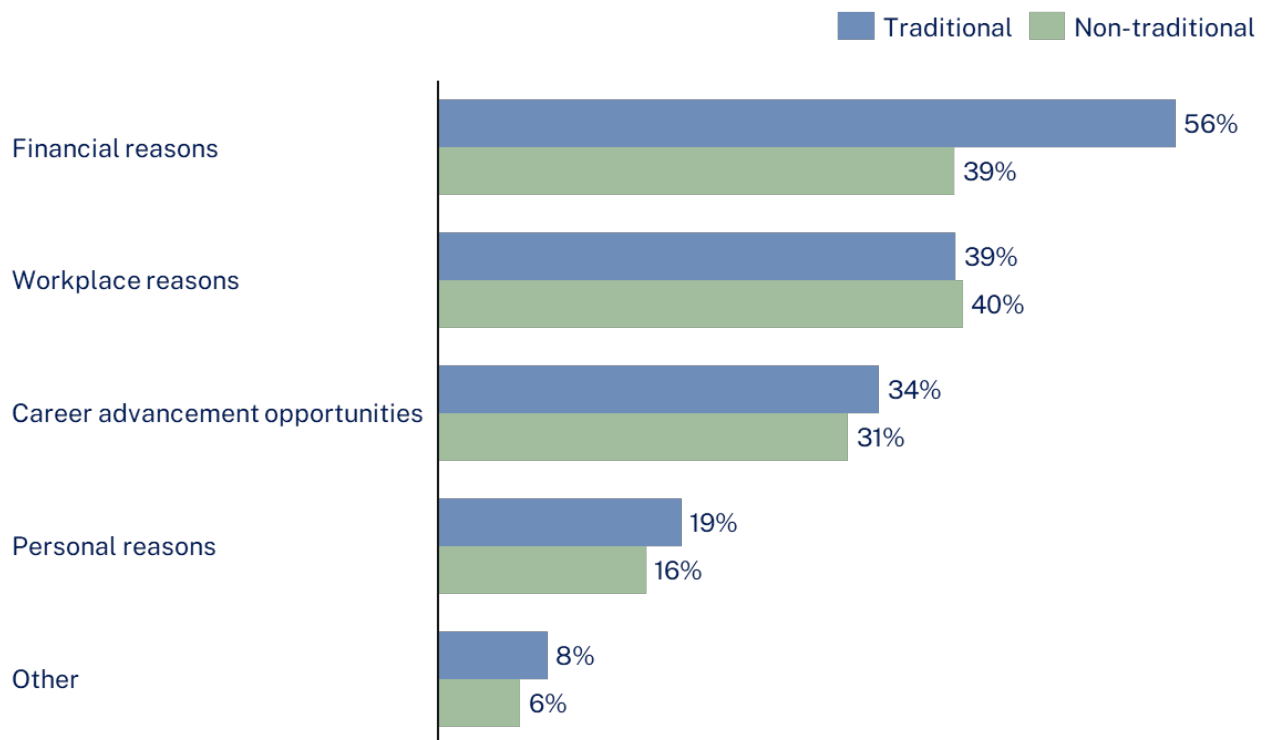
⁵⁵ Australian Health and Medical Research Workforce Survey; Mandala analysis. Respondents could select more than one reason. Responses have been weighted to align with the Revelio data on gender, state and territory and traditional and non-traditional workforce fields.

⁵⁶ ASMR (2016) Building Knowledge, Supporting Innovation 2016 ASMR Health and Medical Research Workforce Survey Brief Report

⁵⁷ Kavallaris et al. (2008) Perceptions in health and medical research careers: the Australian Society for Medical Research Workforce Survey

"I love the work and the impact but am always worried about what may happen in the next one to two years and am constantly considering when I should 'jump ship' and move away from primary research to something more stable."

Figure 30: Reasons for considering leaving research (proportion of current researchers who have considered leaving research)⁵⁸



⁵⁸ Australian Health and Medical Research Workforce Survey; Mandala analysis. Respondents could select more than one reason. Responses have been weighted to align with the Revelio data on gender, state and territory and traditional and non-traditional workforce fields.

Career advancement opportunities were the main reason traditional researchers left research, with workplace reasons the most common for non-traditional researchers

The decision to leave the HMR sector is driven by a range of factors, with career advancement opportunities and workplace conditions playing pivotal roles for both traditional and non-traditional researchers.

More than half of the inactive researchers who most recently worked in a traditional research role reported career advancement opportunities as the reason they left their research role. Existing research supports these findings with one report showing 78% consider a lack of career development opportunities as an important factor on whether to leave health and medical research.⁵⁹ Workplace reasons followed by career advancement opportunities were the most common reason for non-traditional researchers to leave research.

Figure 31: Reasons why the traditional and non-traditional workforce left their role in research (proportion of responses who do not currently work in research)⁶⁰



When providing more detail of why they left their role in research, across both traditional and non-traditional researchers, job insecurity and funding uncertainties were the most common reasons for leaving research roles. Work-life balance issues, including long hours, high stress, and difficulty

⁵⁹ Kavallaris et al. (2008) Perceptions in health and medical research careers: the Australian Society for Medical Research Workforce Survey

⁶⁰ Australian Health and Medical Research Workforce Survey; Mandala analysis. Respondents could select more than one reason. Responses have been weighted to align with the Revelio data on gender, state and territory and traditional and non-traditional workforce fields.

balancing family responsibilities, were consistently cited as significant factors. Workplace culture issues was also referenced by some.

For traditional researchers, job insecurity and lack of stable funding were overwhelmingly cited as key reasons for leaving research roles. Career progression concerns, including limited advancement opportunities and low salaries, pushed many to seek roles outside of research.

For non-traditional researchers many cited a desire for better work-life balance, higher pay, and more job security as motivations for seeking opportunities outside of research. Career advancement and the opportunity to apply their skills in different contexts such as in industry or policy roles attracted some away from research roles.

"I wanted to employ my research expertise and experience in an industrial setup and build my career around it"

A significant number of respondents indicated that nothing would convince them to return to research. For those who did provide a suggestion, the majority referenced job security and compensation. Researchers noted the need for permanent positions, ongoing contracts, or longer-term job security and movement away from reliance on short-term grant funding. They also mentioned improved salaries and pay that reflects their experience and qualifications.

"I'm not interested in returning to research. I don't think I could handle the decrease in pay, working conditions, or work-life balance."

Researchers want to see funding, security and support improved in the health and medical research sector

There are several opportunities identified to maintain Australia's competitive edge in health and medical research and ensure a robust, diverse, and sustainable research workforce: This audit also identified key opportunities and challenges for the health and medical research workforce more broadly.

- Improving job security and offering longer-term contracts, particularly in the traditional research sector.
 - *Significant disparities in job security exist, with 55% of traditional researchers on fixed-term or casual contracts compared to 31% of non-traditional researchers.*
- Addressing the gender imbalance in senior roles through targeted mentoring, leadership programs, and family-friendly policies.
 - *Women make up 52% of the workforce overall but only one in four researchers at the most senior levels. Women experience higher rates of career interruptions (55% for women compared to 27% for men), predominantly due to parental leave.*
 - *Women are most likely to be funded by someone else's grant as a non-chief investigator role (42%). Men are Lead or Chief Investigator in 79% of cases, with more in a lead investigator (37% for men, compared to 25% for women) or chief investigator role (42% for men, compared 32% for women).*
- Enhancing funding stability and opportunities, including exploring innovative funding models that blend public and private sources.
 - *72% of traditional researchers citing lack of funding as their greatest challenge, followed closely by job insecurity.*
- Supporting career development and progression, with clear pathways for researchers in both traditional and non-traditional sectors, including communicating and fostering opportunities for researchers to enrich non-research sectors with their skills, or to support research activity, policy or translation and commercialisation.
 - *Over a 5-year period, 62% of traditional researchers and 64% of non-traditional researchers leave the HMR workforce for other roles and sectors.*
 - *The largest destination for inactive HMR workers is into government roles, with 31% of inactive researchers now employed in the public sector.*

The findings in this chapter provide an evidence base for policy and decision making by demonstrating the factors driving recruitment, retention, and attrition within health and medical research. This chapter validates testimonial evidence from throughout the sector around what attracts researchers to the sector and what are the challenges and reasons for leaving.

FUTURE MONITORING PLAN

To guide effective policy and decision making, collecting and analysing the right data on the health and medical research workforce is essential. This report does this by using a range of data sources, including Revelio microdata and a one-off survey. However, to guide effective policy and decision-making in the long term, it is important to implement systematic and regular data collection processes.

5 opportunities for future monitoring of the health and medical research workforce were identified through this Audit:

1. **Agree on a workforce definition:** The sector should agree upon a clear, comprehensive definition of the health and medical research workforce. This definition should encompass both traditional and non-traditional roles, reflecting the evolving nature of the field. Consideration as to whether a task-based or occupation-based approach should be taken when defining the workforce is important to guide future data collection approaches. An important distinction that may be useful to consider for inclusion in workforce definitions is the status of individuals as either researchers, or research support roles. While both are captured using the approach in this audit, they are not necessarily distinguished or split out.

To reiterate, for the purposes of this Audit, the health and medical research workforce consists of those traditionally considered researchers: those who perform research in organisations like universities and Medical Research Institutes (MRIs), and those who work in less commonly surveyed areas of health and medical research, such as those in the private sector (pharmaceuticals, medical technology, and biotechnology) and those in clinical roles such as those who work as clinicians, including nurses, midwives, allied health workers and others, and also produce research. We describe these groups as “traditional” and “non-traditional” researchers respectively. Given the dynamism of many labour markets an important third segment to the health and medical research workforce is those who may have previously worked as traditional or non-traditional researchers, but now work in other roles across the economy. This segment we describe as “inactive” researchers. A similar definition could be considered for future monitoring following consultation with the sector.

2. **Explore potential adjustments to ANZSCO:** Exploring potential adjustments to the Australian and New Zealand Standard Classification of Occupations (ANZSCO) could significantly improve the accuracy of workforce categorisation. These refinements would enable more precise tracking and analysis of workforce trends over time through official statistical channels including the Census.
3. **Explore future regular data collection:** There are existing and historical datasets that provide varying levels of coverage for segments over the workforce, including traditional academic researchers, graduate students, and clinicians. These do not account for any potential overlap, but are valuable sources of understanding for specific segments. Australian Research Council evaluations have historically provided valuable benchmarks for in-depth analysis of the traditional health and medical research workforce in universities. While the ARC’s new Research Evaluation Framework is being developed, considerations should be made as to how to capture valuable workforce data from the health and medical research sector in a data-driven manner than minimised reporting burden. The appropriate frequency of data collection can be determined in consultation with the sector and other reporting requirements, or to align to other government reporting. For example, the Aged Care Workforce Census (now Survey) has been

run every 3-5 years, in 2003, 2007, 2012, 2016, 2020, and 2023. Collection of data should include continuous as well as regular collection.

4. **Consider repeating microdata analysis:** To monitor changes in workforce composition, employment trends, and the impact of funding or policy changes, it is recommended to repeat the Revelio microdata analysis at regular intervals. This longitudinal approach will provide insights into workforce transitions and sector dynamics. Future analysis could also include assessment of other industries for comparison, or assessment of other countries HMR workforces.
5. **Explore opportunities to conduct a regular HMR workforce survey:** Collaborating with the ABS to develop and conduct a regular health and medical research workforce survey would significantly enhance the quality and specificity of official statistics in this area. Distinct strategies could be undertaken to capture specific groups, particularly underrepresented ones such as non-traditional groups and inactive researchers. Specific targeting and engagement of underrepresented groups via peak bodies, such as non-traditional clinician researchers through AHPRA. For the inactive researchers, approaches such as the tertiary education sector's Graduate Outcomes Survey (GOS) could be adapted to track and maintain engagement with those who no longer perform or support research.

Through these opportunities, the sector can establish a robust, data-driven framework for ongoing workforce monitoring. This approach will not only provide a clear picture of the current state of the workforce but also enable stakeholders to anticipate future trends, identify emerging challenges, and make informed decisions to support the continued growth and success of Australia's health and medical research workforce. Regular, high-quality data collection and analysis will ultimately contribute to more effective policymaking, resource allocation, and strategic planning, ensuring that Australia remains at the forefront of global health and medical research.

APPENDIX

Desktop scan: The desktop scan was performed to understand existing evidence and identify key gaps to be filled by novel microdata and survey data

A large language model approach was used to scrape, categorise and assess 21 previous reports on the health and medical research workforce. The desktop scan was made up of three stages:

1. Scrape data from public reports

A large language model was used to scrape information from 21 public reports. These were published over the period 2008-2023 from a mix of government and private sources:

- Government bodies including the Department of Health and Aged Care, ARC and NHMRC
- Peak bodies such as AAMRI
- Private sources including Deloitte Access Economics and KPMG

2. Assess based on topic areas

After fine-tuning model context and parameters, the model was used to collect information and understand gaps on the following key issues:

- **Segments:** How are the traditional, non-traditional and inactive workforce categories structured? How big are they, which employers are key, and what are the primary sources for funding?
- **Transitions:** How do researchers move between workforce categories? How often is movement occurring and what are the major pathways for movement?
- **Motivators:** Why do people move between workforce categories? What are the personal and financial reasons for movement or retention?

3. Synthesise results

The accuracy of the model results was assessed by reviewing a sample of the outputs. Results were then synthesised for presentation according to a prioritisation framework:

- Workforce definitions
- Workforce size estimates
- Information gaps for project issues framework

Microdata: Classification of online job profile microdata using a Large Language Model (LLM) provides insights previously not available through other data sources

Methods typically used to capture traditional workforce statistics do not accurately capture the health and medical research workforce. The ABS collects population-wide figures with industries and sectors of employment classified under ANZSCO and ANZSIC codes. For the traditional health and medical research workforce, these classification structures are not useful as many roles are captured under tertiary education occupations and are indistinguishable from non-health and medical research academic teaching and research activities. For the non-traditional workforce, there is no simple way to distinguish which clinical workers in the ABS may be performing research as a task as part of their occupation.

Given the limitations of common data sources for workforce analysis, microdata sources were explored as an alternative to provide rich information on:

- The career pathways and transitions of health and medical research workers
- Employers and their characteristics

Revelio Labs data is a workforce database which collects and aggregates publicly available employment information worldwide. Despite it being a relatively new dataset, Revelio Labs has been used in several economics' papers in the past year⁶¹. To analyse the microdata for the health and medical research workforce, a classification exercise was required to identify the health and medical research workforce within the overall Australian workforce. Three approaches were explored to classify the microdata.

1. Rules-based classification

Determine a set of selection criteria characteristics and included workers who fit all the criteria. Process excluded workers who did not meet all the inclusion criteria. Inclusion criteria were research role in Australia, degree in a relevant field of study such as medical sciences and worked in a relevant industry such as professional, scientific and technical services.

However, this approach was too strict and excluded too much of the workforce. This approach was very strict in the selection of relevant researchers and did not account for the diversity within the health and medical research workforce. For example, researchers working in HMR roles who do not have relevant fields of study would be excluded.

2. Machine learning model⁶²

The use of a machine learning algorithms such as a random forest model to better classify and segment the workforce was assessed. A machine learning model would be based on a combination of decision trees to determine the outcome of inclusion into the health and medical research workforce. This process would require the construction of a training data set, which involves manual classification of a sample of the data to train the model.

⁶¹ Cole, Jeng, Lerner, Rigol, and Roth (2022); Cai, Chen, Rajgopal et. al. (2024); Liu, Chen and Lyu (2024); Welsh and Ruda (2024)

⁶² Machine learning models have been used to classify large unstructured datasets to understand cybersecurity roles (Centre for Security and Emerging Technology, 2024) and job advertisements (Boselli et al. 2018)

However, this approach was too time-consuming and had a high risk of human error. Assuming 30 seconds per person classifying, with a two-person team, this would take 500 hours to classify 120,000 positions required to train the machine learning model. This was not reasonable in our timeframe for this project and the degree of human-error is potentially high with manual classification.

3. Large language model (LLM)⁶³

An LLM, such as ChatGPT, to segment the workforce. The LLM classifier is designed to assign a probability score of the likelihood of an individual working in the HMR workforce. A prompt with job title, company, degree, industry and field of study is given to the LLM to provide examples of workers who are within the traditional or non-traditional segments. Based on these suggested definitions the model assigns each worker a probability score of being in the HMR workforce.

False positives can occur within the classifier, but manual checks can resolve this. The model is accurate when classifying the traditional workers with more reclassification and exclusions of the non-traditional workers.

Large language model (LLM) approach was chosen to ensure timeliness of delivery and to ensure the data represents the diversity of the HMR workforce in terms of field of study, role and industry.

Using the LLM approach, we were able to segment the HMR workforce from the Revelio Labs data. The model included workers in the HMR workforce with characteristics such as:

- Research officer at the Walter and Eliza Hall Institute of Medical Research, qualification in molecular medicine
- Senior clinical research associate, at Novotech, qualification in biomedical sciences

The model excluded workers with characteristics such as:

- PhD researcher at the Australian Nuclear Science & Technology Organisation, qualification in industrial engineering
- Research scientist at the CSIRO, qualification in Animal Science

⁶³ LLM have been used in various text classification tasks across legal, medical and job data (Zhang et al. 2024; Levine et al. 2023; Laughlin et al. 2024).

Revelio data was classified to understand employment trends for 59,400 health and medical researchers in Australia over the last 5 years

The Revelio data set has **1.4 billion positions worldwide** and after classification, 59,400 health and medical researchers were identified.

Key steps in identifying health and medical researchers in the dataset:

- **Identify potential job categories:** To create the initial dataset, we identified profiles who had at least one position that was in one of the relevant job categories. Revelio Labs maps the job titles from a free text field to one of 1,500 job categories using a proprietary algorithm. These job categories are a mapping of underlying free text entries and are not a list of keywords. Mandala identified 98 possible job categories of individuals who could be in the HMR workforce and removed all profiles that did not have a position containing one of these job categories.
- **Remove non-Australian profiles:** To generate a workable dataset, we limited our analysis to individuals who have been active in Australia at some point in the last 5 years (June 2019 – June 2024).
- **Remove non-relevant industries and roles:** To further refine our working list of individuals and positions we removed any individuals that reported **only** holding positions in non-relevant industries (taking a conservative approach to non-relevant industries, e.g., mining and steel manufacturing). We also removed individuals who reported **only** non-research healthcare roles. Individuals who hold non-research healthcare roles, e.g., nurse practitioner or midwife or RN or medical specialist would be included if at any point in the past 5 years they had also held a position that is assigned a high probability of being involved in HMR, for example (but not limited to) an honorary position at a university, a research role at a hospital. If this step were not performed, and all clinical roles were included this could add up to 300,000 registered nurses, or up to 130,000 registered medical specialists and doctors, across Australia.
- **Weighting of data: Step 1. Revelio:** To account for bias in the microdata, we employed a two-step weighting approach. The first step uses weights for each individual profile provided by Revelio Labs. These weightings are always larger than 1 and reflect the probability that an individual is not on LinkedIn. They take into account the individual's country, gender, seniority and occupation. For example, the profile of a male, senior professor from the ACT may have a weighting of 1.2. Revelio uses detailed occupational breakdowns for the United States (using Bureau of Labor Statistics data), which allows them to infer the likelihood of representation in the dataset. They then extrapolate to other countries, such as Australia, using international statistics (using International Labor Organization data) with a similar methodology.
- **Weighting of data: Step 2. Post-stratification weighting:** Mandala then adjusts these profile weights using a post-stratification weighting method. This method updates Revelio Labs weights using the proportion of each gender and state and territory within a select sample of the broad science workforce within the ABS census. This ensures that the geographic and gender split of our dataset across Australia is comparable to that of the scientific workforce. Post stratification weighting means that the total weight across all profiles assessed by the LLM remains the same. This means the male, senior professor from the ACT contributes 1.2 to the overall person count, however, their contribution to other charts, i.e. gender distribution by seniority may be 0.4. Note,

we do post-stratification weighting before removing profiles that are unlikely to be categorised as in the HMR workforce. This is because the dataset before segmentation most closely resembles the entire scientific workforce. Due to this, there is a small discrepancy between results that have been weighted using just the Revelio Labs weights and the post-stratified Revelio Labs weights. In the cause of the overall numbers, results are slightly larger if Revelio Labs weights are used.

- **LLM-based segmentation:** We then used a LLM to assign a probability to each individual position (not individual) in the dataset of likelihood to be a traditional or non-traditional researcher, based on a combination of features including job title, company name, degree name, and degree field.
- **Review segmentation results and remove edge cases:** We took any individual position with a greater than 80% probability to be a researcher and reviewed the segmentation results, adjusting for edge cases such as individuals with limited data available or incorrectly classified by the LLM (<20% of results).

Survey: A bespoke survey of the health and medical research workforce supplements and validates findings from the microdata analysis

Purpose and Scope

The primary objective of this survey was to establish a comprehensive fact base for the health and medical research workforce. The survey aimed to capture data that is not readily available through other means, and supplement research to date from desktop and novel microdata sources.

The key questions in scope for this analysis were:

- What are the characteristics of the different segments of the health and medical research workforce?
- How do these workers transition to different jobs across the economy?
- What are the motivating factors behind decisions to remain in different segments of the research workforce and/or transition to other segments?

Target Population

The survey was designed to encompass a broad spectrum of individuals within the health and medical research domain, including:

- Direct research roles (primary or secondary activities, paid or unpaid)
- Supportive roles (indirectly contributing to research activities)

It was distributed through networks from peak bodies and representative organisations including Research Australia, direct requests for distribution with large employers such as pharmaceutical firms, and by utilising a snowballing approach whereby respondents are asked to share the survey within their circles.

Individuals self-identified as either currently performing, or previously performing, a role that is involved with health and medical research. The definitions provided to the target population were:

The researchers are interested in hearing from anyone who has at some point worked in the health and medical research space. Participants may be in:

- *A direct research role (performing research as a primary or secondary activity, in paid or unpaid roles including research students, and in university, Medical Research Institutes, industry, health services or other settings), or*
- *A supportive role (not directly performing research yourself but supporting those who do, e.g. clinical trial coordinator, research nurses, biostatistician, laboratory technician, medical product research and development, research support officer, etc), or*
- *A non-research role currently, but have had one or more of the roles above in the past.*

For this study, health and medical research is defined as a wide range of scientific investigations aimed at improving human health and healthcare. This includes:

- *Basic Science Research*
- *Applied Research*
- *Translational Research*
- *Clinical Medicine and Science Research*
- *Biotechnology, Medical Device Technology, and Pharmaceutical Research*
- *Public Health Research*
- *Health Services Research*

Research may be performed across various settings, including universities, Medical Research Institutes, hospitals, government agencies, and private companies.

Because the survey relied on self-identification as belonging to the health and medical research workforce, it is possible that some individuals may have elected not to participate that would still be classed as health and medical researchers using the definition above.

Complementary Data Sources

This survey serves as a complement other data collection methods:

- Revelio microdata analysis
- Desktop scan
- Data Validation

The survey intentionally overlapped with some areas covered in the Revelio microdata analysis, enabling cross-validation between these two data sources. Results below demonstrate good alignment between the survey results and the Revelio microdata analysis.

Unique Contributions

A key contribution of this survey to the Audit is the collection of sentiment data, providing insights into:

- Motivations for working in health and medical research
- Challenges faced by the workforce
- Reasons for leaving the field

Survey Design

The Australian Health and Medical Research Workforce Survey was developed by Mandala, the Department of Health and Aged Care, and members of the project's Expert Panel.

Data Collection Methodology

The survey was hosted on Typeform, a digital survey platform. The distribution channels included the Department of Health and Aged Care, peak bodies and industry partners. The survey remained active in the field for a period of 4 weeks and was extended at the request of peak bodies.

Rationale for data weighting

Data weighting was implemented to mitigate selection bias in the survey sample. This process ensures that the results accurately represent the workforce population rather than merely reflecting the characteristics of survey respondents. The survey results had a strong bias towards women that is not reflected in the Revelio data or other research. It is a known and well-reported phenomenon that women are more likely to respond to surveys than men, biasing raw results.¹⁶⁴ For this reason, the majority of weighting is driven by gender, rather than location or workforce segment.

Reference Dataset

Due to the limited availability of comprehensive data on the health and medical research workforce, the weighted Revelio dataset was selected as the most reliable representation of this population. It served as the reference point for generating weights to be applied to the survey data. The Revelio data weights were derived from the Australian Bureau of Statistics (ABS) 2021 Census data, based on combinations of gender, state and territory, and industry.

Weighting Procedure

Weights were calculated for each unique combination of demographic characteristics, including gender, state and territory, and researcher classification (traditional or non-traditional). This approach aligns the survey sample with the Revelio dataset distribution.

Comparative analysis

By employing this dual weighting strategy – weighting the survey data to the Revelio dataset, and the Revelio dataset to Census data – a basis for valid comparisons between these data sources was established. This methodology facilitates integrated reporting and analysis of findings from multiple sources.

Survey weights

Survey weights as shown in table 1 are calculated based on a combination of state and territory, gender and workforce segment. When values are missing from the survey data, a value of 1 is given to this piece of survey data.

Table 4: Survey weights

State and territory	Gender	Workforce	Revelio count	Revelio proportion	Survey count	Survey proportion	Weight
ACT	Woman or female	Non-Traditional	145	0.4%	22	1.1%	0.4
ACT	Woman or female	Traditional	338	1.0%	42	2.1%	0.5
ACT	Man or male	Non-Traditional	196	0.6%	1	0.0%	1
ACT	Man or male	Traditional	242	0.7%	11	0.5%	1.3

⁶⁴ Does Gender Influence Online Survey Participation? A Record-Linkage Analysis of University Faculty Online Survey Response Behavior (2008) William G. Smith

NSW	Woman or female	Non-Traditional	2130	6.3%	185	9.1%	0.7
NSW	Woman or female	Traditional	4270	12.7%	288	14.1%	0.9
NSW	Man or male	Non-Traditional	1416	4.2%	55	2.7%	1.6
NSW	Man or male	Traditional	2718	8.1%	108	5.3%	1.5
NT	Woman or female	Non-Traditional	24	0.1%	5	0.2%	0.3
NT	Woman or female	Traditional	85	0.3%	22	1.1%	0.2
NT	Man or male	Non-Traditional	20	0.1%	0	0.0%	-
NT	Man or male	Traditional	34	0.1%	4	0.2%	0.5
QLD	Woman or female	Non-Traditional	980	2.9%	64	3.1%	0.9
QLD	Woman or female	Traditional	2371	7.0%	151	7.4%	0.9
QLD	Man or male	Non-Traditional	685	2.0%	21	1.0%	2.0
QLD	Man or male	Traditional	1652	4.9%	53	2.6%	1.9
SA	Woman or female	Non-Traditional	384	1.1%	49	2.4%	0.5
SA	Woman or female	Traditional	1044	3.1%	60	2.9%	1.1
SA	Man or male	Non-Traditional	286	0.8%	14	0.7%	1.2
SA	Man or male	Traditional	675	2.0%	23	1.1%	1.8
TAS	Woman or female	Non-Traditional	61	0.2%	4	0.2%	0.9
TAS	Woman or female	Traditional	221	0.7%	37	1.8%	0.4
TAS	Man or male	Non-Traditional	65	0.2%	3	0.1%	1.3
TAS	Man or male	Traditional	112	0.3%	7	0.3%	1.0
VIC	Woman or female	Non-Traditional	2190	6.5%	119	5.8%	1.1
VIC	Woman or female	Traditional	4476	13.3%	294	14.4%	0.9
VIC	Man or male	Non-Traditional	1507	4.5%	30	1.5%	3.0

VIC	Man or male	Traditional	2759	8.2%	95	4.7%	1.8
WA	Woman or female	Non-Traditional	546	1.6%	55	2.7%	0.6
WA	Woman or female	Traditional	1093	3.2%	142	7.0%	0.5
WA	Man or male	Non-Traditional	364	1.1%	14	0.7%	1.6
WA	Man or male	Traditional	648	1.9%	61	3.0%	0.6
ACT	other	Traditional			3		1
ACT	other	Non-Traditional			0		1
NSW	other	Traditional			11		1
NSW	other	Non-Traditional			5		1
NT	other	Traditional			1		1
QLD	other	Non-Traditional			1		1
QLD	other	Traditional			2		1
SA	other	Non-Traditional			0		1
SA	other	Traditional			1		1
TAS	other	Non-Traditional			1		1
TAS	other	Traditional			2		1
VIC	other	Non-Traditional			2		1
VIC	other	Traditional			6		1
WA	other	Non-Traditional			1		1
WA	other	Traditional			3		1
empty	Woman or female	Non-Traditional					1
empty	Woman or female	Traditional					1
empty	Man or male	Non-Traditional					1
empty	Man or male	Traditional					1