

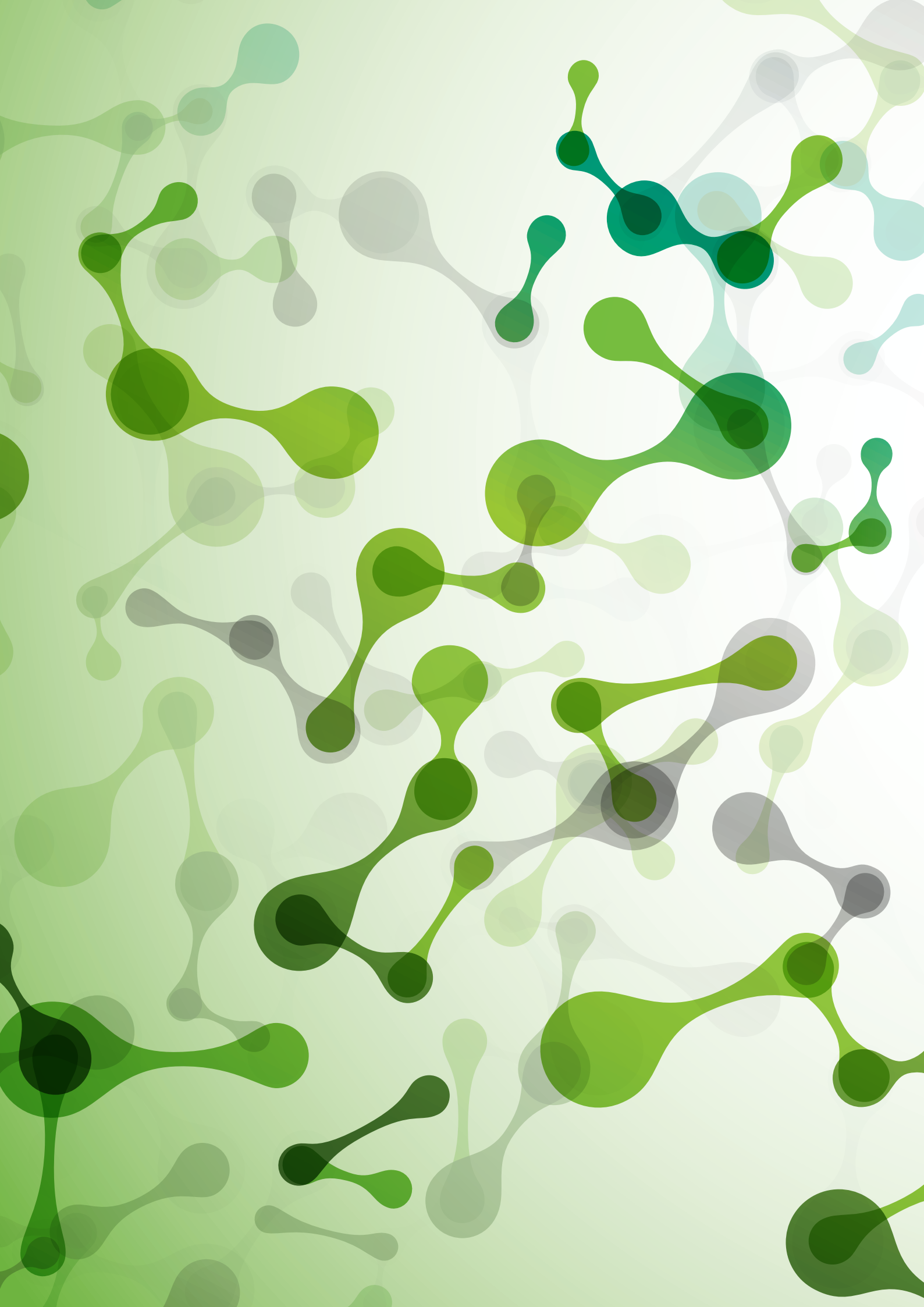


Australia's
Life Sciences Sector
Snapshot 2017

Conducted by

AusBiotech
AUSTRALIA'S BIOTECHNOLOGY ORGANISATION





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LIFE SCIENCES SECTOR IN AUSTRALIA ENCOMPASSES

- Industry
- Funding bodies
- Government & regulatory
- Research institutes
- Support services



2017 SNAPSHOT

Provides a comprehensive overview of the life sciences sector within Australia, in terms of company and employment numbers, sectors, states and gender distribution.

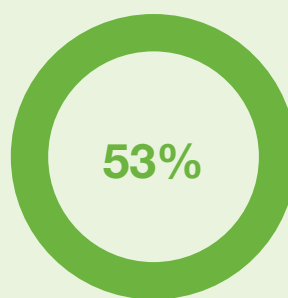
140
ASX-LISTED
LIFE SCIENCES
COMPANIES



people employed in the Australian life sciences sector



organisations



industry-based organisations



employed by industry

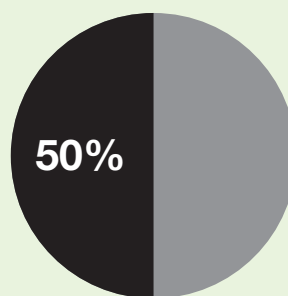
More than **\$50 BILLION** Market Capitalisation

Research institutes are the second largest employers in the sector

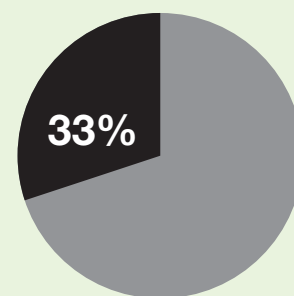
69% of research is on health & biomedical research

FEMALE REPRESENTATION

Female representation decreases as seniority levels increase.



Average across the whole sector



Industry

Executive Summary

The life sciences sector in Australia encompasses companies and organisations in industry, funding bodies, government & regulatory, research institutes and support services. It is a growing and maturing sector, with Australia positioned in the world's top five in biotechnology for the past three years¹. The Snapshot 2017, was commissioned by AusBiotech to provide an overview of the life sciences sector within Australia, in terms of company and employment numbers, sectors, states and gender distribution.

This sector 'snapshot' shows that there are approximately 232,213 people employed in the Australian life sciences sector, across 1,654 organisations. The research shows that 53 per cent of life sciences organisations in Australia are industry-based, with 876 companies and approximately 30 per cent of the workforce in the sector employed by industry, at around 69,108 people². The Australian life sciences industry sector was once dominated by human therapeutics (pharmaceutical) companies. It now includes the fast-growing medical technology (devices and diagnostics) & digital health sector (325 companies), a steadily-emerging food & agriculture technology sector (270 companies) and 281 pharmaceutical companies.

With respect to industry credentials, there are currently about 140 ASX-listed life sciences companies, with a market capitalisation of more than \$50 billion. Out of 876 companies in the industry sector, the majority are based in New South Wales (322), employing just over 26,000 people, closely followed by Victoria with 309 companies and the sector employing about 25,000 people. About 84 per cent are SMEs³, which represents 733 of the companies within the industry sector.

Research institutes are the second largest employers in the sector, with approximately 65,780 employees. Of the research undertaken in these organisations, 69 per cent is on health & biomedical research, and 66 per cent of the research organisations are based in New South Wales (68) and Victoria (67).

In terms of gender equity, while female representation is around or above 50 per cent for research institutes, funding bodies, government & regulatory and support services, females are under-represented in industry, with only 33 per cent of the workforce found to be female. While pharmaceutical companies are leading the way on 45 per cent, across the sector, female representation decreases as seniority levels increase.

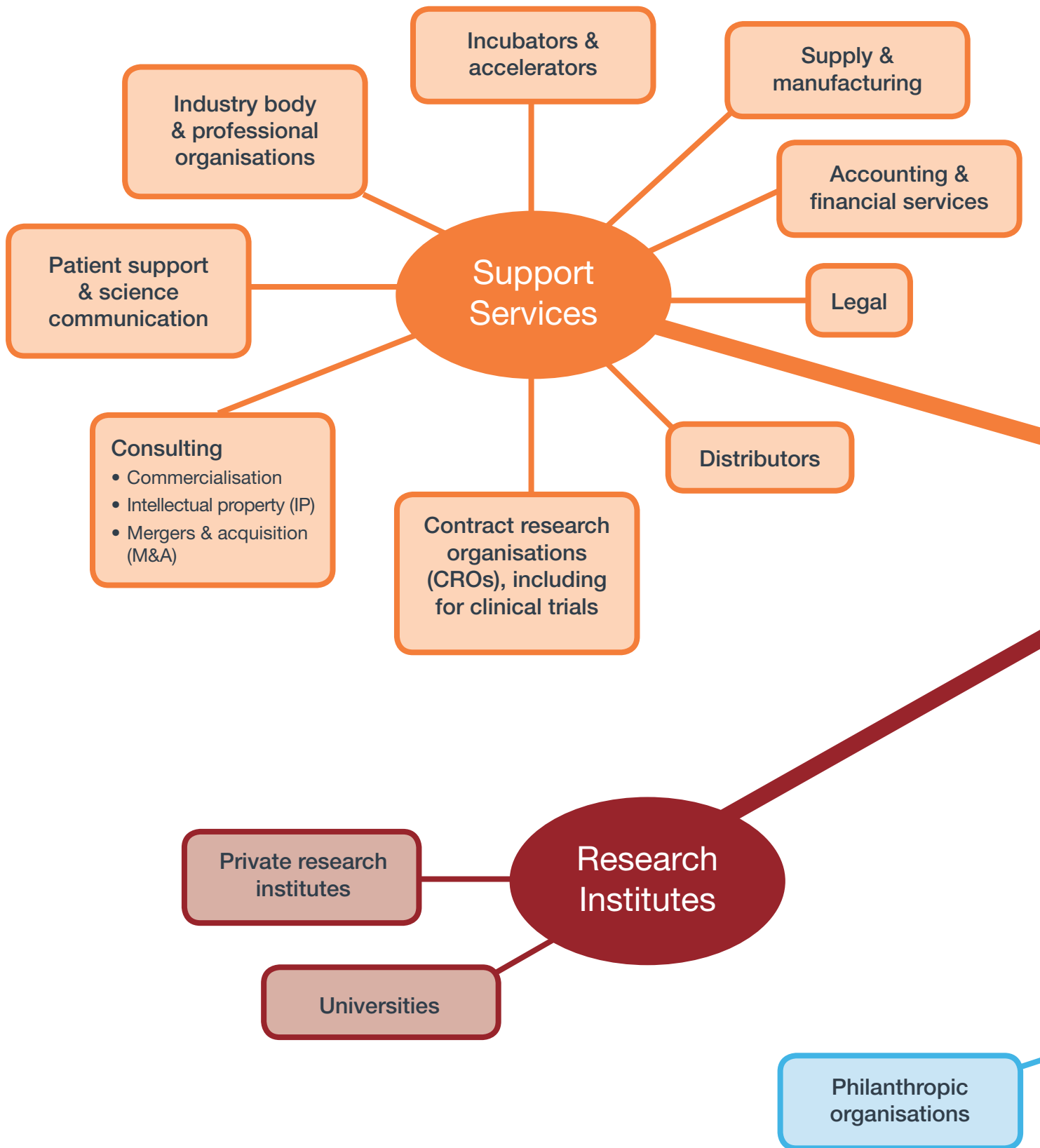
The large workforce shown in this Snapshot 2017 depicts a thriving Australian life sciences sector that is active and substantial – and well positioned to build Australia's capacity as a technologically-innovative country, vital for our economic future. It is largely agreed that high-tech industries generate globally competitive economies and sustainable, high-skilled jobs and Australia can compete on a world stage in the knowledge economy with a strong comparative advantage.

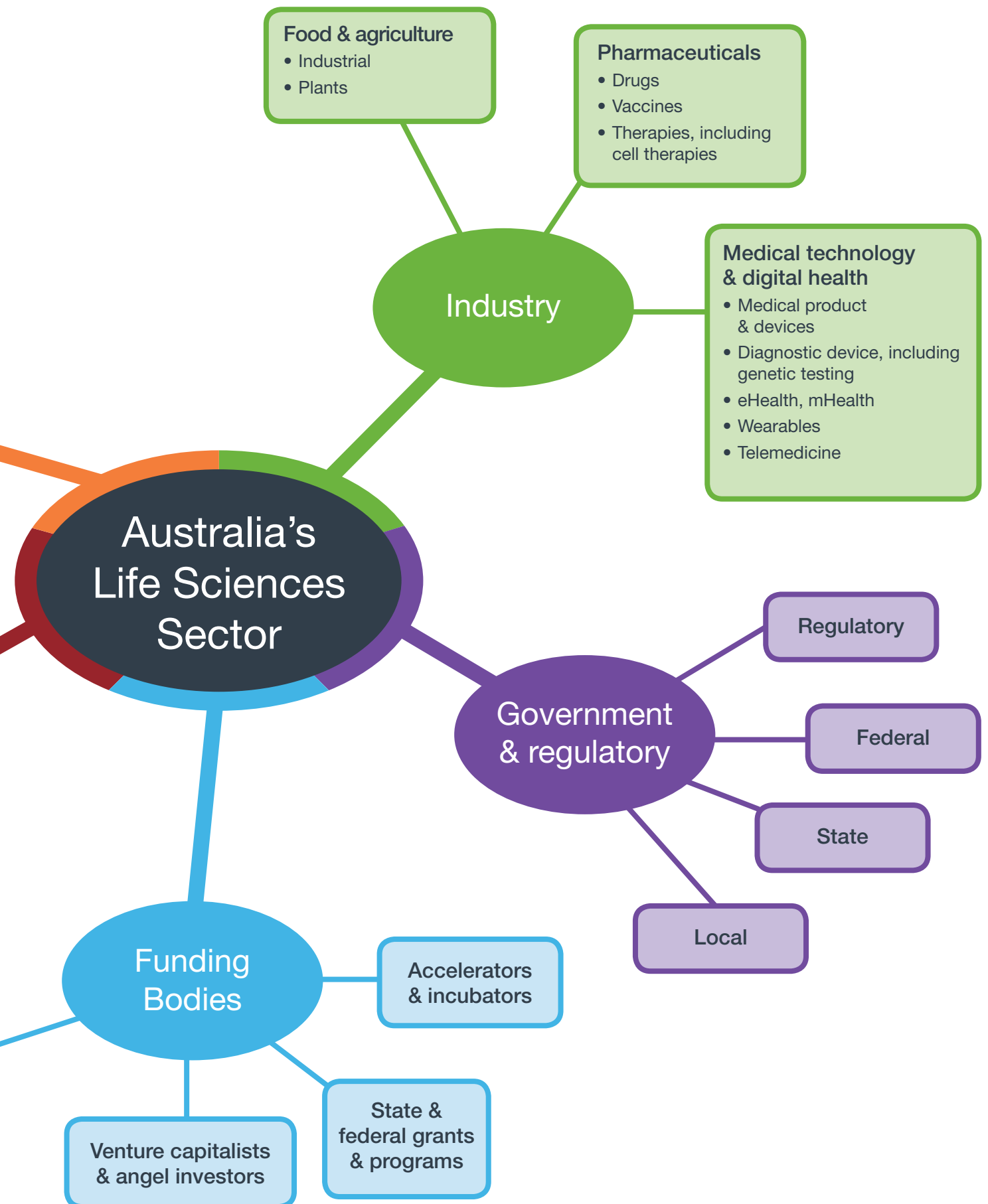
Along with the global trend, the shift from industrialisation to service and knowledge industries is pervasive and governments around the world are making strong and large commitments to build the foundation stones of innovation-driven economies. We live in a time where technological innovation, knowledge and networking are the drivers of our productivity. Australia has expertise and ballast in these areas to leverage to our economy's advantage.

1 Scientific American, Worldview scorecard 2016

2 Consisting of medical technology & digital health, pharmaceuticals and food & agriculture companies.

3 As defined by the project, SMEs are companies that employ less than 100 people.





Key Findings

Industry constitutes approximately 53 per cent of the life sciences sector in Australia

Industry made up around 53 per cent of the sector, with 876 companies within medical technology & digital health (325 companies), pharmaceuticals (281 companies) and food & agriculture (270 companies). Support services made up the second largest portion of the sector with 399 companies/organisations (24 per cent); this category encompassed organisations ranging from legal firms, to consultancies to industry bodies and professional associations. Research institutes, government & regulatory and funding bodies made up the remaining 23 per cent of the life sciences sector in Australia.

Distribution of life sciences companies/organisation (number)

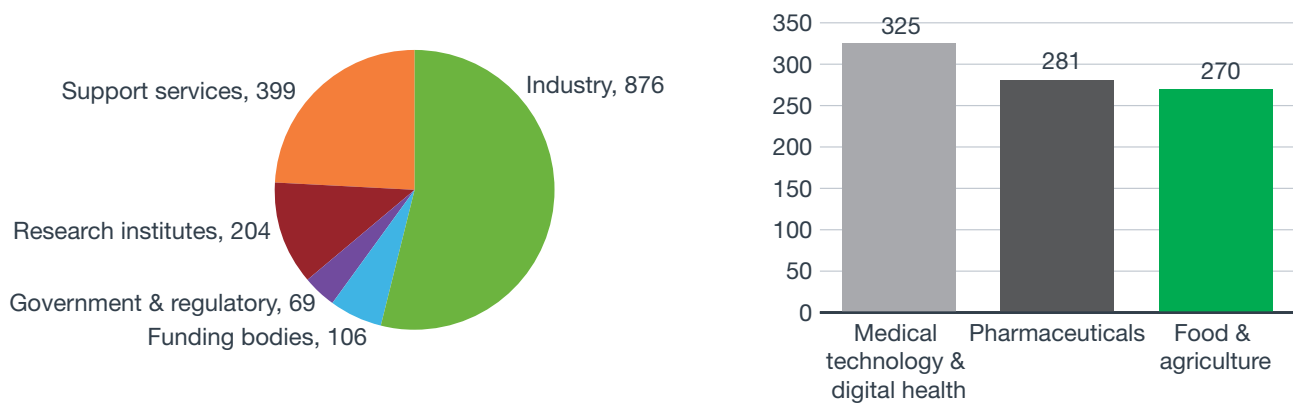
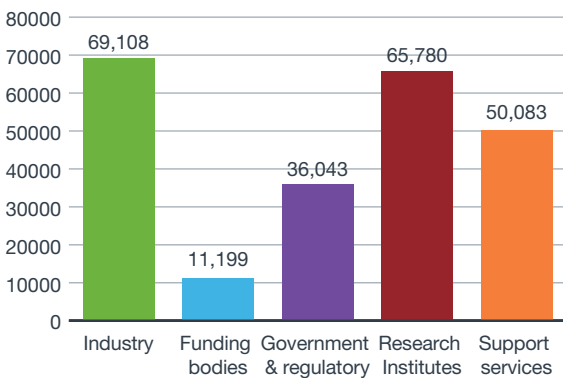


Figure 1. Number of life sciences companies/organisations across different categories

Industry employs approximately 30 per cent of life sciences employees in Australia

It was determined that there were approximately 232,213 people employed in the life sciences across 1,654 organisations⁴. Figure 2 shows the number of life sciences employees in industry, funding bodies, government & regulatory, research institutes and support services. The majority were employed by industry and research institutes, with approximately 69,108 (30 per cent) and 65,780 (28 per cent) employees respectively.

Distribution of life sciences employee (number)



Distribution of industry life sciences employee (number)

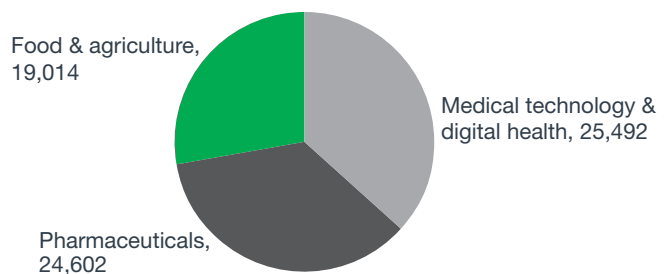


Figure 2. Total number of employees in each category within the life sciences sector

⁴ Standard error = 28,252; 95% Confidence Interval = 175,707-238,199, the large confidence interval is predominantly due to large companies having a larger range of employee numbers (200-6,000 employees).

New South Wales and Victoria have the largest numbers of life sciences organisations and employees

Figure 3 shows the distribution of life sciences organisations and employees across Australia. It was found that 69 per cent of the organisations were based in Victoria (VIC; 583) and New South Wales (NSW; 554). VIC and NSW also had the highest number of life sciences employees, approximately 75,151 and 69,873 people, respectively. Queensland (QLD) was found to have the third largest number of life sciences organisations (186, 11 per cent) and had the third highest number of life sciences employees, approximately 28,164 people.

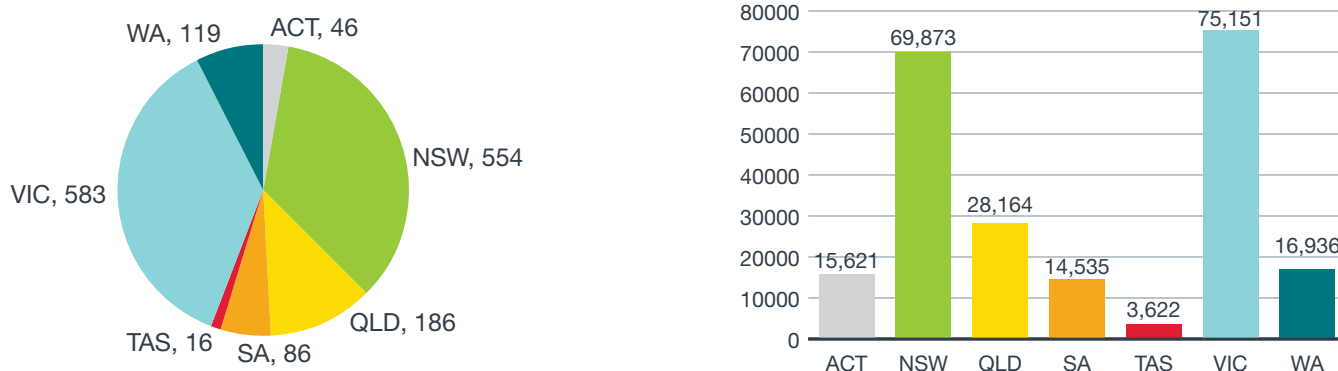
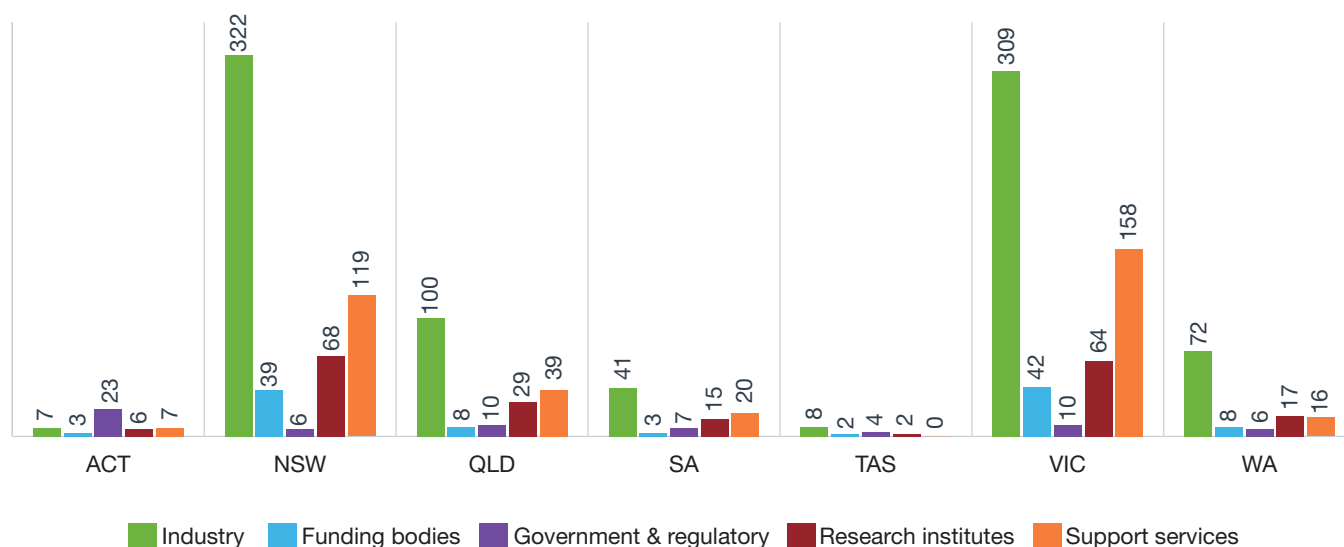


Figure 3. State distribution of life sciences organisations and employees

There were 64 organisations and 8,311 employees that fit into multiple states and/or categories. These have been excluded from the figure above.

Figure 4 further breaks down the distribution of life sciences companies and employees within each state. It was found that industry form the majority of life sciences organisations in all the states apart from the Australian Capital Territory (ACT). The majority of support services, research institutes and funding bodies were based in NSW and VIC. Government & regulatory organisations made up the majority of the life sciences organisations in the ACT. Industry, research institutes and support services were the top life sciences employers in NSW, VIC and QLD. Government & regulatory organisations employed the largest proportion of life sciences employees in ACT and Tasmania (TAS). Funding bodies generally employed the least amount of people in all states.

Organisation distribution in NSW, QLD, VIC, ACT, SA, TAS & WA



Key Findings (cont)

Employee distribution in NSW, QLD, VIC, ACT, SA, TAS & WA

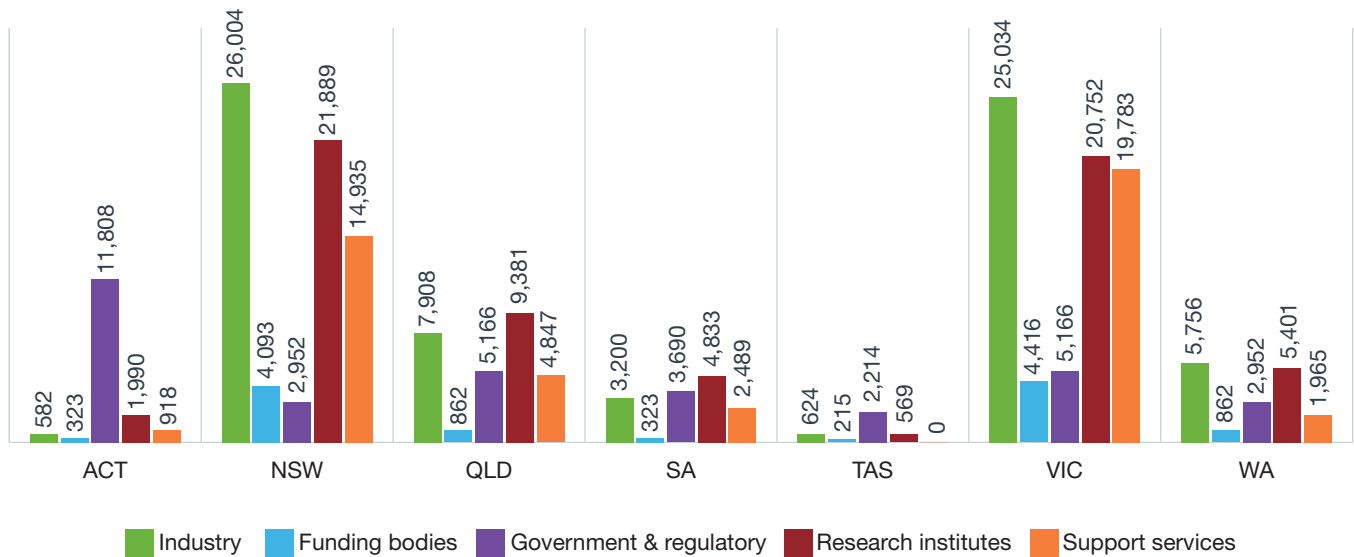
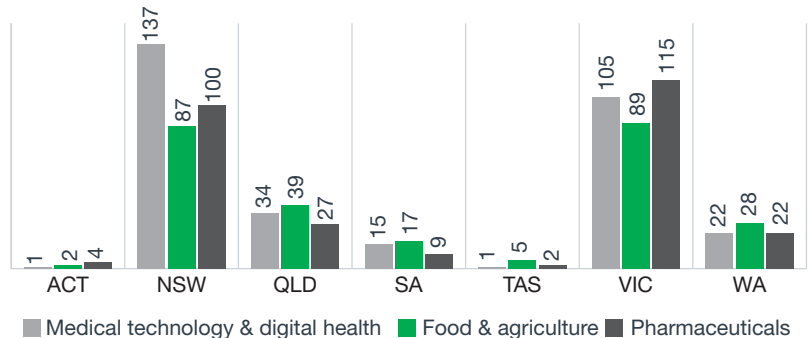
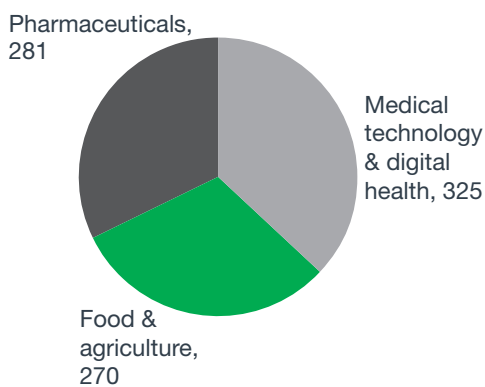


Figure 4. Distribution of life sciences organisations and employees within each state
 There were 64 organisations and 8,311 employees that fit into multiple states and/or categories. These have been excluded from the figure above.

Industry distribution (number)



Industry distribution (number)



Industry employee distribution (number)

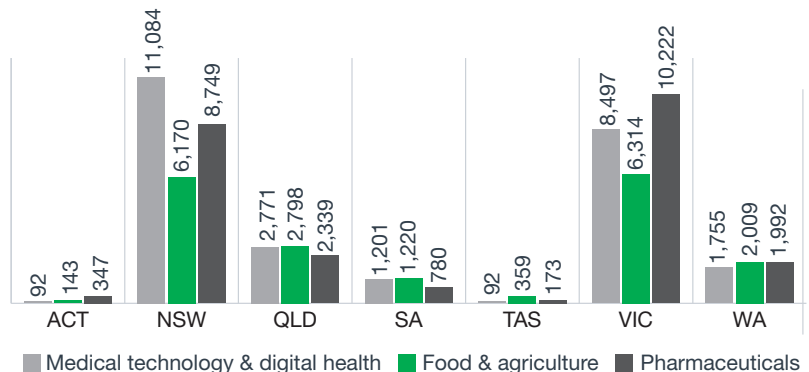


Figure 5. Distribution of industry companies and employees within each state
 These numbers were obtained via statistical calculations and should not be taken as definitive. Discrepancies in numbers could also be due to companies operating in multiple states and/or across multiple categories.

The distribution of medical technology & digital health, food & agriculture and pharmaceutical companies within each state was further delineated in Figure 5. Overall distribution of the different industry sectors within each state was generally even. There were slightly more medical technology & digital health companies based in NSW compared to food & agriculture and pharmaceutical companies. The employee numbers generally correlated to the number of companies within each industry sector.

SMEs make up the overwhelming majority of companies within the life sciences industry

Of the 876 companies in the industry, 733 were found to be small or medium sized enterprises (SMEs), making up 84 per cent of the life sciences industry. It was found that there were approximately 270 SMEs in medical technology & digital health, 233 SMEs in food & agriculture and 230 SMEs in pharmaceuticals in Australia as of October 2017.

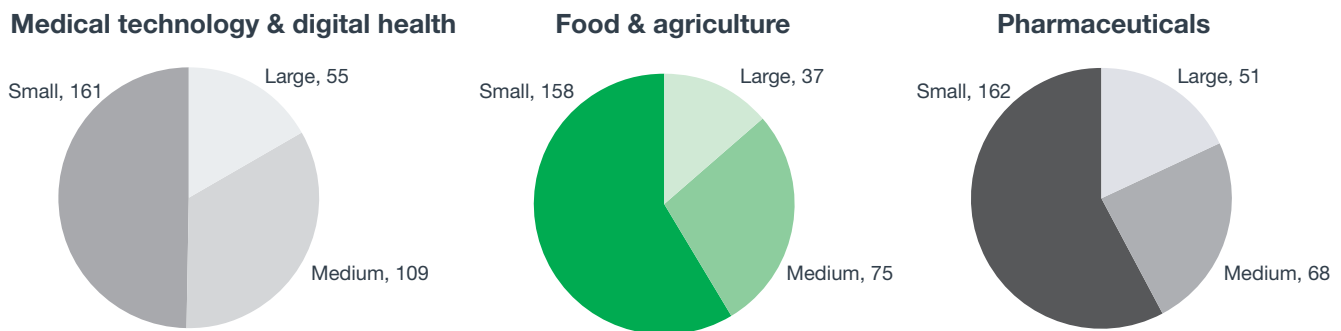


Figure 6. Number of small, medium and large companies in the life sciences industry

Health and biomedical research is a major investment area

Medical technology & digital health had the highest proportion of ASX-listed companies in the industry, with approximately 23 per cent of companies listed on ASX. This was followed by pharmaceutical companies with 19 per cent. Surprisingly, it was found that only 4 per cent of food & agriculture companies were ASX-listed.

There were approximately 177 funding bodies that invest in the life sciences sector, including state and federal governments, venture capitals and angel investors, philanthropic foundations, accelerators and incubators. The major area of investment for most funding bodies was found to be in health and biomedical research, with 63 per cent of the funding bodies investing in this area. The percentage distribution indicated areas of investment, not the amount of funding in each category.

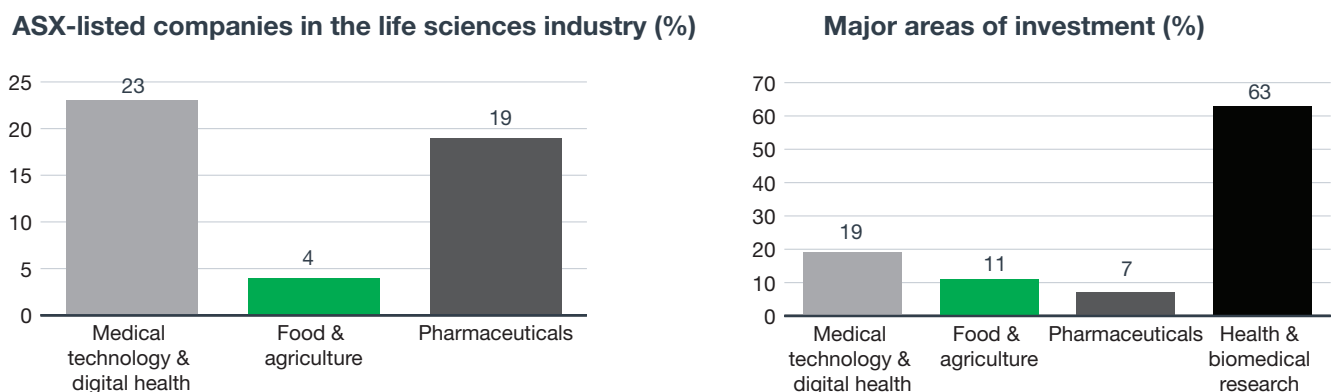


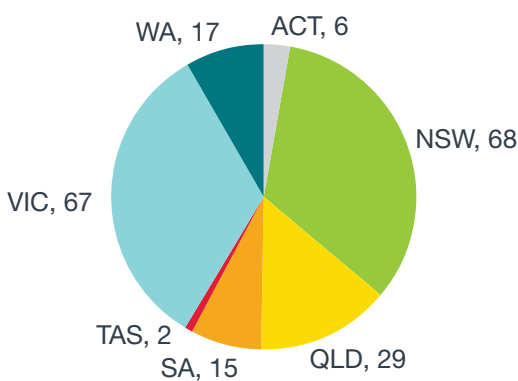
Figure 7. Proportion of ASX-listed life sciences companies and major areas of investment by funding bodies

Key Findings (cont)

The majority of research institutes are based in New South Wales and Victoria and they predominantly engage in health & biomedical research

Figure 8 shows the distribution of research institutes across Australia as well as the major areas of research focus and investment. The majority of research institutes were based in NSW (33 per cent) and VIC (33 per cent) followed by QLD (14 per cent). It was found that most research institutes engaged in health and biomedical research (69 per cent). 13 per cent of the institutes conducted pure biological research and another 14 per cent conducted research in the food & agriculture sector. Only a small portion of the institutes conducted social research (4 per cent)

State distribution of research institutes (number)



Distribution of research focus (%)

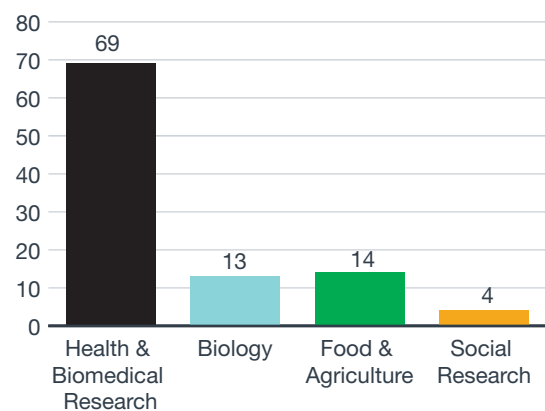


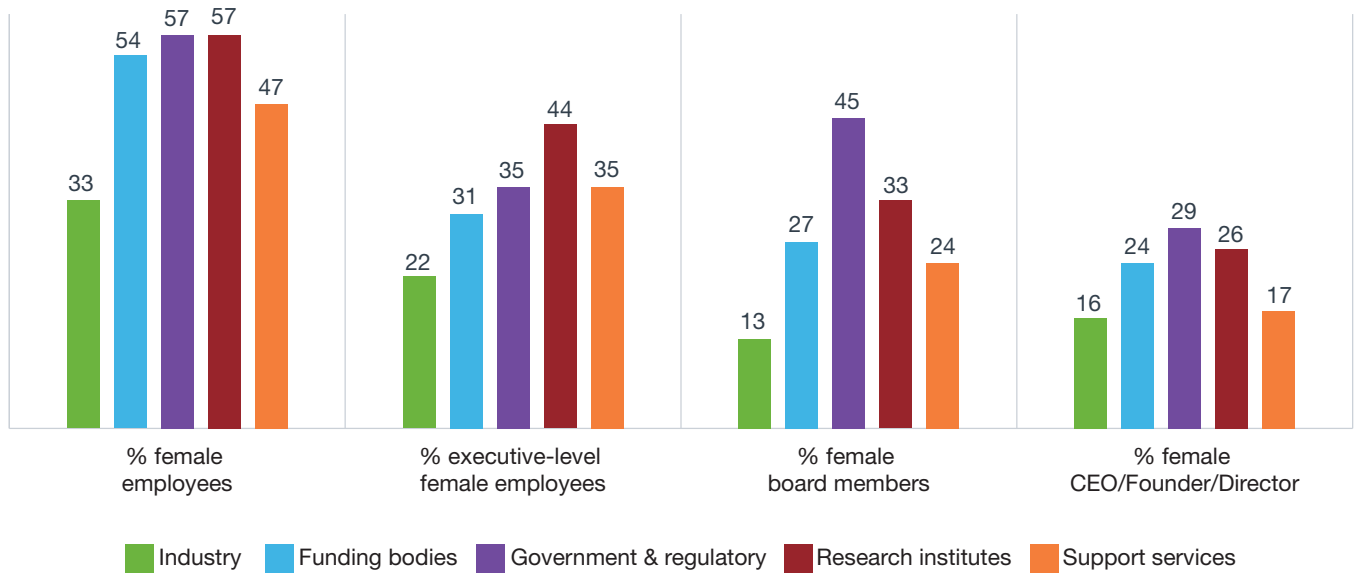
Figure 8. Research activity within Australia, including state distribution and research focus

On average, women represent 50 per cent of the workforce across the entire sector; however women are under-represented in industry, representing only 33 per cent of the workforce

Figure 9 shows the distribution of female employees within the life sciences sector. It was found that more than 50 per cent of employees in government & regulatory (57 per cent), research institutes (57 per cent) and funding bodies (54 per cent) were female. The percentage of female employees across the sector dropped as seniority levels increased. Publicly-funded organisations such as research institutes and government & regulatory organisations performed slightly better than their privately-funded counterparts within the sector. However, female representation at senior level was found to be below 50 per cent across the sector.

Overall, industry had the lowest percentage of female employees. This was reflected in its general workforce, where only 33 per cent were found to be female. Female representation at senior levels in industry was also the lowest compared to other categories within the sector. Within the different industry sectors, pharmaceutical companies had the highest percentage of female employees (45 per cent) while food & agriculture had the lowest (22 per cent). It was found that there was a slightly higher percentage of female CEOs/founders/directors in medical technology & digital health (20 per cent) compared to pharmaceuticals (14 per cent) and food & agriculture (10 per cent).

Distribution of female employees across the sector



Distribution of female employees in industry

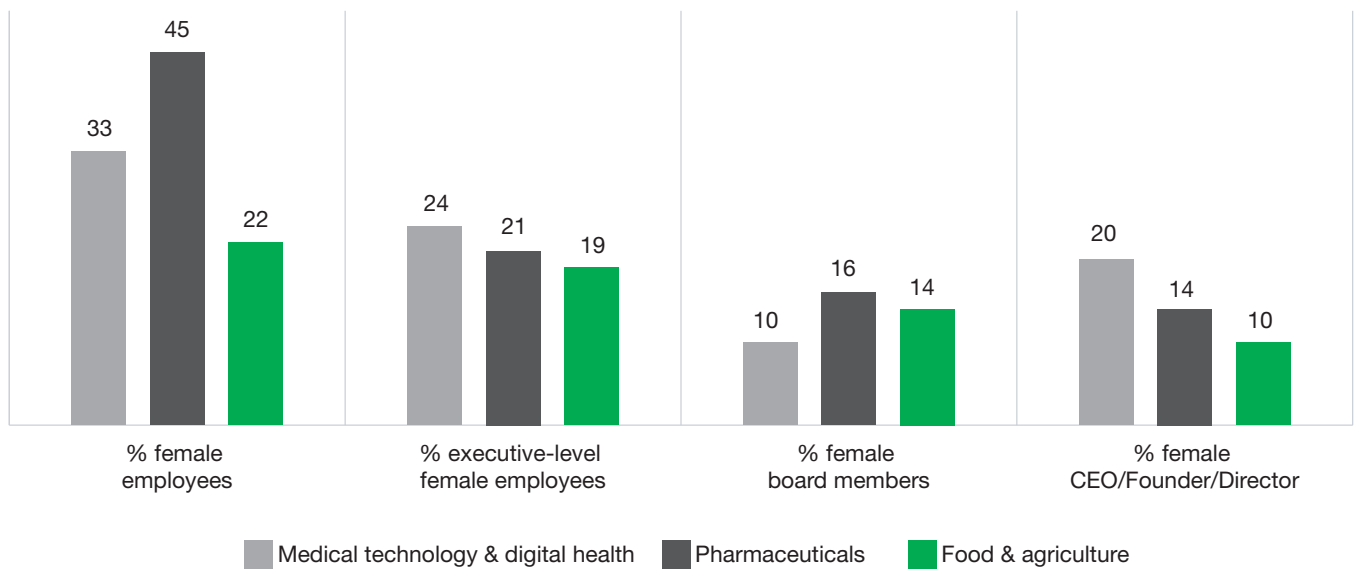


Figure 9. Percentage distribution of female employees in the life sciences sector

Conclusions

This report provides a statistically quantified snapshot of the employment numbers as well as the sector, state and gender distribution within the Australian life sciences sector. By collecting data for the whole sector, including industry, research institutes, funding sources and support services, the report presents a comprehensive overview of the sector.

There are currently 1,654 verifiable life sciences organisations, as defined in this project, in Australia employing approximately 232,213 people. By far, the largest two areas of the sector are industry and research institutes, which employ 30 per cent and 28 per cent of the entire life sciences workforce respectively. The majority of industry and research institutes are based in Victoria and New South Wales, although Queensland, South Australia and Western Australia all have fairly active life sciences industry and research sectors. The majority of research institutes (69 per cent) in Australia are involved in health and biomedical research. Industry as defined by this project is made up of medical technology & digital health, pharmaceutical and food & agriculture companies; the majority (84 per cent) of these companies are SMEs. It was found that female representation in industry is lower than other areas in the sector, 33 per cent compared to 54 per cent. However, as seniority levels increase, female representation decreases across the sector.

The information presented within this report has been derived from data that was collected over a four month period from May 2017 to September 2017. The report provides a representative snapshot of the sector. It should be noted that the information presented are approximations based on statistical calculations and should not be taken as definitive. The large workforce depicts a thriving Australian life sciences sector that is active both in terms of industry and research activity, with support services, funding bodies and government & regulatory bodies supporting, financing and regulating the sector.

Acknowledgements

This report was commissioned by AusBiotech and report data was obtained between the period of May 10, 2017 and September 27, 2017 by Master of Biotechnology students at the University of Melbourne. Sincere appreciation is extended to all group members of the project.

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Appendix A

Definition List

TERM	DEFINITION	RATIONALE
Life sciences sector	As defined by the scope of the project, this includes all entities involved in sciences that have a direct or indirect impact on human life (this does not include animal sciences in terms of companion animals and sporting animals).	This definition includes all businesses, organisations, government sectors, and all individuals employed that support the growing life sciences industry i.e. sciences relating directly or indirectly to human life, including those used in the primary industries but not in sporting and companion animal life sciences. This sector is broken down into digital health, food & agriculture, pharmaceuticals, research institutes, funding bodies, support services and government & regulatory.
Food & agriculture	This category includes all organisations that develop and sell technological innovations (chemical and biological) to improve, or create new processes for food, agricultural, or environmental purposes. These innovations act on the life of an organism i.e. agricultural animal, crop or pest, or on an ecological system, directly or indirectly related to human life.	This has been modified from the Department of Industry definition. This sector is broken down into research and companies.
Medical technology & digital health	Medical technology includes a wide range of medical devices (including in vitro diagnostics) used to diagnose, monitor or treat diseases in humans that are used within a hospital, general practitioner or home setting. Digital health includes eHealth (Information and communication technologies that work to improve, prevent, diagnose, treat, monitor and manage) and mHealth (mobile health that works to allow patients to manage their health - wearable or mobile data collection) that captures data about patient treatments and non-drug factors.	<p>The definition for medical technology is obtained from the AusBiotech website. This category is broken down into companies, research, and clinical. The definition for digital health is a combination of the Nature and EU definition of digital health. This category is broken down into the un-regulated applications and software, as well as the regulated.</p> <p>The TGA classifies digital health/ software under medical devices, and there are some companies within the list that can fit into either one of the categories. To reduce the misclassification of companies into either categories, the two categories have been combined. It is estimated that there are around 150 digital health companies in Australia.</p>
Pharmaceuticals	This is defined as the industry concerned with the discovery, research, development, regulation and commercialisation of human medicines.	This is the general definition for the industry including all, cellular therapies and regenerative medicine. This sector is broken down into clinical, companies, research and education.

Appendix A (cont)

Definition List

TERM	DEFINITION	RATIONALE
Government & regulatory	This is defined as the body that governs businesses, research institutes and workers within the life sciences sector. The sector answers to, and finds guidance about ethics, regulations, funding, laws and governance, from government & regulatory bodies such as the Therapeutic Goods Administration (TGA; for therapeutics, medical technology and digital health technology), Food Standards Australia New Zealand (FSANZ; for food biotechnologies & GM foods), Office of Gene Technology Regulator (OGTR; for GMO products), Australian Pesticides and Veterinary Medicines Authority (APVMA; for agricultural and veterinary products, i.e. animal medicines and agricultural chemicals).	Information from government websites, including: tga.gov.au foodstandards.gov.au ogtr.gov.au apvma.gov.au This sector is broken down into federal, state and local.
Funding bodies	This category is defined by organised entities that privately invest in research, business development and commercialisation of life sciences companies and/or organisations.	This definition should include any entity (business or organisation) that invests large amounts of money to companies in return for a stake in the company or equity but does not include stakeholders through Australian Securities Exchange (ASX).
Support services	This category includes all organised entities that provide support for life science companies and/or organisations.	This sector should include any company or entity that supports the sectors including IP management and firms, contract research organisations (CROs), contract manufacturing organisations (CMOs), incubation hubs and distributors.
Research institutes	This is defined by organised entities with the purpose of research in life sciences, either privately or publicly.	Universities and private research institutions will be considered.
Life sciences employee	A person employed (for tax purposes) within Australia for a life sciences company/institution/ government organisation that operates in Australia.	Any person working in Australia that supports the sector and pays Australian taxes.
Current	Data collection for this report occurs between May 10, 2017 and September 27, 2017.	The most current and reliable available sources were used for data collection, including government websites, company websites, peer reviewed websites/ databases.
Company size	Defined by the number of employees, where: a small company has less than 20 employees; a medium company has less than 100 employees; and a large company has over 100 employees.	This follows the AusBiotech definition of company sizes on its website.

Appendix B

Statistics methodology

Overview

An initial list of 4,000 organisations was obtained using different databases⁵. Companies with no websites, those which were acquired, insolvent, irrelevant or without products/patents were removed, resulting in 1,654 verified life sciences organisations that fit into one or more of the categories defined above. Of the 1,654, 776 random organisations were further probed to determine their employee numbers along with the per centage of employees that work in the life sciences sector, gender distribution as well as whether they were public or private organisations⁶. The percentage of staff involved in life sciences in each category was determined based on company/organisational background.

Assumptions made for the proportion of staff directly involved in the life sciences sector are as below:

- 25 per cent of universities were assumed to be involved in the life sciences⁷.
- 10 per cent of hospital staff are estimated to be involved in the life sciences sector i.e. involved in research, including physicians that are involved in clinical trials.
- For organisations that have less than 30 employees, it was assumed that 100 per cent of the employees are involved in the sector as smaller organisations usually have employees that perform overlapping functions.

These per centages were used to determine the total number of employees directly involved in the life sciences in each organisation.

Total number of employees x per centage involved in life sciences = total number of life sciences employees

The size of each organisation was determined based on the number of employees, from there the proportion of micro, small, medium and large organisations in the sector was determined. This information was extrapolated to the whole dataset to determine the total number of employees in the life sciences sector.

Detailed methodology

A refined list of 1,654 life sciences organisations was randomised and information on 776 companies/organisations was obtained. Of this, complete employee numbers were obtained for 602 companies/organisations. These numbers were multiplied by the per centage of employees in each organisation/company that were involved in life sciences to obtain the number of employees that are in life sciences in each organisation/company.

Number of life sciences employees

= total employee numbers x percentage of the company/organisation that is involved in life sciences

The 602 life sciences companies/organisations were grouped into micro, small, medium and large organisations based on the number of life sciences employees (not the total number of employees). The average and standard deviation (SD) for each group was also obtained using standard Excel functions.

Based on the proportion of micro, small, medium and large organisation in the sample group, the total number of companies in each group were determined as below.

$(n_{\text{micro}} / n_{\text{micro, small, medium, large}}) \times 1,654 = \text{total number of micro life sciences companies/organisations}$

$(n_{\text{small}} / n_{\text{micro, small, medium, large}}) \times 1,654 = \text{total number of small life sciences companies/organisations}$

$(n_{\text{medium}} / n_{\text{micro, small, medium, large}}) \times 1,654 = \text{total number of medium life sciences companies/organisations}$

$(n_{\text{large}} / n_{\text{micro, small, medium, large}}) \times 1,654 = \text{total number of large life sciences companies/organisations}$

The SD and standard error (SE) for each group was calculated. The total employee numbers for each group was calculated as below.

5 Cortellis, Biotechgate, ASX, APVMA, OGTR, Google, AVCAL members directory, the national cancer co-operative trials group, the list of independent medical research institutes, AAMRI.

6 Of the 776 organisations, 174 (22.4 per cent) did not have actual employee numbers. Employee numbers were obtained via the company website, annual reports, Company360, IBISWorld, Manta or LinkedIn. Information on gender distribution was obtained via the company website or public report database from the workplace gender equality agency.

7 Based on actual percentages from 8 different universities: Bond University, Charles Darwin University, Central Queensland University, Murdoch University, University of Sydney, University of Western Sydney, Victoria University, Australian National University.

Appendix B (cont)

Statistics methodology

Total number of employees_{micro/small/medium/large}

= average number of life sciences employees_{micro/small/medium/large} x total number of life sciences companies/organisations_{micro/small/medium/large}

The total employee numbers in each group were combined to obtain an estimated total for the entire sector and all the standard errors were combined to obtain the total SE. The 95% confidence interval (CI) was calculated using the estimated total +/- 2 SE. The results are as below.

Total number of life sciences employees	232,213
SE	28,252
95% CI	175,707-238,199

Statistically, based on the data collected for nearly half the list, a confident projection of the total employee number can be obtained. The very large CI is predominantly due to large companies/organisations with sizes ranging from 200 to 6,000 employees. This range is much lower for micro, small and medium companies/organisations. Reducing the CI would require data to be collected for the remaining 877 companies/organisations.

A log scale of the average employee numbers in micro, small, medium and large companies/organisations was used to find a median, which provides figures based on a typical company/organisation size that is less skewed by the larger companies/organisations. However to quantify the company size, the average was used to project total employee size as large companies were also to be included in the calculations.

Disclaimer

The material in this publication is intended to provide a general summary only and should not be relied on as a substitute for legal or other professional advice. You should obtain your own legal or other professional advice.

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About AusBiotech

AusBiotech is Australia's biotechnology industry organisation representing over 3,000 members, covering the human health, agricultural, medical devices and diagnostics, functional foods, environmental and industrial biotechnology industries.

AusBiotech is dedicated to the development, growth and prosperity of the Australian biotechnology industry, by providing initiatives to drive sustainability and growth, outreach and access to markets, and representation and support for members nationally and around the world.

AusBiotech is a not-for-profit organisation, which has representation in each Australian state and in various special interest sectors. Active state committees and advisory groups provide a national network to support members and promote the commercialisation of Australian bioscience in the global marketplace.

AusBiotech has been working on behalf of members for more than 30 years, since it was established as the Australian Biotechnology Association and 15 years later changed its name to AusBiotech.

AusBiotech's membership base includes biotechnology companies, ranging from start-ups to mature multinationals, research institutes and universities, specialist service professionals, corporate, institutional and individual members from Australia and overseas.

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