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Australian veterinary workforce review report

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Executive summary

The Australian Veterinary Association represents the interest of its member veterinarians throughout Australia. The future size and structure of the workforce of registered vets, especially those in clinical practice, has emerged as a major issue of concern for the profession.

The AVA commissioned Taverner Research to review available sources of data and the published literature on veterinary workforce issues. The aim was to identify specific issues that concern stakeholders about the development of the veterinary workforce, and identify gaps in the available data that would be needed to support evidence-based submissions for policy actions by Australian governments to deal with those concerns.

Review of a range of publications, anecdotal information and some published research literature on approaches to workforce forecasting have identified the following key issues.

1. **Supply and demand mismatch** There may be an oversupply of vets compared to demand in the near future.
2. **Changes in gender workforce composition** As the proportion of women in the profession increases, the full-time equivalent number of practitioners will decrease, despite the increase in the numbers graduating.
3. **Workforce location, gender and type of work** The supply of vets willing and able to deliver appropriate services to support production of livestock does not meet the need for services to monitor outbreaks of disease and the improvement of herd health and productivity.
4. **Viability of the private practice model** Veterinary practice under current market conditions is becoming less financially viable.
5. **Data availability and forecasting** Data required to construct a valid model that allows forecasting of the supply and composition of the veterinary workforce and testing of the sensitivity of forecasts to changes in assumptions is largely unavailable. Without such models, it will be very difficult to make a case for policy changes to Australian governments.

This review also examines evidence on some policy responses to these and related issues, and how these have worked in practice.

Conclusions

There is insufficient evidence to establish whether the overall supply of vets falls short of, meets or exceeds demand, either for companion animal services or for production animal services.

It is reasonable to conclude that the effective full-time number of vets in practice will fall further below the numbers registered as the percentage of women among

registered vets increases and the women enter the stage in their careers when many shift to part-time work or cease work.

Whether this will be sufficient to outweigh the overall increase in the numbers graduating cannot be decided without a good dynamic model of the flows into and out of clinical practice, segmented by length of practice or age group, and gender.

There are grounds for concern about the supply of vets willing to enter and remain in rural practice with production animals. There is no valid basis at present for estimating the demand for such services, although policies have been implemented to remunerate practices for undertaking herd health surveillance and disease reporting work.

While the evidence is limited, there appear to be valid grounds for concern about the continued financial viability of practices under current practice models and market conditions.

There are numerous major gaps in the data required to develop a valid and useful model of the size and composition of the veterinary workforce.

What data and what type of model would be required to forecast demand for veterinary services is difficult to establish. There might be a basis for estimating changes in the balance between demand and supply for companion animal and for production animal services.

Additional resources are required to develop valid models of both the supply of vets and of the demand with appropriate segmentation by location and type of practice and by key variables that impact on the composition of the workforce. A stronger case needs to be made for the involvement of government in resourcing such work.

There is little information available on the effectiveness of policy interventions in Australia or overseas designed to impact supply or demand for veterinary services.

Recommendations

1. The profession seeks the resources to develop and maintain a valid dynamic model of the number and composition (by length of service or age group, gender, location and type of practice) of vets in active practice, and of a valid basis for forecasting demand for both companion animal and production animal services.
2. The model needs to enable calculations on the transition probabilities between full-time, part-time, and non-practice.
3. The model needs to enable forecasts and tests of sensitivity for both the total supply of vets and for the supply of vets willing to work in rural practice that includes or mainly focusses on production animals.

4. The AVA seek the resources to obtain annual data from a cross section of practices on income broken down by the income generating activity, and costs broken down by the activity generating the costs.
5. The data be used to assess trends in the financial viability of current practices.
6. Policy makers consider what action might be taken to encourage financially sustainable demand for veterinary services for production animal herds that focus on herd health and productivity in addition to the clinical treatment of individual animals.
7. The AVA advocates coordinated national collection of data on:
 - the annual cohorts entering the profession (from universities)
 - those currently in active practice (through a national survey associated with annual registration)
 - those exiting the profession either temporarily or permanently (by linking results of successive annual surveys)
 - the size of the companion animal and production animal populations.
8. Data collected by veterinary schools on students entering and graduating from their programs be standardised to facilitate consistent collection, reporting and comparison of data on the composition of the cohorts entering the profession.
9. An annual survey of the total profession be implemented with completion of the survey being tied to re-registration following the successful model implemented in New Zealand. For those in practice for more than one year, the data should include:
 - gender
 - age
 - when they commenced practice
 - any periods working only part-time or not working in clinical practice
 - whether working in metro or other areas
 - current hours worked by type of work (companion animal, production animal and possibly horses, herd health and productivity work, other work).

The data for those entering the profession should include:

- gender
- age
- whether grew up in a rural or metro location
- whether Australian residents or from overseas
- whether seeking employment in clinical practice as a vet

- whether seeking full-time or part-time work
- whether seeking to work in metro or country locations
- whether willing to work in production animal practice.

It would also be useful to have data for those who have left clinical practice in the previous year on:

- gender
- age
- reason for leaving
- whether planning to return to clinical practice, if so when and whether planning to do so full-time or part-time and in what type of practice and where
- whether planning to change to a different type of practice, or to leave clinical practice in the coming year
- whether planning to reduce or increase hours of work in the coming year.

While some of the data on those leaving practice can be obtained by linking successive annual surveys, some would require a specific survey of practitioners who do not renew registration.

Effective processes to increase the response rate to the annual surveys should be implemented.

Analysis of the data by year of entry into practice should be undertaken to provide a useful picture of the likely rate of loss by retirement, and of the retention in different types of clinical practice of new entrants.

10. The AVA develops a case to convince policy makers of the need to resource development of workforce and demand models for animal health services paralleling the work already underway for human health services.

Supply and demand mismatch: the evidence

Data on the size of the workforce

Expansion of the veterinary workforce has been estimated at 8.3% per annum for the five years to 2010 compared to 2.1% for all occupations (DEEWR, 2010). Expansion of the supply of vets has generated concern about the possibility of oversupply.

Estimates of the total number employed (which includes those employed as vets but not in clinical practice) based on ABS Labour Force Survey statistics from 2000 to 2011 suggest substantial growth following the three years from 2001 to 2003, but indicate a substantial drop between 2000 and 2001. These estimates inevitably fluctuate around the long term trend as the base numbers in the profession in any one survey will be quite small. Figure 1 below shows the estimates in thousands, rounded to the nearest 100.

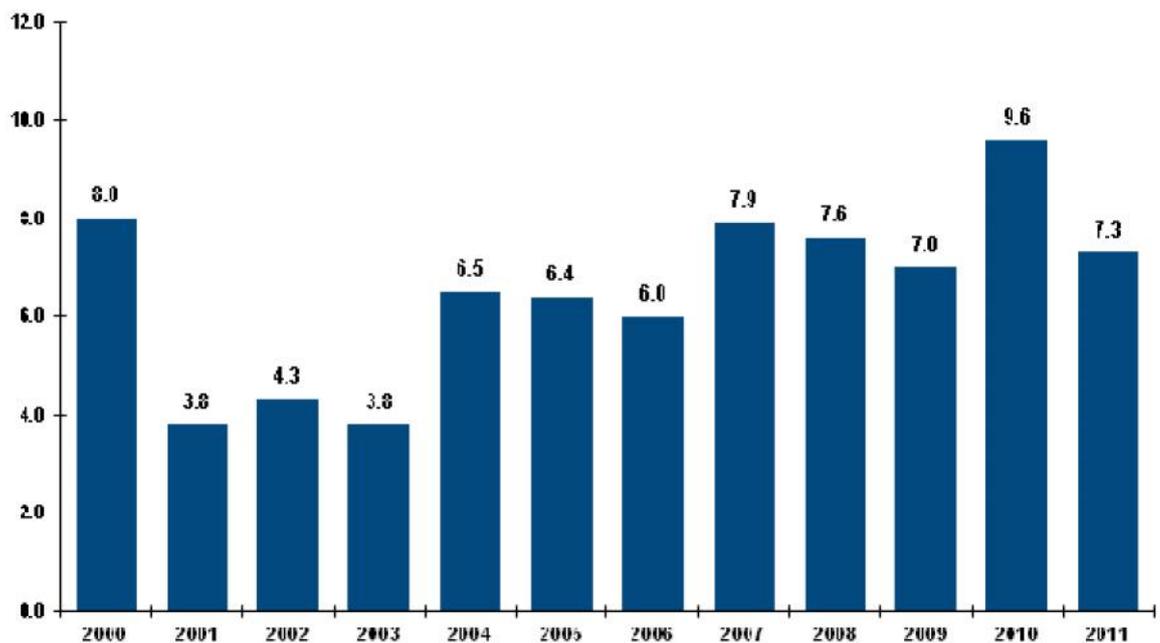


Figure 1: ABS Labour Force estimates of numbers working as vets November 2000 to November 2011 ('000s rounded to nearest 100)

Downloaded and reproduced from ABS (2012)

<http://joboutlook.gov.au/pages/occupation.aspx?search=alpha&tab=stats&cluster=&code=2347>

The following points also contribute to concern about possible oversupply:

- The ratio of vets per 10,000 population in Australia is higher than in other comparable countries (NAB Health, 2009, p5).
- The number of vets per 10,000 companion animals and per 10,000 production animal population might be a more appropriate basis for

assessing demand. If there are more companion animals or production animals per 10,000 human population in Australia this could explain the higher ratio to human population.

- Another ratio related to demand for and supply of veterinary services for livestock is the number of vets per million tons of meat produced. Frawley (2003, p7) reported that this ratio in Australia (then 1,647) was similar to the USA (1,648), slightly below the ratio in Canada (1,974) and well below the ratio in the UK (3,563). This suggests that the supply of vets for work with livestock production is not out of line with international ratios. However, a firm conclusion would require data on the number of vets in each country directly giving service to livestock production.
- It has been reported that the total population of companion animals which should be one “driver” of demand for vet services, has been contracting (ACAC, 2011).
- The annual supply of new graduates has expanded since 1995 with the opening of additional training programs. There are indications that the total number graduating is stabilising after removing overseas students (see Figure 2), but the continued flow at a higher rate into the profession should drive continued increase in total numbers unless balanced by an increased rate of exits.

Pratley and Abbott (2012) gives estimates of the number of registered veterinarians from a range of sources which indicate that the numbers have risen from just under 3,200 in 1981 to just over 9,700 in 2010, with a marked increase in the ratio of vets to human population from 213 vets per million population in 1981 to 442 per million in 2010.

Taking these points together, there appears to be a risk of an oversupply developing. However, other evidence suggests that this is not yet happening, and that in some types of practice, there continues to be an undersupply. Specifically:

- The vacancy level was recently assessed as high in 2010 (DEEWR, 2010); earlier surveys of practising vets suggest that vacancies are likely to concentrate in rural practices dealing with production animals (Heath, 2001; Heath and Niethé, 2000; AVA, n.d.).
- Few graduates (under 10%) report not gaining work or seeking full-time work while working only part-time according to the annual surveys of recent graduates by the Graduate Careers Council (2012).
- Data shown later in this report (see section on workforce composition) confirm that the gender balance of the profession is changing and consequently the proportion of vets practising part-time is increasing. Thus some vets have expressed concern that despite the increased supply of new graduates, that a shortage of vets able and willing to practice might develop, especially in services for large or production animals.

- Similar concerns about the impact of the increased proportion of women among graduates have been expressed in the USA (American Veterinary Medical Association, 2010, 15 February)

Data on the numbers entering the workforce

There has been a major expansion in the number of newly-qualified vets entering the profession in line with the increased number of university veterinary science programs.

In 1995 there were only four veterinary science programs graduating vets in Australia, located at the University of Sydney, the University of Melbourne, the University of Queensland, and Murdoch University in WA. Additional programs have started since then at:

- Charles Sturt University – first graduates completed in 2010
- James Cook University – first graduates completed in 2010
- University of Adelaide – first graduates from the clinical Doctor of Veterinary Medicine program will graduate in 2013; there have been no graduates to date.

For this report, the universities providing courses leading to registration as a vet were asked to report on the number of students who had been graduating since 1995. All have supplied data.

Based on this data, the number graduating who are qualified to register for practice increased from an average of 229 per year in the period from 1995 to 1999, to 463 in 2008-2011. Further increases are expected up to 2015 by those universities that provided forecasts, with the numbers likely to be in the range from 500-550.

Only two offered forecasts past 2017. Both expect numbers to remain steady but perhaps slightly below the 2016 level. We can thus expect that numbers graduating will stabilise at around 500-550 from 2015 on.

DEEWR statistics indicate that 406 students graduated as registered vets in 2011, slightly below the 463 reported by the universities that provided us with their internal data. The difference could be accounted for by the inclusion by some universities of overseas students in the statistics supplied to us.

Pratley and Abbott (2012) reported that the supply of veterinary science graduates including overseas students who stay in Australia has been around 450-550 per year up to 2010, and that with the increased number of courses, this is projected to rise to 670 by 2013. Given that all universities except Adelaide have been graduating students since 2010, this forward estimate appears rather high, even allowing for overseas students and the addition of graduates from the University of Adelaide in 2013.

Demand for vet services

It is difficult to establish sound estimates of the demand for vets. Nor are there any standards for the ratio of vets to the human population or of vets to animal populations. Frawley (2003) reported marked international variations in the ratio of vets to human population, but very similar levels in Australia, New Zealand and the USA.

Data on the actual population of animals are also somewhat sketchy.

The Australian Companion Animals Council (ACAC) has published estimates of the number of pets in Australia, providing data on trends in the number of dogs, cats and other pets. The most recent report (Australian Companion Animals Council, 2010) indicated that there has been a substantial and continuing fall in the number of dogs, and that cat numbers fell sharply from 2000 until levelling out in 2007. When the reported ratios of pets per 100 households are examined for dogs and cats, the trend is clearly downward. However, the basis for the estimates given is quite unclear. The report gives no details of the methodology used to arrive at the estimates.

While there is ongoing work on estimating the size and geographic distribution of livestock herds that require veterinary services, this has not yet been published. Nor are there clear standards for the ratio between the supply of vets working with livestock, and the size of the national herds.

One proxy for the match between supply and demand is to examine statistics on starting salaries and employment levels among new graduates.

There has been some dispute in relevant publications about whether the increase in the numbers graduating and the apparent increase in the total numbers in practice will result in an oversupply. Pratley and Abbott (2012a) concluded that there is an oversupply overall and that this will become more marked as the number of new graduates increases, but an undersupply for rural practices that serve production animals and mixed populations (production animals, horses and companion animals). White (2012) agreed with the conclusion about an overall oversupply, but argued that there was no actual shortage for rural practitioners providing services to production animals. His argument was based on indications that the starting salaries for vets in all types of practice remain low compared to other professions requiring similar levels of training. He argued that this reflects a low level of demand compared to supply. Pratley and Abbott (2012b) responded that this is true for companion animal practice but that from their follow up of three years of students graduating from Charles Sturt University's program, all of the large majority who wished to work in Australia had obtained jobs in rural practice and had achieved higher than average starting salaries. Further, they reported that they had unfilled requests from rural mixed and production animal practices for graduates.

The employment experience of new graduates from Charles Sturt University is of particular interest as the program gives preference to students who grew up in rural

areas and have had direct responsibility for managing animals. Pratley and Abbott (2012a) also reported that job advertisements for rural vets, continued pressure from livestock industries seeking an increase in supply, and the experience of Charles Sturt University's graduates converge to confirm that there is a shortage of rural vets willing to undertake practice with production animals as part or all of their practice.

Graduate Outlook advice throughout the period from 2000 to date continued to state that there is a high demand for veterinary graduates. For example the ABS Job Outlook for vets in 2011 reported that a high proportion of vets are employed full-time (77%) and that there is almost no unemployment in the occupation. The Job Outlook forecasts further increases in employment up to 2016. However, the sources for these conclusions might not be highly reliable.

Respondents to the Graduate Careers Survey in 2012 indicated that 91% of those available for employment in the profession were working, with 76% working full-time. The number of responses to this survey (N=211 for those followed up in 2012), suggests a reasonably good response rate of just over 50% (based on about 400 graduating in 2011). However, there could be some bias in the results if those who do or do not obtain employment differ in their willingness to respond to the survey.

Despite the indications that there is a general oversupply (reflected in part in lower starting salaries) concerns have been expressed that much of the increase in the numbers entering the profession will be offset by changes in the gender composition of the workforce. The shift to a majority being female will result in larger numbers taking time out from practice or working part-time and those working full-time undertaking fewer hours of work. This issue is taken up next.

The potential for oversupply

Pratley and Abbott (2012a) and White (2012) concurred that there might already be an oversupply of vets compared to the existing demand, and that the oversupply is likely to increase in coming years. The primary lines of argument were based on data about advertised vacancies and data on starting salaries.

While White (2012) argued that there is no evidence of an undersupply of vets for rural production animal practice and mixed practice, Pratley and Abbott (2012a, b) make a case for a continued problem in filling vacant positions where such work is a substantial part of the practice, based in part on consultations with practice managers, and the experience of Charles Sturt University in placing its graduates who come from a rural background. It might of course be that practice managers particularly seek Charles Sturt University graduates in the expectation that they will be more willing to enter and remain in practices that have a substantial component of or main focus on production animal practice, and that the unmet demand for the Charles Sturt University graduates reflects this rather than an overall undersupply.

As noted in discussing the numbers graduating, the estimates of new graduates given in Pratley and Abbott (2012a) do appear higher than justified by the data we have been given on numbers graduating, unless there will be a large and increasing number of overseas students who will be entering practice in Australia.

Without reliable estimates of the numbers retiring from active practice or leaving the profession for other work, it is difficult to arrive at any firmer conclusions.

The expected numbers of new graduates remaining in active practice might over time fall off as many within the large majority that are women reduce their hours of work or at least cease active practice for a period to have and care for children. This possibility is discussed in more detail in the next major section of this report. At this point, it is clear that the supply of vet service hours will not grow as quickly as the numbers graduating. This is because new entrants are balanced by those reducing hours or exiting practice to care for children, in addition to vets who are retiring or exiting practice for other reasons. What we cannot establish from current data is how large this effect will be.

Conclusions

There is insufficient evidence to establish whether the overall supply of vets falls short of, meets or exceed demand either for companion or production animal services. While there are indications that there might be a degree of oversupply, whether this will increase and by how much cannot be determined from available data.

Recommendations

1. The profession seeks the resources to develop and maintain a valid dynamic model of the number and composition (by length of service or age group, gender, location and type of practice) of vets in active practice, and of a valid basis for forecasting demand for both companion animal and production animal services.

Impact of changes in workforce gender composition

NAB Health (2009) reported that:

- There were just 471 female vets in 1981 compared to 3,629 full-time equivalent (FTE) female vets in 2008 in a workforce of 7,849 vets
- Female vets made up 83% of the increase in the total number of vets between 2001 and 2006.

This report drew on work done by Access Economics which was commissioned in 2008 to review the size and economic contribution of the veterinary workforce.

The report forecast that there would be an equal number of male and female vets in practice by 2010, and that the FTE balance would be equal by 2013.

Despite the concern already canvassed about an oversupply of vets, some have argued that the change in gender composition of the total workforce could reduce the oversupply or even result in an undersupply, especially in some areas of practice. The basis for the argument is that women practitioners are likely to reduce their hours of work or leave practice at least for some years to have and care for children. The proportion of women in the profession is expected to continue to grow as older, largely male vets retire and are replaced by largely female new graduates.

To assess the evidence on which these concerns are based, we review first the data on the gender composition of new graduates, and then the evidence on the gender composition of those in practice or who at least hold registration.

New graduates

One source of data on gender composition shows that the gender makeup of new graduates has been changing. It was:

- around equal male/female in 1989 and 1990 (see Figure 2)
- around 64% female 1997 to 1999 (see Figure 2)

The data series from DEEWR on which Figure 2 is based stopped in 2000 and only gave gender breakdowns for 1989-1999. DEEWR data on numbers graduating to register as vets are available for 2007-2011 and have also been plotted in Figure 2. These DEEWR figures do not give a breakdown by gender.

The value for 2007 appears likely to be incorrect, possibly due to incomplete enumeration in the first year that the collection of data on those graduating to register as vets was resumed.

As a substitute, results on the gender composition of the sample responding to the Graduate Careers Survey for 2011 are shown. This found that 87% of the 211 survey respondents graduating as vets were female. This might over-estimate the

percentage of graduates who are female, as females are generally more likely than males to respond to invitations to do a survey. However, it appears reasonable to conclude that there has been a continuing and substantial shift in the gender composition of new graduates, with around 80% now being female.

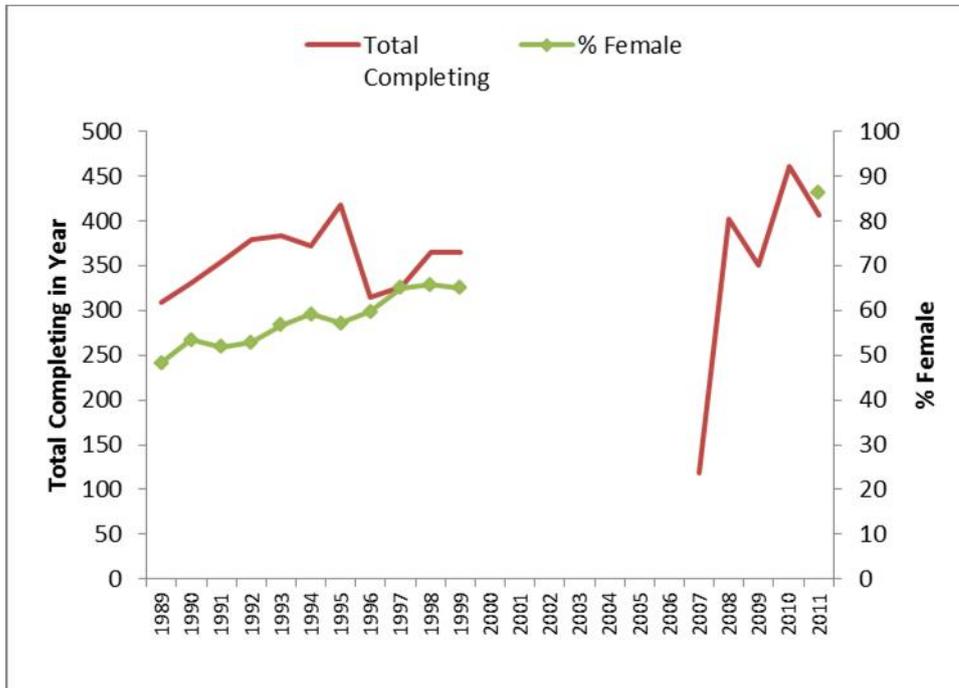


Figure 2 Australian students completing and percent female, 1989 to 2011

DEEWR and DIISTR data. The low number in 2007 appears to be an anomaly, perhaps due to this being the first year that the new data series was published.

Further data on the gender composition of new entrants was obtained directly from the universities for the period from 1995 on.

The reported numbers showed that the percentage of women among graduates has been increasing from 60-61% in 1995 and 1996 to a peak of 81%-83% in 2008 and 2009. For the next three years, the percentage ranged from 75-76%, and is expected in 2013 to again reach 81%, and to remain above 70% for the foreseeable future.

Veterinary workforce

The gender makeup of the profession has also been changing, although different sources give somewhat different estimates.

The November 2011 Labour Force Survey reported that 60% of vets were female.

The DEEWR Labour Market Update – Veterinarian, April 2010 estimated that 55% were female.

More detailed evidence of the change in gender composition can be found in the November 2011 ABS Labour Force Survey. Compared to the survey for November 2006, there has been (see Figure 3):

- An overall increase in the numbers employed (by about 1,600)
- A small decrease in the total number of males working as vets since 2006 (200), with a shift from part-time (down by ~500) to full-time employment (rose ~300)
- A much larger increase in the number of females working full-time (~1,000) and part-time (~700).

Note that all of these estimates are rounded to the nearest 100.

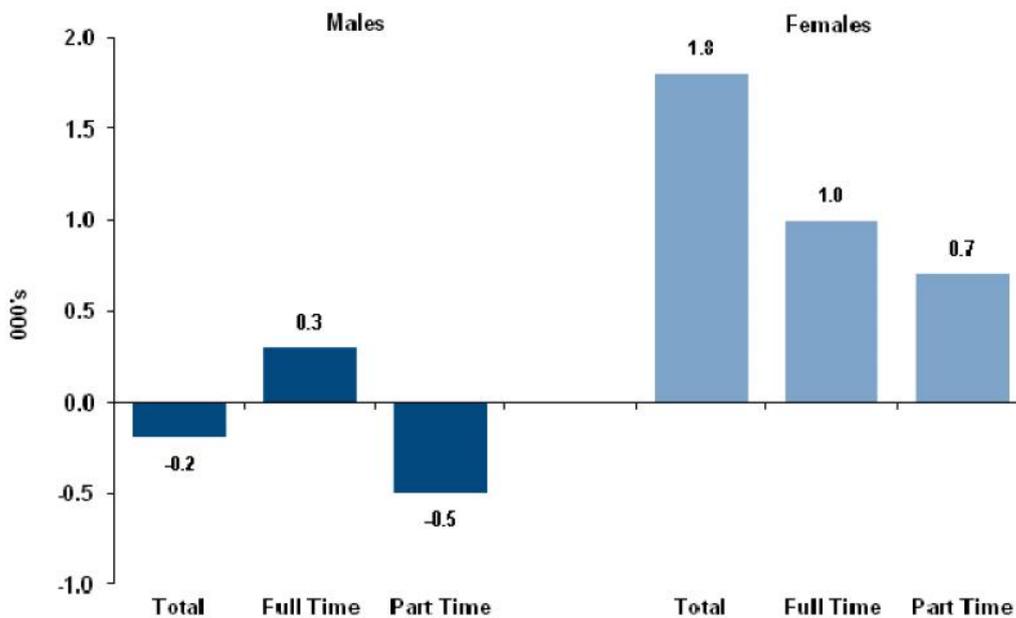


Figure 3 Employment growth 2006 to 2011 by gender ('000s, rounded to nearest 100)

Australian Government (2012) Downloaded from

<http://joboutlook.gov.au/pages/occupation.aspx?search=alpha&tab=stats&cluster=&code=2347>

These shifts reflect the balance between exits (expected to be largely by older, largely male vets retiring) and entries (largely new graduates taking up positions with an increasing proportion being female). Over time the proportion of those currently working who are female will increase and approach the proportion of females among new graduates. A possible limitation on this would be that women might not be as likely as men to work full-time and might take extended periods out of the workforce when their children are young.

A survey of members distributed by the AVA in April 2000 with the AVJ Jobs Supplement (Heath and Niethe, 2000) obtained a sample of 1,367 respondents with

33% female. The report notes that some discarded the Supplement without seeing the survey invitation. Given the marked discrepancy between the percentage of female vets in this 2000 sample and the estimate of the percent of female vets from the ABS Labour Force Survey, it appears likely the female vets were more likely than male vets to have not seen or for some other reason to have not responded to the survey.

By contrast a survey of the profession conducted in the 1999-2000 financial year by the ABS (2001) stated that 41% of the 4,778 practising vets (4,513 in general practice and 265 in specialist practice) were female. As would be expected, this is well below the percentage of new graduates who were female. This gap reflects the slow replacement of a largely male profession (as it was in the 1960s) by the increasing number of females among new entrants.

If we take the ABS survey as a benchmark, then in 11 years the practising workforce has moved from 41% female to 60% female while new graduates have moved from being around 65% female to 75-80% female.

The effect of the documented changes in the gender composition of new entrants on the composition of the total workforce is illustrated by data from the NSW Registration Board that breaks down the gender of registered vets by their age group (see Figure 4).

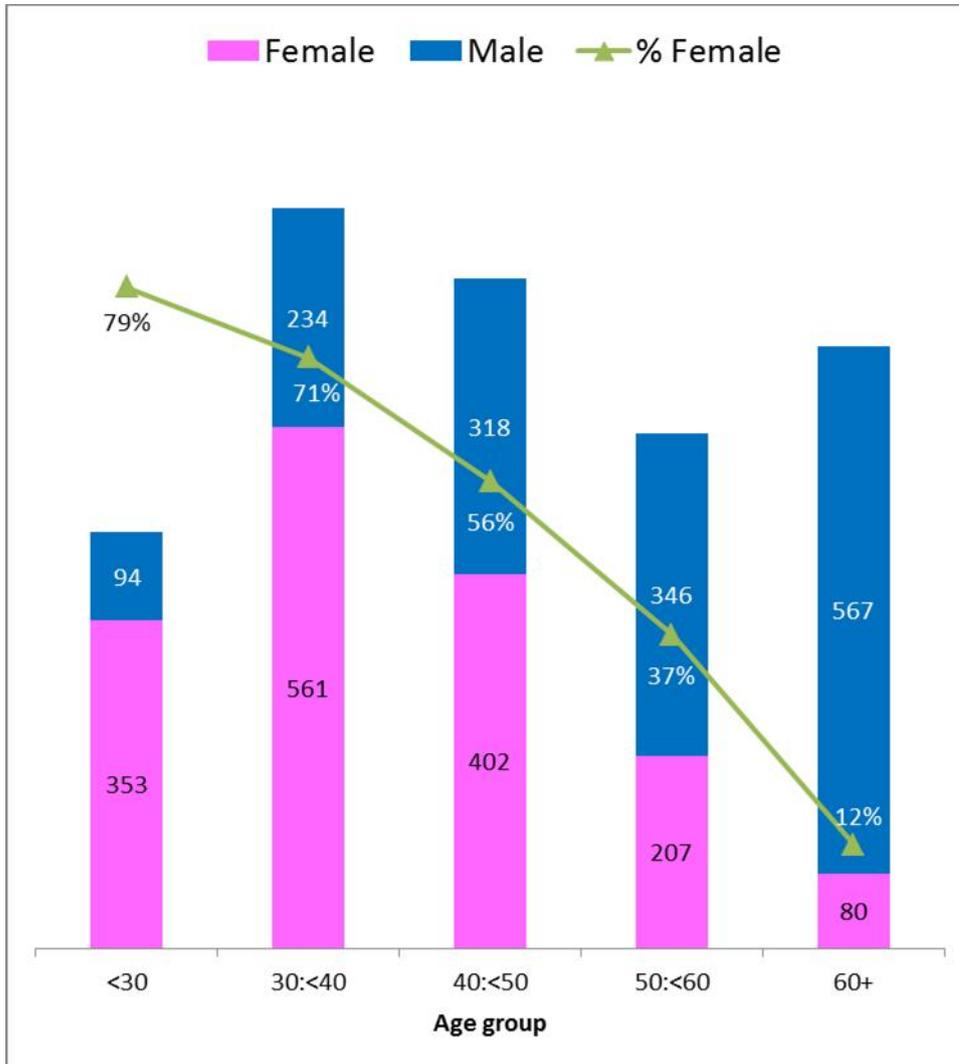


Figure 4 Gender mix by age group of vets registered in NSW in 2012
 From: *Veterinary Practitioners Board of NSW Annual Report, 2012, page 26*

The effect of the shifting gender mix of new entrants is very clear, with those aged under 30 being 79% female (matching the percentage of women among new graduates), while only 12% of those aged 60 or more are women.

In the total population of NSW registered vets for 2012, 51% were women. This will obviously increase as the older, mostly male vets, retire and more, mostly female, new entrants register.

The percentage of FTE women actually working might be somewhat lower than the percentage registered in the 30-39 and 40-49 year age cohorts if women who take time out or shift to part-time work to rear families mostly keep their registration. Despite this, it is likely that a substantial majority of vets will be women by 2022. As many of those registered in 2012 who were 60 or over might not be in active practice, the percentage of women among those actually working is probably already well above 50%.

Projecting changes over time

Assume that:

- in 10 years all those currently aged 60 or over have retired or are no longer registered
- those in each of the age ranges shown in Figure 4 simply move into the age bracket above that shown
- the new cohort aged under 30 is the same as shown in Figure 4

On these admittedly unrealistic assumptions, in 2022 58% of NSW registered vets would be female. This gives some sense of how long it might take for the percentage of female registered vets to reach 70%.

Applying the same assumptions, after another ten years, the percentage would reach 64% by 2032. If the intakes increased and remained around 80% female, then the balance would shift more quickly, but the acceleration would not be rapid.

This is a simple example of what can be done applying the logic of stock and flow models outlined later in this report, even with limited cross sectional data.

There is no reason to expect that the distribution by age group and gender would differ very much for Australia as a whole.

Impact of child rearing on supply

The change in gender composition contributes to concern about potential undersupply, particularly in rural production animal practice.

The first reason for this concern is the assumption that female vets will be more likely to spend part of their career not working or working part-time to handle child-rearing responsibilities. The second is the belief that female vets are (partly as a result of anticipating child care responsibilities) less interested in rural and production animal practice.

There is some evidence that confirms these grounds for concern. Specifically:

- DEEWR estimated that in 2010 25.6% of registered vets work part-time.
- ABS estimated that in November 2011, 33% of vets work part-time.
- However, the Graduate Careers Survey sample for those graduating from 1999 to 2011 found:
 - only 9% of the new graduates who returned the survey from the 2011 graduates were working part-time
 - there appeared to be no directional trend in data from this survey in the proportion working part-time (See Figure 6, Appendix 1)

- there appeared to be an increase in the proportion returning the survey that are female from mostly under 70% from 1999 to 2002, to around 80% from 2003 to 2011, consistent with the other data on the gender composition of new graduates.

It appears likely that most new graduates, male and female, commence work on a full-time basis and that some switch to part-time work at a later point in their career. The bulk of such shifts will probably be due to female vets moving to part-time employment to make time for child rearing. Heath (1998) found that five years after graduation, female vets were much more likely than males to be working part-time (27% against 2%) and to say they would like to be working part-time (47% against 10%). Raising children was given as an important reason for working part-time by 70% of those doing so. The effect of this on the pool of vets available for full-time practice will depend on the rate at which female vets enter the life stage where they have small children, the hours they are then willing to work, and for how long they remain unavailable for full-time practice. While we found evidence that some gender differences have faded out over time, women will probably continue to be more likely than men to shift to part-time work or withdraw from practice to undertake child rearing responsibilities.

A similar pattern is shown in a report on results from the ongoing annual survey of New Zealand vets renewing their practice certificates. In New Zealand, just over 40% of registered vets are female. There is little difference between male and female vets in the average hours worked for those aged 20-30 who would be within 10 years or less of graduation, but the average hours worked by women vets decreases sharply for those aged 30-35 and stays well below the average hours worked by male vets throughout the ages above 30. This will reflect a substantially larger proportion of women working part-time after the first few years of practice (see Veterinary Council of New Zealand, 2012, Figure 2, p4)

There is also evidence from Heath and Lanyon (1996) that women graduates were more likely than male graduates to start work in a capital city and there was a trend for females to be more likely than males to commence practice with small animals. However, more recent data suggests that such differences might no longer operate, perhaps because so many graduates are now female that to obtain work they have to consider other practice locations and types of work.

As already noted, Charles Sturt University reports that its women graduates are just as willing as the males to undertake mixed and production animal practice and to work in rural locations. Whether they will continue to do so once they have children, and whether even the male graduates will continue to do so remains to be seen. As Pratley and Abbot (2012b) remarked "it now remains to be seen if there is a higher than usual retention rate of these graduates in those rural practices in 5, 10 and 15 years."

As the supply of new male vets declines, this could reduce any oversupply of vets overall, and create a growing deficiency in vets willing to work in rural and especially production animal practice unless:

- (1) additional programs adopt admission policies similar to those implemented at Charles Sturt University, and

(2) the new vets from farming backgrounds prove less likely to “burn out” than those who entered production animal and mixed rural practice in the cohort followed by Heath (2007).

Conclusions

There is convincing evidence that:

- the proportion of women among new graduates has increased and will stabilise in the range from 70-85%
- the proportion of women among registered practitioners is increasing as older, mostly male practitioners, retire and younger, mostly female graduates register and enter practice.

The shift towards a profession where the large majority of practitioners will be women will be slowed by women vets in mid-career reducing hours of work or leaving active practice to have and rear children.

It is not possible from existing data to estimate the effect of mid-career withdrawal from practice by many women practitioners on the total supply of practitioners.

Recommendations

1. The profession seeks the resources to develop and maintain a valid dynamic model of the number and composition (by length of service or age group, gender, location and type of practice) of vets in active practice, and of a valid basis for forecasting demand for both companion animal and production animal services.
2. The model needs to enable calculations on the transition probabilities between full-time, part-time, and non-practice.

Workforce location, gender and type of work

The evidence

A paper by Heath et al (2006) compared the career choices of first year veterinary science students at Charles Sturt University and Sydney University. Combined with the results from earlier longitudinal studies of a cohort of graduates in Queensland (Heath, 2001a, 2001b, 2002), the studies confirmed that those with responsibility for more than five animals before commencing study and those who grew up on a farm that derived most of its income from livestock were much more likely to start work in a rural practice that served livestock and to continue to do so after five years. Although many in all segments who started working with livestock had dropped out of livestock practice after five years the same two segments were more likely to still be in mixed practice.

It has been suggested that as the profession becomes more female, it will become harder to fill and retain vets in rural practice and especially in production animal or mixed practice. The NSW data on registered vets allows calculation of a breakdown by age group, gender and location.

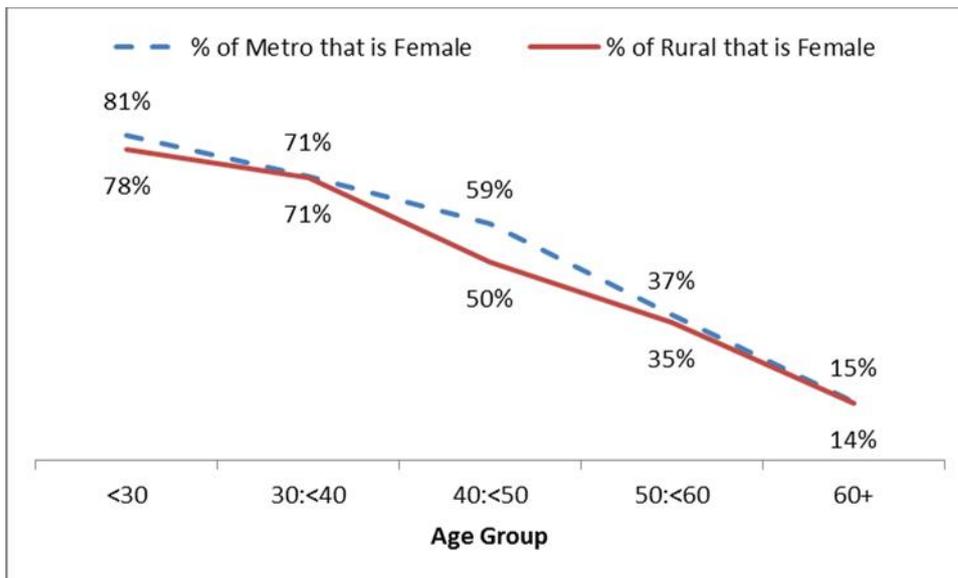


Figure 5 Percentage of female registered vets in NSW 2012 by age group and location
From: *Veterinary Practitioners Board of NSW Annual Report, 2012*

The percentage of women among rural vets is consistently lower than the percentage of women among metro vets registered in NSW except for those aged 30-39. However, the only substantial difference is evident for those aged 40-49 with 59% of metro vets and 50% of rural vets being female. Even this difference is not large.

The data used here might not reveal the full impact of gender on the numbers available to practice. The reliance here on total registrations might obscure real differences by gender in actual practice. There might be a greater difference in the percentage undertaking a substantial amount of production animal work and in the

percentage of registered women working part-time or keeping their registration but not working.

The rate of drop out from livestock practice even among those disposed to take up such work on graduation is an issue that appears likely to require attention. Heath (2007) reported a follow up after 15 years of a cohort of vets graduating from the University of Queensland. While a majority (61%) started work in mixed practice, more than half had decided to move to other work after two years, and after five years only 26% still worked in mixed practice. By 15 years this had dropped to 19%, with about half of these working with horses rather than with production animals. Thus it appears that the prime difficulty in maintaining numbers in mixed practice is not that beginning vets avoid such work, but that it is difficult to keep vets in such practices.

Conclusions

It is reasonable to conclude that the effective full-time number of vets in practice will fall further below the numbers registered as the percentage of women among registered vets increases and the women enter the stage in their careers when many shift to part-time work or cease work.

Whether Heath's research provides a valid basis for estimating the size of this effect is uncertain, as the willingness to remain in active practice might change over time and Heath's data are now around ten years old.

Whether the reduced participation by the increased proportion of women vets will be sufficient to outweigh the overall increase in the numbers graduating cannot be decided without a good dynamic model of the flows into and out of clinical practice, segmented by length of practice or age group, and gender.

Recommendations

1. The profession seeks the resources to develop and maintain a valid dynamic model of the number and composition (by length of service or age group, gender, location and type of practice) of vets in active practice, and of a valid basis for forecasting demand for both companion animal and production animal services.
2. The model needs to enable calculations on the transition probabilities between full-time, part-time, and non-practice.
3. The model needs to enable forecasts and tests of sensitivity for both the total supply of vets and for the supply of vets willing to work in rural practice that includes or mainly focusses on production animals.

Viability of the private practice model

Concerns have been expressed about the future viability of the private practice model for delivery of veterinary services. These concerns include:

- the growing supply of individuals qualified to practice increasing competition, reducing average fee income, and rendering the business model unviable
- the potential for contracting demand due to reduction in the companion animal population
- the continued impact on practice revenue of the loss of monopoly over supply of medication and vaccines
- the high and escalating cost of equipping a practice while faced with little increase and possibly reductions in income.

The evidence

To test the seriousness of the first concern (effects of increased supply) requires, at a minimum, being able to develop scenarios for the future size and composition of the workforce against assumptions about the trends in demand for different types of service (companion animal, production animal).

To test the seriousness of the second concern requires development of a model for forecasting demand, including willingness to pay for different types of service by different segments of the market (companion animal owners, horse owners, different livestock segments).

Accepting that the Australian Companion Animals Council (ACAC) estimates of the size of the companion animal population are valid, if the declining trends continue and the number of vets increases further, there is real potential for the supply of vets to exceed the demand for services covering the companion animal population. This would threaten the viability of most veterinary practices.

The third concern has been somewhat mitigated by the development of payment to rural practices for surveillance and emergency services. However, this does not assist metropolitan or small animal practices which will also have lost income from the increased competition.

The costs of equipping a practice against the returns that can be obtained from owning or maintaining a practice require detailed examination of practice incomes, operating costs and the possibilities for financing capital expenditure. The issue has been identified in several consultations with practice owners but it appears little has been done to quantify the impact. There is anecdotal evidence that it is becoming more difficult for practitioners to sell practices on retirement, and that this is particularly difficult in rural production animal and mixed practices. There appear to be almost no relevant data to test how seriously this issue threatens the future viability of the private practice model for delivery of different types of veterinary services.

Policy responses

Frawley (2003) concluded that there was a need to increase the capacity to provide herd management and herd improvement consulting work to supplement clinical work in country areas if supply of services for production animals was to remain financially viable. Frawley also found that there was some reluctance among farmers to use vets and a lack of awareness among farmers of the potential contribution vets could make to herd health and productivity. He provided some evidence of greater acceptance of the additional services among intensive farming sectors, especially among dairy farms. The AVA (n.d., p1) reported that there has been a “rapid increase in the dairy industry (which has a high demand for veterinarians) in the last 20 years”. If this is correct, this avenue for improving the financial viability of rural production animal practice requires changes in how vets approach their market, and also effective marketing to raise the level of willingness to pay for such services among farmers. Lessons for how to achieve this could be drawn from the apparent success with the dairy sector.

The Australian Government has implemented a scheme to remunerate practices for providing disease monitoring services (Neumann, 2007). A similar scheme has been introduced in New Zealand. However, no data were found on the number participating in Australia or the effect on the total income of the practices involved.

A New Zealand discussion of their scheme did provide some estimates of the effect on practice incomes which suggested that this could make a useful contribution to reducing the loss of income due to loss of monopoly rights over supply of prescription medicines (Sanderson and Arcus, 2007).

The introduction of payment for surveillance services and for responding to disease outbreaks mitigates both a critical threat to the value of rural livestock production, and the impact of these changes in income potential. Whether this is sufficient to ensure the participating practices continue to provide production animal services remains to be seen. It is probably too early to decide the ratio between the number of practices that are currently funded for such work and the total number of practices required to ensure the health and productivity of production herds.

There does not appear, at this stage, to be any evidence of the effects of the policy changes on the viability of practices beyond the indications reported by Sanderson and Arcus (2007) for New Zealand.

Conclusions

While the evidence is limited, there appear to be valid grounds for concern about the continued financial viability of practices under current practice models and market conditions.

To obtain stronger evidence would require collection of data on practice costs and incomes that would provide quantitative evidence to test the plausible assertions that have been made about the financial pressures on practices.

If a representative sample of practices willing to provide such data to an independent “third party” can be recruited and sustained, an annual online collection of data could be set up at relatively low operating cost.

A system like this is used by the Association of Market and Social Research Organisations to track total revenues by the type of study carried out for a number of the larger suppliers, that covers a substantial part of total income in the industry. Data collection and reporting is maintained for a relatively low cost. While this system does not obtain data on costs or margins, and it is possible in this industry to obtain data on a large percentage of total industry revenue from a relatively small group of suppliers, it does provide an example of how enlightened self interest enables collection of very useful data about an industry. The payoff for those who take part is access to the overall data trends.

Recommendations

1. The AVA seek the resources to obtain annual data from a cross-section of practices on income broken down by the income generating activity, and costs broken down by the activity generating the costs.
2. The data be used to assess trends in the financial viability of current practices.
3. Policy makers consider what action might be taken to encourage financially sustainable demand for veterinary services for production animal herds that focus on herd health and productivity in addition to the clinical treatment of individual animals.

Data availability and forecasting

There are two broad categories of approach to forecasting a workforce:

- Time series analysis.
- Dynamic systems stock and flow simulation models.

Both depend on past history to develop forecasts of the future.

It must be recognised that any point forecast is more likely to be wrong than right. The further ahead a statistical forecast is projected, the wider the expected range of error, even if the forecasts have no source of systematic bias.

Forecasting models are much better used to test the sensitivity of the size of a workforce to changes in assumptions, than to arrive at definite predictions.

Forecasting of the health workforce has moved toward using stock and flow models rather than time series forecasts. Time series methods are, however, still used to forecast demand (Masnick and McDonald, 2010).

Forecasting supply: time series analysis

This approach can be applied when there is a “sufficiently long” series of observations that display a clear and identifiable pattern to which a mathematical model can be fitted. Common models are simple linear, exponential, or allow for cyclical variation around a linear or exponential trend. Other functions can be assumed and the “goodness of fit” tested. Forecasts then project ahead using the function fitted to the available data.

This approach is probably not a good one for simulating the changes in the population of vets as the inflows (new graduates taking clinical jobs) have changed sharply with the increase in the number of training programs. The change in gender balance will also tend to invalidate the assumptions needed for a valid time series model.

Forecasting supply: dynamic systems stock and flow models

This approach treats the size of a workforce, or of a set of segments within a workforce, as stocks subject to inflows and outflows. To develop a model requires specification of:

- the stock segments and “starting” stock numbers
- the inflow and outflow paths for each stock
- determining the “operators” or functions that govern the rates of each flow (for past years) and deciding how these operators might change.

Appendix 2 briefly outlines how a stock and flow system analysis can be displayed graphically.

Stocks that would be useful to model include:

- The number of male practitioners in:
 - companion animal practice
 - mixed practice or production animal practice.
- The number of female practitioners in:
 - companion animal practice
 - mixed practice or production animal practice.
- The number of male practitioners in:
 - metropolitan practice, further broken down by State
 - rural practice, further broken down by State.
- The number of female practitioners in:
 - metropolitan practice, further broken down by State
 - rural practice, further broken down by State.

Flows for a model of the veterinary workforce would include:

- new graduates entering work in metro area companion animal practices
- established vets moving from other types of practice into metro area companion animal practices
- established vets moving to other types of practice
- established vets moving to non-clinical veterinary work
- established vets moving to other occupations, and
- established vets retiring.

Ideally both the stocks and flows would be further segmented into full-time and part-time workers and each stock would ideally include a distribution by length of time in that stock (as this is likely to affect the probability of exit to other stocks or from the profession).

Good forecasting models attempt to model both supply and demand using dynamic system stock and flow models. Software to develop such models is readily available. What is lacking is the critical data and a good analysis of the “stocks”.

Put another way, transition probabilities and current “stock size” are needed for entry to different segments, movements between segments and exits from profession, segmented by:

- type of practice (companion animal, mixed or production animal)
- location (state or territory, urban or rural)
- hours worked
- gender (as probabilities will vary with gender)
- age or length of career
- possibly status (practice owner, practice partner, employee).

So far, only the work of Heath (2008a) has followed a cohort of graduates, and this was a single cohort from one university. Consequently, transition probabilities (entry and exit from clinical practice, change of practice type, change of working hours) are not known. Even estimates of current “stocks” are very limited and different sources of data give somewhat different results.

To supplement the available data, every veterinary science school was asked to supply data on numbers of Australian residents graduating from 1995 to 2011, and any forecasts available for 2012 to 2028. The request also sought to have these totals broken down by:

- gender
- whether the graduate came from a capital city or rural area
- whether the graduate came from the same state as the school or from another state.

Such data would greatly assist in defining what data can be obtained at low cost about some of the critical inflows.

All have provided data broken down by the gender of the graduating student.

At a consultation with Deans, it was pointed out that providing additional breakdowns would be very difficult unless an agreed, consistent set of data items is developed that all universities commit to collecting. To extract data from existing student records is a time consuming task, and most were only able to provide breakdowns by gender. Some were able to exclude overseas students and some were not.

Without estimates of transition probabilities this inflow data is of limited value. The best estimates require longitudinal data from the current stock qualified to practice (including those not engaged in clinical practice at present).

Some of the required transition probabilities could be estimated from cross sectional surveys taken at a point in time that ask about prior behaviour. An example of this using NSW data on registrations broken down by age group and gender has already been given.

Great care is needed in interpreting such data. In any stock, those who have spent longer in that stock will be over-represented compared to the proportion that will remain for a longer period among those entering the stock. Also, to gain a full picture of flows into and out of one stock, data are required for the other stocks to pick up all those who have exited, when they entered and when they left. Even with careful cohort analysis (segmenting stocks by the length of time since entry) it is very easy to arrive at seriously biased estimates of the distribution of future length of stay among those entering the stock.

While these cautions might seem to make the approach more complex than is feasible, an incremental approach can be adopted that starts with some very broadly defined stocks and tests the sensitivity of the those stocks to different assumptions about flows. Over time as experience accumulates, the models can be calibrated to the actual data and elaborated to be more accurate.

An example of this relatively simple approach can be found in the recent report of the veterinary medicine workforce in the USA (see Committee to Assess the Current and Future Workforce Needs in Veterinary Medicine, 2012). This analysed data on the age distribution of practitioners and made the assumptions that metro practitioners would have careers of 35 years, while rural, mixed practice and production animal practitioners would have a career of 30 years. Data on the percentage of vets in a cross sectional survey that had commenced practice in rural production practice in each previous year were analysed to establish a likely stable retention rate. This suggested that about 50% of those who started in such practice would still be involved after 4-5 years, and that this retention rate stabilised at around that point. Given the known recent numbers entering such practice, it was possible to estimate how many vets were entering and likely to remain in such work, compared to the expected exits due to retirement, given the assumptions made. It was then very clear that new entrants were not sufficient (given the attrition rate) to replace those likely to retire.

We have already given a very simple example using data on the age and gender of registered vets in NSW and data-based assumptions about the gender composition of new entrants to arrive at estimates of the percentage of NSW registered vets who will be female in 2022 and 2032. While over-simplified, the projections give a sense of how slowly the gender mix of the registered profession will change even with around 80% of new entrants being female, and up to 80% of those retiring being male.

These calculations could be taken further by making some assumptions about whether and when male and female practitioners will move to part-time practice or cease work, and when they might return to full-time practice or to at least part-time practice, and “ageing” the population in ten year steps (so those currently under 30 move into the 30-39 age range, and so on). Assumptions would also be needed about the proportion of those registered aged 60 or more who are still practising, and how this will change over each ten year period. It would then be possible to arrive at some estimates of the size and composition of the workforce in 10 and in 20 years, given different assumptions about the numbers commencing active practice, and retention in the profession.

Use of an appropriate computer package designed for such modelling would make the process much easier, but it could be done even with use of a spreadsheet.

Similar modelling has already been done for the Australian pharmacists' profession and produced some simple dashboards that allow different segments to be modelled and projected. There could be value in discussing with the pharmacist's professional body the value gained from these models, and what drawbacks have been experienced.

Forecasting demand

Demand might be forecast from data on characteristics of target populations – companion animals and types of livestock, numbers, ages, and incidence of conditions requiring treatment needed, costs and affordability of services. This would parallel emerging approaches to forecasting demand for human health services, (Committee to Assess the Current and Future Workforce Needs in Veterinary Medicine, 2012; Masnick and McDonnell, 2010) but data availability will be even more of an issue.

Conclusions

There are numerous major gaps in the data required to develop a valid and useful model of the size and composition of the veterinary workforce.

What data and what type of model would be required to forecast demand for veterinary services is more difficult to establish. There might be a basis for estimating changes in the balance between demand and supply for companion animal and for production animal services.

Recommendations

1. The AVA advocates coordinated national collection of data on:
 - the annual cohorts entering the profession (from universities)
 - those currently in active practice (through a national survey associated with annual registration)
 - those exiting the profession either temporarily or permanently (by linking results of successive annual surveys)
 - the size of the companion animal and production animal populations.
2. Data collected by veterinary schools on students entering and graduating from their programs be standardised to facilitate consistent collection, reporting and comparison of data on the composition of the cohorts entering the profession.
3. An annual survey of the total profession be implemented with completion of the survey being tied to re-registration following the successful model

implemented in New Zealand. For those in practice for more than one year, the data should include:

- gender
- age
- when they commenced practice
- any periods working only part-time or not working in clinical practice
- whether working in metro or other areas
- current hours worked by type of work (companion animal, production animal and possibly horses, herd health and productivity work, other work).

The data for those entering the profession should include:

- gender
- age
- whether grew up in a rural or metro location
- whether Australian residents or from overseas
- whether seeking employment in clinical practice as a vet
- whether seeking full-time or part-time work
- whether seeking to work in metro or country locations
- whether willing to work in production animal practice.

It would also be useful to have data for those who have left clinical practice in the previous year on:

- gender
- age
- reason for leaving
- whether planning to return to clinical practice, if so when and whether planning to do so full-time or part-time and in what type of practice and where
- whether planning to change to a different type of practice, or to leave clinical practice in the coming year
- whether planning to reduce or increase hours of work in the coming year.

While some of the data on those leaving practice can be obtained by linking successive annual surveys, some would require a specific survey of practitioners who do not renew registration.

Effective processes to increase the response rate to the annual surveys should be implemented.

Analysis of the data by year of entry into practice should be undertaken to provide a useful picture of the likely rate of loss by retirement, and of the retention in different types of clinical practice of new entrants.

Policy interventions and their effects

A range of policy interventions have been suggested and some have been implemented in Australia or in other similar economies, including the USA, Canada New Zealand and the UK.

Policy initiatives that have been discussed include:

- Schemes that subsidise the cost of training and bond subsidised graduates to work in rural or large animal practice or “forgive” training debts for those who undertake such work for a required period (USA).
- Schemes that subsidise practices to provide internships for new graduates to work in rural or large animal practice (NZ).
- Policies to provide additional support for graduates to make the transition to practice and especially target such assistance to those undertaking rural practice that provide production animal services.
- Policies designed to increase the proportion of students entering courses who come from rural areas and/or have already had responsibility for management of animals.
- Policies to encourage (companion) animal owners to take up insurance.
- Policies to provide funds to practices to undertake work that goes beyond direct clinical practice including:
 - monitoring of herd health and of disease outbreaks
 - herd improvement
 - extending veterinary services to new species such as fish stocks.

Evidence available about the effectiveness of any of these interventions appears very limited.

The UK and Australia have some interesting initiatives for providing support to new graduates, but these do not appear to target the additional support needs that research has found among those entering rural production animal practice.

Recommendations

1. The AVA develop a case to convince policy makers of the need to resource development of workforce and demand models for animal health services paralleling the work already underway for human health services.

Appendix 1: Trends in work status and gender of recent graduates

The table below shows the percentages reporting that they were working full-time, part-time or seeking work of those graduates responding to the survey who were available for work. The survey appears to assume that any working part-time are seeking full-time work. Data are drawn from annual reports of the Graduate Careers Survey.

The percentage female estimate is based on those working full-time who gave data on their starting salary. The instability of the data might in part be due to the smaller sample (generally around 70-80) for which gender counts were reported. The percentage female might over-estimate the true percentage because females are usually more willing than males to complete surveys and thus might be over-represented.

Figure 6: Trends in new graduates working full-time, part-time or not working as vets and percent of new graduates who are female

	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
F/T	95%	94%	92%	97%	93%	98%	94%	95%	94%	92%	92%	91%	88%
P/T	2%	3%	1%	1%	4%	2%	2%	5%	4%	4%	3%	4%	4%
Not working	4%	2%	7%	3%	3%	0%	4%	1%	2%	5%	5%	6%	7%
Female*	68%	69%	41%	64%	77%	78%	79%	74%	77%	64%	88%	NA	78%

* As a percentage of those giving a starting salary

No trend is apparent in the percentage working full-time or part-time or seeking work.

In only one year were there more males than females (2001) responding to the question on starting salary. However, there appears to have been an increase in the percentage of female respondents to this question in 2003 - previously between 41% and 68%, subsequently between 64% and 88%, with only one year since 2003 below 74% female.

Appendix 2: More about stock and flow models

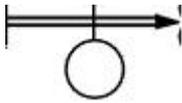
Common symbols used in a diagram to analyse stocks and flows for a population or set of population segments are shown below.



Common symbol for a “cloud” – a source of input or destination for output that is outside the boundary of the system



A rectangular box commonly represents a stock such as a count of people



An arrow with a symbol representing a tap commonly stands for a flow into or out of a stock. In modelling the rate of flow over time has to be specified



Sometimes called an “operator”, this symbol stand for a determinant of the rate of a flow, or of the form of another operator

Figure 7 Common stock and flow system diagrammatic symbols

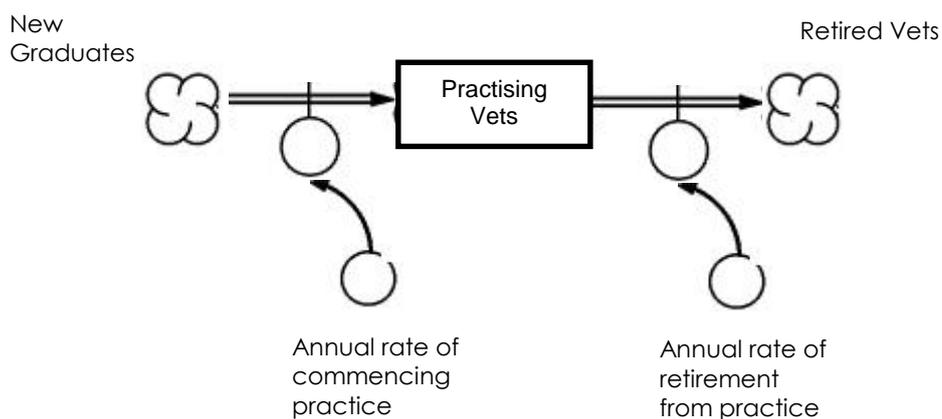


Figure 8 Oversimplified model of stock of practising vets

Given a starting year and starting stock and annual rates for the two operators, this model can forecast the stock of practising vets year by year. It is grossly over-

simplified, but is the basis for building more complex models with segmented stocks and flows between them as well as from outside and to outside the system.

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