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The Australian Veterinary
Association Ltd

Technical Paper:
Workforce Modelling

10 December 2014

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WORKFORCE PROFILE

1.0. Introduction

This Veterinary Workforce Technical Paper (Technical Paper) has been prepared to report on the findings of the data analysis undertaken for the project. The Technical Paper 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 on the results of the modelling for the national workforce and the workforce by practice area.

This report has been prepared as a companion report to the Environmental Scan which was prepared in September 2014.

2.0. Definitions

Workforce planning is having the right people, in the right place, with the right capabilities at the right time. (WHO, 2004).¹

Supply forecasting is the process of calculating the likely future supply of current employees with a particular skills set. (Mercer College, p.18)²

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)³

Practice area is defined as the area of veterinary practice where veterinarians work the majority of their time for most practice areas, with further specific definitions on page 4-5.

3.0. Estimating Workforce Size by Practice Area

There are multiple 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.

¹

² Mercer College (2009). *Workforce Planning– Facilitator's Guide*. Department of Premier and Cabinet, New South Wales Government.

³ Ibid, p. 19

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3.1. AVA Survey Data

The AVA Survey conducted in 2013 to collect data for 2012 had a reported response rate of 14%, based on 1,447 rows of completed records. The original data set from the survey responses has been reanalysed to determine the profile of the workforce by State and by practice area. Tests of significance were undertaken to determine the level at which the survey data is consistent with other data sources, including the Registration Board survey data and the Census data.

The following filters were applied to the data set:

- Development of a workforce status flag to identify respondents working in Australia;
- Development of an hours flag to exclude respondents not reporting hours worked;
- Review of data items and results for reported total hours worked and reported hours on call; and
- Review of data items and results for practice area using current primary employment and current role to collapse the data into eight categories for modelling purposes.

There were 3,069 records in the survey file and 2,151 reported age and gender, as shown in the table below. This is consistent with the 2,152 records reporting completion of the first page, including age and gender.

Table 1: Age by Gender, total responses, 2012 AVA Survey

Age range	Female	Male	Total
20-30 years	359	70	429
31-40 years	397	115	512
41-50 years	289	214	503
51-60 years	191	224	415
61-70 years	41	206	247
>70 years	4	41	45
Total	1281	870	2151
<i>non response</i>			918
<i>total file records</i>			3069

Source: AVA Survey data set, 2012

Incomplete records where the respondent was working in Australia and reported key data were included in the analysis on estimating workforce size. This resulted in 1,751 records being identified which were usable for the purposes of the analysis. This is higher than the number reported above but consistent with the method used. This results in a response rate of 16.8% based on the 10,436 primary registrants reported in AVA data (see Table 5).

The AVA survey showed that there were 980 female respondents (59.0%) and 680 male respondents (41.0%). The proportion varied by State, with the Northern Territory having the highest proportion of females (81.8%) and South Australia having the lowest proportion (49.2%).

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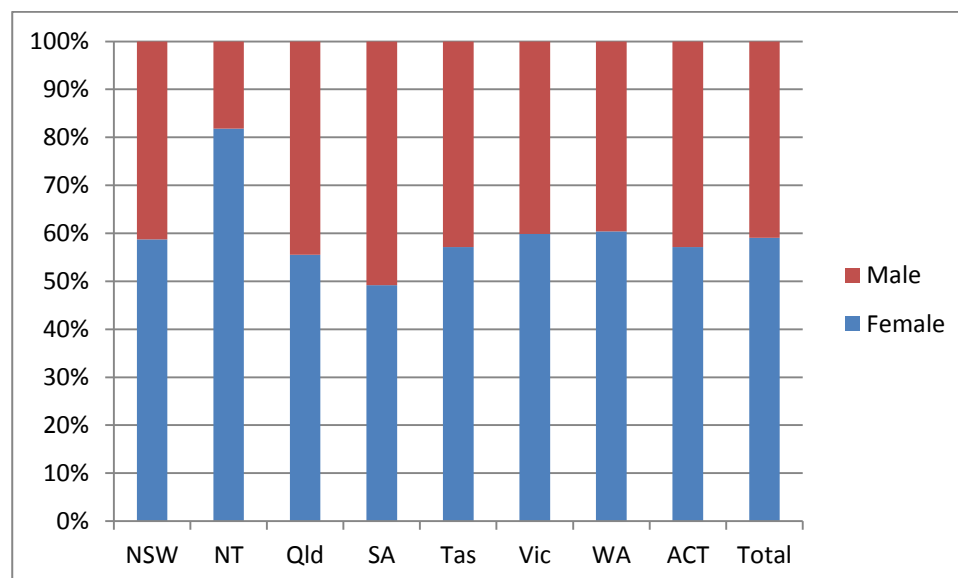
Table 2: State/Territory by Gender, veterinarian workforce, 2012 AVA Survey

	Headcount			Row Percentage		
	Female	Male	Total	Female	Male	Total
NSW	396	278	674	58.8%	41.2%	100.0%
NT	27	6	33	81.8%	18.2%	100.0%
Qld	65	52	117	55.6%	44.4%	100.0%
SA	31	32	63	49.2%	50.8%	100.0%
Tasmania	28	21	49	57.1%	42.9%	100.0%
Vic	273	183	456	59.9%	40.1%	100.0%
WA	128	84	212	60.4%	39.6%	100.0%
ACT	32	24	56	57.1%	42.9%	100.0%
Total	980	680	1660	59.0%	41.0%	100.0%

Non response 58 33 91

Source: AVA Survey data set, 2012

Graph 1: Proportion of Survey Respondents by Gender by State, veterinarian workforce, 2012 AVA Survey



Source: AVA Survey data set, 2012

The hours worked based on primary employment area, current role and hours worked excluding active or non active on call duty were analysed to determine the hours by practice area. A series of allocation rules were determined to aggregate the data and also ensure that the category best identified the practice area as follows:

- Small animals included the categories of companion animals and reptiles/ pocket animals

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- 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”. Teaching and research categories were combined for comparison with Registration Board data from annual surveys.

The following tables show the main results as follows:

- Small animal practice is the largest practice area, accounting for 55.1% of respondents; followed by mixed practice with 15.1%;
- Over three quarters or 77.5% of veterinarians work in a private practice area;
- There is variation by State/Territory based on the main practice area allocation as identified by respondents.

Table 3: Headcount workforce by State/Territory and main practice area, AVA Survey, 2012

	NSW	NT	Qld	SA	Tas	Vic	WA	ACT	Sub-Total	Unknown	Total
Small animal practice	344	25	68	37	25	261	125	29	914	43	43
Large animal practice/production	15	1	13	3	3	28	6	1	70	5	5
mixed practice	103	3	20	12	15	76	21	1	251	13	48
equine practice	33	0	2	1	0	10	6	0	52	6	6
Sub total private practice	495	29	103	53	43	375	158	31	1287	67	6
State & Commonwealth Gov't	44	2	3	3	3	14	17	16	102	6	108
Teaching/research	50	1	6	4	0	32	22	1	116	6	122
Industry	43	0	1	0	0	9	1	1	55	4	59
Other	42	1	4	3	3	26	14	7	100	8	108
Total	674	33	117	63	49	456	212	56	1660	91	1751
Row percentage	40.6%	2.0%	7.0%	3.8%	3.0%	27.5%	12.8%	3.4%	100.0%		

Source: AVA Survey data set, 2012

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Table 4: Percentage of headcount workforce by State/Territory and practice area, AVA Survey, 2012

Sector	NSW	NT	Qld	SA	Tas	Vic	WA	ACT	Total
Small animal practice	51.0%	75.8%	58.1%	58.7%	51.0%	57.2%	59.0%	51.8%	55.1%
Large animal practice	2.2%	3.0%	11.1%	4.8%	6.1%	6.1%	2.8%	1.8%	4.2%
mixed practice	15.3%	9.1%	17.1%	19.0%	30.6%	16.7%	9.9%	1.8%	15.1%
equine practice	4.9%	0.0%	1.7%	1.6%	0.0%	2.2%	2.8%	0.0%	3.1%
Sub total private practice	73.4%	87.9%	88.0%	84.1%	87.8%	82.2%	74.5%	55.4%	77.5%
State & Commonwealth Gov't	6.5%	6.1%	2.6%	4.8%	6.1%	3.1%	8.0%	28.6%	6.1%
Teaching/research	7.4%	3.0%	5.1%	6.3%	0.0%	7.0%	10.4%	1.8%	7.0%
Industry	6.4%	0.0%	0.9%	0.0%	0.0%	2.0%	0.5%	1.8%	3.3%
Other	6.2%	3.0%	3.4%	4.8%	6.1%	5.7%	6.6%	12.5%	6.0%
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Source: AVA Survey data set, 2012

3.2. Registration Board Data

3.2.1. Registrations and primary registrations

An extensive review was undertaken of the data collected in the annual Registration Board surveys for those States and Territories conducting surveys, as well as data on new registrations, renewals, restorations and deletions from the Registers. The other key data related to the category of registration, with primary registration within the State/Territory investigated as a measure of working in that State/Territory. Primary registration is defined as the State/Territory of registration where the majority of their veterinary practice is undertaken. Therefore individuals may be registered in more than one State but the second place of registration is called secondary registration.

The following tables and graphs show that there has been variable growth by State/Territory between 2005 and 2012, 2005 and 2014 and 2012 to 2014. These time periods were chosen as 2012 was the date of the AVA Survey and therefore is the base year of the projection model. National registrations declined between 2006 and 2008 and did not return to 2006 levels until 2010. However numbers have increased particularly between 2012 and 2014, with the average growth per annum of 4.1%. The growth between 2005 and 2012 was 2.4% per annum on average, and then increased to 2.8% per annum on average over the longer time period 2005 to 2014, due to the rapid growth in the more recent period.

There has been differential growth rate by State/Territory, with primary registrations declining in the Northern Territory between 2005 and 2014. The ACT saw growth between 2005 to 2012 (210 to 272 registrations), and has now plateaued at 255 primary registrations (Note: data only available until 2012). NSW saw a decline between 2006 and 2010, and only increased beyond 2006 levels in 2014. However earlier figures may have included secondary registrations.

Over the nine year period, the highest growth was in primary registrations in Western Australia (4.6% per annum on average) followed by South Australia (4.5%). The largest number of additional primary registrations was in Victoria (an additional 609 primary registrations).

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Table 5: Primary registrations by State/Territory, 2005 to 2014

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
NSW	2604	2923	2771	2222	2413	2573	2615	2632	2874	2948
VIC	1977	2250	2188	2159	2233	2401	2371	2395	2573	2586
QLD	1993	2081	2138	2228	2353	2432	2589	2468	2476	2503
SA	467	520	481	501	523	559	595	613	627	655
WA	918	943	988	1081	1087	1148	1130	1209	1264	1296
TAS	186	192	196	198	202	210	221	240	244	252
ACT	210	246	213	260	235	272	256	255	255*	255*
NT	161	119	90	97	106	115	117	117	123	134
Total	8516	9274	9065	8746	9152	9710	9894	9929	10436	10629

Source: AVBC data set

Note: (*) ACT data for 2013 and 2014 based on 2012 data

Note: earlier years of data may include secondary registrations data

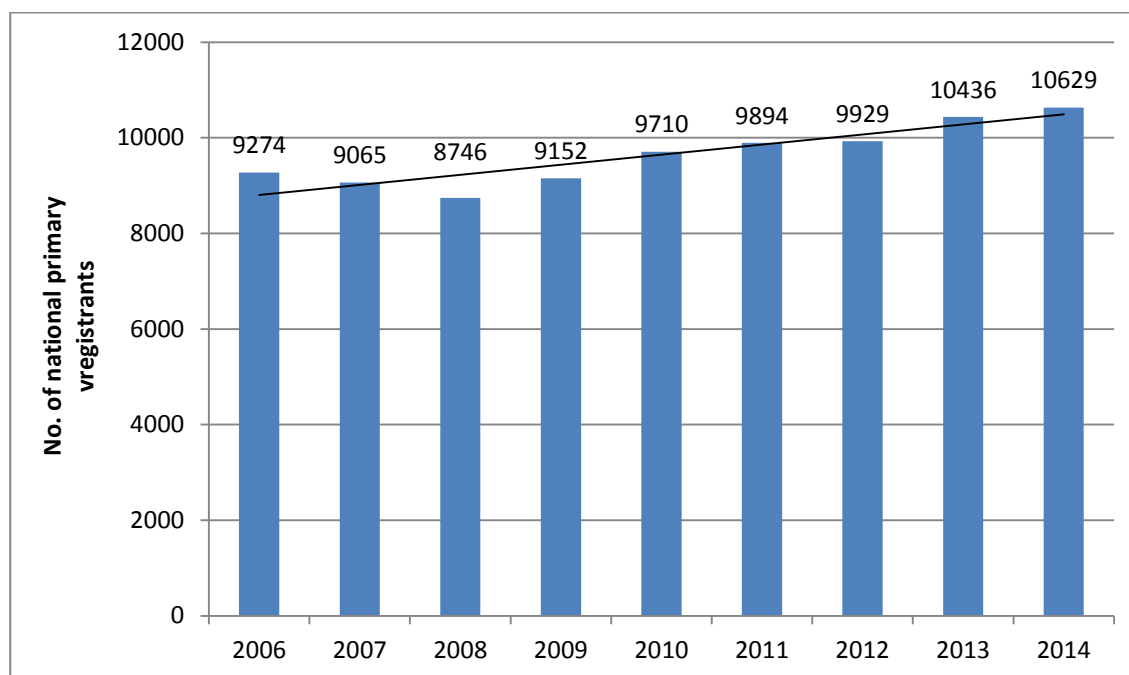
Table 6: Variation in primary registrations by State, 2005 to 2012 and 2005 to 2014

	2005-2012			2005-2014			2012-2014		
	Var.	% Var.	% Var. p.a.	Var.	% Var.	% Var. p.a.	Var.	% Var.	% Var. p.a.
NSW	28	1.1%	0.2%	344	13.2%	1.5%	316	12.1%	6.1%
VIC	418	21.1%	3.0%	609	30.8%	3.4%	191	9.7%	4.8%
QLD	475	23.8%	3.4%	510	25.6%	2.8%	35	1.8%	0.9%
SA	146	31.3%	4.5%	188	40.3%	4.5%	42	9.0%	4.5%
WA	291	31.7%	4.5%	378	41.2%	4.6%	87	9.5%	4.7%
TAS	54	29.0%	4.1%	66	35.5%	3.9%	12	6.5%	3.2%
ACT	45	21.4%	3.1%	45	21.4%	2.4%	0	0.0%	0.0%
NT	-44	-27.3%	-3.9%	-27	-16.8%	-1.9%	17	10.6%	5.3%
Total	1413	16.6%	2.4%	2113	24.8%	2.8%	700	8.2%	4.1%

Source: AVBC data set

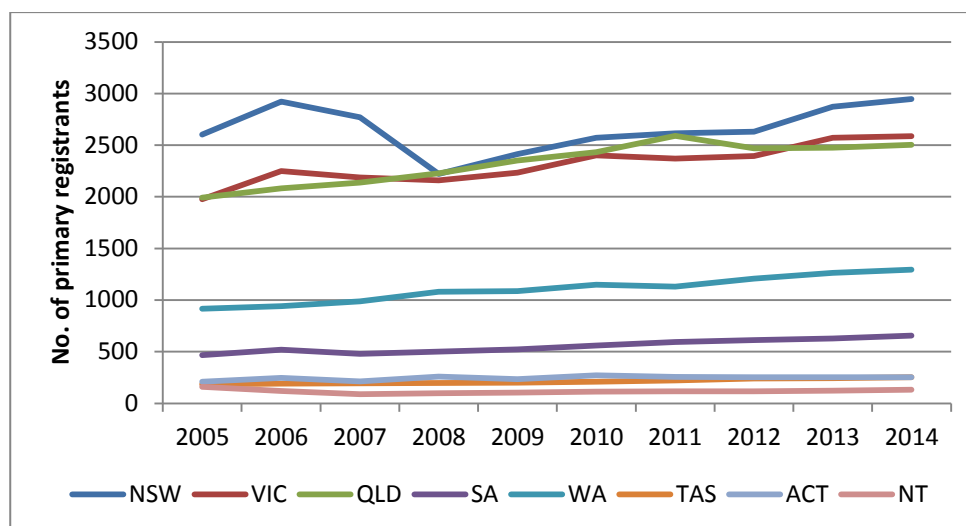
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Table 7: National primary veterinarian registrations, 2005 to 2014



Source: AVA data set

Graph 2: Primary veterinarian registrations by State/Territory, 2005 to 2014



Source: AVA data set

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A comparison of the response of individual surveys conducted by the Veterinary Registration Boards of New South Wales (including ACT addresses), Victoria, Western Australia and Tasmania was undertaken with the number of primary registrations between 2009 and 2013. This showed that on average over the five years the estimated workforce was 98.3% of primary registrations. Therefore this estimate was applied to the primary registrations in other States/Territories to calculate their estimated workforce size.

Table 8: Estimated workforce compared to primary veterinarian registrations, 2009 to 2013

	Estimates of workforce size as percentage of primary registrations					5 year average
	2009	2010	2011	2012	2013	
NSW/ACT	98.6%	95.1%	96.3%	100.4%	95.2%	
VIC	100.0%	100.0%	100.0%	100.0%	100.0%	
WA	100.2%	97.6%	101.0%	100.5%	99.5%	
TAS	84.2%	87.4%	79.5%	89.2%	89.7%	
Total 5 States/Territories	98.9%	97.2%	97.9%	99.8%	97.6%	98.3%

Source: Annual Veterinary Board Survey data

3.2.2. 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.

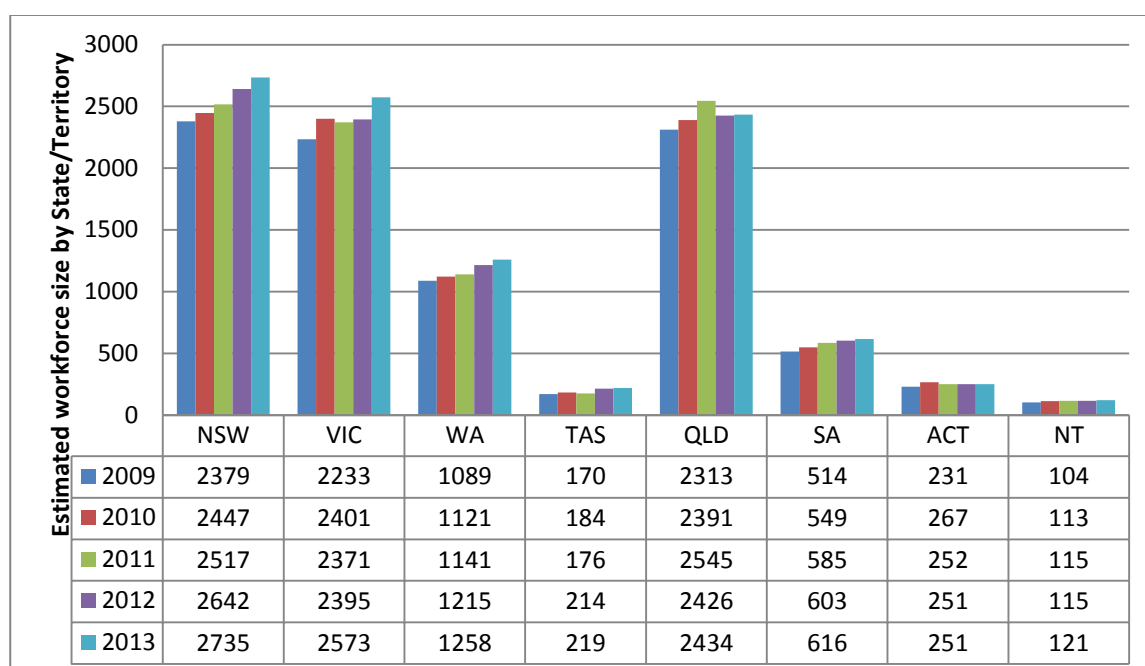
The largest workforce is in NSW in 2013 with an estimated 2,735 veterinarians (26.8% of national workforce) , followed closely by Victoria with 25.2% (2,573 headcount workforce) and Queensland with 23.8% (2,434 headcount workforce). The smallest workforce number are in the Northern Territory (121 headcount)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

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Table 9: 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 3: Estimated veterinarian workforce by State/Territory, 2005 to 2014



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3.2.3. Estimated workforce size by practice area

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.

Table 10: Workforce by practice area, Veterinary Registration Board survey data, States/Territories, 2009 to 2013

	Practice area, Victoria, NSW, Tasmania & WA					Var.	% Var.	% Var. p.a.
	2009	2010	2011	2012	2013			
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

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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 small animal practice offsetting those changes.

No adjustments were made in the analysis for secondary practice areas, which were only recorded in the AVA Survey.

Table 10: Estimated national workforce by practice area, Veterinary Registration Board survey data, 2009 to 2013

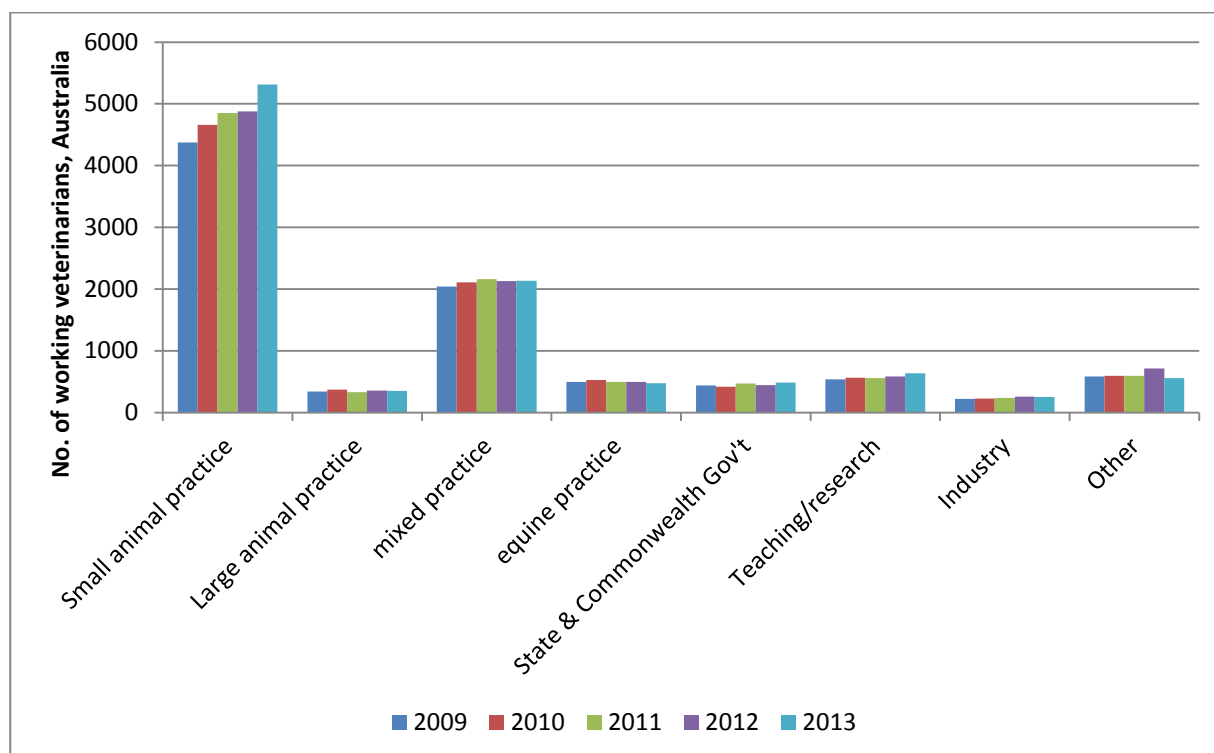
	National workforce estimate					Var.	% Var.	% Var. p.a.
	2009	2010	2011	2012	2013			
Small animal practice	4376	4661	4850	4878	5314	938	21.4%	5.4%
Large animal practice	340	372	331	356	352	12	3.6%	0.9%
Mixed practice	2042	2109	2160	2128	2134	92	4.5%	1.1%
Equine practice	495	529	498	498	473	-22	-4.5%	-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%

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Table 11: 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%

Graph 4: Estimated workforce by practice area, State/Territory, 2009 to 2013



4.0. Workforce Profile

4.1. ABS 2011 Census by State/Territory

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.

The initial analysis of the ABS 2011 Census data showed that the Census only accounted for 7,231 veterinarians working nationally, based on extraction using the ANZSCO code 234711. This is 74.5% of the 9,701 veterinarians estimated to be in the national workforce in 2011 based on the method outlined in Section 3. The reasons for the undercounting relate to the method of coding of the Census data. Some respondents provide work titles which are classified to other occupations including management and scientific areas.

As indicated previously, 2012 had been chosen as the base year of the projection model due to the timing of the AVA Survey and its closeness to the 2011 Census. Board data was also available for 2012 based on the four State sample.

The table below shows that the Board data and the Census data account for relatively similar proportions of the workforce, 65.6% for the Board data for 2012 and 68.3% for the Census, while the AVA sample data had a higher proportion of respondents from those four States (83.8%). This is a major constraint on the total workforce estimates by practice area by State/Territory, as there is no information available from veterinarians working in the other four States/Territories by practice area and Queensland is a populous State.

Therefore following this analysis it was decided to limit the projection modelling to a national model and a model by practice area at national level. This decision is supported by additional analysis using tests of significance which is reported in the following section.

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Table 12: Comparison of data sources by State/Territory, 2011 Census, 2012 AVA Survey and 2012 estimated national workforce (Boards 2012)

	Headcount			Percentage		
	Boards 2012	AVA Survey 2012	Census 2011	Boards 2012	AVA Survey 2012	Census 2011
NSW	2642	674	2095	26.8%	40.6%	29.2%
VIC	2395	456	1853	24.3%	27.5%	25.8%
WA	1215	212	792	12.3%	12.8%	11.0%
TAS	214	49	158	2.2%	3.0%	2.2%
Sub Total 4 States	6466	1391	4898	65.6%	83.8%	68.3%
QLD	2426	117	1558	24.6%	7.0%	21.7%
SA	603	63	471	6.1%	3.8%	6.6%
ACT	251	56	171	2.5%	3.4%	2.4%
NT	115	33	73	1.2%	2.0%	1.0%
Sub Total other States	3394	269	2273	34.4%	16.2%	31.7%
National total	9860	1660	7171	100.0%	100.0%	100.0%
<i>UK</i>		<i>91</i>	<i>60</i>			

4.2. Age and Gender Profile

One of the constraints in comparing the data sets by age and gender was the lack of data by age and gender from the four State sample for working veterinarians. In addition data provided by some Boards did not differentiate primary registrations from other registrations. Therefore the only potential usable data for the projection model was the 2011 Census data and the AVA survey. ABS TableBuilder data provided data by five year age and gender cohorts. However the AVA Survey collapsed age categories into cohorts which were not directly comparable with the Census data. Future surveys conducted by the AVA should use age cohorts which are directly comparable with Census data.

The following table compares the two data sets by age and gender. Modal age ranges (the age range with the largest proportion of the workforce) are marked in yellow, and the comparison shows some differences between the two data sources. The AVA survey shows that the working survey respondents were 59.3% female and 40.7% male, while the Census data shows that the workforce was 55.7% female and 44.3% male. Both data sources show an inverse relationship by age and gender with females more highly represented in younger age groups and males in older age groups.

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Table 13: Workforce age and gender, headcount and percentages by age, 2011 Census, 2012 AVA Survey

AVA 2012 Survey	Headcount			Percentage by Age		
Age group	Female	Male	Total	Female	Male	Total
20-30 years	251	52	303	24.2%	7.3%	17.3%
31-40 years	345	98	443	33.2%	13.7%	25.3%
41-50 years	249	194	443	24.0%	27.2%	25.3%
51-60 years	160	194	354	15.4%	27.2%	20.2%
61-70 years	31	157	188	3.0%	22.0%	10.7%
>70 years	2	18	20	0.2%	2.5%	1.1%
Grand Total	1038	713	1751	100.0%	100.0%	100.0%
Census 2011	Headcount			Percentage by Age		
Age group	Female	Male	Total	Female	Male	Total
< 30 years	1180	281	1461	29.3%	8.8%	20.2%
30-39	1447	698	2145	35.9%	21.8%	29.7%
40-49	901	815	1716	22.4%	25.4%	23.7%
50-59	409	831	1240	10.2%	25.9%	17.1%
60-69	83	512	595	2.1%	16.0%	8.2%
70+ years	6	68	74	0.1%	2.1%	1.0%
Grand Total	4026	3205	7231	100.0%	100.0%	100.0%

Sources: AVA Workforce survey data set; ABS TableBuilder, 2011 Census of Population and Housing

Table 14: Workforce age and gender, row percentages by age, 2012 AVA Survey

	Row percentages AVA Survey		
Age group	Female	Male	Total
20-30 years	82.8%	17.2%	100.0%
31-40 years	77.9%	22.1%	100.0%
41-50 years	56.2%	43.8%	100.0%
51-60 years	45.2%	54.8%	100.0%
61-70 years	16.5%	83.5%	100.0%
>70 years	10.0%	90.0%	100.0%
Grand Total	59.3%	40.7%	100.0%

Source: AVA Workforce survey data set

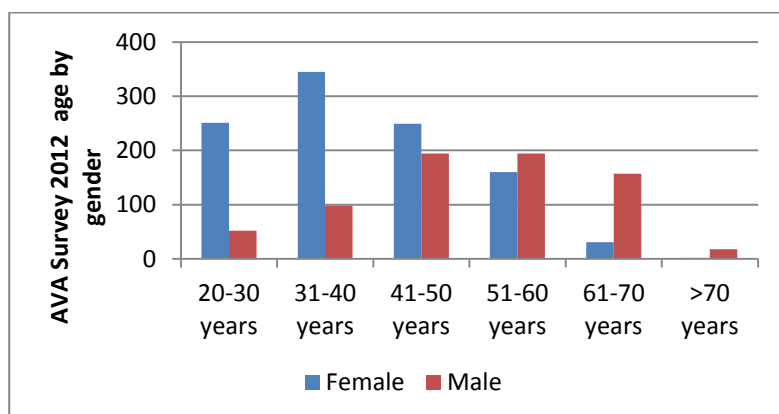
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Table 15: Workforce age and gender, row percentages by age, 2011 Census

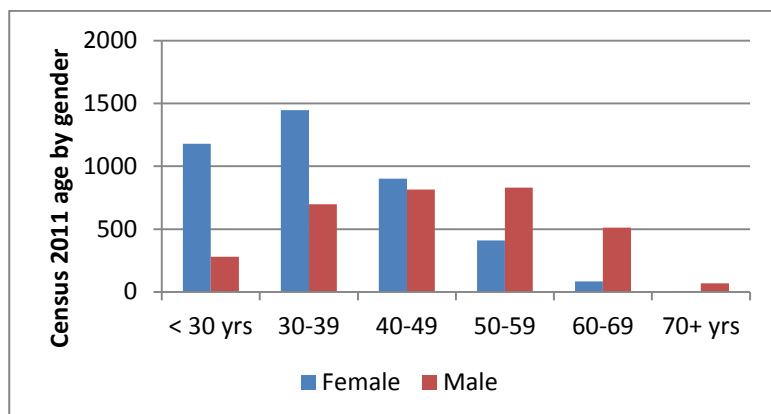
Age group	Row percentages Census		
	Female	Male	Total
< 30 years	80.8%	19.2%	100.0%
30-39	67.5%	32.5%	100.0%
40-49	52.5%	47.5%	100.0%
50-59	33.0%	67.0%	100.0%
60-69	13.9%	86.1%	100.0%
70+ years	8.1%	91.9%	100.0%
Grand Total	55.7%	44.3%	100.0%

Sources: ABS TableBuilder, 2011 Census of Population and Housing

Graph 5: Workforce age and gender, AVA Survey 2012



Graph 6: Workforce age and gender, Census 2011



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The following tables and graphs show the data from the two data sources by gender and State/Territory. Both data sets show variation in the profile of the workforce by gender by State/Territory, with the Northern Territory having the most predominantly female workforce in both data sets. There are a majority of male respondents in the AVA survey in South Australia, while they are no States/Territories with a majority of males in the Census data.

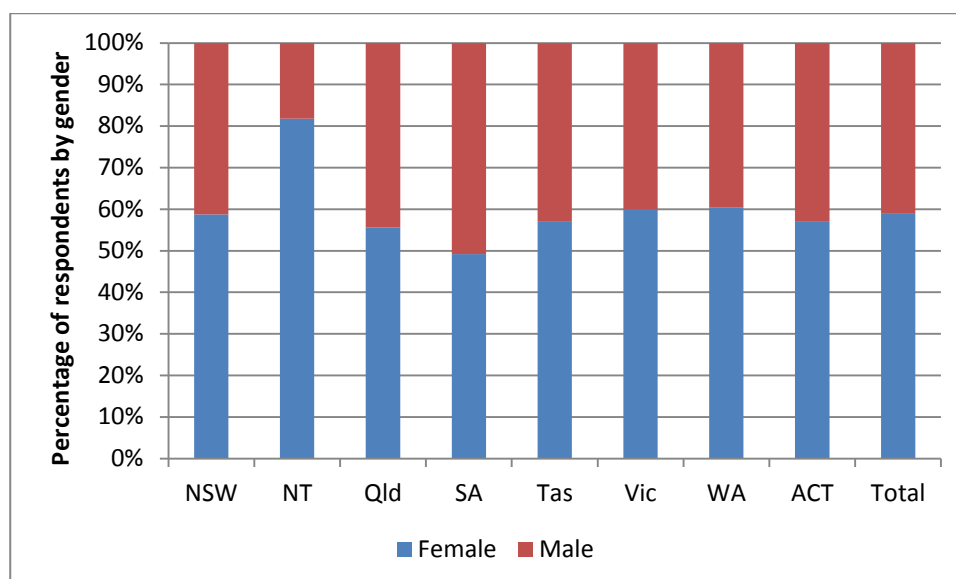
Table 16: Workforce gender, row percentages by gender, 2012 AVA Survey

	Headcount			Row Percentage		
	Female	Male	Total	Female	Male	Total
NSW	396	278	674	58.8%	41.2%	100.0%
NT	27	6	33	81.8%	18.2%	100.0%
Qld	65	52	117	55.6%	44.4%	100.0%
SA	31	32	63	49.2%	50.8%	100.0%
Tas	28	21	49	57.1%	42.9%	100.0%
Vic	273	183	456	59.9%	40.1%	100.0%
WA	128	84	212	60.4%	39.6%	100.0%
ACT	32	24	56	57.1%	42.9%	100.0%
Total	980	680	1660	59.0%	41.0%	100.0%

UK 58 33 91

Source: AVA Workforce survey data set

Graph 7: Percentage of workforce by gender by State/Territory, 2012 AVA Survey



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Table 17: Workforce headcount by State/Territory, row percentages by gender, 2011 Census

	Headcount			Row Percentage		
	Female	Male	Total	Female	Male	Total
New South Wales	1129	964	2093	53.9%	46.1%	100.0%
Victoria	1028	828	1856	55.4%	44.6%	100.0%
Queensland	869	690	1559	55.7%	44.3%	100.0%
South Australia	256	214	470	54.5%	45.5%	100.0%
Western Australia	480	311	791	60.7%	39.3%	100.0%
Tasmania	84	72	156	53.8%	46.2%	100.0%
NT	57	16	73	78.1%	21.9%	100.0%
ACT	95	76	171	55.6%	44.4%	100.0%
Total	3998	3171	7169	55.8%	44.2%	100.0%

Sources: ABS TableBuilder, 2011 Census of Population and Housing

Graph 8: Percentage of workforce by gender by State/Territory, 2011 Census



Sources: ABS TableBuilder, 2011 Census of Population and Housing

WORKFORCE PROFILE

4.2.1. 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%.

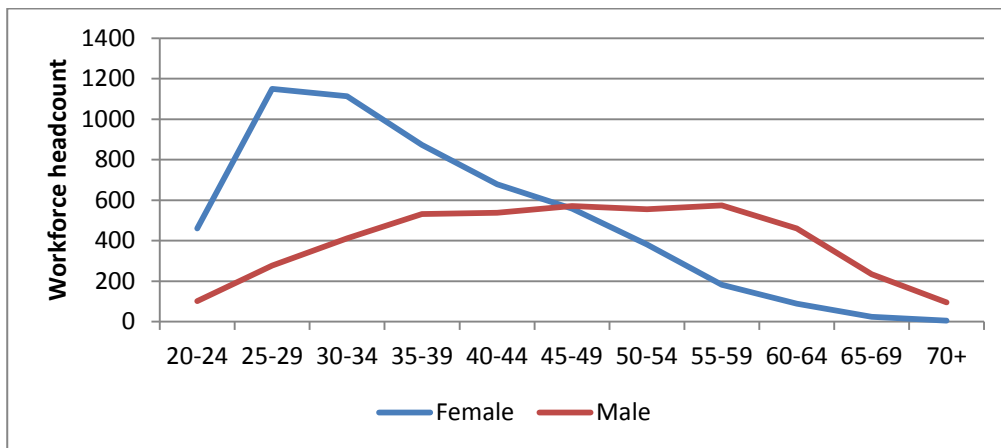
The data shows that the model age range for the female national workforce is 25 to 29 years, for males is 55 to 59 years, and in total is 30 to 34 years. Males are a larger number of the workforce for each age cohort from 45 years and older. There are 117 or 2.1% of the female workforce who are 60 years and older, while there are 789 or 18.2% 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 18: Estimated national workforce by age and gender, 2012

2012 Age	Headcount			Percentage by 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%	5.4%	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%			

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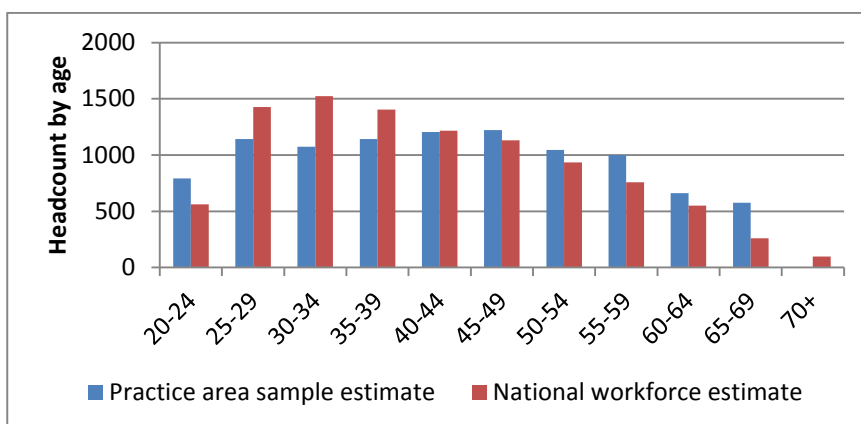
Graph 9: National workforce headcount by age and gender, 2012



4.2.2. 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. The first method showed that when the AVA Survey data by practice area and age and gender was weighted to the national estimates by practice area there was a variation in the age and gender profile compared to the national profile based on the Census data. The practice area sample estimate (see Graph 10) shows an older workforce with a model age range of 45 to 49 years while there are virtually no workforce participants over 70 years ($n=2$). The model age range for the national workforce estimate is 30 to 34 years, as reported in Table 18. As the AVA survey is distributed to members of the Association, it may be that the membership profile is older than the total workforce and therefore undercounts younger workforce participants.

Graph 10: Comparison of workforce profile by age, practice area sample estimate (AVA Survey) and national estimate (Census data)



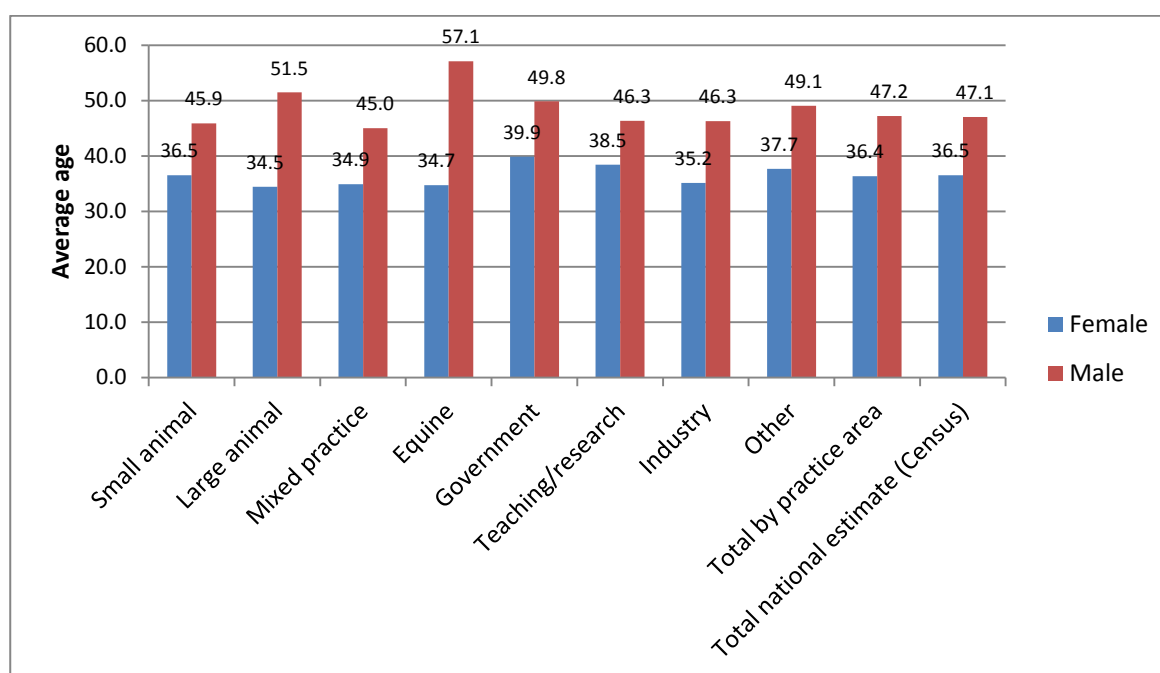
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The second method involved calculations of the percentage of each five year age and gender cohort by practice area from the AVA Survey sample data. These percentages were applied to the national workforce estimate by five year age and gender cohorts. However these calculations resulted in an over-count of some practice areas and an under-count in other practice areas compared to the national estimated by practice area using the Registration Boards four State sample. There was a lower headcount for the practice area of mixed practice, with less than the headcount for the four State sample before adjustment to national estimates. The equine workforce was estimated to be only slightly greater than the headcount for the four State sample before adjustment to national estimates. This analysis confirmed that the AVA Survey is not representative 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 from the second method 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.

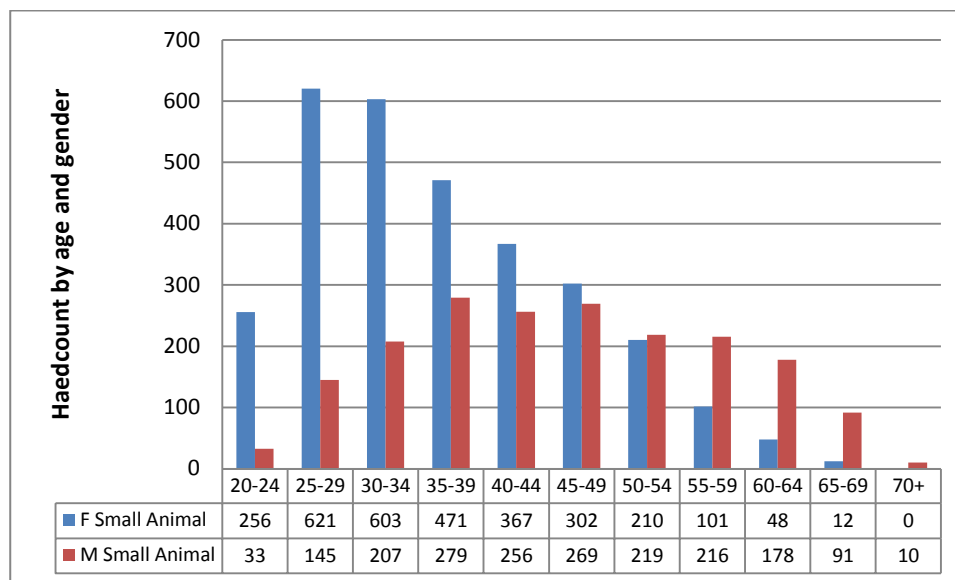
The total average age of the national workforce for 2012 by practice area is estimated to be 41.3 years, very similar to the average age of the national workforce of 41.2 years. The graph below shows that the average age by gender is 36.4 years for females, and 47.2 years for males, similar to the average 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.

Graph 11: Estimated average age by gender and practice area, 2012

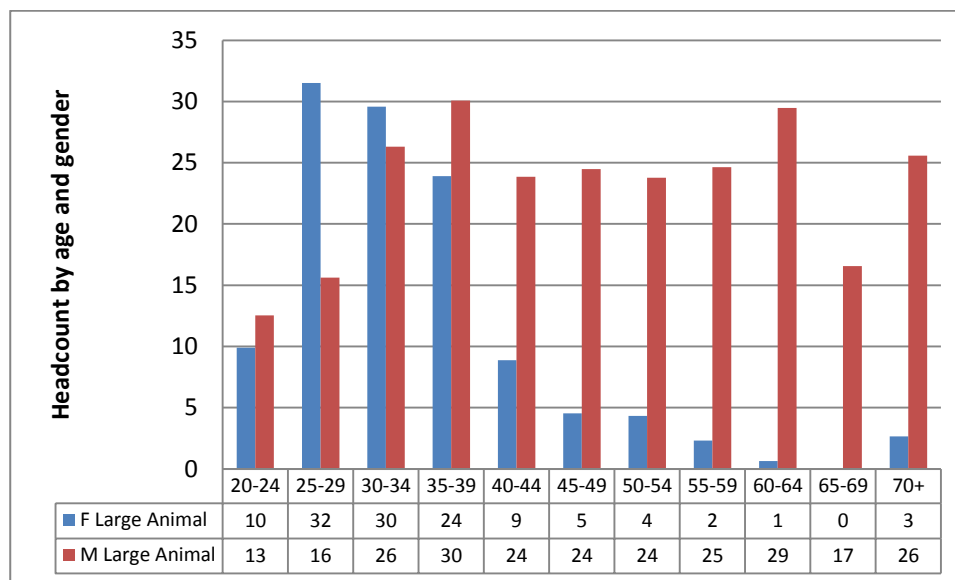


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Graph 12: Estimated national small animal workforce by age and gender, 2012

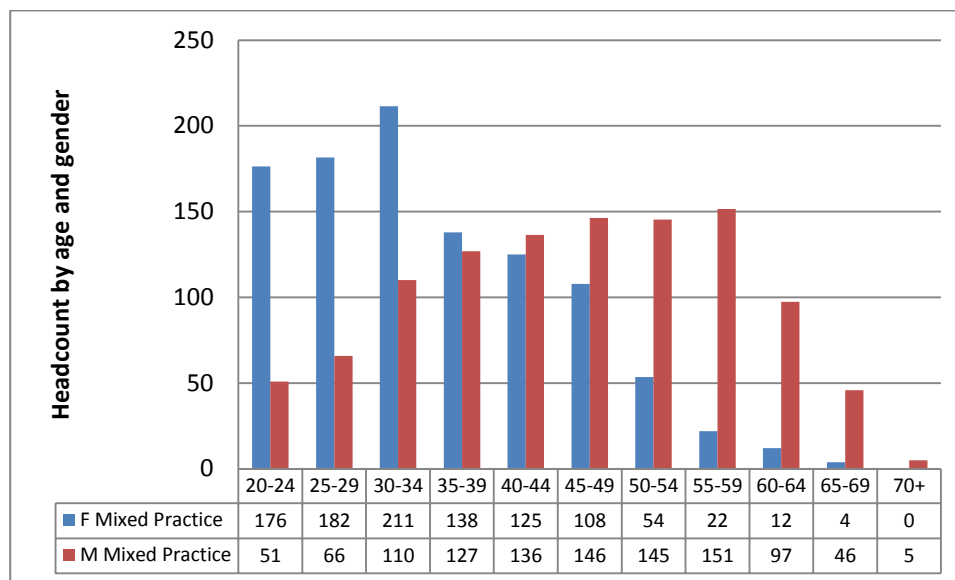


Graph 13: Estimated national large animal workforce by age and gender, 2012

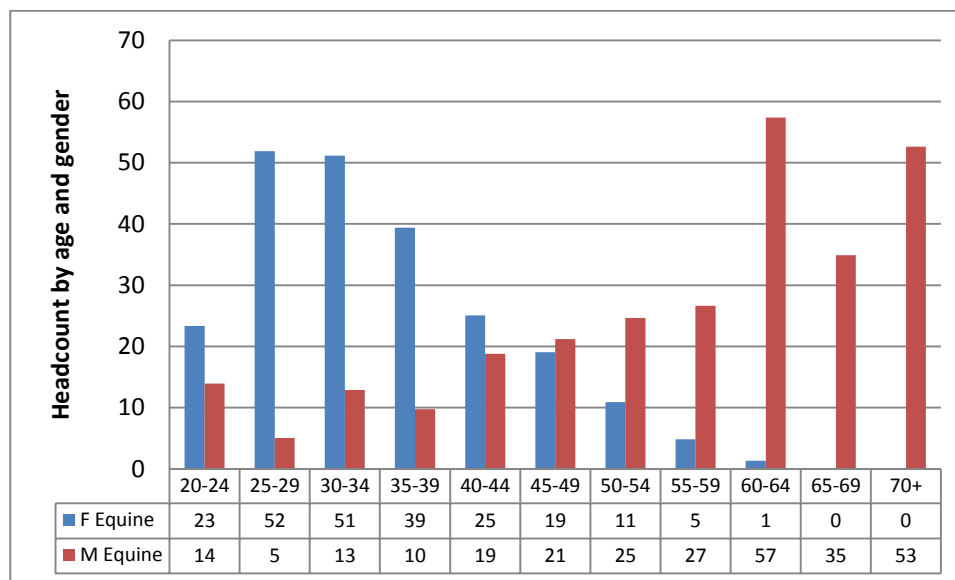


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Graph 14: Estimated national mixed practice workforce by age and gender, 2012

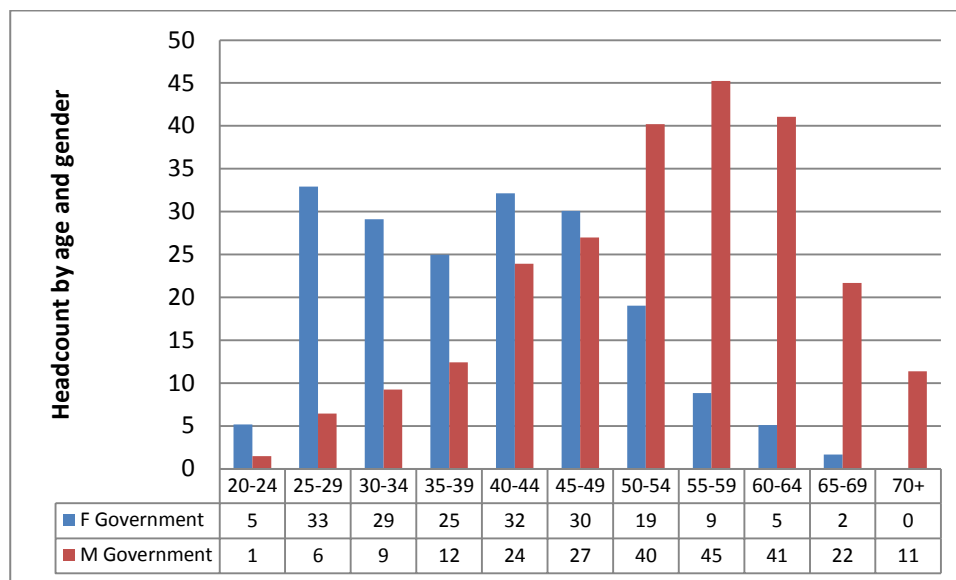


Graph 15: Estimated national equine workforce by age and gender, 2012

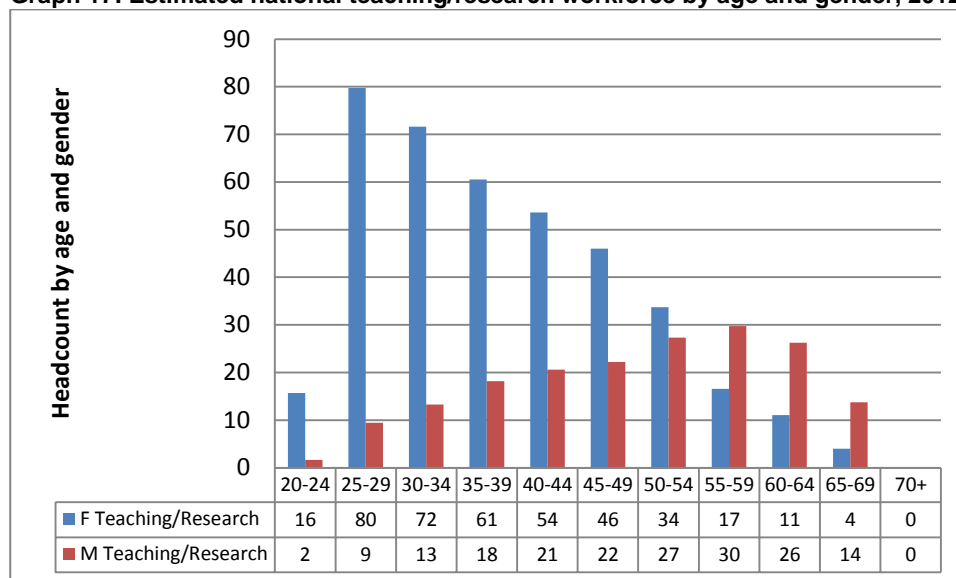


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Graph 16: Estimated national government workforce by age and gender, 2012

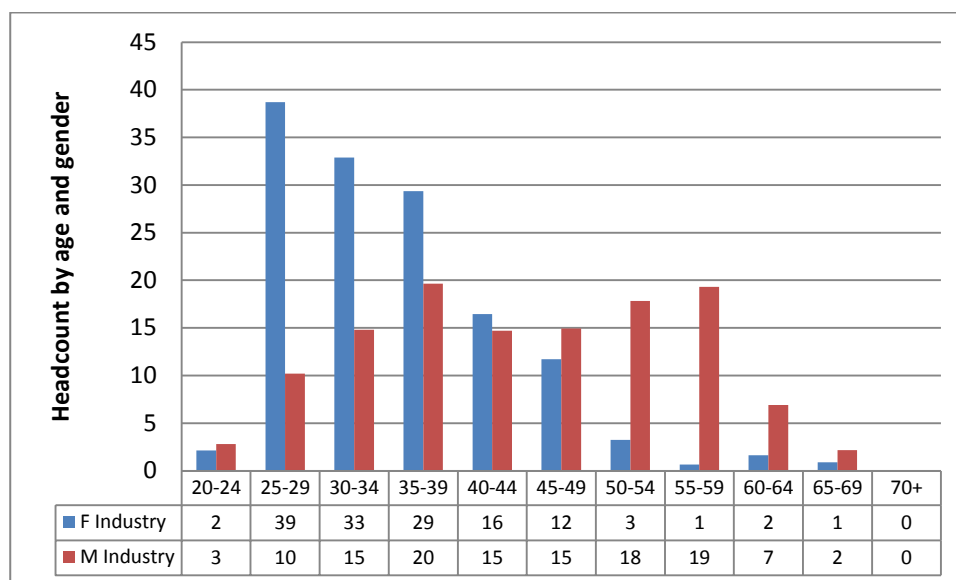


Graph 17: Estimated national teaching/research workforce by age and gender, 2012

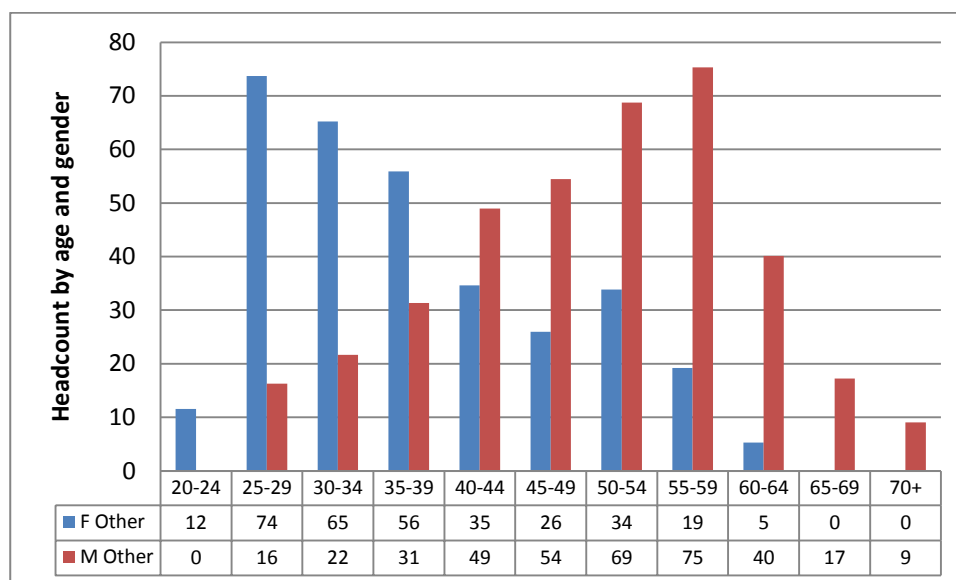


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Graph 18: Estimated national industry/pharmaceutical workforce by age and gender, 2012



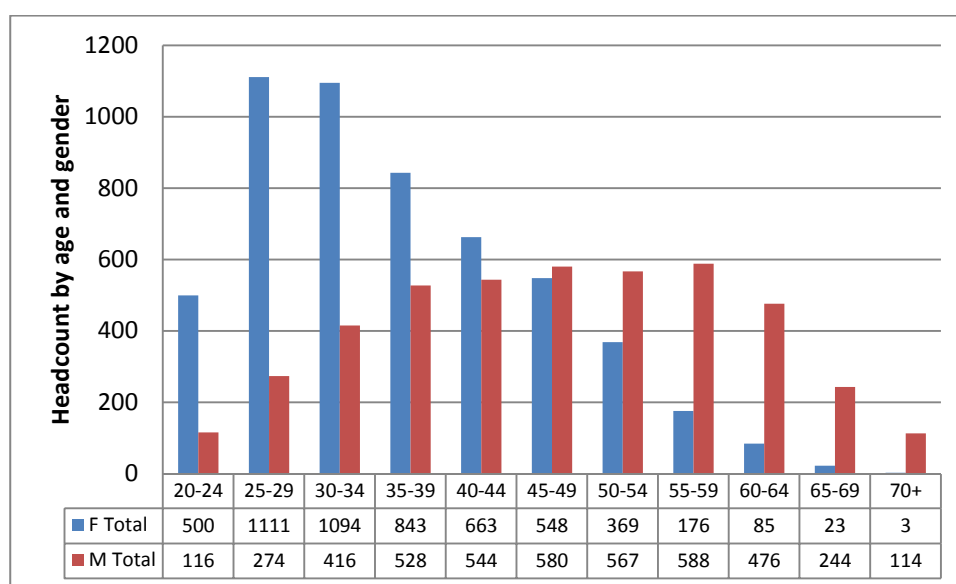
Graph 19: Estimated national “other” workforce by age and gender, 2012



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A test of significance was conducted between the age and gender profile for each gender resulting from the weighting process by practice area and the national workforce estimate based on Census data. There was no significant difference for either analysis between the two data sets. Therefore the national data estimates for practice area are representative of the age and sex profile for the national estimate when added together, but show small differences in the totals due to the weighting process.

Graph 20: Estimated national workforce by age and gender, 2012 (weighted data by practice area)



4.3. Hours worked profile

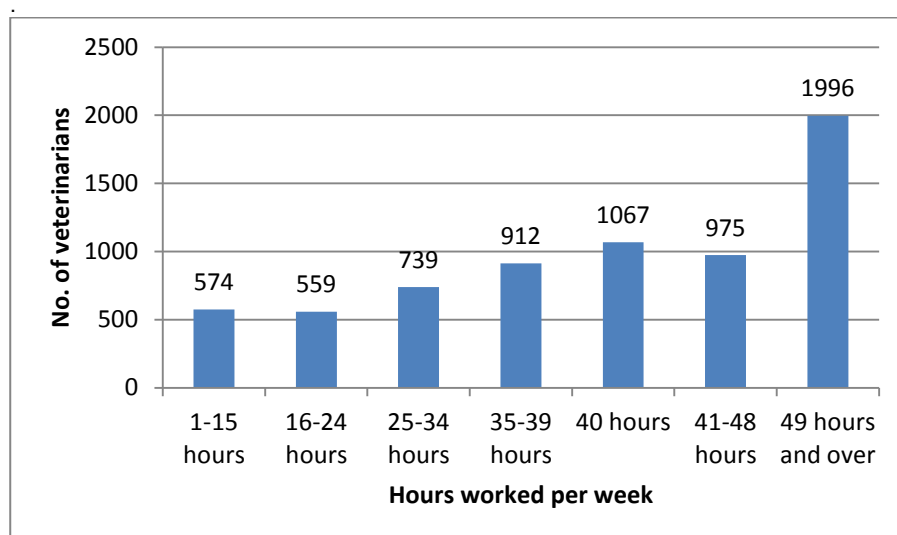
4.3.1. Analysis of Data Sources

The major data sources for hours worked were the same as the analysis by age and gender. The 2011 Census data and the AVA survey data provided data at differing levels of aggregation. However the Census collapsed hours worked per week into ranges and therefore the data from the AVA survey was matched to that data. Hours worked per week were extracted from ABS TableBuilder data using the ANZSCO code as identified previously for Veterinarians.

The following graph shows that hours worked per week are greatest for veterinarians working over 49 hours per week, accounting for 29.3% or 1,996 veterinarians reporting data.

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Graph 21: Profile of hours worked per week , Census 2011



Source: ABS TableBuilder, 2011 Census of Population and Housing

The following table and graph show that for both males and females the largest proportion work 49 and over hours per week, with 19.6% for females and 41.2% for males. There is a larger proportion of females than males working all hours ranges up to 39 hours per week, after which there is a greater proportion of males working 40 plus hours per week. In total, 40.8% work less than forty hours per week (52.0% of females, 26.7% of males).

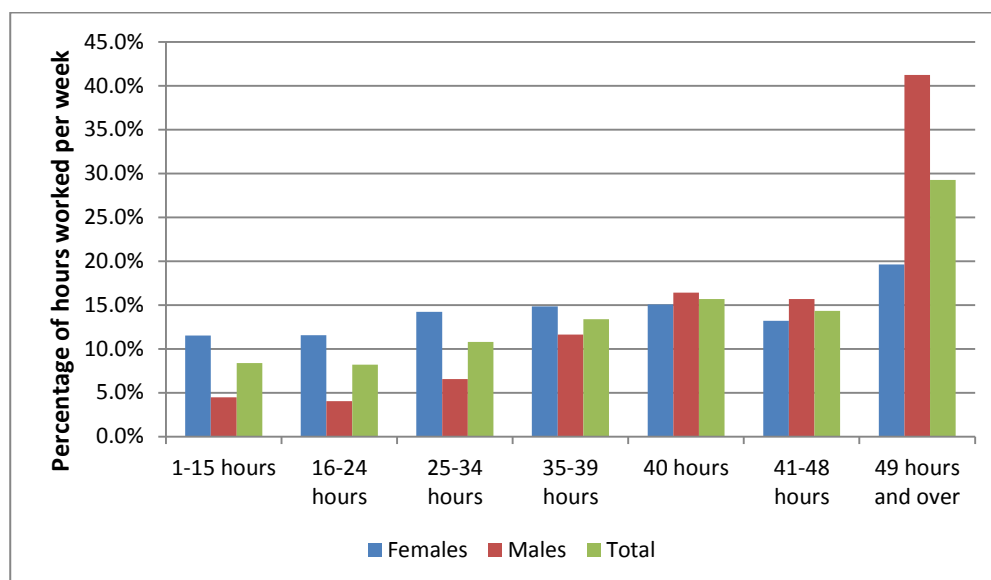
Table 19: Profile of hours worked per week by gender, Census 2011

Census 2011 Hrs worked per week	Headcount			Percentage by Age		
	Females	Males	Total	Females	Males	Total
1-15 hours	435	136	571	11.5%	4.5%	8.4%
16-24 hours	436	123	559	11.5%	4.0%	8.2%
25-34 hours	537	200	737	14.2%	6.6%	10.8%
35-39 hours	560	354	914	14.8%	11.6%	13.4%
40 hours	569	500	1069	15.1%	16.4%	15.7%
41-48 hours	499	478	977	13.2%	15.7%	14.3%
49 hours and over	741	1256	1997	19.6%	41.2%	29.3%
Total	3777	3047	6824	100.0%	100.0%	100.0%

Sources: ABS TableBuilder, 2011 Census of Population and Housing

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Graph 22: Profile of hours worked per week by gender, Census 2011



The data collected from the AVA Survey shows a similar profile to the Census data. The largest proportion work 49 and over hours per week, with 19.7% for females and 42.2% for males. There is a larger proportion of females than males working all hours ranges up to 40 hours per week, after which there is a greater proportion of males working 41 plus hours per week. In total, 49.9% work less than forty hours per week (49.9% of females, 26.6% of males).

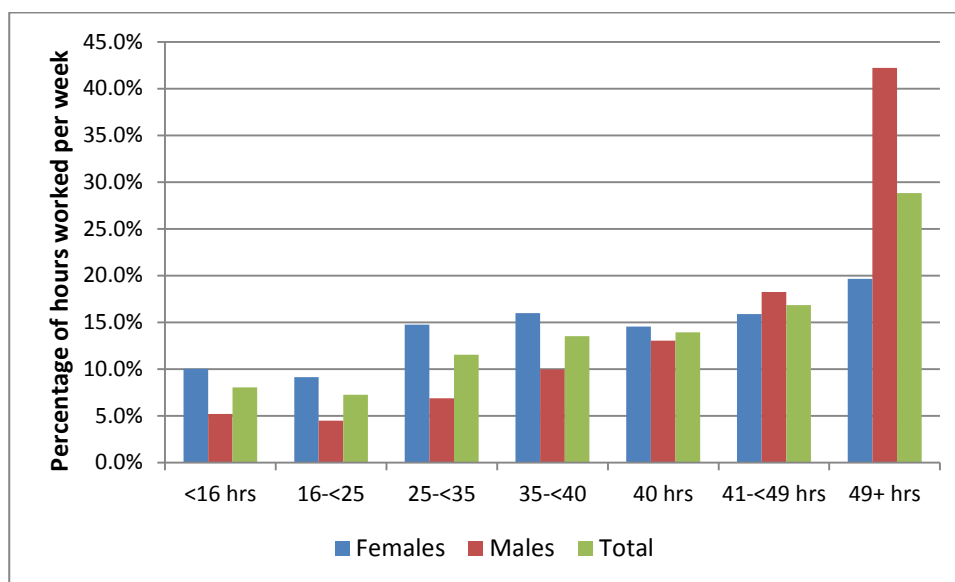
Table 20: Profile of hours worked per week by gender, AVA 2012

AVA Survey Hours worked per week	Headcount			Percentage by Age		
	Females	Males	Total	Females	Males	Total
<16 Hours	104	37	141	10.0%	5.2%	8.1%
16-<25	95	32	127	9.2%	4.5%	7.3%
25-<35	153	49	202	14.7%	6.9%	11.5%
35-<40	166	71	237	16.0%	10.0%	13.5%
40 Hours	151	93	244	14.5%	13.0%	13.9%
41-<49 Hours	165	130	295	15.9%	18.2%	16.8%
49+ Hours	204	301	505	19.7%	42.2%	28.8%
Grand Total	1038	713	1751	100.0%	100.0%	100.0%

Source: AVA Survey data set, 2012

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Graph 23: Profile of hours worked per week by gender, AVA 2012



The following table and graph compare the profile of hours worked per week by hours range, and again results show a similar distribution based on each data source.

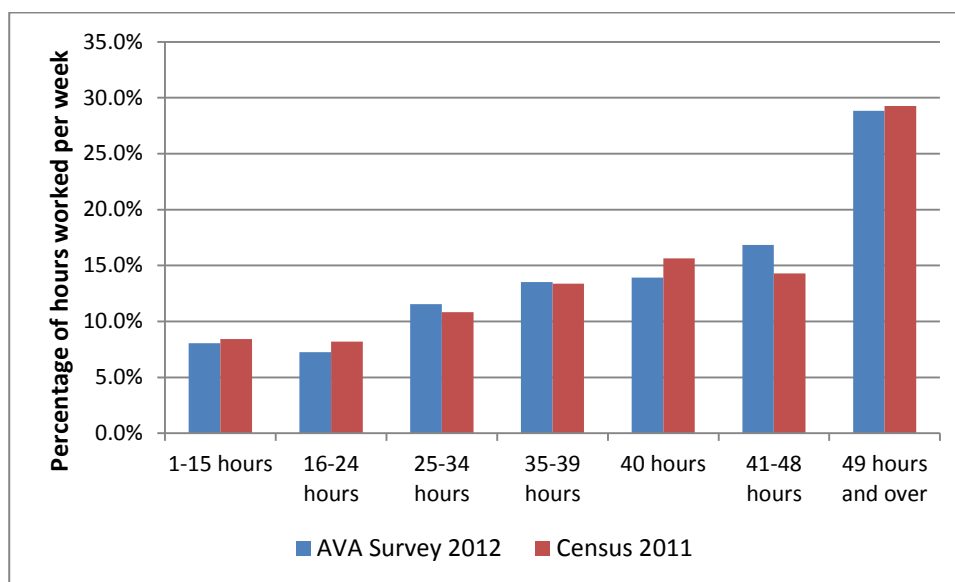
Table 21: Comparison of hours worked per week, Census 2011 and AVA 2012

Hours worked	Headcount		Percentage by hours	
	AVA Survey 2012	Census 2011	AVA Survey 2012	Census 2011
1-15 hours	141	574	8.1%	8.4%
16-24 hours	127	559	7.3%	8.2%
25-34 hours	202	739	11.5%	10.8%
35-39 hours	237	912	13.5%	13.4%
40 hours	244	1067	13.9%	15.6%
41-48 hours	295	975	16.8%	14.3%
49 hours and over	505	1996	28.8%	29.3%
Total	1751	6822	100.0%	100.0%

Sources: AVA Survey data set, 2012, ABS TableBuilder, 2011 Census of Population and Housing

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Graph 24: Comparison of hours worked per week, Census 2011 and AVA 2012



4.3.2. 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.

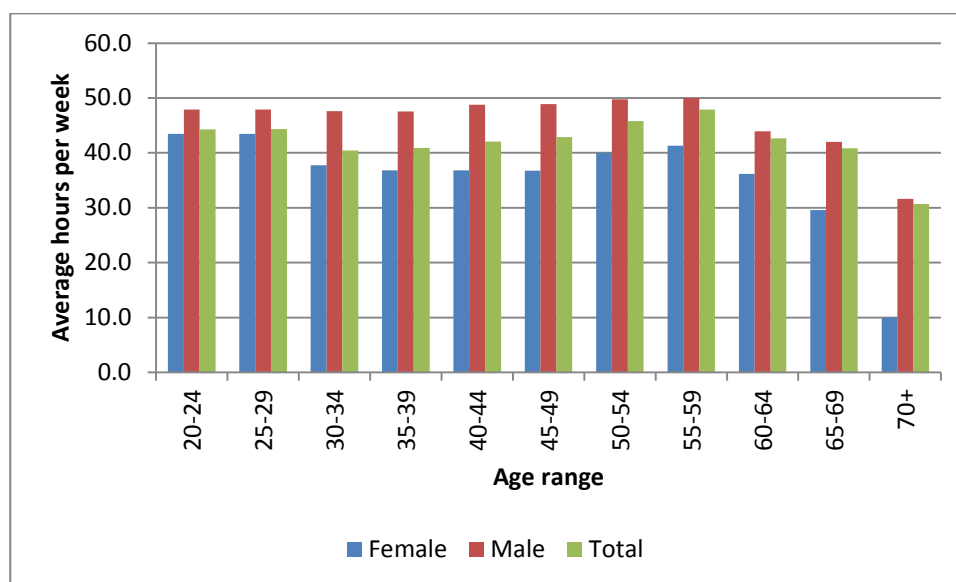
The age group working the least hours is for females and males and in total is for those aged over 70 years (10.0, 31.6, and 30.7 hours respectively).

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Table 22: 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

Graph 25: Estimate of national workforce profile, average hours worked per week by age and gender



5.0. Tests of Significance

5.1. State and practice area distribution

A range of tests of significance have been undertaken to determine the level of similarity between the 2012 AVA survey, the 2012 Registration Board annual survey data and the 2011 Census data for the following comparisons:

- Workforce size at State level;
- Workforce size at national level by practice area;
- Workforce size at State level by practice area;

The analysis indicated results as follows:

Workforce size by State/Territory:

- There is a significant difference in workforce size using the three data sources of AVA Survey (2012), Registration Board data (using primary registrations for 2012 adjusted for not working in the State), and Census Data (2011 data) ($p < 0.001$, 14 d.f.). The AVA Survey over-enumerates the workforce in ACT, NSW, NT, Tasmania and Victoria while it under-enumerates the workforce in Queensland and South Australia, based on a sample of 17.8%.
- There is also a significant difference in State/Territory distribution of the workforce when comparing Registration Board data (using primary registrations for 2012 adjusted for not working in the State), and Census Data (2011 data) ($p < 0.001$, 7 d.f.).

Previous analysis indicated that the Census 2011 data only accounted for 72.7% of the Registration Board estimate of the workforce for 2012. This varied from a low of 63.5% for the Northern Territory and 64.2% for Queensland to a high of 78.2% for South Australia and 79.3% for NSW.

Therefore Registration Board data is the only reliable source of data to use for State/Territory distribution of the workforce. This limits the ability to model State/Territory workforces due to a lack of access to age, gender and hours worked data for working Veterinarians.

National and State workforce by practice area:

The distribution of the workforce by practice area was based on the unknown equals known principle, using the four State sample of 65.6% of the total workforce extrapolated to the national workforce by practice area. This approach assumes that the four States and Territories with no data by practice area in total have the same practice area profile as the four States where data was available. This allowed for a national estimate by State and practice area. This is called the **national workforce estimate by practice area, 2012**.

The data from the AVA Survey and the Registration Board survey were each clustered to compare NSW & ACT combined, Victoria and Western Australia individually and Tasmania, South Australia, Queensland and the Northern Territory combined (called "other States") to determine if there was any significant difference based on practice area

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distribution. This is called **the clustered State workforce by practice area**. A test of significance for each of the two data sources was undertaken to determine if there was variation between State profiles by practice area.

- There is a significant difference between the 2012 AVA Survey and the 2012 Registration Board survey national workforce estimate by practice area ($p < 0.0001$, 7 d.f.). Veterinarians working in small animal practices are significantly over-represented in the AVA Survey (more than five percent higher in the survey), together with government employees and in teaching and research (between one and five percent higher in the survey) as well as industry and large animal practices (less than one percent higher in the survey). The workforce in mixed practices is significantly under-represented in the AVA Survey (more than five percent lower in the survey) while, equine practices and those in the “other” practice area are also under-represented in the AVA survey (between one and five percent lower in the survey). This analysis is based on the assumption that the 65.6% Registration Board survey sample is a more representative sample than the AVA Survey (17.8% response).
- There is no significant difference between the 2012 AVA Survey and the 2012 Registration Board survey of the workforce by practice area for NSW ($p = 0.0226$, 7 d.f.) and Western Australia ($p = 0.0003$, 7 d.f.);
- There is a significant difference between the 2012 AVA Survey and the 2012 Registration Board survey of the workforce by practice area for Victoria ($p < 0.0001$, 7 d.f.). Veterinarians working in small animal practices and in teaching and research in particular are over-represented in the AVA Survey, and those working in mixed practices, equine practices and other practice areas under-represented in the AVA survey for those working in Victoria;
- There is a significant difference between the clustered State workforce by practice area for each of the two data sources (AVA data: $p < 0.0001$, 21 d.f.) (Registration Board data : $p < 0.0001$, 21 d.f.). This suggests real differences in the practice area distribution by State; although the AVA survey has survey bias as indicated above. **This data needs further validation by representatives of the workforce to determine which pattern of practice area distribution is most consistent with known patterns of distribution by State and practice area.**
 - For the AVA survey data comparison; industry was higher in NSW& ACT combined and very low in WA (*as a proportion by practice area for that State compared to the national proportion*) , large animal practices were higher in Victoria and other States, small animal practices were higher in Victoria and Western Australia, government services were higher in NSW and WA, teaching and research were higher in WA and lower in other States, the equine workforce was higher in NSW, and mixed practices were higher in other States and lower in WA.
 - For the Registration Board survey data comparison; industry was higher in NSW& ACT combined and lower in WA, large animal practices were higher in Victoria and lower in WA, small animal practices higher in NSW and lower in Victoria, government services higher in WA and NSW and lower in Victoria, teaching and research were higher in WA and other States, the equine workforce was higher in Victoria and lower in WA, mixed practices were higher in Victoria and WA and lower in NSW and other areas were higher in Victoria.

As there were only three larger States with available Registration Board data by practice area these were the only States tested individually by practice area. With one of the three States having a significantly different practice area distribution this indicates that the AVA Survey is not representative of the practice area distribution by State for all of the larger States where data are available for comparison. Therefore the use of the AVA Survey data by practice area has statistical constraints. **As this is the only source of data for workforce by practice area for the four States who do**

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not collect data via Registration Board surveys the national estimate of the workforce by practice area may include response bias for those States (Queensland, South Australia, ACT and Northern Territory).

The analysis of the distribution of the workforce by practice area by State and Territory indicates differences although the findings were inconclusive.

5.2. Age, gender and hours worked profile

The tests of significance were undertaken for each of the three data items independently for the two available sources of data; the AVA workforce survey 2012 and the Census data, 2011. The findings were as follows:

- There is no significant difference by gender for the two data sources ($p=0.0546$, 1 d.f.);
- There is a significant difference by age for the two data sources ($p<0.0001$, 5 d.f.) with the AVA survey data over-representing the older workforce (from 41 to 50 and older) and under-representing the younger workforce (up to 40 years);
- There is no significant difference for hours worked by the two sources ($p=0.0813$, 6 d.f.).

This indicates that the AVA survey data has value in reporting on gender and hours worked, but limited value when age is reported or any interaction between age and gender as an example. Therefore the Census data is the preferred data source for age, gender and hours worked.

6.0. Supply Dynamics

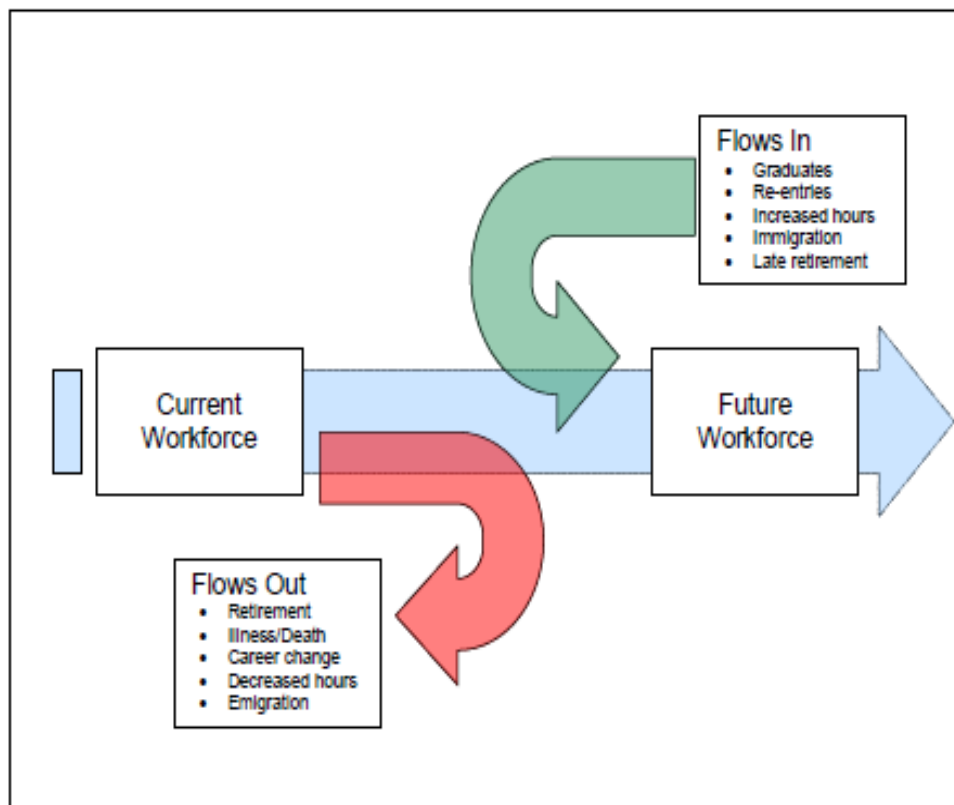
6.1. Overview of supply data components

Health Workforce Australia (2012)⁴ 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).

⁴ Health Workforce Australia (2012). *Health Workforce 2025 – Doctors, Nurses and Midwives – Volume 1*.

Figure 1: Stock and flow process



Source: HWA (2012). P. 40.

The following data has been included in the modelling:

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.

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6.2. 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.

Table 22: University commencements by University by year, Veterinarian courses, 2007-2013

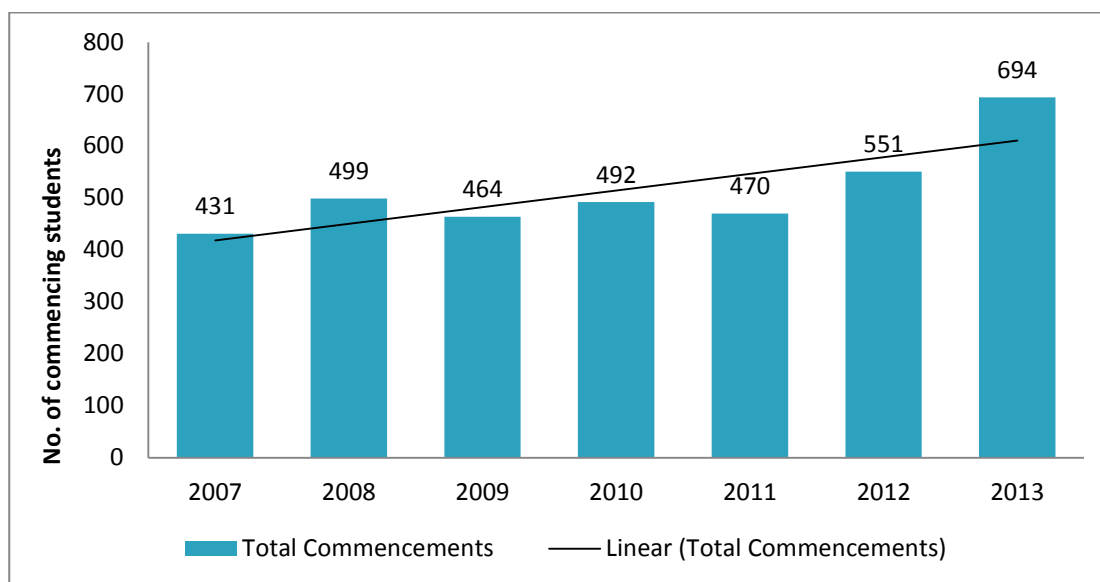
University	2007	2008	2009	2010	2011	2012	2013	Var. 1	% Annual Var. 1	% Var. 2007-2013
USyd	127	123	118	140	124	132	142	15	2.0%	
UQ	103	135	117	124	118	123	146	43	7.0%	
UMelb	106	120	120	125	88	74	129	23	3.6%	
Murdu	95	43	30	39	36	34	53	-42	-7.4%	
JCU		78	79	64	60	65	87	9	2.3%	
UAdel					44	53	54	10	11.4%	
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/>

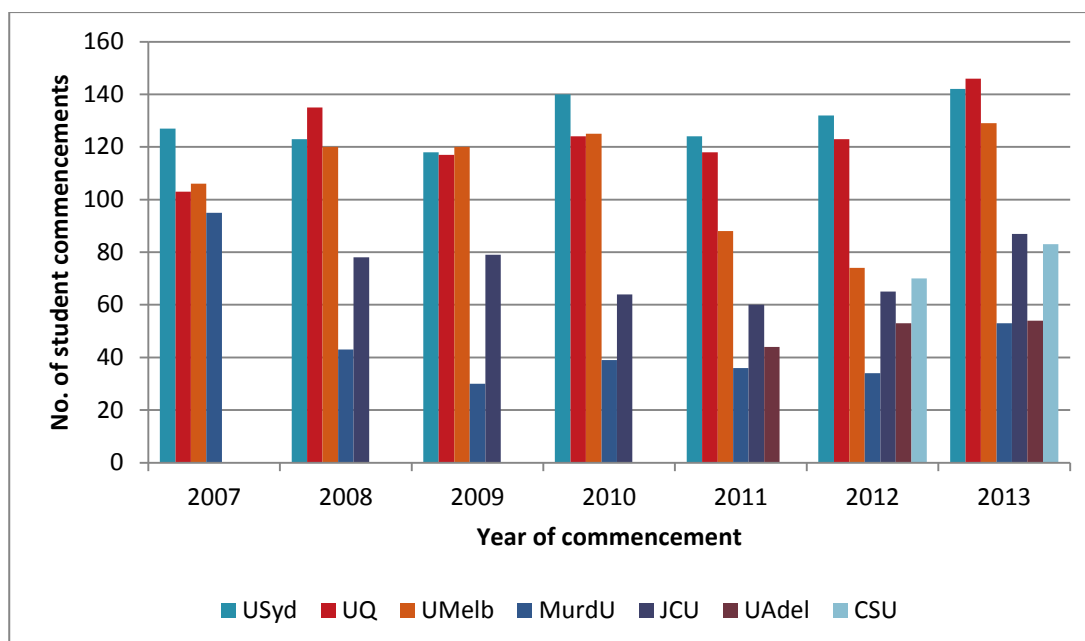
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Graph 26: University commencements by year, Veterinarian courses, 2007-2013



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

Graph 26: University commencements by University by year, Veterinarian courses, 2007-2013



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

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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.

Table 23: 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%

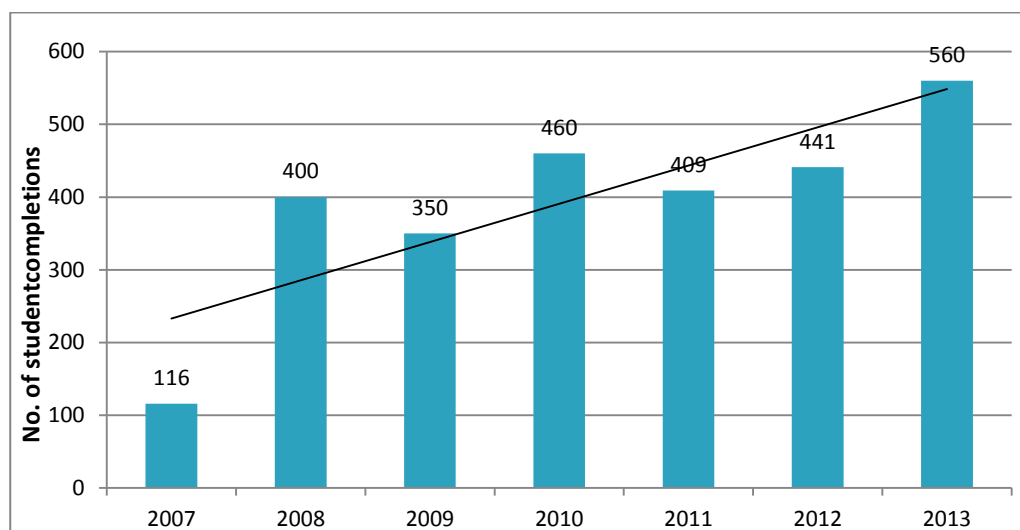
Note: (1) Variation and Annual % Variation is calculated from the initial year the course commenced to 2013.

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/>

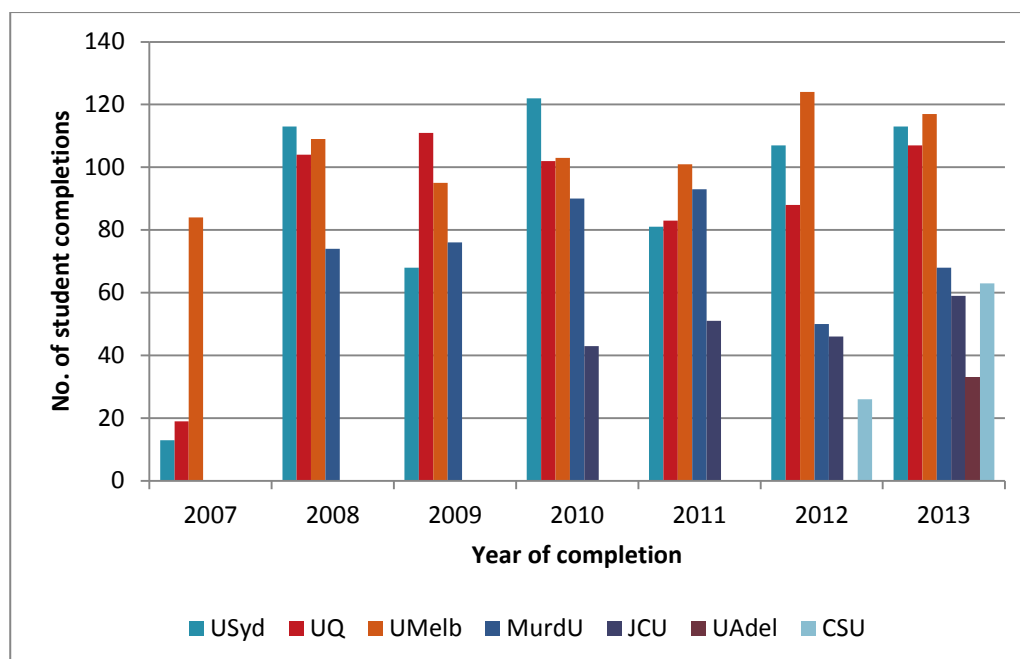
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Graph 27: University completions by University by year, Veterinarian courses, 2007-2013



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

Graph 28: University completions by University by year, Veterinarian courses, 2007-2013



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

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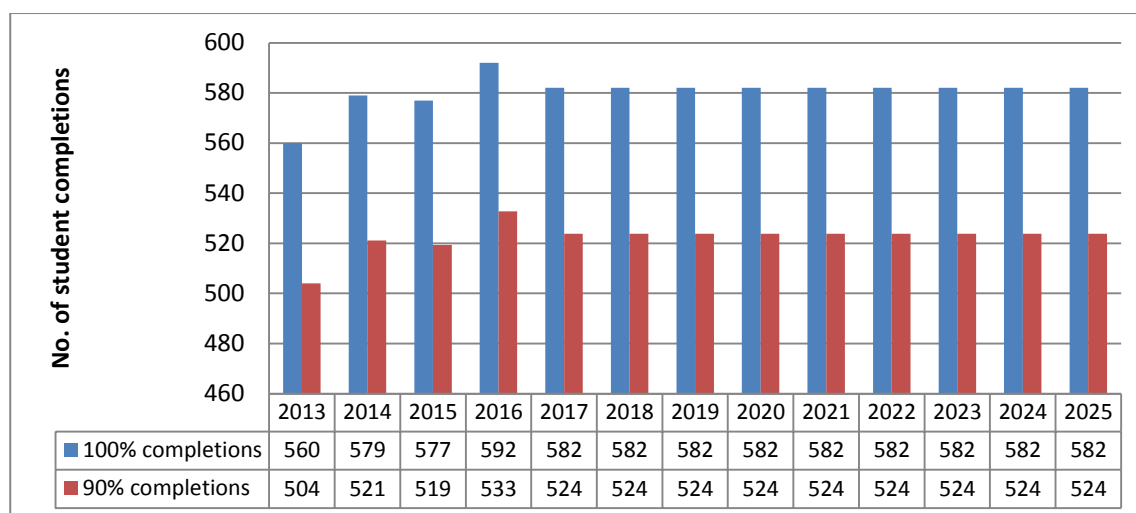
6.2.1. Projected student completions and modelling assumptions

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).⁵

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 for domestic/international students;
- 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 29: Projected University completions by percentage completing, Veterinarian courses, 2013-2025



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

⁵ 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.

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6.3. 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.

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

6.3.1. 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.

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Table 24: 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)

6.4. 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. 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 re-registered in the year of return. 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 of this analysis, 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;

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- 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 25: Long-term resident return, veterinary workforce, 2012-13

Age Group	Female	Male	Total
20-24 years	3	2	5
25-29 years	24	10	34
30-34 years	25	9	34
35-39 years	14	10	24
40-44 years	4	5	9
45-49 years	3	3	6
50-54 years		2	2
55-59 years	1		1
60-64 years	1	1	2
65+ years		1	1
Total	75	43	118

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

Table 26: 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

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6.5. 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, 2005-06⁶, and retirement rates for veterinarians in the USA based on AVMA modelling.⁷

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 27: Estimated wastage levels for the veterinary workforce, 2012

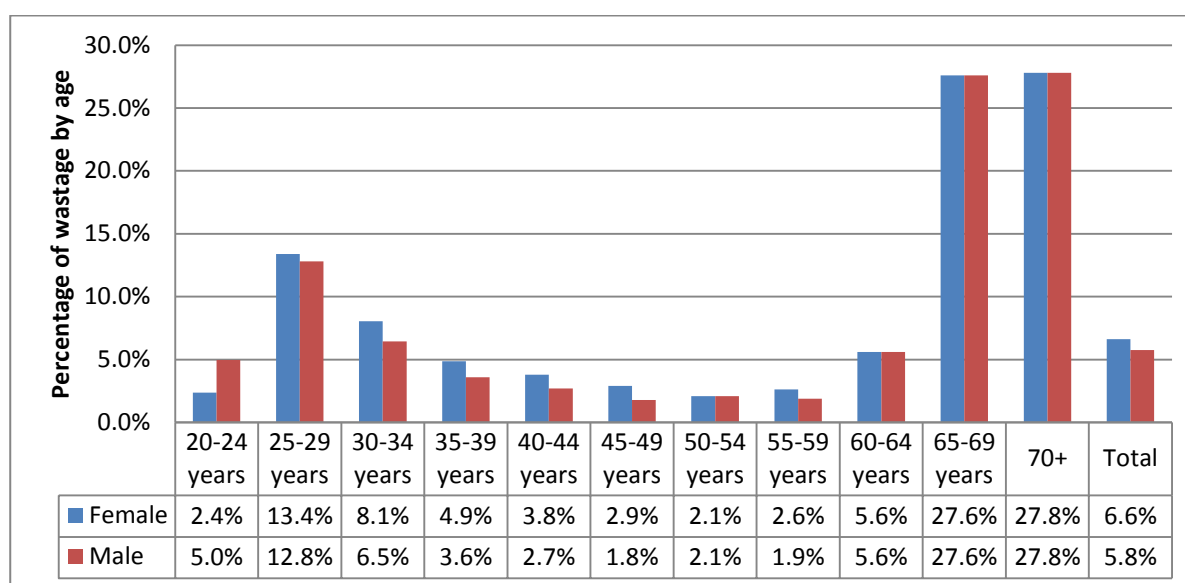
Age Group	Losses			Workforce			Losses as percentage of workforce		
	Female	Male	Total	Female	Male	Total	Female	Male	Total
20-24 years	11	5	16	460	101	561	2.4%	5.0%	2.9%
25-29 years	154	35	189	1150	276	1426	13.4%	12.8%	13.1%
30-34 years	90	27	116	1113	412	1525	8.1%	6.5%	7.2%
35-39 years	43	19	62	872	532	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%			

⁶ 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).

⁷ American Veterinary Medical Association (2013). *2013 US Veterinary Workforce Study: Modeling Capacity Utilization*.

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Graph 30: Percentage of wastage levels by age and gender, veterinary workforce, 2012



6.6. 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 28: 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

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7.0. Demand Estimates

7.1. Demand Drivers

The Environmental Scan (the Scan) document which was prepared as part of this exercise identified the problems associated with determining demand. The overview of the veterinarian profession and key demand issues in that document has identified the complexity of the veterinary workforce for the purposes of workforce modelling. The 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) is 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 2026.⁸ 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 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

⁸ 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. p. 352.

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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 and increasing competition from non-veterinary providers in niche markets which will challenge future growth in the workforce.

A summary has been prepared of the demand drivers which are negative and positive in terms of projected growth, 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 scenarios.

Table 29: 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</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</p>

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Model	Positive demand drivers	Negative demand drivers
	<p>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>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 demand subject to length and spread of outbreak(s)</p> <p>Contracting of stock management and surveillance to private sector</p>	<p>Disease outbreaks may be managed temporarily from the existing workforce by 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</p>	<p>Fall out in universities offering courses due to increasing costs</p>

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Model	Positive demand drivers	Negative demand drivers
	therefore more university courses Increasing overseas demand for Australian courses Increases in research funding	Cuts to research funding and local Australian expertise as a result
Industry	Steady growth linked to workforce growth creating more sales representatives, technical roles Increases in industry due to increasing de-regulation	Merging of pharmaceutical companies resulting in less employment opportunities
Other	Trends in specialisation continues Demand for specific areas such as aquaculture, wildlife management, animal welfare increases Increased funding for public health initiatives	Trends in specialisation decrease with more veterinary bioscience graduates filling those roles

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

The only other recent sources of quantitative data on projected growth or change in demand were sources from the AVMA study (2013) modelling capacity utilisation by State in the USA.⁹ However these did not necessarily translate to the Australian situation.

The assumptions made were as follows:

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)¹⁰

⁹ 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.

¹⁰ 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>

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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.¹¹

The projected number of households in Australia from 2012 to 2025 (Series II) was projected to grow from 8.711 million households to 10.715 million 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 2021.¹²

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

¹¹ *ibid.*

¹² 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>

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Table 30: 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*

7.2. 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. Appendix one provides information relating to each scenario. The definitions 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%.

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Table 31: Results of projections for national projection and scenarios and by practice area

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

7.3. 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.

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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.

7.4. 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. There 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.