

Australian veterinary workforce modelling

An Australian Veterinary Association initiative

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Foreword

Veterinarians have important roles to play in animal, human and community wellbeing. Veterinarians in rural and regional areas ensure the safety of the food we eat and export, care for the health and welfare of livestock, and are necessary to our biosecurity, helping identify and respond to a serious disease outbreak.

Veterinarians are also important to the two-thirds of households which now include companion animals, and pets are increasingly valued as important family members. There is a significant body of evidence that pet ownership has benefits for the health and wellbeing of individuals and the community.

For the veterinary profession to have a sustainable future, it is essential that the nation has the right number of vets to meet the needs of Australia's animals, owners and communities; that those vets have the right skills, and are in the right places. This requires effective workforce planning, via an evidence-based and co-ordinated approach. Planning an effective veterinary workforce is one of the Australian Veterinary Association's five strategic priorities.

There have been concerns within the profession for some time about a potential future imbalance between the veterinary workforce and the demand for their services. Over the past 10 years the establishment of three new veterinary schools combined with increased student intakes from the existing schools led to a significant growth in the number of veterinary graduates. There are reports that indicate a recent increase in unemployment among new graduates; we have seen a reduction in the income of veterinary graduates compared with professionals who have obtained similar professional degrees.

The *Australian veterinary workforce modelling* report provides Australia's first major, long-term national projections for the veterinary workforce and presents the best available information to inform the planning for our future veterinary workforce.

Although there have been government and industry reports in the past about ensuring veterinary services are meeting Australia's needs, these have often focused on rural services. There has never before been a reliable Australian veterinary workforce analysis. Until now there have been no efforts to quantify current demand for veterinary services, or project future demand. Filling this data and analysis vacuum is the necessary first step to planning an effective veterinary workforce in Australia.

This report provides a sound evidence base for policy-makers and workforce planners. It is the culmination of one of several projects initiated by the Australian Veterinary Association (AVA) to facilitate more effective veterinary workforce planning. Integral to this project was the development of a computer simulation model of the veterinary workforce. This can be used to estimate future supply and demand under alternative scenarios, and allows the AVA to periodically update projections as additional information becomes available.

The size of the veterinary workforce depends on graduate numbers, retention rates and immigration, and is influenced by age, gender and working hours of veterinarians. The model looks at the relationship between the projected workforce and projected demand for veterinary services.

This report has been produced by independent and respected workforce planning experts, based on best available data. The tools and methodology are the same as those used by Health Workforce Australia to assess the human health workforce. This report will be used to inform essential, coordinated, long-term reforms by government, the profession and higher education providers to secure a sustainable and affordable veterinary workforce capable of maintaining high quality veterinary care.

Key findings

The projections contained in *Australian veterinary workforce modelling* report show that unless we initiate change, Australia will experience a significant oversupply of veterinarians. Significant unemployment or underemployment is likely unless fewer veterinarians are trained or new demand for services is generated.

The most significant outcome of this project and its findings is evidence that reform and action is needed to ensure a sustainable, affordable veterinary workforce for the future. It is simply not tenable to continue with a business-as-usual approach.

Key documents

Australian veterinary workforce modelling

The report that follows includes the summary of the findings of an environmental scan which was a systematic approach to collecting and analysing information relating to the workforce's internal and external environment influencing the role and practice of the veterinary profession. This process involved a literature review and conduct of telephone interviews with key stakeholders. The report also provides a summary of the technical paper which was prepared to provide more detailed analysis of current and historic supply and demand data, document assumptions supporting the projection modelling and report on findings from the projection modelling including scenario projections.

Australian veterinary workforce environmental scan

The environmental scan provides information relevant to the analysis of the internal and external environment for the veterinary workforce. The environmental scan includes:

- knowledge and understanding of the external environment (government policies and funding arrangements, the regulatory environment)
- business models and commercial arrangements regarding ownership and provision of veterinary services in the private sector
- government and research organisations and their roles and responsibilities
- educational authorities and the courses offered
- demand drivers for the workforce
- current workforce characteristics
- analysis of current workforce data and relevant data sources
- financial factors influencing the workforce
- potential sources of risk in undertaking modelling and relevant to analysing the findings.

This information was compiled from a range of source documentation, stakeholder interviews and workshops.

Australian veterinary workforce technical paper

The technical paper has been prepared to report on the findings of the data analysis undertaken for the project. It documents characteristics of the workforce (age, gender, average hours worked, employment status, location) as well as demand assumptions and preferred data sources. This document has been prepared to report in detail on the data analysis undertaken to support the projection modelling of future supply and requirements until 2030 for the veterinarian workforce in Australia.

This technical paper also reports in detail on the results of the modelling for the national workforce and the workforce by practice area. It also details the results of the scenario modelling.

Next steps

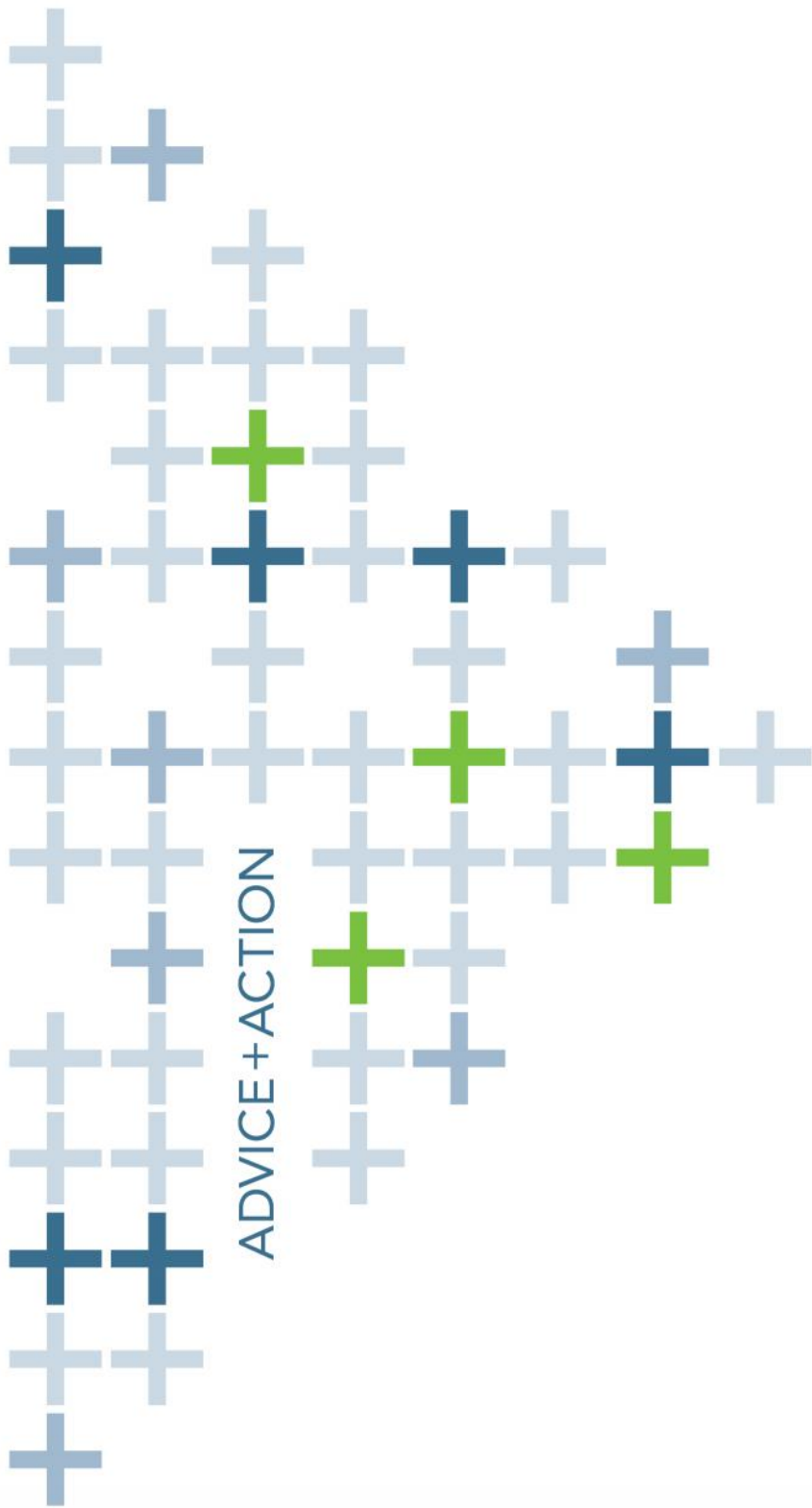
To address the findings of this report, a clear set of actions is needed. The actions and an implementation plan are currently in development. All interested parties who would like to give feedback relating to the report and its findings should email them to Debbie Neutze debbie.neutze@ava.com.au by 16 March 2015.

Acknowledgements

AVA wishes to acknowledge and thank some of the many stakeholders involved with this project for their assistance in this project to date.

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**The Australian Veterinary
Association**

**Report on Projection
Modelling for the
Veterinarian Workforce**

Final Draft

12 December 2014

CONTENTS

| | | |
|-------------|--|-----------|
| 1.0. | EXECUTIVE SUMMARY | 3 |
| 2.0. | INTRODUCTION | 5 |
| 2.1. | Process of Preparation of the Report | 5 |
| 3.0. | KEY FINDINGS FROM THE ENVIRONMENTAL SCAN | 8 |
| 3.1. | The Veterinarian profession | 8 |
| 3.2. | Regulatory environment | 8 |
| 3.3. | Funding environment | 9 |
| 3.4. | Business models and commercial arrangements regarding ownership and provision of veterinary services in the private sector | 10 |
| 3.5. | Veterinary services | 12 |
| 3.6. | Overview of workforce by State/Territory and veterinary practice areas | 14 |
| 3.6.1. | Estimated workforce size by State/Territory | 14 |
| 3.6.2. | Estimated workforce size by practice area | 16 |
| 3.7. | Demand drivers | 19 |
| 3.8. | Supply factors | 20 |
| 4.0. | WORKFORCE PROFILE | 21 |
| 4.1. | Estimated national workforce by age and gender | 21 |
| 4.1.1. | Estimated workforce profile by age and gender by practice area | 22 |
| 4.2. | Hours worked profile | 28 |
| 4.2.1. | National Workforce Estimate, age, gender and hours worked | 28 |
| 5.0. | SUPPLY DYNAMICS | 30 |
| 5.1. | Overview of supply data components | 30 |
| 5.2. | Student commencements and completions | 31 |
| 5.2.1. | Projected student completions and modelling assumptions | 35 |
| 5.3. | Immigration data | 36 |
| 5.3.1. | Immigration data | 37 |
| 5.4. | Re-entry to the workforce | 37 |
| 5.5. | Workforce losses | 39 |
| 5.6. | Flow dynamics for national workforce | 40 |
| 6.0. | LABOUR MARKET ANALYSIS | 41 |
| 6.1. | Current labour market analysis | 41 |
| 7.0. | DEMAND ESTIMATES | 43 |
| 8.0. | RESULTS OF PROJECTION MODELLING | 47 |

CONTENTS

| | | |
|--------|--|----|
| 8.1. | Results of national model | 49 |
| 8.2. | Output screens | 49 |
| 8.2.1. | Low scenario | 49 |
| 8.2.2. | Medium scenario | 49 |
| 8.2.3. | Medium scenario – average hours worked | 50 |
| 8.2.4. | High scenario | 50 |
| 8.3. | Output data | 51 |
| 8.3.1. | Low scenario | 51 |
| 8.3.2. | Medium scenario | 52 |
| 8.3.3. | High scenario | 53 |
| 8.4. | Summary of findings | 54 |
| 8.5. | Further data requirements | 54 |

WORKFORCE PROFILE

1.0. Executive Summary

The Australian Veterinary Association Ltd (the “Association”, or AVA) commissioned Thinc Health for the development of a projection modelling strategy and to undertake the projection modelling for the organisation. The future size and structure of the workforce of registered vets, especially those in clinical practice, has emerged as a major issue of concern for the profession (Porritt, D., 2013, p. 3).¹

The report includes the summary of the findings of an Environmental Scan which was a systematic approach to collecting and analysing information relating to the workforce’s internal and external environment influencing the role and practice of the veterinary profession. This process involved a literature review and conduct of telephone interviews with key stakeholders. The report also provides a summary of the Technical Paper which was prepared to provide more detailed analysis of current and historic supply and demand data, document assumptions supporting the projection modelling and report on findings from the projection modelling including scenario projections.

One major finding from the study is that the workforce is estimated to have grown from 9,033 to 10,207 headcount from 2009 to 2013, a growth overall of 3.2% per annum on average, or 1,173 veterinarians. The calculation of workforce size was based on minor adjustments to the primary registrations by States and Territory to account for workforce participation rates. The largest workforce is in NSW in 2013 with an estimated 2,735 veterinarians (26.8% of national workforce), followed closely by Victoria with 25.2% (2,573 headcount workforce) and Queensland with 23.8% (2,434 headcount workforce). The smallest workforce number are in the Northern Territory (121 headcount) and Tasmania (219 headcount).

The projection modelling was based on low, medium and high demand scenarios. The findings clearly show that the national veterinarian workforce will be in major oversupply between 2012 and 2025 even if the demand level rises to as high as 1.8% per annum, consistent with projected population and household growth. Supply exceeds demand by over 50% in all cases for the national workforce. The results of the projection modelling for future supply and requirements are shown in the table below.

The definitions used are:

- **Large over supply:** supply exceeds demand by greater than 50%
- **Over supply:** supply exceeds demand by between 1 and 50%
- **Under supply:** supply is less than demand by between 1 and 50%.

The only practice area where there is large oversupply for all three scenarios is for equine practice, although mixed practice is in large over supply for low and medium demand scenarios, and in over supply for the high demand scenario.

¹ Porritt,D., (2013) *Australian Veterinary Workforce review report*. Taverner Research & The Australian Veterinary Association Ltd.

WORKFORCE PROFILE

There are two practice areas where there is under supply in all demand scenarios; government services and other services. Teach/research is in over supply in low and medium demand scenarios, but moves to under supply in the high demand scenario where demand is assumed to occur at 3% per annum to allow for additional University courses. All of the demand estimates are below the current rate of growth of the workforce, which is estimated at 3.2% per annum on average between 2009 and 2013.

Two sensitivity scenarios were also undertaken for supply and workforce size. The first scenario was for a higher wastage from the workforce than was estimated based on historical data. The second scenario covered the situation where the workforce includes veterinarians who are not registered due to their role not requiring registration.

For the first sensitivity scenario, national workforce projections show that even with a doubling of wastage the workforce is only under supplied until 2017 and then an oversupply occurs from 2018 onwards. Given that there is no anecdotal evidence to support an under supply at present it is very unlikely that wastage has increased to this level and supply would be sufficient by 2018 to account for a large increase in wastage (if it did occur) between 2014 and 2018.

The sensitivity analysis for the larger workforce size (a five percent increase) shows that the workforce will still be in an oversupply with existing supply dynamics.

The projections show that for the majority of practice areas over supply will continue until 2025. The areas where there may be opportunities for employment are government and other practice areas.

| Scenario | Low demand | Medium demand | High demand |
|----------------------------------|-------------------|--|-------------------|
| National | Large over supply | Large over supply | Large oversupply |
| National high wastage | | Undersupply to 2017, oversupply 2018 to 2025 | |
| National larger workforce | | Large oversupply | |
| Small animal | Large over supply | Over supply | Over supply |
| Large animal/production | Large over supply | Over supply | Over supply |
| Mixed practice | Large over supply | Large over supply | Over supply |
| Equine | Large over supply | Large over supply | Large over supply |
| Government | Under supply | Under supply | Under supply |
| Teaching/research | Over supply | Over supply | Under supply |
| Industry | Over supply | Over supply | Over supply |
| Other | Under supply | Under supply | Under supply |

2.0. Introduction

Thinc Health has been appointed by The Australian Veterinary Association Ltd (the “Association”, or AVA), for the development of a projection modelling strategy and to undertake the projection modelling for the organisation. The future size and structure of the workforce of registered vets, especially those in clinical practice, has emerged as a major issue of concern for the profession (Porritt, D., 2013, p. 3).²

2.1. Process of Preparation of the Report

The report has two supporting documents:

- Environmental Scan
- Technical Paper with Appendix of Projection Modelling Results

The process has included quantitative and qualitative data collection and analysis. The consultation process involved a meeting with the Board members of The AVA and telephone interviews with key stakeholders. The list of key stakeholders is included in Appendix 1.

The development of the Environmental Scan of the veterinary profession and its services has involved a systematic approach to collecting and analysing information relating to the workforce or profession’s internal and external operating environment or the internal and external environment that influences the role and practice of a workforce or profession.

The steps in developing the Environmental Scan included:

- Knowledge and understanding of the external environment (Government policies and funding arrangements, the regulatory environment);
- Business models and commercial arrangements regarding ownership and provision of veterinary services in the private sector;
- Types of veterinary services;
- Government and research organisations and their roles and responsibilities;
- Educational authorities and the courses offered;
- Demand drivers for the workforce;
- Current workforce characteristics;
- Analysis of current workforce data & relevant data sources; and
- Potential sources of risk in undertaking modelling and relevant to analysing the findings.

For planning purposes, it is important to determine whether the present workforce is adequately meeting population and service requirements (as defined by health needs of the animal population and areas of unmet need) or whether a shortage or excess or maldistribution situation applies. This evaluation is then incorporated into the workforce modelling

² Porritt,D., (2013) *Australian Veterinary Workforce review report*. Taverner Research & The Australian Veterinary Association Ltd.

WORKFORCE PROFILE

process. Assessing current workforce requirements means identifying whether a profession or workforce is operating effectively to meet service needs and where problems or areas for improvement are already known. This assessment provides a basis for considering what the profession will be doing in the future and what skills will be needed.

Therefore the environmental scan was designed to address these questions and determine the environmental issues that are currently driving the supply of and demand for veterinarians and to what extent they will play that role in the future.

The Environmental Scan was prepared to be one component of the documentation that supported the workforce planning process for the profession including the development of workforce projections and scenarios for balancing supply and demand.

Another paper, the “*Technical Workforce Modelling Paper for the Veterinary Workforce*” was prepared to provide more detailed analysis of current and historic supply and demand data, document assumptions supporting the projection modelling and report on findings from the projection modelling including scenario projections.

Appendix 1 of the Technical Paper provides comprehensive diagrams of the results of the modelling for the period 2012 to 2025 on baseline supply and demand, demand assumptions, average hours worked, age and sex profile, graduate numbers, workforce profile, migration and re-entry to the workforce and wastage from the workforce. The diagrams for the national model have been included in this report.

2.2. Definitions of Workforce Planning

The most common definition of workforce planning is:

“having the right people, in the right place, with the right capabilities at the right time”.(WHO, 2004).

The process can be described as follows:

“Workforce planning typically examines the current state, the desired future state and identifies ways of dealing with gaps that emerge between the two” (Mercer College, 2009, p.16)³.

The Mercer College Guide provides a workforce planning framework which describes the steps in the process as shown below.

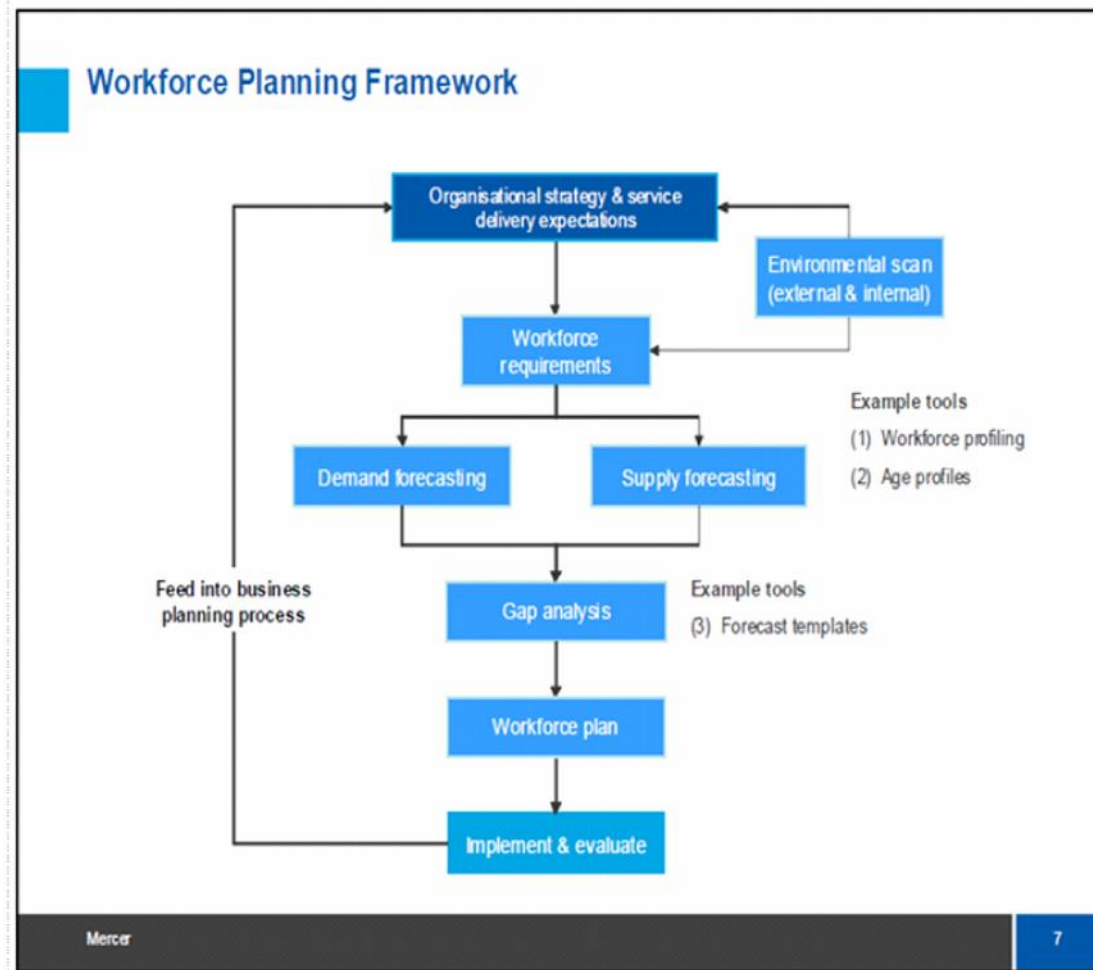
³ Mercer College (2009). *Workforce Planning– Facilitator’s Guide*. Department of Premier and Cabinet, New South Wales Government.

Retrieved 28 August from the World Wide Web:

http://www.dpc.nsw.gov.au/_data/assets/pdf_file/0005/54716/Workforce_planning_training_-_Facilitators_Guide.pdf

WORKFORCE PROFILE

Diagram 1: Workforce Planning Framework



The definition of the components of modelling future supply and demand are as follows:

“Supply forecasting is the process of calculating the likely future supply of current employees with a particular skills set “. (Mercer College, p.18)

“Demand forecasting is the process of calculating the future demand for employees with a particular skills set, to meet future service delivery requirements”. (Mercer College, p.19)

WORKFORCE PROFILE

3.0. Key findings from the Environmental Scan

3.1. The Veterinarian profession

The *Higher Education Base Funding Review* (CVDANZ, n.d.)⁴ reports that “veterinary science is the application of medical, diagnostic, prophylactic and therapeutic principles to companion, domestic, exotic, wildlife, and production animals. Veterinary science is vital to the study and protection of animal production, provision of herd health and monitoring and preventing the spread of disease. It requires the acquisition and application of scientific knowledge in multiple disciplines and uses technical skills to manage disease prevention in both domestic and wild animals” (p.8)

The review by the Council of Veterinary Deans of Australia and New Zealand (CVDANZ) identifies the importance of the veterinary role in ensuring human health through treatment and prevention of disease in animals. The role of veterinarians in Australian society often covers multiple sectors and responsibilities including practice and care for the health, wellbeing and welfare of pets and production animals, roles in academia and also in industry as biomedical scientists investigating basic and applied aspects of human and animal disease. Veterinarians have a significant role in public service, “Many veterinarians enter public service to secure the safety and wholesomeness of human food and safeguard animal industries by preventing incursions of exotic diseases, or work to prevent the spread of diseases from animals to humans”. (p. 4)

The Australian Workforce and Productivity Agency has nominated veterinarians as one of the ‘specialised occupations’ that should be the focus of national planning. Veterinarians are on the Specialised Occupations List in recognition of their high value to Australian economy and community and because their skills take a long time to develop and acquire. As the labour market is not able to adjust quickly there is a potential for market failure.

3.2. Regulatory environment

The veterinary workforce is regulated by eight Veterinary Boards in Australian States and Territories whose major roles are to:

- Register appropriately qualified persons as veterinarians and veterinary specialists and provide a public roll recording those persons;
- Ensure that the interests of the public and the welfare of animals in each jurisdiction are protected;
- Conduct inquiries as required to ensure that professional standards of practice are maintained; and
- Provide advice to government agencies and interest groups.

Health professions are regulated by the Australian Health Practitioner Regulation Agency (AHPRA). AHPRA’s operations are governed by the Health Practitioner Regulation National Law, as in force in each state and territory (the National Law), which came into effect on 1 July 2010. This law means that fourteen health professions are now regulated by

⁴ Council of Veterinary Deans of Australia and New Zealand (n.d.). *Higher Education Base Funding Review*. Unpublished document.

WORKFORCE PROFILE

nationally consistent legislation under the National Registration and Accreditation Scheme. AHPRA also conducts national annual workforce surveys for each of the registered health professions.

While these changes have not occurred for the regulation of the veterinary profession, there have been developments to standardise the roles and functions of each of the jurisdictional Boards. An initial review of annual reports from the States and Territories identified major differences in the level of reporting of registration data and workforce survey data.

3.3. Funding environment

In 2001 the Australian Bureau of Statistics reported that the veterinary industry contributed \$549 million to gross domestic product (GDP) and by 2007 this had increased to \$681 million. (NAB Health, 2009, p.5)⁵ Animal Health Alliance (2013) report that the pet care industry is estimated to be worth \$8.0 billion annually (p. 12). Veterinary services were estimated to account for 21% or \$1,650 million of that expenditure in 2012-13. (p. 40)⁶

The provision of insurance to fund the provision of private veterinary services is discretionary, based on a user-pays system and not supported by government funding. Therefore income to practices is dependent on the performance of the broader economy and capacity to pay for the services. Therefore the concept of demand should be interpreted as “economic demand”, which reflects consumers’ willingness to pay for veterinary services given the price of services. There is evidence from the recent report by the Animal Health Alliance of Australia (2013) that the popularity of pet insurance is increasing, but varies by generation within the population.⁷

While there are views that “need” should be based on expert clinical judgement of the care required, animal owners may not be willing to pay for such services at prevailing prices or may be unaware of the need for such services. This results in unmet demand. An example of this lack of translation into effective demand is the provision of preventative services such as vaccinations and medications to prevent parasitic infestation. (American Veterinary Medical Association, 2013, p. 3)⁸

Baguley, J. (2011) has analysed the demand for and revenue from companion animal veterinary services between 1996 and 2026 and shown that revenue growth has been much stronger than demand growth. Therefore pet ownership trends are the most important factor in determining the potential demand for and revenue from companion animal veterinary services (p. 352).⁹ Baguley concluded that the market for companion animal veterinary services in Australia is mature

⁵ National Australia Bank Health (2009). *The changing face of the healthcare industry; a special report on the veterinary sector by NAB Health*.

⁶ Animal Health Alliance (2013). *Pet Ownership in Australia*.

⁷ Ibid. (p. 12).

⁸ American Veterinary Medical Association (AVMA) (2013). *2013 U.S. Veterinary Workforce Study: Modelling Capacity Utilisation*. The Centre for Health Workforce Studies, School of Public Health, University of Albany, N.Y.

⁹ Baguley, J. (2011). An analysis of the demand for and revenue from companion veterinary services in Australia between 1996 and 2026 using industry revenue data and household census and pet ownership data and forecasts. *Australian Veterinary Journal*, Vol.89, No. 9., September.

WORKFORCE PROFILE

and that growth in demand is expected to remain low over the forecast period to 2026. As a result, for most veterinary practices within this environment, growth in revenue will be a function of growth in average client fees.

NAB Health also reported that there was a 41% increase in average income for vets between 1996 and 2006, increasing to \$61,464 by 2006. Male vets earned on average \$71,552 and females \$50,908. Access Economics examined ten medical professions (dentists, pharmacists, veterinarians, general practitioners and six medical specialties) and rated vets the fourth highest paid, after general practitioners, dentists and pharmacists (as quoted in NAB Health, p. 7).

The variation in income levels by gender is attributable to employee status (where the large majority of female veterinarians are employees; the fact that females are more likely to work part time (38% compared to 15% of male vets) and the fact that men are much more likely to own a veterinary practice than women (78% for males and 36% for females (NAB Health, p. 7). These figures also vary by length of time since graduation and city versus country location of practice.

There is evidence from the Australian Veterinary Association (2013) to suggest that the veterinary starting salary has fallen significantly against other professions (from 6th rank in 1996 to 20th rank in 2012). (Source: Graduate Careers Australia, starting salary for graduates less than 25 years and in first full time employment)¹⁰. The Skilled Occupation List data in the annual review indicated that median annual university graduate earnings for veterinarians four months after completion were \$45,000 compared to \$56,000 for university graduates working full time as professionals. (Source: Graduate Careers Australia, 2011 as quoted in Skilled Occupation List, No. 2347))¹¹

There are multiple studies which also report that the number of veterinarians working in the government or public sector is decreasing in areas such as disease surveillance and field veterinarians monitoring and responding to livestock diseases (Heath, 2008, AVA, 2013). This suggests decreased funding for these services, although this analysis is not based on an analysis of actual government expenditure figures.

3.4. Business models and commercial arrangements regarding ownership and provision of veterinary services in the private sector

Baguley (2011) reports that veterinary services that provide services to companion animals contribute approximately 83% of total veterinary service industry revenue (Australian Bureau of Statistics, 2001, as cited in Baguley, J. (2011), p. 352). His analysis also reveals that any significant growth in industry profitability in Australia will be based on increased pet ownership, increased fees and/or decreased costs rather than organic growth. His view is that profitability is of particular concern to the Australian industry, because of poor returns to veterinary practice owners and the comparatively low veterinary graduate starting salaries (p. 358).

¹⁰ Australian Veterinary Association (2013) *Review of the demand-driven funding system, Submission from the AVA Ltd*. Graduate earnings as retrieved from World Wide Web: <http://www.graduatecareers.com.au/>

¹¹ Graduate Careers Australia (2011) *Australian Graduate Survey*.

WORKFORCE PROFILE

Baguley also discusses market sensitivity to pricing levels. The author argues that increases in fees will result in increased revenue from some pet-owning segments (defined as price inelastic) and decreased revenue from other pet owning segments (price elastic). He foresees the potential for a shift in market segmentation with fewer households but more willingness to pay for new, highly priced services and products created by technological innovations.

Animal Health Alliance in their report on *Pet Ownership in Australia* (2013) provided information to support the view that despite periods of weak consumer confidence, pet owners have not been prepared to economise on pet care, and therefore expenditure has a level of resilience in the market place. The reports indicates that prioritisation of pets has also led to the growth of new and emerging products and services in the pet care sector. This includes pet insurance, alternative healthcare, hotels catering for pets and spas and pet massage (p. 26).

However international studies such as the one undertaken by the American Veterinary Medical Association (AMVA) indicate that there is excess national capacity for veterinary services in private clinical practice, with their analysis indicating 17% excess capacity under certain assumptions. This was estimated to be highest for equine practice (23% excess capacity) followed by small animal (18%), food animal (15% and mixed practices (13%). These estimates allowed for the fact that 42% of veterinarians who reported on the capacity status of their practice reported that their practice was already working at full capacity.¹²

In terms of ownership arrangements, there have been changes made to ownership arrangements which Baguley (2011) reports may facilitate industry consolidation (p. 359). His argument is that industry consolidation has the potential to achieve cost efficiencies through economies of scale. There are direct parallels with the market for medical general practice in Australia where the number of practices has continued to decline nationally over an extended period. (Note: The *Summary Data Report of the 2011-2012 Annual Survey of Divisions of General Practice* (Carne, 2013)¹³ is the most recent source of information on general practices and the most recent comprehensive estimate of general practices was 7,035 practices in 2010/11 (p. 7). The report documents the longitudinal declining trend in the total number of practices nationally from 2000- 01 to 2010-11 (from 8,309 practices to 7,035 practices), while there has been growth in the number of general practitioners overall. (p. 7)

¹² Op. cit. p. 14.

¹³ Carne, A. (2013). *Summary Data Report of the 2011-2012 Annual Survey of Divisions of General Practice*. Adelaide: Primary Health Care Research and Information Service and Australian Government Department of Health and Ageing.

WORKFORCE PROFILE

3.5. Veterinary services

There has been a comprehensive review of employment patterns of veterinary graduates by Heath, T. J. (2005a, 2005b)^{14 15} and number, distribution and concentration of Australian veterinarians between 1981 and 2006 (Heath, 2008).¹⁶ The two studies published in 2005 were based on the results of surveys sent to about 100 veterinarians who graduated in or about each of the decades from 1950 to 2000. The response rate was 68% (420 out of 615 mailed questionnaires). Overall, Heath found that over the last five decades from 1950 to 2000 that the average recent graduate has had progressively more opportunity for support and advice from other veterinarians, to work more sociable hours, and to work with a narrower range of species, especially dogs and cats (2005a, p. 626). There is an increasing dependence on cats and dogs by recently-graduated veterinarians. (2005b, p. 750)

Heath's analysis of employment trends has shown the following changes over the period:

- There was a different employment pattern for graduates of 1950 and 1960, where about half of graduates were employed in their first position in government service, with financial support provided by Departments of Agriculture (or equivalent) in the home state as cadetships. With the phasing out of cadetships the number entering government service decreased to 27% in 1970, and to only two percent in 1980 and later years. Almost half of those who started in government departments then moved to mixed practice in the main over the following decade;
- From 1970 and more recently there has been an increasing proportion of graduates employed in small animal practice, followed by mixed practice. Almost all graduates were initially in private practice, with about half in mixed practices, and the majority of those working as employees;
- Accompanying this shift in employment following graduation, there has been a major decline in the proportion of graduates seeing cattle. Some 39% of graduates from 1970 saw cattle as part of their caseload compared to an average of 19% for the 1990 graduates. By the tenth year of work for the 1990 graduates only eight percent included cattle in their caseload. By 2000 only one-tenth of the work of the 1990 cohort was made up of production animals, with about eighty percent seeing dogs and cats;
- The proportion of the 2000 graduate cohort in mixed practice declined from 59% to 36% within three years. Heath believes that continuation of this trend will result in further difficulties for principals seeking to retain veterinarians, especially those with experience, for their rural practices;
- There were significant differences between genders in the percentages working in mixed practice, small animal practice, government service and other career paths immediately after graduation and ten years later. There were higher percentages of males in mixed practice and higher percentages of females in small animal practice, in each of the ten years after graduation;

¹⁴ Heath, T.J. (2005a) Recent veterinary graduates over the last five decades: initial career experiences. *Australian Veterinary Journal*. Vol 83, No. 10, October. p. 626-632.

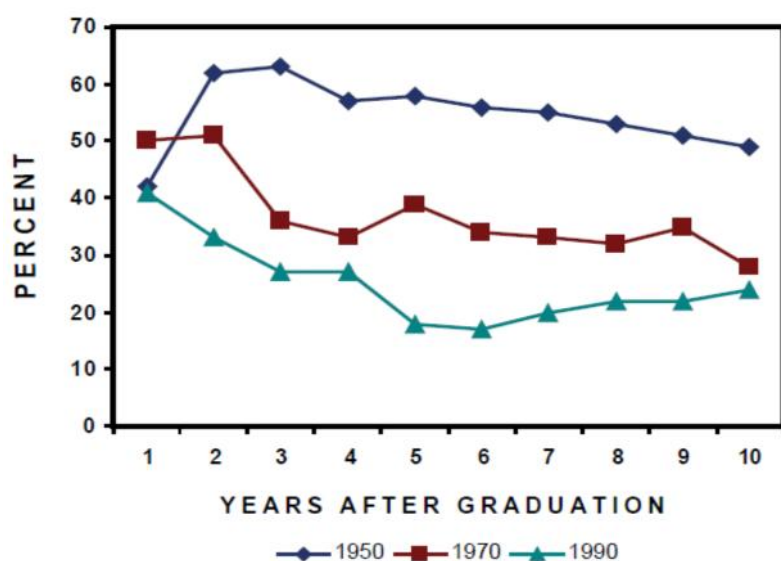
¹⁵ Heath, T.J. (2005b) Recent veterinary graduates over the last five decades: the first ten years. *Australian Veterinary Journal*. Vol 83, No. 12, December. p. 746-750.

¹⁶ Heath, T.J. (2008) Number, distribution, and concentration of Australian veterinarians in 2006, compared with 1981, 1991 and 2001. *Australian Veterinary Journal*. Vol. 86, No. 7. July. p. 283-289..

WORKFORCE PROFILE

- Ownership of practices changed over the period with all 1950 graduates in private practice after ten years being sole owners (62%) or part owners (38%). Fewer than half of those who graduated in 1990 were sole (17%) or part (30%) owners of their practices, with many employed or working as practice associates. Some eight percent of these 1990 graduates were employed to manage practices. This trend is also influenced by gender, with males twice as likely to be sole (52%) or part owners (32%) ten years after graduation (totally 84%) compared to females at 40% (16% sole, 24% part-owners);
- There have also been major changes in the career pathways by location of work over the decades. For each of the cohorts of 1950, 1970, and 1990 there has been a pattern of movement from location in towns at the commencement of the decade to higher proportions in cities by the end of the decade. The major change has been the percentages remaining in country towns after ten years (46% for 1950 graduates, 26% for 1990 graduates) (see Figure 1 below).

Graph 1: Percentage of graduates of 1950, 1970 and 1990 who were working in towns of <10,000 people in each of the first ten years after graduation



Source: As reproduced from Heath, 2005b: Figure 4, p. 748

- Heath has shown that there have been changes in the caseload associated with horses; from ten percent of the caseload for 1950 graduates in both the first and tenth years to 14% for 1990 graduates halving to seven percent by the tenth year. Heath indicates that relevant factors may include that there has been a decrease in the amount of horse work generally in mixed practices, an increase in female veterinarians who on average work more with small animals and less with horses (and production animals) than males, the exodus from mixed practice, the economic climate affecting horse owners and the increasing role of non-veterinarians into equine veterinary practice.
- Heath has also documented changes in the role and function of veterinarians together with the decline in the proportion seeing production animals; including increases in parvovirus and kennel/canine cough, increases in skin

WORKFORCE PROFILE

conditions for canines, decreases in trauma for canines related to motor vehicle accidents, increases in the removal of lumps and repair of lacerations for canines; and changes in anaesthetic procedures (Heath, 2005a).

3.6. Overview of workforce by State/Territory and veterinary practice areas

The AVMA study (2013) in developing their Veterinary Workforce Model, prepared forecasts for pet ownership and food animal populations, demand for veterinary services, and the derived demand for veterinarians through to 2025 by employment sector. The demand projections were developed at State level for the small animal, equine and food animal sectors, but calculated at the national level for industry, academia, government, and the “other” employment due to lack of state-level data and the regional nature of these employment sectors (p. 37).

This study has developed the concept of practice areas within veterinary services delivered by veterinarians and practice areas are defined as the area of veterinary practice where veterinarians work the majority of their time for most practice areas, with further specific definitions in section 3.6.2.

The most important sources of data on the headcount workforce size, gender, age, hours worked and range of practice areas where veterinarians work, including:

- annual Veterinary Registration Board survey data collected by some States and Territories;
- Registration Board data on registrations, renewals, new registrations and deletions from the register as well as primary registrations and secondary registrations;
- results of the 2012 workforce survey conducted by the AVA; and
- ABS 2011 Census data.

3.6.1. Estimated workforce size by State/Territory

The following table and graph shows the estimated workforce size by year and State/Territory. The estimates show a growth overall of 3.2% per annum on average between 2009 and 2013, from 9,033 to 10,207; or 1,173 veterinarians. These estimates show an estimated growth for every State Territory over the period, with the highest growth of 7.2% per annum in Tasmania, and the lowest of 1.3% in Queensland. The workforce for the four States/Territories where the workforce could be calculated from Board surveys is estimated to be 65% of the total in 2009 and 64.9% in 2013.

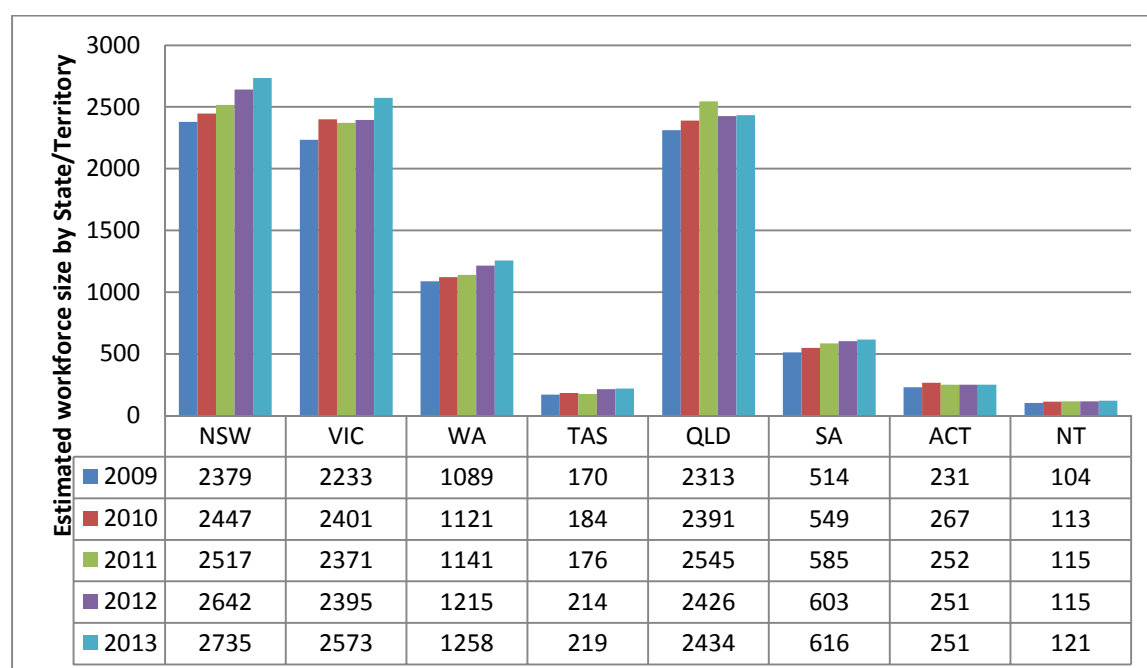
The largest workforce is in NSW in 2013 with an estimated 2,735 veterinarians (26.8% of national workforce), followed closely by Victoria with 25.2% (2,573 headcount workforce) and Queensland with 23.8% (2,434 headcount workforce). The smallest workforce number are in the Northern Territory (121 headcount) and Tasmania (219 headcount).

WORKFORCE PROFILE

Table 1: Estimated veterinarian workforce by State/Territory, 2009 to 2013

| | Estimates of workforce size | | | | | Trends 2009 to 2013 | | | Percentage by State | |
|-------------------------------|-----------------------------|-------------|-------------|-------------|--------------|---------------------|--------------|-------------|------------------------------|------------------------------|
| | 2009 | 2010 | 2011 | 2012 | 2013 | Var. | % Var. | % Var. p.a. | % of national workforce 2009 | % of national workforce 2013 |
| NSW | 2379 | 2447 | 2517 | 2642 | 2735 | 356 | 15.0% | 3.7% | 26.3% | 26.8% |
| VIC | 2233 | 2401 | 2371 | 2395 | 2573 | 340 | 15.2% | 3.8% | 24.7% | 25.2% |
| WA | 1089 | 1121 | 1141 | 1215 | 1258 | 169 | 15.5% | 3.9% | 12.1% | 12.3% |
| TAS | 170 | 184 | 176 | 214 | 219 | 49 | 28.8% | 7.2% | 1.9% | 2.1% |
| Sub Total 4 States | 5871 | 6153 | 6205 | 6466 | 6785 | 914 | 15.6% | 3.9% | 65.0% | 66.5% |
| QLD | 2313 | 2391 | 2545 | 2426 | 2434 | 121 | 5.2% | 1.3% | 25.6% | 23.8% |
| SA | 514 | 549 | 585 | 603 | 616 | 102 | 19.9% | 5.0% | 5.7% | 6.0% |
| ACT | 231 | 267 | 252 | 251 | 251 | 20 | 8.5% | 2.1% | 2.6% | 2.5% |
| NT | 104 | 113 | 115 | 115 | 121 | 17 | 16.0% | 4.0% | 1.2% | 1.2% |
| Sub Total other States | 3162 | 3321 | 3497 | 3394 | 3422 | 260 | 8.2% | 2.1% | 35.0% | 33.5% |
| National total | 9033 | 9473 | 9701 | 9860 | 10207 | 1173 | 13.0% | 3.2% | 100.0% | 100.0% |

Graph 2: Estimated veterinarian workforce by State/Territory, 2005 to 2014



WORKFORCE PROFILE

3.6.2. Estimated workforce size by practice area

The definition of each practice area based on the categories developed for the AVA 2012 survey was as follows:

- Small animals included the categories of companion animals and reptiles/ pocket animals
- Veterinarians working in the equine industry were allocated to the category “equine” if they worked 90% or more of their total hours in the equine area;
- Large/production animals included beef, camelids, dairy, deer, goats, sheep, pigs and goats where more than fifty percent of total hours worked were with one or more of those large animals, as well as > 50% to 89% of time with horses;
- Mixed practice included less than 50% of hours worked with large animals, as well as small animals
- Industry included industry and pharmaceuticals;
- Government included government roles and meat inspection based on 50% and over of time in those areas, and was cross checked with current primary employment and current role to ensure the allocation was consistent with those selections;
- Teaching and research were combined based on 50% and over of time in those areas, and cross checked with current primary employment and current role to ensure the allocation was consistent with those selections; and
- “Other” included areas such as aquaculture, animal welfare, avian, pathology, poultry, reproduction, wildlife, hobby farms, consultancy practice and practice management where more than fifty percent of time was spent in those roles as values were small for individual responses from the survey. This category also included “various” and “other”.

The following table shows the data from the States where data was available from the Annual Surveys conducted by the Veterinary Registration Boards. By 2013, this represents virtually two thirds or 66.5% of the total national workforce. Two options were developed for the national profile by practice area:

- Option 1 using the AVA survey data by practice area extrapolated to the national workforce size;
- Option 2 using the 66.5% known practice area data, extrapolated to the national workforce size (unknown equals known).

Option 1 resulted in estimates of mixed practice and large animal practice which were too low based on the analysis. Option 2 was the preferred method as it is based on known responses of two thirds of the estimated workforce. However there could be a level of error in the allocation if the States/Territories without data have a significantly different profile by practice area.

The trends in the table below show that the total workforce for those four States grew by 3.9%, higher than the estimated growth of the national workforce of 3.2%. Largest growth for those four states was for small animal practice, with an annual average growth of 6.1%, followed by teaching /research with 5.2%. Equine practice showed a minor contraction with an average annual change of -0.6% per annum.

WORKFORCE PROFILE

Table 2: Workforce by practice area, Veterinary Registration Board survey data, States/Territories, 2009 to 2013

| | Practice area, Victoria, NSW, Tasmania & WA | | | | | | | |
|-----------------------------------|---|-------------|-------------|-------------|-------------|------------|--------------|-------------|
| | 2009 | 2010 | 2011 | 2012 | 2013 | Var. | % Var. | % Var. p.a. |
| Small animal practice | 2844 | 3027 | 3102 | 3199 | 3532 | 688 | 24.2% | 6.1% |
| Large animal practice | 221 | 241 | 212 | 233 | 234 | 13 | 6.0% | 1.5% |
| mixed practice | 1327 | 1370 | 1381 | 1396 | 1418 | 91 | 6.9% | 1.7% |
| equine practice | 322 | 344 | 319 | 327 | 314 | -8 | -2.4% | -0.6% |
| sub total private practice | 4714 | 4981 | 5014 | 5155 | 5499 | 785 | 16.7% | 4.2% |
| State & Commonwealth Gov't | 284 | 272 | 301 | 291 | 324 | 40 | 14.2% | 3.5% |
| Teaching/research | 349 | 365 | 358 | 384 | 422 | 73 | 20.9% | 5.2% |
| Industry | 143 | 148 | 150 | 168 | 168 | 24 | 17.1% | 4.3% |
| Other | 381 | 385 | 381 | 468 | 372 | -9 | -2.4% | -0.6% |
| Total | 5871 | 6153 | 6205 | 6466 | 6785 | 914 | 15.6% | 3.9% |

| | | | | | | | | |
|-------------------------------------|--------------|--------------|--------------|--------------|--------------|-------------|--------------|-------------|
| Estimated national workforce | 9033 | 9473 | 9701 | 9860 | 10207 | 1173 | 13.0% | 3.2% |
| % of national workforce | 65.0% | 64.9% | 64.0% | 65.6% | 66.5% | | | |

Source: Veterinary Registration Board Survey data, Annual Reports

The following two tables and graph show the estimated distribution of the national workforce by practice area based on Option 2, with small animal practice accounting for 5,314 veterinarians or 52.1% of the workforce by 2013. Mixed practice accounted for 2,134 veterinarians or 20.9% of the workforce. The smallest practice area is industry, accounting for an estimated 252 veterinarians or 2.5% by 2013.

The trend data shows that small animal practice grew at the highest rate, of 5.4% on average per annum. This is followed by teaching/research, where the workforce grew by 4.6% on average per annum. This is consistent with the opening of additional University courses over the period. Equine practice shows a decrease of 1.1% per annum, as does the "other" areas of practice. Private practice is estimated to be growing at the rate of 3.5% per annum in total, with large animal practice and mixed practice showing lower rates of growth (0.9% and 1.1%) than small animal practice.

As a result of these changes over the period, small animal practice accounts for over half of the workforce by 2013 (52.1%), followed by one in five working in mixed practice (20.9%), two areas with just over five percent each (teaching/research with 6.2%, other with 5.5%), State and Commonwealth government and equine practice between four and five percent each (4.8% and 4.6% respectively) and then other areas between two and four percent (large animal practice at 3.5% and industry at 2.5%).

Private practice accounts for over four in five of the workforce by 2013 at 81.1% by 2013. However there is a decline in the proportion of large animal practice, mixed practice and equine practice between 2009 and 2013, with the growth in

WORKFORCE PROFILE

small animal practice offsetting those changes. (Note: No adjustments were made in the analysis for secondary practice areas, which were only recorded in the AVA Survey).

Table 3: Estimated national workforce by practice area, Veterinary Registration Board survey data, 2009 to 2013

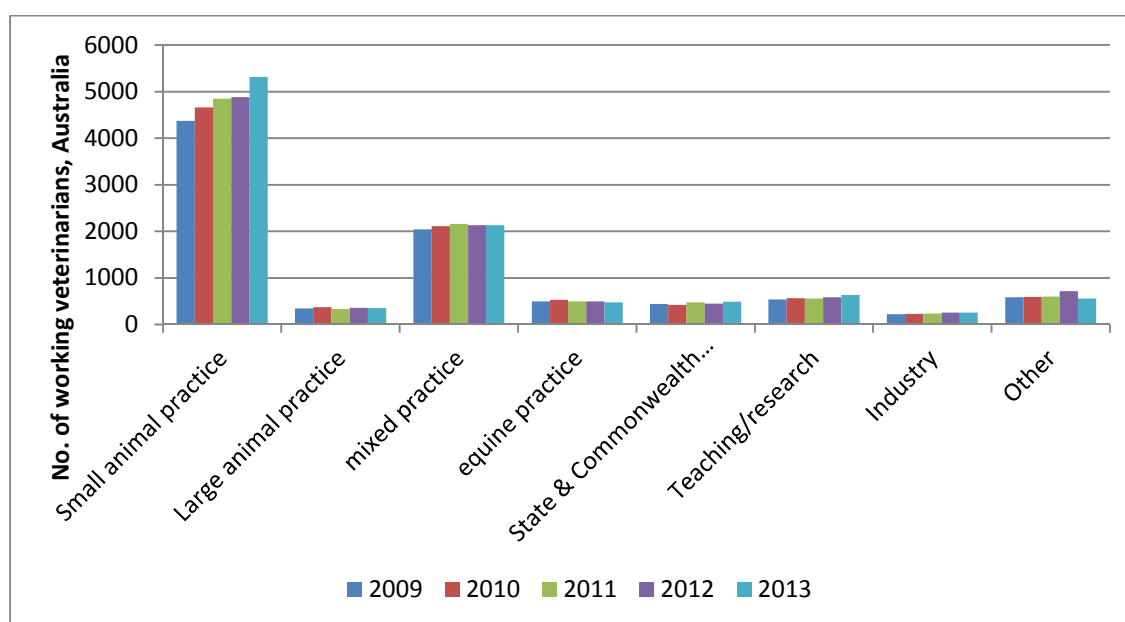
| | National workforce estimate | | | | | | | |
|-----------------------------------|-----------------------------|-------------|-------------|-------------|--------------|-------------|--------------|----------------|
| | 2009 | 2010 | 2011 | 2012 | 2013 | Var. | % Var. | % Var. p.a. |
| Small animal practice | 4376 | 4661 | 4850 | 4878 | 5314 | 938 | 21.4% | 5.4% |
| Large animal practice | 340 | 372 | 331 | 356 | 352 | 12 | 3.6% | 0.9% |
| Mixed practice | 2042 | 2109 | 2160 | 2128 | 2134 | 92 | 4.5% | 1.1% |
| Equine practice | 495 | 529 | 498 | 498 | 473 | -22 | -4.5% | -1.1% |
| sub total private practice | 7253 | 7670 | 7839 | 7860 | 8273 | 1020 | 14.1% | 3.5% |
| State & Commonwealth Gov't | 437 | 419 | 471 | 444 | 488 | 51 | 11.6% | 2.9% |
| Teaching/research | 537 | 563 | 560 | 586 | 635 | 98 | 18.2% | 4.6% |
| Industry | 220 | 228 | 235 | 256 | 252 | 32 | 14.5% | 3.6% |
| Other | 586 | 593 | 596 | 714 | 559 | -27 | -4.6% | -1.1% |
| Total | 9033 | 9473 | 9701 | 9860 | 10207 | 1173 | 13.0% | 3.2% |

Table 4: Percentage of estimated workforce by practice area, State/Territory, 2009 to 2013

| | Percentage by employment practice area, National workforce | | | | |
|--|--|---------------|---------------|---------------|---------------|
| | 2009 | 2010 | 2011 | 2012 | 2013 |
| Small animal practice | 48.4% | 49.2% | 50.0% | 49.5% | 52.1% |
| Large animal practice | 3.8% | 3.9% | 3.4% | 3.6% | 3.5% |
| mixed practice | 22.6% | 22.3% | 22.3% | 21.6% | 20.9% |
| equine practice | 5.5% | 5.6% | 5.1% | 5.1% | 4.6% |
| sub total private practice | 80.3% | 81.0% | 80.8% | 79.7% | 81.1% |
| State & Commonwealth Government | 4.8% | 4.4% | 4.9% | 4.5% | 4.8% |
| Teaching/research | 5.9% | 5.9% | 5.8% | 5.9% | 6.2% |
| Industry | 2.4% | 2.4% | 2.4% | 2.6% | 2.5% |
| Other | 6.5% | 6.3% | 6.1% | 7.2% | 5.5% |
| Total percentage employed in profession | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% |

WORKFORCE PROFILE

Graph 3: Estimated workforce by practice area, State/Territory, 2009 to 2013



3.7. Demand drivers

The overview of the veterinarian profession and key demand issues has identified the complexity of the veterinary workforce for the purposes of workforce modelling. The Environmental Scan indicates that there have been major changes in the funding and organisational arrangements for veterinary services, including the composition of the types of veterinary practice, business models and commercial arrangements regarding ownership of private practices and the government funding and delivery of government services. There are major changes occurring in key demand factors such as levels of pet ownership, the provision of rural services and services to the equine industry, as well as changes in the roles performed by veterinarians, together with increasing roles for paraprofessionals.

The study conducted by Baguley (2011)¹⁷ was the most definitive study reviewed for the Environmental Scan regarding projected demand for the veterinarian profession, and this study was limited to the demand for and revenue from companion animal veterinary services in Australia. Baguley concluded that the market for companion animal veterinary services is a mature market and that growth in demand is expected to remain low over the forecast period from 1996 to 2026.¹⁸ His conclusion is that the companion animal industry in Australia is likely to grow in real terms by around 1.2% over the next 10-15 years (p. 359). However he also highlights demand factors which could limit the translation of this demand growth into similar growth in demand for veterinarians, which includes factors such as a change in the skills mix

¹⁷ Baguley, J. (2011). An analysis of the demand for and revenue from companion veterinary services in Australia between 1996 and 2026 using industry revenue data and household census and pet ownership data and forecasts. *Australian Veterinary Journal*, Vol.89, No. 9., September.

¹⁸ . Ibid. p. 352.

WORKFORCE PROFILE

of the workforce to a greater proportion of paraprofessional staff, as well as consolidation of practices resulting in more economies of scale.

Baguley's study used industry data on pet population estimates from the time series 1994 to 1997 and then from a separate data set in 1998 (p. 357). The analysis has provided some key conclusions including that the model forecasts an increase in dog and cat populations during the period under analysis, despite decreases in the percentage of households owning dogs and cats. This is related to the more than proportionate growth in household numbers over the same period.

The international experience during the global financial crisis however indicates that the role of pets in households is increasingly important, and that both pet ownership and related expenditure is relatively resilient to broader economic downturn. However Baguley also argues that there is mixed data on the level to which expenditure is price inelastic (the extent to which increases in fees will result in increased revenue) and therefore the market has multiple segments which will respond differentially to changes in fee levels. Purchasing behaviour may decrease as fees increase, but there will be a segment of the market that is willing and able to pay for new, higher priced services and products created by technological innovation.

The drivers for demand for other sectors of the veterinary workforce are also complex in that there are significant challenges for growth in the rural sector with increasing reliance on companion animal services to support rural practice viability. The level of government services provided by veterinarians has fallen substantially but there is minimal evidence of the extent to which the concept of an enhanced role for private practices to contract those essential services back to producers and government agencies has actually occurred.

There is also increasing specialisation in the market, particularly in areas such as surgery for small animals and equine services. There is also increasing emphasis being placed on biosecurity services to replace the more traditional quarantine services. However it is unclear to the extent to which these changes will consolidate and strengthen the role of veterinarians as there are changes occurring in the skills mix in practices with the use of paraprofessionals as well as increasing competition from non-veterinary providers in niche markets which will challenge future growth in the workforce.

3.8. Supply factors

The key data on the supply indicators to date show:

- An increasing number of university courses, together with increasing student commencements and completions. The student completions are yet to increase further as increased commencements flow through to completions;
- A major variation in the gender mix of the workforce with a majority of females in the workforce (55.8%), very high proportions of females in the younger age groups up to 44 years, after which there are more male veterinarians by age group. Females make up 82.1% of the workforce aged up to 24 years, and the proportion of females then declines by age cohort. This trend is apparent across every State and Territory within Australia;
- A high modal range for hours worked, with the largest number of veterinarians working 49 hours and over per week;
- Emerging oversupply with an increasing proportion of graduates seeking work at four months after graduation from 2004 onwards; together with a reduction in parity with overall graduate wages, particularly since 2009.

WORKFORCE PROFILE

4.0. Workforce Profile

The following section shows the results of the analysis of the various data sources for age, gender and hours worked.

The three data sources analysed were:

- annual Veterinary Registration Board survey data collected by some States and Territories;
- results of the 2012 workforce survey conducted by the AVA; and
- ABS 2011 Census of Population and Housing data.

Following initial analysis documented in full in the Technical Paper it was decided to limit the projection modelling to a national model and a model by practice area at national level. This decision was supported by additional analysis using tests of significance which is reported in detail in the Technical Paper.

4.1. Estimated national workforce by age and gender

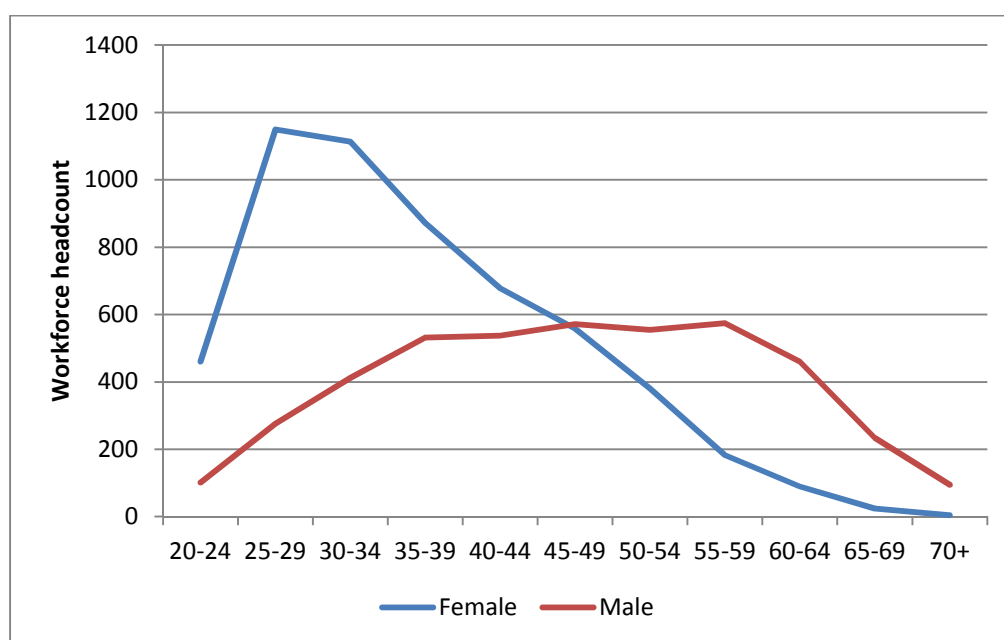
The following table and graph show the estimated workforce by age and gender. The Census data on age and gender was applied to the estimated workforce size by State/Territory to derive this profile. Females are 55.9% of the national workforce and males 44.1%.

The data shows that the model age range for the female national workforce is 25 to 29 years, for males is 55 to 59 years, and in total is 30 to 34 years. Males are a larger number of the workforce for each age cohort from 45 years and older. There are 117 or 2.1% of the female workforce who are 60 years and older, while there are 789 or 18.1% of the male workforce who are 60 years and older. In total, this accounts for 906 or 9.2% of the national workforce who will retire within the next ten years.

Table 5: Estimated national workforce by age and gender, 2012

| 2012 | Headcount | | | Percentage by age | | |
|--------------------|--------------|--------------|---------------|-------------------|---------------|---------------|
| Age | Female | Male | Total | Female | Male | Total |
| 20-24 | 460 | 101 | 561 | 8.3% | 2.3% | 5.7% |
| 25-29 | 1150 | 276 | 1426 | 20.9% | 6.4% | 14.5% |
| 30-34 | 1113 | 412 | 1525 | 20.2% | 9.5% | 15.5% |
| 35-39 | 872 | 532 | 1404 | 15.8% | 12.2% | 14.2% |
| 40-44 | 678 | 537 | 1215 | 12.3% | 12.4% | 12.3% |
| 45-49 | 559 | 571 | 1130 | 10.1% | 13.1% | 11.5% |
| 50-54 | 381 | 555 | 935 | 6.9% | 12.8% | 9.5% |
| 55-59 | 182 | 575 | 757 | 3.3% | 13.2% | 7.7% |
| 60-64 | 89 | 460 | 549 | 1.6% | 10.6% | 5.6% |
| 65-69 | 24 | 234 | 259 | 0.4% | 5.4gender | 2.6% |
| 70+ | 4 | 94 | 98 | 0.1% | 2.2% | 1.0% |
| Total | 5513 | 4346 | 9860 | 100.0% | 100.0% | 100.0% |
| % by gender | 55.9% | 44.1% | 100.0% | | | |

WORKFORCE PROFILE

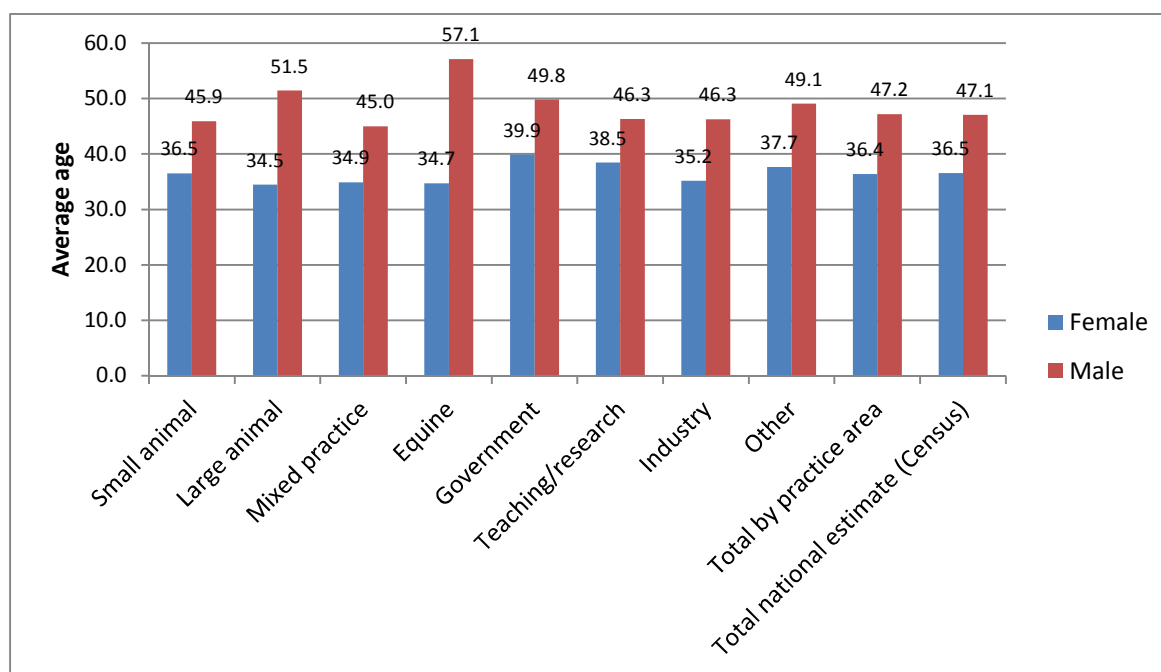
Graph 4: National workforce headcount by age and gender, 2012**4.1.1. Estimated workforce profile by age and gender by practice area**

Several methods were used to calculate the age and gender profile of the workforce by practice area. However, as the AVA survey was the only data for the age and gender profile by practice area, the proportion of each practice area workforce by age and gender using AVA sample data was applied to the totals by gender using the national estimates by practice area. The results are reported below by practice area, together with a graph showing average age by practice area.

The total average age of the national workforce for 2012 by practice area is estimated to be 41.3 years, very similar to the average age of the national workforce of 41.2 years. The graph below shows that the average age by gender is 36.4 years for females, and 47.2 years for males, similar to the average age calculated from the Census data. The average age of the female workforce is younger in every practice area; women working in government have the oldest average age at 39.9 years. Males working in equine practice are on average 57.1 years, with the youngest age group on average in mixed practice at 45.0 years.

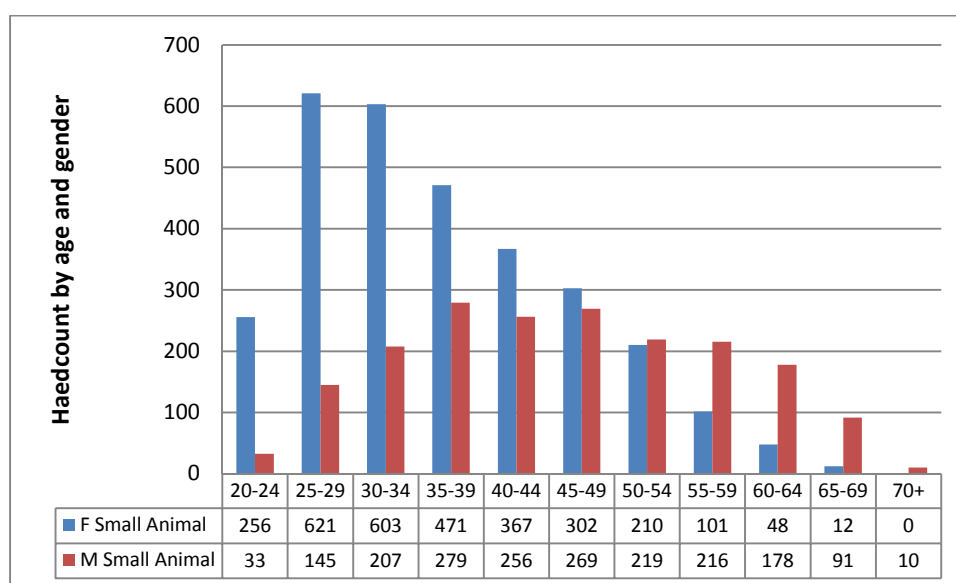
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Graph 6: Estimated average age by gender and practice area, 2012

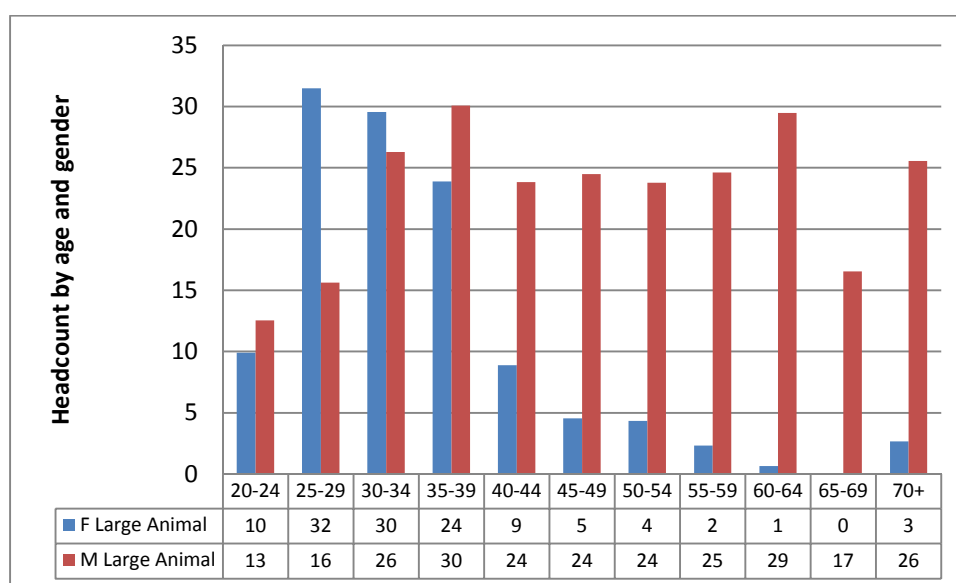


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Graph 7: Estimated national small animal workforce by age and gender, 2012

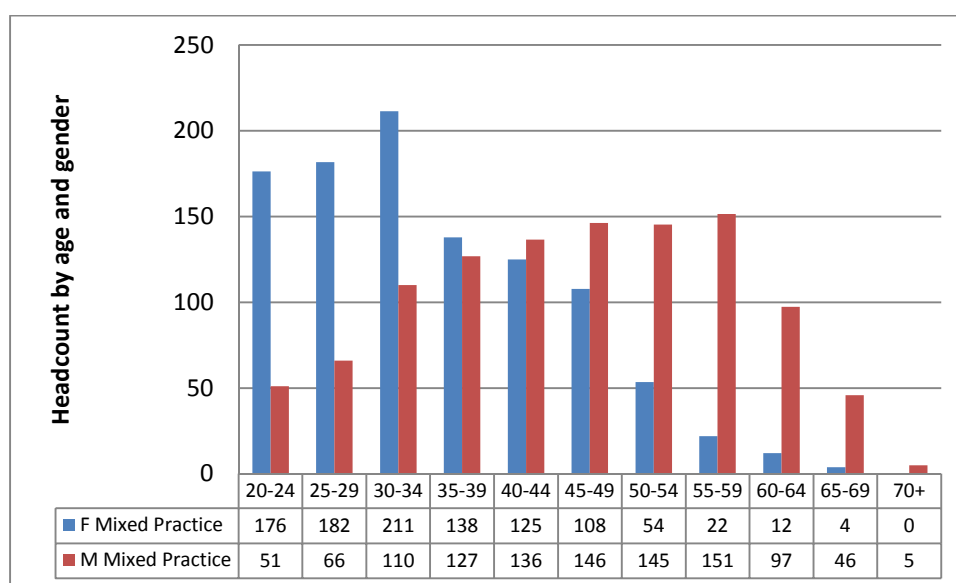


Graph 8: Estimated national large animal workforce by age and gender, 2012

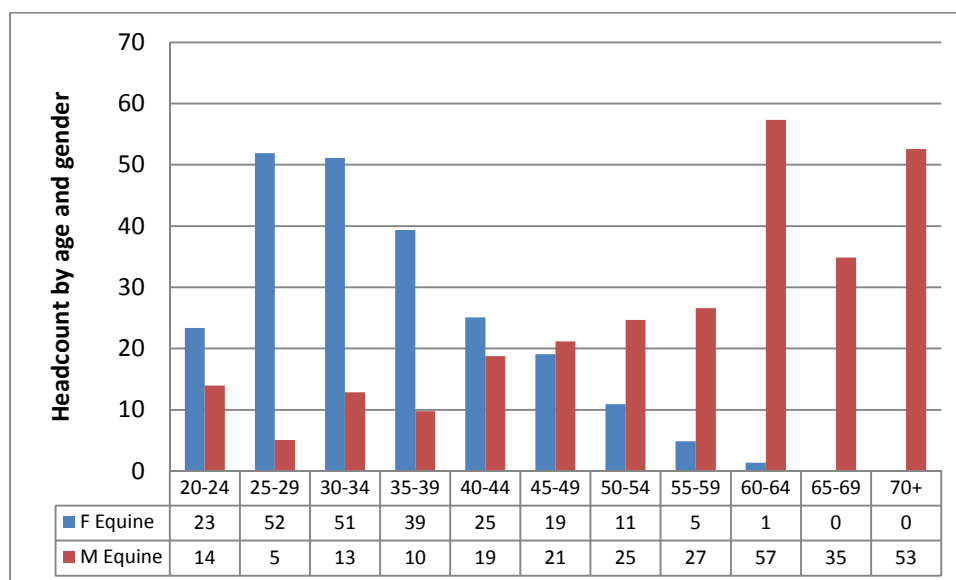


WORKFORCE PROFILE

Graph 9: Estimated national mixed practice workforce by age and gender, 2012

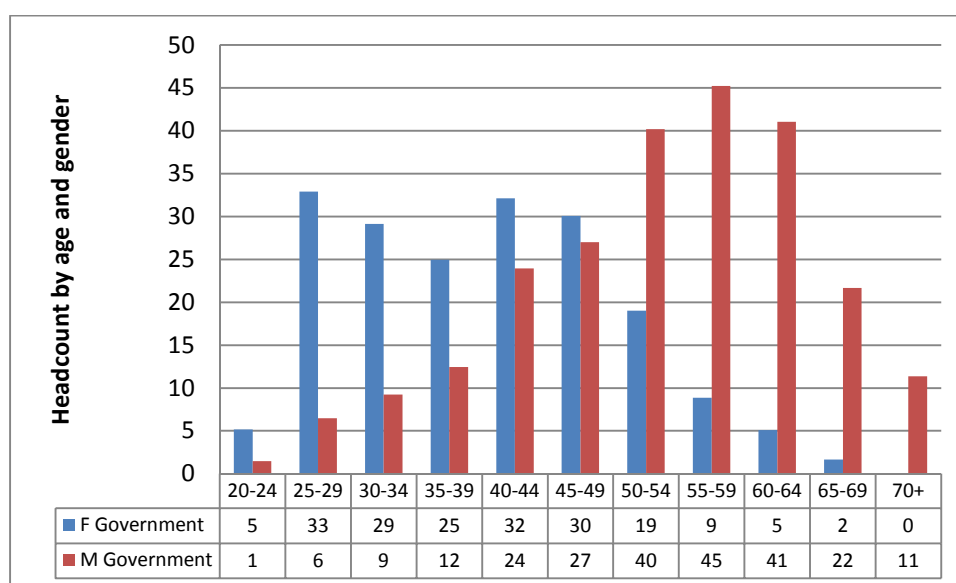


Graph 10: Estimated national equine workforce by age and gender, 2012

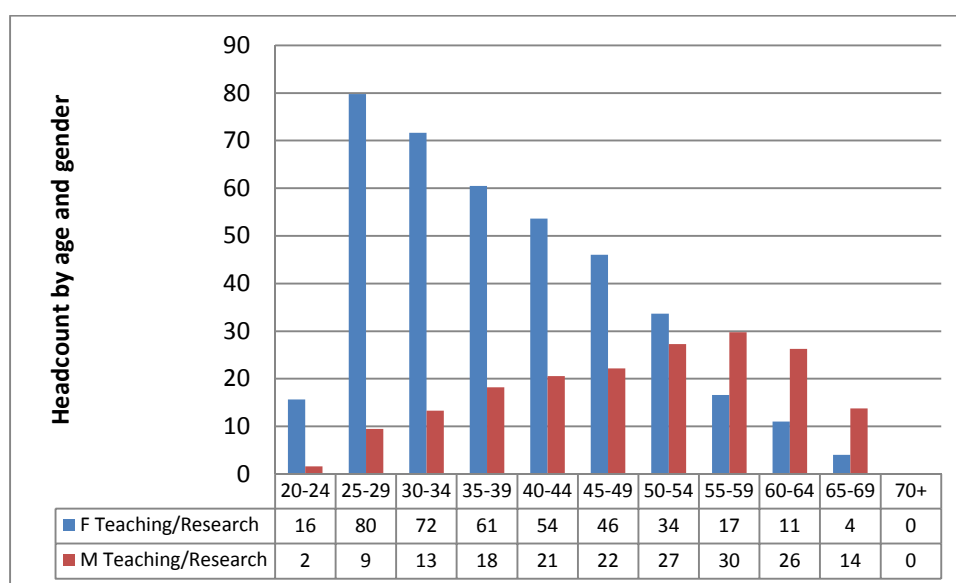


WORKFORCE PROFILE

Graph 11: Estimated national government workforce by age and gender, 2012

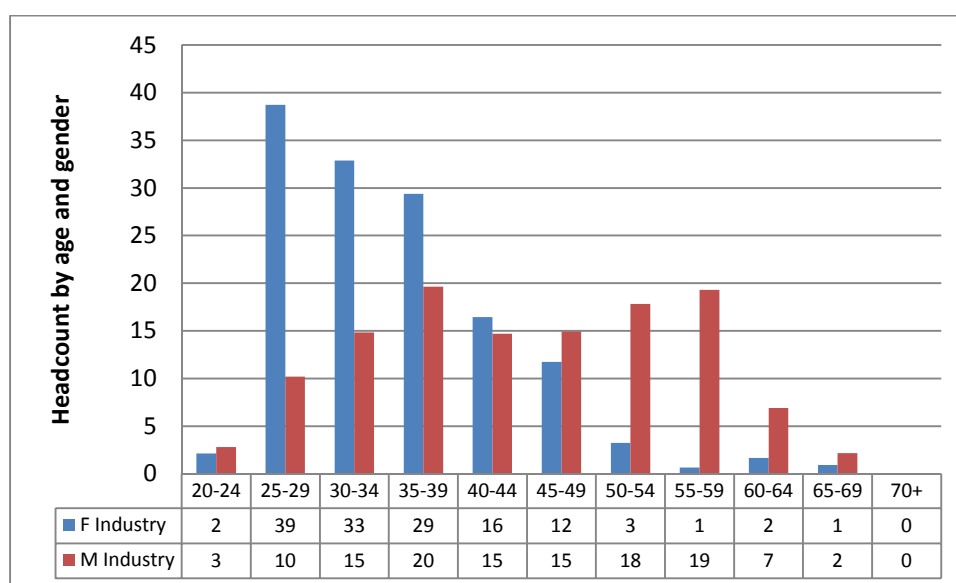


Graph 12: Estimated national teaching/research workforce by age and gender, 2012

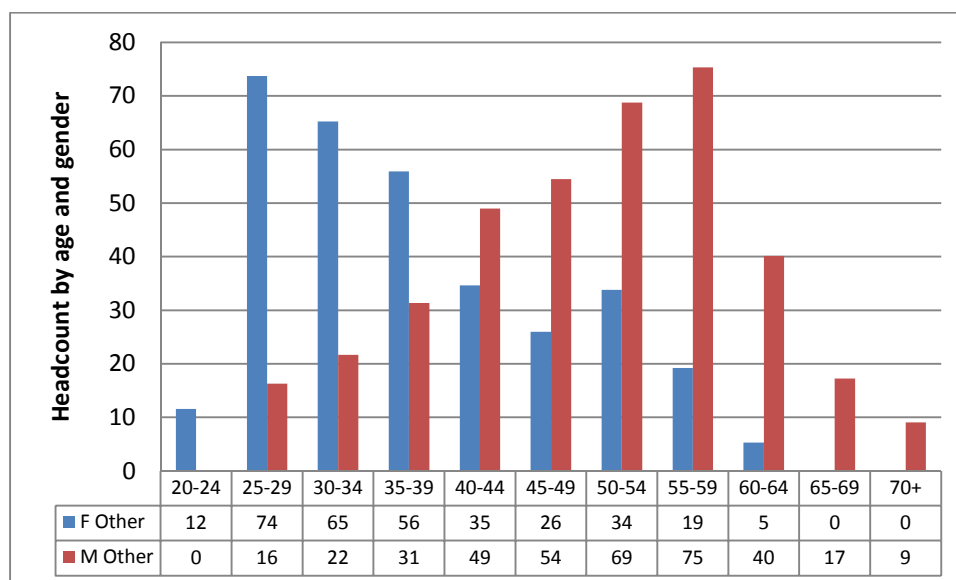


WORKFORCE PROFILE

Graph 13: Estimated national industry/pharmaceutical workforce by age and gender, 2012



Graph 14: Estimated national “other” workforce by age and gender, 2012



WORKFORCE PROFILE

4.2. Hours worked profile

4.2.1. National Workforce Estimate, age, gender and hours worked

The following table and graph show the national workforce estimate by age, gender and hours worked. The data shows that the average hours per week worked per week is 42.9 hours, with 39.3 hours worked per average per week by females and 47.5 hours worked per week on average by males. This is on average 8.2 hours less per week worked by females.

The total hours worked excludes on-call hours active on duty and on-call hours worked.

The major finding from the analysis is that females work on average less hours per week in every age group and in total. The largest variations occur in the age groups of 35 to 49 years and again after 65 years where females work over ten hours per week on average less than males. The modal range of hours worked per week for females is for 20 to 29 years (average of 43.5 hours), for males is 55 to 59 years (average of 50.0 hours) and for the total workforce is for 55 to 59 years (average of 47.9 hours). This has implications for the productivity of the workforce as large numbers of females move into the 30+ age group and both sexes move from the 55 to 59 year age group to over 60 years.

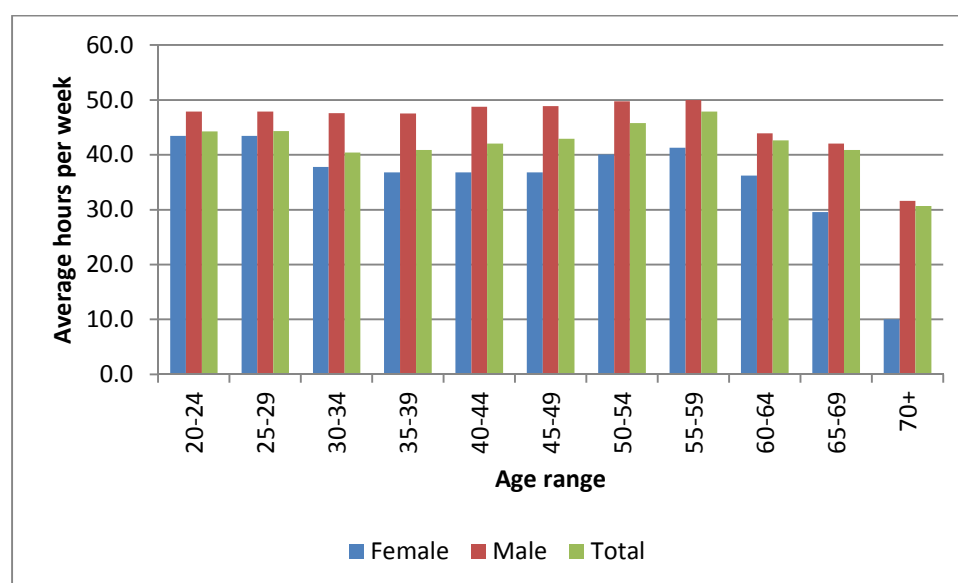
The age group working the least hours is for females and males and in total is for those aged over 70 years (10.0, 31.6, and 30.7 hours respectively).

Table 6: Estimate of national workforce profile by age, gender and average hours worked

| Age | Headcount | | | Average hours per week | | |
|--------------|-------------|-------------|-------------|------------------------|-------------|-------------|
| | Female | Male | Total | Female | Male | Total |
| 20-24 | 460 | 101 | 561 | 43.5 | 47.9 | 44.3 |
| 25-29 | 1150 | 276 | 1426 | 43.5 | 47.9 | 44.3 |
| 30-34 | 1113 | 412 | 1525 | 37.8 | 47.6 | 40.4 |
| 35-39 | 872 | 532 | 1404 | 36.8 | 47.5 | 40.9 |
| 40-44 | 678 | 537 | 1215 | 36.8 | 48.7 | 42.1 |
| 45-49 | 559 | 571 | 1130 | 36.8 | 48.9 | 42.9 |
| 50-54 | 381 | 555 | 935 | 40.0 | 49.8 | 45.8 |
| 55-59 | 182 | 575 | 757 | 41.3 | 50.0 | 47.9 |
| 60-64 | 89 | 460 | 549 | 36.2 | 43.9 | 42.6 |
| 65-69 | 24 | 234 | 259 | 29.6 | 42.0 | 40.9 |
| 70+ | 4 | 94 | 98 | 10.0 | 31.6 | 30.7 |
| Total | 5513 | 4346 | 9860 | 39.3 | 47.5 | 42.9 |

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Graph 15: Estimate of national workforce profile, average hours worked per week by age and gender



WORKFORCE PROFILE

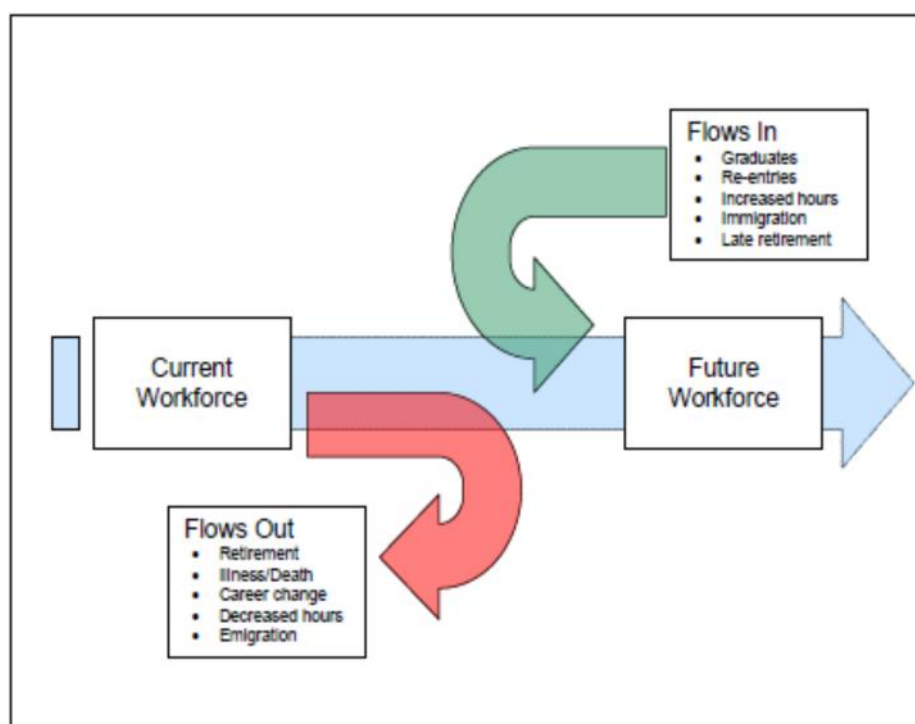
5.0. Supply Dynamics

5.1. Overview of supply data components

Health Workforce Australia (2012) ¹⁹ has developed the projection model that is used in this modelling project. The model is described as follows:

“The principal method used to develop the projections of the medical, nursing and midwifery workforce numbers is mathematical simulation modelling. The simulation model employed to generate the workforce supply projections is referred to as a stock and flow model, where people entering and exiting the workforce (flows) periodically adjust the initial number in the workforce (stock). The workforce is broken down into age and gender cohorts and different flow rates are applied to each cohort. The model then takes these different flow rates into account by progressive ageing of the workforce through iteration of the stock and flow process. This process is represented in Figure 1 (see below) “ (p. 40).

Figure 1: Stock and flow process



Source: HWA (2012). P. 40.

The following data has been included in the modelling:

¹⁹ Health Workforce Australia (2012). *Health Workforce 2025 – Doctors, Nurses and Midwives – Volume 1*.

WORKFORCE PROFILE

Flows in:

- Student completions, actual data 2007 to 2013 by University, age and gender, domestic/international status;
- Estimated graduate completions 2014 to 2028 (advice from Universities, collected by AVA);
- Re-entries based on immigration data (OAD data – see below, based on long-term resident return for employment purposes)
- Restorations to the Register from Veterinary Boards data (sample from NSW, Victoria and South Australia)
- Immigration data (OAD data – see below, based on long-term visitor and settler arrival)

Flows out:

- Immigration data (OAD data – see below, based on long-term resident departure)
- Retirements – based on assumptions of the proportion of retirements by age cohort.

5.2. Student commencements and completions

There has been a major increase in the number of students entering Australian universities to undertake veterinary degrees, due to an increase in the number of educational providers. (Pratley, J.E. and Abbott, K. (2012); AVA Media releases (2013)). Pratley, J.E. and Abbott, K. (2012) in their analysis of the study of the supply of veterinary science graduates indicate that up to 2010 there was graduate supply from four universities: The University of Queensland (UQ), The University of Sydney (USyd), The University of Melbourne (UMelb) and Murdoch University in Western Australia (MurdU). A data base was commissioned by AVA for use in the study providing age, gender, University and domestic/international status.

There has been a major change in the number of Universities offering these courses with three additional universities commencing educational courses from 2008 onwards; James Cook University (JCU), The University of Adelaide in 2011 (UAdel) and Charles Sturt University in 2012 (CSU). The following graph shows the trends for student commencements between 2007 and 2013.

The following table and graph show an increase from 431 commencements in 2007 to 694 commencements in 2013, an increase of 263 in total (61.0%). The largest increase in numbers has been for The University of Queensland (43 additional students, 7.0% per annum average growth), followed by The University of Melbourne (23 additional students, 3.6% per annum average growth). Across all universities there has been a growth of 263 students, with ten percent per annum average growth. Murdoch University has shown a different trend with a decline of 42 students or 7.4% decrease per annum on average. There was also a large increase between 2012 and 2013 of 26%, although there were no additional courses commencing in 2013.

WORKFORCE PROFILE

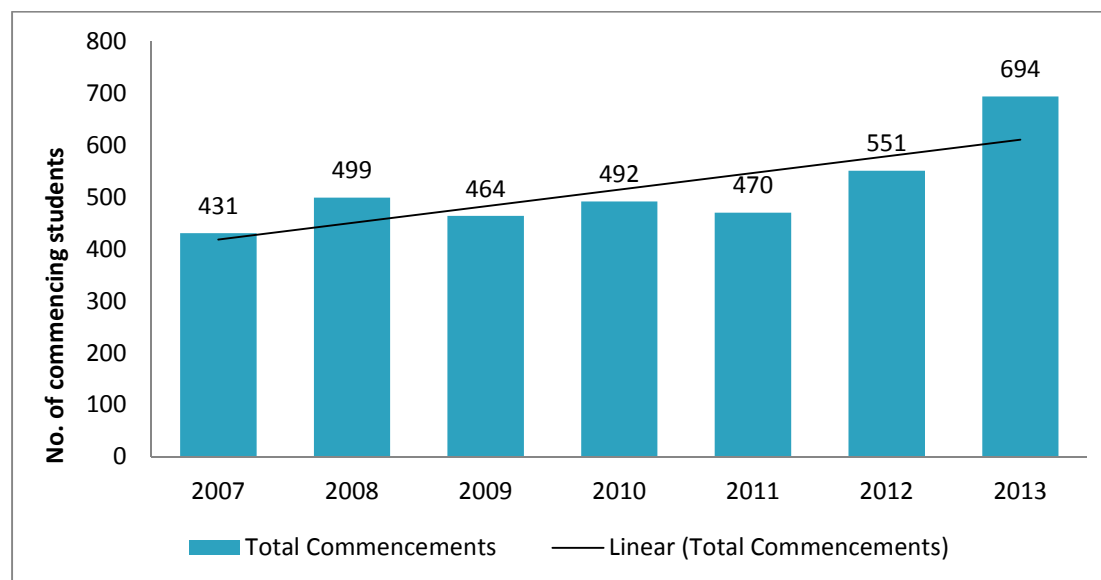
Table 7: University commencements by University by year, Veterinarian courses, 2007-2013

| University | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | Var. 1 | % Annual Var. 1 | % Var. 2007-2013 |
|----------------------------|------------|------------|------------|------------|------------|------------|------------|------------|-----------------|------------------|
| USyd | 127 | 123 | 118 | 140 | 124 | 132 | 142 | 15 | 2.0% | |
| UQ | 103 | 135 | 117 | 124 | 118 | 123 | 146 | 43 | 7.0% | |
| UMelb | 106 | 120 | 120 | 125 | 88 | 74 | 129 | 23 | 3.6% | |
| MurdU | 95 | 43 | 30 | 39 | 36 | 34 | 53 | -42 | -7.4% | |
| JCU | | 78 | 79 | 64 | 60 | 65 | 87 | 9 | 2.3% | |
| UAdel | | | | | 44 | 53 | 54 | 10 | 11.4% | |
| CSU | | | | | | 70 | 83 | 13 | 18.6% | |
| Total Commencements | 431 | 499 | 464 | 492 | 470 | 551 | 694 | | | |
| Total change | | | | | | | | 263 | 10% | 61.0% |

Note: (1) Variation and Annual % Variation is calculated from the initial year the course commenced to 2013.

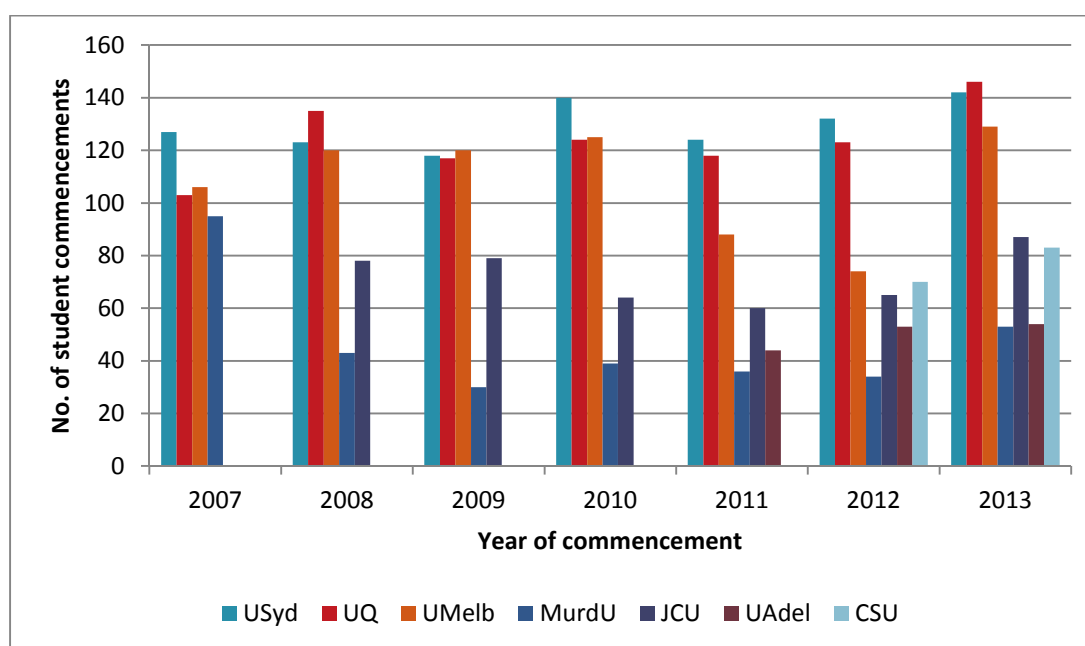
Source: <http://highereducationstatistics.education.gov.au/>

Graph 16: University commencements by year, Veterinarian courses, 2007-2013



Source: <http://highereducationstatistics.education.gov.au/>

WORKFORCE PROFILE

Graph 17: University commencements by University by year, Veterinarian courses, 2007-2013

Source: <http://highereducationstatistics.education.gov.au/>

The following table and graphs show the trends for student completions between 2007 and 2013. The graph shows an increase from 116 completions in 2007 to 560 commencements in 2013. Due to the very low numbers of completions in 2007, the change in completions between 2008 and 2013 was calculated (160 additional students, 40% growth, an average of eight percent per annum growth on average). The linear trend line shows that 2013 completions are close to the trend in growth between 2009 and 2013. However it is anticipated that after several years of projected growth based on further recent commencement increases there will be a plateauing of completions.

This is supported by a survey of Universities where they were requested to provide data on the number of anticipated completions from 2012 to 2028. These data have been used to update the estimated completions from 2014 to 2030.

WORKFORCE PROFILE

Table 8: University completions by University by year, Veterinarian courses, 2007-2013

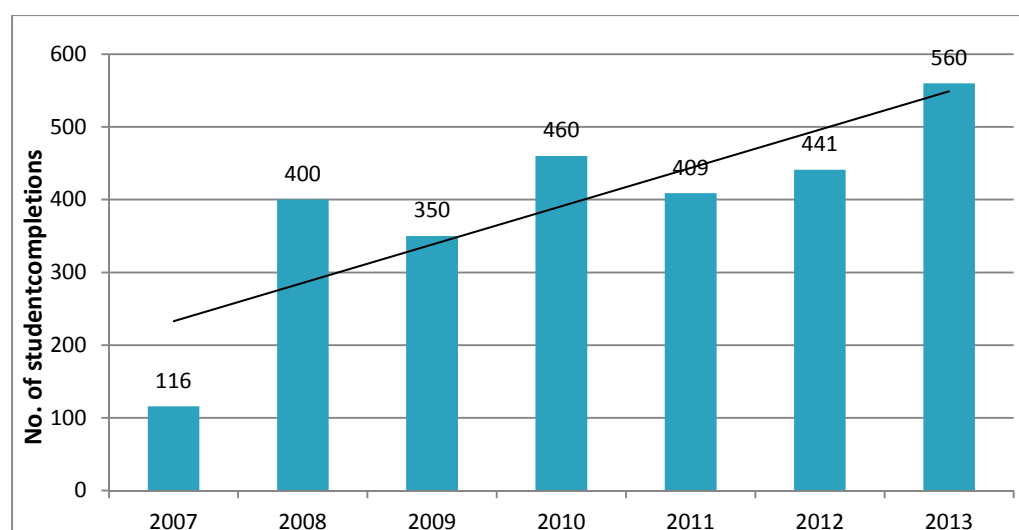
| | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2008 -2013 Var. 1 | % Annual Var. 1 | % Var. 2008- 2013 |
|--------------------------------------|------------|------------|------------|------------|------------|------------|------------|-------------------------|-----------------------|-------------------------|
| USyd | 13 | 113 | 68 | 122 | 81 | 107 | 113 | 0 | 0.0% | |
| UQ | 19 | 104 | 111 | 102 | 83 | 88 | 107 | 3 | 0.6% | |
| UMelb | 84 | 109 | 95 | 103 | 101 | 124 | 117 | 8 | 1.5% | |
| Murdu | | 74 | 76 | 90 | 93 | 50 | 68 | -6 | -1.6% | |
| JCU | | | | 43 | 51 | 46 | 59 | 16 | 7.4% | |
| UAdel | | | | | | | 33 | n.a. | n.a. | |
| CSU | | | | | | 26 | 63 | 37 | 142.3% | |
| Total Completions | 116 | 400 | 350 | 460 | 409 | 441 | 560 | | | |
| Total change 2008 to 2013 | | | | | | | | 160 | 8% | 40.0% |

Note: (1) Variation and Annual % Variation is calculated from the initial year the course commenced to 2013.

Note: Change rates were calculated from 2008 to 2013 due to the very small number of completions in 2007

Source: <http://highereducationstatistics.education.gov.au/>

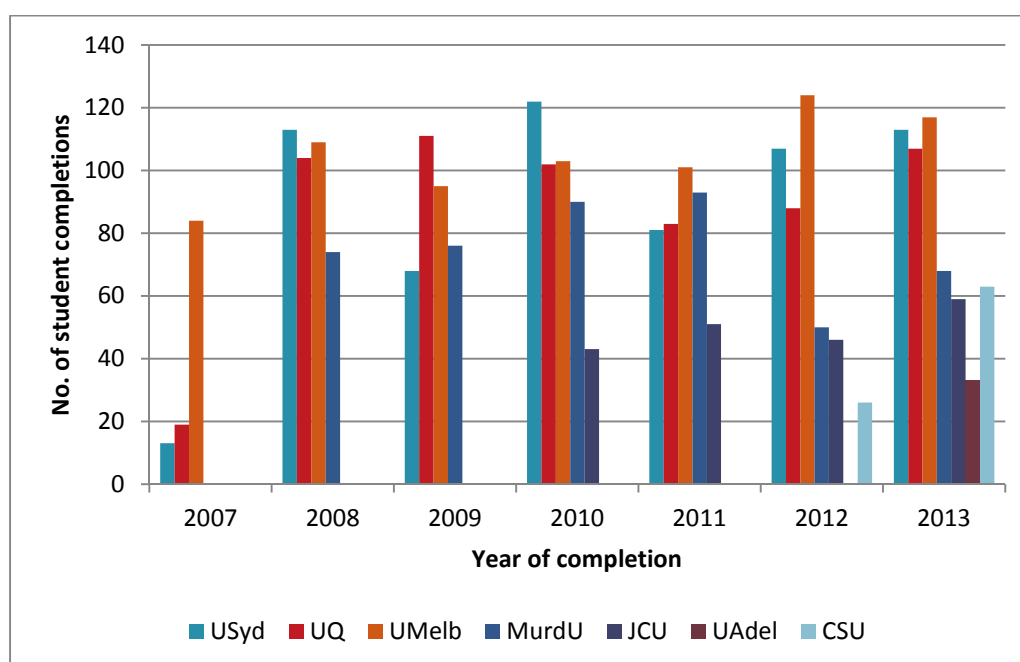
Graph 18: University completions by University by year, Veterinarian courses, 2007-2013



Source: <http://highereducationstatistics.education.gov.au/>

WORKFORCE PROFILE

Graph 19: University completions by University by year, Veterinarian courses, 2007-2013



Source: <http://highereducationstatistics.education.gov.au/>

5.2.1. Projected student completions and modelling assumptions

The AVA conducted a survey of all Universities to determine actual graduate completions from 1995 to 2011 and anticipated completions between 2012 and 2028. The following graph shows the completions by year, from 2013 to 2025, the final year of the projection model. Graduate completions show fluctuation by year until 2017, when from that year onwards graduate numbers stabilise at 582 per annum. The graph also shows the number of graduates based on 90% moving into the workforce the following year. This is based on the analysis of the career paths of veterinary graduates from the research conducted by Heath (2007, p.287).²⁰

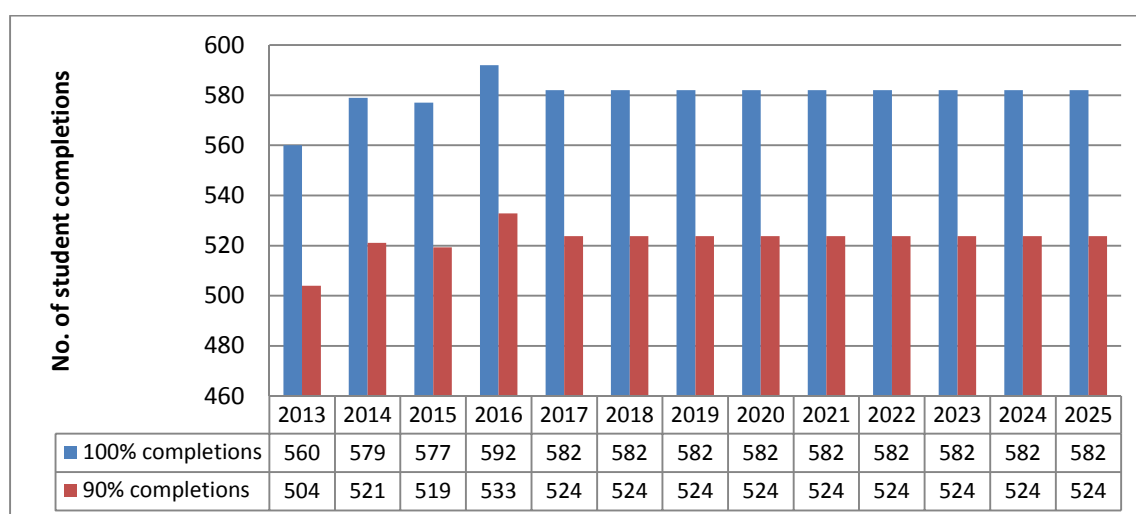
Therefore the key assumptions relating to graduate completions and entry into the workforce are:

- 90% of completing graduates will enter the workforce the following year;
- The course length on average is five years;
- No differential participation rates from domestic/international students;

²⁰ Heath, T.J. (2007). Longitudinal study of veterinary students and veterinarians: the first 20 years. *Australian Veterinary Journal*. Vol. 85, No. 7, July 2007. p.281-289.

WORKFORCE PROFILE

- The age and gender profile for subsequent years is the same as the age and sex profile for 2012 graduates from the Higher Education Statistics extract weighted to completion estimates.

Graph 20: Projected University completions by percentage completing, Veterinarian courses, 2013-2025

Source: AVA University survey, 2013 (unpublished material).

5.3. Immigration data

The Australian Government Department of Immigration and Border Protection (DIBP) collects data on Overseas arrivals and departures (OAD) statistics. The main source data are incoming and outgoing passenger cards completed by persons arriving in or departing from Australia. Data from passports and visa (entry permit) applications and approvals are also provided from DIBP's Travel and Immigration Processing System (TRIPS). These three data sources are collected, compiled and matched together by DIBP.

OAD data provides information on all recorded movements across Australia's borders, both in-bound and out-bound, by category of movement and numerous other variables. The three main categories of movement are:

- permanent movements;
- long-term movements (one year or more); and
- short-term movements (less than one year).

The Overseas Arrivals and Departures, Australia (cat. no. 3401.0) publication provides the most comprehensive source for statistics on OAD in Australia, particularly for short-term movements. Over the years OAD data have been released via various outputs including .pdf, spreadsheets and data files. Currently, this publication is released as a monthly web only release (e.g. Key Figures, Main Features, Explanatory Notes, etc.) with an associated 12 time series spreadsheets (Excel format) available from the Downloads tab.

WORKFORCE PROFILE

The data items able to be extracted included age, gender, ANZSCO Unit Group (2347- Veterinarians), main reason for travel and financial year. The data for the 2012-13 financial year was extracted for the purposes of the modelling.

5.3.1. Immigration data

The two categories of international immigration data included in the analysis were long-term visitor and settler arrival in the category of ANZSCO Unit Group 2347- Veterinarians. The criteria for selection were where main reason for visit was employment, business, other. This resulted in 114 long-term visitor arrivals for employment purposes, 15 for business and other purposes, and 53 settler arrivals in those categories. This totalled 182 arrivals. After adjustment for the age and gender profile where there were small cell sizes under 5, the resulting overseas immigration totalled 180 persons. The following table shows the age and gender profile.

Table 10: International immigration data, veterinary workforce, 2012-13

| Age Group | Female | Male | Total |
|--------------|------------|-----------|------------|
| 20-24 years | 11 | 4 | 15 |
| 25-29 years | 43 | 26 | 69 |
| 30-34 years | 34 | 14 | 48 |
| 35-39 years | 15 | 9 | 24 |
| 40-44 years | 6 | 3 | 10 |
| 45-49 years | 2 | 5 | 6 |
| 50-54 years | 1 | 3 | 4 |
| 55-59 years | 1 | | 1 |
| 65+ years | | 3 | 3 |
| Total | 113 | 67 | 180 |

Source: Overseas Arrivals and Departures (OAD), Australia, web-only data release, Australian Government Department of Immigration and Border Protection (DIBP)

5.4. Re-entry to the workforce

The analysis for the projection modelling was based on two data sources for the purpose of re-entry to the workforce:

- Resident re-entry to Australia using Immigration data (OAD data extraction of long-term resident return);
- Restorations to the Registers in a three State sample from Veterinary Registration Board data. The data on the number of restorations was available from Annual Reports from those States (NSW, Victoria and South Australia) as shown in the table below.

The data for the long-term resident returns were assumed to represent Australian-trained veterinarian residents returning to work in the industry. Therefore it was assumed that all of those in that category for 2012-13 would re-join the workforce. The challenge with re-entry to the workforce data is that there is very little information available on the restorations to the registers in each of the States and Territories and whether those individuals actually re-enter the

WORKFORCE PROFILE

workforce. In addition, there is concern that those in the category of re-entry based on long-term resident return may have allowed their registration to lapse and therefore there may be some double counting of the two re-entry categories. Therefore restoration to the register was used as a balancing statistic to the change in workforce size between 2012 and 2013.

As a result, the following assumptions were made:

- The data estimate for restorations entering the workforce between 2012-13 was assumed to be 77% of the estimated national restorations (251/327) and this figure was calculated to balance growth in the estimated workforce size between 2012 and 2013;
- All long-term resident returns were assumed to enter the workforce in the year of return;
- The age and gender profile of the long-term resident returns for employment purposes was assumed to be the same as those restoring to the registers and entering the workforce.

Table 11: Long-term resident return, veterinary workforce, 2012-13

.Source: Overseas Arrivals and Departures (OAD), Australia, web-only data release, Australian Government Department of Immigration and Border Protection (DIBP)

Table 12: Restorations to the register by State of Registration, Veterinary Registration Boards, 2009-2013

| State of registration | Restorations to the register | | | | |
|---------------------------------|------------------------------|--------------|--------------|--------------|--------------|
| | 2009 | 2010 | 2011 | 2012 | 2013 |
| NSW | 113 | 116 | 98 | 115 | 63 |
| VIC | 69 | 23 | 25 | 33 | 48 |
| WA | | | | | |
| TAS | | | | | |
| QLD | | | | | |
| SA | 14 | 26 | 24 | 39 | 34 |
| ACT | | | | | |
| NT | | | | | |
| National total (known) | 196 | 165 | 147 | 187 | 145 |
| Estimated national total | 343 | 288 | 257 | 327 | 250 |
| Known as % of total | 56.7% | 57.0% | 56.4% | 57.2% | 58.0% |

Source: NSW, Victorian and South Australian Veterinary Registration Boards

WORKFORCE PROFILE

5.5. Workforce losses

The two main initial data sources for the estimates of wastage to the workforce were:

- long-term and permanent resident departure and long-term visitor departure (OAD statistics)
- adjustments for retirement assumptions.

The initial data analysis indicated that wastage was too high (estimated to be 8.3% of the 2012 workforce) and therefore it was difficult to balance the growth in workforce size to the following year's estimate using stocks and flows calculations. Therefore the wastage rates were benchmarked to other data sets including total workforce wastage by age and gender for the medical workforce in NSW, 2005-06²¹, and retirement rates for veterinarians in the USA based on AVMA modelling.²²

Therefore the following assumptions have been used in the modelling:

- wastage rates based on 2005-06 total medical workforce losses by five year age and gender cohorts up to 59 years;
- retirement rates for five year age and gender cohorts from 60 years onwards based on annual retirement rates from AVMA modelling.

The following table reports the results of the analysis for wastage data and the data used in the workforce modelling.

Table 13: Estimated wastage levels for the veterinary workforce, 2012

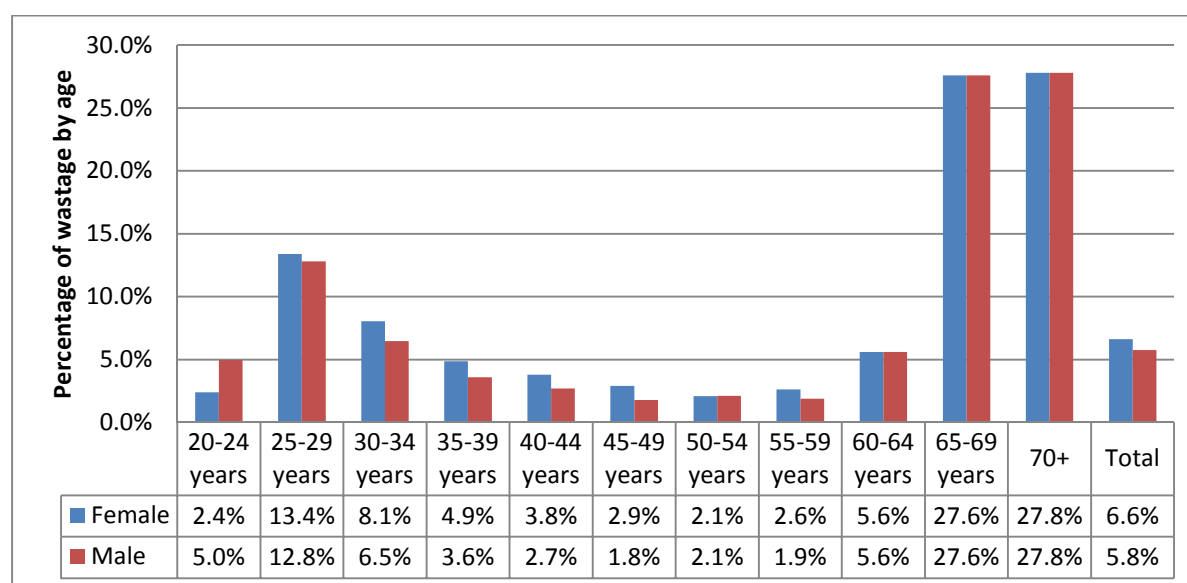
| Age Group | Losses | | | Workforce | | | Losses as percentage of workforce | | |
|--------------------|--------------|--------------|---------------|--------------|--------------|---------------|-----------------------------------|-------------|-------------|
| | Female | Male | Total | Female | Male | Total | Female | Male | Total |
| 20-24 years | 11 | 5 | 16 | 460 | 101 | 561 | 2.4% | 5.0% | 2.9% |
| 25-29 years | 154 | 35 | 189 | 1150 | 276 | 1426 | 13.4% | 12.8% | 13.1% |
| 30-34 years | 90 | 27 | 116 | 1113 | 412 | 1525 | 8.1% | 6.5% | 7.2% |
| 35-39 years | 43 | 19 | 62 | 872 | 532 | 1404 | 4.9% | 3.6% | 4.1% |
| 40-44 years | 26 | 15 | 40 | 678 | 537 | 1215 | 3.8% | 2.7% | 3.2% |
| 45-49 years | 16 | 10 | 26 | 559 | 571 | 1130 | 2.9% | 1.8% | 2.2% |
| 50-54 years | 8 | 12 | 20 | 381 | 555 | 935 | 2.1% | 2.1% | 2.1% |
| 55-59 years | 5 | 11 | 16 | 182 | 575 | 757 | 2.6% | 1.9% | 2.1% |
| 60-64 years | 5 | 26 | 31 | 89 | 460 | 549 | 5.6% | 5.6% | 5.6% |
| 65-69 years | 7 | 65 | 71 | 24 | 234 | 259 | 27.6% | 27.6% | 27.6% |
| 70+ | 1 | 26 | 27 | 4 | 94.0 | 98 | 27.8% | 27.8% | 27.8% |
| Total | 365 | 250 | 615 | 5513 | 4346 | 9859 | 6.6% | 5.8% | 6.2% |
| % by gender | 59.3% | 40.7% | 100.0% | 55.9% | 44.1% | 100.0% | | | |

²¹ Aurora Projects P/L (2008). *Medical Workforce in NSW. Specialist and General Practice Flow Dynamics*. Data set for total medical workforce flow dynamics. Prepared for NSW Department of Health (unpublished report and data).

²² American Veterinary Medical Association (2013). *2013 US Veterinary Workforce Study: Modeling Capacity Utilization*.

WORKFORCE PROFILE

Graph 21: Percentage of wastage levels by age and gender, veterinary workforce, 2012



5.6. Flow dynamics for national workforce

The following table shows the estimates of flow dynamics by component between 2012 and 2013. The assumptions are also shown in the table.

Table 14: Workforce dynamics 2012-2013

| 2012-2013 | No. | Percentage | Assumption |
|---|--------------|---------------|--|
| Estimated workforce size 2012 | 9860 | 100.0% | |
| Add 2012 completions | 410 | 4.2% | 90% of completions |
| Add OS migration | 180 | 1.8% | 100% |
| Add restorations | 251 | 2.5% | 77% |
| Add re-entry - long term resident return | 118 | 1.2% | 100% |
| Total workforce plus increases in supply | 10819 | 109.7% | |
| Deduct lapsed registrations/removal | 615 | 6.2% | medical workforce movement & AVMA retirement assumptions |
| estimated 2013 workforce | 10204 | 103.5% | growth to balance to 2013 workforce estimate |

Note: 2013 estimate based on minor differences to earlier estimate of 10,207 due to rounding

NATIONAL MODEL

6.0. Labour market analysis

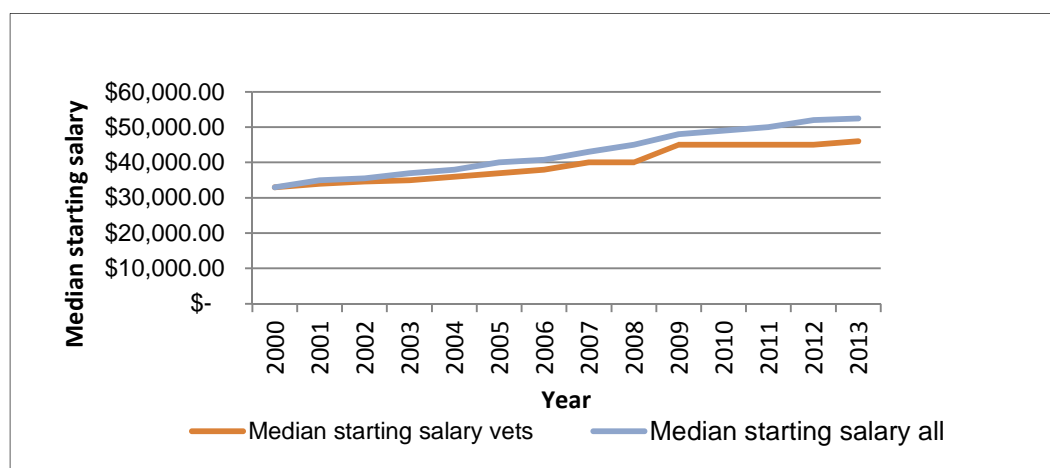
6.1. Current labour market analysis

Heath in 2008 reported that the data available for Australia indicate that the current number of veterinary graduates is likely to be sufficient for the needs of animal owners of Australia over the years ahead. His view was that if shortages occur in particular areas, this is likely to be related to poor distribution rather than an overall shortage (p.28).

Since then there have been major increases in university students commencing and completing university courses and the AVA (2013)²³ put forward the view that Australia is currently facing a likely oversupply in the veterinary workforce. The AVA argues that veterinary science is one of the most expensive university courses to deliver, and it is underfunded, poorly resourced and under strain. The AVA also reports that there are constraints on the capacity of the industry to provide enough quality clinical placements.

Supporting evidence of an emerging oversupply comes from data from Graduate Careers Australia. This indicates that the starting salary for veterinary graduates has not kept pace with other graduate salaries between 2000 and 2013, and has plateaued from 2009 onwards (see Graph 9). Graph 10 includes data on the graduates seeking employment four months after graduation and in total the percentage of graduates has continued to increase since 2004, from less than five percent to 20% of graduates. These data indicate a tightening of the labour market and increasing unemployment for new graduates.

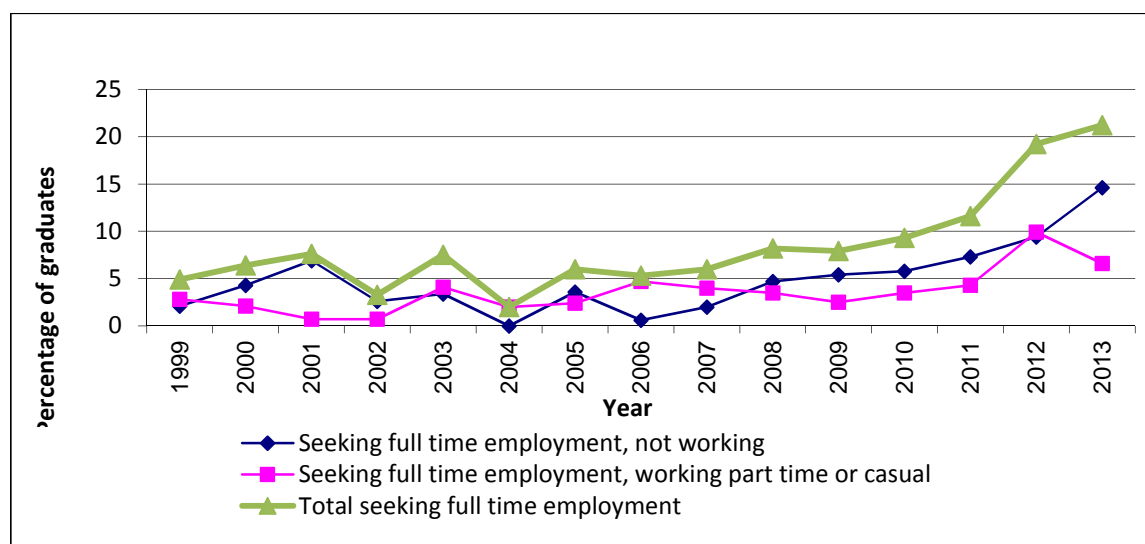
Graph 22: Median starting salaries in Australia, veterinary and all graduates, 2000 to 2013



Source: Graduate Careers Australia

²³ Op. cit. p. 1

Graph 23: Percentage of new graduate veterinarians seeking employment Australia, 2000 to 2013



Source: Graduate Careers Australia

7.0. Demand Estimates

A summary has been prepared of the demand drivers which are negative and positive in terms of projected growth for each of the projection models, and this is shown in the table below. This analysis is supported by the interviews which were undertaken with key stakeholders. A table is then provided of the demand assumptions used in the modelling for low, medium and high demand scenarios and two sensitivity scenarios.

Table 15: Demand drivers, national workforce and by practice area

| Model | Positive demand drivers | Negative demand drivers |
|--------------------------------|--|--|
| National workforce | <p>The level of growth in pet ownership and the extent to which this translates into use of veterinary practices and veterinarians for preventative care and treatment is the key driver for change</p> <p>Government policy results in more regulation requiring veterinarian services</p> <p>Biosecurity issues drive growth in demand for veterinary services</p> | <p>Capacity to pay decreases due to economic downturn</p> <p>Services become more expensive due to increases in practice costs</p> <p>Decreases in ownership of practices without sufficient corporatisation of practices to offset changes</p> <p>Corporatisation of practices achieves efficiencies of scale reducing workforce required</p> <p>Laissez-faire government policy</p> |
| Small animal | <p>The level of growth in pet ownership based on increasing numbers of households translates into greater use of veterinary practices and veterinarians for preventative care and treatment</p> <p>Pressure for responsible pet ownership increases including preventative care</p> <p>Greater service complexity and specialisation drives greater revenue for practices based on more services and higher cost</p> | <p>Capacity to pay decreases</p> <p>Services become more expensive due to increases in practice costs</p> <p>Decreases in ownership of practices without sufficient corporatisation of practices to offset changes</p> <p>Corporatisation of practices achieves efficiencies of scale reducing workforce required</p> <p>Shift to more urbanised environments reduces capacity for pet ownership</p> |
| Large animal/production | <p>Live export trade is growing</p> <p>Possibility of disease outbreaks creating one off increases in demand with extra</p> | <p>Disease outbreaks may be temporarily managed from the existing workforce by</p> |

| Model | Positive demand drivers | Negative demand drivers |
|--------------------------|--|---|
| | <p>demand subject to length and spread of outbreak(s)</p> <p>Contracting of stock management and surveillance to private sector</p> | <p>decreasing numbers in each private practice</p> <p>A major risk is the stopping of the live export trade</p> <p>Farmers are providing their own care where possible</p> <p>Losing services to paraprofessionals</p> |
| Mixed practice | <p>Growth is driven by same drivers as small animal and large animal/production practice areas</p> | <p>Growth is driven by same drivers as small animal and large animal/production practice areas</p> <p>Changing career options for graduates decreases demand for mixed practice placements, particularly in rural areas</p> |
| Equine | <p>High level of income continues to attract specialised practice</p> <p>High cost of horses creates owners prepared to pay for services including reproduction services</p> | <p>Reluctance to work with disease outbreak associated with horses</p> |
| Government | <p>Government policy results in more regulation requiring veterinarian services as occurred recently in the USA</p> <p>Gaps in service provision due to historical downsizing creates opportunities for contracting services</p> | <p>Laissez-faire government policy</p> |
| Teaching/research | <p>De-regulation of university funding by government creates more demand and therefore more university courses</p> <p>Increasing overseas demand for Australian courses</p> <p>Increases in research funding</p> | <p>Fall out in universities offering courses due to increasing costs</p> <p>Cuts to research funding and local Australian expertise as a result</p> |
| Industry | <p>Steady growth linked to workforce growth creating more sales representatives, technical roles</p> <p>Increases in industry due to increasing de-regulation</p> | <p>Merging of pharmaceutical companies resulting in less employment opportunities</p> |
| Other | <p>Trends in specialisation continues</p> | <p>Trends in specialisation decrease</p> |

| Model | Positive demand drivers | Negative demand drivers |
|-------|---|-------------------------|
| | Demand for specific areas such as aquaculture, wildlife management, animal welfare increases Increased funding for public health initiatives | |

The following table translates those positive and negative demand drivers into low, medium and high demand assumptions of percentage annual change.

The only other sources of quantitative data on projected growth or change in demand were sourced from the AVMA study (2013) modelling capacity utilisation by State in the USA.²⁴

Two other data sources have been used in the modelling of future demand for veterinarians. There are:

- Household and Family Projections, Australia, 2006 to 2031 (Note: projections based on the 2011 Census will be released within the next six months)²⁵

Three main series of projections (Series I, II and III) are presented in this publication for analysis and reporting. The projections are based on assumptions about changing living arrangements of Australia's population, which is assumed to increase according to the Series B projection from Population Projections, Australia, 2006 to 2101 (cat. no. 3222.0). A household is defined as one or more persons, at least one of whom is at least 15 years of age, usually resident in the same private dwelling. The Census categorises households as discrete units, thus the projection method is based on the assumption that households are discrete units.

The method identifies propensities from the Census of Population and Housing for persons to be in different living arrangement types. Trends observed in the propensities over the last four Censuses are assumed to continue into the future, and applied to a projected population. Numbers of households and families are then derived from the projected living arrangements of the population.²⁶

²⁴ American Veterinary Medical Association (AVMA) (2013). *2013 U.S. Veterinary Workforce Study: Modelling Capacity Utilisation*. The Centre for Health Workforce Studies, School of Public Health, University of Albany, N.Y.

²⁵ Australian Bureau of Statistics (2010). Cat. No. 3236. *Household and Family Projections, Australia, 2006 to 2031*. As retrieved from the world wide Web:
<http://www.abs.gov.au/ausstats/abs@.nsf/mf/3236.0>

²⁶ *ibid.*

The projected number of households in Australia from 2012 to 2025 (Series II) was projected to grow from 8.711million households to 10.715million households, a growth of just over two million households, twenty three percent overall or 1.8% on average per annum.

- Population Projections, Australia, Time Series, 2012 (base) to 2021.²⁷

The projected population is projected to grow from 22.722 million in 2012 to 28.099 million, a growth of 5.377 million of 23.7%. This is an average growth of 1.8% per annum over the period, exactly the same rate of growth as for households.

Table 16: Demand assumptions, per annum change, national projections and projections by practice area

| Projection | Low | Medium | High |
|-------------------------|------|--------|-------|
| National workforce | 0.5% | 1.0% | 1.8%* |
| Small animal | 0.5% | 1.0% | 1.8%* |
| Large animal/production | 0.1% | 1.0% | 1.3% |
| Mixed practice | 0.5% | 1.0% | 1.5% |
| Equine | 0.5% | 1.0% | 1.5% |
| Government | 0.5% | 1.0% | 2.0% |
| Teaching/research | 0.0% | 1.0% | 3.0% |
| Industry | 1.0% | 1.0% | 1.0% |
| Other | 1.0% | 1.5% | 2.5% |

Note(*) based on population and household projections per annum, as cited above

²⁷ Australian Bureau of Statistics (2013). Cat. No. 3222.0. *Population Projections, Australia. Time series*. As retrieved from the World Wide Web:

<http://www.abs.gov.au/ausstats/abs@.nsf/Lookup/3222.0main+features52012%20%28base%29%20to%202101>

8.0. Results of projection modelling

The following table summarises the results of the projection modelling for the national model, each of the practice area models as well as two additional sensitivity scenarios. The assumptions supporting the sensitivity scenarios were based on the national model and were:

- **High wastage scenario:** this model assumed that wastage doubled in every age and sex cohort. Instead of workforce leaving at 6.2% per annum or one in sixteen it doubles to 12.4% or one in eight.
- **Larger workforce size:** this model assumed that the 2012 workforce increased by 5% to 10,353. This is based on the assumption that there are trained veterinarians working in the industry who are currently not registered. No other supply dynamics were changed from the base workforce model.

The following table shows the findings for each scenario. The definitions used are:

- **Large over supply:** supply exceeds demand by greater than 50%
- **Over supply:** supply exceeds demand by between 1 and 50%
- **Under supply:** supply is less than demand by between 1 and 50%.

Table 17: Results of projection modelling

| Scenario | Low demand | Medium demand | High demand |
|----------------------------------|-------------------|---|-------------------|
| National | Large over supply | Large over supply | Large oversupply |
| National high wastage | | Undersupply to 2017, oversupply 2018 to 2025 | |
| National larger workforce | | Large oversupply | |
| Small animal | Large over supply | Over supply | Over supply |
| Large animal/production | Large over supply | Over supply | Over supply |
| Mixed practice | Large over supply | Large over supply | Over supply |
| Equine | Large over supply | Large over supply | Large over supply |
| Government | Under supply | Under supply | Under supply |
| Teaching/research | Over supply | Over supply | Under supply |



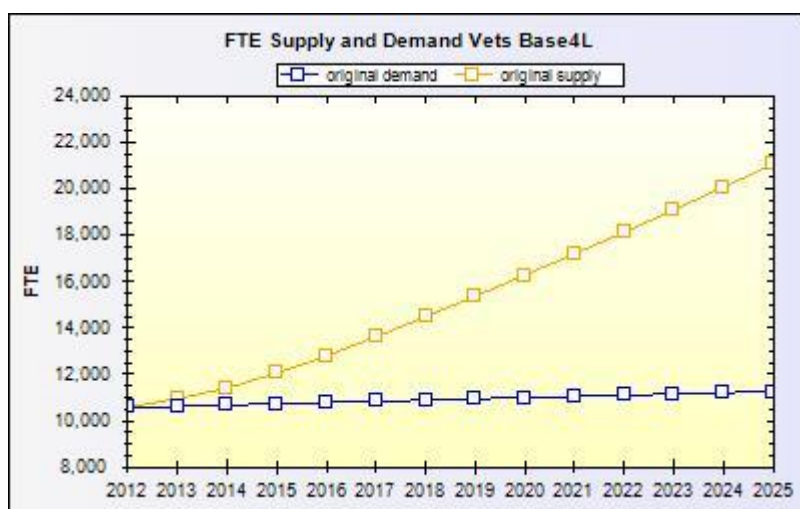
| | | | |
|-----------------|--------------|--------------|--------------|
| Industry | Over supply | Over supply | Over supply |
| Other | Under supply | Under supply | Under supply |

8.1. Results of national model

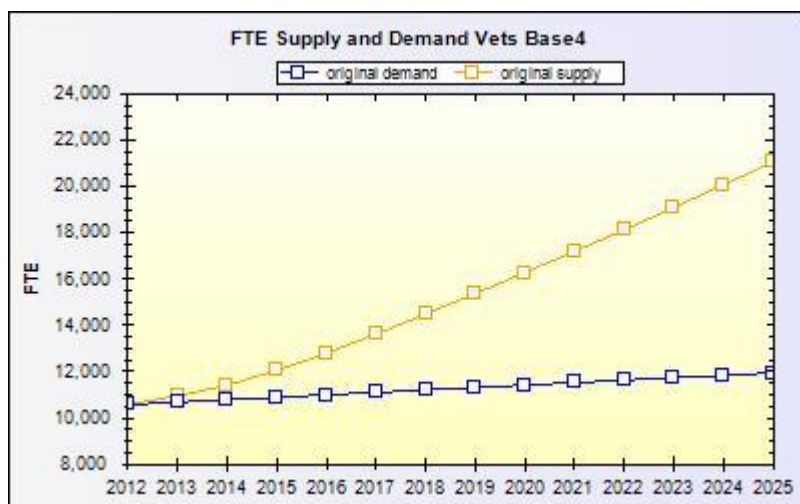
The following graphs show the results of the projection modelling from the base year of 2012 to 2025.

8.2. Output screens

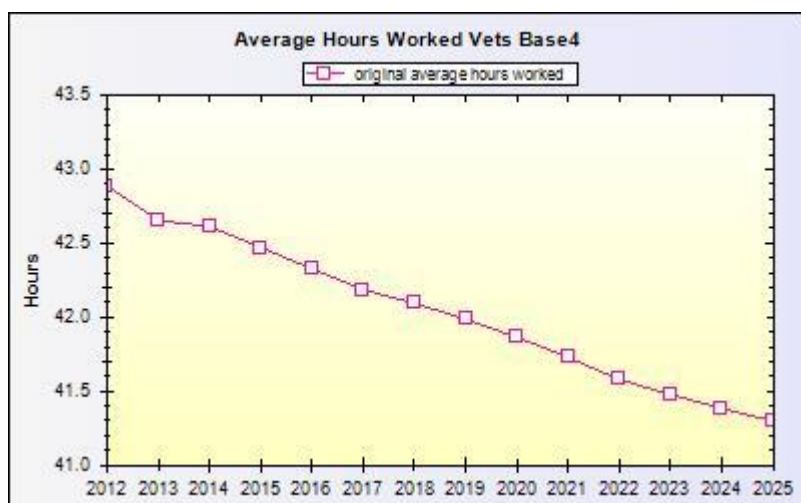
8.2.1. Low scenario



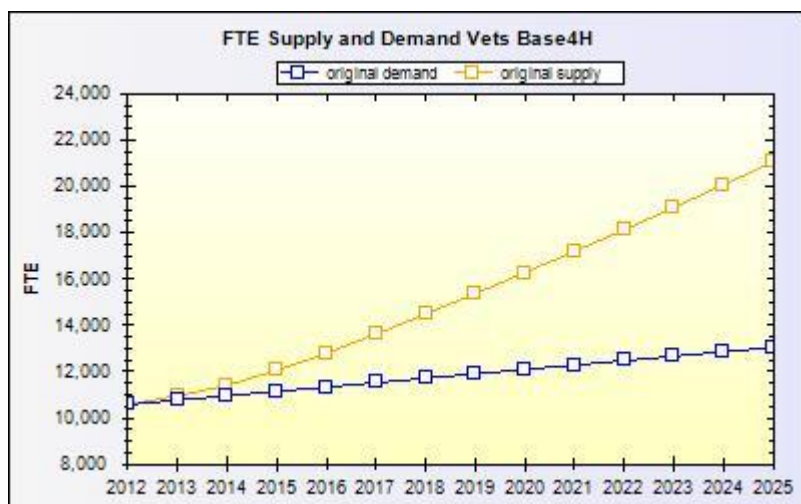
8.2.2. Medium scenario



8.2.3. Medium scenario – average hours worked



8.2.4. High scenario



8.3. Output data

8.3.1. Low scenario

| Status quo and scenario headcounts for National Vets Base4 Low scenario | | | | | | | | | | | | | | |
|---|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|--------|
| Assumptions | Demand | Migration | Reentries | Losses | Immigratic | Starting | Training | Dropouts | | | | | | |
| Status Quo assumptions | 0.5% | 1.00 | 1.00 | 1.00 | 1.00 | 2015 | 5 years | 20.0% | | | | | | |
| User assumptions | 0.5% | 1.00 | 1.00 | 1.00 | 1.00 | 2015 | 5 years | 20.0% | | | | | | |
| Projection Years | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 |
| Required FTE | 10,571 | 10,624 | 10,677 | 10,730 | 10,782 | 10,835 | 10,888 | 10,941 | 10,994 | 11,047 | 11,100 | 11,152 | 11,205 | 11,258 |
| Status quo FTE | 10,571 | 10,952 | 11,401 | 12,061 | 12,802 | 13,617 | 14,487 | 15,377 | 16,282 | 17,201 | 18,131 | 19,099 | 20,081 | 21,075 |
| Status quo FTE gap | 0 | 328 | 724 | 1,332 | 2,019 | 2,781 | 3,599 | 4,436 | 5,288 | 6,154 | 7,032 | 7,946 | 8,875 | 9,817 |
| Adjusted FTE | 10,571 | 10,952 | 11,401 | 12,061 | 12,802 | 13,617 | 14,487 | 15,377 | 16,282 | 17,201 | 18,131 | 19,099 | 20,081 | 21,075 |
| Adjusted FTE gap | 0 | 328 | 724 | 1,332 | 2,019 | 2,781 | 3,599 | 4,436 | 5,288 | 6,154 | 7,032 | 7,946 | 8,875 | 9,817 |
| Status quo graduates | 504 | 504 | 521 | 519 | 532 | 523 | 523 | 523 | 523 | 523 | 523 | 523 | 523 | |
| Additional graduates required | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Adjusted graduates | 504 | 504 | 521 | 519 | 532 | 523 | 523 | 523 | 523 | 523 | 523 | 523 | 523 | |
| Status quo placements | 630 | 630 | 651 | 649 | 665 | 654 | 654 | 654 | 654 | 654 | 654 | 654 | 654 | |
| Net extra placements | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Revised placements | 630 | 630 | 651 | 649 | 665 | 654 | 654 | 654 | 654 | 654 | 654 | 654 | 654 | |

8.3.2. Medium scenario

| Status quo and scenario headcounts for National Vets Base4 | | | | Medium scenario | | | | | | | | | | |
|--|------------|------------|------------|-----------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|--------|
| Assumptions | Demand | Migration | Reentries | Losses | Immigratio | Starting | Training | Dropouts | | | | | | |
| Status Quo assumptions | 1.0% | 1.00 | 1.00 | 1.00 | 1.00 | 2015 | 5 years | 0.1% | | | | | | |
| User assumptions | 1.0% | 1.00 | 1.00 | 1.00 | 1.00 | 2015 | 5 years | 0.1% | | | | | | |
| Projection Years | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 |
| Required FTE | 10,571 | 10,677 | 10,782 | 10,888 | 10,994 | 11,100 | 11,205 | 11,311 | 11,417 | 11,522 | 11,628 | 11,734 | 11,840 | 11,945 |
| Status quo FTE | 10,571 | 10,952 | 11,401 | 12,061 | 12,802 | 13,617 | 14,487 | 15,377 | 16,282 | 17,201 | 18,131 | 19,099 | 20,081 | 21,075 |
| Status quo FTE gap | 0 | 275 | 618 | 1,173 | 1,808 | 2,517 | 3,282 | 4,066 | 4,865 | 5,679 | 6,503 | 7,365 | 8,241 | 9,130 |
| Adjusted FTE | 10,571 | 10,952 | 11,401 | 12,061 | 12,802 | 13,617 | 14,487 | 15,377 | 16,282 | 17,201 | 18,131 | 19,099 | 20,081 | 21,075 |
| Adjusted FTE gap | 0 | 275 | 618 | 1,173 | 1,808 | 2,517 | 3,282 | 4,066 | 4,865 | 5,679 | 6,503 | 7,365 | 8,241 | 9,130 |
| Status quo graduates | 504 | 504 | 521 | 519 | 532 | 523 | 523 | 523 | 523 | 523 | 523 | 523 | 523 | |
| Additional graduates required | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Adjusted graduates | 504 | 504 | 521 | 519 | 532 | 523 | 523 | 523 | 523 | 523 | 523 | 523 | 523 | |
| Status quo placements | 505 | 505 | 522 | 520 | 533 | 524 | 524 | 524 | 524 | 524 | 524 | 524 | 524 | |
| Net extra placements | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Revised placements | 505 | 505 | 522 | 520 | 533 | 524 | 524 | 524 | 524 | 524 | 524 | 524 | 524 | |

8.3.3. High scenario

| Status quo and scenario headcounts for National Vets Base4H | | | | | | high scenario | | | | | | | | |
|---|------------|------------|------------|------------|------------|---------------|------------|------------|------------|------------|------------|------------|------------|--------|
| Assumptions | Demand | Migration | Reentries | Losses | Immigratic | Starting | Training | Dropouts | | | | | | |
| Status Quo assumptions | 1.8% | 1.00 | 1.00 | 1.00 | 1.00 | 2015 | 5 years | 0.1% | | | | | | |
| User assumptions | 1.8% | 1.00 | 1.00 | 1.00 | 1.00 | 2015 | 5 years | 0.1% | | | | | | |
| Projection Years | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 |
| Required FTE | 10,571 | 10,761 | 10,952 | 11,142 | 11,332 | 11,522 | 11,713 | 11,903 | 12,093 | 12,284 | 12,474 | 12,664 | 12,854 | 13,045 |
| Status quo FTE | 10,571 | 10,952 | 11,401 | 12,061 | 12,802 | 13,617 | 14,487 | 15,377 | 16,282 | 17,201 | 18,131 | 19,099 | 20,081 | 21,075 |
| Status quo FTE gap | 0 | 191 | 449 | 919 | 1,470 | 2,094 | 2,775 | 3,474 | 4,189 | 4,917 | 5,657 | 6,435 | 7,226 | 8,031 |
| Adjusted FTE | 10,571 | 10,952 | 11,401 | 12,061 | 12,802 | 13,617 | 14,487 | 15,377 | 16,282 | 17,201 | 18,131 | 19,099 | 20,081 | 21,075 |
| Adjusted FTE gap | 0 | 191 | 449 | 919 | 1,470 | 2,094 | 2,775 | 3,474 | 4,189 | 4,917 | 5,657 | 6,435 | 7,226 | 8,031 |
| Status quo graduates | 504 | 504 | 521 | 519 | 532 | 523 | 523 | 523 | 523 | 523 | 523 | 523 | 523 | |
| Additional graduates required | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Adjusted graduates | 504 | 504 | 521 | 519 | 532 | 523 | 523 | 523 | 523 | 523 | 523 | 523 | 523 | |
| Status quo placements | 505 | 505 | 522 | 520 | 533 | 524 | 524 | 524 | 524 | 524 | 524 | 524 | 524 | |
| Net extra placements | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Revised placements | 505 | 505 | 522 | 520 | 533 | 524 | 524 | 524 | 524 | 524 | 524 | 524 | 524 | |

8.4. Summary of findings

The projection modelling shows that for the national model, there is a large oversupply for all three demand scenarios, where supply exceeds demand by over 50% in all cases. The only practice area where this occurs is for equine practice, although mixed practice is in large over supply for low and medium demand scenarios, and in over supply for the high demand scenario.

There are two practice areas where there is under supply in all demand scenarios; government services and other services. Teach/research is in over supply in low and medium demand scenarios, but moves to under supply in the high demand scenario where demand is assumed to occur at 3% per annum to allow for additional University courses. All of the demand estimates are below the current rate of growth of the workforce, which is estimated at 3.2% per annum on average between 2009 and 2013 (see Table 9).

The two sensitivity scenarios for the national workforce projections show that even with a doubling of wastage the workforce is only under supplied until 2017 and then an oversupply occurs from 2018 onwards. As commencements for 2014 have already taken place and the anticipated commencements included in the model the workforce would still be in over supply by 2018. Given that there is no anecdotal evidence to support an under supply at present it is very unlikely that wastage has increased to this level and supply would be sufficient by 2018 to account for a large increase in wastage (if it did occur) between 2014 and 2018.

The sensitivity analysis for the larger workforce size (a five percent increase) shows that the workforce will still be in an over supply with existing supply dynamics.

The projections show that for the majority of practice areas over supply will continue until 2025. The areas where there may be opportunities for employment are government and other practice areas. One of the limitations of the modelling is that the movement between practice areas could not be analysed and therefore the modelling assumes that entry and wastage from one practice area to another are equal and cancel each other out. These assumptions need further testing.

8.5. Further data requirements

The analysis has shown that there are multiple sources of data for modelling for the veterinarian workforce, but that each source has some constraints. The triangulation of data sources as has been undertaken in this analysis is the best way forward. However data sources could be improved as follows:

- Provision of primary registrations, new registrations (separated by graduates, migration and inter-state movement), deletions from the register and registrants who are retired by each Veterinary Registration Board on an annual basis would significantly improve the data quality;
- Conduct of an annual survey including workforce status and key demographic and work related data by each Veterinary Registration Board would provide more reliable estimates of workforce size and characteristics;

- The development of transition matrices with the tracking of workforce status and practice area between two year points would significantly enhance the calculation of flow dynamics;
- The conduct of further research into demand assumptions including rates of pet ownership, levels of pet health insurance and levels of usage of veterinary services by practice area should be undertaken and added to the available pool of information;
- Estimates of workforce size including adjustments for secondary practice areas should be undertaken to refine the estimates;
- Assumptions for the demand scenarios should be reviewed and updated as needed, particularly where there are major shifts occurring due to government policy.

Appendix 1 – Key stakeholders

AVA wishes to acknowledge and thank some of the many stakeholders involved with this project for their assistance.

Dr John Baguley - Registrar of Veterinary Practitioners Board of NSW

Dr Julie Strous – Executive Officer of Australasian Veterinary Boards Council

Professor Ken Hinchcliff – Dean of Veterinary Science Faculty, The University of Melbourne

Professor Nicholas Sangster – Head of School, Animal and Veterinary Sciences School, Charles Sturt University

Dr Patricia Stewart – President of Victorian Division of the Australian Veterinary Association

Dr Roslyn Nichol - Chair of the Victorian Veterinary Practitioners Board and Chair of Australasian Veterinary Boards Council

Professor Rosanne Taylor - Dean and Professor Faculty of Veterinary Science, The University of Sydney

Dr Tim White – Veterinary graduate

Zachary Lederhose – Veterinary student, AVA student representative, Charles Sturt University

Members of the AVA Board - Dr Julia Nicholls, Dr David Neck, Dr Susan Beetson, Dr Rob Bonanno, Dr Chris Reardon, Dr Malcolm McLennan, Dr Robert Johnson, Dr Ben Gardiner, Professor James Gilkerson.