2018 AVMA & AAVMC Report on

THE MARKET FOR VETERINARY EDUCATION

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Veterinary Economics Division
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SUMMARY

As the preceding Table of Contents suggests, this latest look by the AVMA Economics Division at the market for veterinary education explores topics concerning the supply of and demand for "seats" in schools of veterinary medicine, as well as looks at the group of students that recently occupied those seats.

Through a collaboration with the Association of American Veterinary Medical Colleges (AAVMC), AVMA gathers applicant information from the Veterinary Medical College Application System (VMCAS) and from the veterinary colleges data on tuition, fees and estimated living expenses.

Trends associated with the careers and finances of new veterinarians are examined in the *2018 AVMA & AAVMC Report on the Market for Veterinary Education*, with a critical focus on the debt situation that figures so prominently in scholastic fields across our society, and which has certainly been an acute concern within the veterinary profession.

Reaching back into the "supply chain" that represents the process by which aspiring veterinarians are transformed into practicing professionals, the analysis rendered begins with observations of the applicant pool – those seeking admittance to the AVMA-accredited domestic and foreign schools of veterinary medicine. Looking at the pipeline to the schools offers insight into how the supply is being developed – in response to perceived demand, or otherwise.

Apparently, that pipeline has become pretty well populated: The report's analysis of applicant volumes finds the number of applicants in 2017 and 2018 on an upswing, with 7,076 applicants in 2017, and 7,507 applicants vying for a 2018 seat – the highest number of applicants in more than 40 years, and a continuation of an ascending trend since what 2015 figures reflected.

And, finds the report, the quality of the applicant pool remains robust: GPA or GRE scores and the North American Veterinary License Exam pass rate levels have been steady in recent years – with a constant pre-vet GPA of 3.6 prevailing.

HOW MUCH?

In working to understand the demand for a veterinary education, the AVMA Economics Division taps the VMCAS in surveying veterinary college applicants to gauge what they are willing to pay for their veterinary education: An aggregation of responses offers answers to questions about the demand for veterinary education, including how the demand is affected by the price of such an education.

Although in 2014 more than half of applicants were willing to pay up to $150,000 for a veterinary education, in 2015 and 2016, 37.1 percent and 40.2 percent of applicants, respectively, were willing to go to that level. New data reveal that in 2017 only slightly more than a quarter (27 percent) of applicants were willing to do so.

Analysis finds the applicant-to-seat ratio over four years showing a modest increase, from 1.6 in 2015 to 1.8 for 2018 applicants. In 2016 6,667 applicants vied for 4,039 available seats, yielding an applicant-to-seat ratio of 1.65; in 2017 there were 7,076 applicants and 4,126 available seats, producing a 1.72 applicant-to-seat ratio. In 2017, there were 7,507 applicants seeking some 4,200 seats for the Fall 2018 semester, equating to an applicant-to-seat ratio of 1.78.

The survey data finds that what 2017 applicants (2021 graduates) indicated they were willing to pay for a seat at a veterinary college is much less that the actual cost of the seats. And debt levels suggest that there is a disconnect between what applicants report as their willingness to pay and what they end up paying.

Currently, it is estimated that there are slightly more than 4,000 veterinary college seats per year available to U.S. students. U.S. graduates in 2017 encountered tuition and fees ranging from just over $79,000 to more than $300,000 for four years of matriculation through the DVM program. The most affordable seats? Those at Purdue available on a discounted tuition basis. Students paying non-discount tuition rates at The Ohio State University saw the priciest seats.

AFTER GRADUATION

The number of new veterinarians finding post-graduate opportunities has been steadily increasing since 2012, with the number of students in 2017 either finding full-time employment or securing continuing education opportunities, reaching its highest point following the 2007-2009 financial crisis.

The percentage of the 2017 graduating class finding full-time employment or receiving offers to pursue post-graduate education was 93.8 percent. While, however, this is the highest

rate for the period analyzed, it is not significantly different from 2016, which registered 93.1 percent. While the recession had a direct impact on the number of students securing post-employment plans, concludes the report, the economy has been regaining ground.

Of significance, the percent of graduates receiving some type of income opportunity is steadily increasing even though the number of graduates is simultaneously increasing over the period. The number of new veterinarians finding full-time employment jumped from 48.9 percent in 2015 to 54.9 percent in 2016, and to 56.1 percent in 2017, while the number of new veterinarians not finding employment or receiving an invitation to pursue continuing education dropped from 6.9 percent in 2016 to 6.3 percent in 2017.

The majority of new veterinarians continue to report finding full-time employment in the companion animal exclusive sector. New entrants into food animal, companion animal predominant, mixed practice and equine practice have remained nearly steady.

FINANCIAL REWARDS

From 2001 through 2017, the mean starting salary for new graduates increased from slightly less than $40,000 to more than $60,000. While these numbers are inclusive of those finding full-time employment along with those pursuing internships, residencies and advanced education, the climb in salaries has not been steady across all sectors and opportunities.

As previously reported, private-practice veterinarians working full-time have consistently been the highest – compensated group among the class since 2010, with veterinarians in public practice trailing closely. Since 2009, private practice has had the highest starting salaries, though before the 2007-2009 financial crisis salaries in public practice were competitive with these.

Numerous factors, outside of the economy, affect starting salaries, with variances attributed to the number of new veterinarians pursuing internships, the change in the gender distribution among new veterinarians, the change in the distribution of the practice type new veterinarians pursue, and the result of changing one's employment location. The report analysis, for example, indicates that on average new veterinarians entering equine practice will receive a starting salary that is about $19,000 less than new veterinarians going into a companion animal exclusive practice, who make over $35,000 more than new veterinarians entering internships.

DEBT FOR THE DEGREE

The mean debt of a new veterinarian has increased by an average of $5,078 each year for nearly two decades now. Considering only the veterinarians with non-zero debt, the mean debt has increased by an average of $6,219 each year. The largest factor noted in the increasing debt is the cost of education.

DVM debt incurred by new veterinarians continued to vary by post-graduation plans. Over the period 2001 through 2017, new veterinarians finding employment in public practice consistently had the lowest debt load. Within the 2017 class, of those pursuing public practice, 68 percent had debt between $12,277 and $207,050; 68 percent incurred debt between $37,000 and $216,000 in 2016, and within the 2015 class, 68 percent incurred DVM debt between $35,000 and $198,000.

For the 2017 graduating class, within private practice, two-thirds of graduates had debt between $48,000 and $321,000. Comparatively, 68 percent of graduates within private practice had a debt load between $54,500 and $232,000 in 2016, while 68 percent of the 2015 graduating class within private practice had a debt load between $50,000 and $222,500.

While the number of students with no debt remained relatively constant from 2001 through 2015, with an increasing class size, the proportion has been declining. And, although a decrease in the mean DVM debt was seen in 2017, the growth rate of DVM debt in each veterinary sector has continued to outstrip the growth rate of new veterinarian starting salaries. Interestingly, the real weighted debt-to-income ratio in 2017 is 1.86, down from 2.00 in 2016, in part attributable to more graduates reporting having zero debt, coupled with an increase in starting salaries.

INTRODUCTION

This report, the latest entry on the subject in what has been a series of annual veterinary economic market reports, provides updates on the market for veterinary education – the first market in the supply chain of the veterinary service industry. An installment that is now a fourth iteration, this report presents updates on the debt and income of new veterinarians, along with information on veterinary college applicants, a breakdown of tuition, fees, living expenses by veterinary college and year, debt and income levels of new veterinarians, demand for and supply of seats and important key performance indicator (KPI), the debt-to-income ratio (DIR).

New to this report is the inclusion of debt and income data on U.S. graduates of foreign veterinary colleges. At present, it is estimated that 19 percent of U.S. citizens enrolled in veterinary college are enrolled at institutions outside the United States and this number has been on the increase. As a result, it is critical to analyze that market, as those returning to the United States to practice will certainly impact the domestic economy.

Also continuing last year's approach to analyzing the market for veterinary education, this report engages the Association of American Veterinary Medical Colleges to produce a joint publication. Through this collaboration, we gather applicant information from the Veterinary Medical College Application System and data on tuition, fees and estimated living expenses is obtained from the veterinary colleges. The primary goal of this partnership is to provide consistent data reporting across multiple channels as well as provide convenient access to data in a single location.

As noted in previous reports, in addition to VMCAS and AAVMC the source of much of this data is AVMA's annual, "senior survey." The senior survey continues to be distributed to graduating veterinary students, weeks before graduation, gathering data on graduates' post-graduation plans, including job offers or continuing education prospects, location, debt levels, practice type and other relevant information. Although these data have been reported for more than a decade, this series of reports is the beginning of AVMA reporting trend data. Consequently, we produce weighted datasets along with an index to measure the economic impact on the market for new veterinarians while controlling for a changing demographic.

Controlling for a changing demographic became critical when analysis revealed that several demographic factors, unrelated to market forces, affected the starting salary of new veterinarians. Among these are gender, age, practice type, location of place of employment, debt load, and work hours per week. For instance, new female veterinarians earn significantly less than new male veterinarians, holding all else constant. As a result, a profession with an increasing female population may appear to have a decreasing mean salary or at least decreasing with respect to the rate of inflation. However, the real phenomenon is an increase in the number of lower-earning, female veterinarians entering the profession and deflating starting salaries, a trend independent of market conditions involving supply and demand for veterinary services. This is just one example, but many demographic factors affect starting salaries and need to be controlled for to obtain an unbiased picture of the market for new veterinarians. Unfortunately, due to poor response rates we were unable to create a comparable index for the graduates of foreign colleges.

Although this process is relatively new to the veterinary profession, it is standard in economics across the globe. This analytical method of controlling the characteristics of a good or bundle of goods to measure the market impact is a common practice in economics and is perhaps most recognized in the Consumer Price Index. This index holds steady the quantity of a specific number of goods (basket of goods) year to year to measure the change in price as an indicator of inflation. Holding constant the demographic characteristics of new veterinarians, (e.g., a constant percentage of a certain gender, practice type and distribution by region) allows for a valid examination of how the changing number of graduates affects the income they receive.

Also, extensively addressed in this report is the DIR, a KPI for the veterinary profession. The ratio does not only measure the performance of the market for new veterinarians but also allows us to quantify the success or impact of implemented programs and strategies. Tracking any KPI would be futile if not tracked accurately and consistently.

In this report we identify the factors that are associated with the variation in the DIR. As evidenced, controlling for these factors allows us to accurately measure the change in this KPI over time and potentially identify strategies that would have an optimal impact on reducing the debt.

We also thoroughly focus on the starting point of the supply side for the market for veterinary services, the market for education.

As noted in previous reports, the three vertically, related markets are the market for education, the market for veterinarians and the market for veterinary services. These markets, though separate, ideally communicate their interconnectedness through price signals. That is, the demand for a veterinary education should react to the prices paid to obtain a veterinarian and likewise the market for veterinarians should react to the demand for veterinary services. As more pre-veterinary students interact with veterinarians who enjoy a financially rewarding career, for example, the demand for a veterinary education increases; likewise, as the demand for veterinary services increases, this is reflected in increased wages for veterinarians, and so market participants respond by increasing the supply of veterinarians.

Nonetheless, the focus of this report, the market for education, represents a complex body of 30 AVMA-accredited veterinary colleges located in the United States, 19 AVMA-accredited colleges located outside the United States, and dozens of other veterinary colleges not accredited by the AVMA but whose graduates are able to enter the market for veterinarians in the United States through various streams.

In addition to analyzing tuition and fees across colleges, this report will examine the student debt incurred by recent graduates, as attributed to both tuition and fees and living expenses. We make this distinction here because, although becoming a veterinarian creates opportunity costs, the cost of living cannot be quantified as cost foregone to become a veterinarian, as one incurs living expenses whether or not they attend veterinary college. This report presents a detailed description of the cost of living in various regions of the country as well as the tuition incurred to matriculate through veterinary college.

The debt-to-income ratio, the KPI measuring the market for a veterinary education is important. Presumably, the income awarded to veterinarians is indicative of animal owners' willingness to pay for veterinary services, which subsequently represents their willingness to pay the cost necessary to train veterinarians to care for their animals. The fact that the DIR is almost 2.0, however, indicates that it costs a veterinarian twice what animal owners are willing to pay for their services to become trained to provide the services. In other words, the market is signaling that the price of veterinary services is too high relative to the cost of producing veterinarians.

Market for Education KPI

The value of KPIs stems from the need to measure the impact of a strategy or protocol that might be implemented to address the high DIR within the veterinary profession. Unless we determine the effect of any initiatives, these actions may be futile or possibly a waste of resources.

Developed by the AVMA's Economics Division, the DIR is essentially the individual debt divided by the individual income. This ratio captures the linkage between the demand and supply of new veterinarians, as the debt is directly related to educational costs while the income is the payoff to the veterinarian for obtaining the DVM degree. Presenting this as an accurate representation of the market for new veterinarians, however, can be challenging.

To accurately determine a trend for the DIR there are several cases that must be considered. The DIR that the AVMA computes is derived from analyzing AVMA's senior survey. The senior survey is distributed to the graduating seniors of the AVMA-accredited U.S. colleges each spring. The survey asks seniors to report their post-graduate plans, educational debt, starting salaries and other basic demographic information. However, some of the information provided is just a rough estimate. Questions such as the number of hours expected to work per week, educational debt and annual production are conjectures made by students based on the information they have available. Students can't pinpoint exactly how many hours they will work per week and they have an even foggier idea of what their production would be as their skills progress. Consequently, it is important to note that a number representing the DIR is not nearly as critical as the direction of these numbers over time.

While the DIR provides a snapshot of the economic state of new veterinarians as they enter the profession, this number varies greatly. Starting salaries range from less than $40,000 per year to more than $90,000 per year and vary by practice type, location and other (more difficult to control and measure) factors. Some students report graduating with zero debt (17.2 percent of the 2017 graduating class, up from 14.2 percent in 2016); others report having obtained no job offers or invitations to pursue continuing education at the time the survey was distributed (6.3 percent in the 2017 graduating class). Others elect to pursue additional education (34 percent of the 2017 graduating class, down from 35.6 percent in 2016 who reported receiving an

offer to pursue an internship, residency or continuing education) and then there are some (an additional 7.7 percent in the 2017 graduating class) who simply do not answer the questions pertaining to their debt, income or other specific and relevant information, up from 7 percent in 2016.

Consequently, there are numerous ways to measure and report the DIR. There is the question of whether those with zero debt should be included; or whether those with almost zero income should be counted. How should we classify interns, residents, those in continuing education programs receiving only a stipend, and of equal importance, those who failed to respond to a pertinent question? Can we fairly assume that those who did not answer the question have a similiar DIR distribution as those who did? Ultimately, the determinant factor stems from the objective of the AVMA Economics division. To effectively impact and improve the economics of the veterinary profession, we must first come up with a measure that accurately describes the current state of the profession. Then we must uniformly measure this statistic over time so that trends can be identified.

The mean debt figure is computed by aggregating all the reported debt numbers and dividing the sum by the number of respondents reporting a debt number; this calculation also includes those reporting zero debt. To give a thorough description of the graduating class' debt levels, however, this report also includes the distribution of debt across the graduating class and the mean debt of both the entire class and of only those with non-zero debt.

The mean starting salary of veterinarians was estimated using income reports of only those securing full-time positions. New veterinarians who reported income through internships, residencies and stipends from pursuing continuing education programs were omitted.

Both the mean debt and the mean starting salary are important descriptive statistics, but neither is used to compute the DIR. The DIR is computed by finding the mean of the debt-to-income ratio for each graduate who reported a value for debt, and for income from full-time employment. And these values are held to a constant demographic distribution over time so that there is no impact on the DIR attributable to changing demographics.

REGIONS OF THE UNITED STATES

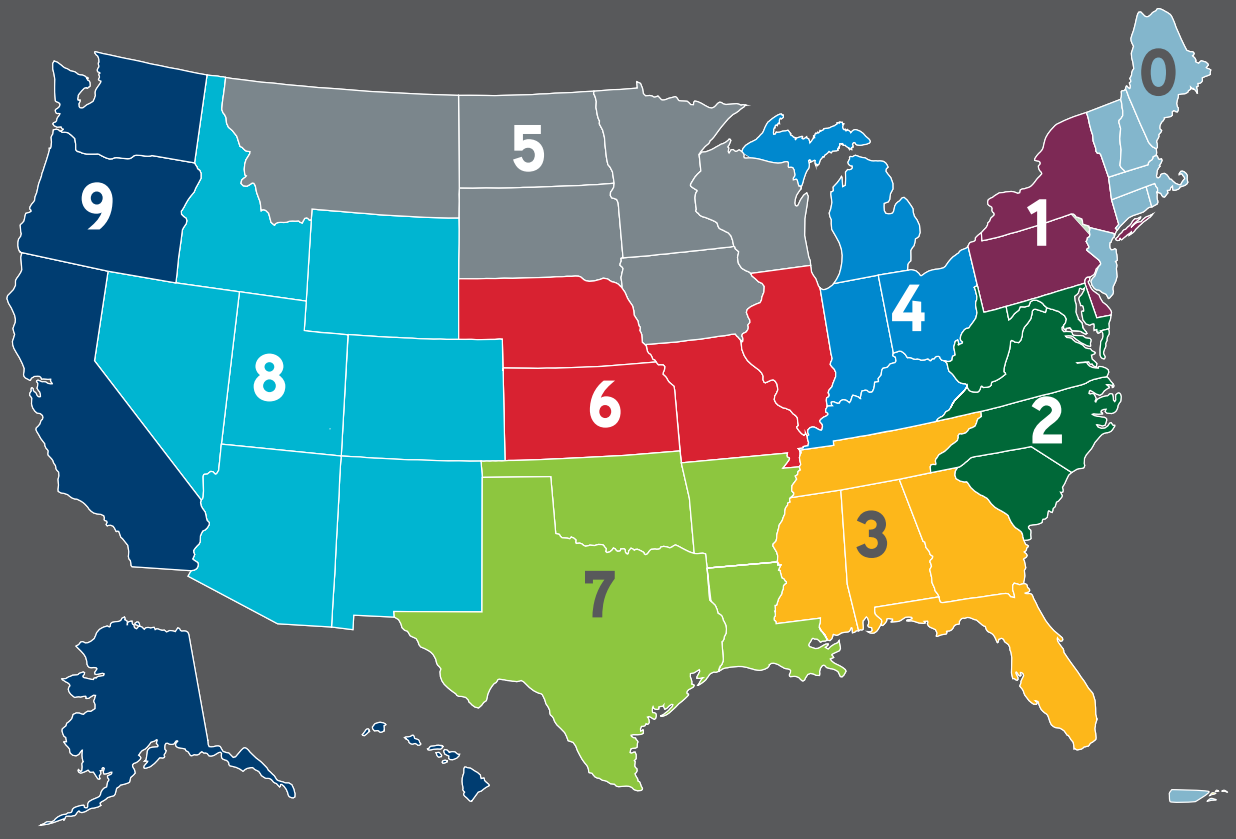


Figure 1

THE APPLICANT POOL FOR VETERINARY COLLEGES

Although we have been unable to determine a specific factor, or set of factors, that might be responsible for the cycle of applicants, the number of applicants has been trending upward since 2015..

The market for veterinary education is critical as it is the source of the supply of veterinarians, which, in turn, determines the supply of veterinary services. In a perfect world, with no information asymmetry, an increase in the demand for veterinary services would signal the market for veterinarians, which would subsequently signal the market for a veterinary education. As applicants receive this signal, that it is an economically viable prospect to pursue a degree in veterinary medicine, the supply of applicants to veterinary colleges would increase to reflect an increasing demand for veterinary services. This, however, is not a perfect world. While some potential applicants might receive the market signals – such as observing a recently graduated veterinarian struggling to make ends meet – and act accordingly, many applicants are unmotivated by economic gain and might opt to pursue a veterinary education independent of perceived cost.

For several years, we reported that the number of applicants to colleges of veterinary medicine was cyclical. In 2013, the number of applicants in the current cycle peaked at 6,769, dropped slightly to 6,744 in 2014 and dropped again in 2015 to 6,600. In 2016, the number of applicants increased slightly to 6,667 and increased even further in 2017 to 7,076. The peak during the last cycle occurred in 1998 at 6,783 applicants. The number of applicants in 2017 and 2018 has been steadily increasing with 7,076 applicants in 2017, and 7,507 applicants vying for a 2018 seat, the highest number of applicants in more than 40 years. Although we have been unable to determine a specific factor, or set of factors, that might be responsible for the cycle of applicants, the number of applicants has been trending upward since 2015.

AAVMC VETERINARY SCHOOL APPLICANT FIGURES

AAVMC INTERNAL DATA REPORTS, 1980-2018

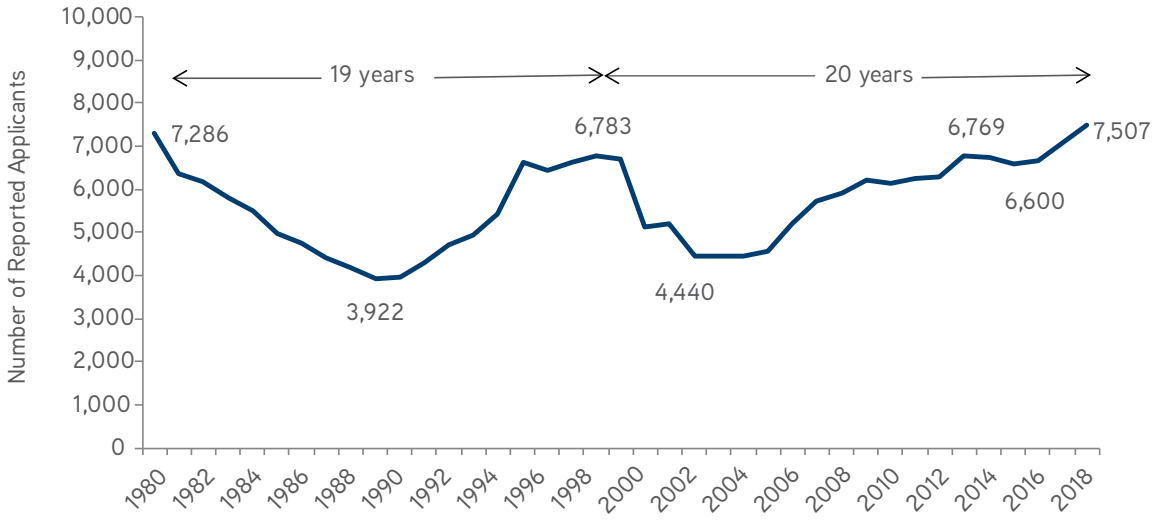


Figure 2

DEMAND FOR VETERINARY COLLEGE SEATS

An analysis of the VMCAS applicants allowed us to determine the demand for veterinary college seats. In this system the applicants can, and often do, apply for multiple seats with the hopes of securing an agreement with at least one institution. As a result, each veterinary college might receive several applicants vying for one seat. Each year since 2014, the VMCAS applicants were surveyed to determine (among other factors) what they are willing to pay for the veterinary education. The willingness to pay conveyed by all the applicants provides a description of the demand for veterinary education, the relationship between the quantity of seats demanded, and the price that the applicants are willing to pay for each seat.

From 2015 to 2017 the demand for veterinary education decreased at almost every price level. We observe this as the demand curves shift to the left. The 2015 and 2016 demand curves are quite similar at price points over $100,000. In 2017, however, the shift occurs at almost every price level; for example, at $50,000 up to $200,000 fewer applicants demand a veterinary education than the quantity who expressed willingness to pay at these same price points in 2016 and 2015.

More specifically, in 2014 53.3 percent of applicants were willing to pay up to $150,000 for a veterinary education, while in 2015 only 37.1 percent of the applicants were willing to pay up to $150,000 for a veterinary education. In 2016, 40.2 percent of applicants were willing to pay up to $150,000 for a veterinary education but only 27 percent were willing to do so in 2017.

APPLICANT DEMAND, 2015, 2016 & 2017

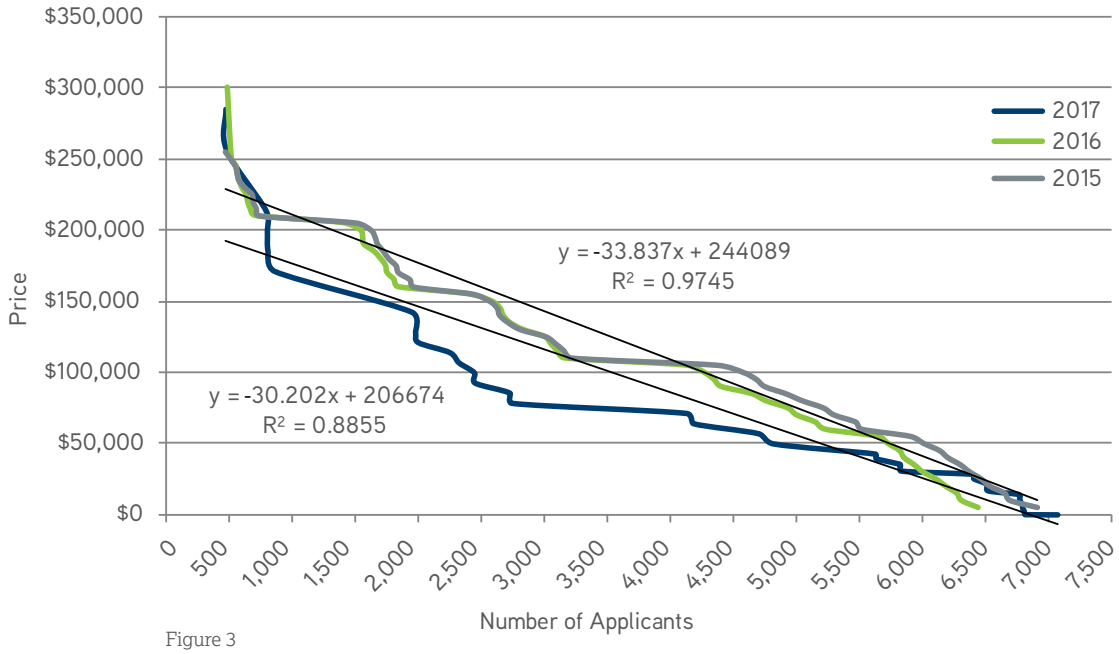


Figure 3

APPLICANT-TO-SEAT RATIO

Over the past four years, the applicant-to-seat ratio has experienced a modest increase from 1.6 in 2015 to 1.8 for 2018 applicants. In 2017, there were 7,507 applicants through the VMCAS system applying for approximately 4,200 seats for the Fall 2018 semester, resulting in a 1.78 applicant-to-seat ratio. In 2016 there were 6,667 applicants and 4,039 available seats, yielding an applicant-to-seat ratio of 1.65; and for the Fall 2017 semester there were 7,076 applicants and 4,126 available seats, producing an applicant-to-seat ratio of 1.72.

The seats available are located both within the United States and at foreign veterinary colleges and are occupied by U.S. first-year students. It is important to note, however, that the dip in the applicant-to-seat ratio in 2009 was primarily a result of adding the U.S.-accredited foreign schools to the calculation and not reflective of any major difference in the number of U.S. applicants or U.S. veterinary college seats.

VMCAS APPLICANTS AND FIRST-YEAR SEAT, U.S. AND INTERNATIONAL INSTITUTIONS

AAVMC INTERNAL REPORTS, 2006-2018

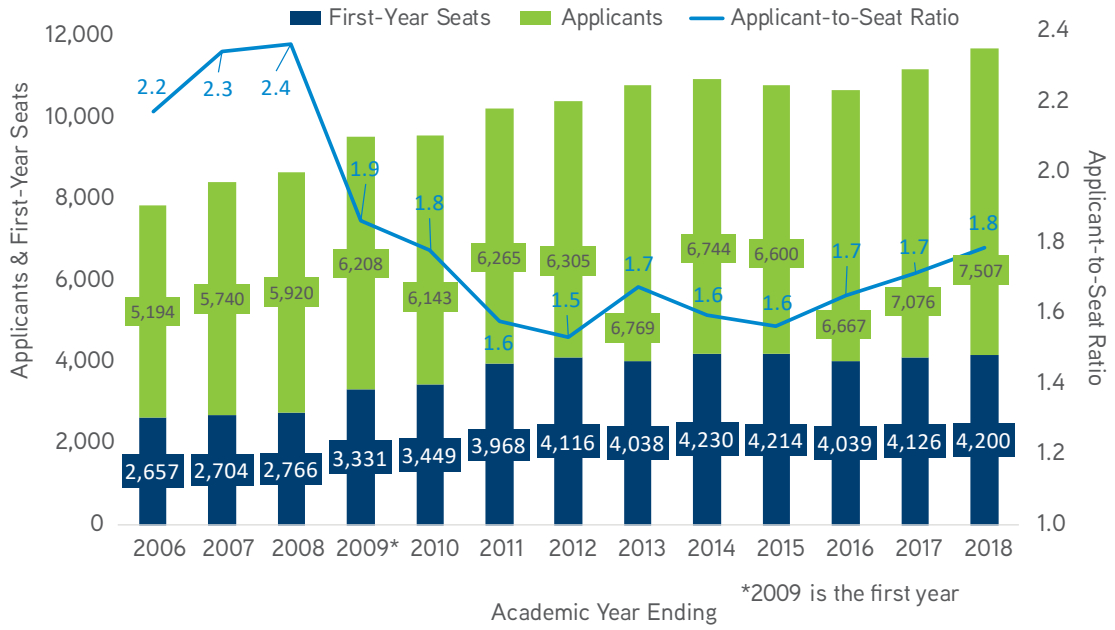


Figure 4

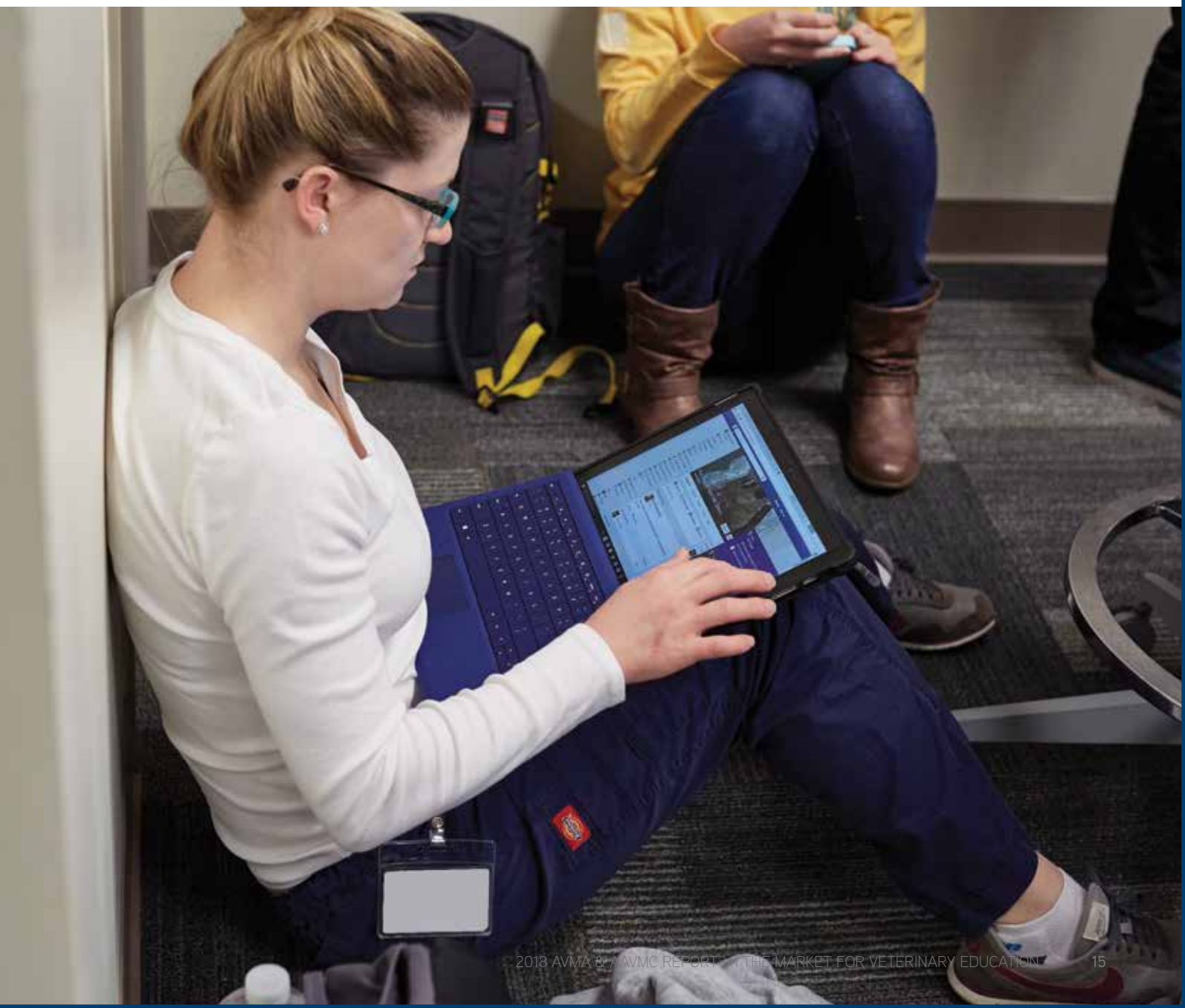
As found in previous trends, the gradually declining applicant-to-seat ratio has yet to translate into an applicant pool of diminished quality. Throughout the last four years, there has been no significant difference in applicants' GPA or GRE scores. Simultaneously, there has also been no significant change in the North American Veterinary License Exam pass rate.

MEAN GPA FOR ACCEPTED STUDENTS

Class of:	Pre-vet GPA	GRE Verbal	GRE Quantitative
2018	3.6	65.1%	58.1%
2019	3.6	65.7%	58.1%
2020	3.6	65.7%	58.1%
2021	3.6	64.8%	54.2%

Source, http://www.aavmc.org/additional-pages/admitted-student-statistics.aspx

Table 1



VETERINARY COLLEGES SUPPLY OF SEATS

The number of seats available to U.S. students includes those seats available at the 30 AVMA-accredited veterinary colleges in the United States, three AVMA-accredited Caribbean colleges, 16 AVMA-accredited veterinary colleges in other countries, and numerous other veterinary colleges across the globe. The AVMA has members who graduated from more than 225 veterinary colleges. However, VMCAS tracks only U.S. citizens who apply for seats at AVMA-accredited veterinary colleges. According to AAVMC there are currently 13,068 U.S. citizens enrolled at U.S. AVMA-accredited veterinary colleges, 2,378 U.S. citizens enrolled at accredited veterinary colleges in the Caribbean, 141 U.S. citizens enrolled at Canadian veterinary schools, and 659 U.S. citizens enrolled at other international veterinary colleges. That is, at present there are approximately 16,246 U.S. citizens enrolled in one of the four years of a veterinary program, domestically or internationally.

Using the estimated number of graduates by source of education, there are currently slightly more than 4,000 seats per year available to U.S. students. The following chart depicts graduates as recorded in the AVMA database.

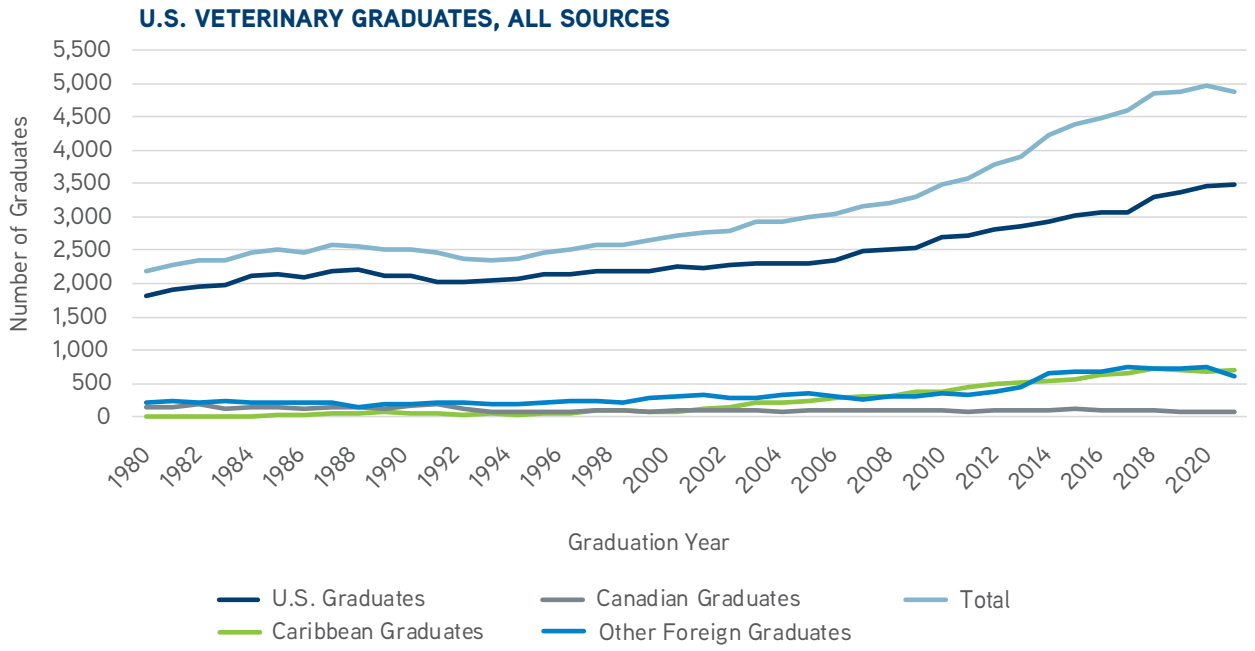


Figure 5

In 2017, 2,942 veterinary students graduated from veterinary colleges in the United States. With colleges averaging four classes in the DVM program at any given point, or roughly 12,000 seats, the income generated by this sector is certainly sustainable at least for the next four years at a time. 2017 U.S. graduates faced tuition and fees ranging from slightly more than $79,000 to more than $300,000 for four years of matriculation through the DVM program. The most affordable seats were supplied to students at Purdue University who were granted discount tuition, while the most expensive seats were supplied to those paying non-discount tuition rates at The Ohio State University.

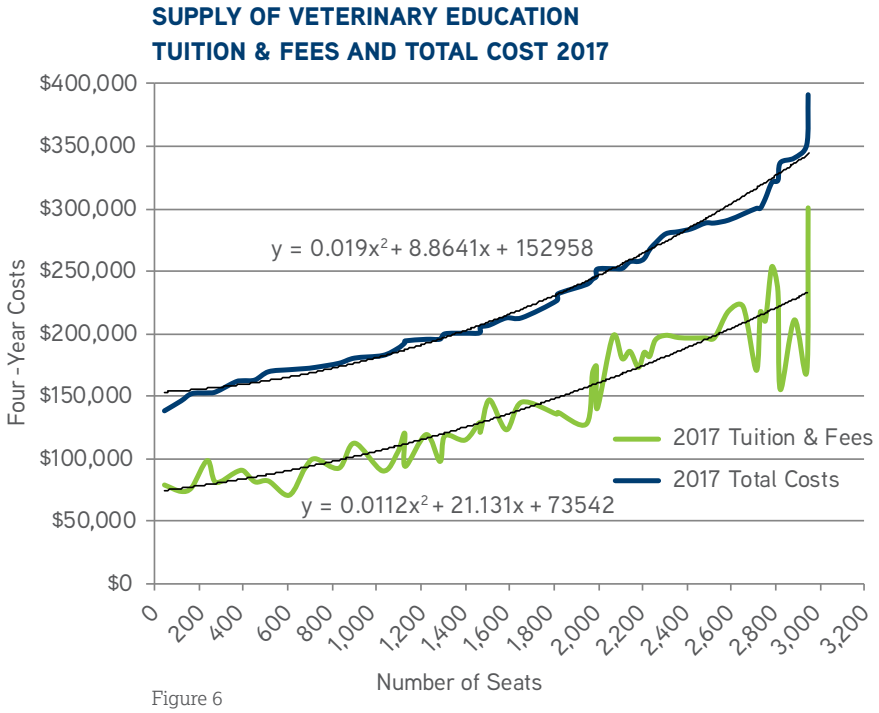


Figure 6

On supply/demand curves, at the point of equilibrium, a transaction occurs. This is portrayed graphically when the curves intersect. When we intersect the demand and supply curves in the market for education, the equilibrium points suggest that the 2017 applicants were willing to occupy 1,349 seats at a mean total cost of $199,483. In 2016, applicants were willing to occupy 1,860 seats at a mean total cost of $180,590. According to what applicants reported, from 2016 to 2017, there was a reduction in demand at higher costs.

At present there are more than 3,300 seats to be filled and a recently steady increase in the applicant pool. Evidently, as the chart indicates, what 2017 applicants (2021 graduates) indicated they were willing to pay for a seat at a veterinary college is far below the actual cost of the seats. Furthermore, debt levels suggest that there is a disconnect between what applicants report as their willingness to pay to attend veterinary school and what they actually paid.

In many instances, if applicants are not accepted into their first choice for veterinary college, instead of foregoing veterinary school altogether for an entire year, they might opt to attend their second- or third-choice school, which is likely out of state and more expensive. We have no research on what factors are important in their decision to attend veterinary school or a specific veterinary college but those who seek education at an "in-state" school and those who are eligible for a discounted rate (contract seat or other form of scholarship) may well indicate a willingness to pay what is well below what they must accept to attend an out-of-state school.

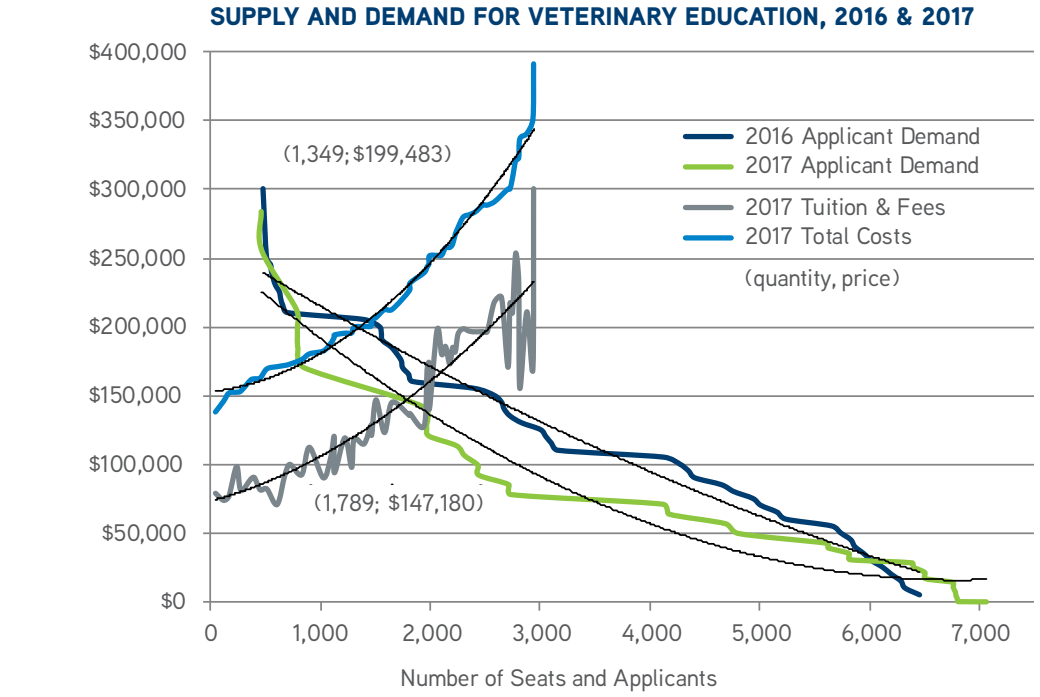


Figure 7

The following chart illustrates the aggregate, comprehensive value of tuition and fees, total cost and self-reported DVM debt. The majority of the graduating class had debt levels that lie below the total cost of matriculation through veterinary school. In 2015, less than 2 percent of students had debt levels reaching more than $450,000 and about 11 percent reported having zero debt, in 2016, less than 1 percent of the graduating class had debt levels more than $450,000 and just over 14 percent reported having zero debt. In 2017, 0.2 percent reported debt levels over $450,000, and more than 17 percent having zero debt. As noted, determining what factors affect the debt-to-cost ratio for individual students will be important to developing strategies to increase the percentage of students who have debt that is less than the cost of their education.

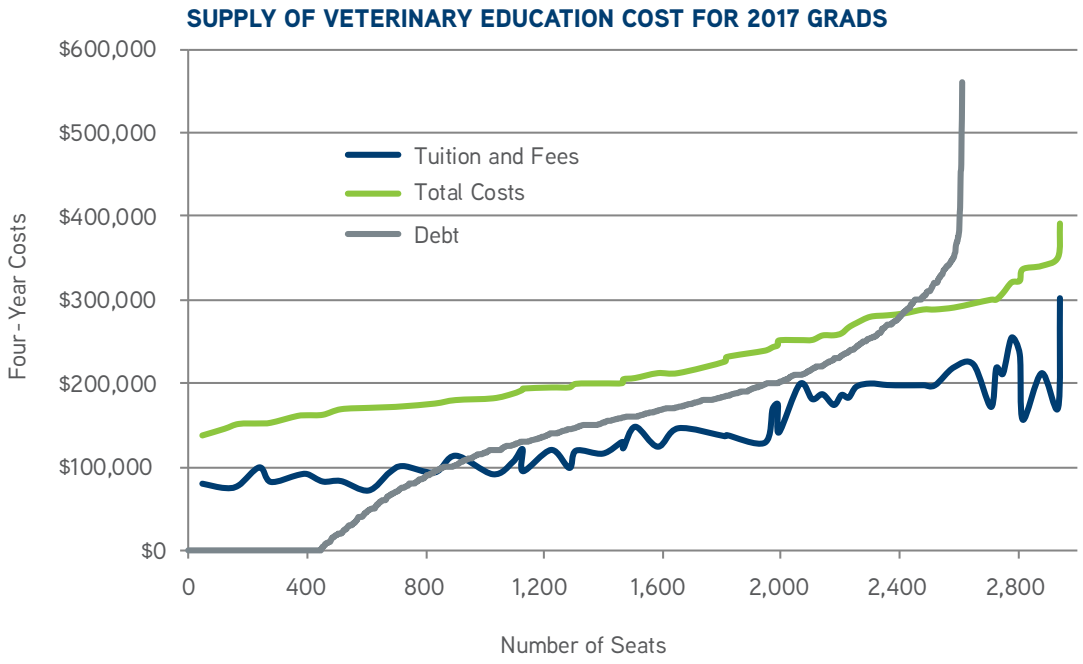


Figure 8

THE APPLICANTS' ESTIMATE OF THE DVM DEBT

The 2017 applicants were asked to estimate the mean debt load of 2016 graduates. The following chart depicts their responses. As a comparison, the actual 2016 reported debt load of the graduates is provided in the same chart. The applicants had a relatively accurate idea of the debt load of new veterinarians. The actual aggregate debt is slightly shifted to the left, indicating that more students paid the debt the applicants estimated than they originally perceived. Although this debt – compared to the starting salaries for new veterinarians – is high it is not high enough to have deterred applicants from pursuing veterinary college.

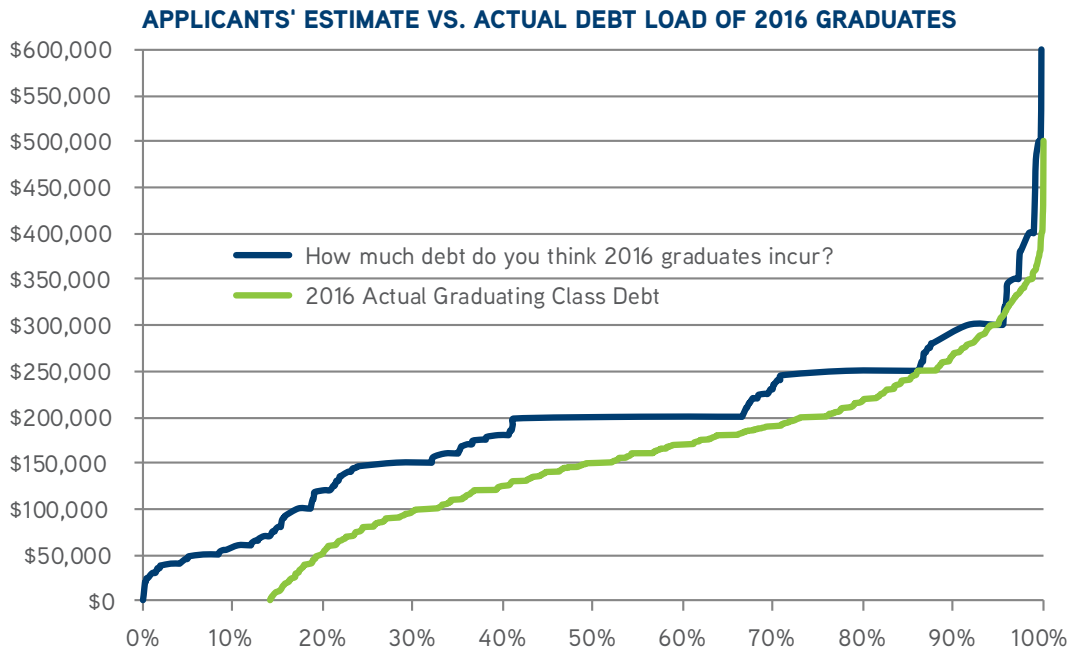


Figure 9

THE 2017 GRADUATING CLASS

In 2017, the Senior Survey was sent to 28 AVMA-accredited U.S. veterinary colleges and three U.S.-accredited veterinary colleges outside the United States that had graduating seniors. The following table shows the response rates by school for the 2017 graduating class.

RESPONSE RATE BY VETERINARY COLLEGE 2017

School Name	# of Graduates	Responses	Response Rate
Auburn University	118	118	**100.0%**
Colorado State University	137	95	**69.3%**
Cornell University	100	100	**100.0%**
Tufts University	95	80	**84.2%**
Iowa State University	141	134	**95.0%**
Kansas State University	109	72	**66.1%**
Louisiana State University	84	82	**97.6%**
Michigan State University	104	94	**90.4%**
Mississippi State University	80	80	**100.0%**
North Carolina State University	95	95	**100.0%**
Oklahoma State University	74	73	**98.6%**
Oregon State University	51	38	**74.5%**
Purdue University	83	83	**100.0%**
Texas A & M University	132	131	**99.2%**
The Ohio State University	163	135	**82.8%**
Tuskegee University	66	65	**98.5%**
University of California-Davis	133	133	**100.0%**
University of Florida	115	100	**87.0%**
University of Georgia	101	101	**100.0%**
University of Illinois	121	89	**73.6%**
University of Minnesota	99	95	**96.0%**
University of Missouri-Columbia	112	103	**92.0%**
University of Pennsylvania	123	83	**67.5%**
University of Tennessee	85	76	**89.4%**
University of Wisconsin	75	74	**98.7%**
Virginia-Maryland College	118	118	**100.0%**
Washington State University	123	94	**76.4%**
Western University of Health Sciences	105	91	**86.7%**
Total U.S. Schools	**2,942**	**2,632**	**89.5%**
Foreign Schools			
Ross University	91	266	**34.2%**
St. George's University	52	169	**30.8%**
University College, Dublin		4	*Unknown*
Total		147	*Unknown*

Table 2

DESCRIPTIVE STATISTICS FOR GRADUATES

Since 2001, the number of students finding either full-time employment or securing opportunities to pursue continuing education reached its highest point in 2017.

A major component of the AVMA senior survey concerns the post-graduate plans of the graduating veterinary students. Students were asked to report their plans after graduating, indicating whether they planned to pursue an internship, residency, continuing education or full-time employment. They were also asked to report the location of their post-graduate employment or education. The following figure illustrates the percentage of new veterinarians finding employment or gaining acceptance into an educational program upon graduation. Although there are students who reported finding no employment at the time the survey was distributed, evidence suggests that many of these new veterinarians found employment within a year of graduating. Since 2001, the number of students finding either full-time employment or securing opportunities to pursue continuing education reached its highest point in 2017. Although this percentage is not a "return-to" the trend observed prior to the effects of the 2007-2009 financial crisis, as of 2012, the number of new veterinarians finding post-graduate opportunities has been steadily increasing.

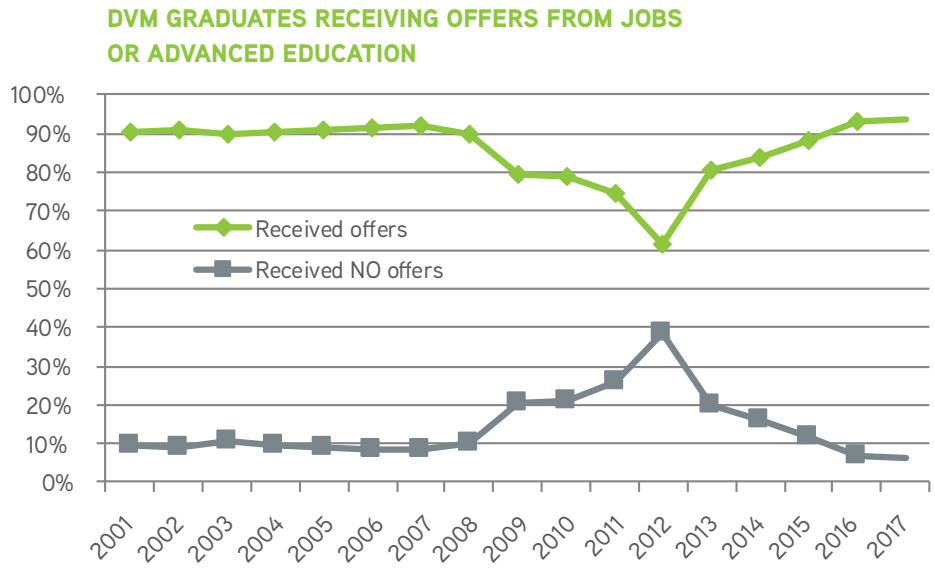


Figure 10

The percentage of graduating veterinary students finding full-time employment or getting offers to pursue post-graduate education in the 2017 graduating class was 93.8 percent. Although this is the highest rate for the entire period under examination, it is not significantly different from the comparable measure in 2016, 93.1 percent. As stated in previous reports, the recent economic recession had a direct impact on the number of students securing post-employment plans, but the economy has been regaining ground. This is reflected in the increasing number of new graduates finding employment or educational opportunities. Also noteworthy, as seen trending the percent of graduates receiving some type of income opportunity is steadily increasing even though the number of graduates is simultaneously increasing over the period. The number of new veterinarians finding full-time employment showed an increase to 54.9 percent in 2016, from 48.9 percent in 2015 and is up to 56.1 percent in 2017. The number of new veterinarians not finding employment or receiving an invitation to pursue continuing education decreased from 6.9 percent in 2016 to 6.3 percent in 2017.

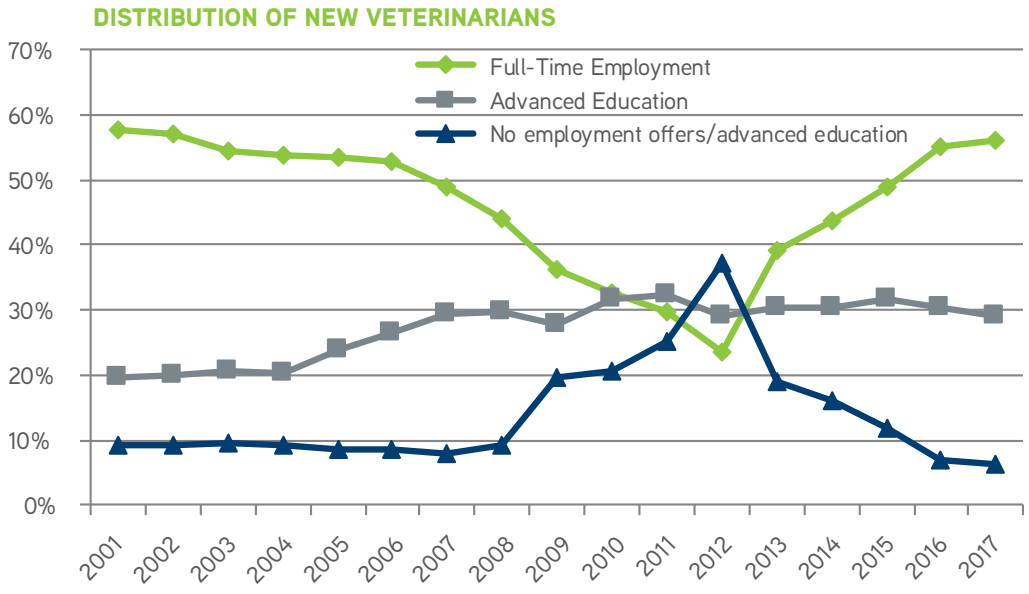


Figure 11

As observed since 2001, the majority of new veterinarians continue to report finding full-time employment in the companion animal exclusive sector. However, new entrants into this sector declined throughout the period 2004 to 2012, with a slight increase between 2012 and 2014, followed by a downward turn in 2015. The trend took a turn in 2016 with an increase to 30.4 percent and continued to rise to 31.6 percent in 2017.

New entrants into other sectors, such as food animal, companion animal predominant, mixed practice and equine practice, remained almost steady in the same period. As noted in previous reports, this information should not be used to indicate the overall supply and demand for new veterinarians in the respective sectors, as this would require data on the ratios of jobs available to available job applicants.

DISTRIBUTION OF NEW VETERINARIANS, PRIVATE PRACTICE

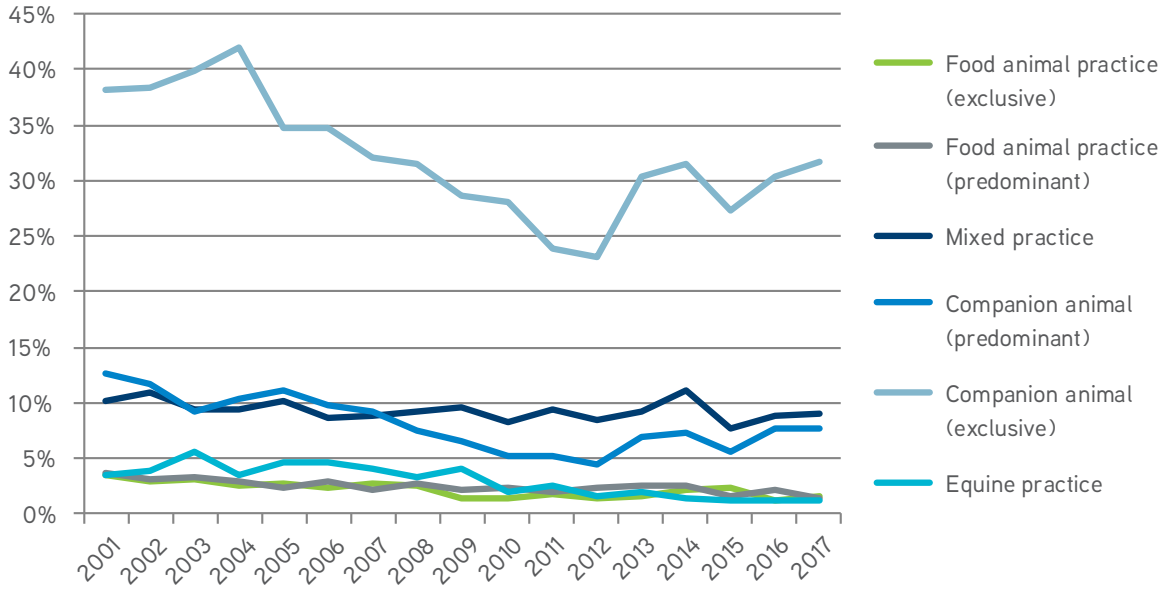


Figure 12

Over the period under observation, the percentage of new veterinarians finding full-time positions in public practice has been consistently small but steady. Between 2016 and 2017 the number of new veterinarians going into uniformed services and not-for-profit organizations increased, while the number of new veterinarians going into college and universities and industry decreased. The percentage of new veterinarians finding employment in federal government and state/local government remained unchanged.

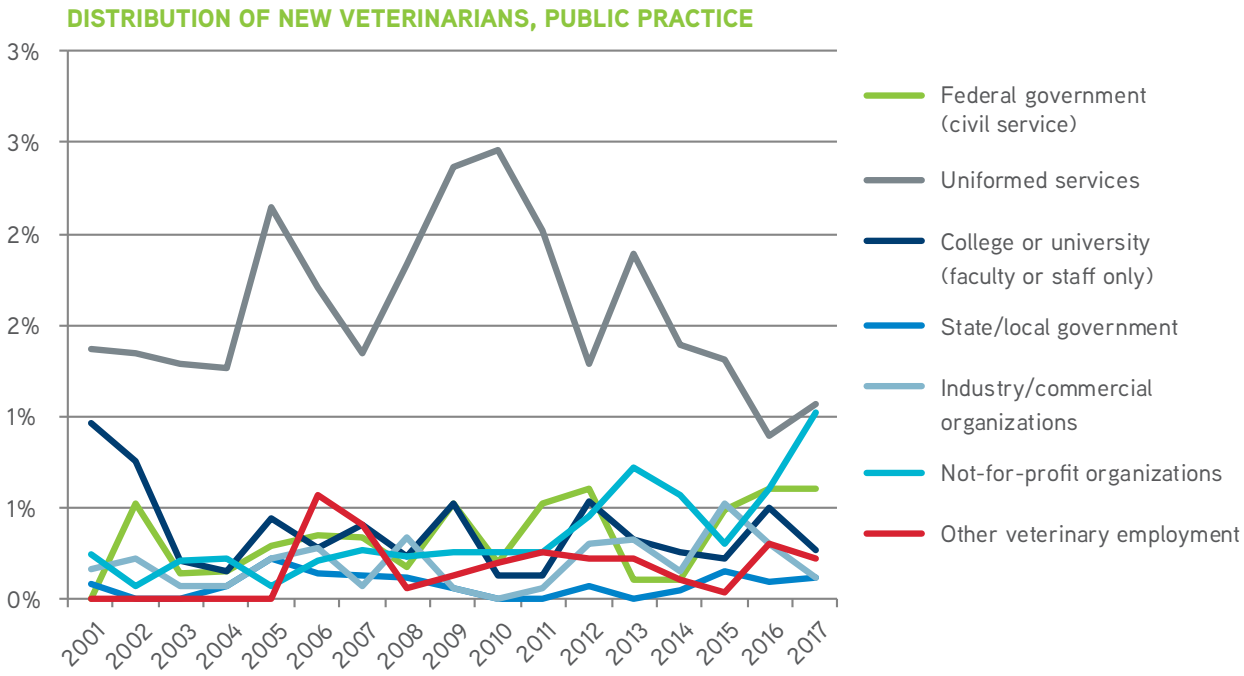


Figure 13

The percentage of new veterinarians pursuing career opportunities in private practice has increased from 56.9 percent in 2015 to 60.5 percent in 2016 to 62.3 percent in 2017. The percentage of new veterinarians pursuing careers in public practice remained primarily steady. Internship participation, however, has decreased from 35.6 percent in 2015 to 31.6 percent in 2016 and even further to 30 percent in 2017. As previously noted, the tradeoff between internships and private practice continues to be evident, while the percentage of public practice entrants is steadily flat.

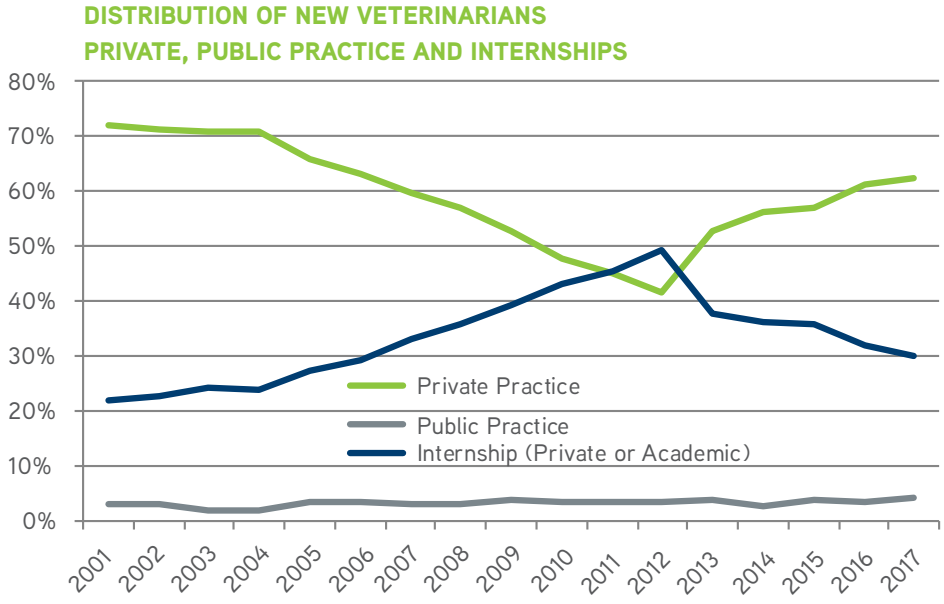


Figure 14

For almost the last decade, 75 percent of new veterinarians pursuing internships reported being in a companion animal species – focused internship. There has generally been no change in the species focus of internships accepted by new veterinarians.

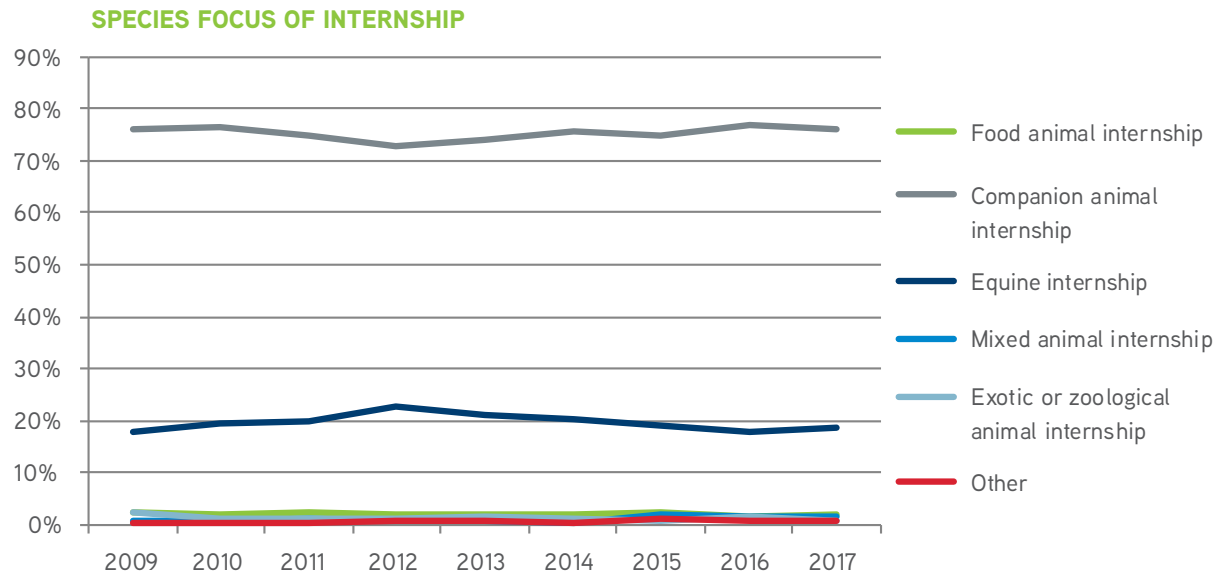


Figure 15

The percentage of new graduates pursuing advanced education after veterinary college has remained relatively constant between 2015 and 2017. After internships, the second largest group, in continuing education continues to be residency programs.

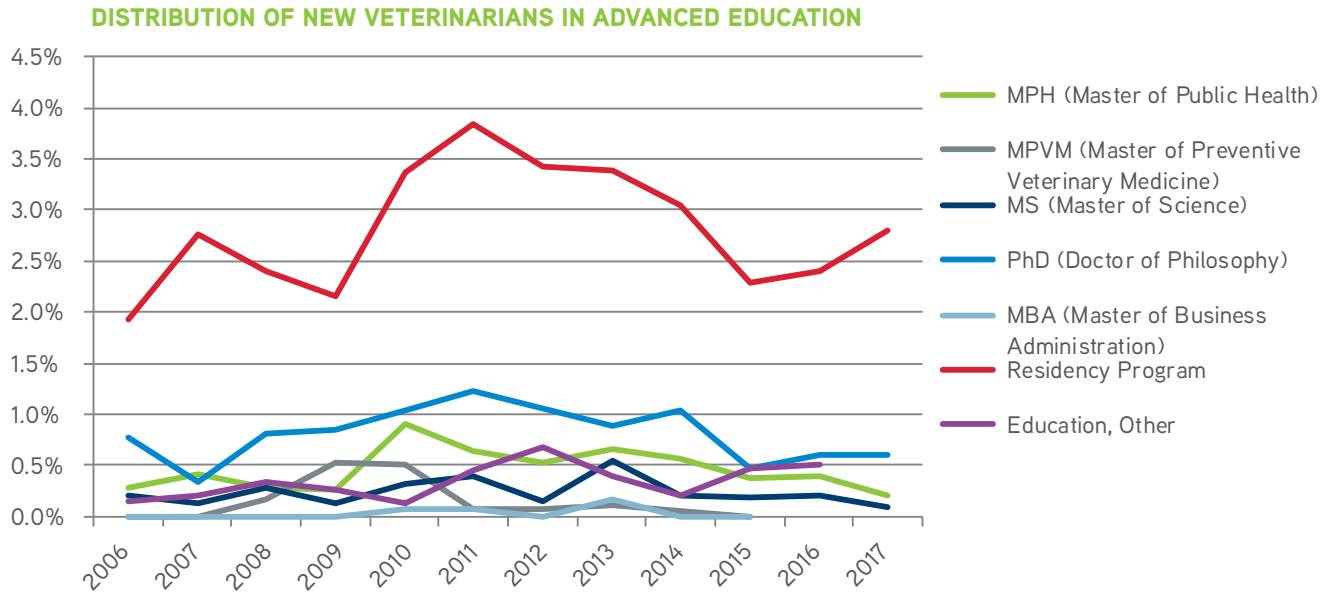


Figure 16

NEW VETERINARIAN INCOMES

From 2001 through 2017, the mean starting salary for new graduates increased from just under $40,000 to more than $60,000.

Post-graduation, veterinarians pursue a host of opportunities. These include finding full-time employment in private practice, public practice, pursuing internships and residencies, and advancing their education. Consequently, the post-graduation income they receive is reflective of the opportunity they pursue. Graduates earn from a stipend that may accompany a graduate assistantship to a full-time salary.

From 2001 through 2017, the mean starting salary for new graduates increased from just under $40,000 to more than $60,000. These numbers are inclusive of those finding full-time employment along with those pursuing internships, residencies and advanced education. Across the board, this is a mean increase of $1,404 per year over the past 17 years. These increases, however, have not been steady across all sectors and opportunities. The mean increase across the 17-year period for those in private practice has been approximately $2,057 per year while the mean increase over the same period has been $1,507 per year for new veterinarians in public practice. New veterinarians pursuing Internships and advanced education opportunities have experienced annual increases to their compensation of $590 and $710, respectively, over the same period.

As reported in years past, veterinarians in full-time positions in private practice have consistently been the highest – compensated group among the class since 2010, with veterinarians in public practice following closely behind. The lowest compensated group within the class was of those pursuing internships, with mean annual earnings of $31,572 in 2017, a 26 percent increase since 2006.

Since 2009 private practice has had the highest starting salaries. However, it was not until the 2007-2009 financial crisis that salaries in public practice began trailing behind. Prior to that, salaries of new veterinarians in public practice and private practice were neck and neck. Evidently, the recession had a greater impact on those in public practice than those in private practice. Currently, both are below their long-term trend but following an upward direction.

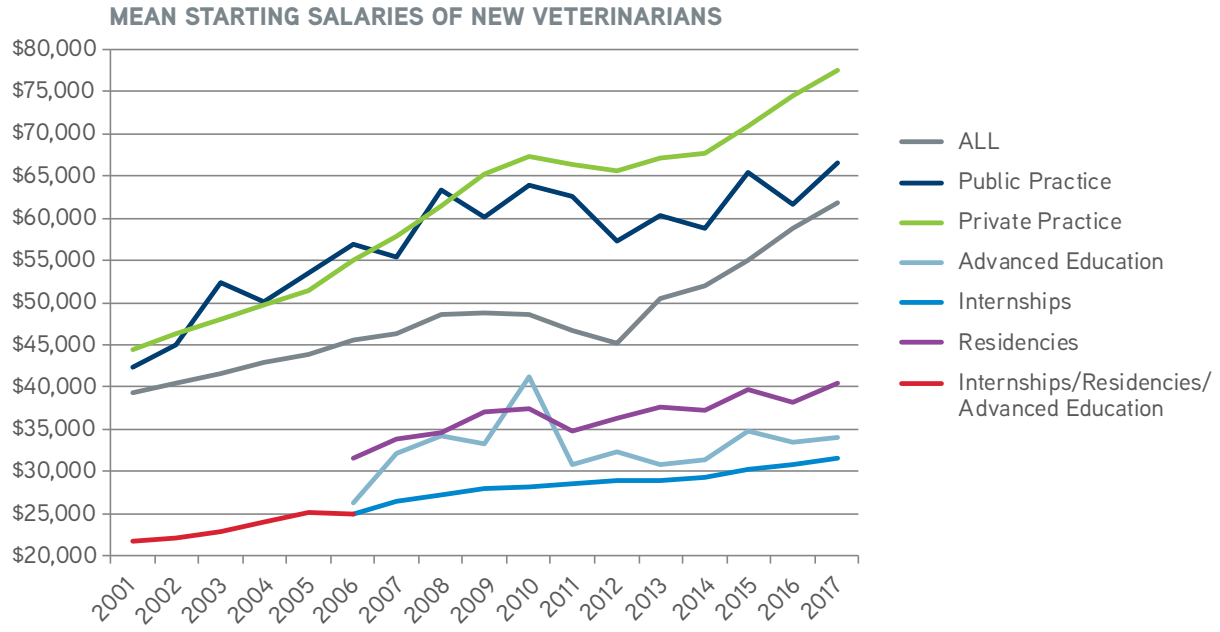


Figure 17

The weighted, mean starting salary for 2017 graduates finding full-time employment prior to graduation was $76,130, up from $73,380 in 2016 and $70,117 in 2015. The following chart illustrates the mean starting salary. The amount of variation in salaries is indicated by one standard deviation around the mean. That is, 68 percent of new veterinarians employed in full-time positions earned between $59,900 and $93,500 in 2017.

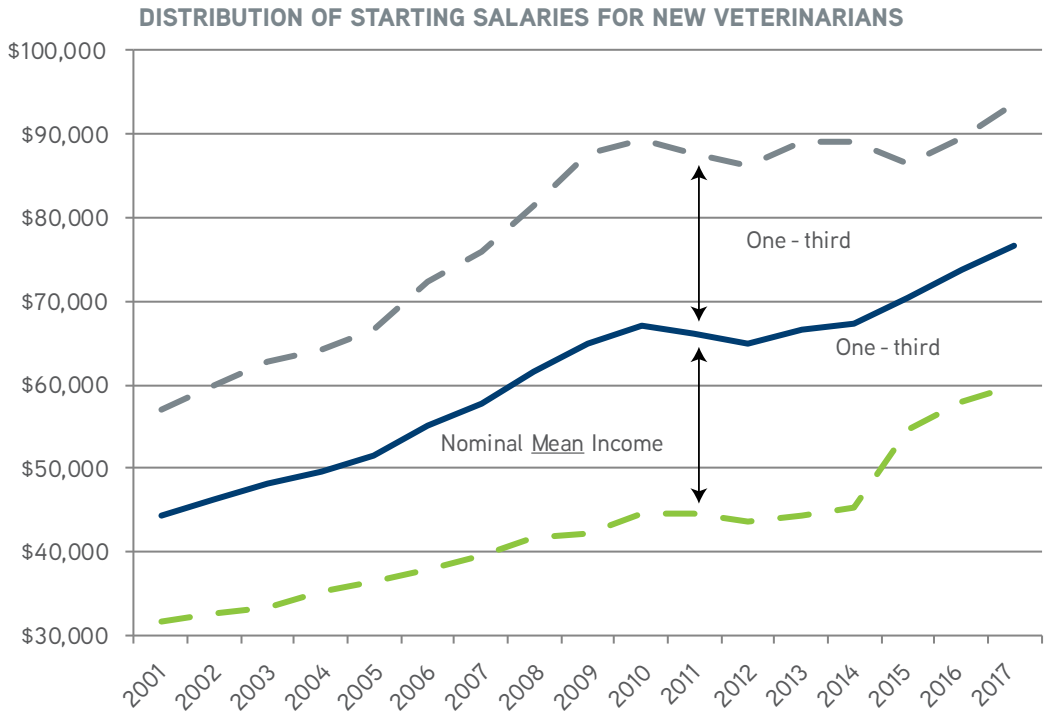


Figure 18

As noted in the previous chart, the mean starting salaries for two-thirds of the new veterinarians pursuing full–time employment had a range of more than $30,000. This variation in starting salaries is most evident among those in private practice and those in public practice. Even within private practice there is much variation. Although starting salaries among new veterinarians in private practice have been on a steady incline, new veterinarians pursuing employment in the equine industry have consistently experienced the lowest starting salaries. In 2017, new veterinarians finding full-time employment in the companion animal exclusive sector had the highest mean income as compared to 2016, where food animal exclusive practice yielded the highest income, with those in companion animal exclusive practice and companion animal predominant practice following closely behind.

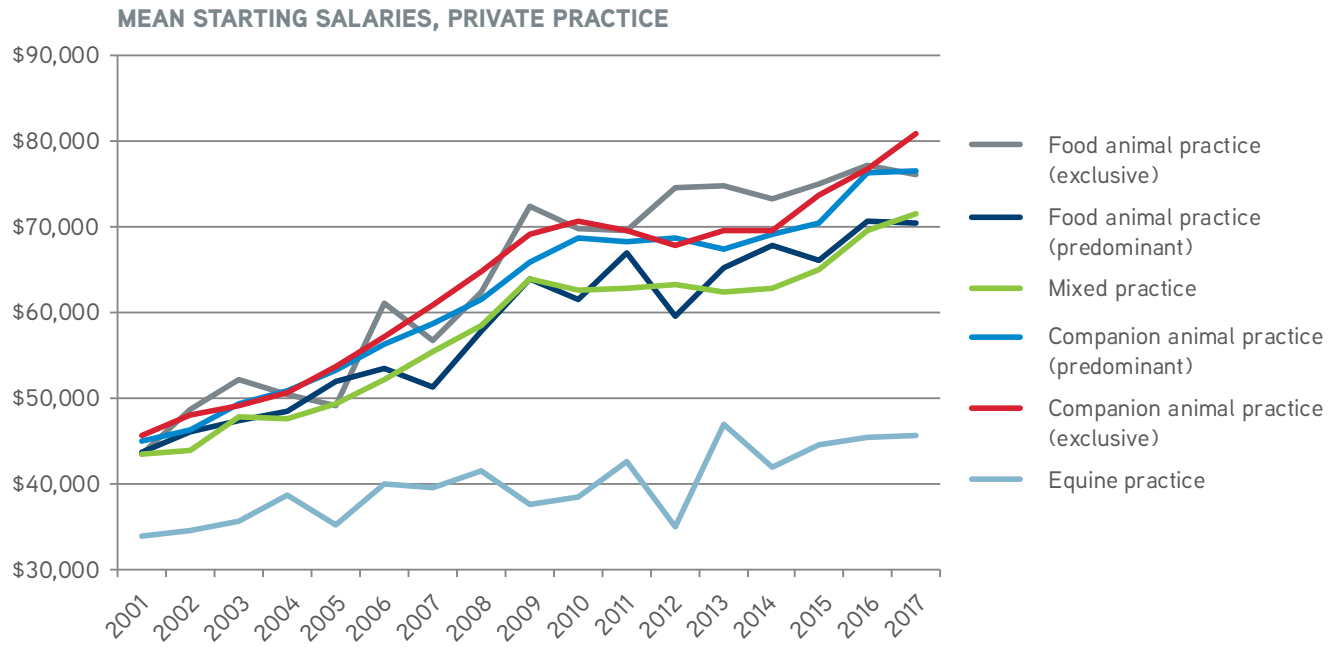


Figure 19

For a number of years, relatively few graduates have reported finding employment in public practice, where the variability in incomes is much larger than among private practices. Despite this variability in incomes, however, starting salaries in industry have consistently been the highest versus other employment options, with new veterinarians employed at colleges or universities reporting the lowest starting salary among those in public practice.

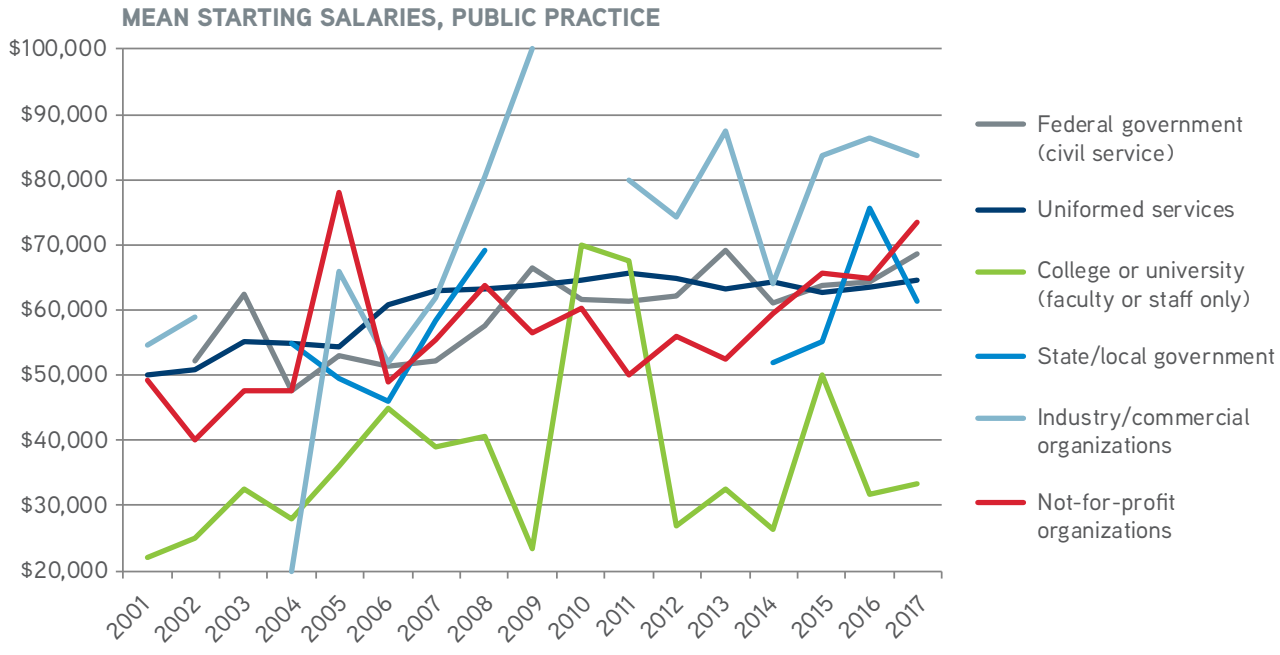


Figure 20

Year after year, the variation in incomes among the various categories of "advanced education" continues to be large. While the income of those pursuing internships, residencies and Ph.D. degrees is relatively stable, the income of those pursuing MS degrees is more volatile.

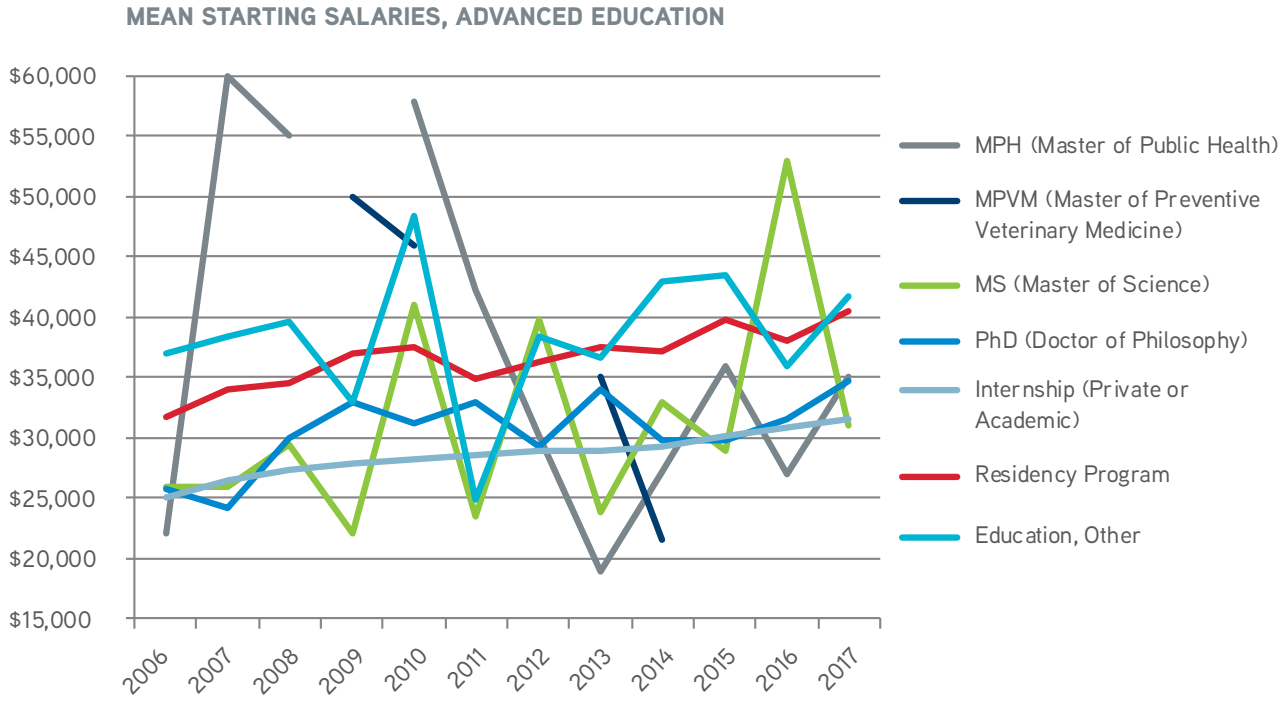


Figure 21

Numerous factors, outside of the economy, affect starting salaries. Our analysis indicates that starting salaries can be affected by the number of new veterinarians pursuing internships, the change in the gender distribution among new veterinarians, the change in the distribution of the practice type new veterinarians pursue, and the result of changing the location of their employment. To accurately identify the trends in starting salaries only impacted by economic factors (general economic growth, number of new veterinarians), an index is created to control for all other factors (changes in demographic characteristics, inflation).

The value of starting salaries, known as the Real Weighted mean Income (RWI) index, measures the change in salary of a constant cohort of veterinarians, after controlling for variables such as gender, practice type, location and inflation. The RWI produces a starting salary "index," a mean starting salary that represents the inflation-adjusted mean starting salary for a constant gender distribution, practice type distribution, and locational distribution for the new graduates who received full-time employment prior to graduation. It is important to note that although we know what factors affect the starting salaries of new veterinarians we have yet to identify why.

INDEXED REAL INCOME & NOMINAL INCOME OF NEW VETERINARIANS

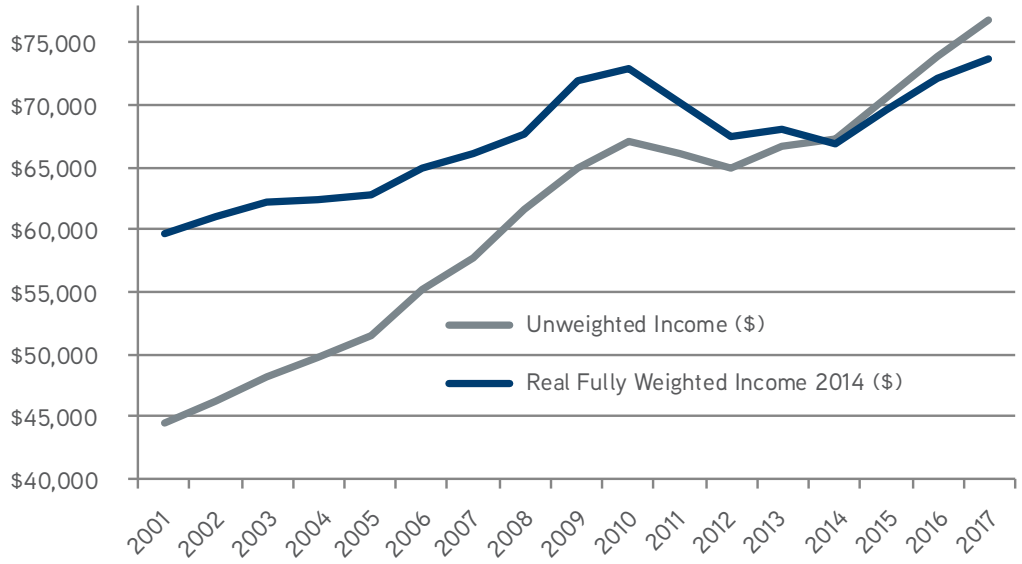


Figure 22

FACTORS AFFECTING INCOMES FOR NEW VETERINARIANS

Numerous factors explain the variation in income. Table 3 describes the effect of various factors on starting salaries. Findings were obtained through the analysis of these starting salaries with a multiple linear regression in which the dependent variable is the starting salary of new veterinarians. The data used in this analysis comprise 17 years of responses from more than 92 percent of all graduates of the 28 U.S. veterinary colleges. We analyzed the impact on salaries of graduating college, DVM debt, age, gender, location, anticipated work hours per week, and post-graduate plans including options to pursue internships, residencies or other advanced education. The variables expressed in the table were found to be significant in explaining the variation in income.

The unstandardized coefficient indicates the dollar-value impact of the corresponding variable. Starting with a constant of $54,721.79, for example, the value of the coefficients (multiplied by the value of the factor) are added. For instance, a graduate in 2017 would have an estimated mean income of $82,498.09 ($54,721.79 plus 17 times $1,633.90).

The final column, labeled "Sig" represents the significant variables. These values, also known as the p-values, are such that for a "sig" less than 0.05, the coefficient of "B" is statistically significantly different from "0." For instance, for Region 4 the p-value is 0.925; this means it is not statistically, significantly different from the baseline, Region 3 (See Figure 1).

The standardized coefficients tell us the relative weight of each variable within the equation. For instance, the graduation year with a standardized coefficient of 0.366 is more than four times as important as the anticipated work hours per week, which has a standardized coefficient of 0.085.

The unstandardized coefficient for the variable,"year", is $1,633.90 and indicates that the mean starting salary for new veterinarians increases by $1,630 every year. However, this is the trend increase and does not consider a change in the number of new veterinarians or a change in the general economic conditions (e.g., Gross Domestic Product [GDP]).

The coefficient for Equine, ($19,065), indicates that on average new veterinarians entering equine practice will receive a starting salary that is $19,065 lower than new veterinarians going into a companion animal exclusive practice, the baseline variable. And new veterinarians going into internships make more than $35,000 less than those going into companion animal exclusive.

The factors that were included in this model produced an R square of 0.728. This indicates that the inclusion of all of these factors was able to explain 72.8 percent of the variation between the individually reported salaries and the estimated, mean starting salary for all new graduates between 2001 and 2017.

FACTORS AFFECTING STARTING SALARIES OF NEW VETERINARIANS

			Unstandardized Coefficients		Standardized Coefficients		
			B	Std. Error	Beta	t	Sig.
Demographics	Basic Info	(Constant)	54721.786	813.035		67.306	.000
		Year (use last 2 digits of grad year)	1633.895	19.162	.366	85.267	.000
		Age	43.464	22.135	.007	1.964	.050
		Gender: F=1, M=0	-2388.069	169.971	-.051	-14.050	.000
		Anticipated Hours Per Week	-121.839	6.889	-.085	-17.686	.000
		DVM debt in thousands	7.397	1.133	.026	6.530	.000
	Region (first digit of zip code)	Region 0	1640.504	319.454	.022	5.135	.000
		Region 1	2657.269	313.677	.036	8.471	.000
		Region 2	1380.939	285.963	.021	4.829	.000
		Region 3	0.00	0.000	0.000	0.000	.000
		Region 4	27.486	292.762	.000	.094	.925
		Region 5	-888.159	343.308	-.011	-2.587	.010
		Region 6	-476.055	311.983	-.007	-1.526	.127
		Region 7	1380.182	289.756	.021	4.763	.000
		Region 8	2224.654	304.803	.031	7.299	.000
		Region 9	4370.863	285.311	.069	15.320	.000
		Outside of the U.S.	620.784	894.193	.003	.694	.488
	Additional Degrees Held	Admitted to DVM Program Before Degree Earned	-69.445	229.645	-.001	-.302	.762
		Bachelor's Degree					
		Master's Degree	439.867	301.513	.005	1.459	.145
		Doctorate Degree	-688.574	890.638	-.003	-.773	.439
		Other Professional Degree (MD, JD, etc)	483.914	1366.623	.001	.354	.723
		Other Degree	-1673.884	1040.344	-.006	-1.609	.108
Post-Graduate Plans	Private Practice	Food Animal (exclusive)	810.068	517.472	.006	1.565	.117
		Food Animal (predominant)	-3022.809	475.379	-.024	-6.359	.000
		Mixed Practice	-4247.680	266.069	-.062	-15.965	.000
		Companion Animal (exclusive)					
		Companion Animal (predominant)	-1165.323	276.904	-.016	-4.208	.000
		Equine	-19065.380	444.536	-.161	-42.888	.000
	Public Practice	Federal Government	-4490.135	1240.010	-.013	-3.621	.000
		Uniformed Services	-1527.505	578.328	-.010	-2.641	.008
		College or University	-28808.724	1226.844	-.083	-23.482	.000
		State or Local Government	-7714.091	2837.523	-.010	-2.719	.007
		Industry	8977.862	1661.659	.019	5.403	.000
		Not-for-Profit	-9615.817	1232.178	-.028	-7.804	.000
	Other	Other Veterinary Employment	-3361.343	1939.884	-.006	-1.733	.083
	Enrolling in an Educational Progam	Masters of Public Health	-28697.980	1911.204	-.053	-15.016	.000
		Masters of Preventive Veterinary Medicine	-27232.304	4743.386	-.020	-5.741	.000
		Masters of Science	-35238.587	1749.586	-.071	-20.141	.000
		PhD	-34988.363	952.662	-.131	-36.727	.000
		MBA	-30428.845	7498.492	-.014	-4.058	.000
		Internship	-35628.369	244.516	-.781	-145.710	.000
		Residency	-29712.713	515.229	-.210	-57.669	.000
		Education (other)	-30785.473	1523.087	-.072	-20.213	.000

a. Dependent Variable: Sum of base, starting and production bonus incomes

ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	6592369161465	41	160789491743	1431.722	.000
	Residual	2467902491606	21975	112305005		
	Total	9060271653071	22016			

MODEL SUMMARY

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.853	.728	.727	10597.40559

Table 3

We projected income using GDP, the number of new veterinarians (N) finding new employment annually, and the year. The graph below illustrates this projection out until 2027. On the same chart we also inserted the real weighted income for comparison. Using our previously defined index, the real weighted income measures the change in income independent of changing demographic variables. The real weighted income appears to trend toward our GDP projected line but salaries, like GDP, still have not returned to pre-financial crisis trends.

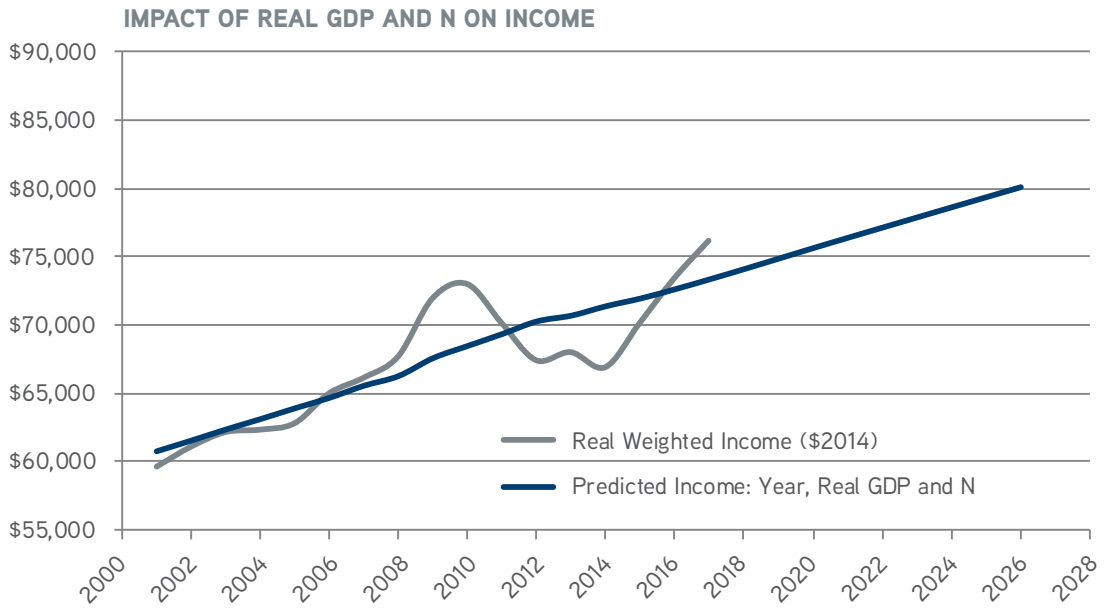


Figure 23

NEW VETERINARIAN DEBT

In 2017, there was a 21 percent difference in the mean debt of new veterinarians who graduated with non-zero debt versus the mean debt of the entire class.

For almost two decades the mean debt of the new veterinarian has increased by an average of $5,078 each year. Considering only those veterinarians with non-zero debt, the mean debt has increased by an average of $6,219 each year. Year after year, the mean debt of the graduating class has been increasing, experiencing a decline only between 2013 and 2014, an average reduction of $80, and now a much larger decline between 2016 and 2017, an average reduction in the mean debt of $5,691.

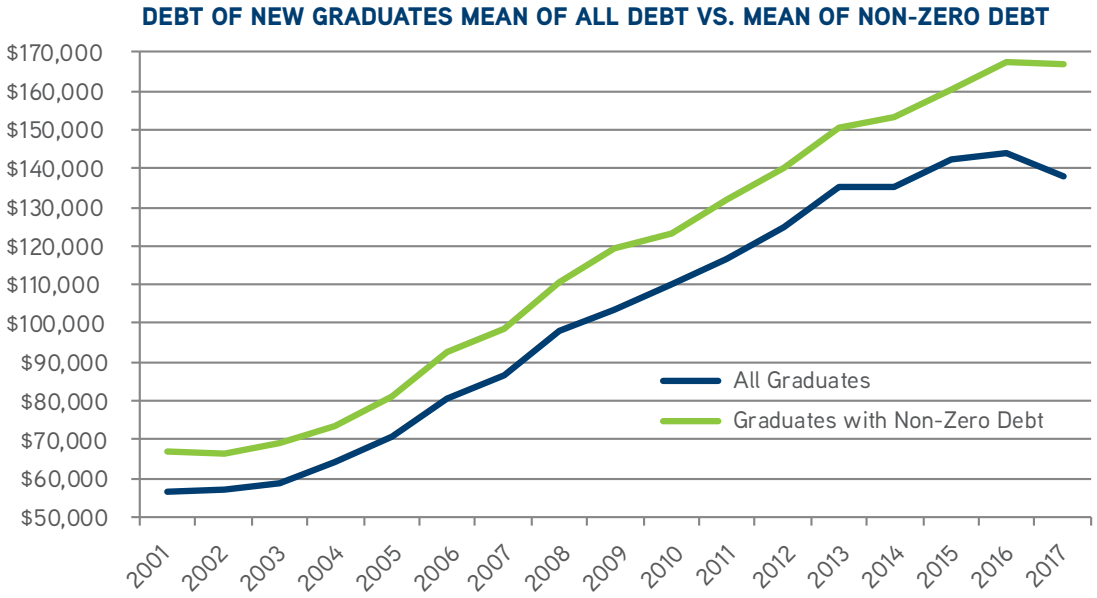


Figure 24

In 2017, there was a 21 percent difference in the mean debt of new veterinarians who graduated with non-zero debt versus the mean debt of the entire class. This difference in mean debt amounted to $28,647. That is, the mean debt of the 2017 graduating class was $28,000 less than the mean debt of those with non-zero debt only. Evidently, this gap is widening since, in 2015 the mean debt of all students was $18,041 less than the mean debt of persons reporting non-zero debt, and in 2016, the mean debt of all students was $23,777 less than the mean debt of graduates reporting zero debt, a 16.5 percent difference in debt.

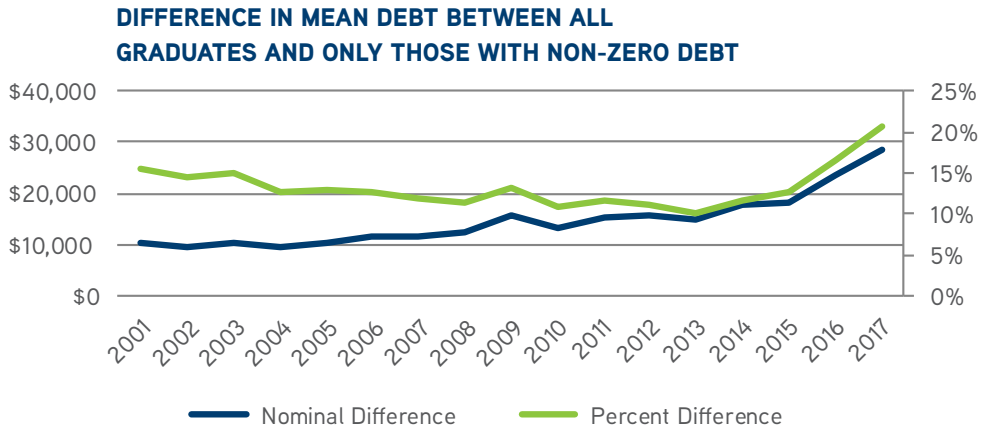


Figure 25

DVM debt incurred by new veterinarians continued to vary by post-graduation plans. Over the period 2001 through 2017 new veterinarians finding employment in public practice consistently had the lowest debt load. In 2017 new veterinarians pursuing advanced education had the highest debt load. As noted in previous reports, it is beyond the scope of this report to identify a research hypothesis as to why a significant difference exists in the DVM debt of new graduates based on post-graduation plans. We can hypothesize that perhaps veterinary students predisposed to public practice are more financially savvy.

Or perhaps those with lower debt feel less financially constrained to enter lower paying careers in public practice. We can even also surmise that maybe those with higher debt feel more obligated to pursue higher paying careers through specialization that requires internships and residencies. There are certainly many plausible hypotheses to explain the larger differences in debt by post-graduate careers, but research on the factors that influence the career choices of graduating seniors is certainly needed.

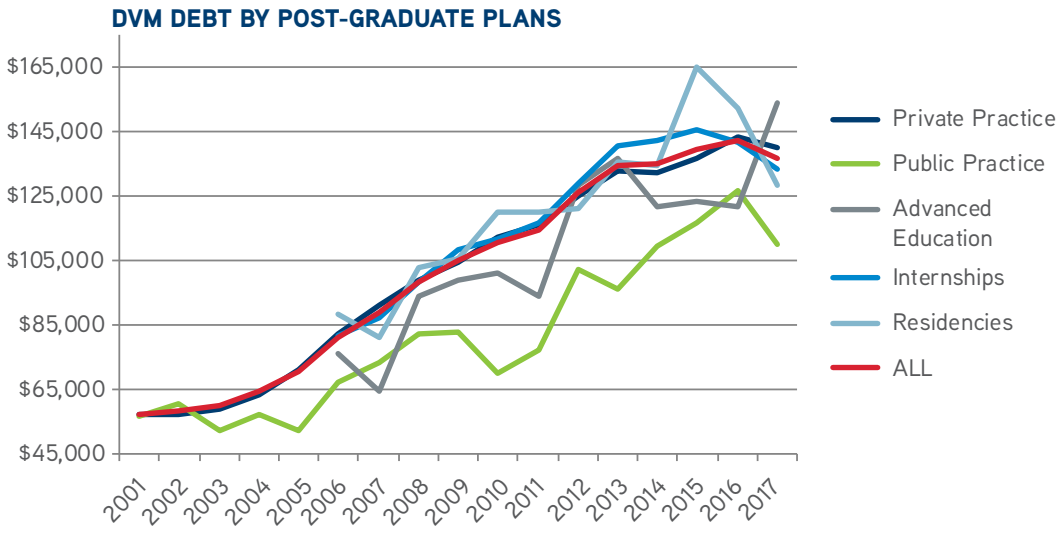


Figure 26

During the period 2015, 2016 and 2017, two standard deviations above the mean debt of the graduating classes has been within $308,000, $320,000 and $321,000, respectively. That is, 95 percent of all new veterinarians who've graduated from U.S. institutions in those years graduated with debt that ranged from $0 to below $308,000, $320,000 and $321,000, respectively. The following table depicts the distribution, by school, of the 2.5 percent of the 2015, 2016 and 2017 classes who graduated with more than $320,000 in student debt.

During the years 2015 through 2017, Western University, Tuskegee University, Kansas State University, University of Minnesota, Michigan State University, University of Tennessee, University of Pennsylvania and Louisiana State University each had students graduating with more than $320,000 in student debt. In 2017, for the first time since 2015, Oregon State University and the University of Illinois graduated new veterinarians who exited with more than $320,000 in debt.

Between 2016 and 2017, of the group graduating with more than $320,000 in debt, Tuskegee University, Kansas State University, Michigan State University, University of Tennessee and Virginia-Maryland College each had a reduction in the percentage of graduates having high debt while Western University, University of Minnesota, University of Pennsylvania, Louisiana State University, Mississippi State University, Colorado State University, The Ohio State University and Tufts University experienced an increase in the percentage of graduates with debt levels among outliers.

THE DISTRIBUTION OF STUDENTS WITH MORE THAN $320,000 DVM DEBT BY COLLEGE

	2015	2016	2017
Western University - California	43.7%	35.6%	36.5%
Tuskegee University	15.5%	22.1%	16.7%
Kansas State University	2.8%	8.7%	5.2%
University of Minnesota	14.1%	4.8%	9.4%
Michigan State University	5.6%	4.8%	4.2%
University of Tennessee	4.2%	3.8%	2.1%
University of Pennsylvania	4.2%	2.9%	5.2%
Louisiana State University	2.8%	2.9%	3.1%
Colorado State University		2.9%	3.1%
Virginia-Maryland College	1.4%	1.9%	1.0%
Iowa State University		1.9%	
Mississippi State University		1.9%	2.1%
Oklahoma State University		1.9%	
University of Georgia		1.9%	
The Ohio State University	1.4%	1.0%	2.1%
Purdue University		1.0%	
Auburn University	1.4%		1.0%
Tufts University	1.4%		5.2%
North Carolina State University	1.4%		
Oregon State University			2.1%
University of Illinois			1.0%
Total	**100.0%**	**100.0%**	**100.0%**

Table 4

Even within public and private practice, the DVM debt owed by new veterinarians varied greatly. For the 2017 graduating class, two-thirds of graduates finding employment within private practice had debt between $48,000 and $321,000. Comparatively, 68 percent of the 2015 graduating class within private practice, had a debt load between $50,000 and $222,500 while 68 percent of graduates within private practice had a debt load between $54,500 and $232,000 in 2016.

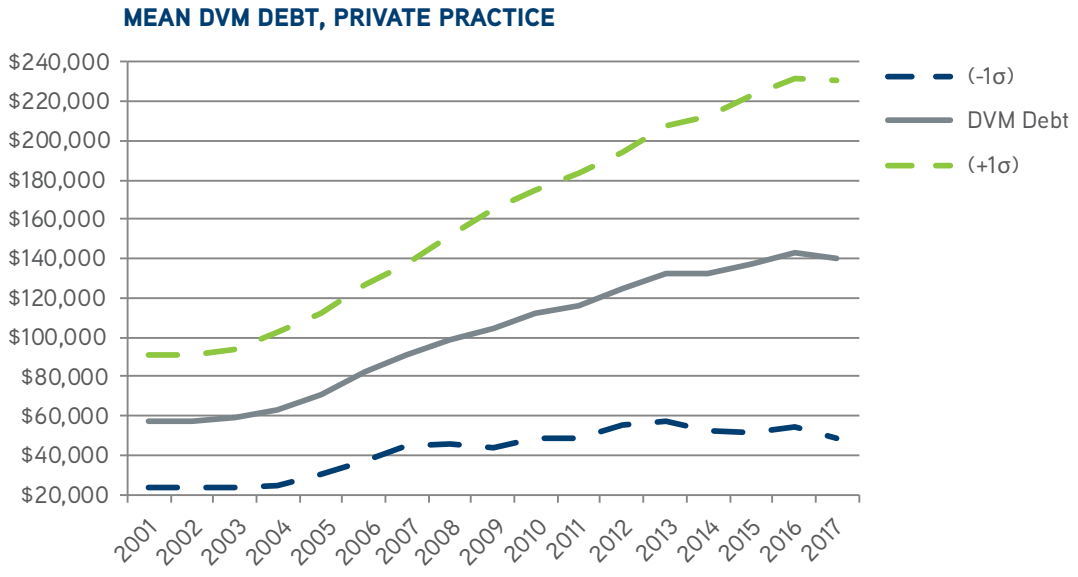


Figure 27

The variation in debt among new veterinarians pursuing public practice was also relatively large. Within the 2017 class, of those pursuing public practice, 68 percent had debt between $12,277 and $207,050, a range of almost $195,000. Comparatively, within the 2015 class, 68 percent incurred DVM debt between $35,000 and $198,000, and 68 percent incurred debt between $37,000 and $216,000 in 2016. Similar to trends observed in 2016, in the 2017 class more graduates pursuing public practice had larger debt levels, a range of $194,777 compared to the range of $161,210 for 2015 graduates and $178,761 for 2016 graduates.

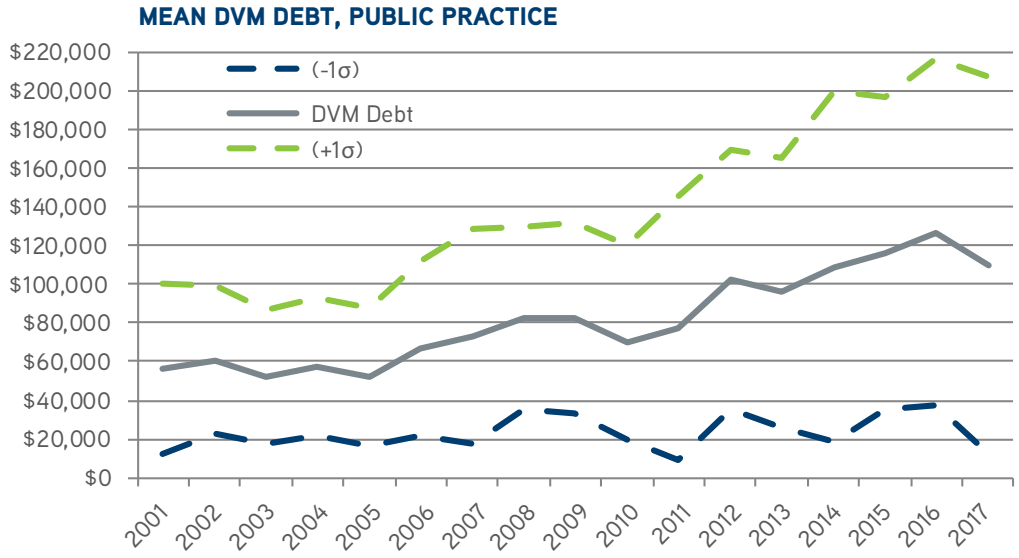


Figure 28

For each sector, whether public practice, private practice or advanced education, the growth rate of DVM debt has continued to outpace the growth rate of starting salaries of new veterinarians. Although the growth rates of debt and starting salaries prior to 2005 were comparable, the rate of growth in debt began to accelerate in 2006 and continued to grow much faster than incomes almost continually through 2016. In 2017, however, a welcome decline in the mean DVM debt was observed.

The largest factor in the increasing debt is the cost of education. This increased cost of education is tied closely to the declining amount of state and federal funding received by the veterinary colleges. In addition, the proportion of female veterinarians, whose debt is significantly higher than male veterinarians, has increased over time, and now comprises more than 80 percent of each new class of veterinarians.

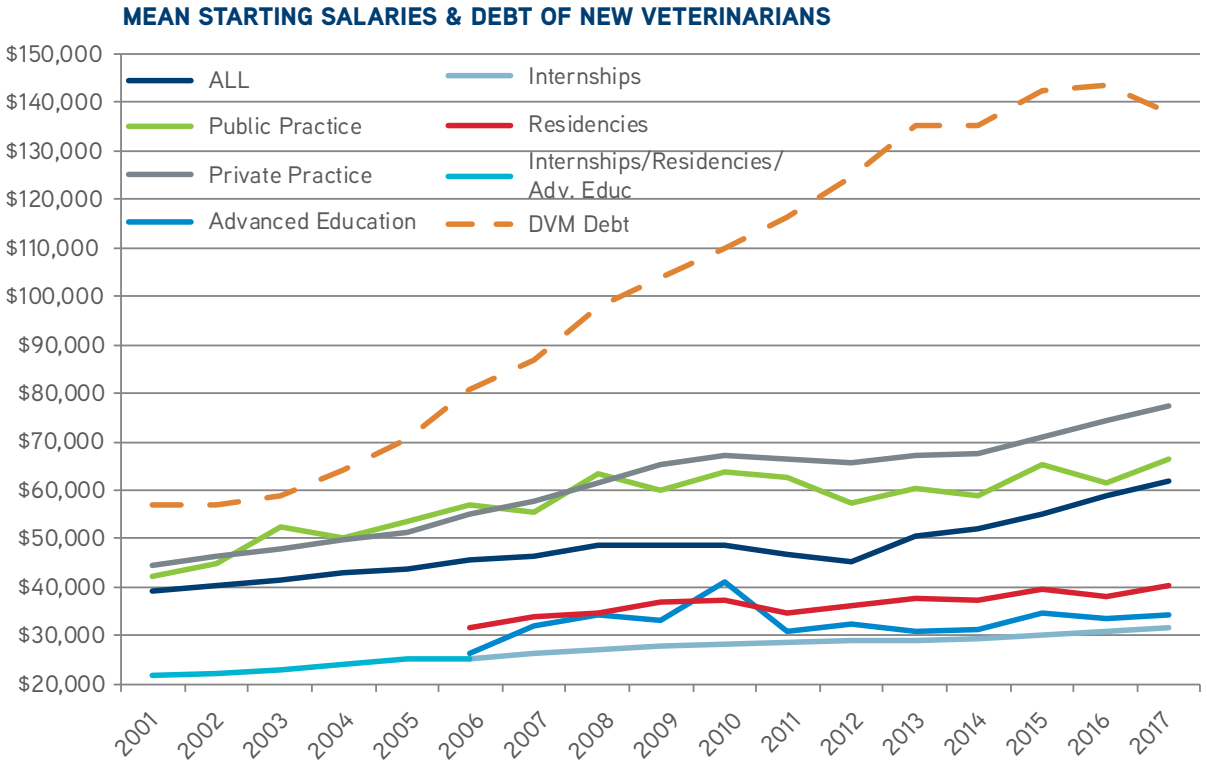


Figure 29

Not only were the starting salaries of female veterinarians significantly lower than those for men in 2017, but new female veterinarians had an average debt load of $9,149 more than new male veterinarians, up from $7,030 more in 2016 and $7,519 more in 2015. Female graduates have had higher veterinary college debt than their male counterparts throughout the period observed.

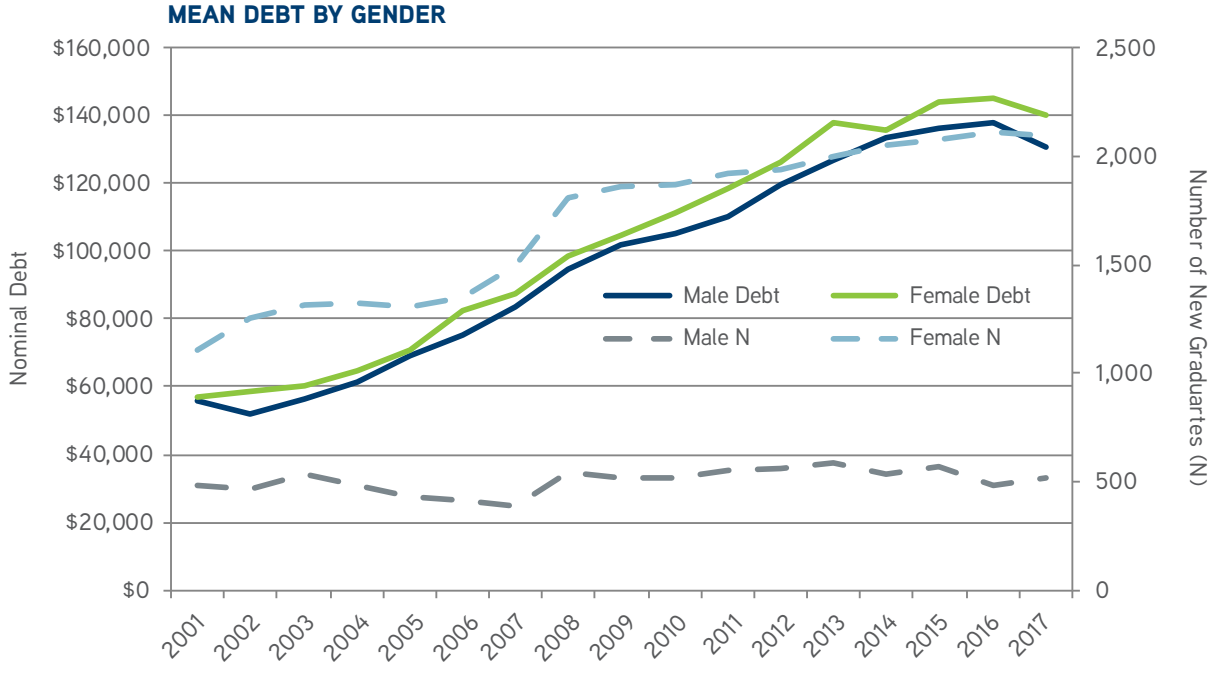
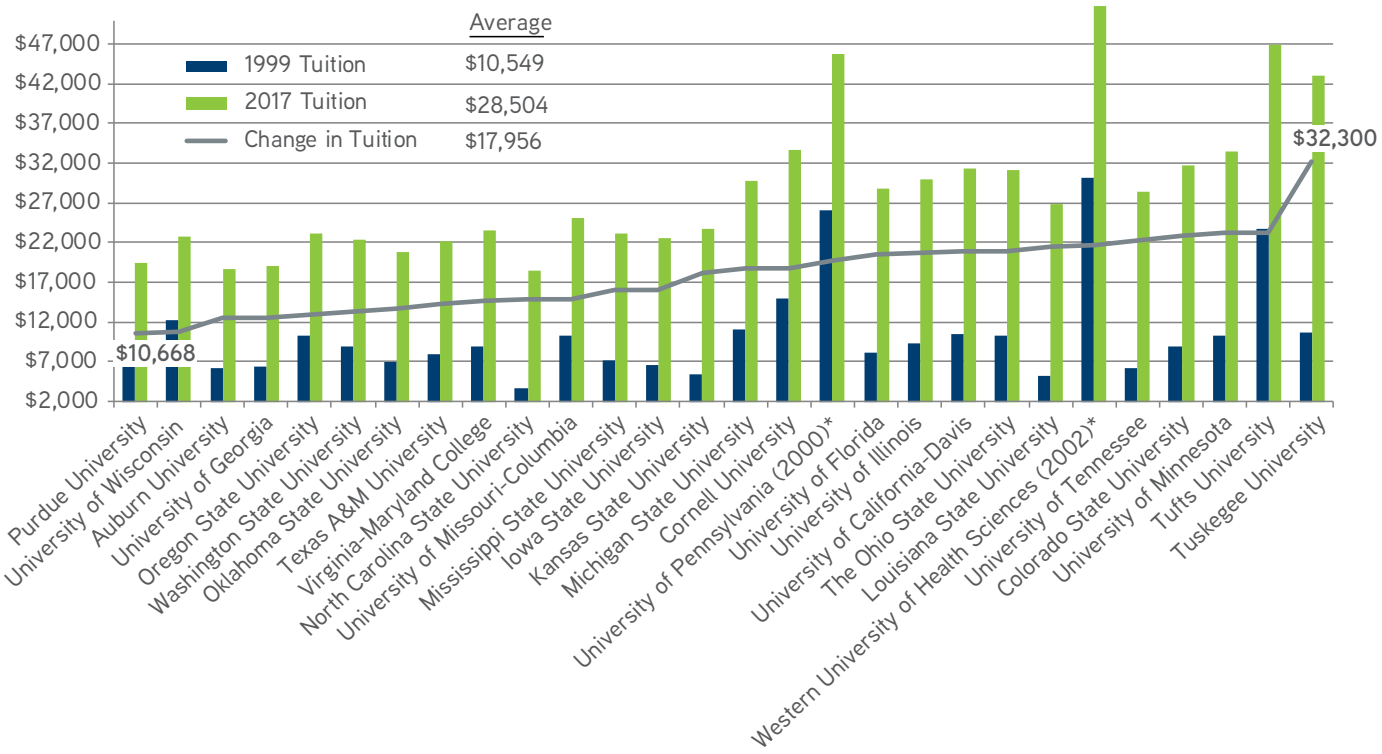


Figure 30

Over the period 1999 through 2017, discounted tuition and fees across veterinary colleges increased by more than 400 percent. The largest increase occurred at North Carolina State University, an increase of 406 percent, followed by Louisiana State University with an increase of 405 percent. The smallest increases occurred at the University of Pennsylvania at 75 percent, and at the University of Wisconsin at 88 percent. The average increase across all colleges throughout the period was 205 percent.

U.S. VETERINARY COLLEGES TUITION AND FEES



* Earliest year tuition data available

Figure 31

One significant factor contributing to the variation in the debt level of new veterinarians is their residency status (e.g., resident is in state, non-resident is out of state). Residents are those who attend veterinary college in the state where they reside, while non-residents are those who attend veterinary colleges outside of the state of their primary residence. At some institutions, however, students who entered the college as a non-resident may be able to attain residency status after their first year in veterinary college. So, more aptly, we refer to discounted and non-discounted seats. Discounted seats refer to those students who pay less than the full cost of attendance either because they are residents of the state where the veterinary college is located or because their state has a contract with the veterinary college to make up the difference in the out-of-state (non-residency) tuition and fees. Over the past 12 years, the mean debt of graduating veterinary students reporting resident status was more than $35,000 less than the mean debt of graduating veterinary students reporting non-resident status. In 2017 the mean debt of students graduating with residency status was almost $45,000 less than the mean debt of students graduating with non-residency status, as compared to a $58,000 difference between these two groups in 2016.

RESIDENT AND NON-RESIDENT DEBT

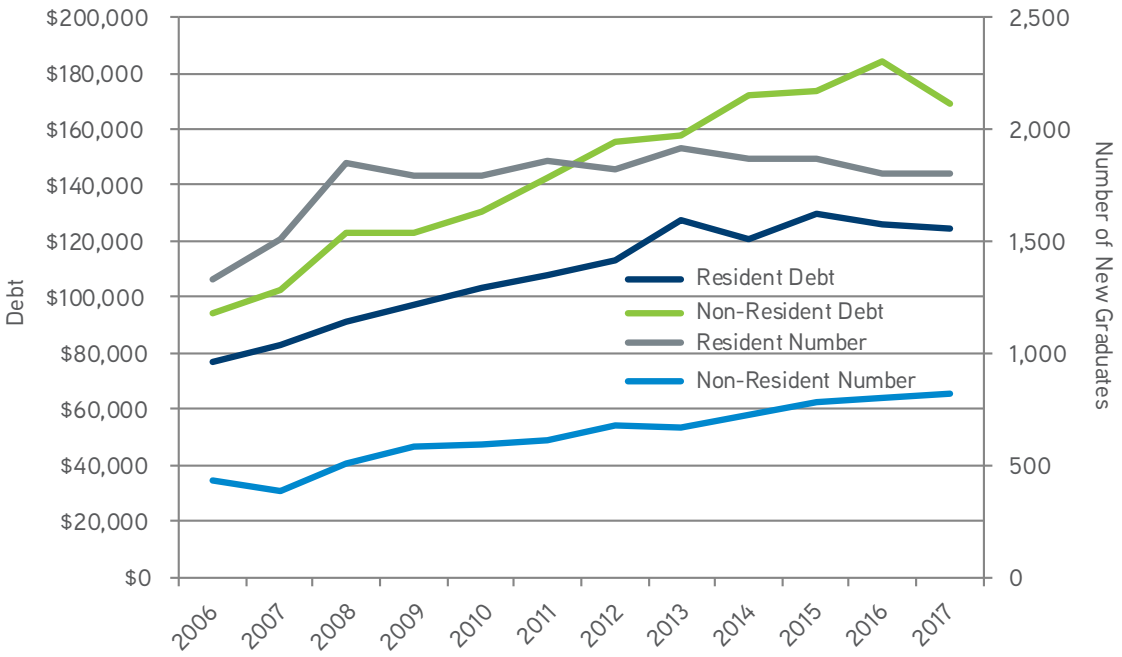


Figure 32

The following chart illustrates the number of new veterinarians graduating, who have reported zero debt or otherwise, and those graduating with non-zero debt. From 2001 through 2015, although the number of students with no non-zero debt remained relatively constant, with an increasing class size, the proportion has been shrinking. In 2001, 15.4 percent reported graduating with no debt and this proportion has been on a steady decline, with 11.2 percent reporting graduating with no debt in 2015. However, a large increase occurred in 2016 with just over 14 percent of the graduating class reporting having no educational debt followed by another increase to 17.2 percent of new graduates reporting no debt in 2017. This most recent year's measure is the highest percent over the last 17 years, the entire period under observation.

DEBT OF ALL STUDENTS VS. ONLY STUDENTS WITH NON-ZERO DEBT

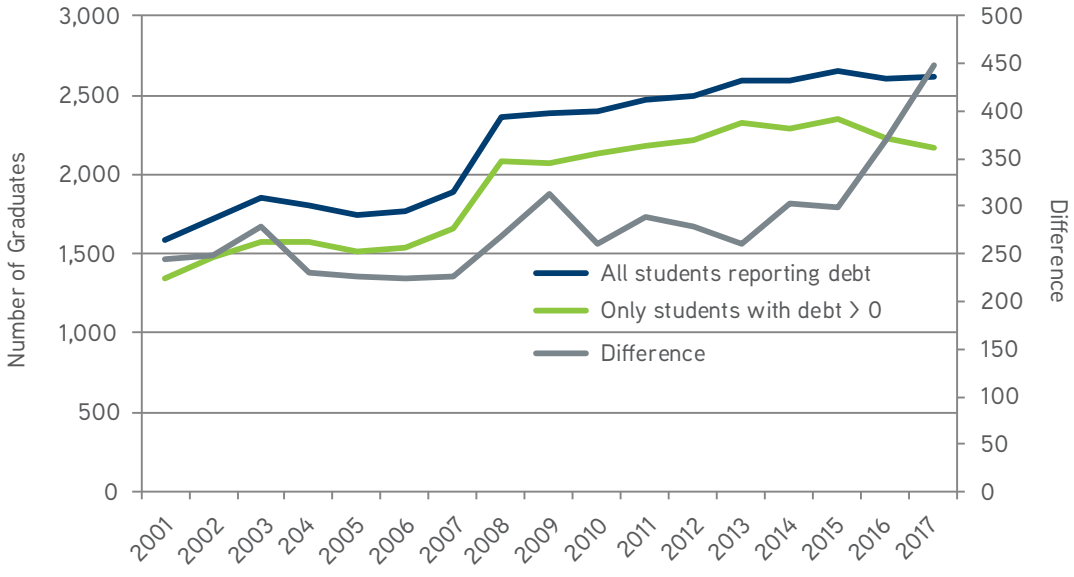


Figure 33

The following chart shows the proportion and number of new veterinarians who've reported they graduated with zero debt. As previously mentioned, in 2017 the highest proportion of the class graduated with zero debt since 2001. At 17 percent, this was the largest proportion as well as the greatest number of new veterinarians graduating without DVM debt.

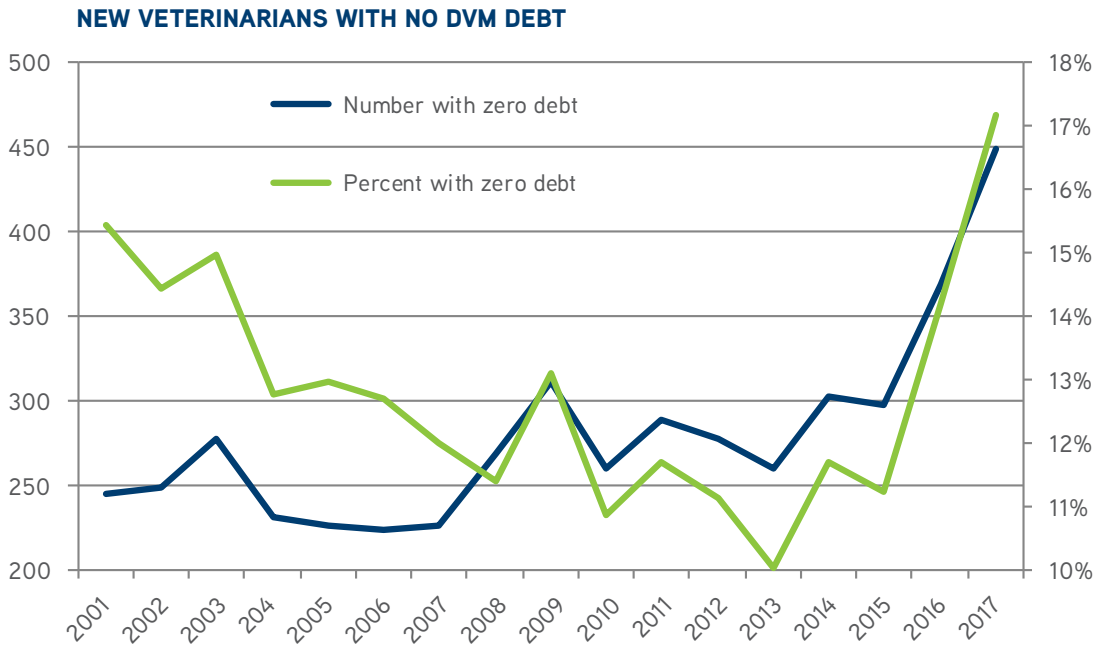


Figure 34

Similar to the methods used to determine the real weighted mean income index, we determine the real weighted mean DVM debt index (RWD) by measuring the annual change in the debt load of a constant cohort of graduates and adjusting for inflation. In 2014 dollars, The RWD nearly doubled from slightly over $75,000 in 2001 to just over $141,000 in 2016 and declined in 2017 to $131,543. To determine this measure, we held constant the following: ratios of gender, the percentage of students in residency status, and the distribution of graduates across schools based on cost of tuition.

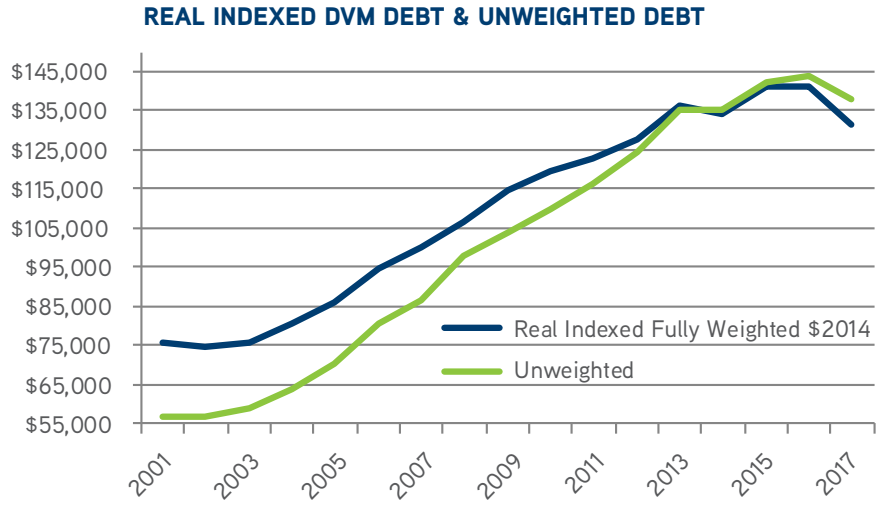


Figure 35

FACTORS AFFECTING DEBT FOR NEW VETERINARIANS

Like the methods used to determine the factors explaining the variation in income, we calculated a multiple linear regression to determine the factors significant in explaining the variation in debt. The factors under observation were the region in which the school is located, the tuition range, age, gender, income, residency status, and a time series factor – year of graduation.

Our baseline variables were schools in Region 3 and schools with "low tuition." Schools in Region 3 are schools located in an area with a ZIP code beginning with 3. To determine tuition grade, we determined by year, the mean tuition and categorized as "low tuition" those schools with tuition that was within two standard deviations below the mean; "median tuition" referred to those schools with tuition above the mean tuition but within two standard deviations above the mean; and schools labeled "pricey tuition" were those with tuition above two standard deviations above the mean tuition.

According to our regression model, new veterinarians graduating from schools in Region 6 had $8,170 more debt than new veterinarians graduating from schools in Region 3, and new veterinarians graduating from schools with "pricey tuition" had $70,611 more debt than those graduating from schools with "low tuition."

Female veterinarians graduated with over $6,200 more debt, on average, than male veterinarians, and non-residents graduated with an average of $37,970 more debt than residents had. In addition, each year, mean DVM debt increased by approximately $5,023.

As in the regression explaining the variation in income, the non-standardized coefficients in this regression explaining the variation in debt represent the dollar value attached to the variable in question, whereas the standardized coefficients represent the relative value of each coefficient. For example, the standardized coefficient for "pricey tuition," 0.198, indicates that the debt incurred from graduating from a school that has "pricey tuition" carries more than five times more weight than the debt incurred from going to a school in Region 0, with a coefficient of 0.037.

Of importance is the unstandardized coefficient for year of the survey, which indicates that the mean value of costs has increased by nearly $5,023 per year, as opposed to an annual increase of $5,800 in 2016. An additional finding of importance is that, while the model explaining the variation in income explains more than 71 percent of the variation with the factors available, this model to explain the variation in debt among students at graduation was only able to explain approximately 18 percent of the variation with the same set of variables. Thus, there are important variables which have not been accounted for that determine how much debt each student has at graduation.

FACTORS AFFECTING DEBT OF NEW VETERINARIANS

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	$(10,141,506)	301,896		-33.593	.000
	Year of the survey	$5,023	150	.221	33.444	.000
	Region of School 0	$(15,922)	3,166	-.037	-5.029	.000
	Region of School 1	$(20,975)	2,368	-.070	-8.858	.000
	Region of School 2	$(4,899)	2,259	-.016	-2.169	.030
	Region of School 3	Baseline				
	Region of School 4	$10,707	1,988	.044	5.385	.000
	Region of School 5	$5,441	1,934	.022	2.813	.005
	Region of School 6	$8,170	1,913	.033	4.271	.000
	Region of School 7	$(15,104)	1,904	-.062	-7.932	.000
	Region of School 8	$(4,184)	2,679	-.011	-1.561	.118
	Region of School 9	$2,851	1,985	.012	1.436	.151
	Low Tuition	Baseline				
	Median Tuition	$22,124	1,286	.134	17.207	.000
	Pricey Tuition	$70,611	2,648	.198	26.663	.000
	Age	$2,943	158	.121	18.595	.000
	Gender	$6,271	1,222	.033	5.130	.000
	Income	$0	0	.031	4.731	.000
	Resident/Non-Resident	$37,970	1,179	.211	32.196	.000
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	22,653,014,990,503	16	,415,813,436,906	273.008	.000
	Residual	104,455,781,103,836	20,142	5,185,968,678		
	Total	127,108,796,094,339	20,158			
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate		
1	0.422	.178	.178	72,013.67		

Table 5

NEW VETERINARIAN DEBT-TO-INCOME RATIO

The debt-to-income ratio varies significantly by post-graduate plans.

The debt-to- income ratio is an important measure of the economic performance of the market for veterinary education. The debt-to-income ratio ties together the market for education and the market for new veterinarians. By definition, the DIR measures the percentage of debt covered by annual income. Although some economists suggest that a debt-to-income ratio of 1:1 may be the limit that should be considered to guarantee personal financial sustainability, this best applies to non-professional undergraduate degrees. Because the increases in income associated with experience is much greater for those with professional degrees, especially graduate professional degrees, the level of debt-to-income that can be serviced without posing serious financial stress is likely closer to 1.4:1.

In the following chart we illustrate several measures for the DIR. The first (highest DIR) represents the mean of the individual debt-to-income ratios. The middle line represents the mean of the individual debt-to-income ratios adjusted to maintain a constant cohort of veterinarians over time. The last (bottom line) provides the simple ratio of the mean of all reported incomes and all reported debt. In all cases, only the incomes of those graduates with full–time employment are included and all reported debt values are included. In other words, the sample of observations of debt is larger than the sample of income from graduates with full–time employment and thus this measure is inaccurate. The first two measures

are based on graduates who have both incomes from full–time employment and reported debt. The AVMA DIR that is used as a KPI is the fully weighted, individual DIR or the real weighted mean Index. The real weighted DIR in 2017 is 1.86, down from 2.00 in 2016, in part attributable to more graduates reporting having zero debt, coupled with an increase in starting salaries.

DEBT-TO-INCOME RATIO MEASURES

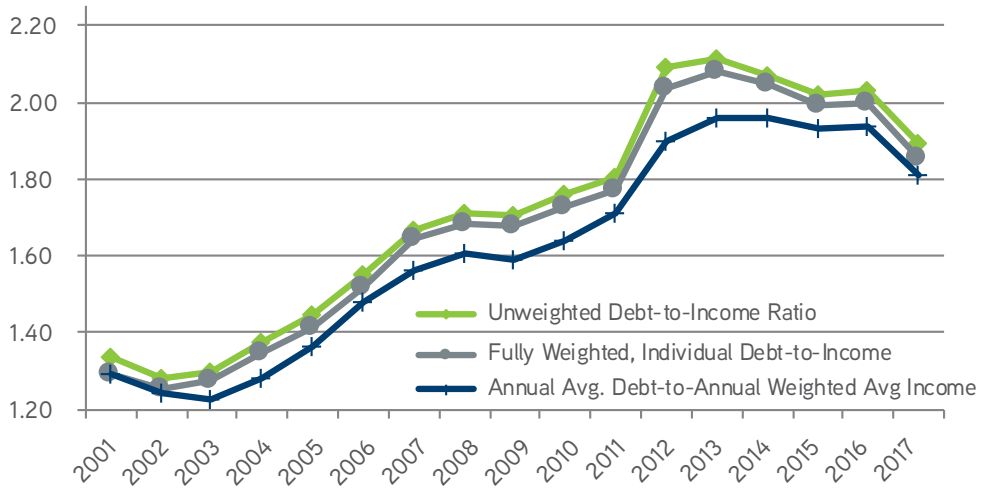


Figure 36

The debt-to-income ratio varies significantly by post-graduate plans. This is somewhat intuitive since we know that practice type is significant in explaining the variation in incomes. The variation in incomes can also be explained by the shifting demand for veterinarians in the respective sectors. Consequently, to portray an accurate picture of the debt-to-income ratio of the profession it is necessary to observe a constant cohort of veterinarians. By doing this, we avoid observing the effects of a changing demographic and attributing these to economic factors.

New veterinarians pursuing public practice have had on average the lowest debt-to-income ratio for most of the period 2001 through 2016. The new, public practitioners' DIR overtook the DIR of new veterinarians pursuing private practice in 2016 but returned to the lowest DIR in 2017. In 2016 new veterinarians pursuing employment in private practice reported a debt-to-income ratio of 1.99, the lowest of the group, while new veterinarians pursuing employment in public practice had an increase in DIR from 1.85 in 2015 to 2.5 in 2016. In 2017 the lowest DIR was held by new veterinarians in public practice, at 1.79, with private practice hovering closely at 1.89. On the other hand, new veterinarians pursuing internships had the highest debt-to-income ratio for most of the same period, with a mean debt-to-income ratio of 4.89 in 2015, 4.69 in 2016 and 4.34 in 2017. Though declining, it was still double that of those securing employment in public practice.

DEBT-TO-INCOME RATIO BY POST-GRADUATE PLANS

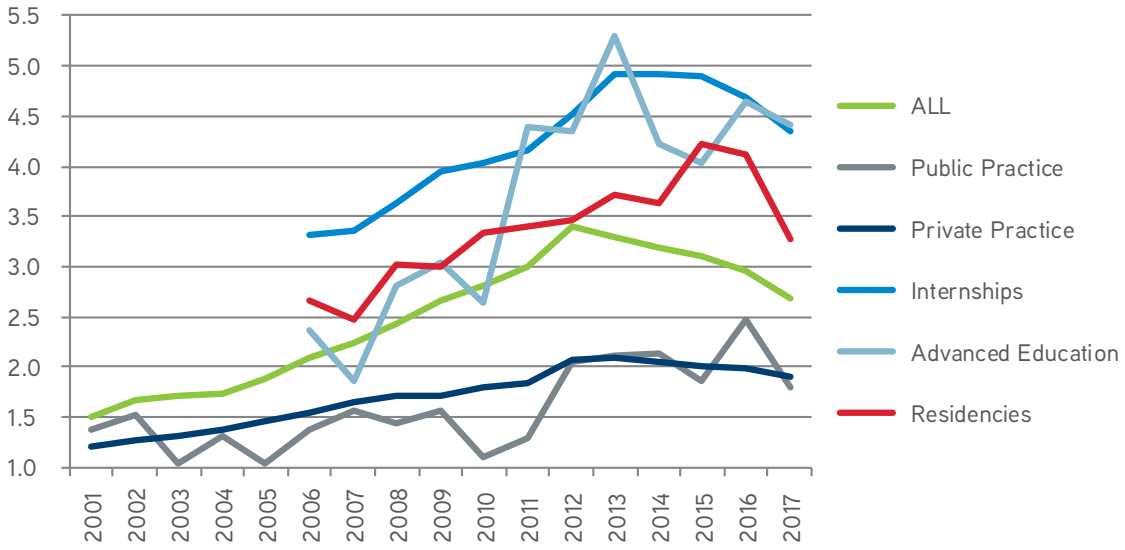


Figure 37

FACTORS SIGNIFICANT IN EXPLAINING THE DEBT-TO-INCOME RATIO

The analyses of the factors that contribute to the difference between the individual level of income and the mean income, and for individual debt and mean debt, for graduates from 2001 to 2017 have been illustrated previously. The following analysis shows the factors that explain the differences between the DIR for each individual and the mean DIR for the sample of all graduates between 2001 and 2017 who reported income and debt. A regression of debt-to-income as a function of year, age, and gender, whether the respondent had children, sought employment, or received any offers; and number of hours and weeks expecting to work, additional degrees held, location of anticipated place of employment, practice type, GDP lagged one year, and veterinary college was performed. Results are provided in the following table.

For comparison with the other variables in the respective groups, The Ohio State University, companion animal predominant (the most populated sector for full-time employment) and new positions located outside the United States, were designated as baselines and omitted from the model.

The following factors were found to be statistically significant in explaining the variation in the debt-to-income ratio of survey respondents, at a 5 percent level of significance: year of graduation, age, gender, hours expected to work, GDP lagged one year, various practice types (food animal, companion animal, mixed practice, equine, government services, uniformed services, industry and not-for profit) and the college of graduation. The group with the most significant variables was the college of graduation. Out of 28 universities, 24 were significantly different from The Ohio State University in contributing to the variation in the debt-to-income ratio. Veterinary colleges at Kansas State University, Michigan State University and the University of Pennsylvania were not statistically different from The Ohio State University.

The unstandardized coefficient indicates the change to the constant debt-to-income ratio attributable to each characteristic (variable). For instance, the mean DIR of women is 0.182 higher than the mean debt-to-income ratio of men over the 2001 to 2017 period and every year older the new veterinarian is, 0.042 is added to that age group's mean DIR.

Graduates of Tuskegee University, University of Minnesota and Western University have a mean DIR that's above the mean DIR of The Ohio State University graduates. Western University had the highest mean attributable to college at 1.977 higher than the mean at The Ohio State University, while all other U.S. colleges had a mean DIR below the mean DIR of the baseline institution, The Ohio State University. This reflects the difference in costs across colleges. However, new veterinarians in the baseline practice type, companion animal predominant, had the highest mean DIR, followed by new veterinarians securing employment in college or university positions; uniform services had the lowest mean DIR, 2.056 less than companion animal predominant. This reflects the difference in starting salary across different occupational paths.

FACTORS AFFECTING THE DEBT-TO-INCOME RATIO

		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
Basic Information	(Constant)	3.906	.783		4.987	.000
	Last 2 digits of grad year	.119	.006	.243	20.026	.000
	Age	.042	.004	.062	10.498	.000
	Gender: Female=1	.182	.030	.033	6.003	.000
	Have children: No=1	.012	.052	.001	.224	.822
	Seeking Employment or Adv. Educ.	-.330	.159	-.011	-2.078	.038
	Received offers	.131	.392	.002	.335	.738
	Anticipated Work hours/week	.026	.001	.155	24.183	.000
	Work at least 48 weeks/year	.072	.096	.004	.753	.452
	GDP lagged 1 year	-9E-05	.000	-.079	-6.542	.000
Additional Degrees	Admitted Before earning degree	BASELINE				
	Bachelor's degree	.296	.042	.049	7.103	.000
	Master's degree	.261	.066	.027	3.970	.000
	Doctorate degree	-.060	.163	-.002	-.369	.712
	Other Professional degree	-.214	.251	-.005	-.852	.394
	Other degree	.601	.198	.016	3.036	.002
Region of New Position	Region 0	.314	.146	.036	2.146	.032
	Region 1	.033	.145	.004	.230	.818
	Region 2	-.113	.144	-.015	-.785	.432
	Region 3	-.032	.143	-.005	-.223	.823
	Region 4	-.174	.145	-.022	-1.203	.229
	Region 5	-.185	.149	-.020	-1.242	.214
	Region 6	-.113	.147	-.013	-.771	.441
	Region 7	-.005	.146	-.001	-.034	.973
	Region 8	-.107	.145	-.013	-.737	.461
	Region 9	-.324	.144	-.044	-2.251	.024
	Outside the US	BASELINE				
Practice Type	Food animal practice (exclusive)	-1.584	.090	-.097	-17.685	.000
	Food animal practice (predominant)	-1.499	.085	-.098	-17.638	.000
	Mixed practice	-1.332	.047	-.167	-28.510	.000
	Companion animal practice (exclusive)	-1.336	.033	-.266	-40.301	.000
	Companion animal practice (predominant)	BASELINE				
	Equine practice	-.726	.078	-.050	-9.341	.000
	Federal Government (civil service)	-1.510	.200	-.040	-7.561	.000
	Uniformed services	-2.056	.102	-.109	-20.217	.000
	College or University (faculty or staff only)	.074	.224	.002	0.329	.742
	State or Local Government	-.817	.459	-.009	-1.779	.075
	Industry or commercial organizations	-1.723	.270	-.034	-6.376	.000
	Not-for-profit organizations	-1.055	.193	-.029	-5.460	.000

FACTORS AFFECTING THE DEBT-TO-INCOME RATIO CONT'D.

University	Auburn University	-.957	.085	-.076	-11.317	.000
	Tuskegee University	.312	.103	.019	3.020	.003
	University of California-Davis	-.872	.091	-.069	-9.593	.000
	Colorado State University	-.527	.083	-.046	-6.339	.000
	University of Florida	-.560	.089	-.043	-6.272	.000
	University of Georgia	-1.157	.084	-.096	-13.757	.000
	University of Illinois	-.638	.084	-.056	-7.609	.000
	Iowa State University	-.424	.085	-.036	-4.965	.000
	Kansas State University	-.049	.085	-.004	-.574	.566
	Louisiana State University	-.849	.090	-.065	-9.417	.000
	Tufts University	-.201	.089	-.016	-2.263	.024
	Michigan State University	-.041	.081	-.003	-.505	.614
	University of Minnesota	.449	.091	.035	4.955	.000
	Mississippi State University	-.227	.094	-.016	-2.415	.016
	Purdue University	-.732	.098	-.046	-7.492	.000
	Cornell University	-.881	.082	-.076	-10.768	.000
	Oklahoma State University	-.804	.092	-.061	-8.758	.000
	University of Pennsylvania	-.034	.091	-.003	-0.377	.706
	Texas A&M University	-1.398	.083	-.137	-16.918	.000
	Washington State University	-.773	.090	-.060	-8.635	.000
	University of Missouri-Columbia	-.688	.092	-.051	-7.515	.000
	Oregon State University	-.443	.119	-.023	-3.736	.000
	University of Tennessee	-.492	.093	-.035	-5.287	.000
	Virginia-Maryland College	-.654	.084	-.055	-7.774	.000
	North Carolina State University	-1.211	.089	-.091	-13.552	.000
	University of Wisconsin	-.651	.091	-.048	-7.117	.000
	The Ohio State University	BASELINE				
	Western University of Health Sciences	1.977	.102	.126	19.360	.000

ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	41,932	62	676.328	170.213	.000
	Residual	101,938	25,655	3.973		
	Total	143,870	25,717			

MODEL SUMMARY

Model	R	R Square	Adj. R Square	Std. Err.
1	.540	.291	.290	1.99334

Table 6

DEBT-TO-INCOME RATIO PROJECTIONS

Using GDP, the number of new veterinarians graduating from U.S. colleges each year, the number of new veterinarians finding full-time employment, and historical debt and income, the following chart projects debt, income and the debt-to-income ratio of new veterinarians. The solid portion of the line portrays the actual, mean debt, income, and debt-to-income ratio of the graduating classes 2001 through 2017 and the perforated portion of the line represents projected estimates.

Until about 2005, the slope of the debt curve and the income curve remained relatively parallel, growing at a comparable rate. After 2005 the rate of increase of the debt far exceeded the rate of increase of the income of new veterinarians. As a consequence, the DIR began increasing steadily. At the projected rate of increase of the debt and income levels of the graduating class, we estimate that the DIR will increase to almost 2.10 by 2027.

DEBT AND INCOME: GRADUATES OF U.S. COLLEGES WITH FULL-TIME EMPLOYMENT

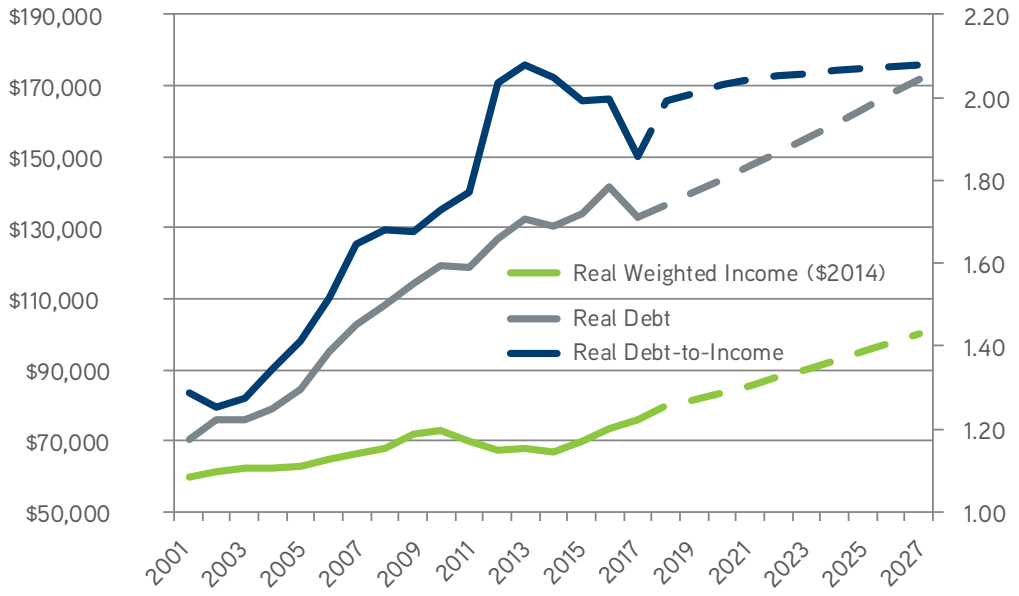


Figure 38

Similar to the updates made by the Federal Reserve Bank of St. Louis and the U.S. Census Bureau, every year, the AVMA Economics Division updates its projection of the debt, income, and debt-to-income ratio of the graduating class. The blue lines in Figure 38 represent 2016's projections, whereas the perforated, continuous lines represent the 2017 updated projections. The income projection of 2017 was adjusted upward and the debt downward, since 2016's projections were below the actual 2017's mean. As a result, the projected DIR declined and was also shifted downward.

DEBT AND INCOME: GRADUATES OF U.S. COLLEGES WITH FULL-TIME EMPLOYMENT, HISTORIC AND PROJECTIONS

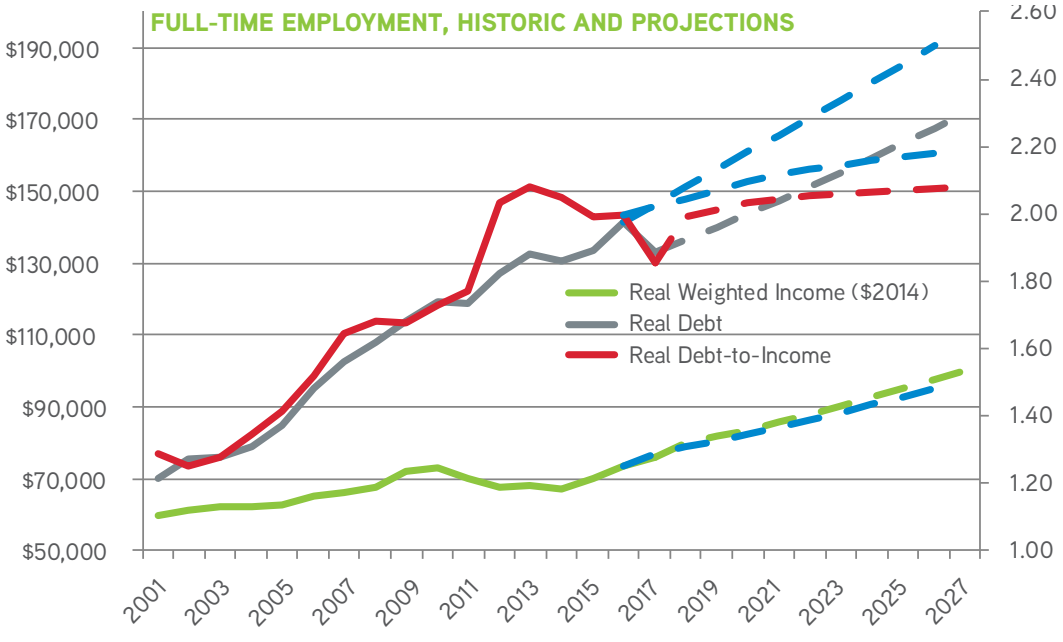


Figure 39

DEBT AND INCOME OF THE 2017 GRADUATING CLASS

the percentage of the class with zero debt has been steadily increasing, up from 14 percent in 2016 to 17 percent in 2017.

The mean debt of U.S. respondents reporting debt for the 2017 graduating class was $138,066.79 with a standard deviation of $90,851.58. Figure 39 illustrates the distribution of debt for the 2017 graduating class. While 44 percent of the class graduated with debt levels that lie between $100,000 and $200,000, the percentage of the class with zero debt has been steadily increasing, up from 14 percent in 2016 to 17 percent in 2017.

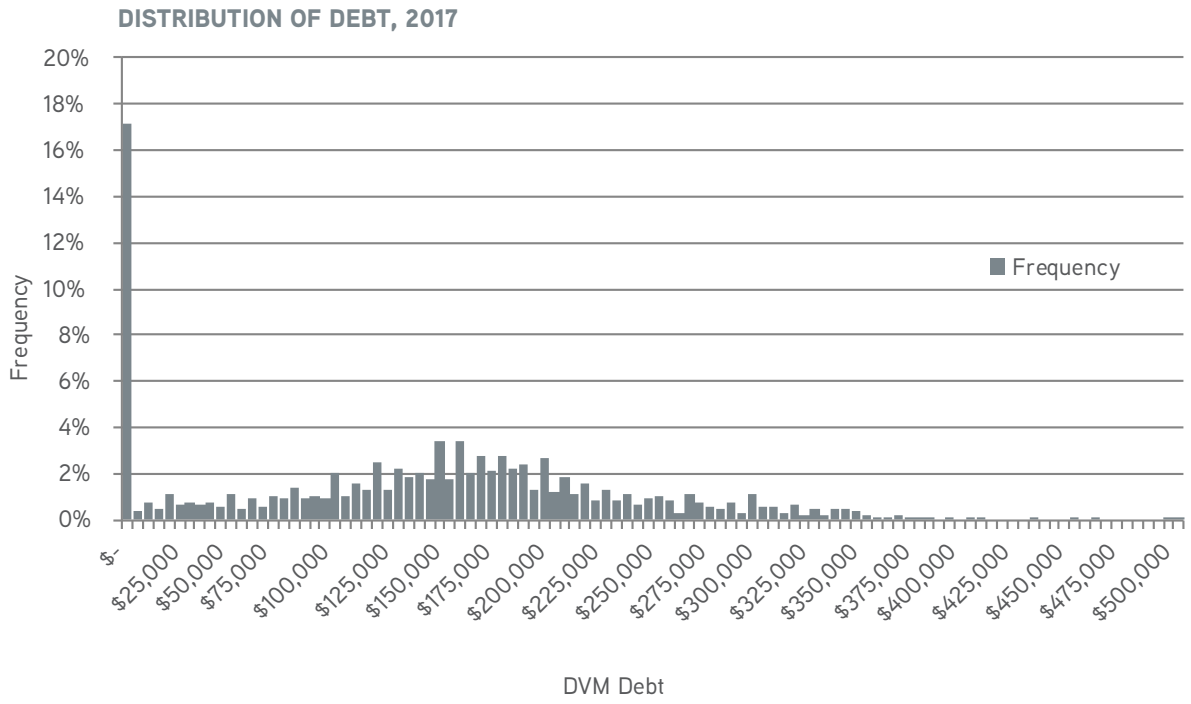


Figure 40

Within the 2017 graduating class, 67.8 percent of respondents had a debt between $50,000 and $270,000 and 94.7 percent had less than $305,000 in debt. Observations beyond $305,000 may be considered statistical outliers. The mean debt of individuals with debt under $305,000 was $157,482.80 excluding those with zero debt.

The following chart illustrates the distribution of reported income, including internships, residencies and other continuing education. The chart has two peaks hovering around $30,000 and $75,000.

The first normally distributed set of bars, peaking at a mean of $30,000, primarily represents the compensation of new veterinarians opting to pursue internships, residencies and other continuing education. The second set of normally distributed bars primarily represents the incomes of new veterinarians securing full-time employment. Evidently, those selecting to pursue internships, residencies and continue their education earn a mean of $40,000 less than those selecting to pursue full-time positions in veterinary medicine.

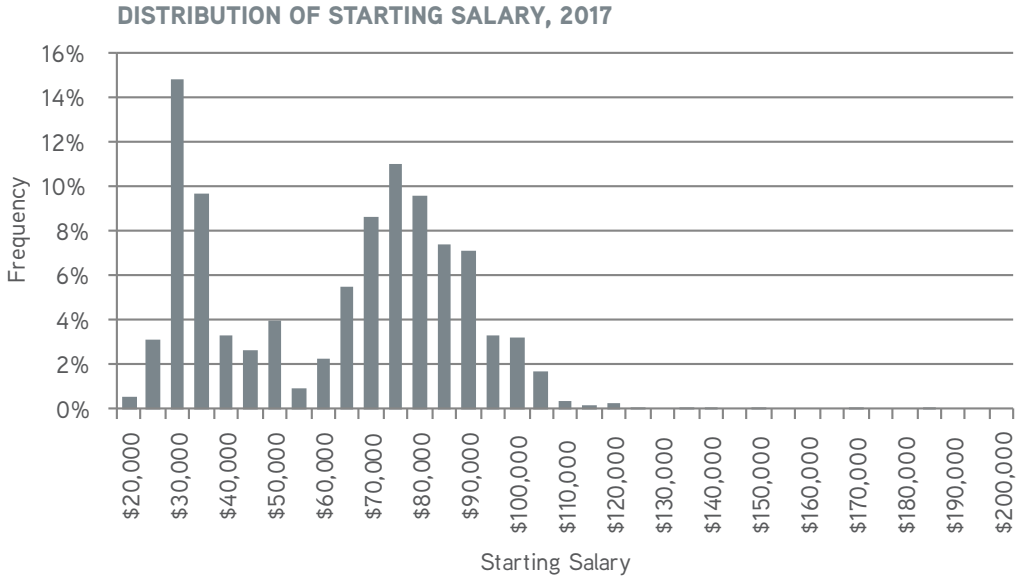


Figure 41

The distribution of starting salaries presented represents 85 percent of the 2017 graduating class. At the time the survey was distributed, approximately 95 percent of veterinary students had secured full-time employment or advanced education and 85 percent provided information about income from the positions they had secured. However, the following table shows data from AVMA's Census of Veterinarians, which was sent to all 2015 graduates in March of 2017. These graduates have approximately one year's experience.

The mean income of new veterinarians with one year's experience is $68,250 with a 95 percent confidence interval of within $66,133 and $70,368. That is, statistically, we are 95 percent confident that the mean income of veterinarians with one year's experience lies within the aforementioned range.

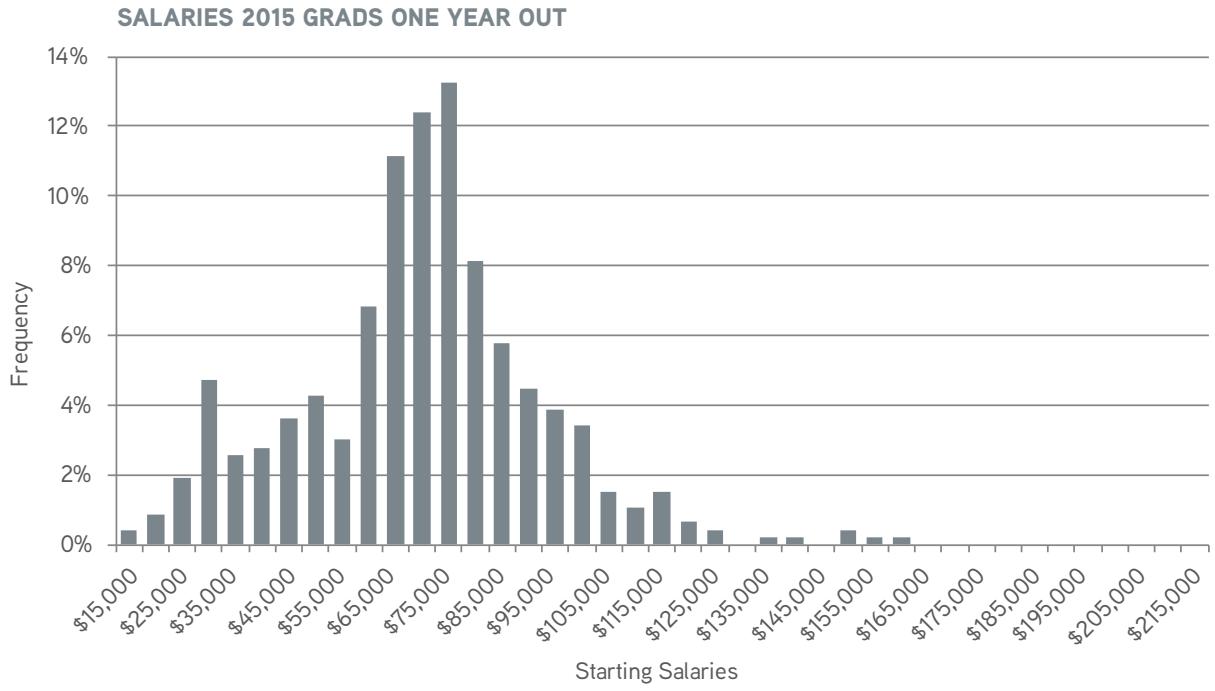


Figure 42

Using the individually reported debt and income, the distribution of the debt-to-income ratio is computed for all graduates who provided a value for debt and a starting salary for full-time employment. The distribution includes a large number of observations at both ends of what might otherwise be a normally distributed sample of graduates. More research is needed to understand what factors contribute to the large number of observations at both ends of the distribution. Most important in the illustration is that the majority of graduates have debt-to-income ratios at the beginning of their career that far exceed the 1.4:1 DIR that establishes an upper bound for "acceptable" levels of financial stress.

For the 2017 graduating class, 76.7 percent of graduates reported a debt-to-income ratio of 1.0 or larger. More than two-thirds (69.1 percent) reported a DIR of 1.4 or greater, 53.5 percent reported a DIR of 2.0 or greater and 5.5 percent reported a DIR of more than 4.0.

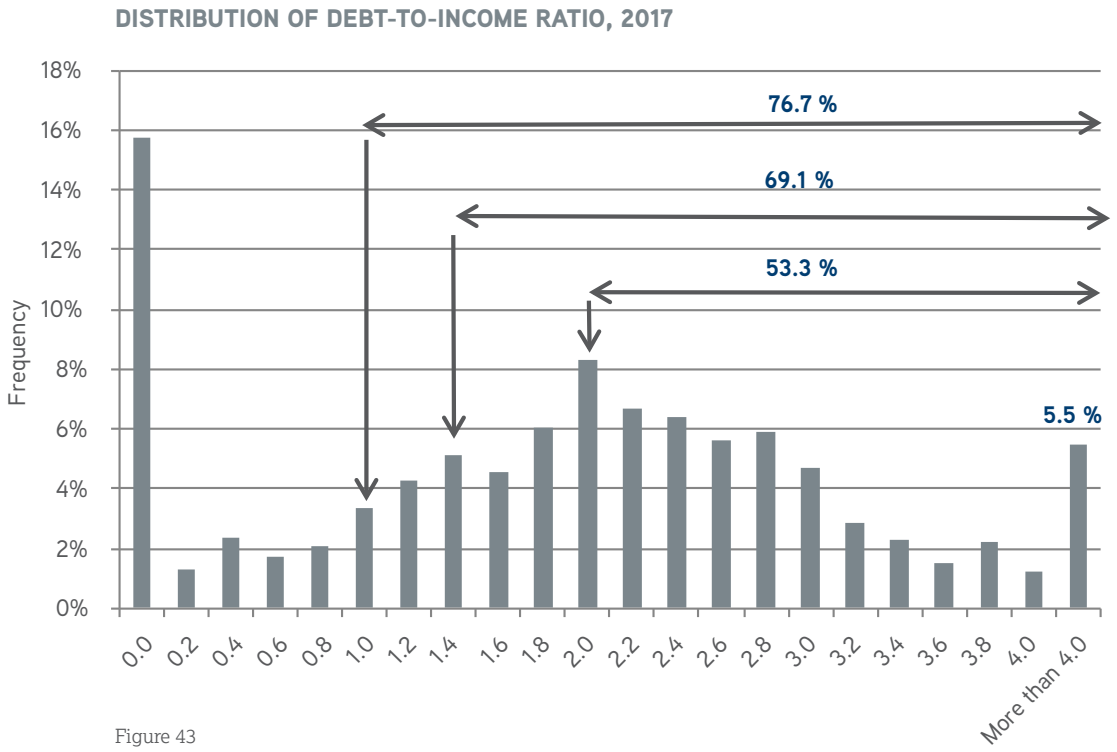


Figure 43

Similar to 2016's findings, the following chart illustrates, in general, that debt levels are about double that of income levels. In addition, the distribution of incomes of new veterinarians finding full-time employment is much more concentrated around the mean while the distribution of debt is more widely dispersed. These trends have been similar in past years.

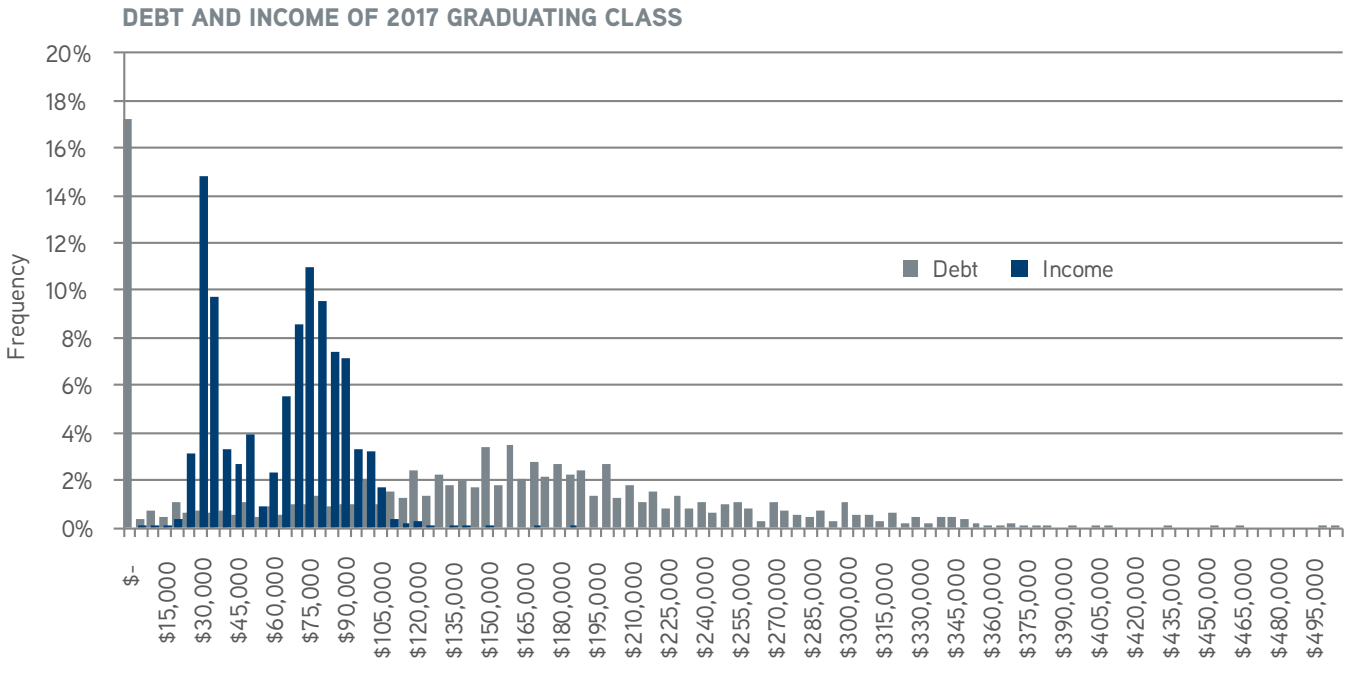


Figure 44

Because the income and debt data from the 2017 class only represents a proportion of the class, the following chart describes a sample of the population surveyed one year after graduation. Evidently, the debt and income numbers of the population one year post-graduation closely mirrors the first years from the senior survey, indicating the validity of our senior survey results.

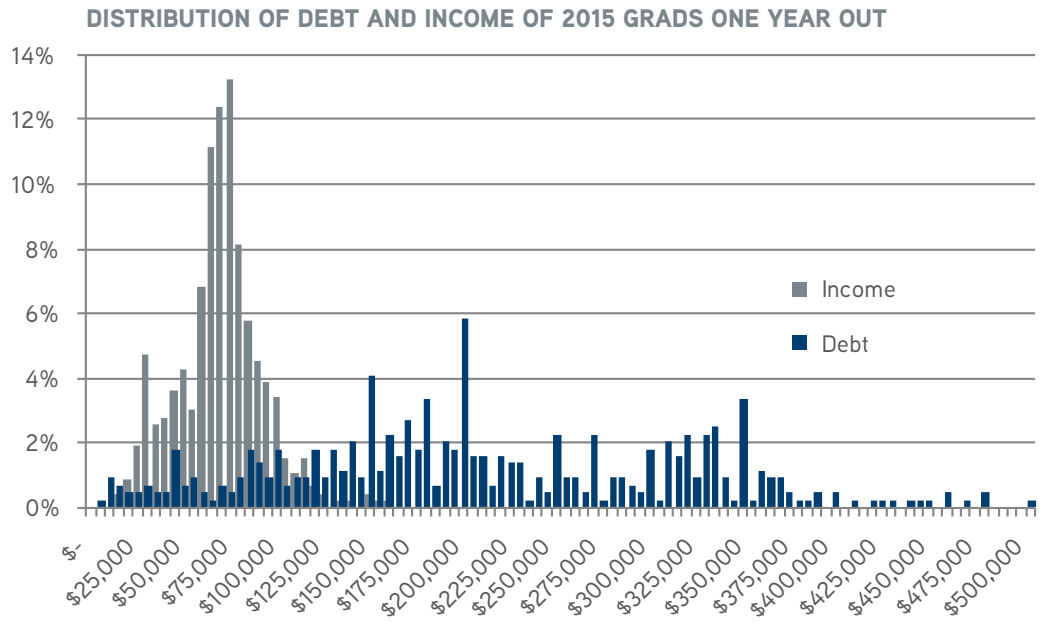


Figure 45

Mean debt for graduates of each of the U.S. veterinary colleges varied from just under $80,000 to almost $260,000 in 2017. The mean debt for all graduates across all the U.S. veterinary colleges was just over $138,000. The school with the highest reported mean debt for 2017 and 2016 was Western University and the lowest was Texas A&M, for both years. Similar to 2016's findings, each school had reported a mean debt that was significantly lower than the debt of Western University at a 5 percent level of significance, except Tuskegee University.

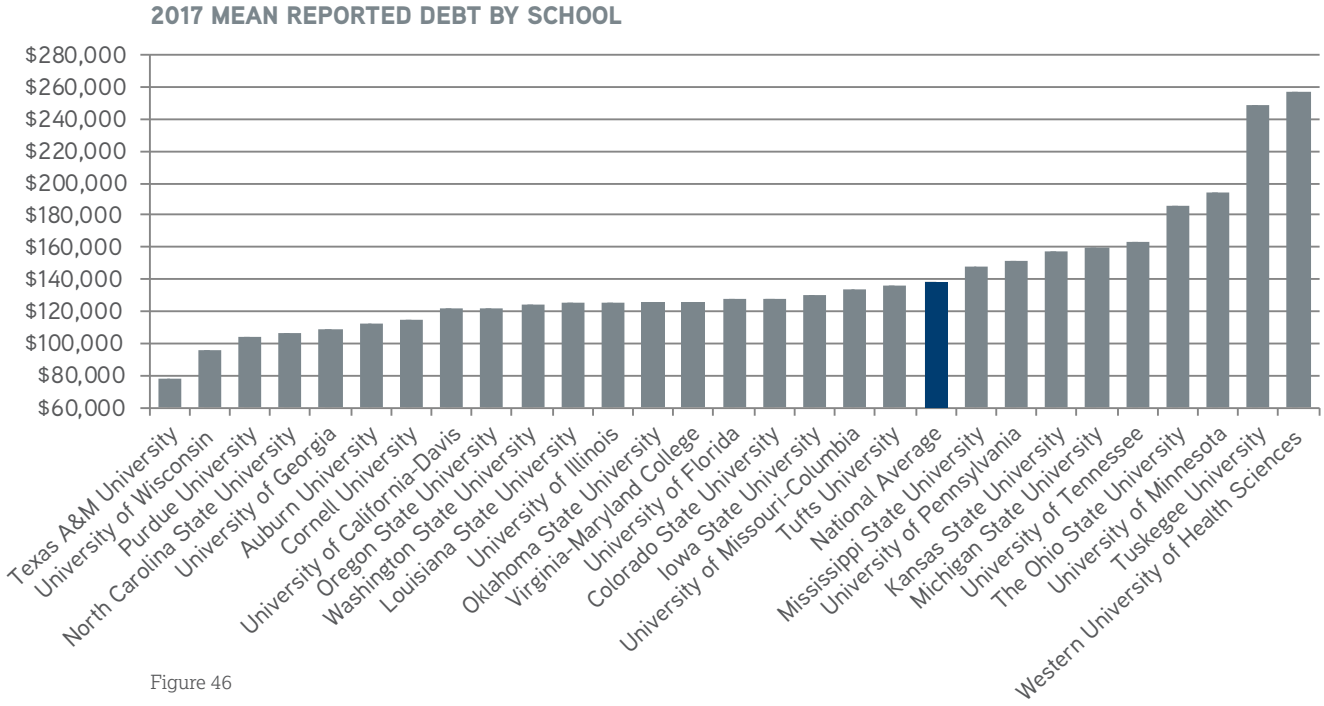


Figure 46

Using the reported residency status of graduates, four years of tuition is subtracted from the reported debt and a mean value of this difference is computed. If the reported tuition for four years was $80,000 and the DVM debt reported for four years was $170,000, for example, then the DVM debt over tuition in this instance would be $90,000 ($170,000-$80,000). Interestingly, several of the more expensive schools have a mean debt for graduates that is below the four-year tuition costs.

For students graduating as residents, or paying discount tuition, the schools with the largest, mean debt load above tuition are Tuskegee University, with a mean debt load of $69,000 above tuition, The Ohio State University, Western University of Health Sciences and Washington State University. With the exception of Tuskegee University, no other school had a mean debt load of $50,000 more than tuition. Schools with residents graduating with debt loads below tuition in 2017 are University of Pennsylvania, Tufts University, Cornell University, Texas A&M University, Purdue University, University of California-Davis, University of Illinois, Kansas State University, Colorado State University, University of Wisconsin and University of Florida. Graduates of Virginia-Maryland College had a mean debt load closest to the cost of tuition, at only $2,443 above tuition.

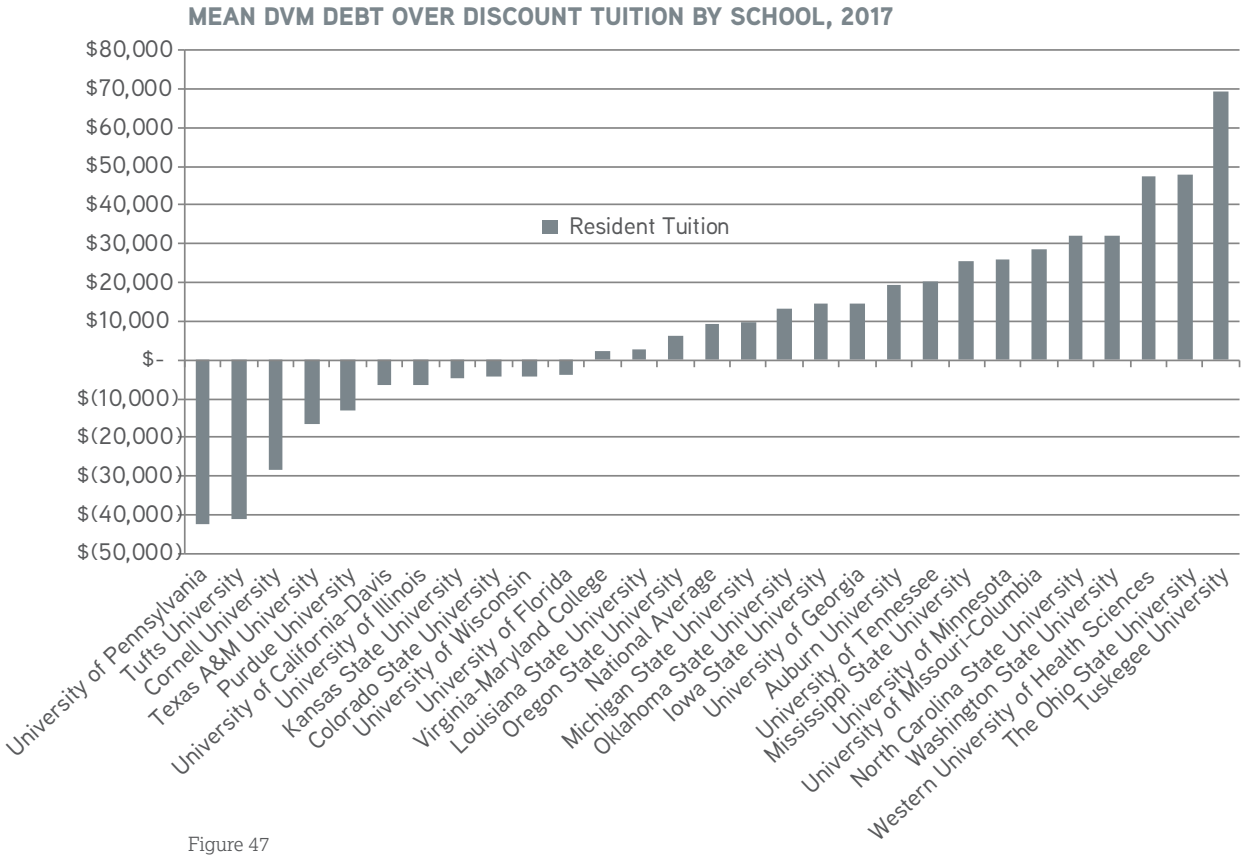


Figure 47

For students graduating with non-resident tuition, the schools with the highest mean debt load over tuition were Tuskegee University, University of Tennessee and Western University of Health Sciences. All other schools reported, for non-resident graduates, a mean debt load below the cost of non-discount tuition.

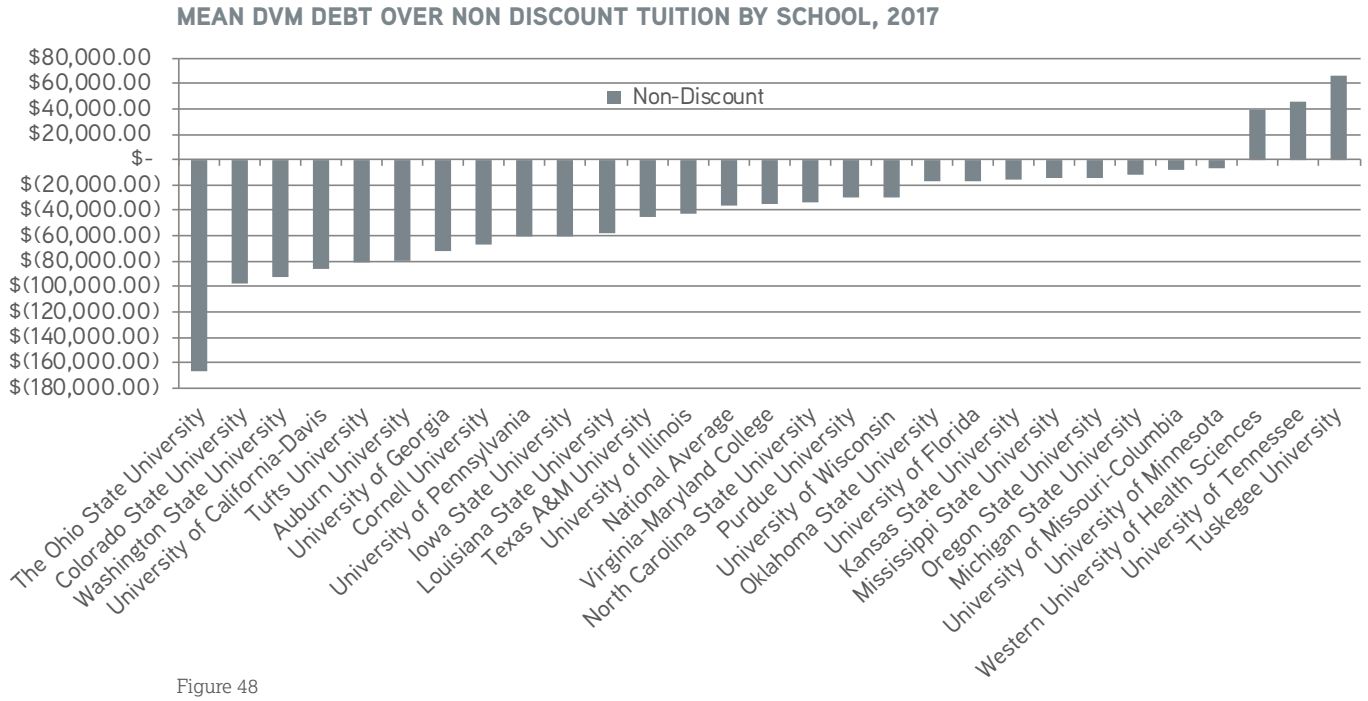


Figure 48

While the mean debt over tuition (i.e., mean debt in dollar value greater than tuition) may be considered as an indication of how much veterinary students may have potentially spent on living expenses, we know that living costs vary by location within the United States. Data on the relative costs of living by state were obtained from the Missouri Economic Research and Information Center, https://www.missourieconomy.org/indicators/cost_of_living/. These values represent those relative costs of living in various locations for the third quarter of 2017.

An illustration of the four-year cost of living, by school, using the U.S. average of $50,000 as a baseline is provided in the table below. As an example, for this illustration we assume a student budgets $12,500 per year for four years, then we determine how much the cost would be in the other states to maintain the same standard of living as provided by the $50,000 national average. The most affordable veterinary school with respect to cost of living, two years in a row is Mississippi State University where, in 2017, only $42,100 is necessary to maintain the standard of living that $50,000 would provide on average in the United States. The most expensive veterinary schools with respect to cost of living are University of California-Davis and Western University -California, where $70,250 is necessary to maintain the standard of living that $50,000 would provide on average in the United States. The college of veterinary medicine with a cost of living closest to the U.S. average is the University of Minnesota, where $49,500 is necessary to sustain a lifestyle afforded to the average U.S. resident with $50,000.

COST OF LIVING CENSUS

	Index	Baseline ($50,000)	College of Veterinary Medicine
Mississippi	84.2	$42,100	Mississippi State University
Arkansas	87.7	$43,850	
Michigan	89.0	$44,500	Michigan State University
Oklahoma	89.3	$44,650	Oklahoma State University
Tennessee	90.1	$45,050	University of Tennessee
Indiana	92.5	$46,250	Purdue University
Kansas	90.7	$45,350	Kansas State University
Missouri	89.2	$44,600	University of Missouri-Columbia
Kentucky	93.7	$46,850	

	Index	Baseline ($50,000)	College of Veterinary Medicine
Texas	91.6	$45,800	Texas A&M University
Iowa	90.0	$45,000	Iowa State University
Alabama	90.2	$45,100	Auburn University, Tuskegee University
Georgia	91.1	$45,550	University of Georgia
Nebraska	92.3	$46,150	
Wyoming	95.5	$47,750	
Idaho	93.3	$46,650	
Utah	96.7	$48,350	
West Virginia	96.8	$48,400	
Ohio	91.7	$45,850	The Ohio State University
North Carolina	93.9	$46,950	North Carolina State University
Illinois	96.6	$48,300	University of Illinois
Louisiana	93.9	$46,950	Louisiana State University
New Mexico	92.5	$46,250	
Wisconsin	95.6	$47,800	University of Wisconsin
Arizona	96.0	$48,000	
Florida	98.9	$49,450	University of Florida
South Carolina	98.4	$49,200	
North Dakota	99.9	$49,950	
Minnesota	99.0	$49,500	University of Minnesota
Montana	101.2	$50,600	
Virginia	101.9	$50,950	Virginia-Maryland Regional
Delaware	103.5	$51,750	
Pennsylvania	101.5	$50,750	University of Pennsylvania
Nevada	106.6	$53,300	
South Dakota	95.7	$47,850	
Colorado	104.0	$52,000	Colorado State University
Washington	107.6	$53,800	Washington State University
Maine	113.5	$56,750	
Oregon	125.7	$62,850	Oregon State University
New Hampshire	113.7	$56,850	
Rhode Island	123.0	$61,500	
Vermont	120.2	$60,100	
New Jersey	120.5	$60,250	
Maryland	128.4	$64,200	
Connecticut	124.9	$62,450	
New York	134.1	$67,050	Cornell University
Alaska	131.9	$65,950	
Massachusetts	127.3	$63,650	Tufts University
California	140.5	$70,250	University of California-Davis, Western University of Health Sciences
District of Columbia	157.4	$78,700	
Hawaii	188.4	$94,200	
Baseline	100.0	$50,000	

Table 7

The following chart illustrates the mean DVM debt over tuition by college, coupled with the cost of living associated with the state in which the school is located.

For discount seats, primarily comprised of residents and students whose home states hold contracts with their college to ensure they pay resident tuition, the mean debt load ranges from almost $50,000 below the cost of tuition at University of Pennsylvania to almost $70,000 above the cost of tuition at Tuskegee University. The schools whose resident students have debt levels closest to the cost of tuition are Virginia-Maryland College and Louisiana State University, whose mean debt lie within $2,500 and $2,900, respectively, of discount tuition.

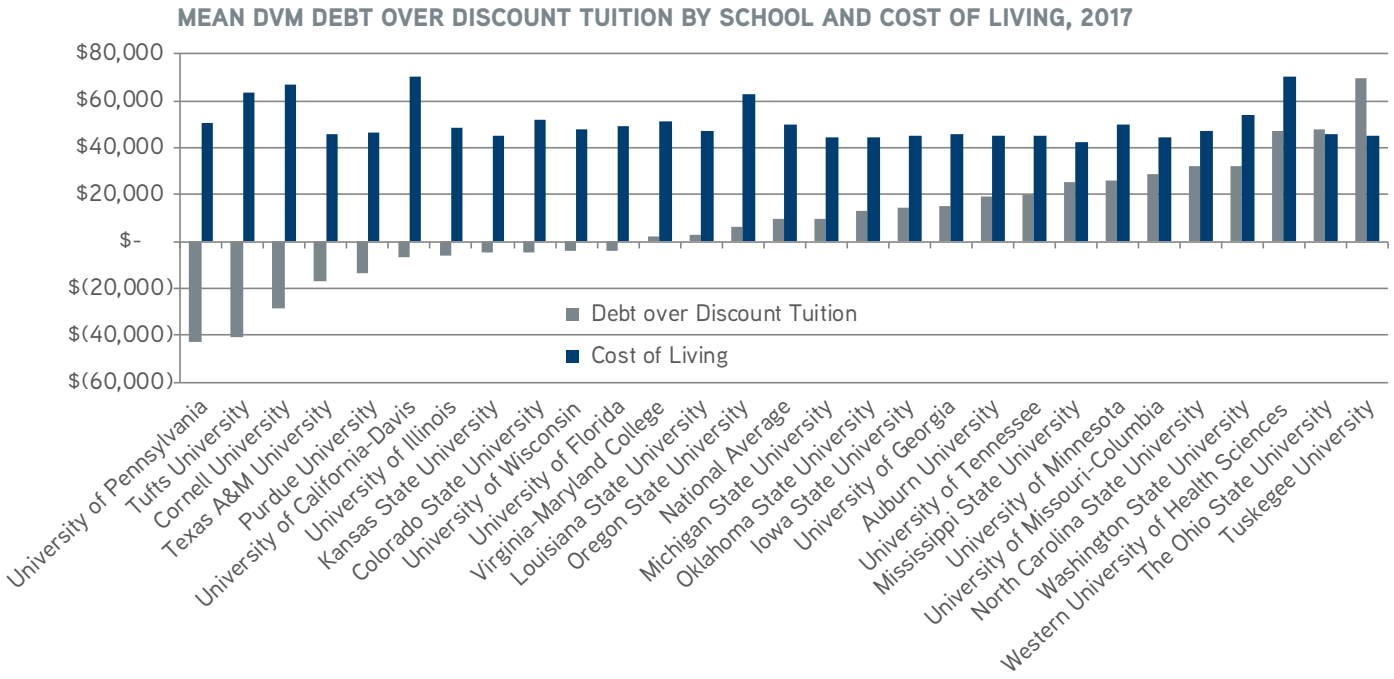


Figure 49

For the non-discount seats, which are primarily occupied by non-residents, there is a large distribution of debt around the cost of tuition. Namely, non-resident graduates of The Ohio State University have mean debt levels of over $160,000 less than the cost of tuition, whereas graduates of Tuskegee University report mean debt levels of over $60,000 more than the cost of tuition.

As previously mentioned, debt levels above tuition could be an indication of the cost of living. The cost of living at The Ohio State University, and Tuskegee University (in Alabama), however, are both below the mean cost of living at the national level, while at Tuskegee the mean debt is above the non-discount tuition and at Ohio State, below.

MEAN DEBT OVER NON-DISCOUNT TUITION BY SCHOOL AND COST OF LIVING, 2017

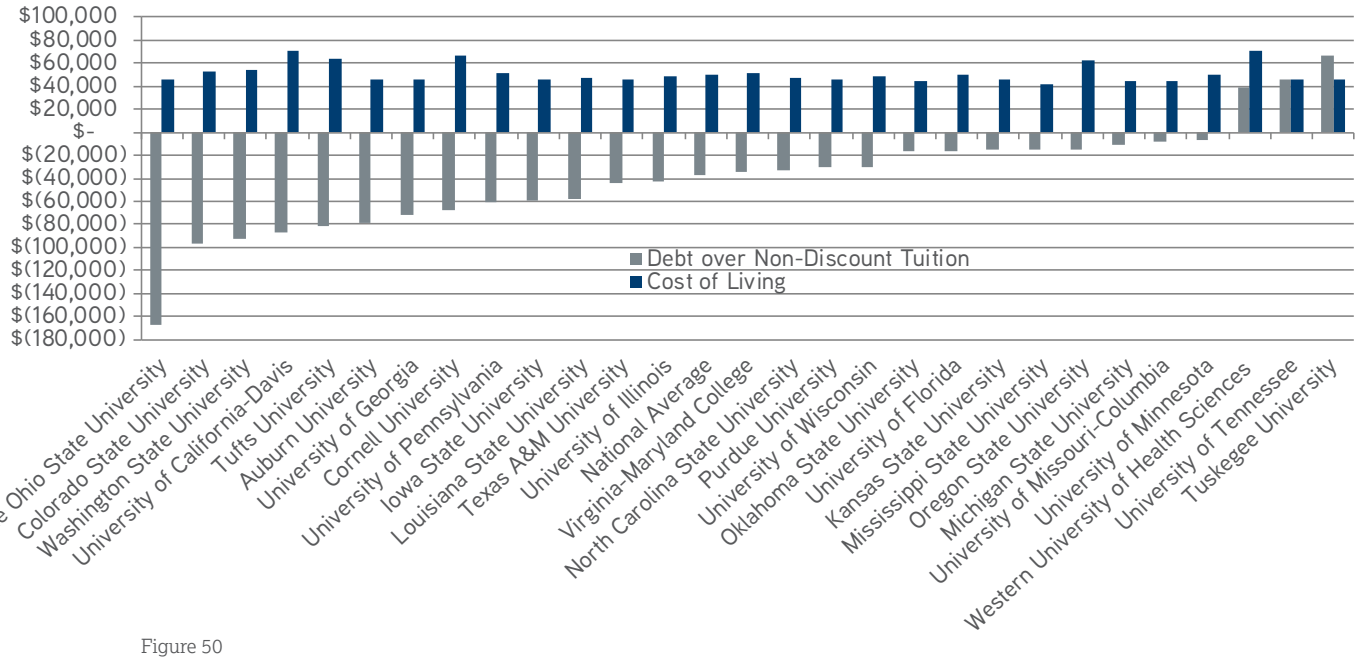


Figure 50

In the following table, we map out by school the number of graduates, mean debt upon entering veterinary college, mean debt upon graduating from veterinary college, mean starting salary and post-graduate plans.

In 2017, University of Missouri-Columbia had the largest proportion of the class reporting having secured post-graduate plans, with 97 percent reporting either finding full-time employment or securing a seat to pursue continuing education. Tuskegee University reported the lowest percentage of students securing a position post-graduation at 68 percent. University of Pennsylvania had the largest percentage of the class pursuing internships, at 52 percent. Iowa State University had the largest percentage in pursuing positions in public practice at 8 percent and University of Missouri-Columbia had the largest percent securing full-time positions in private practice at 72 percent. Comparably, in 2016, University of California-Davis had the largest percentage of the class pursuing advanced education, inclusive of internships and residencies, at 61 percent. Purdue University had the highest proportion of new graduates pursuing public practice at 9 percent of the class, and Washington State University had the highest percentage of new veterinarians reporting pursuing full-time employment in private practice, at 84 percent of the class.

NUMBER OF GRADUATES, POST–GRADUATION PLANS AND MEAN DEBT AND INCOME BY SCHOOL, 2017

	2017 Grads	Mean debt upon entering veterinary college			Mean debt upon graduating from veterinary college		
Veterinary Medical College		Mean	N	Std. Dev.	Mean	N	Std. Dev.
Auburn University	118	$6,569	118	$14,192	$119,403	118	$92,023
Colorado State University	95	$10,101	95	$23,807	$138,228	95	$104,341
Cornell University	100	$11,074	100	$20,632	$126,096	100	$91,302
Iowa State University	134	$16,978	134	$20,732	$147,197	134	$81,295
Kansas State University	72	$12,824	72	$27,645	$170,797	72	$123,292
Louisiana State University	82	$8,179	82	$20,516	$133,266	82	$96,380
Michigan State University	94	$16,941	93	$27,506	$175,441	93	$102,915
Mississippi State University	80	$14,600	79	$30,130	$162,264	79	$103,250
North Carolina State University	95	$12,514	95	$20,918	$119,247	95	$72,667
Oklahoma State University	73	$8,757	72	$14,155	$134,503	72	$95,532
Oregon State University	38	$11,823	38	$15,000	$134,248	38	$96,864
Purdue University	83	$11,413	83	$18,322	$112,924	83	$102,325
Texas A&M University	131	$10,149	130	$24,535	$88,434	130	$75,026
The Ohio State University	135	$14,309	135	$25,355	$200,602	135	$92,826
Tufts University	80	$6,554	79	$14,043	$142,808	79	$122,001
Tuskegee University	65	$22,530	65	$29,102	$271,440	65	$111,866
University of California-Davis	133	$6,611	133	$15,935	$128,420	133	$83,833
University of Florida	100	$9,654	96	$22,647	$137,371	96	$105,163
University of Georgia	101	$11,633	99	$23,422	$119,956	100	$82,907
University of Illinois	89	$15,326	89	$28,861	$140,807	89	$99,813
University of Minnesota	95	$16,220	95	$24,974	$210,743	95	$106,818
University of Missouri-Columbia	103	$13,925	102	$21,766	$147,695	102	$84,949
University of Pennsylvania	83	$12,319	81	$20,757	$164,077	83	$122,555
University of Tennessee	76	$6,913	76	$11,045	$169,821	76	$92,105
University of Wisconsin	74	$15,027	74	$29,682	$110,315	74	$70,465
Virginia-Maryland College	118	$13,518	118	$23,042	$138,251	118	$106,760
Washington State University	94	$11,253	92	$18,710	$135,709	92	$74,817
Western University of Health Sciences	91	$16,469	89	$28,955	$273,532	89	$131,059
Total	**2,632**	**$12,205**	**2,614**	**$22,780**	**$150,025**	**2,617**	**$105,093**

Table 8

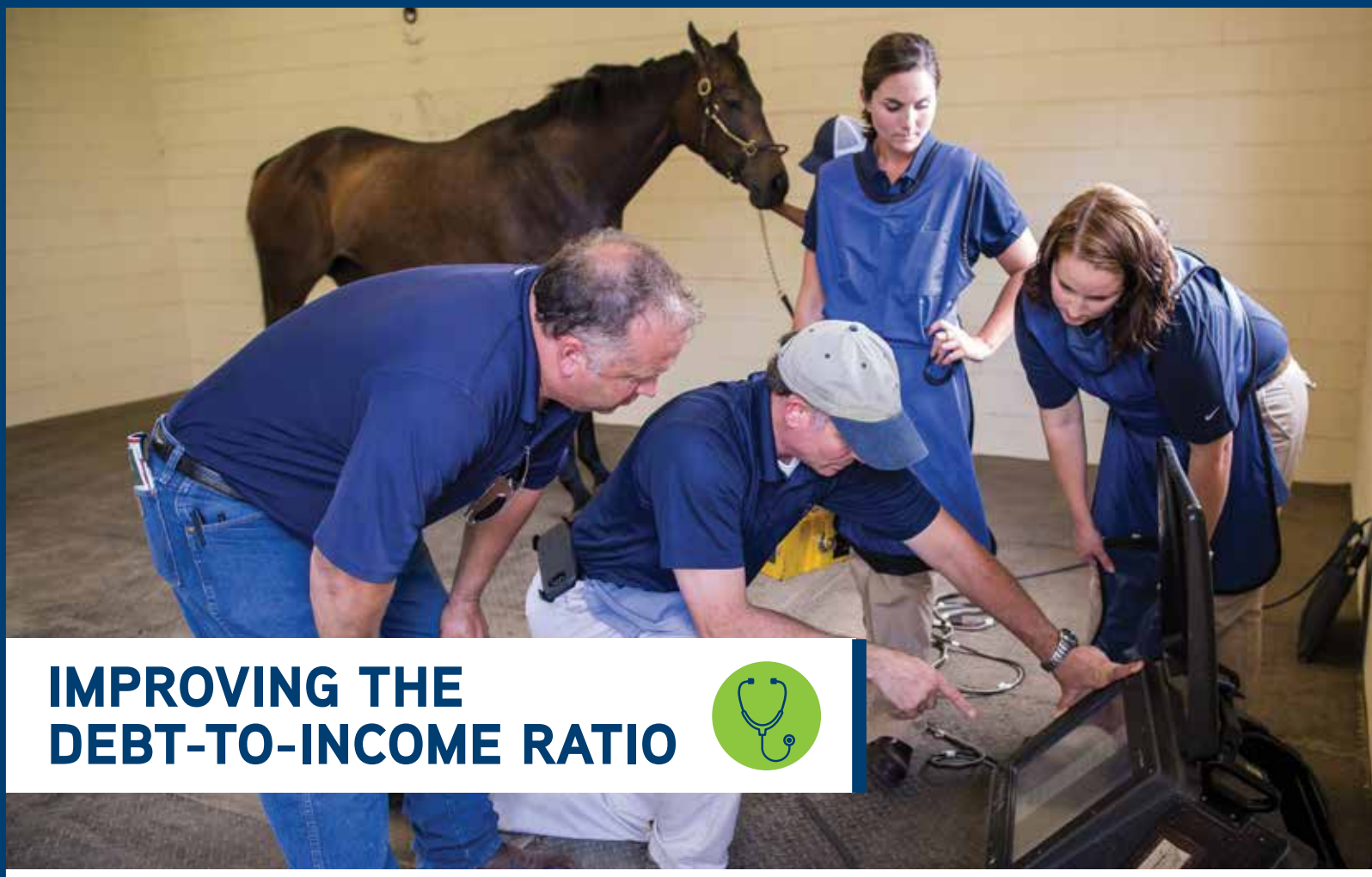
REGIONAL EXCHANGES AND STATE–TO-STATE ARRANGEMENTS

As noted in previous reports, there continues to exist a large discrepancy between the cost of resident tuition and non-resident tuition at veterinary colleges. In addition, with public veterinary colleges located in only 24 states, the number of states without a veterinary college exceeds the number of states with a veterinary college, leaving most students with limited options to obtain resident tuition. Short state arrangements that allow non-residents to pay resident tuition and in other cases, non-residents to obtain residency status after an allotted period, most students graduate with hundreds of thousands of dollars in debt as their best option if they are to obtain a doctorate in veterinary medicine. Furthermore, not only is the likelihood of obtaining resident tuition slim for many potential students, there is also an enormous decline in state support for public education, passing on these increased costs to students.

	Mean Starting Salary			Distribution of Post-Graduate Plans			
Veterinary Medical College	Mean	N	Std. Dev.	Private Practice	Public Practice	Internship/ Residency/ Adv. Educ.	Total
Auburn University	$75,063	60	$8,393	58	2	31	91
Colorado State University	$74,953	53	$20,164	49	5	30	84
Cornell University	$77,382	55	$19,268	50	5	35	90
Iowa State University	$72,745	92	$14,907	83	11	22	116
Kansas State University	$76,302	43	$23,743	39	4	16	59
Louisiana State University	$77,298	49	$13,016	48	1	20	69
Michigan State University	$78,748	58	$11,385	58	1	19	78
Mississippi State University	$76,696	56	$10,884	52	4	14	70
North Carolina State University	$71,325	41	$18,988	39	3	27	69
Oklahoma State University	$79,547	48	$21,558	46	2	12	60
Oregon State University	$76,470	23	$12,342	21	2	12	35
Purdue University	$81,638	50	$16,209	47	3	19	69
Texas A&M University	$81,987	85	$17,053	83	2	31	116
The Ohio State University	$76,293	92	$15,367	86	6	32	124
Tufts University	$76,854	24	$21,493	23	1	40	64
Tuskegee University	$89,133	20	$12,062	18	2	24	44
University of California-Davis	$79,150	51	$21,387	45	6	64	115
University of Florida	$80,328	58	$16,614	53	5	31	89
University of Georgia	$68,611	54	$18,502	51	3	34	88
University of Illinois	$76,527	55	$12,633	51	4	24	79
University of Minnesota	$72,567	54	$14,286	54	0	30	84
University of Missouri-Columbia	$76,998	77	$18,314	74	3	23	100
University of Pennsylvania	$76,206	34	$19,917	33	1	43	77
University of Tennessee	$74,122	41	$11,868	39	2	18	59
University of Wisconsin	$72,426	28	$13,870	28	1	29	58
Virginia-Maryland College	$76,755	83	$15,298	76	7	19	102
Washington State University	$80,280	56	$19,137	54	2	27	83
Western University of Health Sciences	$76,203	30	$19,362	28	2	36	66
Total	**$76,749**	**1,470**	**$16,833**	**1,386**	**90**	**762**	**2,238**

Regional institutional programs such as The Southern Regional Education Board and The Western Interstate Commission for Higher Education, established in the late 1940s and 50s continue to facilitate regional contract exchanges that significantly reduce the cost of professional healthcare education for students who reside in a state without a public veterinary program (as well as other healthcare curricula).

Without these regional programs, non-resident students would be required to pay much higher tuition and would be at a distinct economic disadvantage upon graduation. Instead, the student's home state provides a "support fee" to the enrolling institution to reduce the student's tuition (students enrolled in a public program typically pay the resident rate) and give them preferential admission as a non-resident.



IMPROVING THE DEBT-TO-INCOME RATIO

The rising costs of tuition and fees and the rising number of students increased the supply of graduates as well as the cost of their future veterinary services.

The debt-to-income problem in the veterinary profession is not new, having been discussed numerous times over the past two decades. However, what is new is the current size of the problem. As illustrated earlier, the current 2:1 mean debt-to-income ratio for graduates from the U.S. colleges of veterinary medicine began to expand from a longer-term plateau of around 1.4:1 in 2006. The mean obscures the fact, however, that the debt-to-income ratio was greater than 4:1 for more than 9 percent and more than 7 percent of U.S. graduates in 2016 and 2017, respectively.

At least in part, the rise in tuition and increased emphasis on recruiting and retention by universities was a response to reduced state and federal (public) funding. However, the sharp rise in tuition met legislative resistance and public universities resorted (outside the jurisdiction of most state legislatures) to raising fees and increasing efforts to enroll more students and, more importantly, ensure that they stayed enrolled.

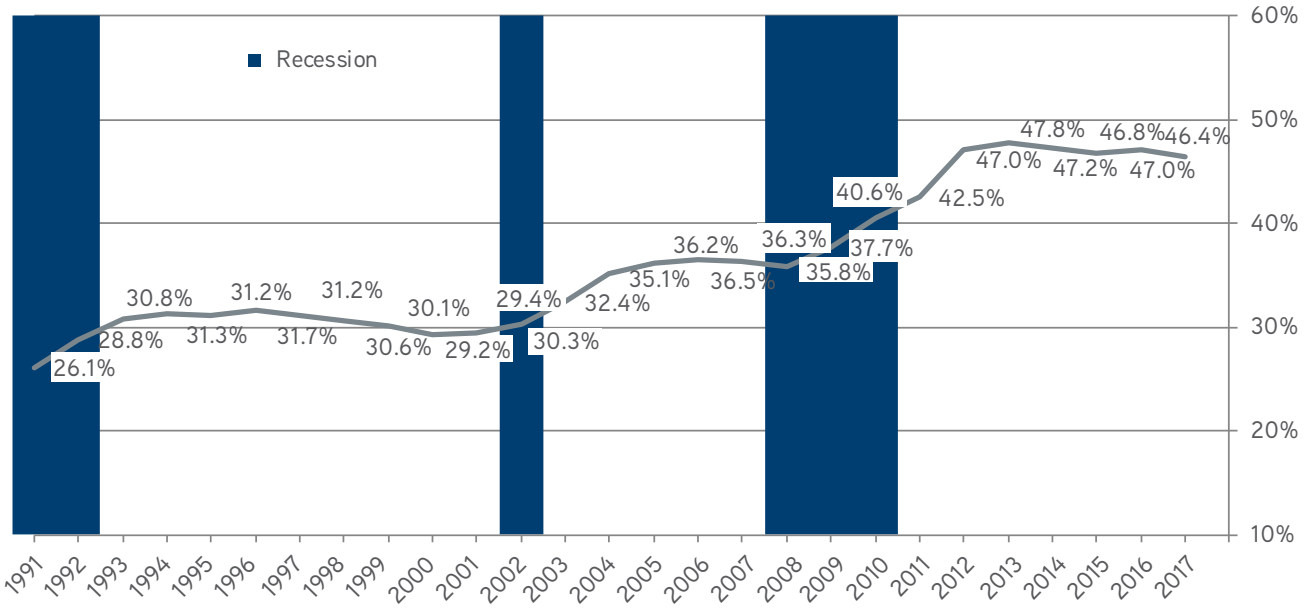
The rising costs of tuition and fees and the rising number of students increased the supply of graduates as well as the cost of their future veterinary services. The increase in the number of seats, especially during the last economic recession, forced the supply of new veterinarians to increase faster than the increase in the demand for the services from these graduates. Part of this new disequilibrium was from the cost-push of the supply and part of it was the absence of growth in quantity demanded of the services of these graduates. More importantly, there has been very little connection between the market for education and the market for graduates.

Before laying all the blame for the high debt-to-income ratio that plagues the veterinary profession, a review of the decisions and overall conditions of the colleges should be considered. And, the outcomes of today need to be considered in the context of the decisions that were made in the early part of the new millennium.

HISTORICAL PERSPECTIVE

As discussed in previous reports, a considerable body of research has indicated that the rise over the last two decades in tuition as a percent of public higher education revenue stems from declining public support for all public education. Other factors contributing to increased costs per student include the cost of administration, increasing pension and health care costs, and the increasing state and federal regulations that require reporting for compliance. The growth in tuition occurred during and just after the recessions of 2001 and 2008, as state and federal legislators cut taxes to stimulate the economy and reduced public support of colleges, both in response to declining budgets and shifting priorities. As previously mentioned, the result of reduced public support was the increasing share of the total cost that was paid by students. During the economic expansions following each recession, education budgets rarely returned to where they had been prior to the recession, resulting in the step increase in the percent of public higher education revenue for which tuition accounts.

NET TUITION AS A PERCENT OF PUBLIC HIGHER EDUCATION TOTAL EDUCATIONAL REVENUE, U.S., FY 1992-2017



NOTE: Net tuition revenue used for capital debt service is included in net tuition revenue, but excluded from total educational revenue in calculating the above figures. SOURCE: State Higher Education Executive Officers

Figure 51

SETTING A NEW TARGET

The current growth in the mean debt-to-income ratio is unsustainable. An appropriate near-term target would be to reduce the ratio from the current 2:0 to 1.4:1. As we have discussed in previous reports, four groups that must be involved in this effort: the general public, veterinary colleges, veterinary students and veterinary employers. Before we begin to discuss strategies to reduce the debt-to-income ratio, however, we need to take a closer look at the source of the debt.

The values for debt and income are reported by students prior to graduation. In 2017, out of 2,942 graduates, 2,617 reported a value (including zero) for debt, but only 1,461 reported both a debt, and income from full-time employment. Using these data, we compute the DIR for each school. Since there is no significant difference across schools with respect to starting salaries, a higher DIR is indicative of higher debt levels of the graduates.

DEBT-TO-INCOME RATIO BY SCHOOL 2017, FULL-TIME ONLY

	Mean	N	Std. Deviation
Western University of Health Sciences	4.12	29	2.09
Tuskegee University	2.87	20	1.06
University of Minnesota	2.73	54	1.85
The Ohio State University	2.46	92	1.28
University of Pennsylvania	2.34	34	1.89
University of Tennessee	2.23	41	0.91
Kansas State University	2.08	43	1.97
Michigan State University	2.05	57	1.01
Tufts University	2.04	24	1.46
University of Missouri-Columbia	1.97	76	1.35
Mississippi State University	1.97	55	1.19
Colorado State University	1.94	54	1.75
National Average/Aggregate N	1.89	1,461	1.45
University of California-Davis	1.87	51	1.63
University of Georgia	1.84	53	1.46
Louisiana State University	1.84	49	1.20
Iowa State University	1.83	93	1.24
Oregon State University	1.81	23	1.38
Virginia-Maryland College	1.73	82	1.37
University of Florida	1.69	55	1.39
University of Illinois	1.68	55	1.26
Cornell University	1.66	55	1.61
Oklahoma State University	1.66	48	1.72
Washington State University	1.61	55	0.80
Auburn University	1.58	60	1.18
North Carolina State University	1.48	41	1.15
Purdue University	1.32	49	1.19
University of Wisconsin	1.31	28	0.82
Texas A&M University	0.99	85	0.78

Table 9

Although 1,461 students reported both a debt, and income from full-time employment, 52 percent more reported both a debt, and an income for positions that were not full time. The following table represents the DIR for the entire graduating class including those who opted to pursue advanced education opportunities, including internships and residencies.

DEBT-TO-INCOME RATIO BY SCHOOL 2017, ALL GRADUATES

	Mean	N	Std. Deviation
Western University of Health Sciences	5.36	64	3.50
Tuskegee University	5.18	44	3.59
University of Minnesota	4.12	84	3.22
The Ohio State University	3.53	124	2.60
University of Pennsylvania	3.48	77	3.39
University of Tennessee	3.25	59	2.86
Tufts University	3.23	64	3.16
Kansas State University	3.15	59	3.06
Colorado State University	2.80	84	2.82
Michigan State University	2.77	75	2.18
National Average/Aggregate N	2.69	2,218	2.54
Mississippi State University	2.59	69	2.06
University of Florida	2.55	85	2.72
University of California-Davis	2.48	115	2.02
University of Missouri-Columbia	2.43	99	1.98
University of Illinois	2.41	79	2.38
University of Georgia	2.40	87	1.89
Virginia-Maryland College	2.36	101	2.29
Cornell University	2.36	90	2.31
North Carolina State University	2.31	68	1.97
Washington State University	2.29	82	1.97
Iowa State University	2.24	115	1.70
Louisiana State University	2.20	69	1.77
Auburn University	2.19	91	2.35
Oklahoma State University	2.19	60	2.11
University of Wisconsin	2.10	56	1.98
Oregon State University	2.03	35	1.69
Purdue University	1.87	68	2.25
Texas A&M University	1.25	115	1.22

Table 10

By comparison, we can use the tuition and fees and the living costs estimated by each school to calculate a mean total cost–(tuition plus living expenses)–to–income ratio for each school. These two tables can then be used to compare the debt-to-income and cost-to-income for each school.

TOTAL COST-TO-INCOME RATIO BY SCHOOL, 2017

	Mean	N	Std. Deviation
University of Pennsylvania	9.55	77	4.57
Tufts University	8.07	64	3.17
Oklahoma State University	6.32	60	15.52
Western University of Health Sciences	6.31	65	2.60
Tuskegee University	6.06	44	3.13
University of Wisconsin	5.71	57	6.43
Colorado State University	5.50	83	3.16
University of California-Davis	5.34	115	2.40
Cornell University	4.88	90	2.59
University of Minnesota	4.80	84	2.66
Kansas State University	4.67	59	2.72
University of Florida	4.55	89	2.58
National Average/Aggregate N	4.51	2,231	3.93
Auburn University	4.48	91	2.67
The Ohio State University	4.42	124	2.24
Michigan State University	4.25	77	2.39
University of Illinois	4.22	79	2.29
University of Tennessee	4.15	59	2.28
Oregon State University	3.88	35	2.00
Louisiana State University	3.85	69	2.11
University of Georgia	3.80	88	2.22
Washington State University	3.77	83	2.39
North Carolina State University	3.70	68	1.65
Mississippi State University	3.67	70	2.06
Purdue University	3.65	69	2.29
Iowa State University	3.49	114	2.00
Texas A&M University	3.31	116	1.88
University of Missouri-Columbia	1.96	100	1.04
Virginia-Maryland College	1.78	102	0.96

Table 11

There is no method except using only the survey responses to determine the accuracy of the reported debt values, whether the values include interest charges, when debts were incurred, or the value of interest charges that would have accumulated (what year or semester the costs were incurred). The interest charges are estimated assuming that the total costs were distributed over the total number of semesters and a 6 percent interest rate was charged. The total interest payments that would have accumulated with full payment of tuition and living expenses are computed for the veterinary college education provided at each college for discounted and non-discounted seats. The following table provides the ratio of total cost to income, assuming the interest charges are included as part of the costs.

TOTAL COST PLUS INTEREST-TO-INCOME RATIO BY SCHOOL, 2017

	Mean	N	Std. Deviation
University of Pennsylvania	10.61	77	5.07
Tufts University	8.96	64	3.52
Oklahoma State University	7.02	60	17.23
Western University of Health Sciences	7.01	65	2.89
Tuskegee University	6.72	44	3.48
University of Wisconsin	6.33	57	7.13
Colorado State University	6.10	83	3.51
University of California-Davis	5.92	115	2.67
Cornell University	5.42	90	2.88
University of Minnesota	5.33	84	2.95
Kansas State University	5.19	59	3.02
University of Florida	5.04	89	2.87
National Average/Aggregate N	5.00	2,231	4.36
Auburn University	4.97	91	2.96
The Ohio State University	4.90	124	2.49
Michigan State University	4.72	77	2.65
University of Illinois	4.68	79	2.55
University of Tennessee	4.60	59	2.53
Oregon State University	4.31	35	2.22
Louisiana State University	4.27	69	2.34
University of Georgia	4.22	88	2.46
Washington State University	4.18	83	2.66
North Carolina State University	4.10	68	1.83
Mississippi State University	4.08	70	2.29
Purdue University	4.05	69	2.54
Iowa State University	3.87	114	2.22
Texas A&M University	3.68	116	2.09
University of Missouri-Columbia	2.17	100	1.16
Virginia-Maryland College	1.98	102	1.06

Table 12

Tables 11 and 12 can be combined to provide an indication of how well students have been able to keep debt below costs. That is, have they had some method of ensuring that they keep a lid on expenses such that the amount of debt that they accumulate while in veterinary college is less than the total cost of attendance? These ratios should not be assumed to indicate students' ability to manage their finances but rather viewed as a potential indicator of the ability of the students to draw upon other sources of income.

DEBT-TO-COST AND DEBT-TO-COST PLUS INTEREST BY SCHOOL, 2017

	D:C Ratio	D:(C+I) Ratio
University of Missouri-Columbia	1.2539	.9785
Virginia-Maryland College	1.2146	.6976
Tuskegee University	.9813	.9837
University of Minnesota	.8483	.8568
Western University Health Sciences	.8483	.9847
The Ohio State University	.7968	.9745
University of Tennessee	.7649	.9092
Iowa State University	.6996	.7212
Mississippi State University	.6959	.8669
University of Georgia	.6845	.8240
Washington State University	.6797	.9158
National Average	.6697	.7538
North Carolina State University	.6561	.9293
Michigan State University	.6468	.7759
Kansas State University	.6346	.7039
Oregon State University	.6238	.7565
Louisiana State University	.6213	.7133
University of Illinois	.5786	.6872
University of Florida	.5715	.4978
Auburn University	.5351	.6609
Colorado State University	.5214	.6378
Oklahoma State University	.5142	.8408
University of California-Davis	.5049	.6560
Purdue University	.5006	.6594
Cornell Veterinary College	.4940	.5854
University of Wisconsin	.4662	.7110
Texas A&M University	.4368	.5706
Tufts University	.4350	.5538
University of Pennsylvania	.4065	.5721

Table 13

In general, the tables above would indicate that the DIR is still a problem, with nine schools having a DIR of 2:1 or higher (compared to 15 in 2016). And, the mean value of debt to total costs (tuition, living and interest) being substantially less than 1.0 would seem to imply that the problem of high debt to income is a problem of the high cost of education only, albeit one of considerable variation among the schools.

Looking at the distribution of debt-to-total costs for each reporting student by college, however, indicates that there are some students who have not found sufficient outside resources or are not frugal in their finances resulting in their debt exceeding the total cost of their education. This high debt-to-total cost ratio occurs at only two schools, University of Missouri-Columbia and Virginia-Maryland College, where it exceeded 1:1 in 2017.

DEBT BELOW AND ABOVE TOTAL COST PLUS INTEREST BY SCHOOL, 2017

	Is my debt greater than total cost plus interest?			
	Debt Below Total Cost plus Interest	Debt Above Total Cost plus Interest	Total	Percent (Debt over TC + int)
Virginia-Maryland College	48	70	**118**	59.3%
University of Missouri-Columbia	37	66	**103**	64.1%
Tuskegee University	39	26	**65**	40.0%
University of Georgia	77	24	**101**	23.8%
Western University of Health Sciences	69	22	**91**	24.2%
University of Minnesota	74	21	**95**	22.1%
The Ohio State University	114	21	**135**	15.6%
Iowa State University	120	14	**134**	10.4%
Mississippi State University	66	14	**80**	17.5%
Washington State University	83	11	**94**	11.7%
Kansas State University	63	9	**72**	12.5%
Louisiana State University	74	8	**82**	9.8%
Auburn University	112	6	**118**	5.1%
North Carolina State University	89	6	**95**	6.3%
Colorado State University	90	5	**95**	5.3%
University of Illinois	84	5	**89**	5.6%
Oregon State University	33	5	**38**	13.2%
University of Florida	96	4	**100**	4.0%
University of Tennessee	72	4	**76**	5.3%
Purdue University	80	3	**83**	3.6%
Tufts University	78	2	**80**	2.5%
Michigan State University	92	2	**94**	2.1%
Texas A&M University	129	2	**131**	1.5%
Cornell University	99	1	**100**	1.0%
Oklahoma State University	72	1	**73**	1.4%
University of California-Davis	133	0	**133**	0.0%
University of Pennsylvania	83	0	**83**	0.0%
University of Wisconsin	74	0	**74**	0.0%
Total	**2,280**	**352**	**2,632**	**13.4%**

Table 14

The national average for the percent of the graduating class whose debt exceeded total cost of attendance plus interest was 13.4 percent in 2017. Some universities, however, had up to five times this ratio, led by 64.1 percent graduates of University of Missouri-Columbia who had mean debt levels above total cost of attendance plus interest. This record was followed by Virginia-Maryland College's at 59.3 percent and Tuskegee University with 40 percent of the class having debt exceeding total cost plus interest. University of California-Davis, University of Pennsylvania and University of Wisconsin had no students whose debt exceed the total cost of attendance plus interest.

These estimates of debt, tuition and fees, living expenses and interest charges provide context to inform the discussion of the relative merits of reducing tuition and fees, better managing living expenses, reducing or eliminating interest charges on loans while in school and aiding students in becoming better with personal financial management.

In 2017, total debt for the 2,942 graduates of U.S. veterinary colleges was estimated at just over $403 million, down from 2016's estimate of $418 million. The estimate of the aggregate cost of tuition and fees was $418 million, up from $403 million in 2016. Aggregate living expenses were estimated at $220 million with interest expense estimated at $70 million. This adds up to an aggregate total cost of $708 million, approximately $305 million more than the debt accumulated by 2017 graduates.

FOREIGN GRADUATES

The debt accumulated by foreign graduates differs significantly from the debt accumulated by U.S. graduates, though there is no difference between U.S. and foreign graduates with respect to income.

At present, 19 percent of U.S. citizens enrolled in veterinary school are enrolled at veterinary colleges outside the United States and, as previously illustrated, this number has been rising. With the growth in the number of U.S. graduates from foreign veterinary colleges increasing, and, because the loans taken by these students are frequently larger than those of students at U.S. veterinary colleges, it is critical to extend our analysis to include these students, as their return to the United States. to find employment and repay their student loans – as many do – would affect the supply of and demand for veterinarians. New veterinarians with larger loans will demand higher salaries to maintain a decent standard of living while repaying their loans. The ripple effect of this would be an increase in the cost of veterinary services to consumers, without necessarily any increase in value.

The following chart displays the mean debt of foreign graduates. These data must be interpreted cautiously, however, since the response rates of foreign graduates are much lower than that of the graduates of U.S. colleges. The differing graduation cycle in Caribbean schools, provided a survey sample of less than 50 percent of students (compared to a 100 percent sample for domestic schools) and yielded debt and income data on only 20 percent to 75 percent of that reduced sample (compared to a 60 percent-100 percent response rate for domestic schools).

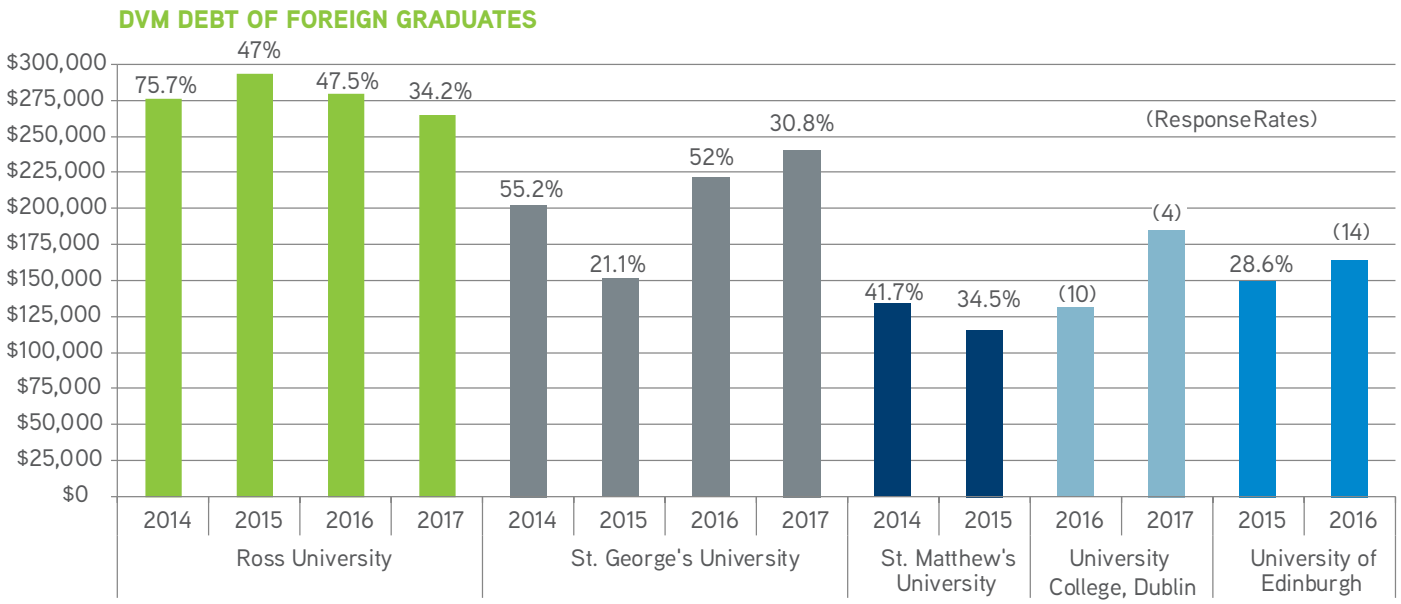


Figure 52

Over the past four years, the mean debt reported from graduates of Ross University has been north of $250,000. In 2017, the mean debt of St. George's graduates was reported as just over $225,000. These findings, however, emerge from a modest response rate of 30.8 percent and so cannot be appropriately compared to the mean debt of U.S. graduates, which hovers around $140,000.

The debt accumulated by foreign graduates differs significantly from the debt accumulated by U.S. graduates, though there is no difference between U.S. and foreign graduates with respect to income. During the years 2014 through 2016, the mean starting salaries – representing those finding full-time employment only – of foreign graduates was slightly higher than that of U.S. graduates, but in 2017 the mean starting salary of U.S. graduates surpassed that of foreign grads. The difference across these years, however, has not been significant.

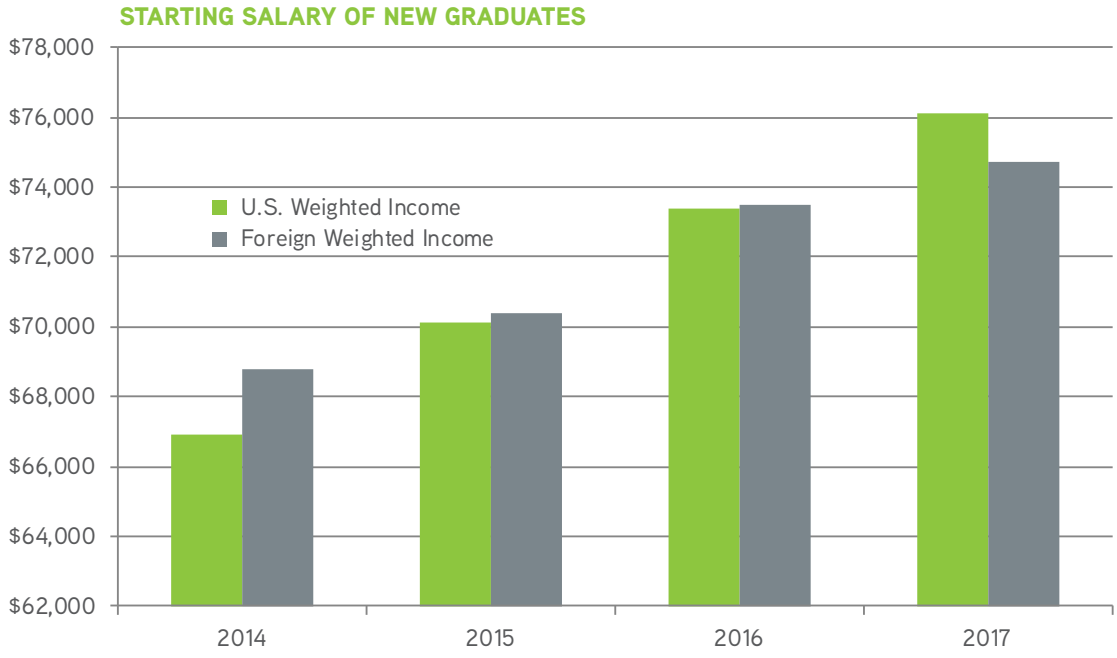


Figure 53

Consequently, with comparable income levels and significantly higher debt levels, the DIR of foreign graduates is bound to be higher than that of U.S. graduates. The following chart illustrates the distribution of the DIR of U.S. graduates of foreign colleges who have secured full-time employment. It is critical to note that because of poor response rates, this distribution represents only 95 respondents.

Excluding the nearly 15 percent of the class that graduated with zero debt, the central tendency of the DIR was 4:1. The vast majority (79 percent) of the class had a DIR between 2:1 and 6:1, with 22 percent reporting a DIR of 4:1.

DISTRIBUTION OF DIR OF 2017 FOREIGN GRADS

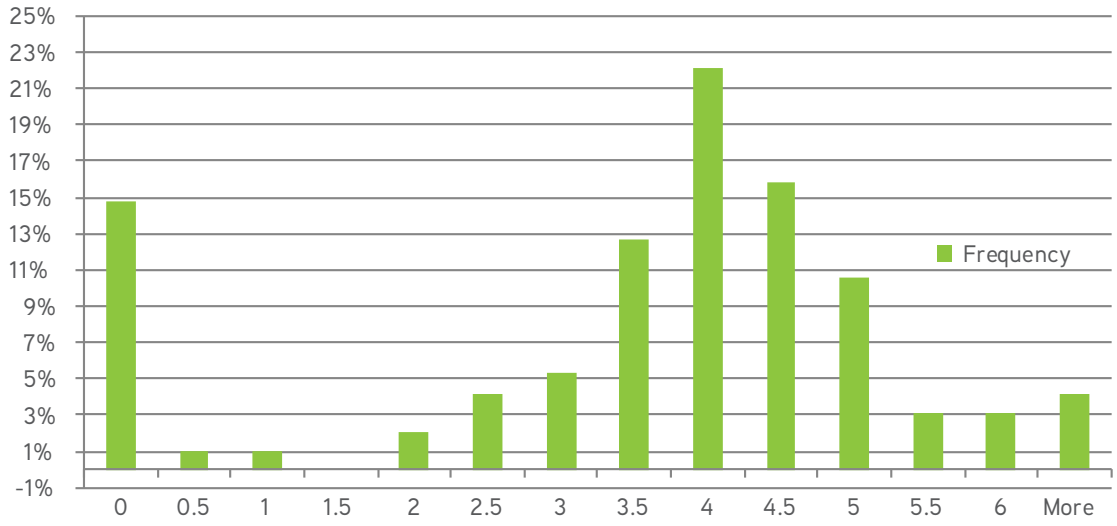


Figure 54

The debt of foreign grads – which is evidently significantly higher than the debt of grads of U.S. institutions – is generally correlated with tuition costs and the amount of state funds appropriated to the institution to cover educational costs. Consequently, because private and public institutions are financed differently, the most appropriate comparison is the debt of students who graduated from private veterinary colleges in the United States. The following chart depicts the 2017 mean and median debt numbers of resident and non-resident graduates of U.S. private and public veterinary colleges and Caribbean veterinary colleges.

As expected, the group with the lowest debt levels – with mean debt between $125,000 and $150,000 – are resident graduates of public institutions. They pay the lowest tuition, benefitting from state appropriations. Graduates of private institutions have larger mean debt levels, with mean debt between $195,000 and $230,000. These schools don't receive federal funding and all costs are passed onto students. Finally, the group with the largest mean debt is graduates of Caribbean schools whose mean debt lies between $275,000 and $310,000.

MEAN AND MEDIAN DEBT OF 2017 GRADUATES WITH NON-ZERO DEBT

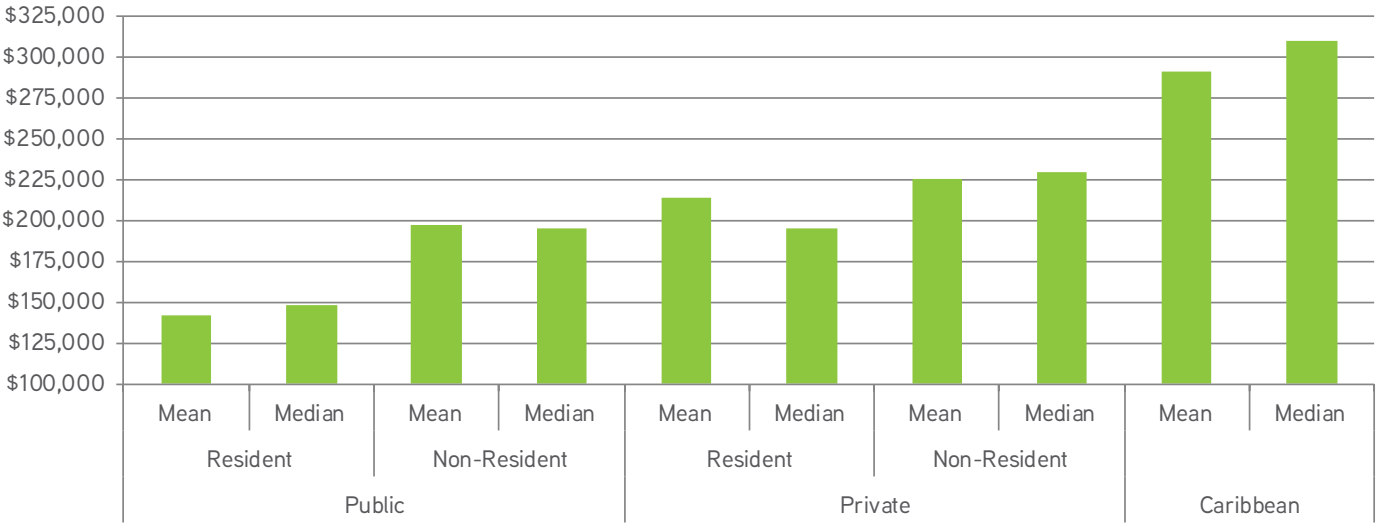


Figure 55

Tuition and fees, however, are no small proportion of the total cost of attendance of veterinary school as reported by their respective financial aid offices, but one pattern does emerge. For non-residents at U.S. institutions and graduates of colleges in the Caribbean, tuition and fees, on average, are 64.2 percent, 64.1 percent and 64.2 percent of total costs for U.S. public schools, U.S. private schools and Caribbean schools, respectively.

For resident graduates of public schools and private schools' tuition and fees, on average, are 51.4 percent and 60.5 percent of total costs, respectively. Consequently, this provides more evidence that, in general, students are fiscally responsible, and it is indeed the cost of tuition and fees that drives total costs and subsequently student debt.

DISCUSSION

This report takes an exploratory and analytical approach to the market for new veterinarians. We observe new veterinarians over the period 2001 through 2017, including their post-graduate plans, income levels, debt levels, and debt-to-income ratios.

New veterinarians come from a pool of applicants that we have recently begun analyzing through the survey of VMCAS applicants. AAMVC analyzes these applicants, observing their decision-making process and willingness to pay for a veterinary education. This is an important area of research that will be beneficial over time and is necessary to better understand how to aid potential veterinary students in preparing for the financial obligations of obtaining their education.

Applicants who have successfully secured a seat and matriculated through veterinary college, generally graduate and become new veterinarians. The main source of data for new veterinarians is AVMA's Senior Survey, which is distributed to graduating seniors just a few weeks before graduation. This survey solicits information on veterinary students' career plans, starting salary, debt and other demographics. However, the survey data have limitations. First, there is limited information on expenditure patterns of the students, the actual costs of their education and any interest payments on the loans they have acquired. While each veterinary college provides the exact cost of tuition and fees for residents and non-residents, and an estimate of living expenses, we have no information on the role of scholarships or other forms of external support, to provide for a precise estimate of costs per student or the amount paid per student. Having this information will be important in developing strategies to reduce the DIR. Other ambiguities arise when graduates securing full-time employment report estimates of the number of hours they anticipate working, forcing estimation of hourly compensation patterns.

The Senior Survey has been distributed by the AVMA for decades and although we have made attempts to expand the respondent pool to AVMA-accredited institutions outside the United States, our data are primarily comprised of responses from the 28 U.S.-located veterinary colleges. This situation presents a caveat in this research piece, since a proportion of U.S. students attend AVMA-accredited foreign colleges and return to the United States to find jobs and repay student loans. It is expected that these students will tend to have significantly larger debt loads and consequently higher debt-to-income ratios. We will continue to work with AAVMC to collect data on the graduates of the AVMA-accredited foreign veterinary colleges.

This report is also in large part a replacement for AVMA's "Facts and Figures" feature report previously published in *JAVMA*. Our efforts here are to go beyond a year-to-year comparison of mean income, toward the use of an index that measures the impact of the economy on a constant cohort of veterinarians. We also will provide an annual update on the model of new graduates' starting salaries, debt, and debt-to-income level. These models will help us, veterinary applicants and students estimate the mean starting salary for a target demographic and debt at graduation, and enable us to better assist them in developing personal strategies for managing their post-graduate finances, and in turn, optimize their standard of living.

We analyze the changing distribution of veterinarians across various practice types and view cases such as real incomes at trend GDP versus projected incomes at current GDP. Also new in this report is an analysis of graduates of foreign veterinary colleges. Every year an increasing number of students opt to pursue their veterinary education outside the borders of the United States. Consequently, the debt of these students, fueled by both tuition costs and cost of living, is much higher than the debt of graduates of veterinary colleges located in the United States. Because we have only captured data on about 30 percent of this market, it is critical for us to continue to report on these students, as they directly impact the domestic economy when they return to the United States to work and repay their debt.

The market for veterinary education is a critical market for the veterinary profession, but it is a market that is not performing optimally. Many new veterinarians are ill–prepared for the financial stress that awaits them, and the percentage of consumers who are willing to pay a price for their services that is in line with veterinary education costs continues to decline. The result will continue to be an increase in untreated animals that also pose a threat to human health. In attempting to select effective strategies to bridge this gap, the focus should be on reducing the DIR while increasing the potential for meeting the veterinary needs of all animals.

REFERENCES

2017 AVMA-AAVMC Report on the Market for Veterinary Education

AAVMC Admitted Students Statistics, http://www.aavmc.org/additional-pages/admitted-student-statistics.aspx

AVMA Senior Survey

State Higher Education Executive Officers Association, https://www.insidehighered.com/news/2018/03/29/state-support-higher-ed-increased-2017-so-did-tuition-revenue

APPENDIX

The table in this appendix, Clinical Competencies, Expectations and Experience by School, depicts the self-reported scores on listed clinical competencies by veterinarians who've graduated within the past five years. They were asked to rate their expectations based on their college training appropriate to the listed clinical competencies, against their experiences based on time spent on the job. The scores were ranked 1-5, with expectations ranked as 5 if respondents expected to perform exceptionally well in the corresponding clinical competency, and 1 in experience, if while on the job they felt exceptionally ill-prepared. The mean score by school and competency is reported.

CLINICAL COMPETENCIES, EXPECTATIONS AND EXPERIENCE BY SCHOOL

		Do a physical examination		Do history taking		Diagnose lameness	
		Expectations	Experience	Expectations	Experience	Expectations	Experience
Auburn University	Mean	4.20	4.37	4.17	4.29	3.31	3.68
	N	35	35	35	35	35	34
Tuskegee University	Mean	3.63	4.53	3.89	4.37	3.00	3.63
	N	19	19	19	19	19	19
University of California-Davis	Mean	4.49	4.36	4.59	4.26	3.61	3.37
	N	37	36	37	34	36	35
Colorado State University	Mean	3.86	4.28	4.18	4.32	3.18	3.66
	N	50	47	50	47	50	47
University of Florida	Mean	3.82	4.27	4.18	4.30	3.32	3.79
	N	34	33	34	33	34	33
University of Georgia	Mean	4.18	4.56	4.35	4.45	3.15	3.70
	N	34	34	34	33	34	33
University of Illinois	Mean	3.78	4.15	4.15	4.20	3.24	3.57
	N	46	46	46	45	46	44
Iowa State University	Mean	3.96	4.27	4.04	4.35	2.98	3.42
	N	53	49	53	48	52	48
Kansas State University	Mean	3.67	4.23	3.76	4.13	2.98	3.54
	N	42	40	42	40	41	39
Louisiana State University	Mean	3.94	4.29	4.24	4.53	3.41	4.06
	N	17	17	17	17	17	16
Tufts University	Mean	3.81	4.11	4.08	4.14	2.97	3.39
	N	37	36	37	36	37	36
Michigan State University	Mean	4.00	4.32	4.08	4.22	3.13	3.42
	N	39	38	39	37	39	36
University of Minnesota	Mean	3.73	4.12	4.08	4.24	2.85	3.33
	N	26	25	26	25	26	24
Mississippi State University	Mean	3.93	4.14	4.11	4.21	3.11	3.15
	N	28	28	28	28	27	26
Purdue University	Mean	4.12	4.27	4.15	4.36	3.38	3.88
	N	33	33	33	33	32	32
Cornell University	Mean	4.11	4.37	4.32	4.41	3.11	3.53
	N	37	35	37	34	36	34
Oklahoma State University	Mean	3.85	4.19	4.19	4.04	3.08	3.46
	N	26	26	26	26	26	26

Table 15

Diagnose and prescribe treatment for parasitic diseases		Give anesthesia		Do fluid therapy		Give an intravenous injection	
Expectations	Experience	Expectations	Experience	Expectations	Experience	Expectations	Experience
3.97	4.23	3.46	3.69	3.63	3.94	3.77	4.37
35	35	35	35	35	35	35	35
4.00	4.47	3.58	3.95	3.37	4.11	4.00	4.53
19	19	19	19	19	19	19	17
3.47	3.74	4.06	3.88	4.17	3.94	4.62	4.47
36	35	36	34	36	35	37	36
3.00	3.60	3.78	4.06	3.50	4.09	3.92	4.42
50	47	50	47	50	47	50	48
3.68	4.21	3.79	3.97	3.76	4.09	4.09	4.55
34	33	34	33	34	33	34	33
3.76	4.19	3.65	4.06	3.65	4.09	3.68	4.39
34	32	34	33	34	33	34	33
3.15	3.80	3.61	3.89	3.48	4.00	3.93	4.27
46	45	46	45	46	45	46	45
3.34	4.02	3.17	3.91	3.29	3.81	3.77	4.60
53	48	52	47	52	47	53	48
3.64	3.95	3.86	4.00	3.19	3.78	3.71	4.40
42	40	42	40	42	40	42	40
3.76	4.38	3.59	3.88	3.71	4.18	4.00	4.65
17	16	17	17	17	17	17	17
3.14	3.94	4.00	3.97	3.78	4.00	3.65	4.06
37	36	37	36	37	36	37	36
3.18	3.97	3.62	3.81	3.64	3.92	3.54	4.08
39	37	39	37	39	38	39	38
2.92	3.60	3.42	3.68	3.54	4.04	3.69	4.48
26	25	26	25	26	25	26	25
3.82	4.14	3.86	3.79	3.61	4.00	4.25	4.46
28	28	28	28	28	28	28	28
3.82	4.25	3.73	4.00	3.74	4.13	4.30	4.52
33	32	33	32	31	30	33	33
3.16	3.82	3.32	3.63	3.51	3.85	3.97	4.35
37	33	37	32	37	33	37	34
4.27	4.04	3.81	3.77	3.69	3.88	4.15	4.50
26	26	26	26	26	26	26	26

		Do a physical examination		Do history taking		Diagnose lameness	
		Expectations	Experience	Expectations	Experience	Expectations	Experience
University of Pennsylvania	Mean	4.00	4.51	4.05	4.57	2.98	3.46
	N	43	41	43	42	42	41
Texas A&M University	Mean	4.27	4.33	4.20	4.31	3.28	3.44
	N	41	39	40	39	40	36
Washington State University	Mean	3.84	4.07	3.97	4.13	2.94	3.25
	N	31	30	31	30	31	28
University of Missouri-Columbia	Mean	3.97	4.29	3.91	4.18	2.79	3.34
	N	35	34	35	33	34	32
The Ohio State University	Mean	3.83	4.26	4.20	4.22	3.07	3.48
	N	54	54	54	54	54	52
Oregon State University	Mean	3.74	4.09	3.91	4.22	2.83	3.27
	N	23	23	23	23	23	22
University of Tennessee	Mean	4.19	4.23	4.29	4.17	3.23	3.55
	N	31	31	31	30	31	31
Virginia-Maryland College	Mean	4.05	4.07	4.19	4.17	3.24	3.74
	N	42	41	42	42	42	42
North Carolina State University	Mean	4.32	4.46	4.41	4.36	3.18	3.56
	N	28	28	27	28	28	27
University of Wisconsin	Mean	4.11	4.11	4.36	4.40	2.83	3.27
	N	36	35	36	35	35	33
Western University of Health Sciences	Mean	4.38	4.30	4.48	4.50	3.75	3.89
	N	21	20	21	20	20	19
Ross University	Mean	4.32	4.41	4.49	4.45	3.52	3.61
	N	73	69	73	69	73	69
St. George's University	Mean	4.41	4.58	4.34	4.59	3.45	3.59
	N	29	26	29	27	29	27
St. Matthew's University	Mean	4.80	4.40	5.00	4.40	3.60	3.60
	N	5	5	5	5	5	5
Total	**Mean**	**4.03**	**4.28**	**4.18**	**4.30**	**3.16**	**3.51**
	N	**1,146**	**1,110**	**1,144**	**1,104**	**1,134**	**1,081**

Diagnose and prescribe treatment for parasitic diseases		Give anesthesia		Do fluid therapy		Give an intravenous injection	
Expectations	Experience	Expectations	Experience	Expectations	Experience	Expectations	Experience
3.53	3.98	3.35	3.78	3.47	3.98	3.91	4.51
43	40	43	41	43	40	43	39
4.05	4.05	3.85	3.92	3.66	3.83	4.12	4.45
41	39	41	38	41	36	41	38
3.32	3.86	3.61	3.73	3.19	3.57	3.71	4.17
31	28	31	30	31	30	31	29
3.40	3.90	3.80	3.97	4.09	4.15	4.23	4.56
35	31	35	34	35	34	35	34
3.61	4.02	3.77	4.00	3.72	3.81	3.85	4.36
54	54	53	52	53	52	53	53
3.13	3.55	3.43	3.70	3.09	3.65	3.74	4.39
23	22	23	23	23	23	23	23
4.06	4.10	3.61	3.74	3.60	3.83	4.03	4.39
31	31	31	31	30	30	31	31
3.71	3.93	3.88	4.00	3.83	4.10	4.12	4.38
41	40	41	40	41	40	42	40
4.14	4.18	4.25	4.00	3.61	3.89	4.39	4.48
28	28	28	26	28	27	28	27
3.64	3.94	3.58	3.91	3.47	4.03	3.53	4.43
36	34	36	34	36	34	36	35
3.57	4.11	3.19	3.67	3.38	3.85	4.24	4.38
21	19	21	21	21	20	21	21
3.93	4.25	4.30	4.28	4.11	4.13	4.32	4.44
73	67	73	68	73	68	73	68
4.10	4.15	4.10	4.07	4.00	4.07	4.48	4.59
29	27	29	27	29	27	29	27
4.20	4.20	3.80	3.80	3.80	3.40	4.80	4.40
5	5	5	5	5	5	5	5
3.60	**3.99**	**3.72**	**3.90**	**3.62**	**3.94**	**4.00**	**4.41**
1,143	**1,085**	**1,142**	**1,092**	**1,138**	**1,089**	**1,145**	**1,098**

		Develop/adapt vaccination protocols		Advise clients on nutrition		Develop diagnostic plans for difficult cases	
		Expectations	Experience	Expectations	Experience	Expectations	Experience
Auburn University	Mean	3.86	4.31	2.71	3.44	3.31	3.74
	N	35	32	35	34	35	34
Tuskegee University	Mean	3.89	4.58	2.84	3.44	3.11	3.79
	N	18	19	19	18	19	19
University of California-Davis	Mean	4.25	4.12	3.43	3.31	3.95	3.81
	N	36	34	35	35	37	36
Colorado State University	Mean	3.38	4.07	2.64	3.32	3.26	4.02
	N	50	44	50	47	50	48
University of Florida	Mean	3.76	4.16	3.15	3.61	3.68	4.03
	N	34	32	34	33	34	33
University of Georgia	Mean	3.76	4.22	3.30	3.91	3.44	3.88
	N	34	32	33	32	34	34
University of Illinois	Mean	2.82	4.03	2.26	3.20	3.59	4.00
	N	45	40	46	44	46	45
Iowa State University	Mean	3.66	4.17	2.47	3.06	3.17	3.88
	N	53	47	53	47	53	48
Kansas State University	Mean	3.60	3.95	2.56	3.10	2.88	3.58
	N	42	38	41	40	41	40
Louisiana State University	Mean	3.65	4.38	2.82	4.00	3.47	4.35
	N	17	16	17	16	17	17
Tufts University	Mean	3.00	4.00	2.95	3.43	3.38	3.97
	N	37	34	37	35	37	36
Michigan State University	Mean	2.90	4.06	2.26	3.27	3.38	3.84
	N	39	36	39	37	39	38
University of Minnesota	Mean	3.15	3.88	3.00	3.50	3.27	3.96
	N	26	24	26	24	26	24
Mississippi State University	Mean	3.54	4.04	2.39	2.93	3.21	3.50
	N	28	27	28	27	28	28
Purdue University	Mean	3.64	4.16	2.39	3.39	3.50	3.97
	N	33	32	33	31	32	32
Cornell University	Mean	3.47	4.13	2.78	3.26	3.41	3.79
	N	36	32	37	34	37	33
Oklahoma State University	Mean	3.77	4.12	2.31	3.12	2.96	3.69
	N	26	26	26	26	26	26

Investigate potential toxin exposure		Prescribe medications		Interpret cytologic specimens		Interpret post-mortem specimens	
Expectations	Experience	Expectations	Experience	Expectations	Experience	Expectations	Experience
2.91	3.18	3.66	4.03	3.18	3.18	3.09	3.07
35	34	35	35	34	33	33	27
3.00	3.47	3.68	4.47	3.22	3.24	3.47	3.08
19	19	19	19	18	17	17	12
3.53	3.51	3.89	4.19	3.58	3.42	3.57	3.23
36	35	37	36	36	31	35	31
2.71	3.42	3.66	4.38	2.98	3.25	3.16	3.29
49	45	50	47	49	48	49	45
2.94	3.42	3.94	4.39	3.34	3.38	2.97	3.07
34	33	34	33	32	32	33	27
2.53	3.15	3.41	4.33	2.97	3.36	3.19	3.42
34	33	34	33	34	33	31	26
2.76	3.36	3.54	4.24	3.20	3.29	2.98	2.97
46	44	46	45	46	45	43	37
2.69	3.17	3.60	4.49	2.83	3.08	3.06	3.33
52	48	53	49	53	49	53	45
2.21	3.08	3.36	4.23	2.65	2.97	2.89	2.97
42	39	42	40	40	39	38	30
3.12	3.82	3.41	4.29	3.06	3.12	3.06	3.25
17	17	17	17	17	17	17	12
2.49	3.31	3.68	4.19	3.22	3.29	2.74	2.46
37	36	37	36	37	35	35	26
2.77	3.38	3.41	4.29	2.64	3.11	2.92	3.12
39	37	39	38	39	35	37	33
2.65	3.42	3.38	4.20	3.23	3.12	2.92	3.00
26	24	26	25	26	25	25	24
2.68	3.07	3.71	4.18	2.82	2.64	2.85	2.83
28	27	28	28	28	28	27	24
2.88	3.45	4.00	4.39	3.22	3.14	3.16	3.12
33	33	32	31	32	29	32	26
3.03	3.28	3.59	4.18	3.27	3.27	2.97	3.22
37	32	37	33	33	30	35	23
2.81	3.35	3.54	4.31	2.88	3.12	3.17	3.57
26	26	26	26	26	26	24	23

		Develop/adapt vaccination protocols		Advise clients on nutrition		Develop diagnostic plans for difficult cases	
		Expectations	Experience	Expectations	Experience	Expectations	Experience
University of Pennsylvania	Mean	3.21	4.11	2.63	3.45	3.53	4.21
	N	43	38	43	40	43	42
Texas A&M University	Mean	3.80	4.21	2.73	3.08	3.95	3.97
	N	41	38	41	39	41	39
Washington State University	Mean	3.55	3.61	2.39	3.17	3.45	3.63
	N	31	28	31	29	31	30
University of Missouri-Columbia	Mean	3.79	4.06	2.97	3.59	3.40	3.94
	N	34	31	35	32	35	34
The Ohio State University	Mean	3.50	4.17	2.49	3.08	3.30	3.77
	N	54	53	53	52	54	53
Oregon State University	Mean	2.57	3.80	2.52	3.43	3.00	3.74
	N	23	20	23	21	23	23
University of Tennessee	Mean	3.74	4.10	3.48	3.84	3.52	3.61
	N	31	31	31	31	31	31
Virginia-Maryland College	Mean	3.74	4.05	3.14	3.48	3.48	3.98
	N	42	40	42	42	42	42
North Carolina State University	Mean	3.96	4.25	3.43	3.57	3.64	4.21
	N	28	24	28	28	28	28
University of Wisconsin	Mean	3.83	4.20	2.53	3.29	3.47	3.91
	N	36	35	36	35	36	34
Western University of Health Sciences	Mean	4.05	4.17	2.71	3.47	3.76	4.00
	N	21	18	21	19	21	20
Ross University	Mean	3.64	4.16	3.15	3.63	3.74	3.99
	N	73	68	73	67	73	69
St. George's University	Mean	3.83	4.16	3.07	3.65	3.90	3.93
	N	29	25	29	26	29	27
St. Matthew's University	Mean	4.00	4.40	4.20	4.20	4.40	4.40
	N	5	5	5	5	5	5
Total	**Mean**	**3.57**	**4.10**	**2.78**	**3.38**	**3.44**	**3.89**
	N	**1,141**	**1,053**	**1,139**	**1,080**	**1,144**	**1,104**

Investigate potential toxin exposure		Prescribe medications		Interpret cytologic specimens		Interpret post-mortem specimens	
Expectations	Experience	Expectations	Experience	Expectations	Experience	Expectations	Experience
2.95	3.38	3.53	4.39	2.79	3.12	2.69	2.74
43	40	43	41	43	41	42	35
2.83	3.24	4.02	4.45	3.28	3.47	3.25	3.18
41	37	41	38	39	38	40	34
3.29	3.18	3.68	4.03	2.68	2.90	2.81	2.93
31	28	31	30	31	30	31	27
2.86	3.41	3.46	4.29	3.27	3.44	3.18	3.00
35	32	35	34	33	34	33	28
2.65	3.28	3.59	4.32	2.80	3.06	3.06	3.00
54	54	54	53	54	53	52	48
2.30	3.13	3.35	4.17	3.41	3.41	3.16	3.11
23	23	23	23	22	22	19	18
2.77	3.40	3.97	4.23	2.94	3.19	3.14	3.36
30	30	31	31	31	31	29	28
2.98	3.33	3.81	4.19	2.63	3.03	3.03	3.03
42	42	42	42	41	40	40	37
3.11	3.64	4.00	4.64	3.62	3.54	3.46	3.19
28	28	28	28	26	26	26	21
2.33	3.03	3.67	4.33	3.03	3.07	3.06	2.93
36	34	36	33	32	29	32	29
3.00	3.61	3.67	4.10	3.14	3.33	3.10	3.27
21	18	21	21	21	21	21	15
3.14	3.47	3.83	4.32	3.24	3.21	3.10	3.12
73	68	72	68	71	67	67	59
3.31	3.65	4.14	4.36	3.48	3.54	3.24	3.24
29	26	28	28	27	26	25	21
3.40	3.40	4.40	5.00	4.20	3.80	4.40	3.60
5	5	5	5	5	5	5	5
2.84	**3.33**	**3.67**	**4.29**	**3.06**	**3.19**	**3.08**	**3.09**
1,141	**1,081**	**1,142**	**1,102**	**1,115**	**1,071**	**1,083**	**918**

		Interpret ultrasound examinations		Interpret radiographs		Interpret hematologic values	
		Expectations	Experience	Expectations	Experience	Expectations	Experience
Auburn University	Mean	2.63	2.97	3.34	3.52	3.69	3.79
	N	35	32	35	33	35	33
Tuskegee University	Mean	2.22	2.79	3.11	3.18	3.50	3.72
	N	18	14	18	17	18	18
University of California-Davis	Mean	3.56	3.42	3.85	3.81	4.03	3.85
	N	36	33	34	31	36	33
Colorado State University	Mean	2.76	3.25	3.34	3.59	3.70	4.04
	N	50	48	50	49	50	49
University of Florida	Mean	2.97	3.23	3.30	3.50	3.94	4.00
	N	32	31	33	32	33	33
University of Georgia	Mean	2.41	3.23	3.18	3.62	3.71	4.09
	N	34	31	34	34	34	34
University of Illinois	Mean	2.48	3.05	3.13	3.40	3.85	4.07
	N	46	43	46	45	46	45
Iowa State University	Mean	2.21	3.02	3.10	3.57	3.67	3.86
	N	52	47	52	46	52	49
Kansas State University	Mean	2.10	2.69	3.28	3.46	3.50	3.65
	N	40	32	40	39	40	40
Louisiana State University	Mean	2.65	3.13	3.71	3.56	3.76	4.06
	N	17	15	17	16	17	17
Tufts University	Mean	2.84	3.40	3.38	3.44	3.84	3.80
	N	37	30	37	36	37	35
Michigan State University	Mean	2.53	3.06	3.10	3.47	3.64	3.89
	N	38	33	39	36	39	37
University of Minnesota	Mean	2.88	3.21	3.31	3.32	4.00	3.92
	N	26	24	26	25	26	25
Mississippi State University	Mean	2.50	2.68	3.07	3.21	3.46	3.61
	N	26	25	28	28	28	28
Purdue University	Mean	2.31	2.72	3.47	3.61	4.19	4.14
	N	32	29	32	28	32	29
Cornell University	Mean	2.63	3.39	3.30	3.55	3.85	3.97
	N	35	31	33	31	33	32
Oklahoma State University	Mean	2.16	3.23	3.15	3.42	3.62	3.73
	N	25	22	26	26	26	26

Diagnose/prescribe therapy for gastrointestinal disease		Diagnose/prescribe therapy for dermatological disease		Diagnose/prescribe therapy for endocrine disease		Diagnose/prescribe therapy for cardiac disease	
Expectations	Experience	Expectations	Experience	Expectations	Experience	Expectations	Experience
3.47	3.91	3.76	4.06	3.38	3.55	3.00	3.45
34	34	34	34	34	33	34	33
3.56	4.33	3.00	4.11	3.06	3.53	2.83	3.50
18	18	18	18	18	17	18	18
3.79	4.17	3.94	3.94	3.82	3.66	3.52	3.45
33	30	33	31	33	29	33	29
3.61	4.17	3.16	3.68	3.06	3.61	2.98	3.50
49	48	49	47	48	46	49	46
3.38	3.97	3.88	3.87	3.50	3.57	3.53	3.62
32	30	32	30	32	30	32	29
3.56	4.26	3.38	3.81	3.50	3.76	3.03	3.61
34	34	34	32	34	33	34	33
3.21	3.97	3.12	3.69	3.55	3.76	2.62	3.43
42	39	42	39	42	38	42	37
3.37	4.04	3.59	3.85	3.16	3.65	2.78	3.34
51	47	51	47	50	46	51	47
3.20	3.95	2.93	3.65	3.15	3.55	2.92	3.26
40	40	40	40	40	40	39	39
3.71	4.25	3.94	4.06	3.76	3.88	3.47	3.69
17	16	17	17	17	16	17	16
3.53	3.97	3.12	3.47	3.32	3.44	3.54	3.50
34	34	34	34	34	34	35	34
3.28	4.00	3.03	3.78	3.31	3.81	3.13	3.32
39	36	39	36	39	36	39	37
3.52	3.91	3.36	3.41	3.32	3.65	3.08	3.39
25	23	25	22	25	23	25	23
3.57	4.04	3.36	3.46	3.52	3.42	2.89	3.26
28	28	28	26	27	26	28	27
3.53	3.97	2.88	3.63	3.53	3.84	2.94	3.35
32	31	33	32	32	31	32	31
3.54	4.12	3.11	3.76	3.41	3.80	3.00	3.17
35	34	35	33	34	30	34	29
3.12	3.83	3.16	3.67	3.04	3.33	3.08	3.46
25	24	25	24	25	24	25	24

		Interpret ultrasound examinations		Interpret radiographs		Interpret hematologic values	
		Expectations	Experience	Expectations	Experience	Expectations	Experience
University of Pennsylvania	Mean	2.43	3.51	3.26	3.83	3.65	4.05
	N	42	39	43	42	43	41
Texas A&M University	Mean	2.34	2.75	3.47	3.49	4.15	4.03
	N	38	36	38	37	39	39
Washington State University	Mean	1.97	2.70	3.13	3.46	3.71	3.90
	N	31	27	31	28	31	30
University of Missouri-Columbia	Mean	2.34	3.09	3.26	3.94	3.77	4.06
	N	35	32	35	34	35	33
The Ohio State University	Mean	2.27	3.06	3.40	3.73	3.77	4.08
	N	52	49	53	51	53	52
Oregon State University	Mean	2.05	3.18	2.82	3.62	3.59	3.77
	N	22	22	22	21	22	22
University of Tennessee	Mean	2.13	2.87	3.68	3.71	3.87	4.00
	N	31	30	31	31	31	31
Virginia-Maryland College	Mean	2.33	2.95	3.67	3.79	4.05	4.08
	N	40	38	39	39	40	40
North Carolina State University	Mean	2.75	3.20	3.68	3.89	4.26	4.23
	N	28	25	28	27	27	26
University of Wisconsin	Mean	2.41	3.03	3.42	3.63	3.85	3.91
	N	32	29	31	30	34	32
Western University of Health Sciences	Mean	2.76	3.38	3.38	3.55	3.81	4.05
	N	21	16	21	20	21	20
Ross University	Mean	2.59	3.11	3.37	3.49	3.86	4.00
	N	69	62	71	70	71	69
St. George's University	Mean	2.73	3.16	3.59	3.81	4.15	4.04
	N	26	25	27	26	26	26
St. Matthew's University	Mean	2.40	2.40	3.60	4.00	4.60	4.40
	N	5	5	5	5	5	5
Total	**Mean**	**2.49**	**3.08**	**3.34**	**3.57**	**3.81**	**3.95**
	N	**1,107**	**1,003**	**1,114**	**1,070**	**1,119**	**1,085**

Diagnose/prescribe therapy for gastrointestinal disease		Diagnose/prescribe therapy for dermatological disease		Diagnose/prescribe therapy for endocrine disease		Diagnose/prescribe therapy for cardiac disease	
Expectations	Experience	Expectations	Experience	Expectations	Experience	Expectations	Experience
3.64	4.23	3.68	3.79	3.60	3.90	3.33	3.70
42	40	41	39	42	40	42	40
3.74	4.21	3.87	3.97	3.76	3.84	3.66	3.86
39	39	38	38	38	38	38	37
3.17	3.86	2.62	3.39	3.14	3.32	3.28	3.35
29	28	29	28	29	25	29	26
3.29	4.21	3.11	3.69	3.31	3.85	3.11	3.73
35	33	35	32	35	33	35	33
3.54	3.98	3.62	3.81	3.19	3.48	3.42	3.48
52	52	52	52	52	52	52	52
3.14	3.67	2.10	3.10	3.00	3.48	3.14	3.20
21	21	21	21	21	21	21	20
3.26	3.93	3.32	3.87	3.48	3.67	3.10	3.34
31	30	31	30	31	30	31	29
3.74	4.24	3.05	3.53	3.42	3.71	3.16	3.39
38	38	38	38	38	38	38	38
3.85	4.19	4.00	3.77	3.67	3.67	3.67	3.74
27	27	27	26	27	27	27	27
3.58	4.06	3.69	3.70	3.34	3.37	3.42	3.58
33	32	32	30	32	30	33	31
3.71	4.20	3.33	3.79	3.43	3.74	3.24	3.42
21	20	21	19	21	19	21	19
3.81	4.21	3.58	3.94	3.30	3.60	3.43	3.67
69	68	69	67	69	67	68	66
4.21	4.39	3.54	4.05	3.79	3.78	3.83	4.04
24	23	24	22	24	23	24	23
4.00	4.20	3.60	4.60	4.20	3.80	3.60	3.75
5	5	5	5	5	5	5	4
3.53	**4.08**	**3.34**	**3.74**	**3.38**	**3.64**	**3.21**	**3.49**
1,092	**1,058**	**1,090**	**1,042**	**1,086**	**1,035**	**1,089**	**1,030**

		Diagnose/prescribe therapy for respiratory disease		Diagnose/prescribe therapy for renal disease		Diagnose/prescribe therapy for neurological disease	
		Expectations	Experience	Expectations	Experience	Expectations	Experience
Auburn University	Mean	3.06	3.38	3.47	3.71	3.44	3.39
	N	34	34	34	34	34	33
Tuskegee University	Mean	2.94	3.78	3.11	3.89	2.67	3.39
	N	18	18	18	18	18	18
University of California-Davis	Mean	3.52	3.70	3.88	3.81	3.73	3.68
	N	33	30	33	31	33	31
Colorado State University	Mean	2.98	3.51	3.39	3.81	3.12	3.34
	N	49	47	49	47	49	47
University of Florida	Mean	3.19	3.40	3.41	3.77	3.22	3.40
	N	32	30	32	30	32	30
University of Georgia	Mean	3.00	3.53	3.62	4.00	3.53	3.76
	N	34	34	34	34	34	34
University of Illinois	Mean	2.83	3.38	3.33	3.82	2.81	3.28
	N	42	39	42	38	42	39
Iowa State University	Mean	2.94	3.60	3.45	3.94	2.84	3.26
	N	51	48	51	47	51	47
Kansas State University	Mean	3.00	3.25	3.36	3.69	2.63	3.18
	N	40	40	39	39	40	40
Louisiana State University	Mean	3.35	3.69	3.71	3.94	3.06	3.47
	N	17	16	17	16	17	17
Tufts University	Mean	3.09	3.21	3.83	3.88	3.60	3.44
	N	35	34	35	34	35	34
Michigan State University	Mean	3.05	3.42	3.44	3.86	2.61	3.11
	N	39	38	39	37	38	38
University of Minnesota	Mean	3.32	3.61	3.40	3.61	2.84	3.35
	N	25	23	25	23	25	23
Mississippi State University	Mean	3.14	3.30	3.37	3.54	3.26	3.12
	N	28	27	27	26	27	26
Purdue University	Mean	3.38	3.58	3.75	3.97	3.38	3.58
	N	32	31	32	31	32	31
Cornell University	Mean	3.09	3.59	3.59	3.97	3.35	3.33
	N	35	34	34	29	34	30
Oklahoma State University	Mean	2.88	3.38	3.24	3.58	3.00	3.33
	N	25	24	25	24	25	24

Diagnose/prescribe therapy for ocular disorders		Perform orthopedic surgery		Perform soft tissue surgery		Spay or neuter	
Expectations	Experience	Expectations	Experience	Expectations	Experience	Expectations	Experience
3.00	3.18	1.65	1.92	2.97	3.59	3.65	4.03
34	33	34	24	34	32	34	32
3.44	3.83	2.27	2.71	4.00	3.76	4.39	4.12
18	18	15	7	18	17	18	17
3.88	4.00	1.66	2.13	3.28	3.34	3.90	3.69
33	32	29	15	32	29	31	26
2.90	3.34	1.69	2.20	2.71	3.69	3.38	3.95
49	47	45	35	49	45	48	43
3.09	3.33	2.15	2.64	3.53	3.81	4.16	4.23
32	30	27	14	32	32	31	30
3.09	3.38	1.72	2.29	2.85	3.80	3.03	4.10
34	32	29	21	33	30	33	30
3.60	3.57	1.85	2.41	2.75	3.45	3.50	3.89
42	37	39	29	40	38	40	38
3.06	3.45	1.75	2.12	3.36	3.88	3.96	4.38
51	47	48	33	50	43	50	42
3.33	3.53	1.54	2.43	2.72	3.50	3.47	4.31
40	40	35	23	39	38	38	36
3.41	3.65	2.06	2.18	2.88	3.59	3.35	4.06
17	17	16	11	17	17	17	16
3.26	3.26	1.81	1.81	2.56	3.19	3.36	3.87
34	34	31	16	34	31	36	31
3.08	3.42	1.67	2.33	2.92	3.74	3.41	4.24
38	36	36	18	39	34	39	33
3.32	3.23	1.50	2.08	2.79	3.38	3.46	3.90
25	22	22	12	24	21	24	20
2.89	3.07	1.83	2.05	3.04	3.50	4.39	4.19
28	27	24	20	28	26	28	27
3.31	3.81	1.97	1.92	3.35	3.67	4.06	4.26
32	31	30	24	31	30	32	31
3.26	3.31	1.67	2.18	2.88	3.58	3.69	4.11
34	32	27	11	34	31	32	27
3.36	3.58	1.52	2.13	3.00	3.59	4.08	3.77
25	24	23	15	24	22	24	22

		Diagnose/prescribe therapy for respiratory disease		Diagnose/prescribe therapy for renal disease		Diagnose/prescribe therapy for neurological disease	
		Expectations	Experience	Expectations	Experience	Expectations	Experience
University of Pennsylvania	Mean	3.29	3.85	3.76	4.03	3.17	3.63
	N	42	39	42	40	42	40
Texas A&M University	Mean	3.23	3.59	3.53	3.87	3.44	3.37
	N	39	39	38	38	39	38
Washington State University	Mean	2.86	3.37	3.28	3.52	3.24	3.19
	N	28	27	29	27	29	27
University of Missouri-Columbia	Mean	3.17	3.67	3.51	4.06	3.49	3.64
	N	35	33	35	33	35	33
The Ohio State University	Mean	3.17	3.52	3.48	3.82	3.29	3.44
	N	52	52	52	51	52	52
Oregon State University	Mean	2.81	3.24	3.24	3.67	2.62	3.10
	N	21	21	21	21	21	21
University of Tennessee	Mean	3.13	3.47	3.52	3.77	3.26	3.57
	N	31	30	31	30	31	30
Virginia-Maryland College	Mean	3.34	3.68	3.74	4.11	3.39	3.63
	N	38	38	38	38	38	38
North Carolina State University	Mean	3.33	3.67	3.89	4.07	3.59	3.81
	N	27	27	27	27	27	27
University of Wisconsin	Mean	2.97	3.22	3.50	3.87	2.84	3.47
	N	33	32	32	30	32	32
Western University of Health Sciences	Mean	3.14	3.55	3.48	3.89	2.95	3.26
	N	21	20	21	19	21	19
Ross University	Mean	3.29	3.53	3.78	3.96	3.10	3.22
	N	69	68	69	67	69	67
St. George's University	Mean	3.83	3.91	3.96	4.04	3.63	3.57
	N	24	23	24	23	24	23
St. Matthew's University	Mean	4.00	4.00	4.40	4.60	3.60	4.00
	N	5	5	5	5	5	5
Total	**Mean**	**3.14**	**3.51**	**3.55**	**3.86**	**3.16**	**3.40**
	N	**1,092**	**1,056**	**1,088**	**1,042**	**1,089**	**1,049**

Diagnose/prescribe therapy for ocular disorders		Perform orthopedic surgery		Perform soft tissue surgery		Spay or neuter	
Expectations	Experience	Expectations	Experience	Expectations	Experience	Expectations	Experience
2.71	3.35	1.69	2.50	2.58	3.44	3.10	3.81
42	40	36	20	40	36	39	31
2.03	2.79	2.00	2.38	3.49	3.70	4.22	4.27
38	38	34	26	37	37	37	37
2.79	3.00	1.56	2.06	2.86	3.62	3.62	4.20
29	27	27	17	29	26	29	25
3.23	3.30	1.67	2.50	2.91	3.84	3.59	4.25
35	33	33	24	34	32	34	32
3.33	3.37	1.65	2.03	3.18	3.83	3.92	4.31
52	52	48	31	51	48	52	49
1.76	2.81	1.68	2.45	2.62	3.47	3.81	3.95
21	21	19	11	21	19	21	19
3.61	3.77	1.96	2.09	2.93	3.57	3.79	4.03
31	30	27	22	29	28	29	29
3.42	3.39	1.66	2.20	2.58	3.46	3.26	3.81
38	38	35	25	38	37	38	37
3.63	3.67	1.69	1.93	3.11	3.69	4.00	4.25
27	27	26	14	28	26	28	24
3.28	3.20	1.33	1.50	2.58	3.55	3.13	3.89
32	30	27	12	33	29	31	27
2.67	3.26	1.63	2.20	3.05	3.84	4.40	4.38
21	19	19	10	20	19	20	16
2.91	3.30	1.86	2.09	3.50	3.79	4.15	4.32
69	67	64	45	68	67	68	66
2.96	3.39	1.90	2.43	3.43	3.68	4.38	4.14
24	23	20	14	23	22	24	21
3.80	3.80	2.40	2.33	3.40	2.75	4.40	4.00
5	5	5	3	5	4	5	4
3.11	**3.36**	**1.74**	**2.18**	**3.01**	**3.62**	**3.72**	**4.10**
1,088	**1,044**	**980**	**633**	**1,070**	**994**	**1,065**	**964**

		Manage reproductive programs		Evaluate disease outbreaks		Evaluate new drugs/products	
		Expectations	Experience	Expectations	Experience	Expectations	Experience
Auburn University	Mean	2.86	2.76	3.09	3.12	3.34	3.77
	N	35	25	34	26	35	35
Tuskegee University	Mean	2.27	3.38	3.06	3.45	2.82	3.53
	N	15	8	17	11	17	17
University of California-Davis	Mean	2.71	3.10	3.23	3.55	3.53	3.72
	N	31	20	31	22	32	32
Colorado State University	Mean	2.30	2.79	3.00	3.12	3.04	3.44
	N	46	34	45	33	47	45
University of Florida	Mean	2.35	2.43	2.83	2.90	3.44	3.68
	N	29	21	29	20	32	31
University of Georgia	Mean	1.90	2.29	2.35	2.61	2.91	3.61
	N	31	21	31	23	33	31
University of Illinois	Mean	2.06	2.44	2.78	3.04	3.05	3.48
	N	36	18	37	23	40	40
Iowa State University	Mean	2.65	2.90	2.92	3.11	2.88	3.63
	N	48	39	49	45	51	48
Kansas State University	Mean	2.26	2.65	2.43	2.71	2.87	3.31
	N	35	23	35	24	39	39
Louisiana State University	Mean	2.53	3.00	2.65	2.92	2.88	3.47
	N	17	10	17	12	17	17
Tufts University	Mean	1.77	1.86	2.39	2.16	2.94	3.36
	N	34	22	33	25	34	33
Michigan State University	Mean	2.18	2.63	2.86	3.00	2.86	3.41
	N	38	27	37	27	36	37
University of Minnesota	Mean	2.65	3.06	2.78	3.19	3.08	3.70
	N	23	17	23	16	24	23
Mississippi State University	Mean	2.50	2.65	2.78	2.94	3.35	3.74
	N	26	17	27	18	26	27
Purdue University	Mean	2.76	3.08	3.06	3.10	3.44	3.91
	N	29	25	31	30	32	32
Cornell University	Mean	2.65	3.06	2.94	3.25	3.20	3.71
	N	31	18	33	20	35	34
Oklahoma State University	Mean	2.50	2.81	2.83	3.05	2.87	3.35
	N	22	21	24	19	23	23

Interpret medical literature		Deal with people		Veterinary medicine as a business		Giving educational presentations to the community	
Expectations	Experience	Expectations	Experience	Expectations	Experience	Expectations	Experience
3.71	3.91	3.11	3.86	2.06	2.97	2.94	3.59
35	35	35	35	35	32	34	29
3.47	3.82	3.35	3.50	2.53	3.13	3.06	3.15
17	17	17	16	17	16	17	13
3.84	3.75	3.94	4.00	3.19	3.12	2.93	3.70
32	32	31	31	31	26	29	23
3.31	3.63	3.96	4.16	2.82	3.29	2.83	3.46
49	49	49	49	49	45	48	35
3.97	3.81	3.22	3.94	2.84	3.03	2.81	3.29
32	31	32	31	32	31	32	28
3.58	3.88	3.42	3.97	2.48	3.12	2.68	3.91
33	33	33	33	33	26	31	22
3.38	3.64	3.00	3.79	2.64	3.03	2.73	3.34
39	39	39	39	39	37	37	32
3.41	3.66	3.22	4.14	2.33	3.04	2.71	3.56
51	50	51	50	49	46	48	41
3.18	3.38	2.92	3.67	1.87	2.66	2.19	3.00
39	39	39	39	39	38	37	26
3.29	3.53	3.06	4.18	2.41	3.53	2.69	3.71
17	17	17	17	17	17	16	17
3.60	3.53	3.14	3.76	2.37	2.73	2.56	3.26
35	34	35	34	35	30	32	23
3.27	3.56	3.03	3.73	2.16	2.94	2.83	3.52
37	36	37	37	37	36	36	33
3.25	3.52	3.63	4.13	2.67	3.17	2.81	3.65
24	23	24	23	24	23	21	17
3.46	3.61	3.18	3.71	2.71	3.00	2.88	3.47
28	28	28	28	28	27	26	17
3.79	3.85	3.21	4.00	2.73	3.12	3.03	3.57
33	33	33	33	33	33	32	28
3.61	3.77	3.55	4.03	2.74	3.24	3.14	3.93
36	35	38	38	35	33	36	27
3.21	3.46	2.92	3.64	2.08	2.70	2.33	3.24
24	24	25	25	25	23	24	21

		Manage reproductive programs		Evaluate disease outbreaks		Evaluate new drugs/ products	
		Expectations	Experience	Expectations	Experience	Expectations	Experience
University of Pennsylvania	Mean	2.33	2.90	2.77	3.14	3.18	3.86
	N	36	20	35	21	39	37
Texas A&M University	Mean	2.22	2.70	2.94	2.96	3.32	3.78
	N	32	20	32	28	38	36
Washington State University	Mean	2.12	2.61	2.48	2.75	2.82	3.21
	N	26	18	29	20	28	28
University of Missouri-Columbia	Mean	2.50	2.75	2.71	2.72	2.88	3.68
	N	32	24	31	25	33	31
The Ohio State University	Mean	2.43	2.85	2.85	3.10	3.08	3.60
	N	47	40	52	42	53	50
Oregon State University	Mean	2.42	2.71	2.60	3.06	2.90	3.37
	N	19	14	20	16	20	19
University of Tennessee	Mean	2.462	2.74	2.75	3.13	3.38	3.62
	N	26	23	28	24	29	29
Virginia-Maryland College	Mean	2.60	3.10	2.75	2.93	3.11	3.62
	N	35	29	36	30	37	37
North Carolina State University	Mean	2.35	2.80	2.92	3.07	3.37	3.54
	N	26	15	25	15	27	28
University of Wisconsin	Mean	2.37	2.71	2.58	2.92	3.09	3.73
	N	30	21	31	24	32	33
Western University of Health Sciences	Mean	2.24	2.75	3.32	3.15	3.57	3.74
	N	17	8	19	13	21	19
Ross University	Mean	2.46	2.46	2.74	2.77	2.99	3.48
	N	59	46	62	48	68	67
St. George's University	Mean	2.29	2.53	2.68	2.77	3.35	3.78
	N	21	15	19	13	23	23
St. Matthew's University	Mean	2.25	2.67	3.40	3.00	3.40	3.80
	N	4	3	5	5	5	5
Total	**Mean**	**2.40**	**2.73**	**2.81**	**2.98**	**3.12**	**3.59**
	N	**986**	**691**	**1,008**	**747**	**1,060**	**1,035**

Interpret medical literature		Deal with people		Veterinary medicine as a business		Giving educational presentations to the community	
Expectations	Experience	Expectations	Experience	Expectations	Experience	Expectations	Experience
3.73	3.80	3.15	4.30	2.80	3.41	2.87	4.21
40	40	40	40	40	39	39	33
3.74	3.76	3.23	4.00	2.44	3.00	2.72	3.43
39	38	39	39	39	37	39	30
3.24	3.38	3.72	3.76	2.48	3.00	2.50	3.23
29	29	29	29	29	25	28	22
3.36	3.60	3.06	3.97	2.38	3.07	2.52	3.44
33	30	32	33	32	30	31	25
3.55	3.62	3.37	4.12	2.50	2.98	2.51	3.40
53	52	52	51	52	47	51	43
3.67	3.65	2.48	3.76	2.19	3.05	2.70	3.64
21	20	21	21	21	20	20	14
3.72	3.72	3.97	4.10	2.52	2.93	2.74	3.44
29	29	29	29	29	29	27	25
3.51	3.68	3.41	4.08	2.32	2.97	2.72	3.59
37	37	37	37	37	35	36	32
3.68	3.68	3.11	3.93	2.79	3.12	2.96	3.71
28	28	28	28	28	26	28	24
3.70	3.85	3.18	3.88	1.85	2.56	2.16	3.23
33	33	33	33	33	32	32	31
4.05	3.95	4.29	4.24	3.19	3.11	3.52	4.00
21	21	21	21	21	18	21	16
3.47	3.54	3.37	3.87	2.53	3.02	2.78	3.47
68	68	68	67	68	65	65	55
3.70	3.78	3.27	3.88	2.54	3.39	3.00	3.69
23	23	22	24	24	23	23	16
4.60	3.80	3.40	4.60	2.80	3.80	3.00	3.25
5	5	5	5	5	5	4	4
3.54	**3.67**	**3.32**	**3.95**	**2.50**	**3.04**	**2.74**	**3.51**
1,076	**1,060**	**1,075**	**1,071**	**1,072**	**1,003**	**1,034**	**840**

		Communicating with clients	
		Expectations	Experience
Auburn University	Mean	3.29	3.94
	N	35	34
Tuskegee University	Mean	3.65	3.69
	N	17	16
University of California-Davis	Mean	4.10	4.10
	N	31	31
Colorado State University	Mean	3.90	4.15
	N	49	48
University of Florida	Mean	3.41	3.97
	N	32	31
University of Georgia	Mean	3.61	4.06
	N	33	32
University of Illinois	Mean	3.23	3.92
	N	39	39
Iowa State University	Mean	3.43	4.18
	N	51	50
Kansas State University	Mean	3.08	3.82
	N	39	39
Louisiana State University	Mean	3.18	4.35
	N	17	17
Tufts University	Mean	3.34	3.85
	N	35	34
Michigan State University	Mean	3.46	4.03
	N	37	37
University of Minnesota	Mean	3.67	4.17
	N	24	23
Mississippi State University	Mean	3.43	3.79
	N	28	28
Purdue University	Mean	3.55	3.94
	N	33	33
Cornell University	Mean	3.46	3.97
	N	37	35
Oklahoma State University	Mean	3.36	3.72
	N	25	25

		Communicating with clients	
		Expectations	Experience
University of Pennsylvania	Mean	3.28	4.45
	N	40	40
Texas A&M University	Mean	3.31	4.08
	N	39	39
Washington State University	Mean	3.86	3.82
	N	29	28
University of Missouri-Columbia	Mean	3.38	4.10
	N	32	30
The Ohio State University	Mean	3.45	4.12
	N	51	50
Oregon State University	Mean	2.86	3.81
	N	21	21
University of Tennessee	Mean	4.00	4.17
	N	29	29
Virginia-Maryland College	Mean	3.59	4.17
	N	37	36
North Carolina State University	Mean	3.46	4.11
	N	28	28
University of Wisconsin	Mean	3.15	4.06
	N	33	33
Western University of Health Sciences	Mean	4.10	4.19
	N	21	21
Ross University	Mean	3.51	4.06
	N	68	65
St. George's University	Mean	3.46	4.00
	N	24	24
St. Matthew's University	Mean	4.00	4.60
	N	5	5
Total	**Mean**	**3.48**	**4.03**
	N	**1,075**	**1,057**

THE AVMA 2018 ECONOMIC REPORTS INCLUDE:

The AVMA & AAVMC Report on the Market for Veterinary Education:

The market for veterinary education is the beginning of the pipeline to the market for veterinary services. This report examines the characteristics of veterinary college applicants, the supply of and demand for veterinary education, and the performance of the market in providing new veterinarians.

The AVMA Report on the Market for Veterinarians:

This report explores the demographics and employment of the veterinary profession: where they are located, what type of work they do, how much they are compensated, and how they are managing their educational debt. The report also measures unemployment and underemployment and identifies the contributing factors, and explores the performance of the market based on the value of the DVM degree.

The AVMA Report on the Market for Veterinary Services:

The demand for veterinarians and veterinary education begins with the demand for veterinary services. This report provides an overview of the veterinary workforce and projections for the supply and demand for veterinary services using recent AVMA Pet Demographics and Ownership study data. The report also presents the results of an efficiency analysis of the veterinary practices. In addition, the economic impact of veterinary businesses on a national scale is discussed.

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2018 AVMA Report on

THE MARKET FOR VETERINARIANS

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2018 AVMA Report on

THE MARKET FOR VETERINARIANS

Veterinary Economics Division
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SUMMARY

The market for veterinary labor continues to be increasingly robust as all indicators point toward favorable conditions for the veterinary industry on a national level, but there are still considerable maldistribution problems creating variations in unemployment, underemployment, incomes, wellbeing and other labor market indicators, such as the net present value of the degree. These variations occur regionally, by state and within states, by gender and by practice type, and the continued increasing scarcity of veterinary labor should help to ameliorate this maldistribution. A compilation of key indicators by region is provided at the end of this summary (Table 1 and Figure 1).

While the number of new veterinarians entering the workforce is nearly 4,062 per year, the number leaving is nearly 2,000, for a net gain of roughly 2,000. The current number of active veterinarians is estimated at approximately 110,500 and thus there are roughly 2,940 people per veterinarian in the United States. At the rate of current population growth and growth in the number of veterinarians, however, only 2,400 new people are being added for every new veterinarian. More importantly, while the cost of veterinarians continues to rise, the median household income of the increased population is not expanding.

The recent economic expansion has maintained a low unemployment rate in veterinary medicine and the changing structure of the veterinarian workforce has helped create an even larger negative underemployment rate. The large number of veterinarians nearing retirement coupled with the increased number of women in the profession is reducing the number of hours in a veterinary full-time equivalent (FTE) and this has led to an actual reduction in the total number of veterinary FTEs, even while the number of veterinarians entering the profession increases.

The number of jobs exceeded the number of applicants on the AVMA's Veterinary Career Center (VCC) in 2017 but there were still markets in which the number of applicants exceeded the number of jobs; in other markets employers went begging for applicants and found none. This disparity led to sharply rising veterinary incomes in some areas with no growth in incomes in other areas.

Veterinary wellbeing, talked about throughout the profession with major concern, does not appear different from other specialized professions, such as medical doctors, engineers and lawyers, when assessed through the ProQOL tool that measures compassion satisfaction, burnout and secondary traumatic stress.

Because the market for veterinarians sits as the crossroads for the market for veterinary services - which drives the demand for veterinarians – and the market for veterinary education – the source of the pipeline of veterinarians – the market is affected by, and is responsive to, changes in these two vertically related markets. Problems in either of these markets become problems in the market for veterinarians and this leads to inefficiency in the market until adjustments are made.

Market adjustments occur when the market players make informed decisions. The purpose of this report is to enhance the decision-making process by providing the best information available for veterinarians to tap for employment and career decisions. Toward this end, those who complete AVMA surveys enable the collection and analysis of data to report on the markets, providing invaluable information to assist veterinarians. These obliging professionals are the source of change in the profession.

2017 CENSUS OF VETERINARIANS KEY IINDICATORS BY REGION

Region of Workplace	Statistic	Change in Hours Desired	Total Personal Income	Burnout Score	Unemployed in Veterinary Medicine	S/D Ratio (Externally Sourced)	Years of Experience of Respondent	Percentage Female
0	Mean	-1.4510	$120,596.60	25.3118	2.5%	0.183	15.3911	78.2%
	N	51	161	186	5		202	
	Std. Deviation	20.6807	$90,306.30	6.2028			12.3285	
1	Mean	-3.6119	$112,613.10	26.0657	1.9%	0.206	13.5775	72.0%
	N	67	174	198	4		213	
	Std. Deviation	14.3695	$79,436.93	6.5089			12.2840	
2	Mean	-4.2250	$109,395.40	25.1798	1.3%	0.231	15.2718	75.0%
	N	80	237	267	4		298	
	Std. Deviation	18.5650	$67,327.33	6.5135			13.3907	
3	Mean	-6.5556	$113,070.30	25.8037	0.3%	0.387	14.7951	68.3%
	N	99	228	270	1		288	
	Std. Deviation	19.4597	$93,047.53	7.2565			13.5087	
4	Mean	-3.7042	$119,112.80	25.575	0.8%	0.225	14.1805	72.6%
	N	71	218	252	2		266	
	Std. Deviation	16.7838	$95,740.55	5.8349			12.7260	
5	Mean	-0.2881	$108,704.90	24.7186	3.2%	0.376	13.7150	68.8%
	N	59	179	199	7		214	
	Std. Deviation	25.5526	$71,305.79	6.3223			12.1101	
6	Mean	-6.5362	$120,513.20	24.8599	0.9%	0.255	16.0591	62.0%
	N	69	179	207	2		220	
	Std. Deviation	19.1139	$94,439.90	6.4217			14.4656	
7	Mean	-2.2344	$134,267.30	25.1269	0.9%	0.226	16.4521	62.4%
	N	64	172	197	2		219	
	Std. Deviation	22.4787	$96,381.82	6.6662			14.5470	
8	Mean	-6.8475	$109,939.30	25.9261	1.4%	0.217	13.4292	69.5%
	N	59	181	203	3		219	
	Std. Deviation	18.0915	$95,463.11	6.3402			14.1894	
9	Mean	-5.3556	$117,324.80	26.4452	2.6%	0.176	14.5131	80.1%
	N	90	237	283	8		306	
	Std. Deviation	18.7349	$80,931.21	6.6182			12.7421	
Total	**Mean**	**-4.3202**	**$116,232.50**	**25.5376**	**1.6%**	**0.176**	**14.7395**	**71.2%**
	N	**709**	**1966**	**2262**	**38**		**2445**	
	Std. Deviation	**19.4146**	**$86,742.79**	**6.5057**			**13.2624**	

Table 1

INTRODUCTION

REGIONS OF THE UNITED STATES

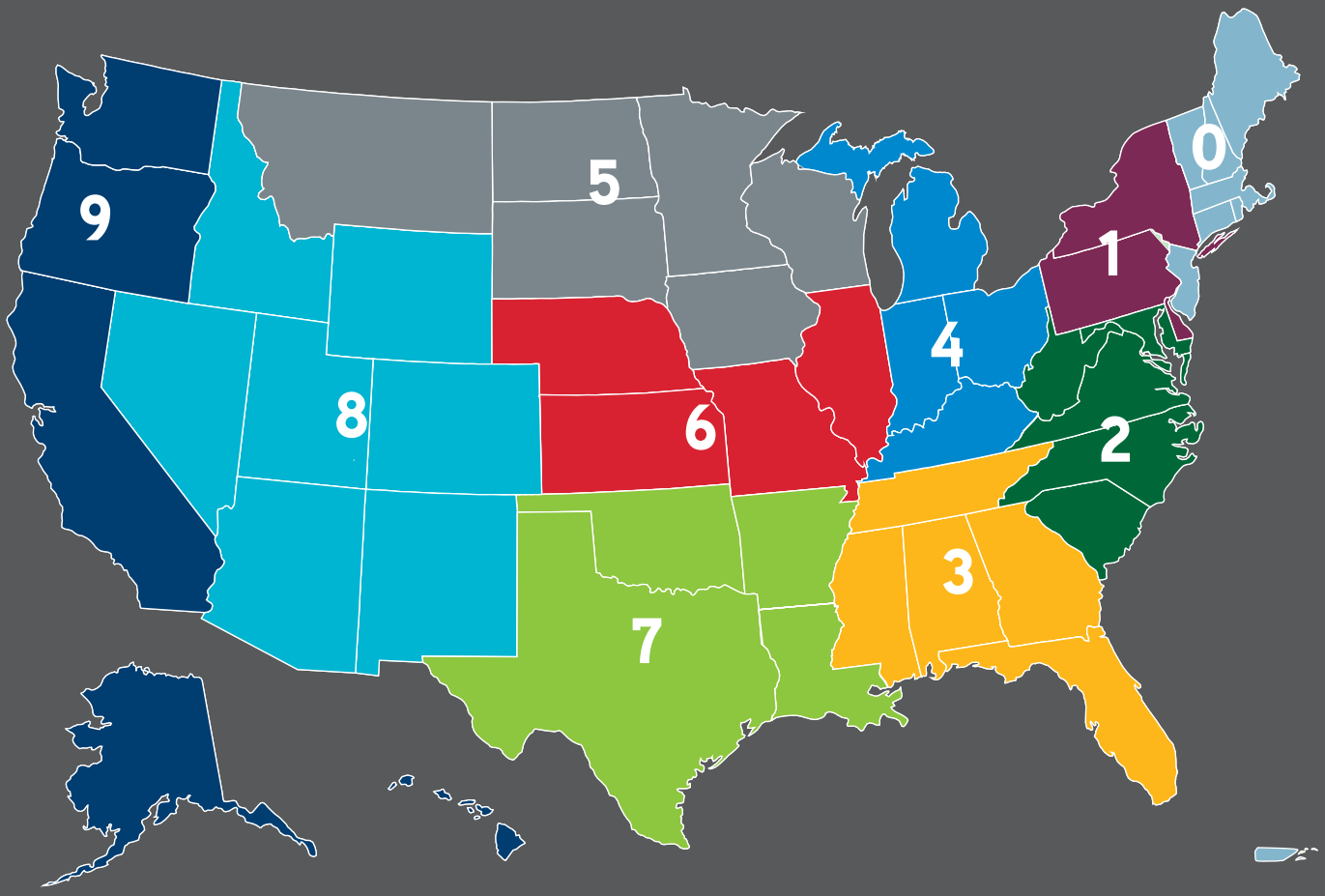


Figure 1

For the third year in a row, the market for veterinarians is increasingly robust with declining levels of unemployment, increasing levels of negative underemployment, larger year-to-year increases in mean starting salaries and the number of graduates who have obtained full-time employment prior to graduation, and an increasing number of employment postings on the AVMA Veterinary Career Center. The number of employment opportunities posted on the VCC continued to exceed the number of applicants, with many of these opportunities remaining unfilled through the end of 2017.

The market for veterinarians is the market of convergence between the market for veterinary education and the market for veterinary services. In this market, the equilibrium price and quantity in the market for veterinary services collides with the price and quantity equilibrium from the market for veterinary education. The number of veterinarians produced by veterinary colleges at a specific cost per veterinarian should confront an income offered by employers that is derived from the willingness of animal owners to purchase veterinary services from veterinary hospitals. This juxtaposition of the cost of veterinarians with the value of services perceived by animal owners, however, presumes that veterinary practices are able to translate the demand for veterinary services into the value accorded the veterinarian producing these services. Unfortunately, few veterinary practices use the value of output per veterinarian to establish veterinary incomes, and even fewer owners understand the relationship between price of services, quantity of services demanded, and veterinary incomes. While all three veterinary markets (education, veterinarian, and veterinary services) will rarely, if ever, have equilibriums that are in alignment, the markets should tend to induce resources to move in the direction of the equilibrium prices and quantities. That is, in each of the markets, movement of resources should occur to produce a quantity of output that just meets quantity demanded at a price that is acceptable to both consumers and producers.

In 2017 there were an estimated total of 110,531 veterinarians actively engaged in the profession in the United States, in public or private practice, and 16,246 veterinary students in the pipeline to become veterinarians in 2017 (in the United States and internationally). The largest segment of the profession is engaged to provide medical services to animals in private and corporate practices. Of these practices, companion animal practices employed the largest number of veterinarians (59.7 percent), followed by food animal (5 percent), equine (4.5 percent) and mixed animal practices (4.7 percent). In public practice, colleges and universities employ the most veterinarians, followed by industry, and state and local governments (Figure 2).

The percent of veterinarians identifying their practice type as companion animal in 2017 increased by almost 1 percent from 2016, while those identifying food animal, mixed animal and equine as their practice type saw a slight decrease from the previous year, and those who selected "other" as their employment type remained about the same from 2016 to 2017.

The single largest source of the continued improvement in the market for veterinarians has been the growth in the U.S. economy, and because the growth in the U.S. economy has not occurred uniformly in all sectors of the economy, and those sectors are not uniformly distributed throughout the United States, economic improvement has not occurred uniformly throughout the country. As such, veterinary markets might not be robust in every locality or practice type. To the extent that veterinarians are mobile, both in location and practice type, the differences in the market that occur as a result of maldistribution should be self-corrective. Lower-income, unemployed or underemployed veterinarians would, in a competitive market, relocate to seek higher-paying employment opportunities. To the extent that mobility is constrained as a result of licenses, experience, technical skills, living costs and/or family situations, the variations in incomes will persist.

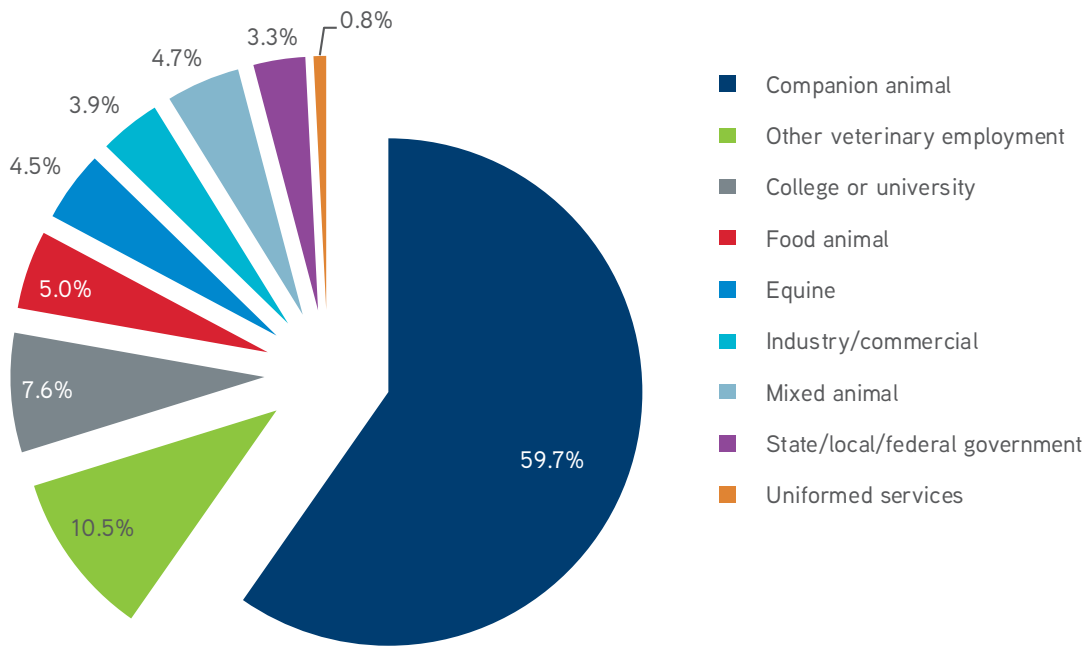
In 2015, the unemployment rate in veterinary medicine (3.4 percent) remained below the national average and was not significantly different from 2014. To better align the veterinary medicine employment rate with the national unemployment statistics, new questions were added to the veterinary census surveys. Eliminating veterinarians who either indicated they

were retired, seeking enrollment in an internship, residency or advanced education, or not currently seeking employment, the 2017 unemployment rate in veterinary medicine comparable to the national unemployment rate was calculated to be 0.4 percent (1.4 percent in 2016).

Underemployment was again negative in 2017, with more veterinarians indicating they wish to work fewer hours for less compensation than those who wish to work more hours for more compensation. The total number of veterinarians that would be required to eliminate the negative underemployment was 3,330 (40 hours per week equals one FTE). Of course, the indivisibility of labor makes eliminating the negative underemployment difficult, as few veterinarians will wish to work the five to 10 hours per week in several practices that would be required; underemployment – both positive and negative – occurs in small numbers of hours distributed throughout the nation and across practice types.

The ability of markets to adjust depends on information conveyed. Veterinarians will not relocate or change career paths without knowledge of the benefits that can be accrued as a result of the move. For this reason, the AVMA's Veterinary Economics Division is providing "salary calculators," tools that provide the relative importance of various demographic factors in determining veterinary incomes. Of course, these are mean incomes, and a great deal of variation in income remains unaccounted for by the factors in the model. Some of these factors, such as personality, lifestyle and energy level, are unique to the individual.

VETERINARY POPULATION, 2017



Estimated number of veterinarians as of December 31, 2017: 110,531

Figure 2

NATIONAL LABOR MARKETS

There are about 2.5 unemployed persons for every two employment opportunities and thus the relative scarcity of labor is high compared to what it was in 2009.

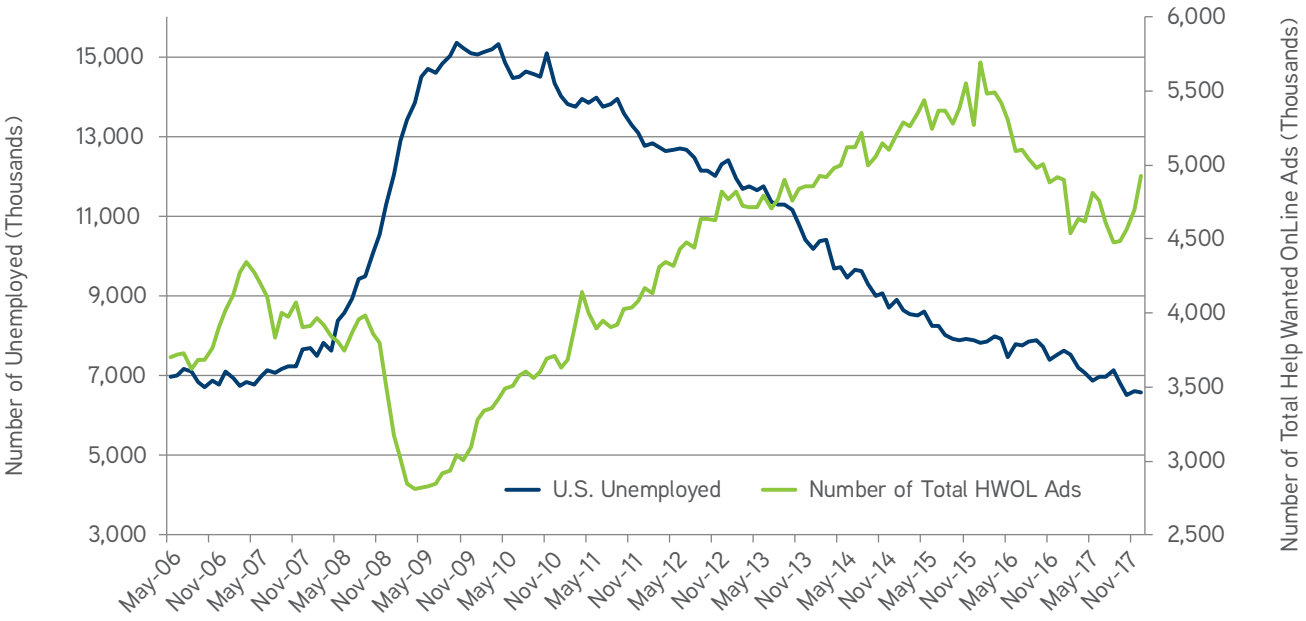
The market for veterinarian labor is connected through price to all other labor markets. Increases in the demand for veterinarians, in theory, should move in the same direction as the national level of demand for labor. As the demand for goods and services throughout the economy increases, businesses will hire new labor to produce the new output needed to meet this demand. The number of jobs (people employed) will rise, and unemployment will fall. Thus, national employment estimates from the Bureau of Labor Statistics (BLS) provide a good indicator for what might be happening in the market for veterinarians.

The Conference Board provides an indicator of the job market through its Help Wanted OnLine (HWOL) Data Series. Information about this series was provided in the *2016 AVMA Report on the Market for Veterinarians*.

The HWOL series (labor demand), in combination with the BLS measure of unemployment (labor supply), provides an overall picture of the U.S. labor market. The HWOL job listings began to decline in 2007 and reached a bottom in early 2009 and then showed continued growth until the Fall of 2015. The number of jobs posted nationally peaked in January of 2016 at almost 5.7 million and then dropped to under 4.5 million jobs posted in September of 2017; after September 2017 and through December 2017 there was an increase in jobs posted. Unemployment mirrored the trend in the HWOL data. The low point for unemployment occurred at the same time that the posted jobs in HWOL hit a high. Unemployment then began to climb and reached a peak at the same time that the number of jobs posted online hit the low

point (Figure 3). Unemployment has declined continually since 2009, hitting a low of under 6.5 million in December of 2017. As noted in the 2017 AVMA Report on Veterinary Markets, these are important indications that the economy might have reached its zenith in the latest business cycle.

U.S. LABOR SUPPLY AND DEMAND, SEASONALLY ADJUSTED

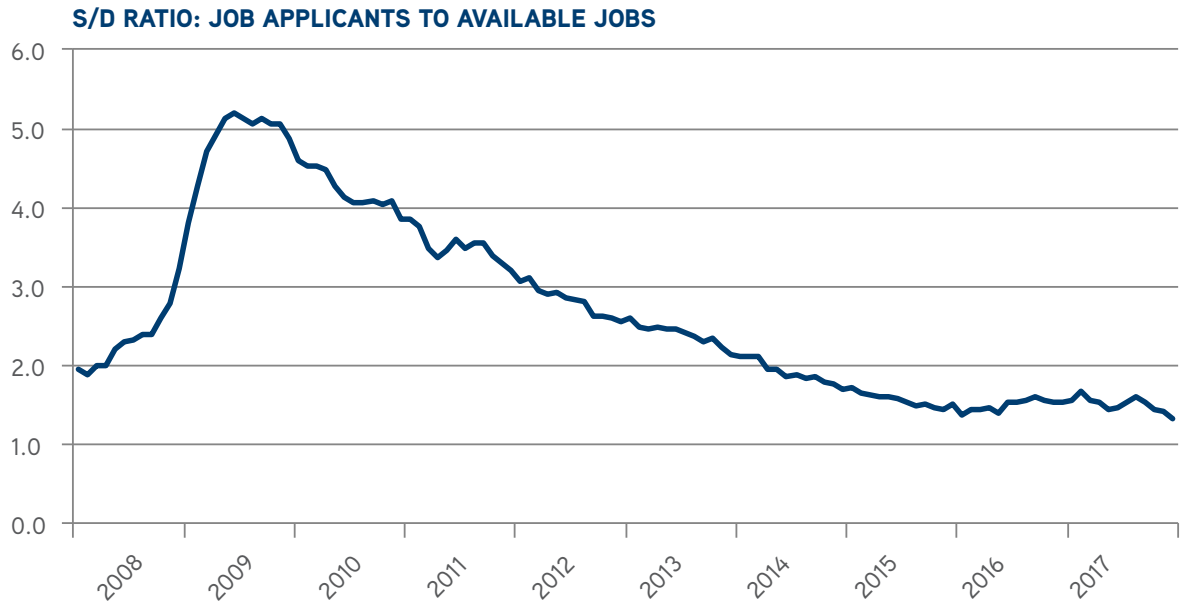


Source: The Conference Board Help Wanted OnLine® (HWOL); United States Bureau of Labor Statistics

Figure 3

A simplified measure of the national labor markets is the supply/demand (S/D) ratio. The S/D ratio is the number of unemployed divided by the number of jobs posted online. The S/D ratio provides an indication of the general tightness of the national labor market and indicates the extent to which the national labor supply and demand is out of balance. At the height of the recession, there were more than five unemployed persons seeking each available employment opportunity. Relative scarcity of labor was very low, and wage growth suffered.

The S/D ratio fell continuously during the last recession reaching a low of 1.38:1 in late 2015 but showed an increasing trend through 2016. Since 2016 it has reached a low of 1.33:1, at the end of 2017. This suggests that there are about 2.5 unemployed persons for every two employment opportunities and thus the relative scarcity of labor is high compared to what it was in 2009. The declining S/D ratio, or increasing labor scarcity, should create increasing pressure on wage growth (Figure 4).



Source: The Conference Board Help Wanted OnLine® (HWOL); United States Bureau of Labor Statistics

Figure 4

While providing an overall indicator of the national aggregate labor market, the S/D ratio may vary considerably by occupation and geographic location. Over time, the S/D ratios across regions and occupations would begin to equilibrate (become similar) if individuals were equally mobile, had information on all employment opportunities and there were no barriers to entry into the various occupations. In practice, none of these conditions hold and thus the S/D ratio maintains differences between occupations and locations even though all may change over time. Table 2 provides the S/D ratio for the 10 top occupations by posted jobs and the associated mean hourly wage rate for three different periods. In June of 2013, the national S/D ratio was 2.45:1, and, as noted earlier, the national S/D ratio at the close of 2017 was approximately 1.33:1. For some of the occupations listed below, such as "Food Preparation and Serving Related," the S/D ratio declined substantially between the three periods but remained above the national average. For "Computer and Mathematical Science" and "Management," the S/D ratio increased between the two periods from 2013 to 2016 and decreased in 2017 but remained far below the national average, with the demand for employees exceeding the available pool of potential applicants. As a result of the differences in the changes in the S/D ratios, the wage rate changes between the three periods were considerably different, as well.

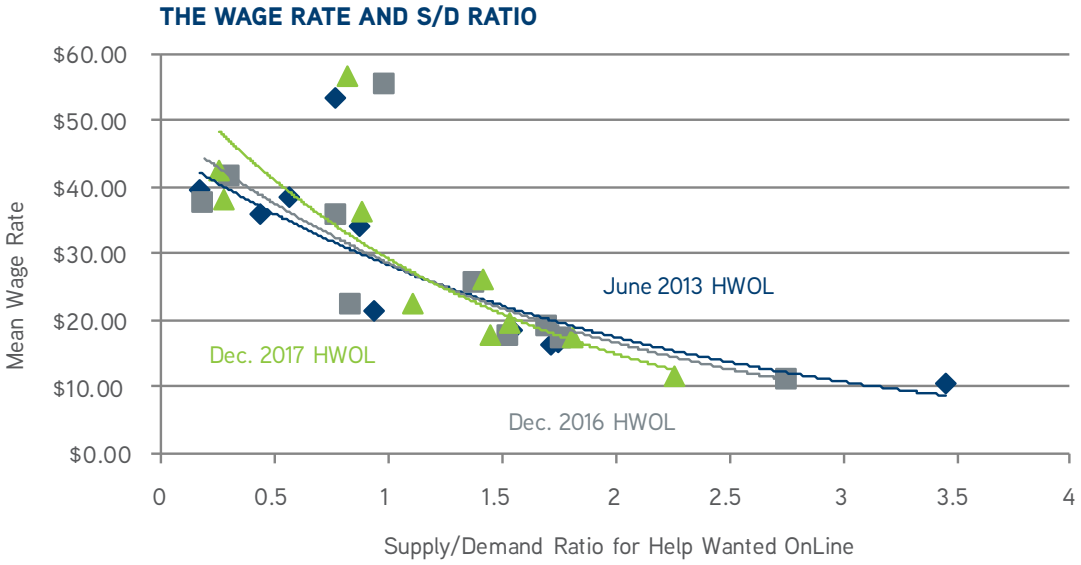
S/D RATIO AND WAGE RATES FOR HELP WANTED ONLINE, 2013, 2016 AND 2017

	June 2013 HWOL		Dec. 2016 HWOL		Dec. 2017 HWOL	
Occupation	Ratio	Mean Wage	Ratio	Mean Wage	Ratio	Mean Wage
Sales and Related	1.54	$18.37	1.71	$18.90	1.53	$19.50
Computer and Mathematical Science	0.17	$39.43	0.31	$41.43	0.26	$42.25
Office and Administrative Support	1.75	$16.78	1.53	$17.47	1.45	$17.91
Healthcare Practitioners and Technical	0.44	$35.93	0.19	$37.40	0.28	$38.06
Management	0.77	$53.15	0.99	$55.30	0.82	$56.74
Transportation and Material Moving	1.72	$16.28	1.77	$16.90	1.81	$17.34
Business and Financial Operations	0.87	$34.14	0.78	$35.48	0.88	$36.09
Food Preparation and Serving Related	3.45	$10.38	2.76	$10.98	2.26	$11.47
Installation, Maintenance and Repair	0.94	$21.35	0.84	$22.11	1.11	$22.45
Education, Training and Library	0.57	$38.51	1.39	$25.48	1.42	$26.21

Source: The Conference Board Help Wanted OnLine® (HWOL)

Table 2

The relationship between the S/D ratio and the wage rate can be illustrated by graphically comparing the points and finding the mathematical relationship (line). This relationship, represented by the blue (2013), gray (2016) and green (2017) lines in Figure 5, can be seen to have become steeper over the past three years. This implies that at higher wage rates, a small change in the S/D ratio results in a large increase in the wage rate.



Source: The Conference Board Help Wanted OnLine® (HWOL)

Figure 5

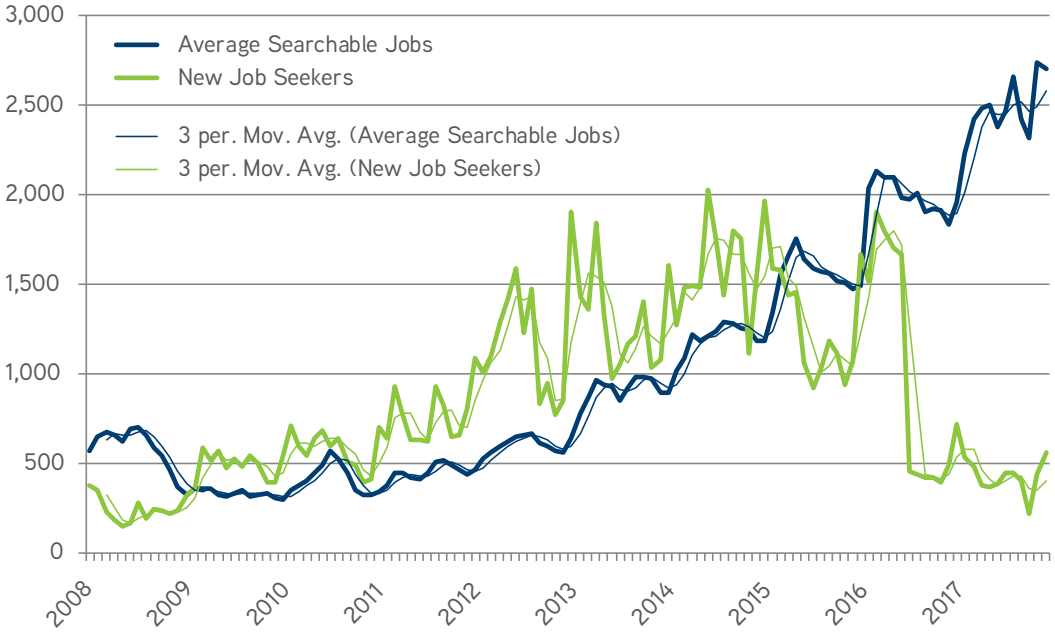
The market for veterinary labor can be compared to the national labor market through the use of the information collected on the AVMA's Veterinary Career Center with respect to posted employment opportunities and posted applications for employment.

Prior to the recession in 2008 and 2009 the number of employment opportunities exceeded the number of applicants. However, after the recession when the S/D national ratio hit a high of more than five applicants looking for every employment opportunity, the number of applicants exceeded the number of employment opportunities for veterinarians nationally. While the national S/D ratio fell by half in 2012 (roughly 2.5 applicants for every job), in the veterinary profession the number of applicants per employment opportunity peaked, and starting salaries for new veterinarians bottomed along with the percentage of graduates who were able to obtain full-time employment opportunities prior to graduation.

While the national S/D ratio hit a low point in 2016 (less than 1.5:1), the number of applicants for the available veterinary employment opportunities fell below 1 for the first time since before the last recession and new graduate starting salaries hit an all-time high real income level along with a record number of new graduates finding full-time employment prior to graduation. In 2017 there was a drop in the number of job applicants applying through the VCC website; this is because VCC jobs were no longer being posted on another search engine (which would direct the applicant to the VCC website), but the overall story remains that there are more employment opportunities than job applicants (Figure 6).

The relationship between the national S/D ratio and the VCC applicant-to-jobs ratio suggests a lag time between the national labor market and the veterinary labor market. This agrees with economic theory. As the economy reaches a peak, inventories begin to accumulate and companies lay off workers. The national S/D would show fewer Help Wanted OnLine employment opportunities and the rising unemployment would produce more applicants. Over time, unemployment benefits and savings would dry up and pet-owning households would reduce their demand for veterinary services. As this demand declined, the number of employment opportunities would decline but the number of potential new employees would not. This process appears, from these data, to take three-four years to occur, and this information should help veterinary practices prepare for the next recession.

VETERINARY CAREER CENTER JOBS AND APPLICANTS



Source: AVMA Veterinary Career Center (VCC)

Figure 6

Not all the employment opportunities on the VCC are for DVMs. Some of the opportunities are for the various staff positions in a veterinary hospital. More than 92 percent of the posted jobs do, however, require a DVM degree[1] (Table 3).

VCC DESCRIPTIVE STATISTICS OF JOBS, 2017

Occupation	< One	One to seven	Seven +	Any experience	Total
Veterinarian	4.0% (636)	47.8% (7,651)	0.4% (58)	47.9% (7,660)	100.0% (16,005)
Vet Tech/Assistant/Nurse	3.8% (27)	74.0% (529)	0.7% (5)	21.5% (154)	100.0% (715)
Practice Manager	0.5% (1)	91.8% (178)	1.5% (3)	6.2% (12)	100.0% (194)
Hospital Administrator	0.0% (0)	100.0% (2)	0.0% (0)	0.0% (0)	100.0% (2)
Medical Director	2.3% (1)	70.5% (31)	15.9% (7)	11.4% (5)	100.0% (44)
Regional Director	0.0% (0)	55.6% (5)	0.0% (0)	44.4% (4)	100.0% (9)
Other	6.4% (26)	69.2% (281)	5.2% (21)	19.2% (78)	100.0% (406)
Total	**691**	**8,677**	**94**	**7,913**	**17,375 (17,375)**

Source: AVMA Veterinary Career Center (VCC)

Table 3

While the DVM is the predominant requirement for employment opportunities listed on the VCC and represents the predominant registered applicant looking for employment, the veterinarian comprised 59 percent of the total number of registered active users of the VCC in 2017[2]. Thus, there were roughly 16,005 DVM job postings that were seeking 2,570 applicants. In comparison to the S/D ratios of other professionals, this 0.16 S/D would suggest that the mean salary would be in the ballpark of $45-$50 per hour. Assuming an average hourly work week of 45 hours, the average salary of a veterinarian would be $105,000 to $117,000 (Table 4).

[1] The total column includes VCC-employment opportunities in which the job indicated the occupation and experience level in the VCC database, and excludes those opportunities that did not provide both types, or provided neither type, of information.

[2] The total column includes VCC-registered applicants who indicated their job level and experience level in the VCC database, and excludes those applicants who did not provide both types, or who provided neither type, of information.

VCC DESCRIPTIVE STATISTICS OF USERS, 2017

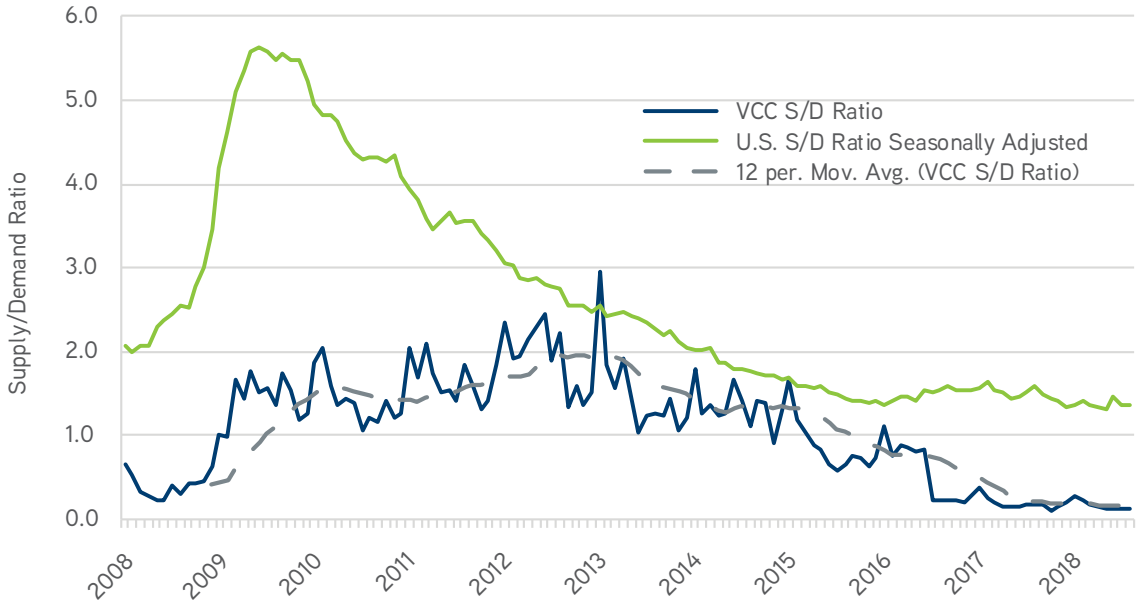
	Experience Level of Registered User				
Registered User	< 1	1 to 7	7+	Any Level	Total
Veterinarian	28.2% (726)	45.6% (1,173)	22.4% (576)	3.7% (95)	100.0% (2,570)
Veterinary Student	80.4% (614)	8.8% (67)	1.7% (13)	9.2% (70)	100.0% (764)
Veterinary Technician	7.8% (46)	63.1% (373)	27.1% (160)	2.0% (12)	100.0% (591)
Not Listed	9.2% (38)	59.3% (246)	24.8% (103)	6.7% (28)	100.0% (415)
Total	**32.8% (1,424)**	**42.8 (1,859)**	**19.6% (852)**	**4.7% (205)**	**100.0% (4,340)**

Source: AVMA Veterinary Career Center (VCC)

Table 4

A comparison of the U.S. S/D ratio and the VCC ratio illustrates a pattern that may suggest a long lag time between changes in the United States S/D and changes in the veterinary labor market. This will be an important relationship to observe over time to determine the exact relationship between the two series and how that relationship can be used by veterinary practices to minimize the impacts of a recession (Figure 7).

JOB APPLICANTS (SUPPLY) AND AVAILABLE JOBS (DEMAND)



Source: AVMA Veterinary Career Center (VCC); The Conference Board Help Wanted OnLine® (HWOL); United States Bureau of Labor Statistics

Figure 7

THE SURVEY INSTRUMENTS

The respondents to the 2017 Census of Veterinarians represented the distribution of veterinarians across the profession by practice type and region.

In 2014 and 2015, two AVMA surveys collected data on employment and income of U.S. veterinarians. The first survey, the Employment Survey, was initiated in 2014 with the purpose of quantifying unemployment and underemployment. The sample frame for the Employment Survey was drawn from the AVMA database of veterinarians that includes all graduates from U.S. veterinary schools; U.S. graduates from AVMA-accredited foreign colleges; and any other veterinarians who have sought AVMA membership at any time in the past. The sample frame included AVMA members and non-members who graduated one, five, 10, 15 (only in the 2015 survey) and 25 years prior.

The second survey, the Veterinary Compensation Survey, formerly known as the Biennial Economic Survey, was conducted to gauge compensation trends among the veterinary profession. The sample frame was randomly drawn from all veterinarians for whom the AVMA had contact information.

In 2016 the employment survey and the compensation survey were combined to reduce the number of national surveys and provide a more comprehensive set of information for each respondent. The new survey, referred to as the Census of Veterinarians is fielded in January and February, and questions cover events that occurred in or over the previous year (Table 5). The 2017 Census of Veterinarians was fielded to 15,904 recipients (21,638 in 2016), with 2,780 responding to the survey (2,545 in 2016), for a 17.5 response rate (11.8 percent in 2016).

AVMA SURVEYS RESPONSE RATES

	2014	2015	2016	2017
Employment Survey	22.7%	19.0%		
Compensation Survey	14.7%	11.8%		
Census of Veterinarians			11.8%	17.5%

Table 5

The respondents to the 2017 Census of Veterinarians represented the distribution of veterinarians across the profession by practice type (Figure 8) and region (Table 6), generally, but there were not sufficient responses to provide detailed information for each practice type in each region.

SAMPLE RESPONDENTS AND AVMA MEMBERSHIP BY PRACTICE TYPE

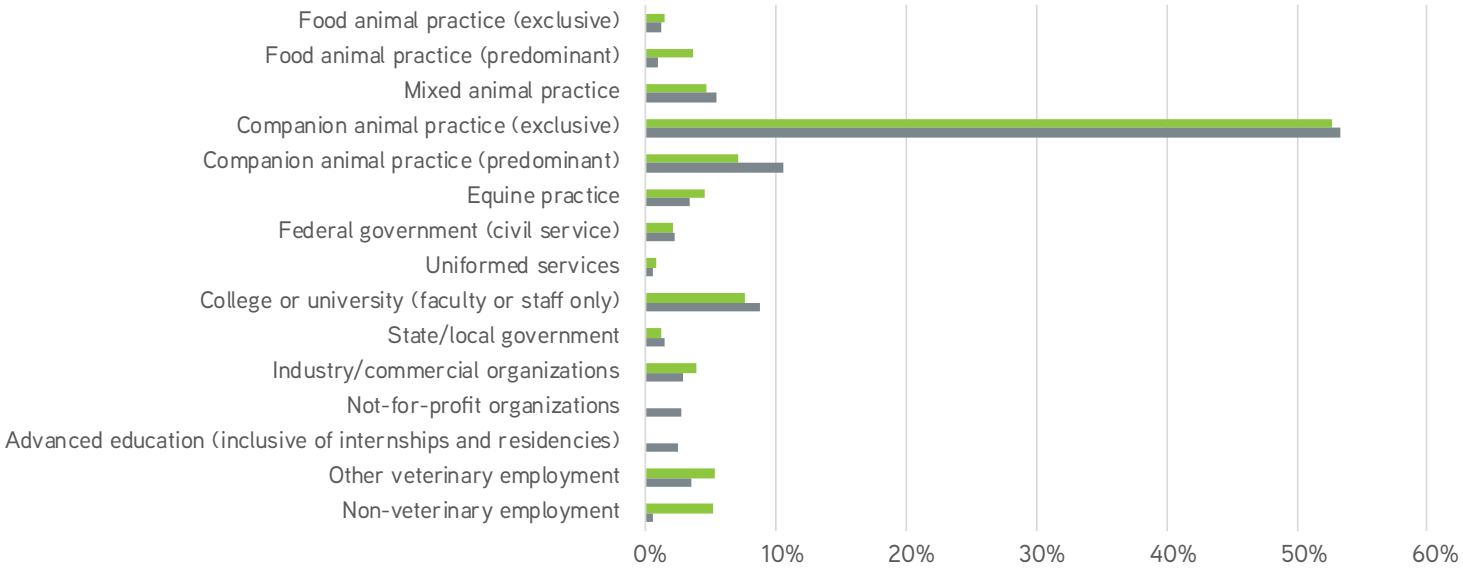


Figure 8

[3] American Association of Bovine Practitioners
[4] American Association of Equine Practitioners

SAMPLE RESPONDENTS, AVMA MEMBERSHIP AND U.S. POPULATION BY REGION

	2017 Census of Veterinarians	AVMA Membership	U.S. Population (est. 2017)
Region 0	8.2%	8.1%	7.3%
Region 1	8.9%	9.2%	10.3%
Region 2	11.8%	10.3%	9.7%
Region 3	11.9%	13.7%	14.1%
Region 4	11.1%	10.4%	10.1%
Region 5	8.8%	7.7%	5.3%
Region 6	9.1%	8.9%	7.3%
Region 7	8.8%	11.3%	12.3%
Region 8	8.9%	7.6%	7.1%
Region 9	12.5%	12.9%	16.4%

Table 6

SAMPLE RESPONDENTS AND AVMA MEMBERSHIP BY GENDER

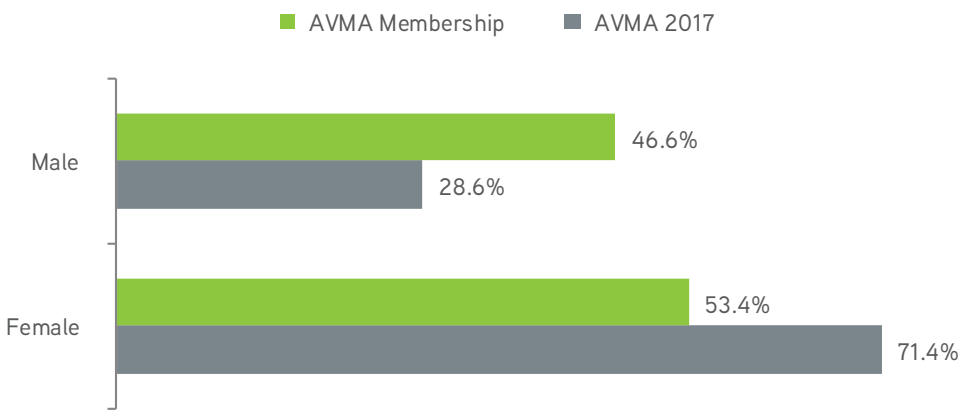


Figure 9

The distribution of gender varies by survey and, again, generally represents a larger share of females in the profession compared to males.

Because of the differences in distribution by practice type, region and gender, descriptive statistics for each survey must be weighted to reflect the change in the distribution of veterinarians across these factors to provide an accurate measure for each variable over time. A higher percentage of females than males responded to the survey compared to the gender distribution found in the profession (Figure 9).

SAMPLE RESPONDENTS AND AVMA MEMBERSHIP BY GRADUATION YEAR

	2017 Census of Veterinarians		AVMA Membership	
	N	Percent	N	Percent
2007-2016	1,346	48.4%	28,704	29.8%
1997-2006	680	24.5%	20,220	21.0%
1987-1996	385	13.8%	17,480	18.2%
1977-1986	209	7.5%	14,300	14.9%
1967-1976	104	3.7%	7,654	8.0%
1957-1966	39	1.4%	4,858	5.0%
1947-1956	8	0.3%	3,023	3.1%
Missing	9	0.3%		
Total	**2,780**		**96,239**	

Table 7

The higher percentage of female respondents corresponds to the higher number of early career veterinarians who responded, as the majority of these early career veterinarians are female (Table 7).

There was, however, very little difference in the distribution of respondents by veterinary college attended, compared to the veterinary population (Figure 10).

More than half of the respondents were working in a suburban area (as with the respondents in the 2016 survey). Compared to 2016, there is a slight increase in respondents working in an urban area and a slight decrease in rural areas (Figure 11).

SAMPLE RESPONDENTS AND AVMA MEMBERSHIP BY VETERINARY COLLEGE ATTENDED

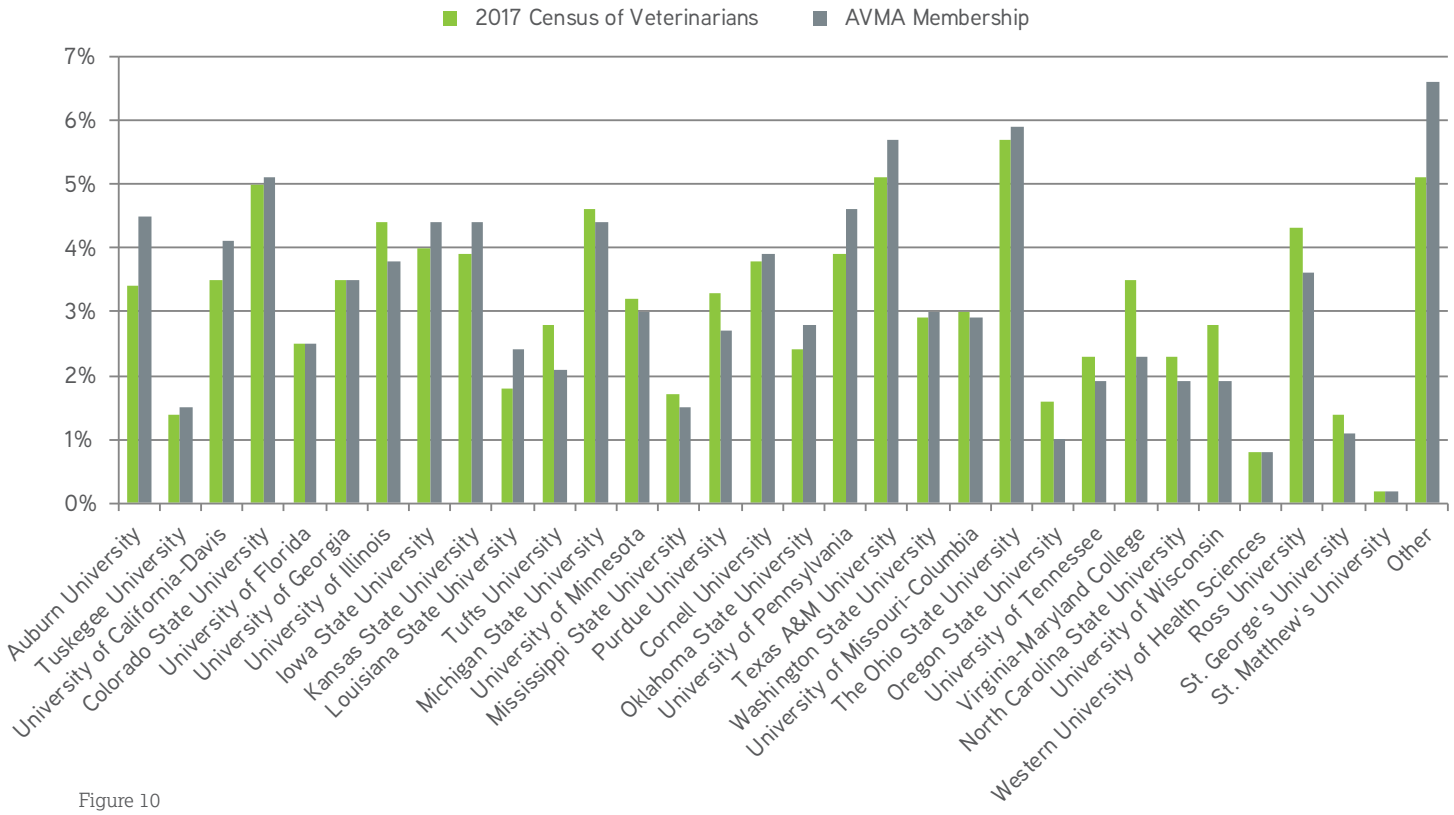


Figure 10

SAMPLE RESPONDENTS BY TYPE OF COMMUNITY

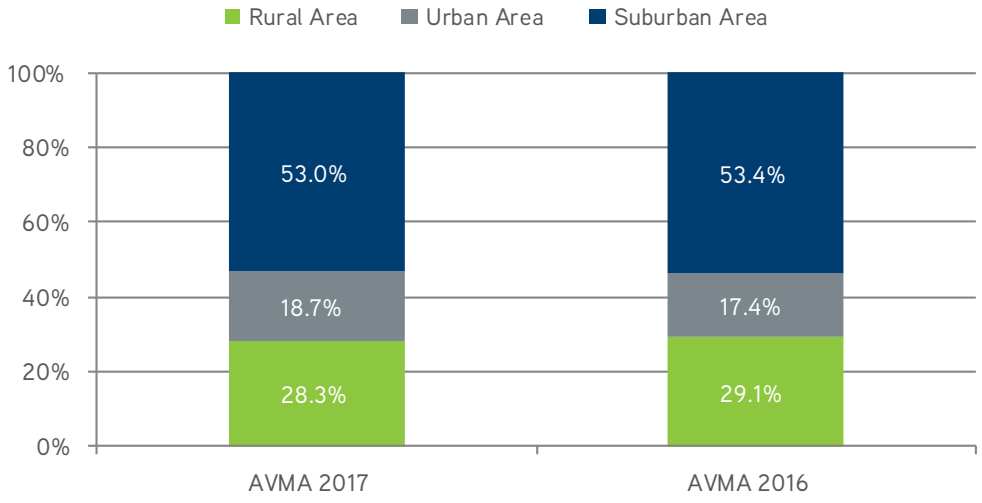


Figure 11

VETERINARIAN INCOMES

There is an increase in the 2017 reported incomes for veterinarians who earned more than $80,000 compared to 2016, and a decrease in the number of veterinarians reporting less than $80,000, with the exception of those reporting less than $20,000 in 2017.

Incomes reported in this section are based on responses from veterinarians who earned more than $30,000 and no more than a $1,000,000 in 2016 and worked full time, between 30 and 90 hours per week. Veterinarians who fell outside of income and hours worked ranges were outliers for this analysis.

Around 65 percent of veterinarians' incomes were between $60,000 and $149,999. There is an increase in the 2017 reported incomes for veterinarians who earned more than $80,000 compared to 2016, and a decrease in the number of veterinarians reporting less than $80,000, with the exception of those reporting less than $20,000 in 2017 (Figure 12).

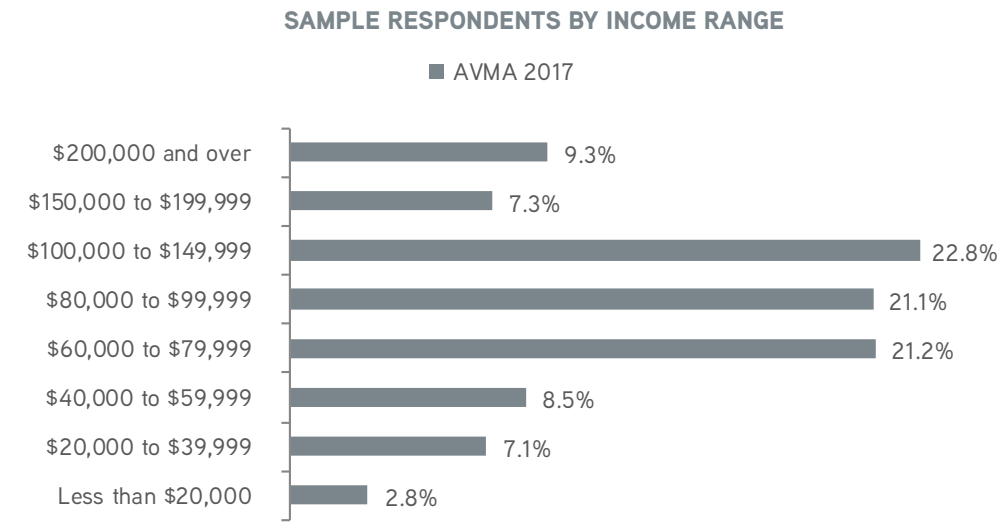


Figure 12

The income for the national sample varies by both graduation year and practice type. Figure 13 displays the mean income (points) by graduation year, as well as the range of incomes within one standard deviation of either side of the mean (line). Incomes increase with experience, and the range of incomes also increases as experience increases for the first three decades post-graduation and then the mean income growth slows and declines along with the variation in income. An increase in average income is shown between 1960-1969, but note there were only eight observations.

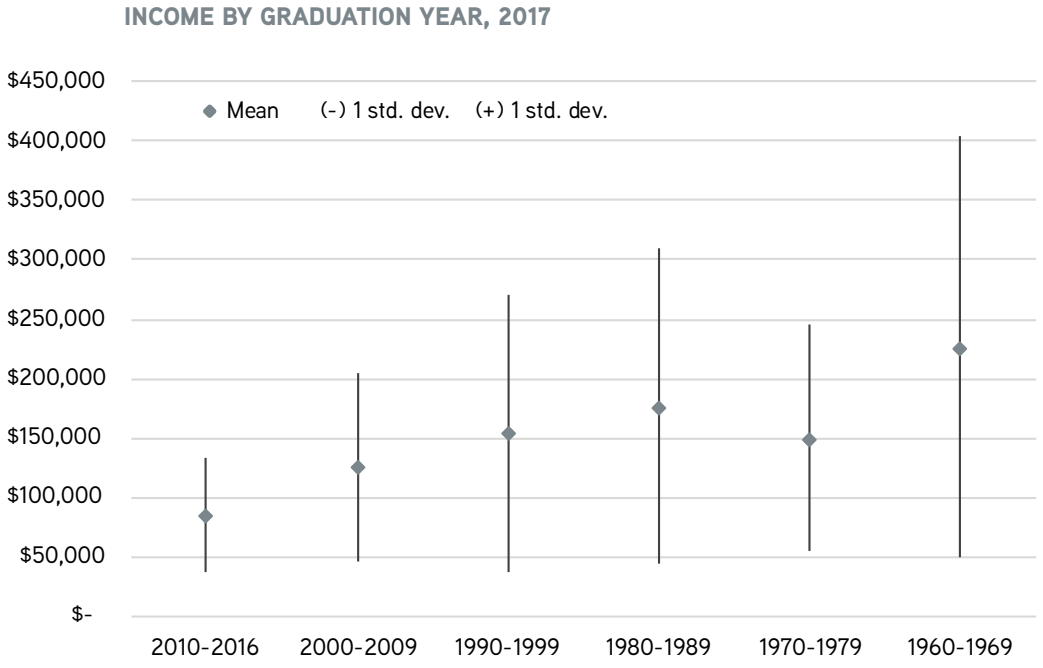


Figure 13

The difference in both mean incomes and the range of incomes within one standard deviation of the mean vary by practice type. This is the first year that additional practice type categories were added: consultant and research contractor. Incomes for industry veterinarians had the highest mean income in 2016 but in 2017 research contractors had the highest mean income followed by consultant, and then industry. Research contractor, equine and food animal practice types had the greatest range of reported incomes within one standard deviation of the mean (Figure 14).

MEAN PROFESSIONAL INCOME BY PRACTICE TYPE, 2017

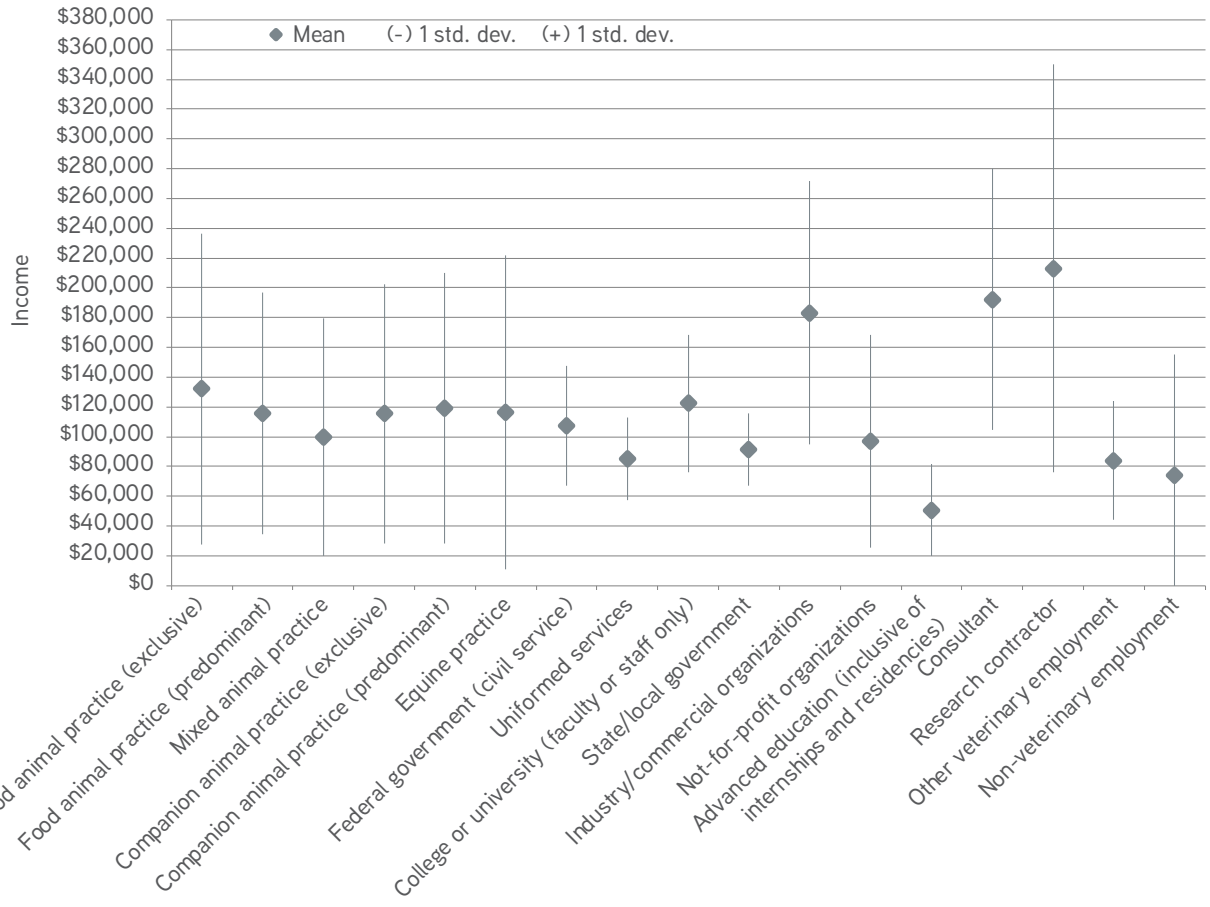


Figure 14

The distribution of incomes by practice type can also be illustrated by describing the mean income at percentiles. Mean income across all practice types for all levels of experience was just more than $115,331 in 2017, placing the mean veterinarian income above the 90th percentile of all U.S. workers (Table 8).

INCOME PERCENTILES BY PRACTICE TYPE, 2017

Private Practice	10%	25%	Median	75%	90%	Mean	Std. Dev.	Obs.
Food Animal Exclusive	$61,351	$70,000	$89,500	$172,500	$228,250	$132,004	$104,485	40
Food Animal Predominant	$65,000	$71,000	$84,000	$126,000	$250,000	$115,851	$81,229	31
Mixed Animal	$55,000	$65,000	$78,000	$98,000	$165,000	$99,790	$79,652	129
Companion Animal Predominant	$60,000	$70,000	$90,000	$130,000	$200,000	$115,325	$86,827	281
Companion Animal Exclusive	$65,000	$77,500	$95,000	$120,000	$190,000	$118,848	$90,874	1,174
Equine	$45,000	$60,000	$80,000	$120,000	$296,000	$116,278	$105,400	69
Total Private Practice	**$61,800**	**$74,000**	**$92,000**	**$120,000**	**$195,000**	**$116,997**	**$90,273**	**1,724**
Public Practice	**10%**	**25%**	**Median**	**75%**	**90%**	**Mean**	**Std. Dev.**	**Obs.**
Federal Government (Civil Service)	$62,000	$73,000	$97,000	$136,000	$160,300	$107,192	$40,026	43
Uniformed Services	$60,000	$61,500	$76,000	$95,000	$120,000	$85,000	$27,868	11
College/University	$74,000	$92,798	$115,000	$145,000	$175,000	$122,297	$45,972	128
State/Local Government	$65,570	$75,000	$84,000	$98,000	$140,000	$91,298	$24,428	18
Industry/Commercial Organization	$95,000	$118,000	$173,000	$224,000	$300,000	$183,259	$88,590	63
Not-for-Profit Organization	$51,385	$62,400	$80,000	$102,000	$150,000	$96,776	$71,514	61
Interns, Residents, & Adv. Education	$31,500	$35,500	$45,000	$55,000	$70,000	$50,592	$30,712	64
Consultant	$70,000	$100,000	$200,000	$265,000	$310,000	$192,143	$87,553	7
Research Contractor	$60,000	$73,500	$206,000	$335,000	$441,968	$212,924	$137,015	7
Other Veterinary Employment	$39,000	$60,000	$80,000	$100,000	$125,000	$83,948	$39,806	73
Non-Veterinary Employment	$34,000	$35,000	$47,000	$72,000	$88,000	$73,786	$81,503	14
Total Public Practice	**$42,620**	**$63,000**	**$91,000**	**$136,000**	**$193,000**	**$109,458**	**$69,575**	**489**
All Employment Types	**$57,000**	**$72,000**	**$92,000**	**$125,000**	**$193,905**	**$115,331**	**$86,170**	**2,213**

Table 8

Using the percentile table to illustrate the influence of experience on income for all practice types indicates that within two decades in the workforce the median income of veterinarians exceeds the median income of the 90th percentile of all U.S. workers. And, as noted earlier, median income begins to drop off after four decades of employment, as veterinarians move towards retirement (Table 9).

INCOME PERCENTILES BY EXPERIENCE LEVEL, 2017

Years of Experience	10%	25%	Median	75%	90%	Mean	Std. Dev.	Obs.
0-1	$31,500	$35,000	$47,042	$71,000	$75,500	$60,354	$49,675	42
2-4	$45,673	$62,000	$72,000	$85,000	$100,750	$75,049	$27,397	540
5-9	$60,000	$75,000	$90,000	$112,000	$145,000	$101,280	$60,090	547
10-19	$68,000	$85,000	$107,000	$140,000	$215,000	$129,086	$83,753	584
20-29	$65,000	$86,000	$120,000	$169,500	$260,000	$151,520	$116,254	296
30-39	$80,000	$99,000	$150,000	$225,000	$340,000	$186,508	$137,651	148
40+	$56,000	$88,000	$113,000	$192,000	$300,000	$157,664	$112,649	57
All Levels	**$57,000**	**$72,000**	**$92,000**	**$125,000**	**$193,905**	**$115,306**	**$86,376**	**2,214**

Table 9

The impact of additional education on income is illustrated in Table 10. Generally, though additional degrees have little impact on income, there is a statistically significant increase in income as a result of obtaining board certification (Table 10).

In some of the practice types, such as college and university, there are significant differences in incomes associated with different positions. Researchers make a significantly higher income followed by managers and executives than all other veterinary employees, while clinicians have the lowest average incomes (Table 11).

INCOME PERCENTILES BY ADDITIONAL EDUCATION, 2017

Education Level	10%	25%	Median	75%	90%	Mean	Std. Dev.	Obs.
DVM only	$60,000	$75,000	$100,000	$150,000	$215,000	$129,890	$95,427	173
DVM and Specialized Degree (JD, MD, etc.) or Other	$67,000	$75,000	$83,000	$95,000	$135,000	$91,232	$32,975	21
DVM & Bachelor's	$55,000	$70,000	$90,000	$118,707	$173,000	$109,102	$81,174	1,596
DVM & Master's	$62,000	$76,000	$100,000	$140,000	$224,000	$123,465	$79,709	318
DVM & PhD	$77,000	$100,000	$140,000	$180,000	$300,000	$167,025	$120,198	87
Board Certification	**10%**	**25%**	**Median**	**75%**	**90%**	**Mean**	**Std. Dev.**	**Obs.**
Board Certified	$85,000	$113,000	$145,000	$206,000	$300,000	$175,249	$110,860	285
Not Board Certified	$55,000	$70,000	$88,000	$115,000	$165,000	$106,553	$78,463	1,934
All Levels	**$57,000**	**$72,000**	**$92,000**	**$125,000**	**$190,000**	**$114,789**	**$85,717**	**2,050**

Table 10

SUMMARY STATISTICS FOR VETERINARIANS IN COLLEGE/UNIVERSITY POSITIONS

	Median*	Mean	Std. Dev.	Freq.
Professor: Assistant, Associate or Full	$124,000	$124,802	$35,143	86
Executive: CEO/Vice President/ Chief Administrator/Dean	$165,000	$163,182	$50,064	11
Manager: Division Director/Department Chair/Section Head	$160,000	$170,984	$90,555	58
Clinician	$80,000	$89,314	$38,833	79
Researcher	$172,000	$179,733	$104,105	15
Other	$88,500	$96,027	$36,991	86
Total	**$109,000**	**$120,762**	**$63,187**	**335**

**Some values rounded to protect privacy.*

Table 11

VETERINARY SALARY WORKSHEET

Questions pertaining to veterinarian incomes are among those most frequently received from veterinarians by the AVMA Veterinary Economics division. The following worksheet was developed using a multiple regression model with available factors found to significantly affect veterinary incomes. The regression model used observations of veterinary incomes from AVMA surveys between 2001 and 2017, including more than 50,000 observations. Thus, the worksheet provides the mean salary for specific demographic characteristics based on historic observations (Table 12). This worksheet can be used to provide veterinarians with an understanding of how years of experience, practice ownership, location of employment, practice type, gender, and education or training beyond the doctor of veterinary medicine degree has affected incomes in the recent past. The worksheet was not intended, however, to be used by either employee or employer in setting or negotiating income. Veterinary incomes should reflect the value of veterinary services provided and the financial performance of the overall operation.

EXPERIENCED VETERINARIAN SALARY CALCULATOR

Category	Description	My Input	Male	Female	Product
Step 1	For ALL of the following items, enter a value in the "My Input" column:				
Basic Information	Constant	1	$40,407	$32,467	
	Last Two Digits of the Current Year	17	$2,682	$1,545	
	Mean Work Hours Per Week		$349	$131	
	Practice Owner (1=yes, 0=no)		$4,738	$3,146	
Step 2	For ONE of the following experience categories, enter a "1" in the "My Input" column:				
Years of Experience[1]	1		$0	$19,867	
	2-3		$25,244	$47,017	
	4-6		$41,200	$57,966	
	7-9		$55,786	$65,863	
	10-14		$71,343	$68,822	
	15-19		$79,695	$76,099	
	20-29		$90,835	$82,402	
	30+		$82,832	$95,044	
Step3	For ONE of the following U.S. regions, enter a "1" in the "My Input" column:				
Employment Region (first digit of Zip code)	Region 0 (ME, NH, VT, MA, CT, RI, NJ, PR)		$6,742	$9,540	
	Region 1 (DE, PA, NY)		$0	$7,344	
	Region 2 (DC, MA, NC, SC, VA, WV)		$0	$3,578	
	Region 3 (AL, FL, GA, MS, TN)		$0	$0	
	Region 4 (IN, KY, MI, OH)		-$7,055	-$4,597	
	Region 5 (IA, MN, MT, ND, SD, WI)		-$7,360	-$2,303	
	Region 6 (IL, KS, MO, NE)		$0	$0	
	Region 7 (AR, LA, OK, TX)		-$6,688	$0	
	Region 8 (AZ, CO, ID, NM, UT, WY)		$7,495	$5,031	
	Region 9 (AK, CA, HI, NV, OR, WA)		$0	-$5,693	
Step 4	For ONE of the following practice types, enter a "1" in the "My Input" column:				
Private Practice	Food Animal (exclusive)		$0	-$5,693	
	Food Animal (predominant)		-$8,918	-$11,744	
	Mixed Animal		-$6,331	-$8,036	
	Companion Animal (exclusive)		$0	$0	
	Companion Animal (predominant)		$0	-$4,687	
	Equine		-$3,470	-$10,209	
Public Practice	Federal Government (civil service)		-$5,471	$4,782	
	Uniformed Services		-$9,898	-$6,103	
	College/University		-$6,631	-$6,364	
	State/Local Government		-$23,929	-$9,665	
	Industry/Commercial Organizations		$23,095	$28,157	
	Other Public		-$7,829	-$3,291	
Step 5	For ANY of the following Additional Qualifications, enter a "1" in the "My Input" column:				
Additional Qualifications	Master's Degree (MS, MBA, MA, etc.)		$0	$4,022	
	Doctorate Degree (besides DVM)		$9,245	$9,613	
	Residency Completed		$4,190	$3,957	
	Board Certified		$14,588	$16,058	
Step 6	For EVERY entry in the "My Input" column, multiply by the number in either the "Male" or "Female" column and enter the result in the "Product" column.				
Step 7	Add ALL of the entries in the "Product" column. This is the mean salary for your situation:				

[1] For "Years of Experience," take the current year and subtract your year of graduation from veterinary college, as well as any time spent out of the workforce or as a full-time student.

Table 12

EARLY CAREER SALARIES OF BOARD-CERTIFIED VETERINARIANS

Among the many factors that might motivate veterinarians to become board certified is increased compensation. This type of specialization leads not only to an increase in the breadth of one's skillset, but also a refinement; focusing on one area of a skillset makes a veterinarian faster and more efficient, which leads to higher compensation.

In the previous section, it was shown that while accounting for all other factors including hours worked, region of the United States, other advanced degrees, practice type, practice ownership, and years of experience, a higher mean income is obtained by both board certification ($14,588 for men and $16,058 for women) and having served in a residency ($4,190 for men and $3,957 for women); both two variables add an additional amount just short of $20,000 together. That is important to know, but a real question faced by veterinarians – particularly those who may have only worked in advanced education positions, such as internships and residencies – is how to determine just how much they should seek for a post-board certification starting salary. As he or she enters the workforce, a new board-certified veterinarian needs information to negotiate a starting salary and knowing the $20,000 premium for all board-certified veterinarians won't help them. They can't simply ask for a $20,000 premium, because they have been board certified. The answer is not straightforward because the interpretation of the survey questions appears to be inconsistent across survey respondents. To counter this inconsistency, the table below provides income summary statistics for a small variety of experience levels. This information could influence the career decision of someone thinking of seeking board certification.

The data represented in Table 13 are drawn from the 2017 AVMA Census of Veterinarians. While a survey respondent's starting salary after the subject has become board certified isn't specifically asked, an educated guess can be made based on the number of years since the reported (DVM) graduation. Table 13 gives the summary statistics for those surveyed who were five, six and seven years post-graduate with their DVM degree, who are board certified, and whose income listed is for the prior year, 2016. For example, someone who graduated five years prior would be from the DVM class of 2011 reporting income for the 2016 year. For a traditional student, this would correspond to graduating in 2011, interning in 2012, serving in a residency from 2012-2015, and earning a full-time income from 2015-2016. This calculation gets complicated, however, because not everyone is a traditional student: Some will take a longer or shorter time to go through internships and residencies; some might take time off between DVM graduation and an internship/residency; some might study longer for exams; and some might face a variety of other complicating circumstances. There are few data points meeting these criteria, so it is not possible to look at each board-certified specialty.

EARLY CAREER SALARIES OF BOARD-CERTIFIED VETERINARIANS, 2017

DVM Graduation Year	Observations	Median	Mean	Std. Dev.
2011	32	$106,850	$115,737	$65,273
2010	8	$110,000	$113,491	$36,935
2009	8	$136,000	$143,128	$46,666
2011***	27	$113,000	$129,026	$62,288

**** Excludes observations below $60,000, which are presumably residents' salaries.*

Table 13

Both the mean and median salaries for those indicating they are board certified are above the mean and median salaries of those not board certified with an equivalent level of education, and represent a large increase, approaching $50,000 over the starting salaries of veterinarians who are recent gradautes.

VETERINARIAN EMPLOYMENT

The mean number of weeks unemployed in veterinary medicine has declined each of the last four years while the number of isolated periods of unemployment has not shown any significant change and remains near two periods.

UNEMPLOYMENT

Since 2014, the AVMA has been estimating the unemployment rate in the profession. As noted earlier, each survey is conducted at the beginning of the year and reports the unemployment rate for the previous year. Thus, the 2017 Survey provides the unemployment rate for 2016, and similarly, the underemployment rate and veterinary education outcomes assessments for the veterinary profession reflect those of the previous year.

SUMMARY STATISTICS

The 2014 Employment Survey indicated that the 2013 unweighted unemployment rate was 3.3 percent, with 1.7 percent of respondents not responding to the question. The 2015 Employment Survey indicated that the 2014 unweighted unemployment rate was 4.4 percent, with 1.2 percent of respondents not responding to the question. The confidence interval around the 2014 and 2015 surveys was .81 percent and .85 percent, respectively, and thus the two rates are not statistically different. In 2016, the census survey was used to indicate the 2015 unweighted unemployment rate of 3.4 percent (updated from the *2017 AVMA Report on The Market for Veterinarians*), with 0.4 percent of the respondents not responding to this specific question, and in 2017, the unweighted unemployment rate was 1.5 percent, with 0.2 percent not responding to this specific question (Table 14).

To better align with the BLS estimates of unemployment, starting in 2016 a set of new questions were introduced in the Census of Veterinarians to

determine how many of those unemployed were actively seeking employment (the BLS definition). Eliminating respondents who indicated they were unemployed in 2016 because they were not actively seeking employment and those who were seeking enrollment in an internship, residency or advanced education yielded an unemployment rate of 0.4 percent, which is well below the 4.9 percent national unemployment rate reported for 2016.

UNEMPLOYMENT RATE, 2017

Are you currently employed in veterinary medicine?	2014 Survey	2015 Survey	2016 Survey	2017 Survey
Yes	95.0%	94.4%	90.2%	94.9%
No	3.3%	4.4%	3.4%	1.5%
Retired			6.0%	3.5%
Missing	1.7%	1.2%	0.4%	0.2%
If unemployed, are you seeking employment in veterinary medicine?				
Seeking employment in veterinary medicine			38.8%	29.3%
Seeking enrollment in an internship, residency, or advanced education program			12.9%	4.9%
Not seeking employment (and not retired)			48.2%	65.9%
Unemployment Rate			1.4%	0.4%

Table 14

The surveys also sought the length and duration of unemployment in the veterinary profession by each of the respondents. The mean number of weeks unemployed in veterinary medicine has declined each of the last four years while the number of isolated periods of unemployment has not shown any significant change and remains near two periods (Table 15).

Unemployment by gender and year of graduation over the last three years has generally shown higher unemployment for females compared to males, and unemployment across all graduation years and gender have generally remained lower than the national average unemployment rate (Figure 15).

LENGTH AND DURATION OF UNEMPLOYMENT

		Mean	N	Std.Dev.	Minimum	Maximum
2014 Survey	How many weeks have you been unemployed in veterinary medicine?	55.7	60	49.7	1	156
	How many isolated periods of unemployment have you had?	1.7	57	1.3	1	10
2015 Survey	How many weeks have you been unemployed in veterinary medicine?	47.9	65	48.5	0	156
	How many isolated periods of unemployment have you had?	2.1	63	1.7	1	10
2016 Survey	How many weeks have you been unemployed in veterinary medicine?	36.5	93	20.3	0	52
	How many isolated periods of unemployment have you had?	1.6	66	1.1	0	5
2017 Survey	How many weeks have you been unemployed in veterinary medicine?	31.8	45	21.8	0	52
	How many isolated periods of unemployment have you had?	1.7	45	2.5	0	13

Table 15

UNEMPLOYMENT BY GENDER AND YEAR OF GRADUATION, 2013-2016

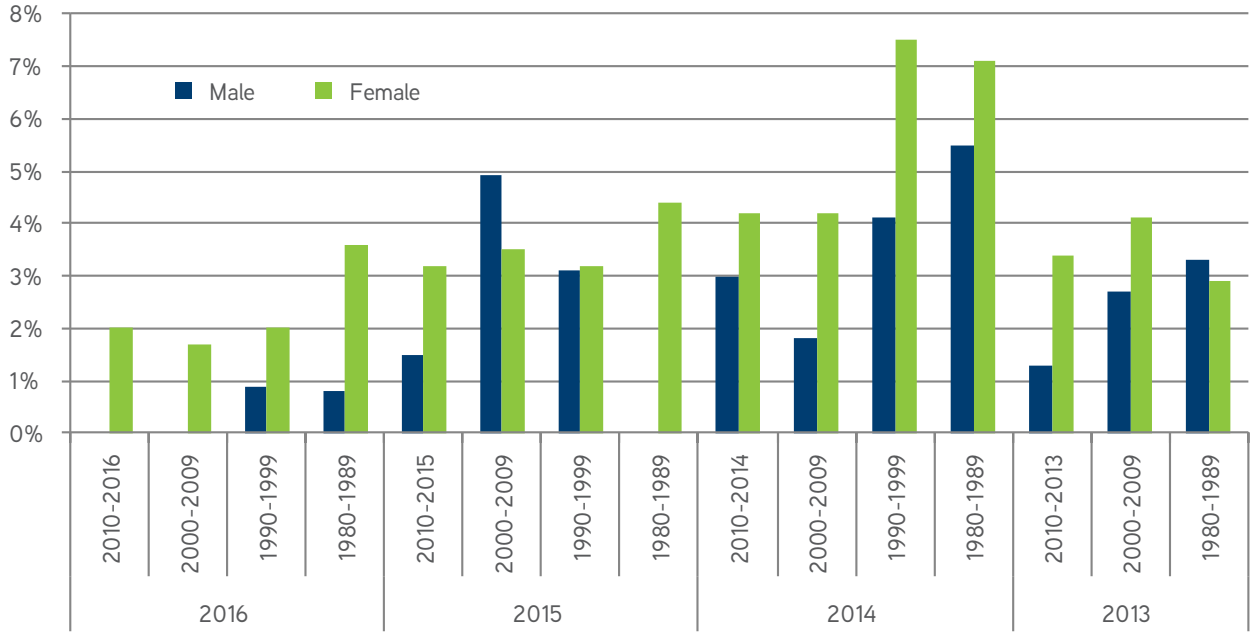


Figure 15

Unemployment also varied by region with the West North Central region (Region 5) having the highest percent of unemployed (3.2 percent) and the South Atlantic (Region 3), which comprises Tennessee, Mississippi, Alabama, Georgia and Florida, having the lowest unemployment (0.3 percent) (Table 16).

REGION AND EMPLOYMENT STATUS, 2017

	Working full time in veterinary medicine	Working part-time in veterinary medicine	Unemployed in veterinary medicine	Retired from veterinary medicine	Total
Region 0	80.7%	13.9%	2.5%	3.0%	100.0%
Region 1	81.7%	15.0%	1.9%	1.4%	100.0%
Region 2	81.2%	10.4%	1.3%	7.0%	100.0%
Region 3	86.8%	8.7%	0.3%	4.2%	100.0%
Region 4	84.2%	12.8%	0.8%	2.3%	100.0%
Region 5	82.9%	11.6%	3.2%	2.3%	100.0%
Region 6	85.1%	10.0%	0.9%	4.1%	100.0%
Region 7	82.6%	11.0%	0.9%	5.5%	100.0%
Region 8	82.7%	11.4%	1.4%	4.5%	100.0%
Region 9	78.2%	16.0%	2.6%	3.3%	100.0%
Total	**82.6%**	**12.0%**	**1.6%**	**3.8%**	**100.0%**

Table 16

Unemployment is also affected by the choice of first employment, with those first employed in uniformed services, food animal predominant, and faculty or staff at a college or university having the highest unemployment (Table 17).

Unemployment also varied by veterinary college attended, with those who attended Iowa State University and Oklahoma State University, followed by those who attended other (schools, not mentioned, outside of the 28 U.S.-accredited colleges of veterinary medicine) having the highest percent of unemployed veterinarians (Table 18).

FIRST VETERINARY EMPLOYMENT AND CURRENT EMPLOYMENT STATUS, 2017

	Working full time in veterinary medicine	Working part-time in veterinary medicine	Unemployed in veterinary medicine	Retired from veterinary medicine	Total
Food animal practice (exclusive)	94.0%	4.0%	2.0%	0.0%	100.0%
Food animal practice (predominant)	76.0%	10.0%	13.0%	1.0%	100.0%
Mixed animal practice	82.0%	12.0%	6.0%	1.0%	100.0%
Companion animal practice (predominant)	84.0%	13.0%	2.0%	1.0%	100.0%
Companion animal practice (exclusive)	82.0%	14.0%	2.0%	1.0%	100.0%
Equine practice	86.0%	10.0%	2.0%	2.0%	100.0%
Federal government (civil service)	90.0%	5.0%	0.0%	5.0%	100.0%
Uniformed services	65.0%	15.0%	19.0%	0.0%	100.0%
College or university (faculty or staff only)	80.0%	8.0%	10.0%	2.0%	100.0%
State/local government	89.0%	11.0%	0.0%	0.0%	100.0%
Industry/commercial organizations	94.0%	3.0%	3.0%	0.0%	100.0%
Not-for-profit organizations	80.0%	15.0%	3.0%	3.0%	100.0%
Currently participating in internship/residency	99.0%	1.0%	0.0%	0.0%	100.0%
Currently pursuing advance education	54.0%	15.0%	8.0%	23.0%	100.0%
Other	81.0%	11.0%	2.0%	6.0%	100.0%
Total	**83.0%**	**12.0%**	**4.0%**	**2.0%**	**100.0%**

Table 17

UNEMPLOYMENT BY VETERINARY COLLEGE

	2017	2016	2015
Iowa State University	4.5%	3.4%	2.4%
Oklahoma State University	4.5%	0.0%	0.0%
Michigan State University	3.1%	3.5%	2.2%
University of California-Davis	3.1%	2.8%	1.2%
Cornell University	2.8%	6.2%	1.3%
Ross University	2.5%	0.0%	0.0%
Washington State University	2.5%	0.0%	0.0%
Purdue University	2.2%	1.5%	0.0%
Virginia-Maryland College	2.1%	2.4%	0.0%
Louisiana State University	2.0%	2.6%	0.0%
North Carolina State University	1.6%	3.0%	1.6%
The Ohio State University	1.3%	4.0%	2.4%
Tufts University	1.3%	3.9%	1.4%
University of Wisconsin	1.3%	4.2%	3.0%
University of Pennsylvania	0.9%	0.9%	0.0%
Kansas State University	0.9%	1.6%	1.1%
University of Illinois	0.8%	0.9%	0.0%
Auburn University	0.0%	2.3%	0.0%
Tuskegee University	0.0%	0.0%	0.0%
Colorado State University	0.0%	1.0%	0.0%
University of Florida	0.0%	1.9%	0.0%
University of Georgia	0.0%	1.0%	0.0%
University of Minnesota	0.0%	5.7%	1.4%
Mississippi State University	0.0%	0.0%	0.0%
Texas A&M University	0.0%	0.6%	0.0%
University of Missouri-Columbia	0.0%	3.8%	2.9%
Oregon State University	0.0%	0.0%	0.0%
University of Tennessee	0.0%	1.6%	0.0%
Western University of Health Sciences	0.0%	3.1%	0.0%
St. George's University	0.0%	7.5%	5.1%
St. Matthew's University	0.0%	0.0%	0.0%
Other	3.5%	13.1%	7.3%
Total	**2.0%**	**3.0%**	**1.4%**

Table 18

FACTORS AFFECTING UNEMPLOYMENT

A logistic regression was employed to identify the relationship between unemployment and the various factors presented above. The logistic regression predicts the probability that an observation falls into one of two categories, in this case employed or unemployed. Unemployment regression identifies the respondents as having a higher likelihood of being unemployed in veterinary medicine if the coefficient is positive and significant. The increase in probability of being unemployed is defined by the Odds Ratio. For instance, having a first employment in a companion animal exclusive practice indicates a .07 times lower probability associated with unemployment, meaning that first employment in this sector decreases the odds of being unemployed by 93 percent. The factors that are significant are associated with unemployment, though are not necessarily a cause of unemployment. This regression, however, applies to all respondents who were unemployed in veterinary medicine. This does not mean they are all seeking employment in veterinary medicine nor does it mean they are unemployed. It just means they are not currently employed in veterinary medicine.

Factors found to be associated with a lower probability of unemployment were male compared to female, board certified compared to non-board certified, home ownership and first employment in mixed animal practice and companion animal practice (exclusive). Factors found to be associated with higher probability of unemployment were M.P.H. degree, reside in Region 5 and attended Oklahoma State University. Even though DVM debt was found to be significant, there was no change in the probability of those with more DVM debt compared to those with less DVM debt (Table 19).

FACTORS AFFECTING UNEMPLOYMENT IN VETERINARY MEDICINE

	Coefficient	Standard Error	t- Statistic	p-value	Odds Ratio	Probability
Number of years post graduation (2016=1)	0.042	0.031	1.36	0.173	1.04	4%
Gender: Male=1, Female=0	-2.216	0.961	-2.30	0.021	0.11	-89%
Board Certified =1 else 0	-1.706	0.988	-1.73	0.084	0.18	-82%
Health, Poor=1, Excellent=5	-0.202	0.255	-0.79	0.429	0.82	-18%
Own	-1.949	1.154	-1.69	0.091	0.14	-86%
Rent	-1.030	1.216	-0.85	0.397	0.36	-64%
Married	-0.131	0.534	-0.25	0.806	0.88	-12%
DVM Debt	0.000	0.000	-1.86	0.062	1.00	0%
Doctorate Degree (Ph.D., Ed.D. etc.)	1.055	1.200	0.88	0.379	2.87	187%
Master's in Public Health (M.P.H., etc.)	1.979	1.153	1.72	0.086	7.24	624%
Master's in Science (M.S.)	0.044	0.914	0.05	0.961	1.05	5%
Other Master's Degree	0.679	1.539	0.44	0.659	1.97	97%
Bachelor's Degree (BSc., B.A., etc.)	-0.623	0.913	-0.68	0.495	0.54	-46%
Other Degree	0.461	1.231	0.37	0.708	1.59	59%
No Additional Degree	0.058	1.262	0.05	0.964	1.06	6%
First Veterinary Employment: Mixed Practice	-3.937	1.163	-3.38	0.001	0.02	-98%
First Veterinary Employment: Companion Animal Exclusive	-2.667	0.805	-3.31	0.001	0.07	-93%
First Veterinary Employment: Equine	-0.632	0.992	-0.64	0.524	0.53	-47%
First Veterinary Employment: College/University	-2.443	1.579	-1.55	0.122	0.09	-91%
First Veterinary Employment: Not-for-Profit	-1.647	1.544	-1.07	0.286	0.19	-81%
Live Region 0	0.769	1.085	0.71	0.478	2.16	116%
Live Region 1	0.175	1.12	0.16	0.876	1.19	19%
Live Region 2	0.153	1.033	0.15	0.883	1.17	17%
Live Region 3	0.396	1.281	0.31	0.757	1.49	49%

FACTORS AFFECTING UNEMPLOYMENT IN VETERINARY MEDICINE CONT'D.

	Coefficient	Standard Error	t- Statistic	p-value	Odds Ratio	Probability
Live Region 4	-0.278	1.140	-0.24	0.807	0.76	-24%
Live Region 5	1.998	1.162	1.72	0.085	7.38	638%
Live Region 6	0.576	1.155	0.5	0.618	1.78	78%
Live Region 7	-1.200	1.445	-0.83	0.406	0.30	-70%
Live Region 8	1.115	1.019	1.09	0.274	3.05	205%
University of California-Davis	0.111	1.448	0.08	0.939	1.12	12%
University of Illinois	-1.032	1.609	-0.64	0.521	0.36	-64%
Iowa State University	-1.336	1.592	-0.84	0.401	0.26	-74%
Tufts University	-1.454	1.793	-0.81	0.418	0.23	-77%
Michigan State University	0.354	1.382	0.26	0.798	1.43	43%
Purdue University	-0.460	1.533	-0.30	0.764	0.63	-37%
Cornell University	-0.769	1.732	-0.44	0.657	0.46	-54%
Oklahoma State University	2.421	1.411	1.72	0.086	11.26	1,026%
University of Pennsylvania	-0.866	1.612	-0.54	0.591	0.42	-58%
Washington State University	-0.346	1.501	-0.23	0.818	0.71	-29%
The Ohio State University	-1.242	1.581	-0.79	0.432	0.29	-71%
Virginia-Maryland College	-0.048	1.493	-0.03	0.975	0.95	-5%
Ross University	1.502	1.364	1.10	0.271	4.49	349%
Constant	2.416	2.428	0.99	0.320	11.20	1,020%
Observations	767					
Prob > chi2	0.0272					

Auburn, Tuskegee, Colorado, Florida, Georgia, Kansas, Louisiana, Minnesota, Mississippi, Texas, Missouri, Oregon, Tennessee, North Carolina State, Wisconsin, Western, St. George's, St. Matthew's, other college, first employment food animal (exclusive), food animal (predominant), companion animal (predominant), federal government, uniform services, state and local government industry and other first employment, M.B.A., Master's degree (M.A., M.S.), specialized degree, and live Region 9 were omitted because the number of unemployment observations did not permit estimation.

Table 19

Only 0.5 percent of the sample is unemployed in veterinary medicine and seeking employment or further continuing education in veterinary medicine. There is an additional set of respondents who are unemployed in veterinary medicine but not seeking employment in veterinary medicine or enrollment in advanced education (Table 20).

UNEMPLOYED SEEKING EMPLOYMENT OR OTHER CONTINUING EDUCATION IN VETERINARY MEDICINE

	Frequency	Percent	Valid Percent
Seeking employment in veterinary medicine	12	0.4	29.3
Seeking enrollment in an internship, residency, or other academic program	2	0.1	4.9
Not seeking employment or enrollment	27	1.0	65.8
Total	41	1.5	100
System	2,698	97.1	
Total	**2,780**	**100**	

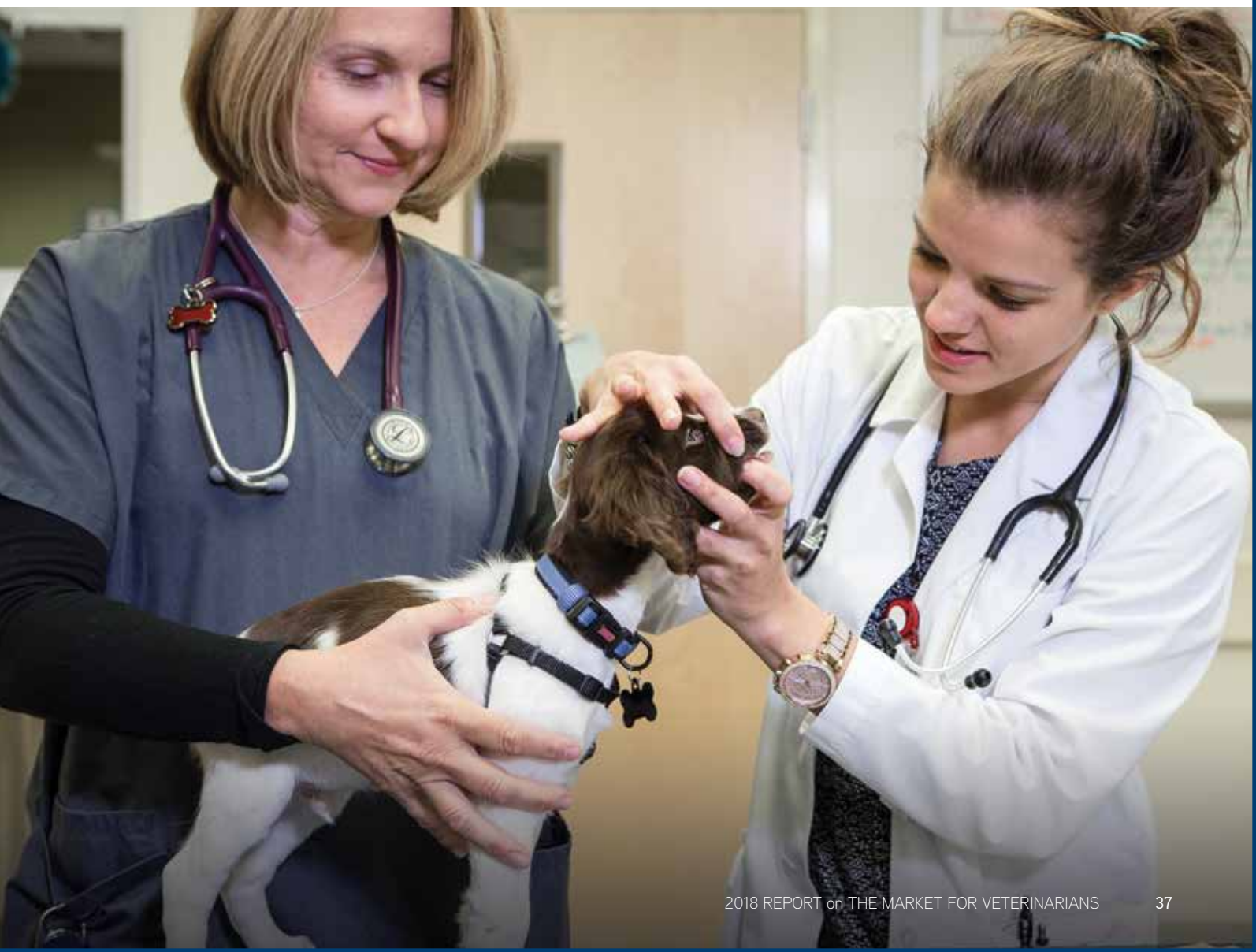
Table 20

When those currently unemployed and seeking employment in veterinary medicine are considered, the only significant variable associated with a higher probability of being unemployed was graduation date. That is, recent graduates have a statistically higher probability of being unemployed and seeking employment in veterinary medicine (Table 21).

SEEKING EMPLOYMENT BY GRADUATION YEAR

Graduation Years	Seeking employment in veterinary medicine	Not seeking employment in veterinary medicine	Total
2007-2016	10	9	19
1997-2006	1	7	8
1987-1996	0	7	7
1977-1986	1	3	4
1967-1976	0	1	1
1957-1966	0	2	2
Total	**12**	**29**	**41**

Table 21



UNDEREMPLOYMENT

Underemployment was again negative in 2017 following the trend started in 2014, with more veterinarians indicating they wish to work fewer hours for less compensation than those who wish to work more hours for more compensation.

As noted earlier, the unemployment rate considers only those who are unemployed and seeking employment. Within veterinary medicine the unemployment rate for veterinarians would consider only those who are not employed but desire to be employed (are actively seeking employment) in the veterinary profession. But the unemployment rate doesn't measure the true number of people who are looking for work, because it does not count those who are underemployed. Because the unemployment rate is computed using the same method each year, it is an indicator of employment conditions. The point of an indicator is to measure the exact same thing consistently over time, not necessarily to put an exact measurement on a broad concept with multiple interpretations. Generally, these indicators are not meant to give accurate point estimates, but to provide an indication as to whether conditions are improving or worsening.

The AVMA Census of Veterinarians Survey was designed to measure both unemployment and underemployment. Underemployment occurs when a worker is not working as many hours as he or she would like, or the worker is not working in a position that utilizes his or her training and experience.

Underemployment has two definitions. In the context of the veterinary field, the first definition of underemployment is when a veterinarian is busy all the time but would be able to see more clients and perform more

productive work with additional veterinary technicians or physical space. The second definition of underemployment, as measured in total hours, represents the number of hours that veterinarians desire to work above what they are currently working. This was measured as the desire to increase/decrease hours worked for an equivalent increase/decrease in compensation. The most important aspect of the question pertaining to hours worked was the associated increase or decrease in compensation. The survey question asked if veterinarians wish to work more for greater compensation or work less for less compensation. Additional questions sought the actual number of hours per week worked currently and the number of hours that would be preferred.

SUMMARY STATISTICS

Underemployment was again negative in 2017 following the trend started in 2014, with more veterinarians indicating they wish to work fewer hours for less compensation than those who wish to work more hours for more compensation. In 2017, veterinarians wanted to reduce a net total 133,219 weekly hours of work, and this would require an additional 3,330 veterinary FTEs (40 hours per week equals one FTE) to eliminate the negative underemployment. This was slightly less than the number of veterinarians needed in 2016 (3,391), and still a substantial increase from the 1,895 new veterinarians needed in 2015 and the 1,713 new veterinarians who would have been needed in 2014.

While the majority of veterinarians are content with their current number of work hours per week, 9.3 percent indicated a desire to increase the number of hours per week for increased compensation, while 20.2 percent indicated a desire to reduce the number of hours worked per week for reduced compensation (Figure 16).

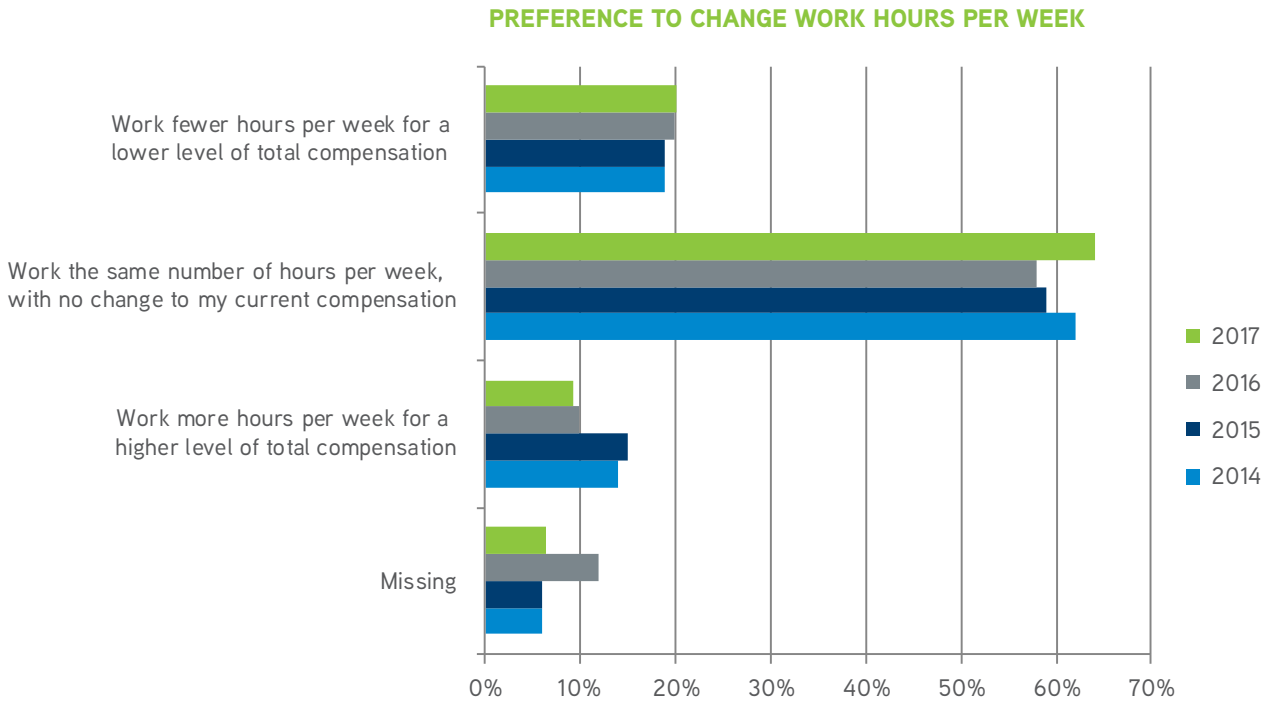


Figure 16

As with unemployment, underemployment varies by gender, region and practice type. More females want to work fewer hours than want to work additional hours, but for the second time since we have measured underemployment, the percent of men who wish to work less is also greater than the percent who wish to work more hours per week (Figure 17).

[6] Number updated since the 2017 AVMA Economic Summit.

UNDEREMPLOYMENT BY GENDER

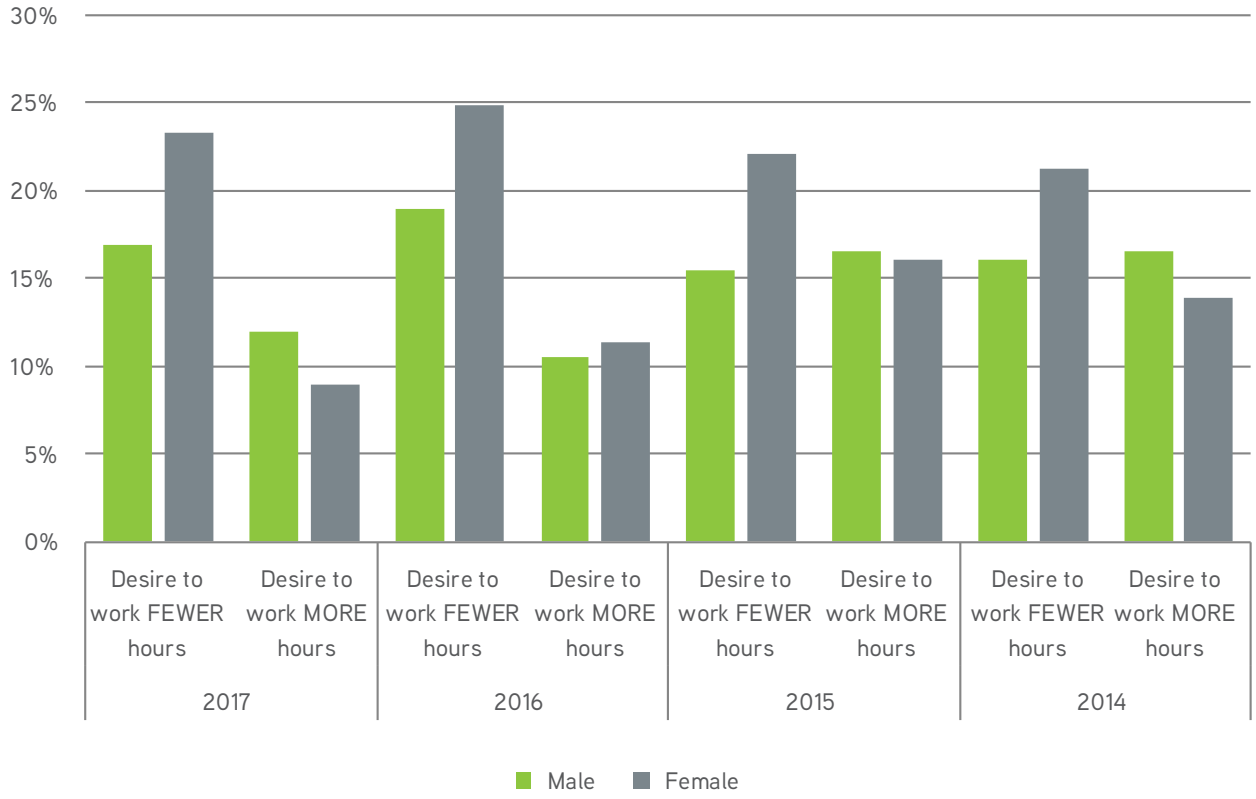


Figure 17

Geographically, less than half of the regions followed the national trend of more veterinarians wanting to work fewer hours than the number of veterinarians wanting to work additional hours. In the Northeast (Region 0), the Middle Atlantic (Region 1), East South Central (Region 4), West North Central (Region 5), West North Central (Region 6) and West South Central (Region 7) there are more veterinarians who wish to work additional hours than those wishing to work fewer hours. This disparity in underemployment across regions illustrates the problem of geographical maldistribution and suggests a need for greater mobility within the profession (Table 22).

UNDEREMPLOYMENT BY REGION

	AVMA Database	Work fewer hours	Work more hours
Region 0	8.0%	7.4%	7.6%
Region 1	9.0%	8.2%	11.7%
Region 2	10.9%	11.4%	10.8%
Region 3	13.7%	15.9%	10.3%
Region 4	10.0%	9.0%	12.1%
Region 5	7.5%	7.8%	9.4%
Region 6	8.3%	9.4%	10.3%
Region 7	11.1%	8.8%	9.4%
Region 8	8.2%	8.8%	6.7%
Region 9	13.3%	13.1%	11.7%
Total	**100.0%**	**100.0%**	**100.0%**

Table 22

Underemployment by practice type also generally followed the national trend with most practice types having more veterinarians who wish to work fewer hours for less compensation than those who wish to work more hours for more compensation (Table 23).

UNDEREMPLOYMENT BY PRACTICE TYPE

	AVMA Database	Work fewer hours	Work more hours
Food animal practice (exclusive)	1.4%	4.3%	10.9%
Food animal practice (predominant)	3.6%	12.2%	12.2%
Mixed animal practice	4.7%	26.6%	9.5%
Companion animal practice (predominant)	7.1%	22.6%	11.5%
Companion animal practice (exclusive)	52.7%	21.8%	8.4%
Equine practice	4.5%	19.2%	10.8%
Federal government (civil service)	2.1%	5.3%	21.1%
Uniformed services	0.8%	31.0%	7.1%
College or university (faculty or staff only)	7.6%	21.8%	10.3%
State/local government	1.2%	22.2%	22.2%
Industry/commercial organizations	3.9%	9.7%	9.7%
Not-for-profit organizations		19.4%	8.3%
Currently participating in internship/residency		25.4%	14.1%
Currently pursuing advanced education		0.0%	25.0%
Other	10.4%	15.5%	20.7%
Total/ Average	**100.0%**	**17.1%**	**13.5%**

Table 23

The number of hours respondents indicated they currently work varied widely, ranging from one hour to more than 100 hours, but the majority of respondents (67.4 percent) indicated that their current hourly work weeks were predominately in the five-hour increments between 30 and 50 hours per week. And, as might be expected there was a higher percentage of respondents who currently work more than 40 hours per week who wish to reduce the number of hours worked per week for less compensation than there are those who wish to increase the number of hours worked per week for more compensation. The reverse was also true. Among those working fewer than 40 hours per week, there was a higher percentage who wished to work more hours per week for greater compensation than those who wish to work less for less compensation (Figure 18). But this differed slightly by gender.

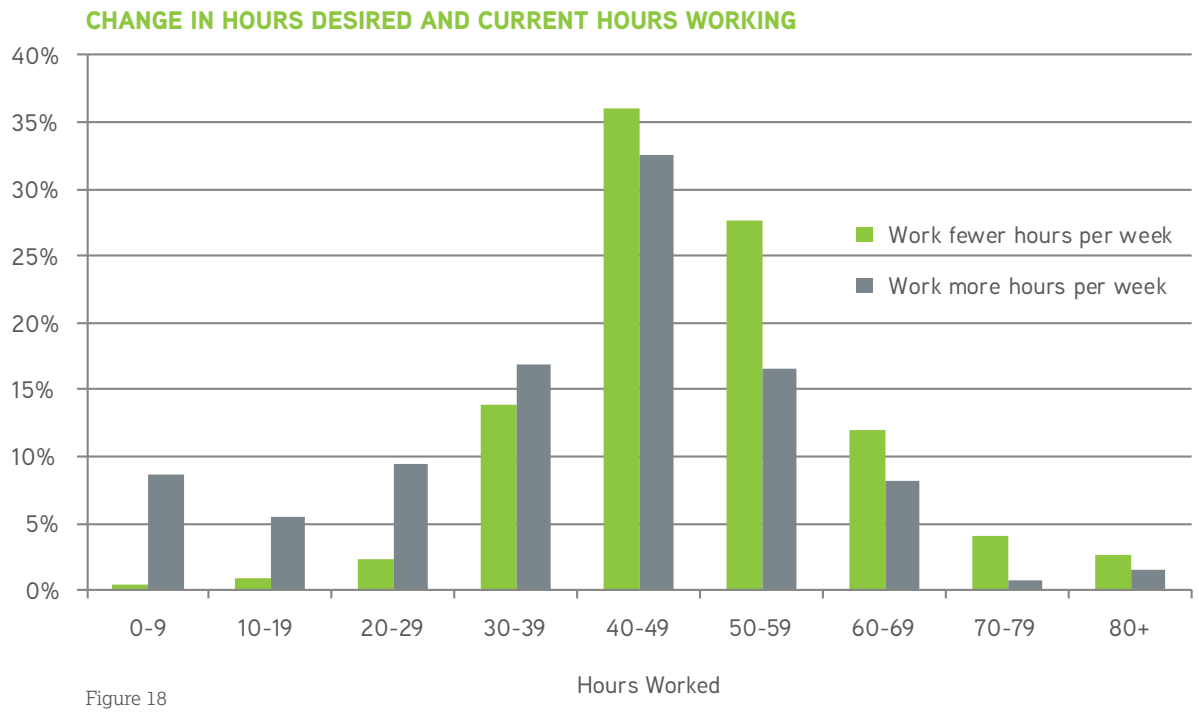


Figure 18

The difference in the preference of hours worked by gender over the last four years illustrates the constant growth in the percentage of female veterinarians who wish to work fewer hours for less compensation. And, for both men and women, the desire to work more hours continued to fall in 2017 compared to the previous years.

Among veterinarians working between 40 and 49 hours per week, approximately 33 percent of males and females want to work more hours while 37 percent of females and 33 percent of males want to work fewer hours. Almost 25 percent of males working between 50 and 59 hours per week want to work fewer hours while almost 30 percent of females in the same category want to work fewer hours (Figure 19 and Figure 20).

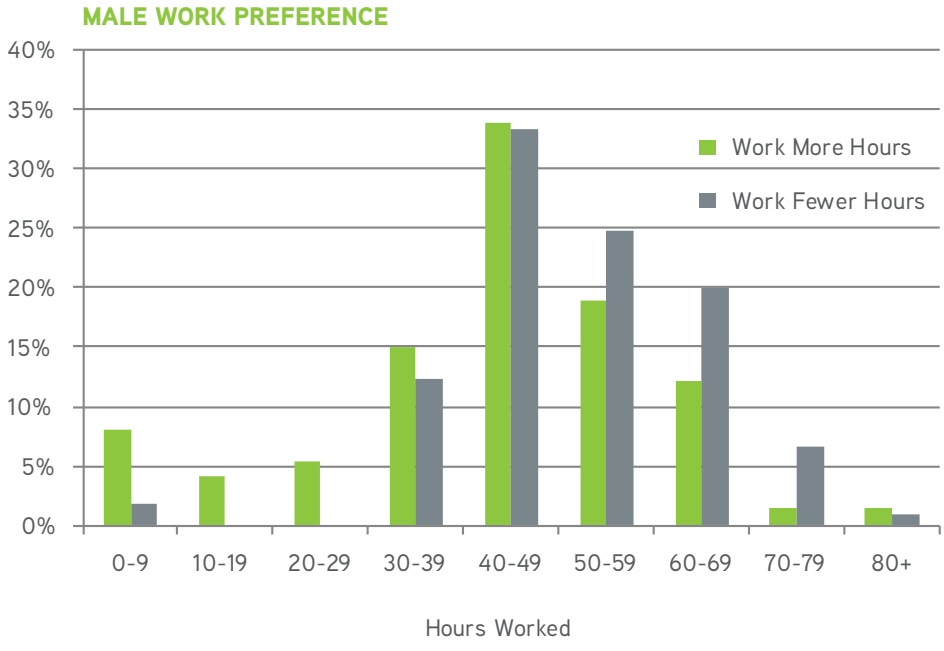


Figure 19

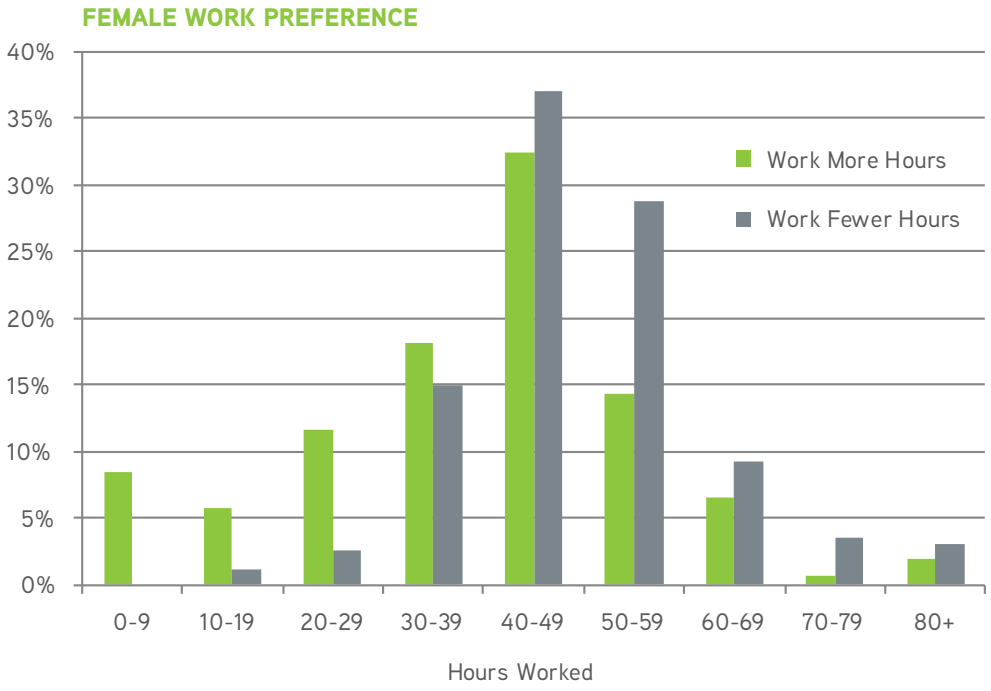


Figure 20

In 2017, the distribution of change in hours among those veterinarians who desired to change their hourly work week varied from a reduction of 49 hours per week to an increase of 50 hours per week from their current hourly work week, just as occurred in 2016. For both men and women in 2017, however, more than 25 percent of males and 35 percent of females desired a reduction in hours per week of 10 to 19 hours while about 17 percent of males and 11 percent of females desired an increase of 10 to 19 hours, compared to the 5 percent that in 2016 desired an increase of this number of hours (Figure 21).

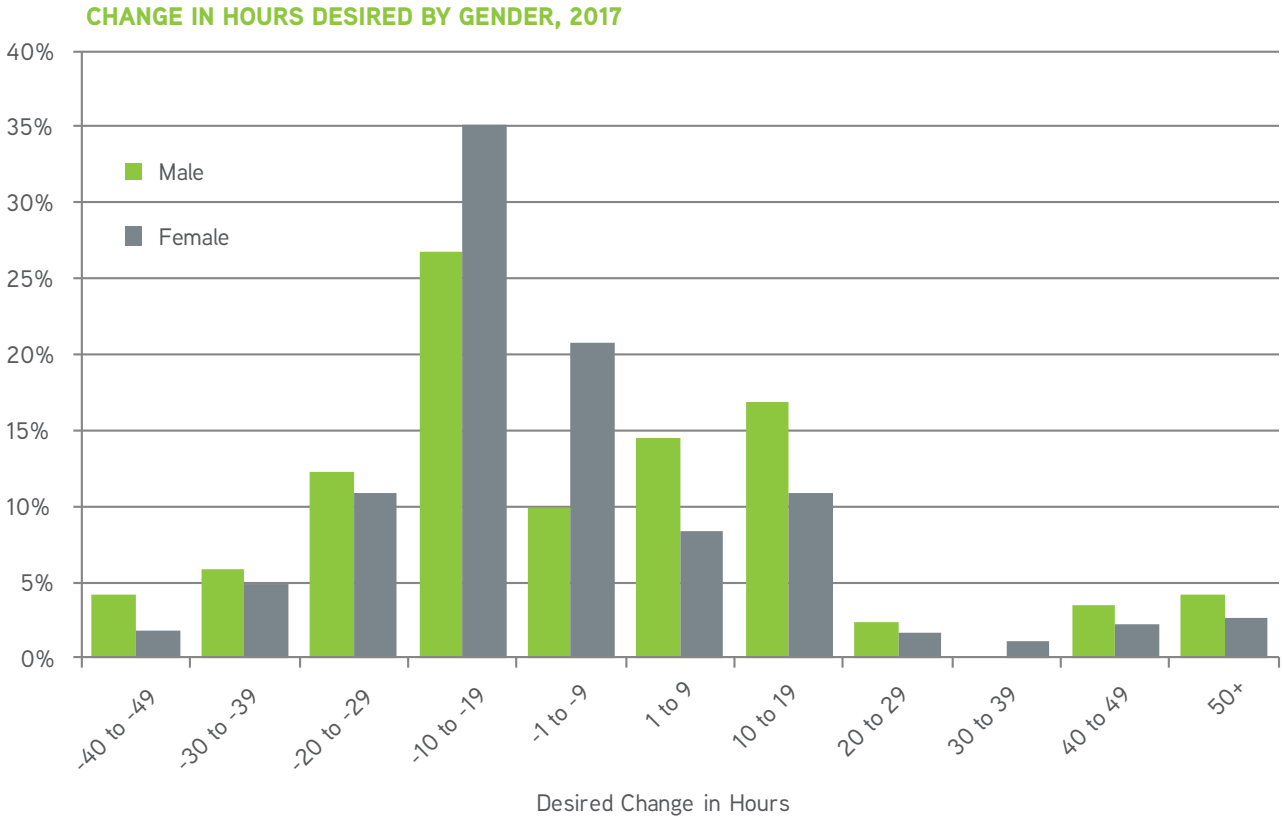


Figure 21

Of the veterinarians who desire a reduction in the number of hours they work per week with a consequence of lower compensation, the mean number of hours that they would like to work weekly, as a group, is fewer than 40. This is in contrast to the group that wants to increase the hours they work to more than 50 hours a week accompanied by increased compensation.

The distribution of the desired hourly work per week reflects what each respondent claimed to be their ideal. For those who did not indicate a desire to either increase or decrease their current hours, the current hours worked was used as their desired level. For those who wished to increase or decrease their hours worked per week, the desired change was added to their current hours to obtain their desired hourly work week.

The difference between genders is observable in the distribution for 2015, 2016 and 2017: The majority wished to work 40-49 hours per week (roughly 35 percent in 2015, 39 percent in 2016, and 40 percent in 2017). In 2015 the desired number of hours per week was normally distributed for women with roughly 30 percent wanting to work fewer hours and 30 percent wanting to work more than 40 to 49 hours per week. This changed in 2016 with 36 percent wishing to work less and 25 percent wishing to work more than the 40 to 49 hours per week, and in 2017, 33 percent wishing to work less and 25 percent wishing to work more than 40 to 49 hours per week.

In 2015, 46 percent of men desired a work week in excess of 40 to 49 hours while only 19 percent wanted to work fewer hours. In 2016 this wide variation declined, however, as only 38 percent indicated that the optimum hours per week exceeded 40 to 49 hours while 24 percent wished to work less than 40 to 49 hours per week. In 2017 it is seen that 28 percent wished to work fewer than 40 to 49 hours per week and 38 percent wished to exceed a 40- to 49-hour work week (Figure 22).

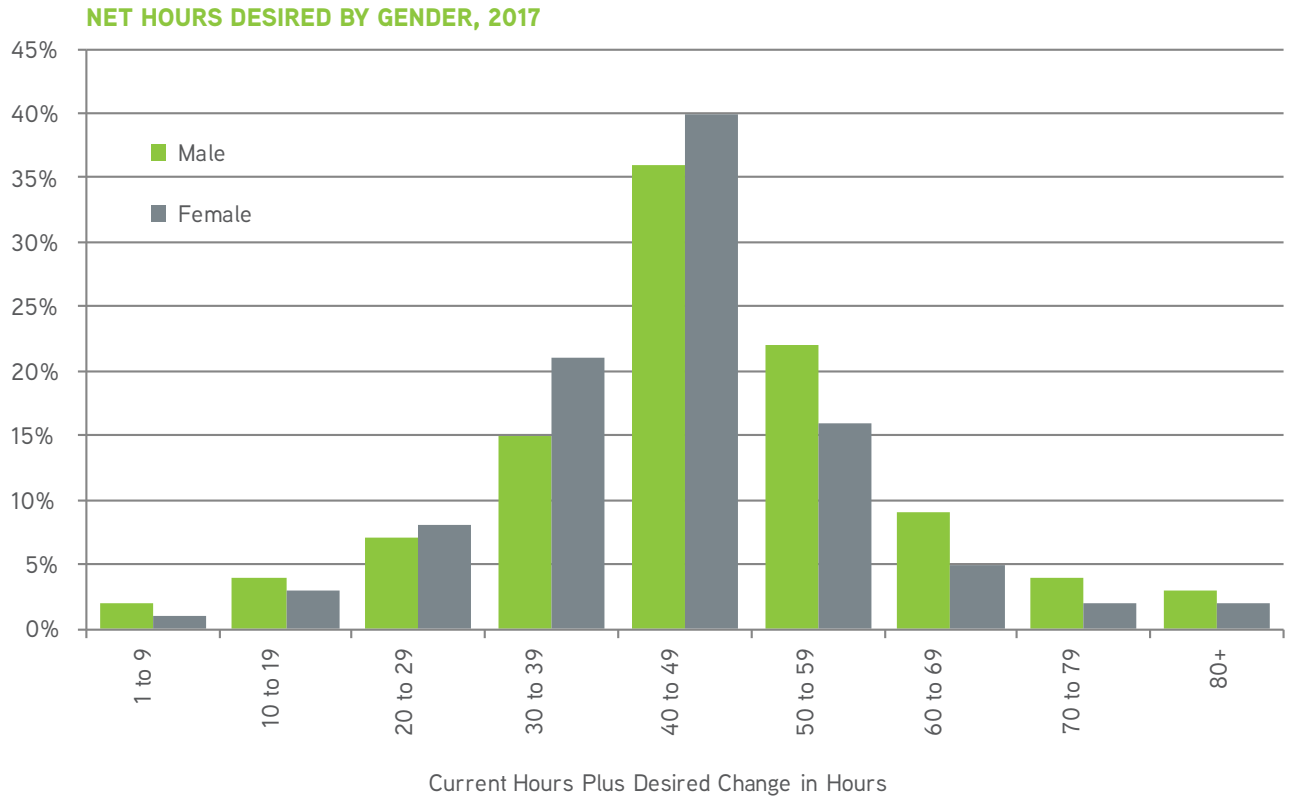


Figure 22

Taking apart the desired change in hours worked by gender and graduation period for those who wish to work more versus those who wish to work less provides greater detail for understanding the distribution of underemployment in the profession.

For nearly every age of female veterinarians, those who wish to reduce the hours per week worked for less compensation exceeded the number of those who wished to increase the number of hours worked per week for increased compensation. In 2017, there is an increase in the percent of female veterinarians who wish to reduce their hourly work week the farther away from their graduation year (Figure 23).

The percentage of female veterinarians that wish to work more hours per week for greater compensation declined across all graduation periods over the last four years. And, a smaller percentage of female veterinarians desired an increase in the hourly work week as they got further away from their graduation year (Figure 24).

For males, the number of those wishing to work fewer hours in 2017 increases for veterinarians the farther they are from the most recent graduation period, and the percentage of male veterinarians who wish to work more hours declined as the graduation period became older (Figure 25 and Figure 26).

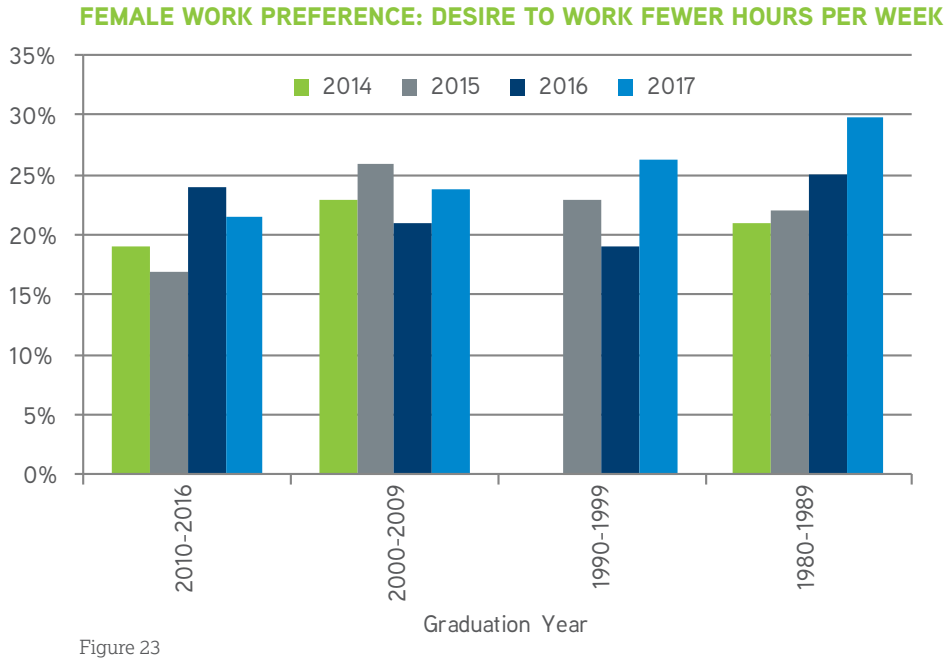


Figure 23

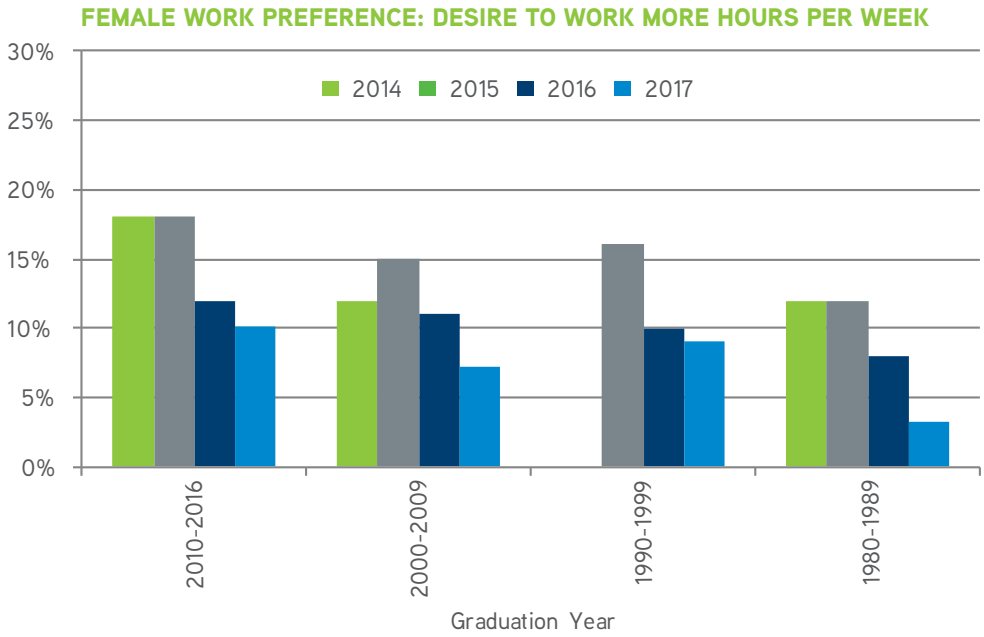


Figure 24

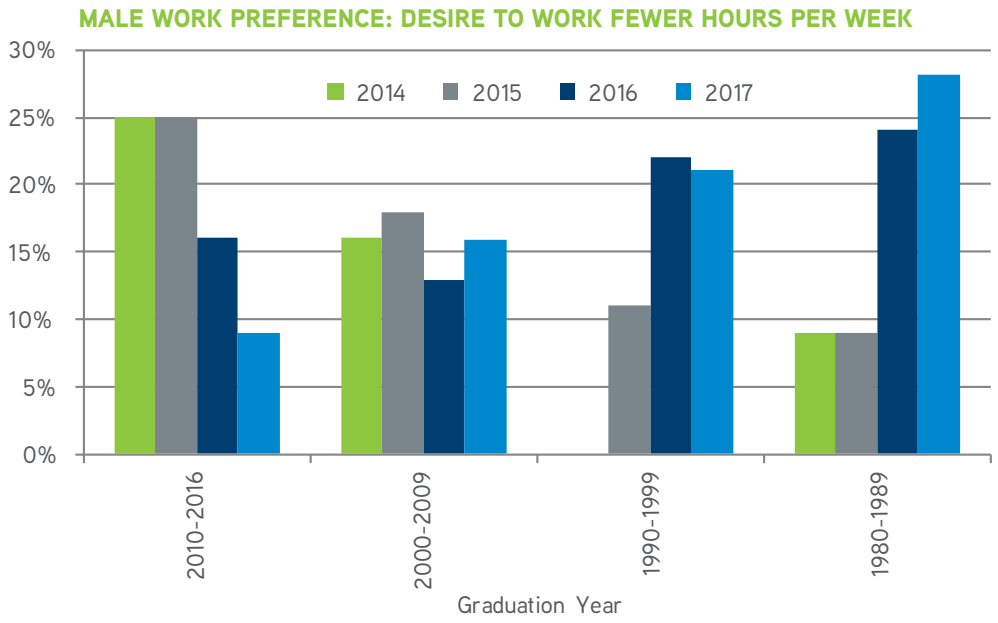


Figure 25

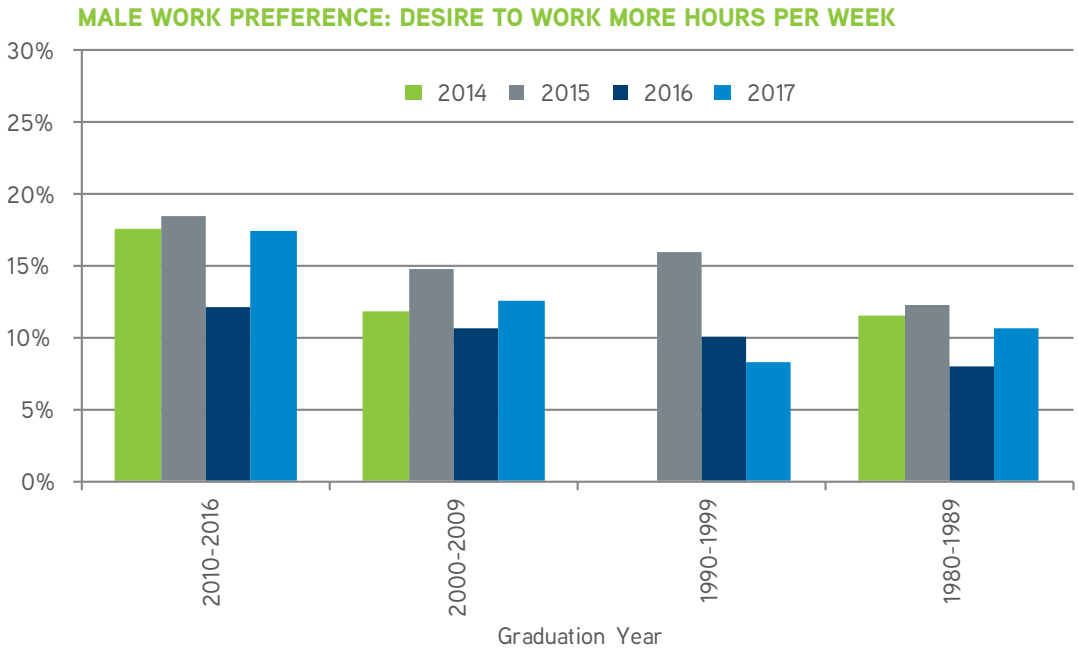


Figure 26

In summary, the veterinary profession does not have a problem with underemployment, according to the results of the 2017 Census Survey, but rather with negative underemployment. There are more veterinarians who wish to work fewer hours than those who wish to work additional hours. If the hours of all veterinarians could be adjusted to align the hours that they wish to work with the hours they actually work, 3,330 additional veterinarians would be required to fill the void. Unfortunately, this situation has an unfeasible solution: Achieving it would require the additional veterinarians needed to work in multiple practices and geographic areas simultaneously. That is, of course, unless a specific employer had numerous veterinary employees working more hours than they desired, and this is unlikely to be the case. Generally, the indivisibility of veterinary labor (or that of any professional) is characterized by blocks of 40-50 hours. A veterinary employer who might only have 20-30 hours of negative underemployment of veterinarians in their practice would probably opt for hiring a new veterinarian, thereby creating a condition of underemployment and excess capacity. When there are multiple practices in an area that have veterinarians who wish to work less for less compensation, however, a single veterinarian may work for different practices to reach a desired level of hours and compensation.

The level of underemployment differed by practice type. For the second time since the AVMA Economics Division began tracking underemployment, the percent of veterinarians who wish to work less exceeded the percent that wish to work more in private and public practice types (veterinarians in food exclusive and state/local government had an equal number desiring more and fewer hours), with the exception of industry/commercial and not-for-profit organizations, advanced education and non-veterinary employment (Figure 27).

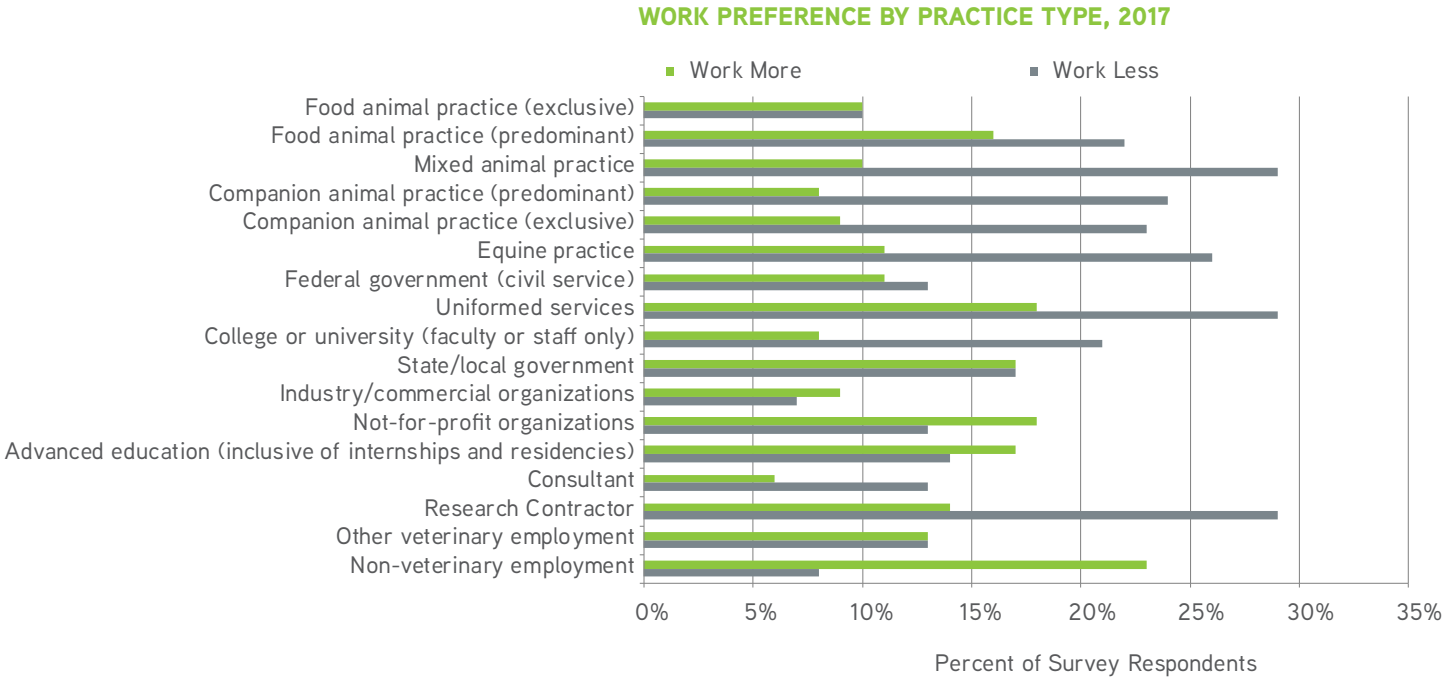


Figure 27

There is no significant difference in underemployment among colleges. Tabulations show that for the second year in a row graduates of Mississippi State University desired the largest mean increase in hours per week, 5.92, followed by graduates of University of Florida, desiring a mean increase of 2.39. Graduates of Oregon State University and St. Matthew's University desire the largest mean decrease in hours, 13.18 and 10, respectively (Table 24).

UNDEREMPLOYMENT BY VETERINARY COLLEGE

	2017			2016			2015		
	Mean change in hours desired	N	Std. Deviation	Mean change in hours desired	N	Std. Deviation	Mean change in hours desired	N	Std. Deviation
Auburn University	-3.53	30	20.16	1.57	23	21.94	1.52	54	6.35
Colorado State University	-8.24	41	15.97	-8.89	68	15.32	-0.8	99	9.45
Cornell University	-7.91	21	13.27	-5.44	25	15.59	-0.82	78	9.88
Iowa State University	-2.31	26	23.79	-4.45	30	16.39	-1.22	103	9.30
Kansas State University	-5.28	32	20.91	-1.30	30	21.25	-2.21	68	8.39
Louisiana State University	-8.84	19	12.41	-4.26	21	17.92	-1.35	47	7.68
Michigan State University	-8.00	36	9.92	-3.61	36	15.69	0.12	89	8.35
Mississippi State University	5.92	13	22.60	4.22	16	21.10	-0.7	30	8.06
North Carolina State University	-2.95	20	12.50	3.26	21	25.92	-1.56	70	8.57
Oklahoma State University	-6.80	20	11.75	-8.52	26	15.06	-0.62	45	8.85
Oregon State University	-13.18	11	15.65	-5.88	12	20.46	-1.39	33	8.69
Other	-6.63	56	18.93	0.54	74	28.65	0.97	106	9.96
Purdue University	-0.47	15	16.02	-10.93	28	14.80	0.85	52	8.54
Ross University	-0.28	36	21.44	-0.69	45	27.42	-0.32	109	7.11
St. George's University	1.60	10	21.57	-3.67	12	24.54	0.63	30	10.93
St. Matthew's University	-10.00	1	.	1.00	2	15.56	3.36	11	15.70
Texas A&M University	-7.90	29	15.28	-7.77	86	17.91	-0.9	79	5.76
The Ohio State University	-4.40	43	16.15	-8.03	45	14.04	-0.07	101	8.48
Tufts University	-4.75	20	12.85	-4.67	26	15.23	-2.42	66	7.92
Tuskegee University	-9.08	13	16.84	0.19	13	28.56	0.08	26	8.23
University of California-Davis	-1.71	31	25.21	-5.34	28	18.70	-1.63	96	9.34
University of Florida	2.39	26	22.47	-4.29	14	15.77	-3.05	40	8.20
University of Georgia	-2.32	28	24.51	-11.43	21	9.38	-1.13	68	11.32
University of Illinois	-3.22	37	24.13	-6.82	31	18.43	-2.6	78	7.25
University of Minnesota	-0.13	24	28.64	0.69	21	20.26	-0.83	69	9.04
University of Missouri-Columbia	-8.00	29	15.53	-9.91	23	19.40	-1.61	66	9.41
University of Pennsylvania	0.07	30	24.12	0.14	35	19.08	-0.57	75	8.38
University of Tennessee	-2.68	19	18.16	-4.04	24	19.39	0.15	54	8.56
University of Wisconsin	-1.50	28	22.01	-8.62	26	14.49	0.16	64	10.80
Virginia-Maryland College	-7.72	29	17.53	-6.17	21	15.81	-1.54	80	7.64
Washington State University	-6.14	22	12.90	-1.12	21	22.92	-1.64	66	7.00
Western University of Health Sciences	-5.00	6	28.28	3.25	12	30.37	-1.59	29	8.85
Total/Average	**-4.34**	**801**	**18.76**	**-4.42**	**916**	**19.96**	**-0.81**	**2,081**	**8.72**

Table 24

VETERINARIANS WHO WISH TO WORK MORE (UNDEREMPLOYMENT)

Within the 2017 sample, 10 percent (15 percent in 2015 and 10.4 percent in 2016) of veterinarians indicated wanting to work a mean of 17.4 (11.6 in 2015 and 18.9 in 2016) additional hours per week. The pattern of respondents who wish to work more hours decreasing with more years since graduation has been continuous through the periods of data collection. There is a decreasing trend in the percent of respondents who indicated they wish to work more hours for more compensation across graduation periods and genders (Figure 28).

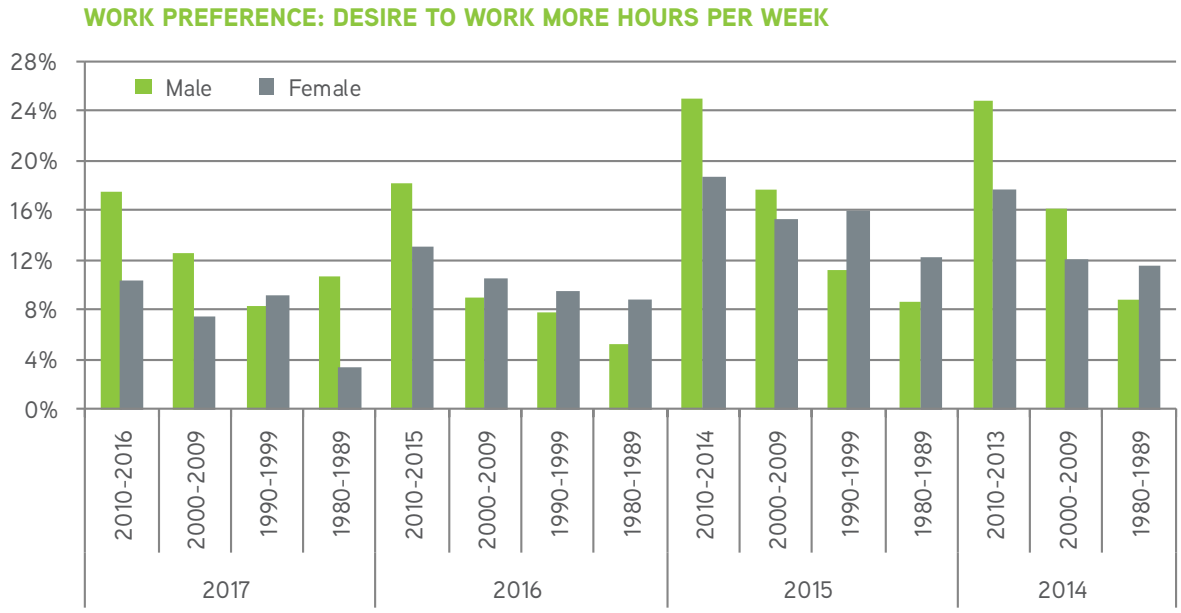


Figure 28

Females wishing to work more comprised 8.9 percent of the sample and the mean number of hours currently worked by this group was 37 in 2017 (38.4 in 2015 and 37.5 in 2016) and the mean number of hours per week the group wished to work increased to 54.6 hours (49.6 in 2015 and 53.8 in 2016). On the other hand, men who wish to work additional hours comprised 12 percent of the sample. This group currently works 41.2 hours per week (45 hours in 2015 and 41.8 in 2016) and wishes to increase work to 58.3 hours per week (56.3 hours in 2015 and 66.7 in 2016) (Figure 29, Figure 30 and Figure 31).

UNDEREMPLOYMENT BY GENDER, 2015

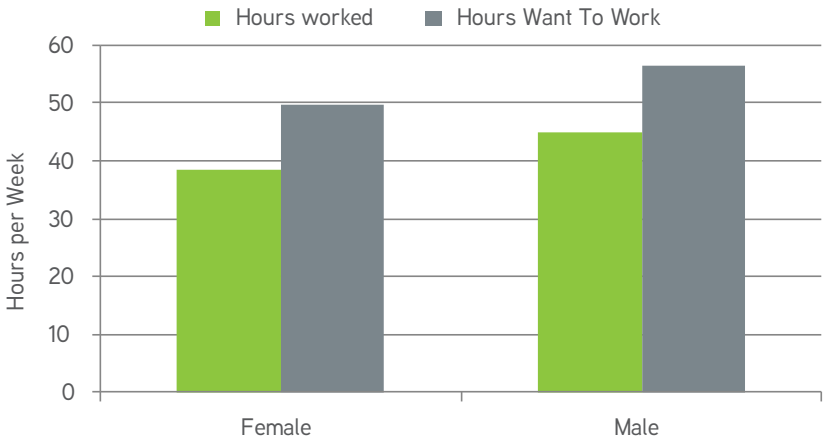


Figure 29

UNDEREMPLOYMENT BY GENDER, 2016

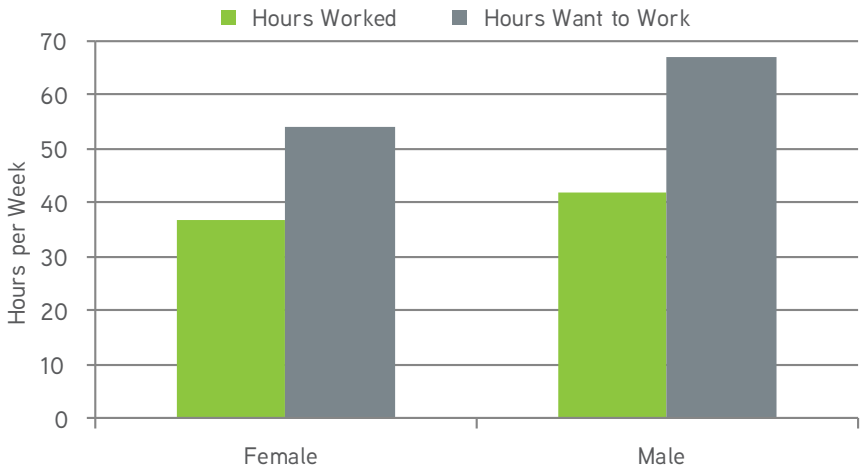


Figure 30

UNDEREMPLOYMENT BY GENDER, 2017

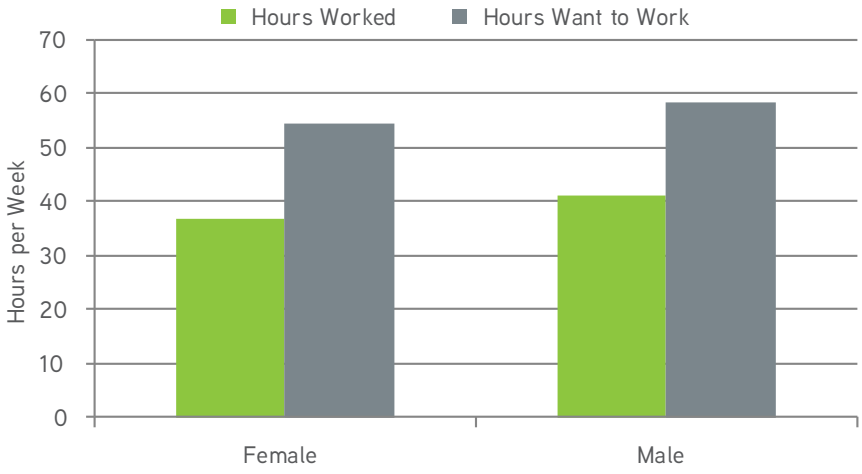


Figure 31

The level of underemployment of those who wish to work more hours for greater compensation also varies by practice type. In 2015, food animal practitioners (predominant), mixed animal and those veterinarians in advanced education who wish to work more hours reported a mean hourly work week of more than 50 hours per week and on average were looking to increase that hourly work week to more than 60 hours per week. In 2016, the veterinarians who wished to work more hours in all of the practice types had a mean hourly work of fewer than 50 hours. In 2017, food animal practitioners (exclusive) and college and university staff/faculty who wish to work more hours reported the highest mean hourly work week of more than 50 hours per week.

Of those veterinarians who desired to work more hours, uniformed services work the fewest hours per week currently (13.3 hours per week) and indicated a desire to move to a 45-hour work week. The low number of respondents in some of the categories and high standard deviations suggest caution in using the means to describe the situation of those considered underemployed. The values reflect the considerable diversity among the types of practices (Figure 32).

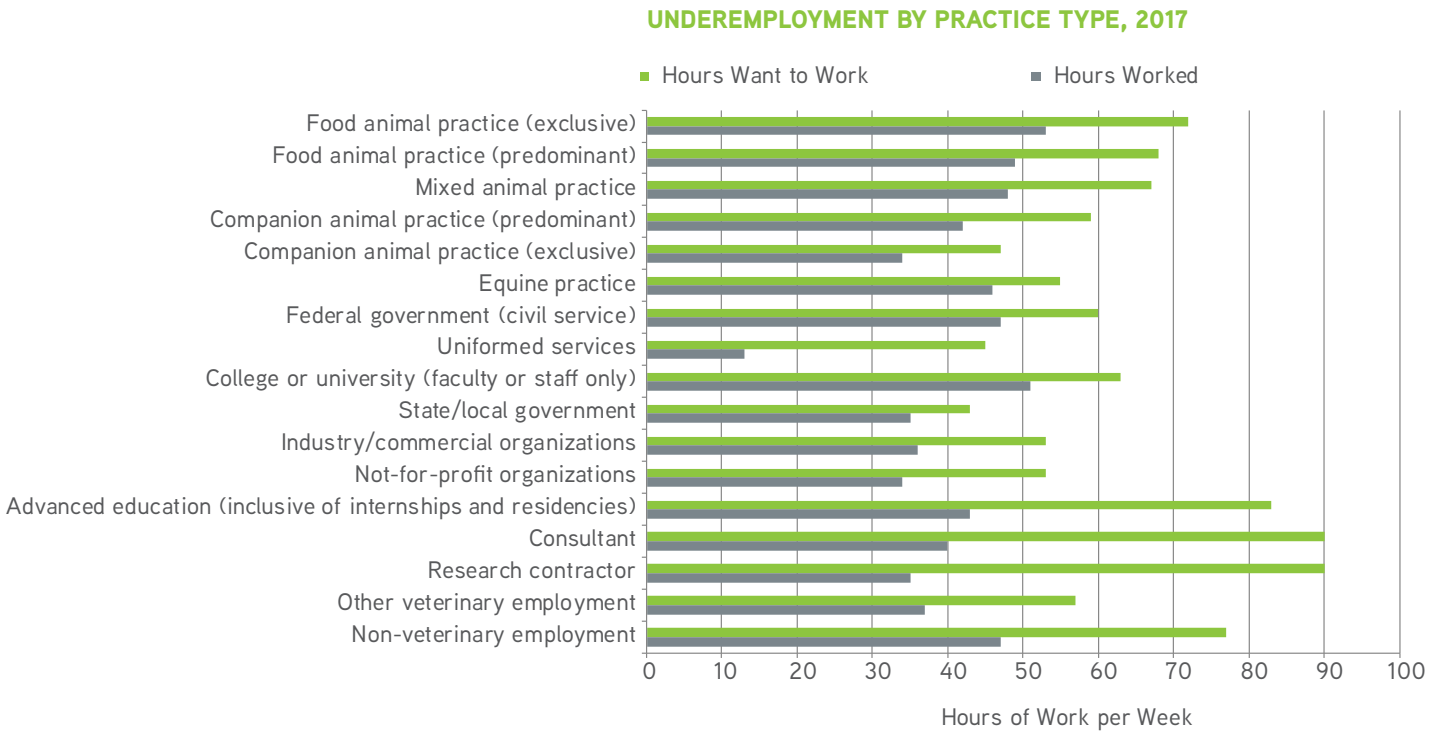


Figure 32

Across regions, veterinarians who wish to work additional hours for increased compensation are generally working a full-time, 35-40-hour work week, but wish to expand this to more than 50 hours per week. As with the underemployment data by practice type, the standard deviations for both the current hours worked and the additional hours veterinarians would like to work are great and point to the large diversity in work hours within regions (Figure 33).

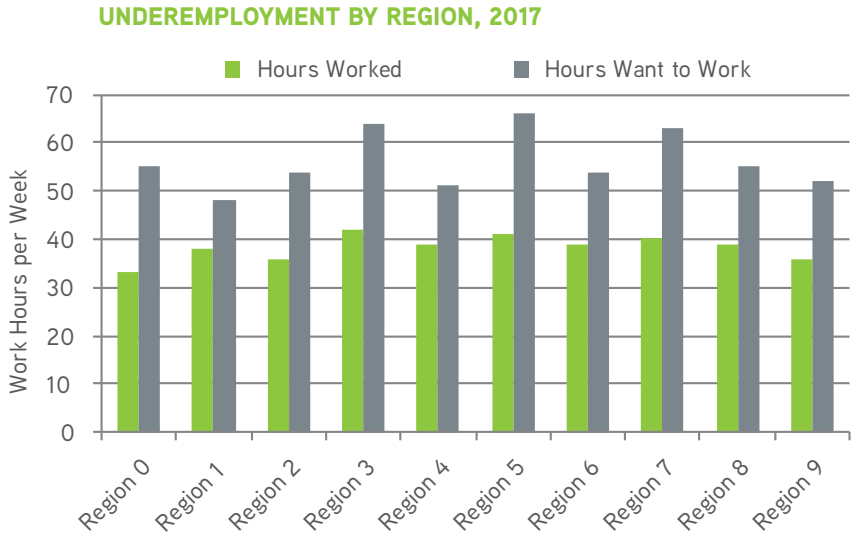


Figure 33

VETERINARIANS WHO WISH TO WORK LESS (NEGATIVE UNDEREMPLOYMENT)

In contrast to those who indicated a desire to work more hours for increased compensation, in 2017, 21.6 percent (18.7 percent in 2015 and 20.6 percent in 2016) of the respondents indicated wanting to work an average of 14.2 hours less per week for less compensation (12.7 hours in 2015 and 14.9 hours in 2016).

The percentage of respondents who wished to work fewer hours per week increased the further veterinarians were from graduation. And for the first time since underemployment was measured, both male and female respondents showed an increase in wishing to cut back on their hourly work week the farther away from their graduation period (Figure 34).

Females wishing to work fewer hours comprised 23.3 percent of the sample and the mean number of hours currently worked by this group was 47.7 in 2017 (48.9 in 2015 and 47.6 in 2016) and the mean number of hours per week the group wished to work decreased to 34 hours (35.9 in 2015 and 33.1 in 2016). Men who wish to work fewer hours comprised 16.9 percent of the sample. This group of males currently works 49.2 hours per week (52.2 in 2015 and 52 in 2016) and wish to decrease that to 32 hours per week (37.8 in 2015 and 35.7 in 2016) (Figure 35, Figure 36 and Figure 37).

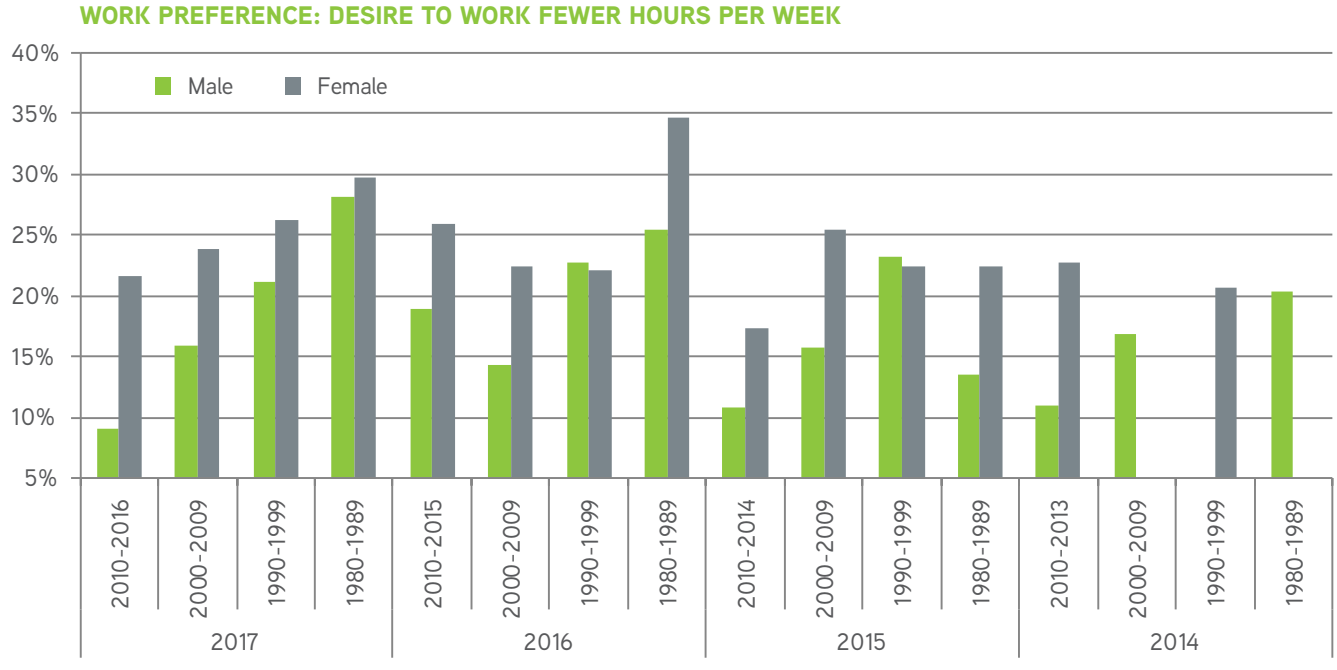


Figure 34

NEGATIVE UNDEREMPLOYMENT BY GENDER, 2015

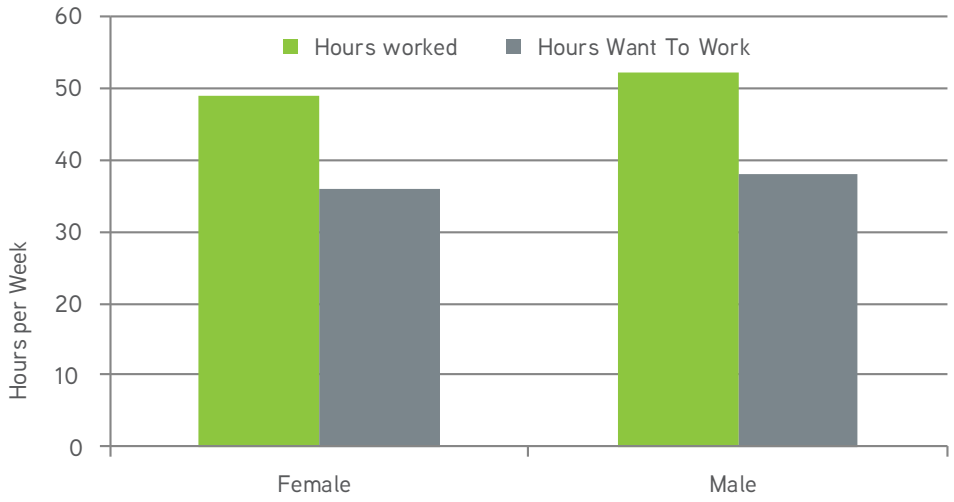


Figure 35

NEGATIVE UNDEREMPLOYMENT BY GENDER, 2016

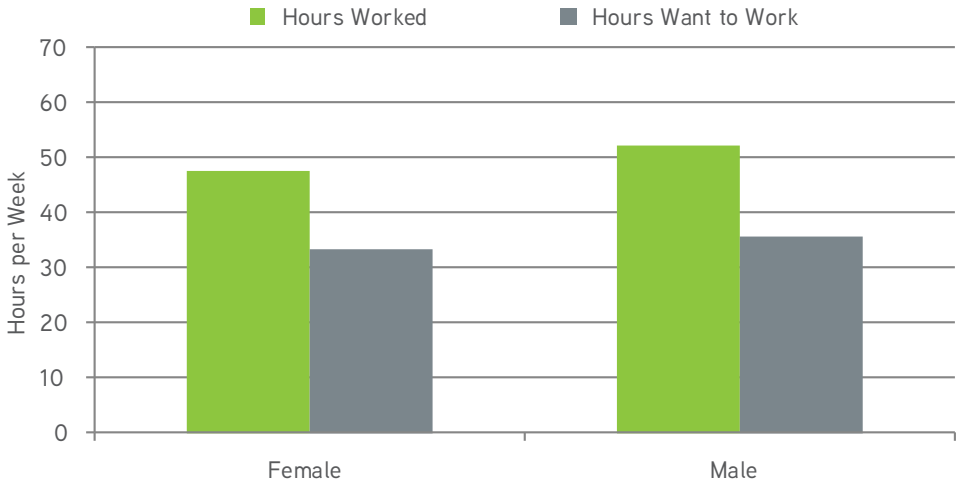


Figure 36

NEGATIVE UNDEREMPLOYMENT BY GENDER, 2017

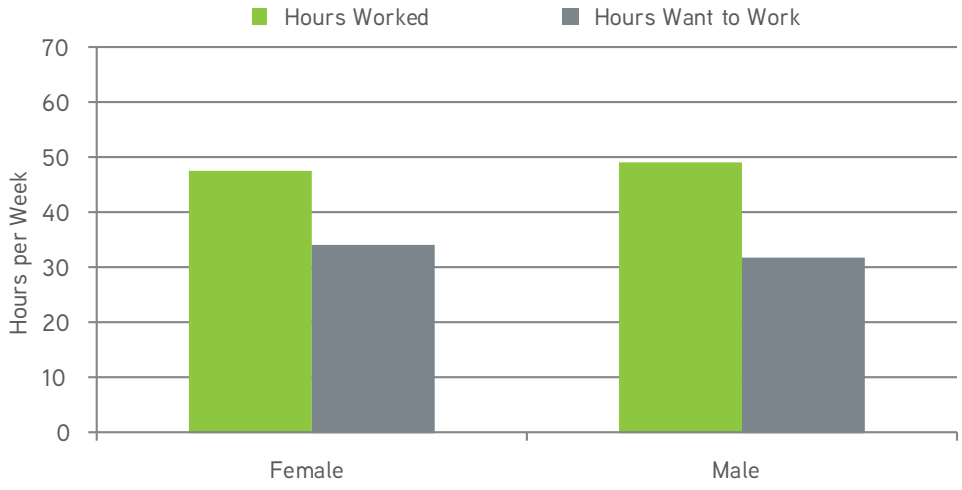


Figure 37

The group that wishes to work less is working roughly 10 hours more per week than the group that wishes to work more (48.1 and 38.3 hours, respectively), and both groups want to change their work hours per week by 14 hours or more. However, because 561 veterinarians in the sample (21.6 percent) desire to work less (351 in 2015 and 465 in 2016) and this exceeds the 257 veterinarians who desire to work more (253 in 2015 and 239 in 2016), and those who want to work less desire to reduce their work week by 14.2 hours (12.86 hours in 2015 and 14.9 hours in 2016) while those who want to work more want to increase their work week by 17.4 hours (12.51 hours in 2015 and 18.9 hours in 2016), the total level of underemployment in the profession is negative. A negative underemployment indicates the need to add veterinarians to the workforce. Because this negative underemployment occurs in different practice types and regions of the country and may not be sufficiently large enough in any specific local area and practice type, however, adding an additional veterinarian in any specific practice or place of employment may not be feasible and thus this measure of negative underemployment cannot be used to define a level of excess demand. Indeed, this misdistribution of underemployment and negative underemployment illustrates the importance of labor indivisibility in the veterinary profession.

Differences in the current work week of veterinarians reporting they wish to work fewer hours for lower compensation are dramatic, with those in advanced education indicating a mean current hourly work week exceeding 60 hours. Representatives of more than half of practice types were exceeding a 50-hour work week and expressed a desire to reduce this by a sufficient number of hours to move closer to a 30-40 hour work week. In private practice, equine practitioners who wished to work fewer hours for less compensation wanted the greatest mean reduction in hours per week (20.5 hours), while companion animal practitioners (exclusive) who sought fewer hours per week with a reduction in compensation sought the lowest hourly work week reduction (13.3 hours). In public practice, practitioners in industry and commercial organizations who wished to work fewer hour for less compensation wanted the greatest mean reduction in hour per week (22), while uniformed service practitioners wanted the smallest mean reduction in hours per week (8.6) (Figure 38).

NEGATIVE UNDEREMPLOYMENT BY PRACTICE TYPE, 2017

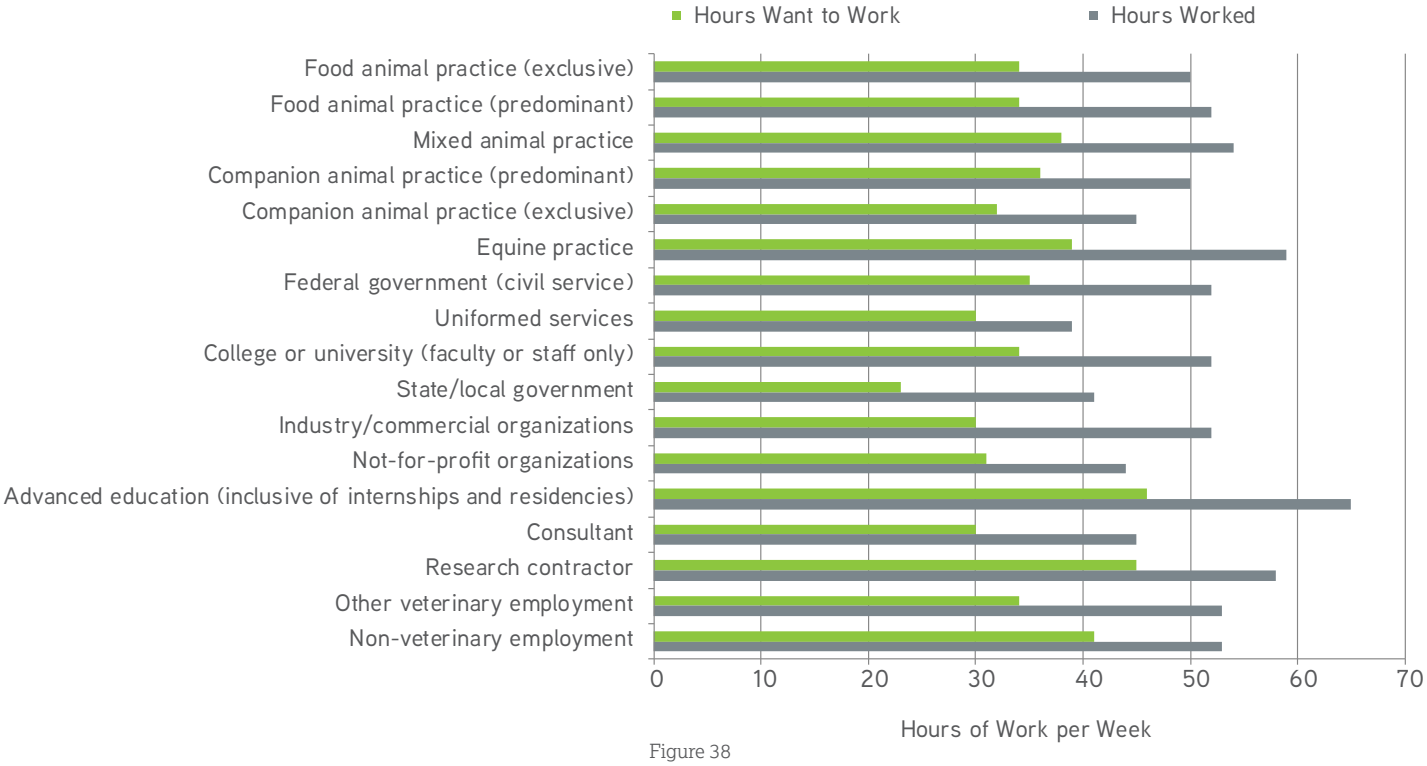


Figure 38

While there were considerable differences in underemployment by practice type, there was little difference across regions. In general, for veterinarians who indicated a desire to reduce their hourly work week for less compensation, the average current hourly work week in each region was near the 50-hour mark. These veterinarians wished to reduce their hourly work week to get under the 40-hour work week.

Region 1 had the lowest mean number of hours worked per week at 44.9 hours and one of the smallest means desired in a reduction of hours worked 12.7 hours, along with Region 0 (12.6 hours). Conversely, Region 7 had the highest mean hourly work week (50.8 hours), and at 16.6 hours, Region 6 had the largest mean desired reduction in hours worked (Figure 39).

NEGATIVE UNDEREMPLOYMENT BY REGION, 2017

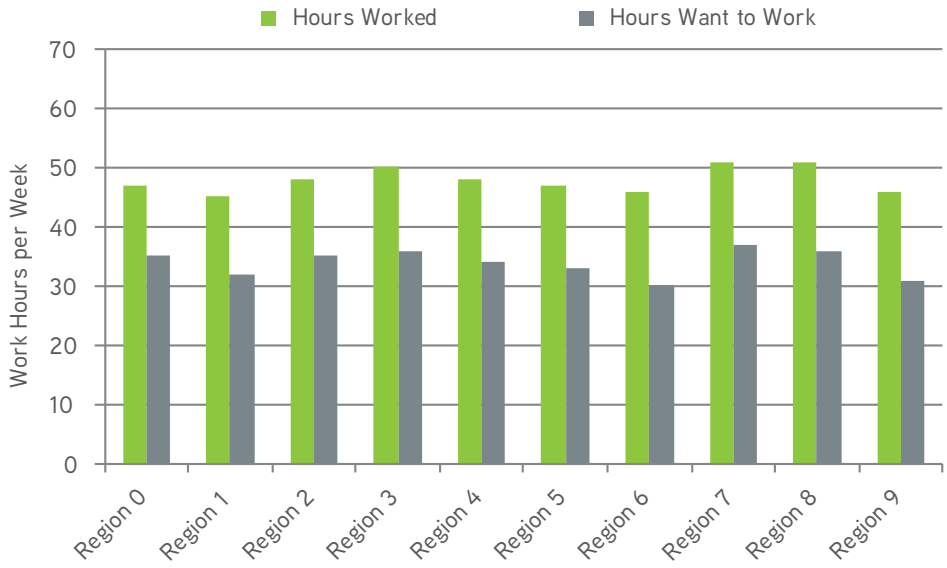


Figure 39

FACTORS CORRELATED WITH UNDEREMPLOYMENT

Following the methods used to identify the factors that are correlated with employment, a similar approach was used to determine the factors that are correlated with underemployment. In the following estimated equation, we identify factors that affect the number of hours veterinarians work. An ordinary least squares regression was performed and included the following variables: veterinary practice type, highest level of education, years of experience practicing veterinary medicine, workplace location, desire to change living location, gender, debt, income, part-time status, home ownership (mobility), marital status, number of children in household, and health. Respondents who reported desiring a decrease or an increase of more than 40 hours per week were excluded from the regression.

An ordinary least squares regression is an equation in which unknown parameters are estimated such that the difference between observed and predicted variables is minimized. The resulting model can be expressed in a formula such that controlled variations in the independent variables are used to predict the dependent variable (the variable being explained). The dependent variable in the following regression is the number of hours the respondent wants to add or subtract from his or her current workload. He or she is willing to take a pay cut to reduce hours and, of course, receive an increase in compensation for working additional hours.

Variables significant in explaining underemployment or negative underemployment in veterinary medicine are veterinarians who obtained a DVM degree and a specialized degree who wanted to work on average 10 additional hours per week; health, with veterinarians reporting their health as fair wanting to work on average five hours less per week; gender, with males wanting to work on average six additional hours per week; debt, with veterinarians with remaining educational debt wanting to work an average of .2 hours (~12 minutes) more for every 10 percent increase of debt above the mean; part-time, with veterinarians who work part-time wanting to work almost 19 hours more per week; and veterinarians in food animal (exclusive), uniformed services, and non-veterinary employment, with respondents from the first two categories expressing a wish to work an average of an additional 11 hours more, and non-veterinary employment eight hours more per week (Table 25).

In the previous year's report, factors identified as significant in explaining the variation to work fewer or more hours were DVM degree and a Masters degree, DVM and a specialized degree, gender, years of experience, income, part-time, working in Region 1, Region 5, Region 6, Region 7, Region 8 and Region 9, and federal goverment. Males wanted to work approximately six hours more and veterinarians with a specialized degree wanted to work 21 hours less (see the *2017 Report on The Market for Veterinarians* for more details).

FACTORS CORRELATED WITH UNDEREMPLOYMENT

Dependent Variable: Desired Change in Work Hours per Week	Coef.	Std. Err.	t	P>t
DVM	-0.84	3.12	-0.30	0.790
DVM + Ph.D.	8.7	5.4	1.60	0.110
DVM + M.S.	1.1	2.2	0.50	0.620
DVM + Specialized degree (J.D., M.D., E.D.)	10	5.4	1.90	0.070
Home Owner	-1.7	1.7	-1.00	0.310
Male	6.1	2	3.10	0.000
Years of Experience	-0.2	0.2	-1.20	0.230
Married	0.7	1.8	0.40	0.720
Want to change living location	0.8	1.5	0.60	0.570
Children	-0.2	0.8	-0.30	0.770
Health 1 - Poor	-0.9	5.8	-0.20	0.880
Health 2 - Fair	-5.3	3	-1.80	0.070
Health 3 - Good	-1.9	2.1	-0.90	0.370
Health 4 - Very Good	-3.3	2.1	-1.50	0.120
Health 5 - Excellent (Omitted)				
Log of Remaining Educational Debt	1.9	0.9	2.10	0.040
Log of Annual Income	-1.1	1.2	-0.90	0.350
Part-time	18.8	2.5	7.40	0.000
Region 0	3.6	3.4	1.00	0.300
Region 1	1.4	2.8	0.50	0.600
Region 2	0.9	2.7	0.30	0.730
Region 4	3.5	2.8	1.30	0.210
Region 5	4.4	3.1	1.40	0.160
Region 6	2.4	3	0.80	0.420
Region 7	3.2	3.1	1.10	0.300
Region 8	0.3	3	0.10	0.930
Region 9	3.2	2.8	1.10	0.260
Food Animal Exclusive	11.3	6	1.90	0.060
Food Animal Predominant	5.5	5.7	1.00	0.340
Mixed Animal	-2.3	2.7	-0.80	0.400
Companion Animal Predominant	0.5	2.2	0.20	0.820
Equine	-3.3	4.1	-0.80	0.420
Federal Government	-0.1	6.9	0.00	0.980
Uniformed Services	10.9	5.8	1.90	0.060
College/University	2.2	4.2	0.50	0.610
State/Local Government	10.1	13.5	0.80	0.450
Industry/Commercial Organization	11	9.8	1.10	0.260
Not-for-profit Organization	-3.5	4.9	-0.70	0.470
Advanced Education	-2.3	4.2	-0.60	0.580
Other Veterinary Employment	1.8	8	0.20	0.830
Non-Veterinary Employment	8.1	4.5	1.80	0.070
Constant	-17.7	17.2	-1.00	0.310
Observations	693			
Prob > F	0.000			
Adjusted R-Square	0.223			

Consultant and research contractor were removed from the model because the number of observations did not permit estimation.

Table 25

To better understand the variation in underemployment, factors affecting mobility were examined. Mobility was determined by using home ownership as a proxy. If the workforce is highly mobile then differences in unemployment rates, underemployment and incomes across regions and within regions between business areas should begin to decline. Factors thought to contribute to reducing job mobility are marital status, number of children and preferences for type of community and size of business. Factors omitted from the equation, to use as a base, are single and no change in community or practice size. Factors that were statistically significant with an increased probability of being less mobile (owning a home) were married, widowed, divorce, and children at home. Factors that were statistically significant with a decreased probability of being less mobile were preference for a smaller community and preference for a larger community (Table 26).

FACTORS CONSIDERED IN EXPLAINING MOBILITY

Logistic regression	Number of obs.	=	2,383		
	LR chi2(10)	=	497.63		
	Prob > chi2	=	0.000		
Log likelihood = -1178.8214	Pseudo R2	=	0.1743		
	Odds Ratio	Coefficient	t-statistic	p-value	Probability
Married	4.290	1.457	11.98	0.000	329%
Separated	1.870	0.626	1.28	0.200	87%
Widowed	7.210	1.976	2.53	0.010	621%
Divorced	3.350	1.209	5.04	0.000	235%
Children at Home	2.070	0.727	10.12	0.000	107%
Prefer Smaller Community	0.630	-0.466	-2.58	0.010	-37%
Prefer Larger Community	0.460	-0.782	-5.42	0.000	-54%
Prefer Smaller Practice	1.060	0.061	0.31	0.760	6%
Prefer Larger Practice	0.910	-0.09	-0.67	0.500	-9%
Constant	0.660	-0.417	-3.9	0.000	-34%
Omitted categories: single/never married, prefer same size community, prefer same size practice					

Table 26

MALDISTRIBUTION OF VETERINARIANS

Four states and Puerto Rico are shown to have less than the national average concentration of veterinarians while most states have between 0.8 and 1.25 of the concentration of veterinarians compared to the national average.

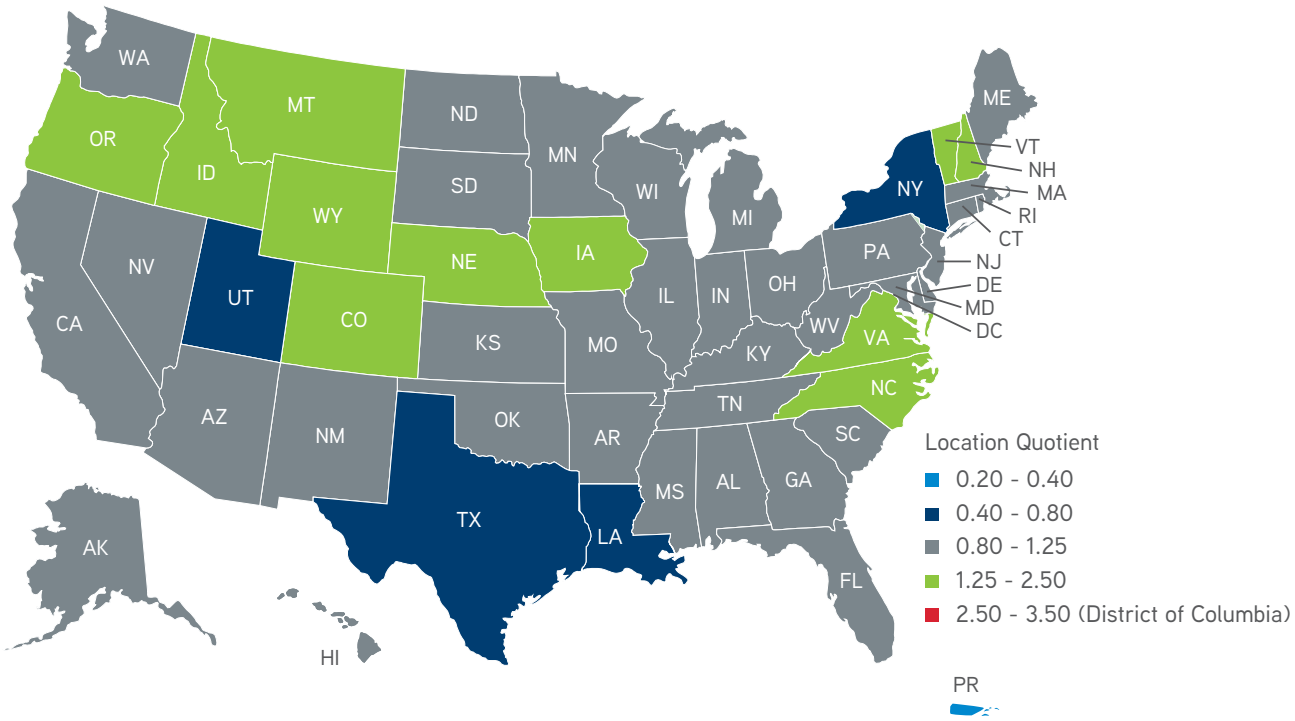
The variation in incomes, unemployment and underemployment by region and practice type are descriptive of symptoms of maldistribution. Maldistribution suggests that the spatial distribution by practice type of the supply of veterinarians does not align with the spatial distribution by practice type of demand for veterinarians.

A location quotient can be used to evaluate maldistribution. The location quotient provides a way to quantify the regional concentration of a specific occupation in comparison to the national average. Specifically, a location quotient for veterinarians compares the number of veterinarians as a percent of all employees in a specific area to the number of veterinarians as a percent of all employees in the United States. Thus, a location quotient of "1" means that the concentration of veterinarians (percent of veterinarians in the workforce) in the local area is equal to the concentration of veterinarians nationally. A location quotient above "1" suggests the concentration of veterinarians is greater in the area than nationally, and below one suggests that the concentration of veterinarians is less in the area than nationally.

The Bureau of Labor statistics tracks veterinarian employees and has mapped by state the location quotient of these workers (veterinarian practice owners are omitted). Four states and Puerto Rico are shown to have less than the national average concentration of veterinarians while most states have between 0.8 and 1.25 of the concentration of veterinarians compared to the national average. Eleven states, however, have between 1.25 and 2.5 times as many veterinarian employees

per total employees in the state than occurs on the average nationally. This variation in concentration, all other factors being equal, should align with the income, unemployment and underemployment statistics. Of course, all other factors are not equal. Cost-of-living differences will interfere with income differences between the states and the median household income variation between states will affect the demand for veterinarians as will the number of pets per household and the extent of the human-animal bond of pet–owning households. Finally, because practice owners are not included in this location quotient, the average number of veterinarians per practice will also affect the quotient (Figure 40).

LOCATION QUOTIENT OF VETERINARIANS BY STATE, 2016



Source: The Bureau of Labor Statistics

Figure 40

AVMA maintains a database of all U.S. veterinarians who have graduated from a U.S.-accredited college of veterinary medicine, and any veterinarian who graduated from a non-U.S.-accredited college and has become an AVMA member. Using this database of roughly 110,531 active veterinarians in the United States, a location quotient was computed for each state. Utah, Hawaii and California still have a concentration of veterinarians below the national average but are joined in this condition by New Jersey. Despite Idaho, North Carolina, New Hampshire and Virginia no longer appearing in the higher concentration category, the number of states with a higher concentration of veterinarians than the national average has grown to 14, with the addition of Maine, Kentucky, Alabama, Wisconsin, South Dakota, Kansas and Oklahoma (Figure 41).

LOCATION QUOTIENT OF AVMA VETERINARIANS BY STATE, 2017

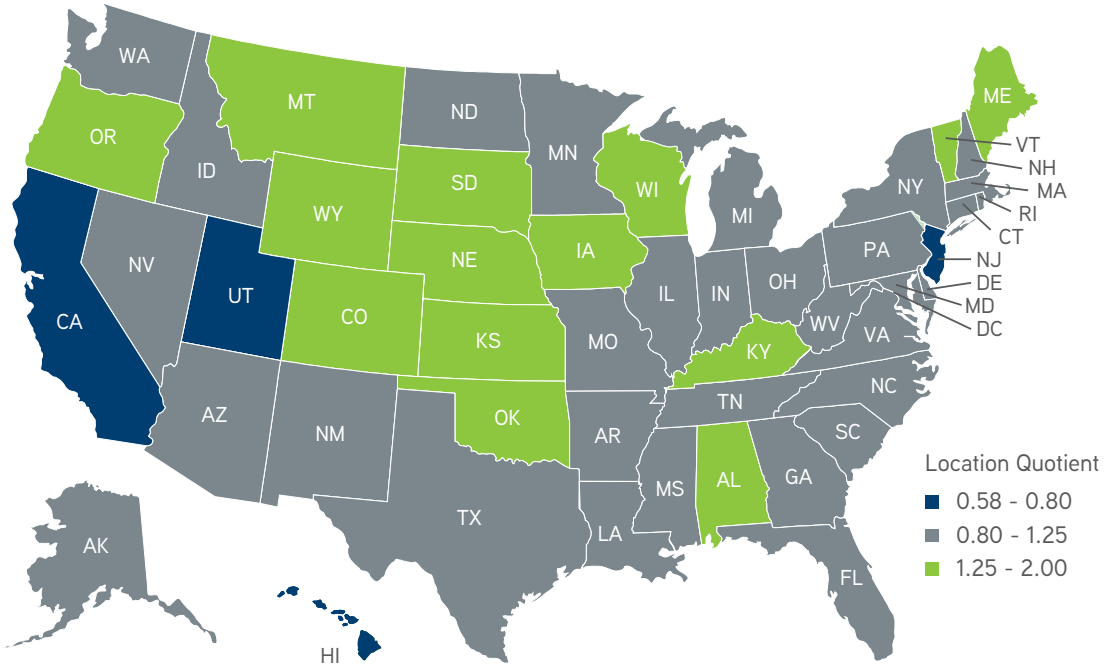


Figure 41

The location quotient was calculated for new AVMA veterinarians and mapped by state. The pattern is similar to the pattern found in the map of the location quotient for all veterinarians but there are more states with a location quotient below the national average. The concentration of new veterinarians to employed veterinarians in California, Utah and Hawaii, however, was below the national concentration. That the location quotient for new graduates is also less than 1 in these states where the location quotient for the profession is less than 1, suggests an increasing scarcity of veterinarians. Hence, these three states should see lower unemployment and more negative underemployment; and higher incomes relative to the cost of living (Figure 42).

LOCATION QUOTIENT OF NEW VETERINARIANS BY STATE, 2017

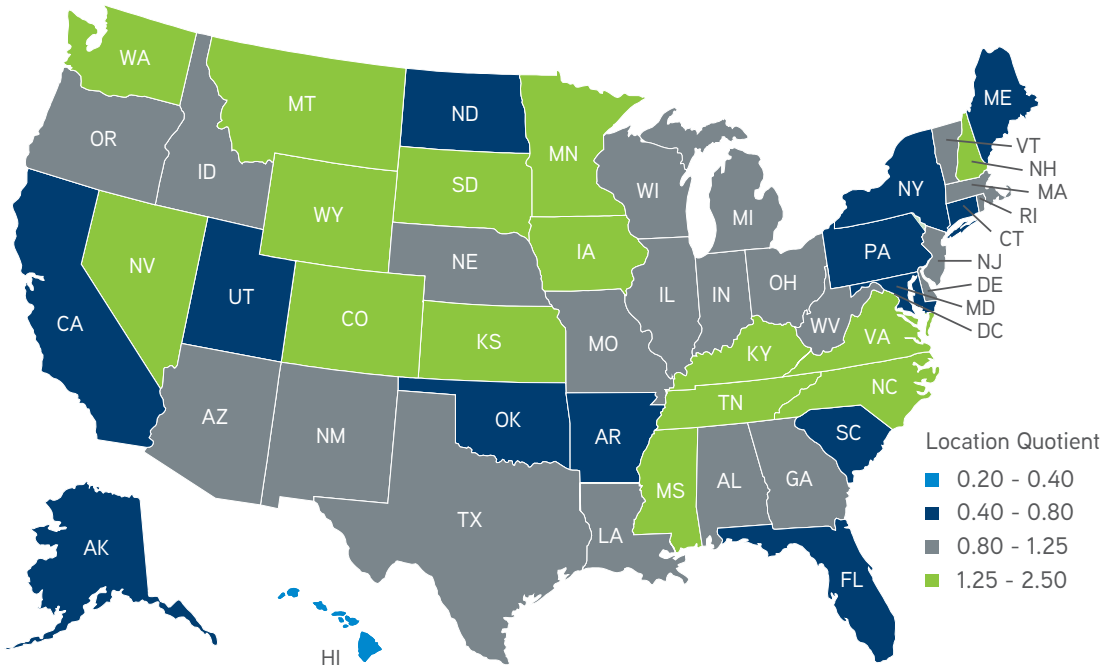


Figure 42

DISTRIBUTION OF VETERINARY JOBS AND APPLICANTS

Using the labor quotient provides an overview of the supply and demand for veterinarians at the state level, but veterinary hospitals comprise nearly 70 percent of employment opportunities and the markets (business areas) for most of these hospitals is less than 10 miles (area where 90 percent of clients reside). Thus, the state location quotient might not be adequate in identifying the problem of maldistribution that occurs within smaller areas of states.

Using the VCC data, the location of the applicants and the employment opportunity can be mapped to identify "hot" areas for employment (small numbers of applicants per employment opportunity) and "cold" areas (large number of applicants per employment opportunity). The map below posts the location (one dot for one applicant) for 4,138 active users (applicants) who provided their ZIP code information. The distribution is strongly concentrated in the eastern United States (Figure 43).

VCC REGISTERED USERS, 2017

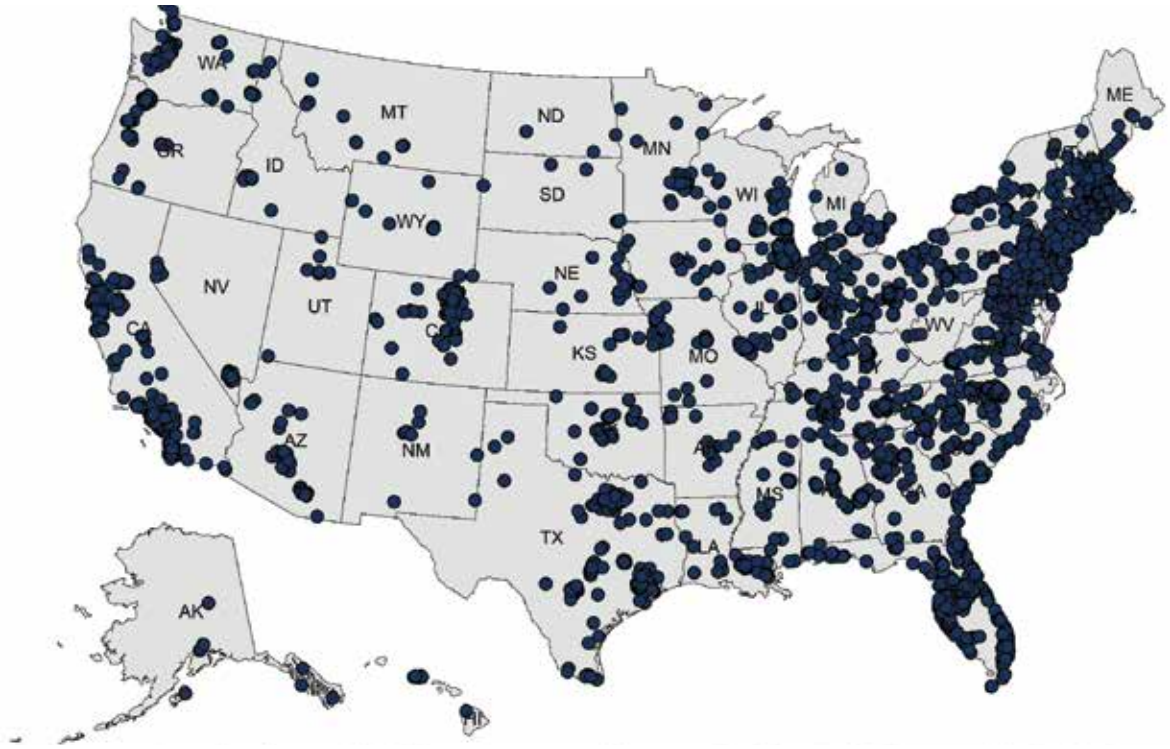


Figure 43

The distribution of VCC active job listings for 2017 appears to be similar to the distribution of active registered users, but their number is shown to be much more concentrated in the eastern third of the United States (Figure 44).

To focus attention on the areas that have "hot" and "cold" labor markets, a state-level supply/demand (S/D) map can be created using the VCC data. The green states are areas where the number of applicants to employment opportunities is high, with Alabama and Mississippi having 1.10-1.45 applicants per employment opportunity. Iowa's S/D ratio is where the number of applicants to employment opportunities is around 1:1, while the remaining states have a low S/D ratio indicating more employment opportunities than applicants (Figure 45).

Using the dot map to plot the job applicants per DVM job listing provides a clearer illustration of the localized veterinary labor markets. The larger the circle the more applicants that exist per job listing. These larger areas represent potential cold spots for veterinary labor. Competition for each available employment opportunity in these areas is stiff and this is likely to hold down income growth in these areas (Figure 46).

One contributing factor to the problem of maldistribution in the profession is community background of the veterinarians. New veterinarians seek employment in communities similar to those where they grew up. While the U.S. Census has no definition (nor statistics) for suburban communities, most people have an idea of the suburbs. However, the idea of what a suburb is varies considerably. Communities that surround urban centers is the most common perception of a suburb, but some who live in communities of more than 10,000 people within proximity of an urban center, but not attached to it, may consider themselves suburban or rural (Table 27).

VCC DVM JOB LISTINGS, 2017

Figure 44

VCC APPLICANT-TO-AVAILABLE-JOBS RATIO, 2017

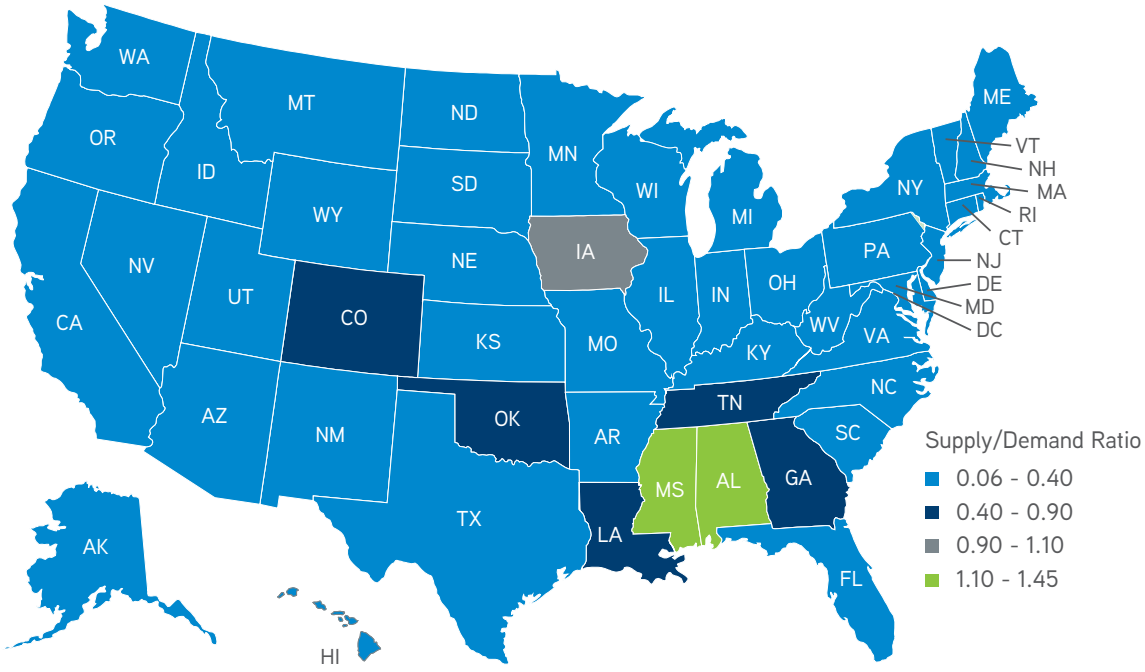


Figure 45

VCC JOB APPLICANT QUANTITY PER DVM JOB LISTING, 2017

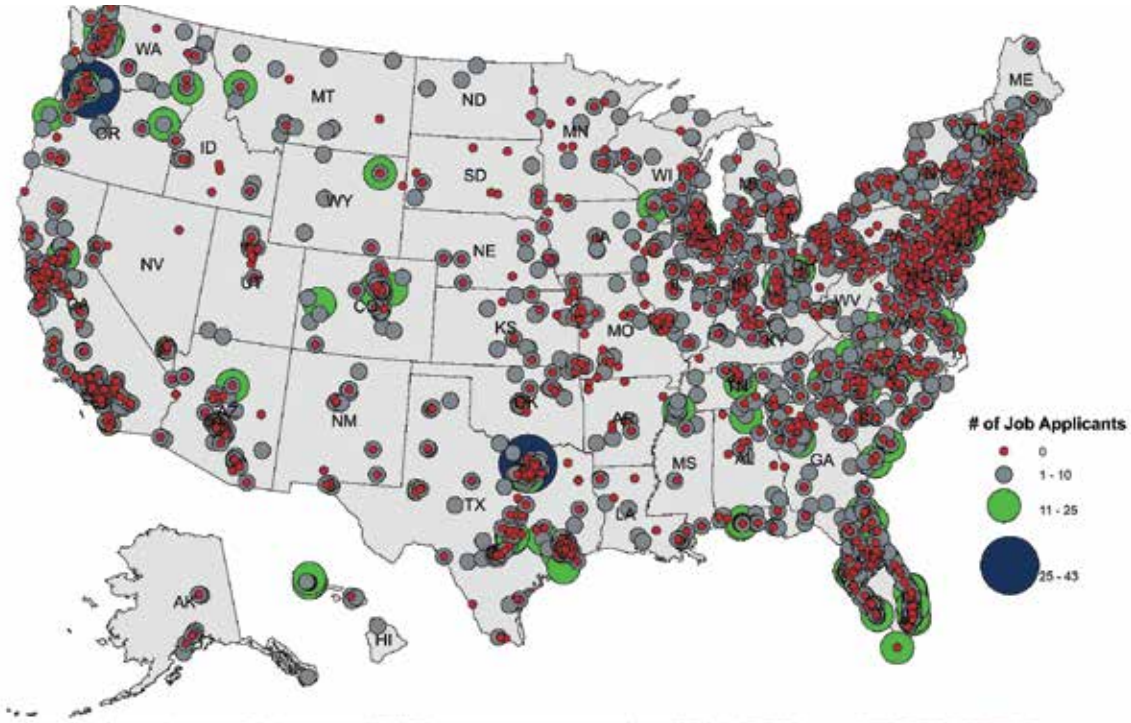


Figure 46

NEW VETERINARIAN COMMUNITY

	Grew Up	Found Employment			
		Rural	Suburb	Urban	Total
2013-2016	Rural	757	320	140	1,217
	Suburban	1,164	3,804	842	5,810
	Urban	480	994	1,674	3,148
	Total	**2,401**	**5,118**	**2,656**	**10,175**

	Grew Up	Found Employment			
		Rural	Suburb	Urban	Total
2016	Rural	204	71	38	313
	Suburban	316	982	210	1,508
	Urban	133	258	398	789
	Total	**653**	**1,311**	**646**	**2,610**

	Grew Up	Found Employment			
		Rural	Suburb	Urban	Total
2017	Rural	196	89	36	321
	Suburban	346	986	189	1,521
	Urban	127	252	363	742
	Total	**669**	**1,327**	**588**	**2,584**

Table 27

VETERINARIAN WELLBEING

Those who graduated prior to 1995 and paid off their student loans did so in less than 10 years, while for years later than 1995 fewer veterinarians have been able to pay off their loans in a 10-year period.

In an effort to address the growing concern over the wellbeing of veterinarians, the AVMA has been collecting data on self-reported wellbeing of veterinarians. The purpose of this collection has been to attempt to find correlations of wellbeing with employment and demographic characteristics. If, in fact, there is a problem with wellbeing in the veterinary profession, then it is important to know what factors are contributing to lower levels of wellbeing.

In addition to self-reported wellbeing measures, the Professional Quality of Life (ProQOL) subscale questions are included in surveys and compassion satisfaction, burnout and secondary traumatic stress scores are calculated for each respondent. In addition, these three scores can be used as dependent variables in measuring the impact of factors that, conceptually, are thought to contribute to compassion satisfaction, burnout or secondary traumatic stress.

The structure of this section follows from the data available on the possible causes of negative wellbeing: student debt load, job, career and lifestyle satisfaction, expenditure patterns, burnout scores and self-reported health evaluations.

STUDENT DEBT LOAD

The literature on debt of practicing veterinarians, while considerable, tends to focus on debt at graduation, since this amount is fairly easy to measure and most graduates are in a simliar lifestage. Less studied is how that debt changes over time according to the experiences (both work experience and personal experience) of practitioners who have been out of school for some time. Admittedly, the problem of large student loan debts has accelerated in recent years, but there are few studies that show, beyond qualitative and personal stories, that DVMs are managing their educational debt rather well. The following figures describe the debt at the start of a veterinarians' career and currently for respondents, according to when an individual graduated from veterinary school.

Figure 47 shows the average debt incurred for each of the sampled graduating classes, with those graduating before 2004 grouped by spans of time. In line with the general population, the level of incurred debt has generally followed an upward trend, with variations most likely due to variation in the respondent sample size in each year. Of those who incurred debt and graduated before 2008, the current amount owed is less than the original balance, but the current debt reported exceeds the incurred debt of most of the respondents who reported graduating after 2008.

VETERINARY COLLEGE DEBT BY GRADUATION YEAR, 2017

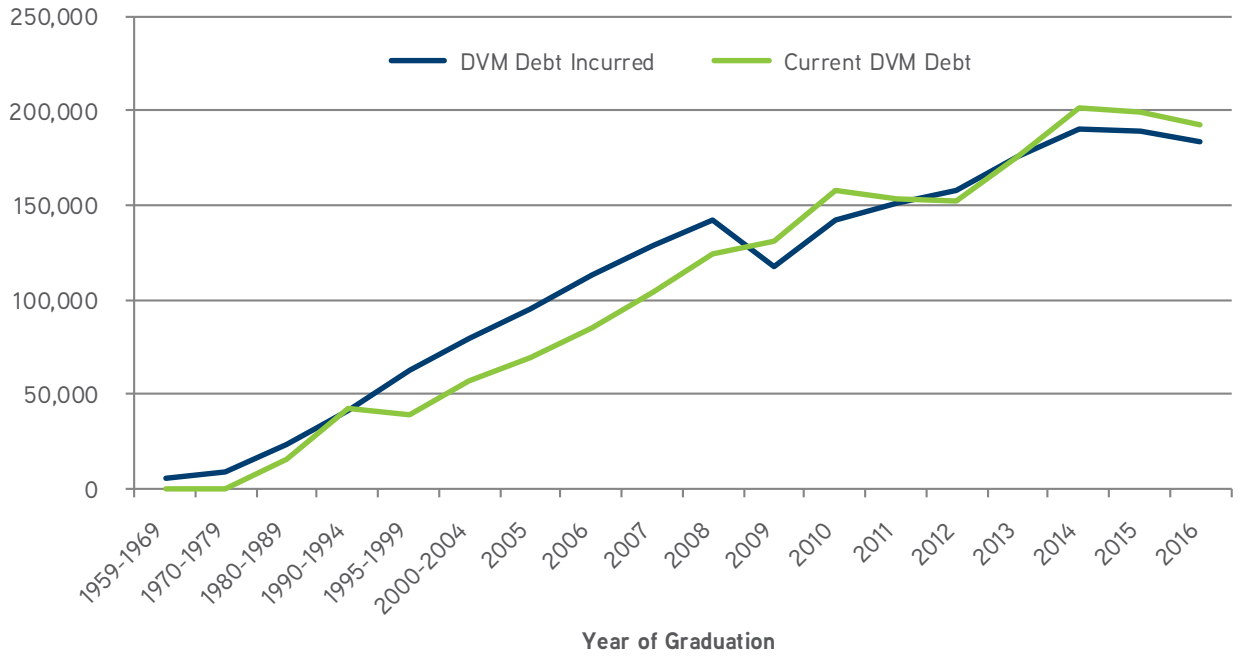


Figure 47

The next debt chart shows the dynamics of how that student loan debt has been paid off (Figure 48). Most veterinarians who graduated before 1990 have paid off their student loans and did so in less than 10 years. For those who graduated after 1990, the proportion of borrowers who still owe on their loans increases proportionally according to their year of graduation, with 5 percent to 30 percent of those who graduated since 2006 having paid off their loans. As a comparison, those who graduated prior to 1995 and paid off their student loans did so in less than 10 years, while for years later than 1995 fewer veterinarians have been able to pay off their loans in a 10-year period. For those who graduated between 1995 and 1999 only 69 percent paid off their loans in 10 years, for those who graduated between 2000 and 2004 that drops to 38 percent and for those who graduated in 2006, only 16 percent were able to pay off their loans in 10 years or less. After 2006 there is fluctuation with the percent of veterinarians having been able to pay off their loans in a 10-year period by graduation year, but overall, fewer and fewer veterinarians are able to pay off their loans in 10 years or less time.

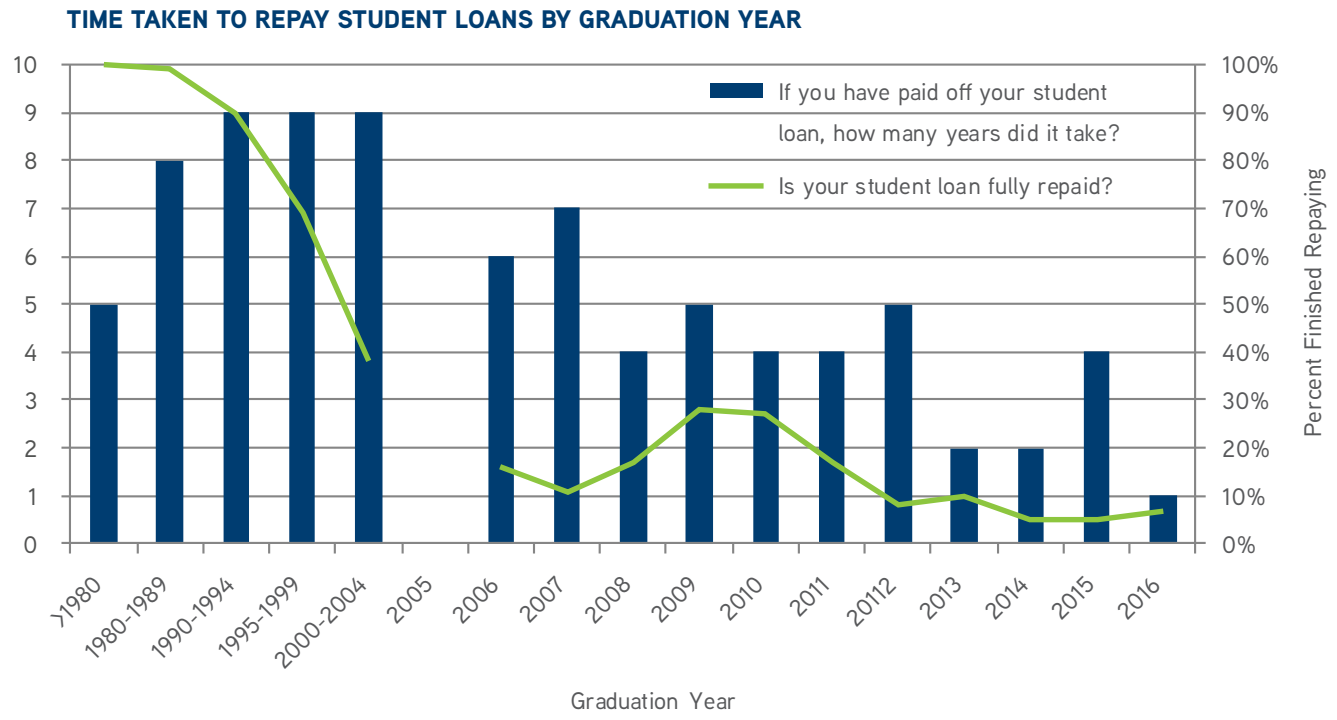


Figure 48

Although student loan debt was significantly lower in previous decades, the time taken to repay loans was generally five-10 years. With student loan balances much higher now, both in nominal dollars and as a percent of income, one would expect that the time required to repay loans will be significantly higher in the future. Indeed, income-based student loan repayment programs allow a borrower to be in repayment for up to 25 years. Thus, as the majority of new graduates will require a full 25 years to repay their loans and this group will continue to grow as a percentage of the total veterinary workforce, a negative impact on job, career and lifestyle satisfaction might begin to appear.

JOB, CAREER AND LIFESTYLE SATISFACTION

The compensation that a veterinarian receives from an employer should represent the price at which the veterinarian is willing to sell his or her labor and the price at which the employer is willing to pay for that labor. In a perfectly competitive market for veterinarians, the level of compensation conceptually represents an equilibrium point: that level of compensation where the willingness of the veterinarian to sell his or her labor is equal to the willingness of the employer to purchase the same amount of labor. The level of compensation and hours of labor provided is a negotiated settlement between the labor provider and the employer. In this case, the hours of labor and total compensation pair represents a point on both the curve of the demand for veterinary labor (veterinarians) and the curve of the supply of veterinary labor. But because the veterinarian is not a homogenous product and each veterinarian can be differentiated by differences in veterinary medical skills, business acumen, client services and individual characteristics, there will be considerable variation in compensation at any point in time.

In terms of supply, the relationship is between the number of hours veterinarians are willing to provide and the compensation required to provide them. The important question to answer pertains to veterinarians' willingness to provide hours of labor at specific levels of compensation. An argument can be made that because of veterinarians' limited ability to use their DVM for other employment opportunities with similar compensation, they are forced to accept employment out of the need to repay the high cost of their education. Thus, the level of compensation does not correctly reflect their willingness to sell their labor for their current level of compensation. That is, it may be that they are taking what they can get but are not satisfied with what they are earning.

To discover veterinarians' willingness to provide the quantity of labor at the level of compensation they currently earn, answers to questions about underemployment can reveal some insight. From the AVMA census survey, it is clear that there were both veterinarians working more hours and fewer hours than they wished. More specifically, some veterinarians indicated they wished to work more hours for more compensation while others indicated they wished to work fewer hours for less compensation.

However, this leaves open the question, "Would you like to work fewer hours at the same level of compensation?" and "Would you be willing to work more hours for the same level of compensation?"

The addition of these two questions would close the gap in analyzing the decision process but still would not adequately address the issue of willingness to sell. To address that question specifically requires an understanding of the schedule of number of hours that each veterinarian is willing to work and the compensation at each amount of hours worked.

Unfortunately, obtaining objective information on willingness of the individual veterinarian to sell his or her labor is difficult. Instead, another approach is to measure the level of satisfaction veterinarians report for their current employment and the relationship between that satisfaction and income. If income is an important factor in determining the level of satisfaction, then the relationship between satisfaction and level of income should be both economically and statistically significant. An analysis of the respondents to the 2017 Census of Veterinarians Survey found a large and statistically significant relationship between income and job satisfaction.

From the survey, the relationship between the expressed level of satisfaction on a seven-point scale where "1" was "not at all satisfied" and "7" was "extremely satisfied" is best defined by those whose level of compensation exceeds $100,000. Very few of these higher-income earners indicated they were not satisfied (a 1 or 2 on the seven-point scale), while the majority of higher earners indicated they were at least pretty to extremely satisfied (a 5 to 7 on the seven-point scale). However, there were low earners (below $50,000) who indicated all levels of satisfaction.

In the 2017 Census of Veterinarians, the job satisfaction reported by respondents is similar to that of the 2016 census. Most respondents fell between an annual income of $50,000 and $99,000. Within this group the majority of respondents were neither satisfied nor dissatisfied with their job, giving the median rank of 4 out of 7. Within the group whose income was the highest, above $200,000, the majority of respondents were extremely satisfied with their jobs, selecting a score of 7 out of 7 (Figure 49).

In line with their satisfaction with current employment, respondents indicated a very similar pattern in satisfaction with compensation. Approximately 52.8 percent indicated satisfaction above the central measure (5-7) while 20.5 percent indicated a greater level of dissatisfaction (1-3) with compensation. Only 9.8 percent of those who were satisfied with their employment indicated a stronger dissatisfaction with their compensation (Figure 50 and Figure 51).

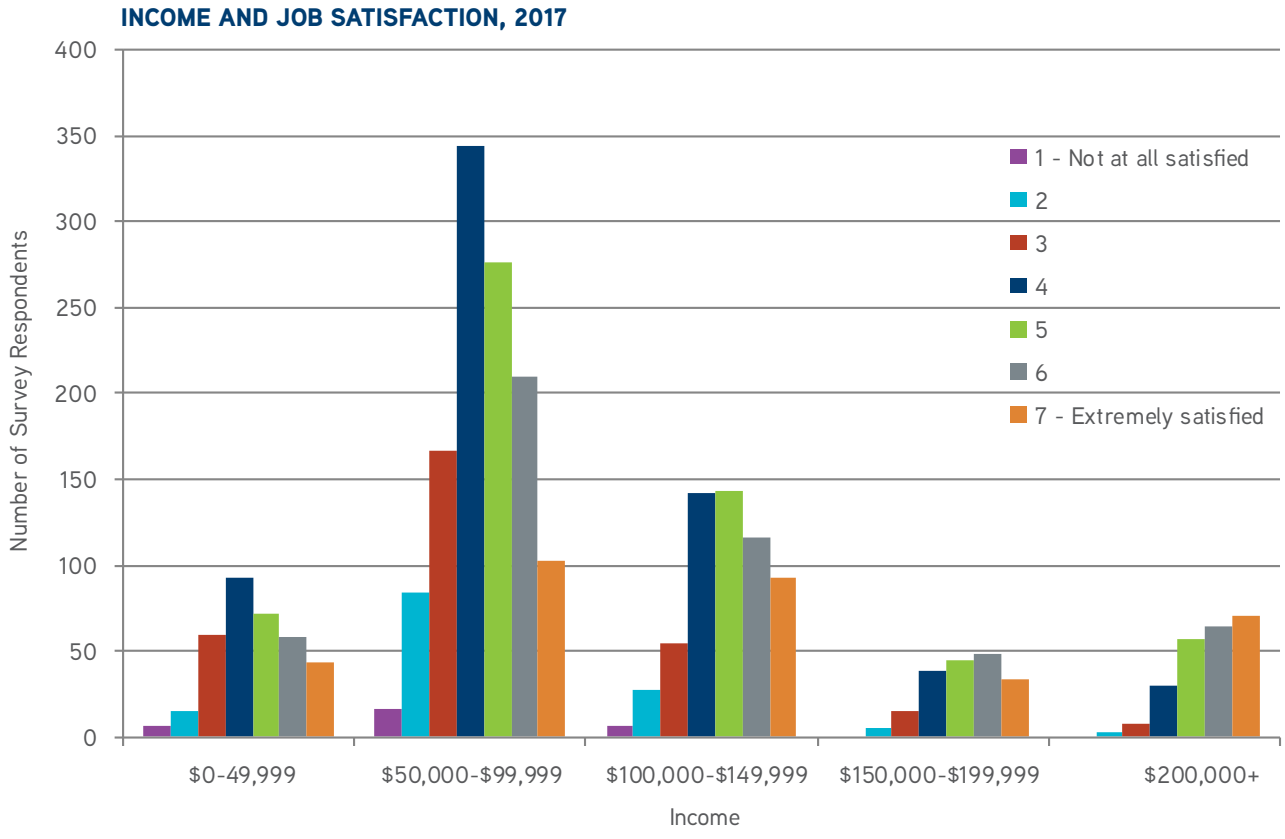


Figure 49

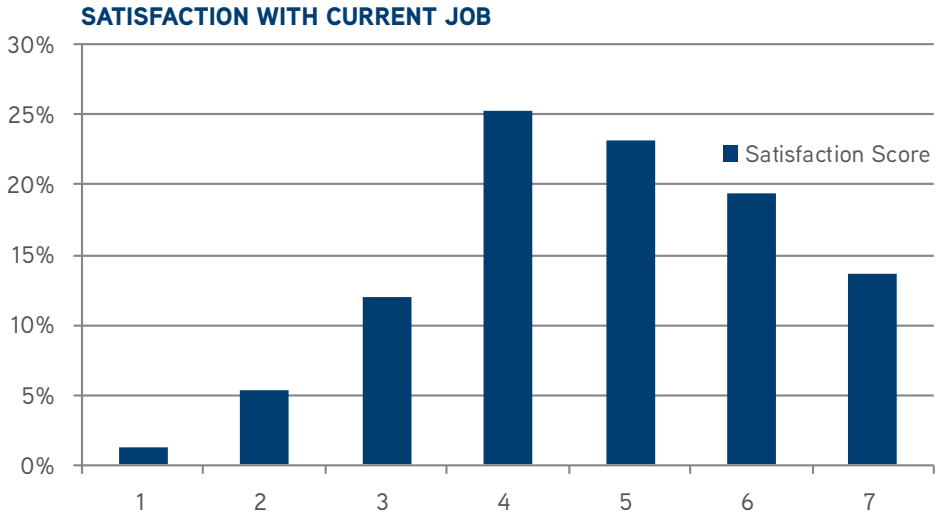


Figure 50

Veterinarians reported that they were less satisfied with their profession than with their current employment or compensation. Only 44.3 percent indicated satisfaction above the central point (4) while 25.5 percent indicated satisfaction below the central point (Figure 52).

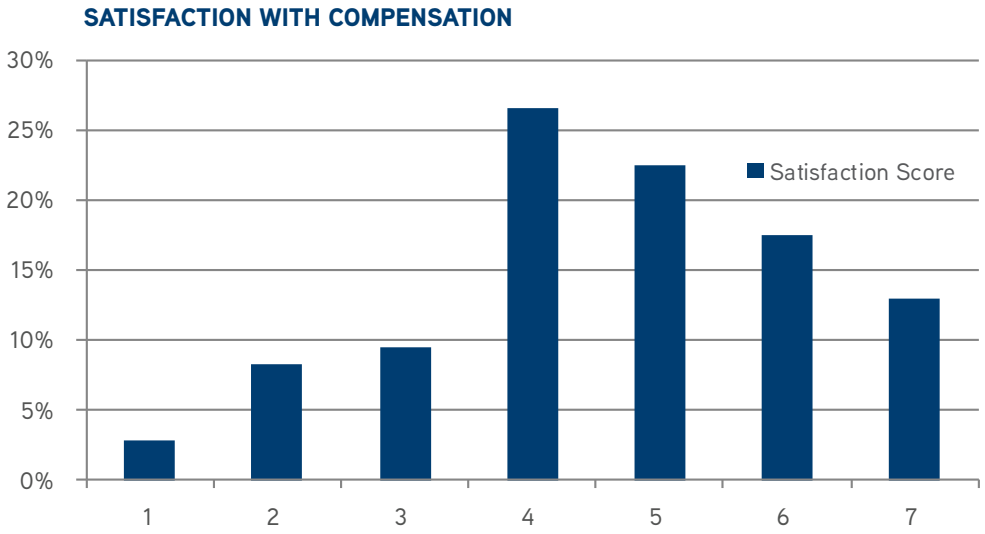


Figure 51

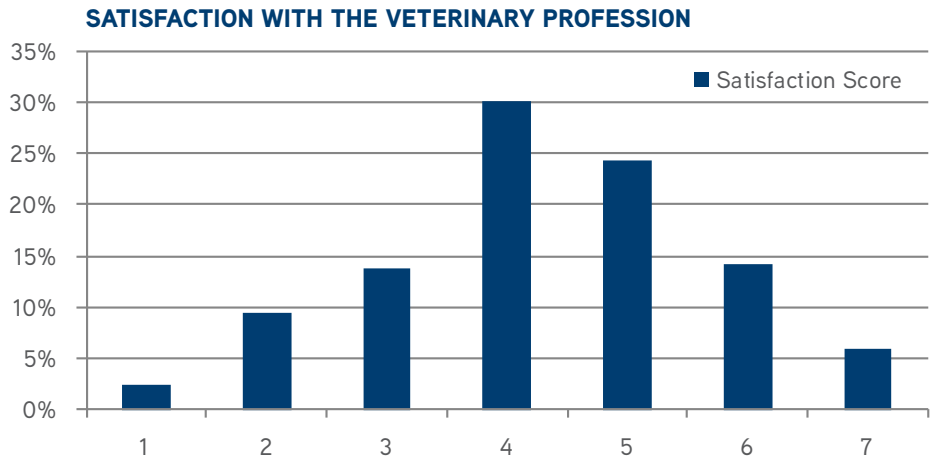


Figure 52

Following closely with the distribution of satisfaction with compensation, 53.4 percent of respondents indicated a level of satisfaction with their lifestyle above the central level while 21.2 percent indicated a level of dissatisfaction with their current lifestyle (Figure 53).

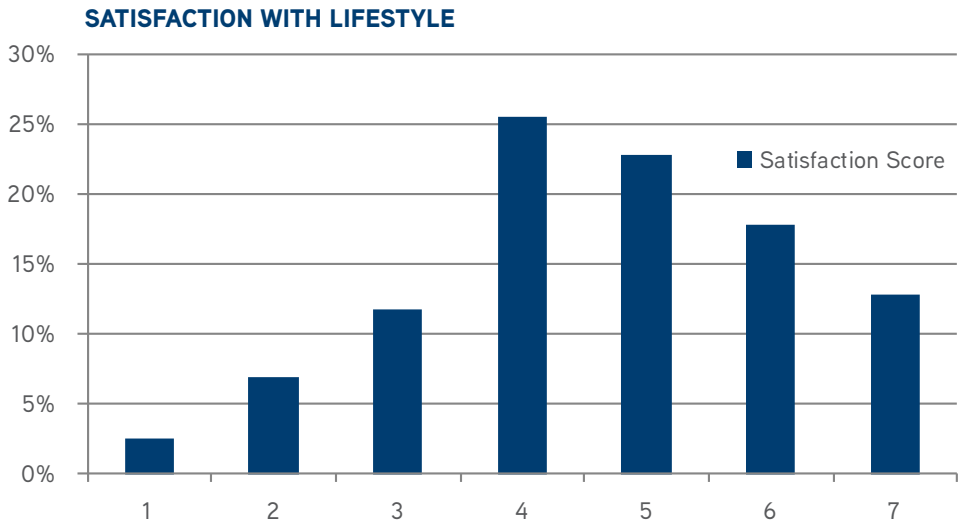


Figure 53

The four measures of satisfaction (employment, compensation, profession, lifestyle) illustrated in this series of charts appear to have similar distributions across levels of satisfaction. To determine how closely respondents replied to each question, a Pearson product-moment correlation matrix was generated for the four measures. The Pearson correlation coefficient measures the linear relationship between two variables. A positive coefficient indicates a positive or direct linear relationship and a negative value indicates a negative or indirect linear relationship. The coefficient value is between 0 and negative or positive 1; the greater the coefficient, the stronger the linear relationship. The level of significance (Sig. 2 tailed) provides a probability that the value of the relationship is 0. For all of the measures the probability that there is not a linear relationship is essentially 0 (.000). A measure of 1 would indicate that the satisfaction measures are perfectly correlated. That is, every respondent who indicated they were extremely satisfied with their employment would also indicate the same level of satisfaction with the correlated measure.

The correlation between each of the measures is strong and statistically significant and this indicates that those who are satisfied with one aspect (employment, compensation, profession and lifestyle) have the same or close level of satisfaction with the other aspects. Thus, these measures of satisfaction suggest a cohort that is dissatisfied with many aspects of their life (Table 28).

The relationship that exists between level of satisfaction with employment and mean income is statistically significant. On average, the mean income at each level of satisfaction is $12,000 greater than the previous, lower level of satisfaction. The biggest difference exists between those who have reported being remarkably satisfied with their job and those reporting being extremely satisfied with their job, with the two groups with respective mean incomes of $122,434 and $148,281 (Figure 54).

CORRELATIONS BETWEEN TYPES OF SATISFACTION

		How satisfied are you with your current employment?	How satisfied are you with the level of your total compensation?	How satisfied are you with the veterinary profession as a whole?	How satisfied are you with your current job?	How satisfied are you with your curent lifestyle?
How satisfied are you with your current employment?	Pearson Correlation	1	.487**	.402**	.797**	.546**
	Sig. (two-tailed)		.000	.000	.000	.000
	N	2,298	2,291	2,274	2,283	2,283
How satisfied are you with the level of your total compensation?	Pearson Correlation	.487**	1	.426**	.624**	.566**
	Sig. (two-tailed)	.000		.000	.000	.000
	N	2,291	2,620	2,601	2,610	2,611
How satisfied are you with the veterinary profession as a whole?	Pearson Correlation	.402**	.426**	1	.540**	.500**
	Sig. (two-tailed)	.000	.000		.000	.000
	N	2,274	2,601	2,603	2,601	2,610
How satisfied are you with your current job?	Pearson Correlation	.797**	.624**	.540**	1	.659**
	Sig. (two-tailed)	.000	.000	.000		.000
	N	2,283	2,610	2,601	2,612	2,610
How satisfied are you with your current lifestyle?	Pearson Correlation	.546**	.566**	.500**	.659**	1
	Sig. (two-tailed)	.000	.000	.000	.000	
	N	2,283	2,611	2,610	2,610	2,613

***Correlation is significant at the 0.01 level (two-tailed).*

Table 28

SATISFACTION WITH EMPLOYMENT AND MEAN INCOME

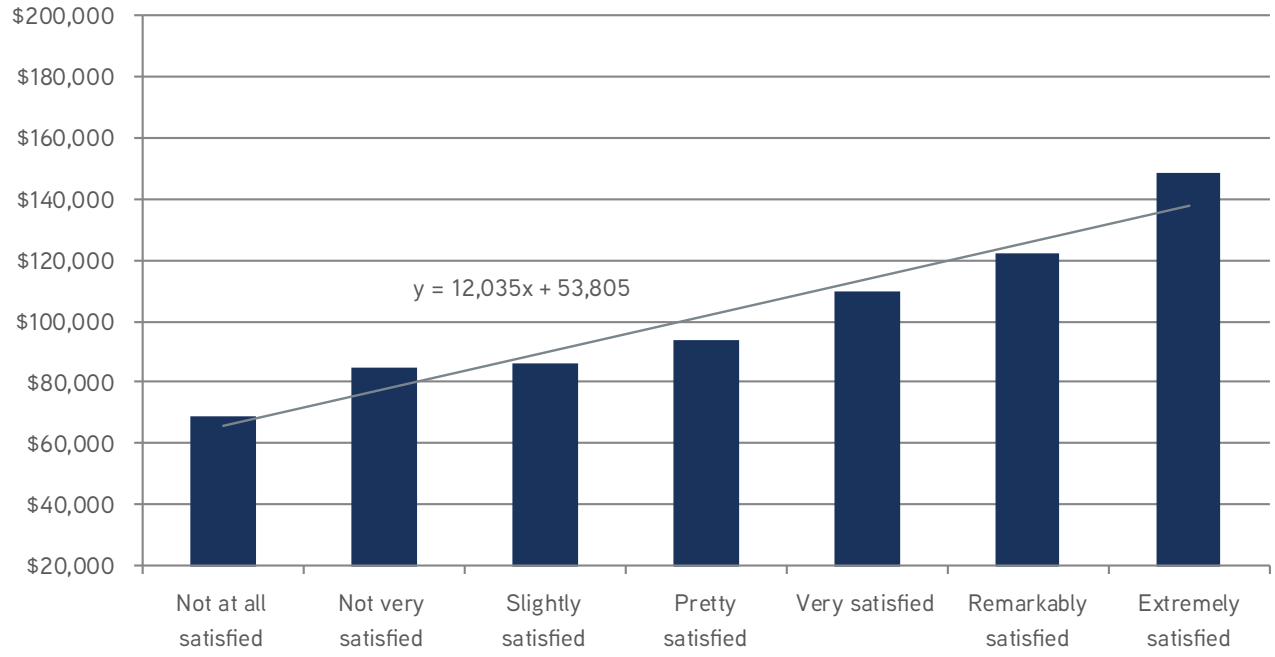


Figure 54

Of course, many factors contribute to satisfaction with employment, including actual hours worked compared to the number of hours desired, internal relationships, number of clients per day and level of debt. But there is a clear relationship between the level of income and satisfaction. This is important, especially to pre-veterinary and veterinary students and new veterinarians who may harbor the belief that compensation is unimportant as long as they are "doing what they love to do." While these data certainly suggest that this outlook may be true for some, generally this is not the case. The results are similar in an analysis of 2015 Compensation Survey data and 2016 Census of Veterinarians data.

The seven levels of responses provided a larger range of mean incomes, from a low of $69,149 from those who responded with a 1 (not at all satisfied), to a high of $148,281 from those who responded with a 7 (extremely satisfied). The linear relationship predicts a $12,000 difference between each level of satisfaction. The important point to take away from this is that the patterns of responses and levels of income are consistent across the two datasets, indicating the existence of a very real, measurable pattern: that higher levels of compensation are correlated with higher levels of satisfaction.

Most important is that, generally, veterinarians seem to be satisfied with their career choice with more than 50 percent of respondents indicating that they are at least very satisfied. Between 75 and 80 percent of respondents claimed to be at least a 4 (pretty satisfied) on the satisfaction scales.

The willingness of veterinarians to provide veterinary service labor, as indicated by this simple analysis, increases as compensation climbs. And this analysis suggests that a satisfaction level of 4 would generally require a level of compensation in the range of $90,000-110,000. In addition, according to previous findings, this level of compensation should occur at the optimum level of hours worked. While the relationship between compensation and number of hours of labor available defines the supply relationship, understanding the factors that affect the willingness of veterinarians to supply labor is important to determining the number of veterinarians needed to meet the demands for veterinary services.

The challenges in estimating the demand for veterinarians are similar to those for estimating the supply. Demand is the relationship between the hours of veterinarian labor and the compensation the employer is willing to pay for those hours. The market demand is the summation of all of the individual employer relationships between hours and level of compensation. As with supply, developing this relationship would require obtaining the willingness-to-pay information from employers.

Our data contain points where the veterinarian and the employer have agreed to a level of compensation and number of hours of labor. For each of these transactions, the employer might have been willing to pay more but was not forced to because the veterinarian accepted less. Or, the veterinarian received a greater level of compensation than he or she would have been willing to accept in return for the hours of labor required. Under normal market circumstances, the veterinarian would not provide labor for less than the compensation he or she was willing to accept, and the employer of veterinarian labor would not pay more for the labor needed than the employer was willing to pay. An abundance of labor and few opportunities for employment would cause the level of compensation to fall. A scarcity of labor in a market with many employment opportunities would cause the level of compensation to rise for the same amount of labor. Thus, over time, the changes in the level of compensation and the number of veterinarians employed can provide insight into the changing willingness of employers to pay for, and veterinarians to sell, veterinary labor.

In the market for new veterinarians, the compensation and number of veterinarians employed contains 14 aggregate annual observations (supply and demand equilibriums), while in the market for current veterinarians there are currently only eight such equilibrium points. This quantity of points is generally insufficient to estimate the demand relationship.

PERSONAL EXPENDITURE PATTERN

In the 2017 calendar year, a sample of 792 recent graduates completed the Personal Financial Planning Tool available on the AVMA website (https://www.avma.org/PracticeManagement/BusinessIssues/Pages/personal-financial-planning-tool.aspx). "Recent graduate" is defined as anyone who graduated between 2012 and 2016, which are the five most recent graduation years studied.

The expenditures of these early career veterinarians were aggregated by expense category and compared to a similar age group and national income averages for the United States. The average early career veterinarian completing the Personal Financial Planning Tool in 2017 had a mean household income of $88,836 and this falls between the seventh ($73,568) and eighth decile ($94,739) of American households (Table 29).

COMPARISON OF MEAN EXPENSES

	Veterinarian Household, Recent Graduate, 2017	General Population, 25-34 Years Old, 2016	Seventh 10 percent
Demographics			
Age	29	30	48
Household Size	1.6	2.7	2.8
Home Ownership Rate	26%	38%	68%
College Education Rate	100%	74%	70%
Gross Household Income	$88,836	$65,467	$73,568
Expenses			
Federal and State Taxes	$25,696	$7,402	$6,892
Student Loan Payments	$10,122	n/a*	n/a*
Credit Card Debt Payments	$3,557	n/a*	n/a*
Housing	$14,263	$18,466	$19,285
Transportation	$3,162	$9,452	$10,136
Food	$4,431	$6,774	$7,502
Healthcare, Insurance and Medicare	$2,796	$2,828	$5,160
Professional Development	$840	$1,160	$913
Recreation and Leisure	$1,811	$2,161	$2,291
Savings, Retirement and Social Security	$4,340	$6,227	$15,813
Personal and Miscellaneous	$1,260	$4,423	$2,344
Child Care**	$486	n/a*	n/a*
Pet Expenses	$413	$437	$625
Annual Expenditures	$73,177	$52,448	$70,961

**These categories are not separately recorded in the BLS CE survey.*

Sources: AVMA estimates and the Bureau of Labor Statistics Consumer Expenditure Survey

Table 29

There are similarities between the veterinarian and similar-aged general and similar-income population households. Expenditures on healthcare, insurance and Medicare were almost identical between veterinarians and the similar-aged general population. Less than a $75 difference between veterinarians and similar-income households was spent on professional development. Recreation and leisure spending is close across the three groups with a few hundred dollars separating the low (veterinarians) and high (similar-aged general population) end. There is a difference of more than $3,000 in average personal and miscellaneous spending between veterinarians and similar-aged households, with similar-income households falling in the middle of the two groups. Pet expenses were comparable between veterinarians and similar-aged general population.

While the similarities are interesting, the differences are even more so. First, notice that the average household size of 1.6 for recent graduates versus 2.7 for the similar-aged and 2.8 for the similar-income households. Furthermore, the home ownership rate in the similar-aged household is 12 percent higher than that of veterinarians while the similar-income households is nearly triple. Of course the similar income households have a mean age of 48 while the veterinarians mean age is 29.

The amount of taxes paid by the similar-aged and similar-income households is considerably less than for the veterinary households. This large variance reflects the difference in income, number of people in the household and the effect of the mortgage interest deduction.

The third large difference is in the amount spent on transportation. The similar-aged households spent almost three times more than the veterinary households while the similar-income households spent more than three times that of a veterinarian household.

The census data do not specifically itemize school loans or credit card debt and thus a comparison cannot be made, but recent graduates pay an average of $10,122 in student loan payments and have an average of $3,557 in credit card payments.

COMPASSION SATISFACTION, BURNOUT AND SECONDARY TRAUMATIC STRESS

Over the last several years, the wellbeing of veterinarians has become a major concern within the profession. The high rate of suicides among veterinarians compared to other professions has led to a call for action.

Starting in 2015, the ProQOL tool was included in the annual survey of veterinarians (employment survey in 2015, Census of Veterinarians in 2016, Census of Veterinarians in 2017) to begin to understand the factors that might contribute to compassion satisfaction, burnout and secondary traumatic stress.

The ProQOL[7] tool is a measure of compassion satisfaction, burnout and secondary traumatic stress associated with helping others who have experienced suffering. Compassion satisfaction is about the pleasure you derive from your work. For example, you might feel like it is a pleasure to help others through what you do at work. You might feel positively about your colleagues or your ability to contribute to the work setting or even the greater good of society through your work with people who need care. On the other hand, negative feelings derived from work is measured by scoring of burnout (exhaustion, frustration, anger, depression) and secondary traumatic stress (work-related trauma).

Responses to the ProQOL questions are scored based on the responses of thousands of individuals across a number of occupations. The ProQOL survey instrument contains a set of 30 questions and asks respondents to consider each of the questions in the context of "you and your current work situation."

A five-point scale is provided (1=never, 5=very often) to reflect honestly how frequently over the last 30 days the respondent experienced each of the feelings listed. The scores have been established to describe low-, normal- and high-compassion satisfaction, burnout and secondary traumatic stress. The results from the AVMA surveys indicated that the mean ProQOL scores for compassion satisfaction were in the higher normal range, while, burnout and secondary traumatic stress were in the lower normal range. But these mean scores fail to illustrate the number of respondents who were in the high range for burnout and secondary traumatic stress. The results of the ProQOL scores are plotted against the percent of respondents with each specific score. The distribution of compassion satisfaction scores follows a normal distribution that is skewed left. A score of less than 22 is considered a low score for compassion satisfaction (Figure 55).

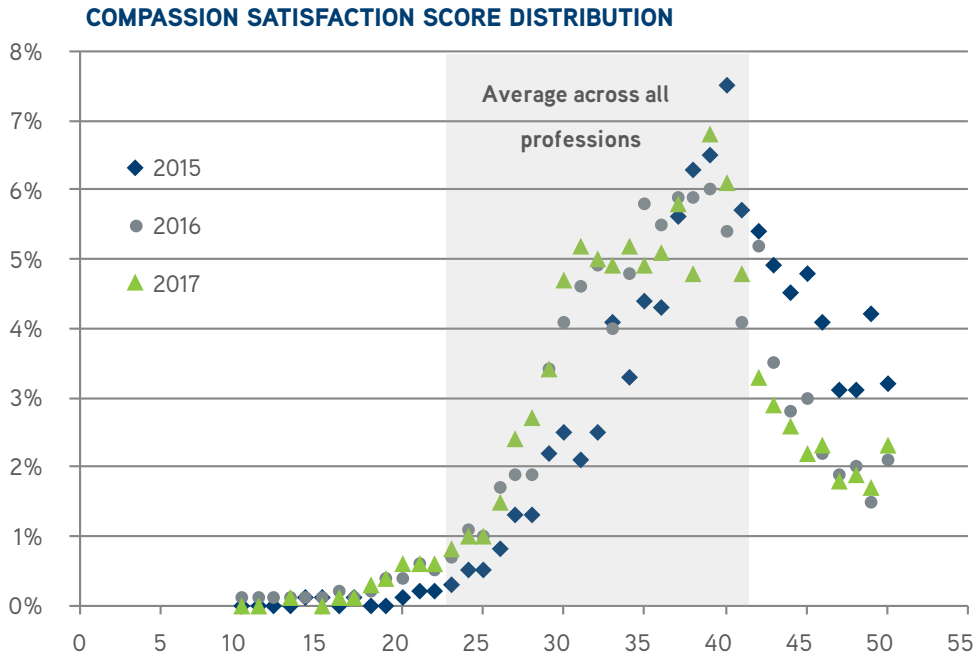


Figure 55

[7] B. Hudnall Stamm, 2009. Professional Quality of Life: Compassion Satisfaction and Fatigue Version 5 (ProQOL). /www.isu.edu/~bhstamm or www.proqol.org

Looking at what factors are associated with compassion satisfaction, a multiple linear regression was conducted with the variables that were thought might contribute to the variation in compassion satisfaction. The result of this analysis indicated that only two factors, satisfaction with current employment and how well the veterinarian felt prepared for his or her career, were statistically significant in both 2015, 2016 and 2017. Both of these factors were positively associated with compassion satisfaction.

In 2017, companion animal practice (predominant and exclusive), community population size of 2,500-49,999 residents where the practice is located, white, single, and married (or living with a partner) were found to be statistically significant in a negative association with compassion satisfaction, while widowed and increased age were positively associated with compassion satisfaction (Table 30).

FACTORS AFFECTING COMPASSION SATISFACTION SCORE

	2017		2016		2015	
	Coefficient	P Value	Coefficient	P Value	Coefficient	P Value
(Constant)	17.90	0.000	16.00	0.000	18.85	0.000
Satisfaction with current employment	2.81	0.000	3.02	0.000	2.75	0.000
How well your education has prepared you to be a veterinarian	2.09	0.000	1.76	0.000	1.68	0.000
Professor (assistant, associate, or full)			4.49	0.025		
Industry/commercial organizations			-4.44	0.038		
Companion animal practice (exclusive)	-2.09	0.000				
Companion animal practice (predominant)	-1.66	0.009				
Advanced Education					-1.76	0.018
Size of community in which practice is located: 2,500 to 49,999 residents	-0.77	0.034	0.66	0.035		
Compensation mode: Hourly			-1.16	0.026		
Personal Income			0.00	0.048		
Gender: Female=1/ Male=0					1.02	0.001
Age	0.09	0.000	0.05	0.000		
Hours worked per week					0.04	0.002
Ethnicity: Asian					2.00	0.012
Ethnicity: White (Eastern & South Eastern European descent)	-2.53	0.001				
Marital Status: Single	-2.59	0.006			-0.93	0.003
Marital Status: Divorced					1.36	0.038
Marital Status: Married or living with a partner	-1.74	0.043				
Marital Status: Widowed	7.73	0.028				

Table 30

Burnout and secondary traumatic stress, were also measured. A score above 35 on the burnout or secondary traumatic stress scale might suggest a need to seek help to deal with the factors that are causing either burnout, secondary traumatic stress or both. The burnout scores from all of the 2015, 2016 and 2017 surveys were normally distributed with the mean at the low end of the normal range. However, 9.6 percent of 2017 respondents (7.2 percent in 2016) had scores in excess of 35 (Figure 56).

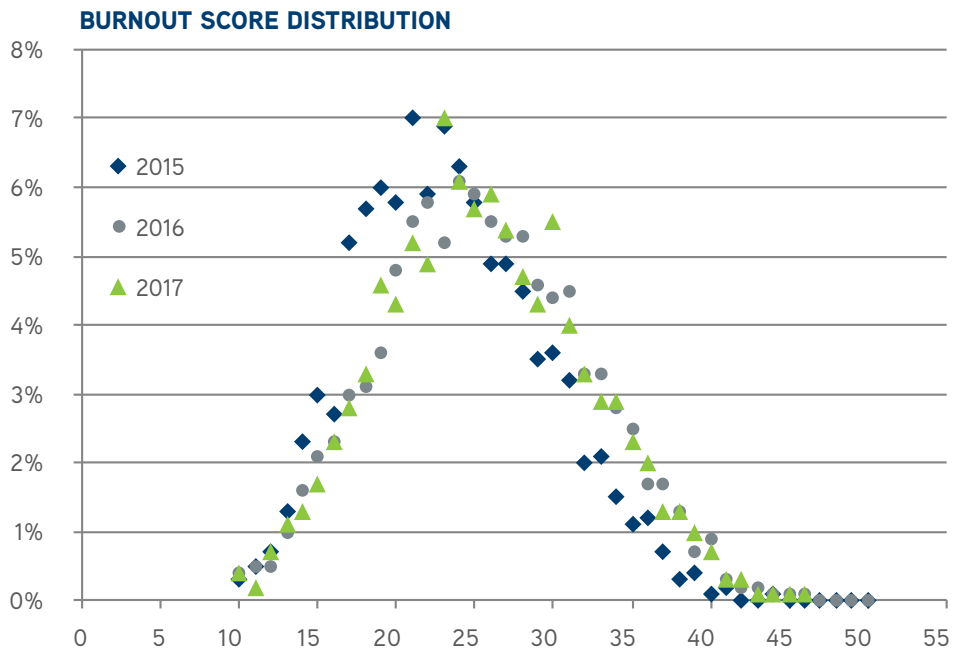


Figure 56

Using the same approach to examine the factors associated with burnout that was used with compassion satisfaction, three factors were found to be statistically significant in 2015, 2016 and 2017. The less satisfied with current employment and the less prepared the respondent thought their education had prepared them for a career in veterinary medicine, the greater the burnout score. The more hours worked per week, the greater the burnout score. Again, there were several other factors that were statistically significant in their association with higher and lower levels of burnout (Table 31).

FACTORS AFFECTING BURNOUT SCORE

	2017		2016		2015	
			Coefficient	P Value	Coefficient	P Value
(Constant)	36.06	0.000	37.04	0.000	36.15	0.000
Satisfaction with current employment	-2.73	0.000	-2.71	0.000	-2.59	0.000
Food animal practice (predominant)					-3.89	0.000
Food animal practice (exclusive)					-3.33	0.000
Equine practice					-1.66	0.008
Companion animal practice (predominant)	3.22	0.000				
Companion animal practice (exclusive)	2.16	0.000				
Not-for-profit organizations			-4.63	0.024		
Hours worked per week	0.09	0.000	0.08	0.000	0.05	0.000
How well your education has prepared you to be a veterinarian	-1.03	0.000	-1.06	0.000	-1.19	0.000
Gender: Female=1/ Male=0	1.78	0.000	1.04	0.002		
Educational Debt			0.00	0.032		
Ethnicity: Black/African American			-3.39	0.038		
Ethnicity: Hispanic/Latino					-2.79	0.001
Ethnicity: Asian					-1.89	0.009
Marital Status: Single					1.02	0.000
Marital Status: Widowed	-7.55	0.016				
Age	-0.08	0.000	-0.05	0.001		
Graduation year					-0.38	0.038
Size of community in which practice is located: 50,000 to 499,999 residents	-0.76	0.026				

Table 31

Secondary traumatic stress scores had a similar distribution to that of the burnout scores. However, the mean in 2017 is to the left (lower) than for burnout and the percent of respondents with a score above 35 (3.6 percent; 4.1 percent in 2016) is lower than for burnout (Figure 57).

SECONDARY TRAUMATIC STRESS SCORE DISTRIBUTION

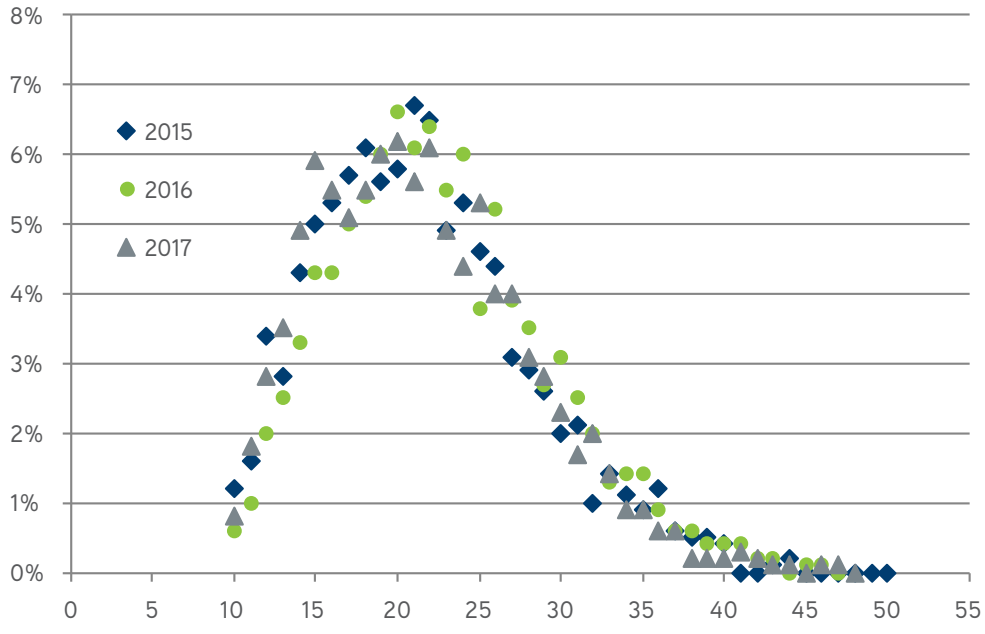


Figure 57

Again, using the same approach to examine the factors associated with secondary traumatic stress that was used with compassion satisfaction and burnout, three factors were found to be statistically significant in 2015, 2016 and 2017. The less satisfied with current employment the greater the secondary traumatic stress score. Females, and the more hours worked per week were associated with greater levels of secondary traumatic stress. Unlike the years 2015 and 2016, and in the compassion satisfaction and burnout regressions above, education preparation was not significant in 2017. As with both compassion satisfaction and burnout, there were several other factors that were statistically significant in their association with higher and lower levels of secondary traumatic stress (Table 32).

FACTORS AFFECTING SECONDARY TRAUMATIC STRESS SCORE

	2017		2016		2015	
			Coefficient	P Value	Coefficient	P Value
(Constant)	23.57	0.000	26.38	0.000	23.24	0.000
Graduation year			-0.75	0.000		
Satisfaction with current employment	-1.48	0.000	-1.35	0.000	-1.31	0.000
Hours worked per week	0.06	0.000	0.08	0.000	0.07	0.000
Gender: Female=1/ Male=0	2.05	0.000	1.46	0.000	1.88	0.000
How well your education has prepared you to be a veterinarian			-0.58	0.009	-0.70	0.001
Food animal practice (predominant)					-3.25	0.014
Food animal practice (exclusive)	1.48	0.007			-2.73	0.017
Companion animal practice (exclusive)					1.72	0.000
Companion animal practice (predominant)	3.02	0.000			1.28	0.015
State/local government					-3.82	0.015
Uniformed services			13.00	0.032		
Researcher			12.11	0.005		
Ethnicity: Black/African American					-3.43	0.032
Age	-0.06	0.006			-0.04	0.033
Current educational debt owed	0.00	0.003				

Table 32

Burnout score also varies across graduation year. Those graduating within the last 10 years on average have the highest burnout scores, with a mean of 26.8. The scores decrease with the number of years since graduation, with those graduating between 1957 and 1966 reporting a mean burnout score of 21.1 (Table 33).

BURNOUT SCORE AND GRADUATION YEAR

Graduation year	Mean	N	Std. Deviation
2007-2016	26.82	1,162	6.20
1997-2006	25.75	611	6.37
1987-1996	24.12	337	6.41
1977-1986	21.49	162	5.98
1967-1976	19.84	62	5.65
1957-1966	21.14	7	3.58
Total/average	**25.58**	**2,341**	**6.49**

Table 33

Those who are board certified reported a mean burnout score of 25.6 versus the mean burnout score of those not board certified, 25.4 (Table 34).

BURNOUT SCORE AND BOARD CERTIFICATION

	Mean	N	Std. Deviation
Not board certified	25.35	286	6.46
Board certified	25.60	2,061	6.49
Total/average	25.57	2,347	6.49

Table 34

The burnout scores among regions within the United States ranged from 24 to 26, with Region 5 having the lowest burnout score and Region 9 having the highest burnout score at 26.4 (Table 35).

Additionally, respondents working full time with an income range exceeding $200,000 reported the lowest burnout score at 23.1 and those working full time within the income range of $50,000-$99,999 reported a mean burnout score of 26.4, the highest within the income ranges (Table 36).

BURNOUT SCALE AND WORKPLACE LOCATION

Region of Workplace	Mean	N	Std. Deviation
Region 0	25.31	186	6.20
Region 1	26.07	198	6.51
Region 2	25.18	267	6.51
Region 3	25.80	270	7.26
Region 4	25.58	252	5.84
Region 5	24.72	199	6.32
Region 6	24.86	207	6.42
Region 7	25.13	197	6.67
Region 8	25.93	203	6.34
Region 9	26.45	283	6.62
Total/average	25.54	2,262	6.51

Table 35

BURNOUT SCALE AND INCOME RANGE

Income Range	Mean	N	Std. Deviation
$0-$29,999	25.22	126	7.07
$30,000-$49,999	25.52	190	6.22
$50,000-$99,999	26.40	1,070	6.37
$100,000-$149,999	25.61	516	6.35
$150,000-$199,999	24.55	175	6.60
$200,000 +	23.11	271	6.40
Total/average	25.57	2,348	6.49

Table 36

Females also had a significantly higher burnout score, 26.3 as compared to male respondents who reported a mean score of 23.5 (Table 37).

Also, understandably, burnout score increases with debt levels. Respondents with less than $10,000 of DVM debt have a mean burnout score of 23.2 while respondents whose debt levels range within $200,000 and $249,999 report a mean burnout score of 26.8 (Table 38).

BURNOUT SCORE AND GENDER

	Mean	N	Std. Deviation
Male	23.49	618	6.52
Female	26.33	1,723	6.32
Total/average	25.58	2,341	6.50

Table 37

BURNOUT SCORE AND CURRENT DVM DEBT

	Mean	N	Std. Deviation
$0-$9,999	23.20	65	7.60
$10,000-$19,999	22.30	85	5.40
$20,000-$29,999	23.00	110	6.00
$30,000-$39,999	24.10	105	6.50
$40,000-$49,999	24.60	108	6.20
$50,000-$59,999	26.20	67	7.10
$60,000-$69,999	26.00	72	5.50
$70,000-$79,999	25.10	83	6.20
$80,000-$89,999	26.10	128	6.00
$90,000-$99,999	25.10	61	6.80
$100,000-$124,999	26.60	223	6.40
$125,000-$149,999	26.90	168	6.00
$150,000-$174,999	27.20	181	6.00
$175,000-$199,999	26.20	116	6.80
$200,000-$249,999	26.80	158	6.30
$250,000 +	25.40	612	6.70
Total/average	**25.60**	**2,342**	**6.50**

Table 38

Burnout scores vary across practice types. Veterinarians reporting as a consultant had the lowest burnout score, 20.7 and those reporting employment in uniformed services register the highest burnout score, at 29.1 (Table 39).

BURNOUT SCORE AND PRACTICE TYPE

	Mean	N	Std. Deviation
Food animal practice (exclusive)	24.88	40	6.67
Food animal practice (predominant)	23.37	30	6.90
Mixed animal practice	25.12	122	6.56
Companion animal practice (predominant)	25.92	293	6.78
Companion animal practice (exclusive)	25.83	1,236	6.37
Equine practice	25.80	64	6.73
Federal government (civil service)	22.17	42	5.84
Uniformed services	29.06	16	8.43
College or university (faculty or staff only)	24.97	127	6.09
State/local government	25.33	21	5.60
Industry/commercial organizations	22.18	62	5.98
Not-for-profit organizations	26.66	64	7.09
Advanced education (inclusive of internships and residencies)	26.96	90	6.20
Consultant	20.73	15	5.82
Research contractor	26.43	7	3.78
Other veterinary employment	24.59	86	6.20
Non-veterinary employment	27.60	25	5.96
Total/average	**25.57**	**2,340**	**6.49**

Table 39

PERSONAL HEALTH ASSESSMENT

The 2017 Census Survey asked respondents to broadly evaluate their own health. Of the Survey's 2,780 respondents who reported being currently employed (2,638), 24 percent of those working full time and 22 percent of those working part-time reported excellent health, and 45 percent of both groups reported very good health; 25 percent of full-time and 22 percent of part-time respondents reported good health; and 6 percent of full-time veterinarians and 11 percent of veterinarians working part-time reported fair to poor health. These contrast with the health of unemployed and retired veterinarians, where 24 percent of unemployed and 13 percent of retired veterinarians report being in excellent health; 38 percent of unemployed and 41 percent of retired veterinarians were in very good health, 24 percent and 31 percent, respectively, were in good health; and 14 percent and 16 percent were in fair or poor health. The overall health of retired and unemployed veterinarians is lower than for employed veterinarians; however, it would be premature to say that one factor causes the other (Figure 58).

SELF-REPORTED HEALTH BY EMPLOYMENT STATUS

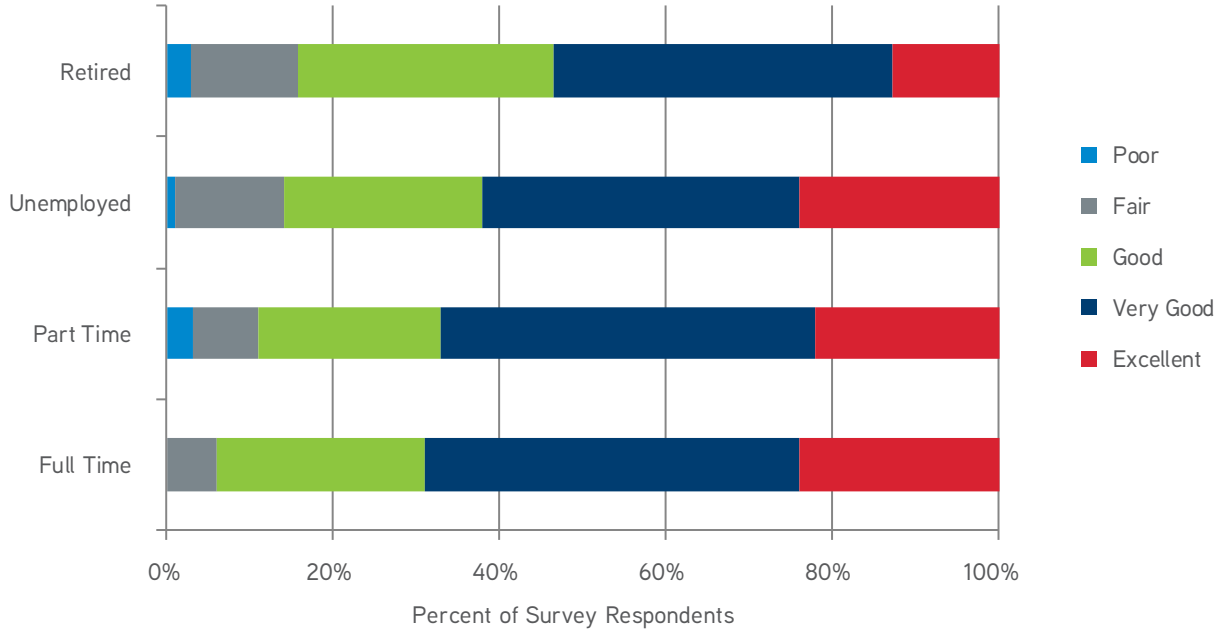


Figure 58

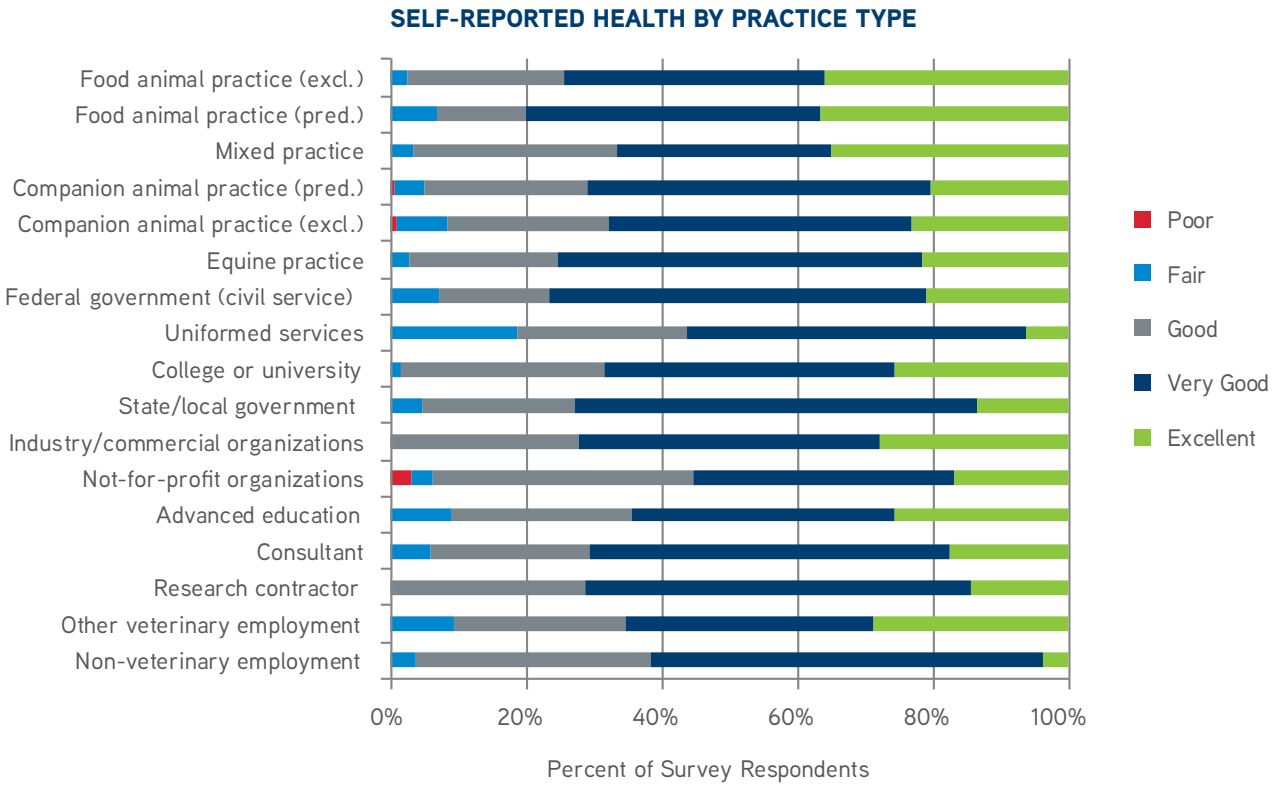


Figure 59

The self-reported health scores also varied by practice type with food animal predominant veterinarians indicating the largest percentage in excellent health, and not-for-profit and uniformed services categories reporting the two largest percentages for good to poor health (Figure 59).

There was little difference in the self-reported health rating by gender with both the mean value and the distribution being very similar (Figure 60).

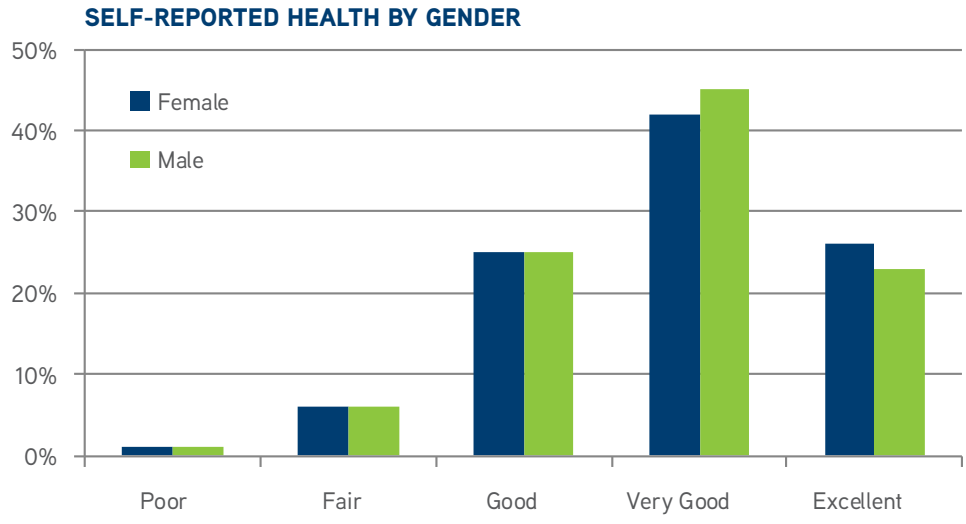


Figure 60

Self-reported health scores also varied little by year of graduation, although respondents who graduated in earlier years had, with one exception, higher percentages indicating they were in excellent health. Only 23 percent of new graduates report excellent health while roughly 30 percent of graduates from 1980 to 1989 reported excellent health (Figure 61).

Self-reported health appears to differ little from region to region. More than 70 percent of respondents from Region 0, Region 2 and Region 6 reported very good to excellent health (Figure 62).

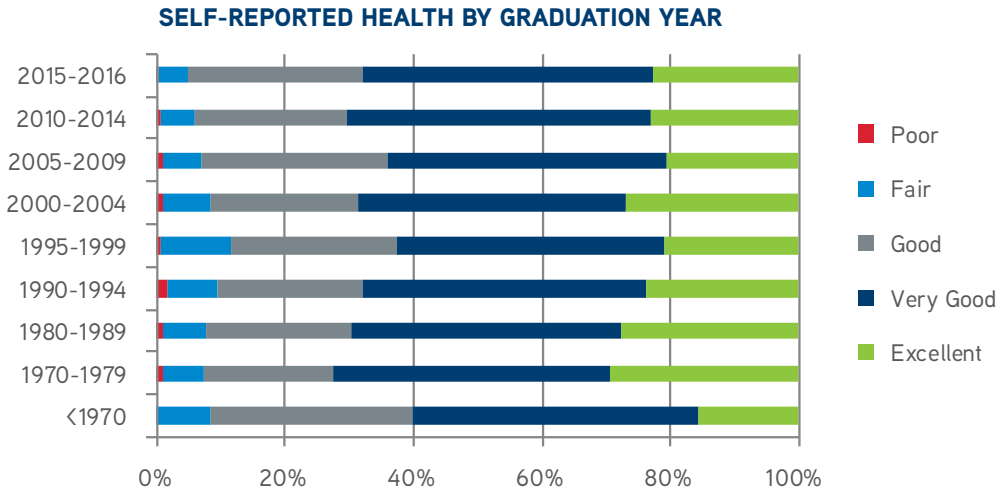


Figure 61

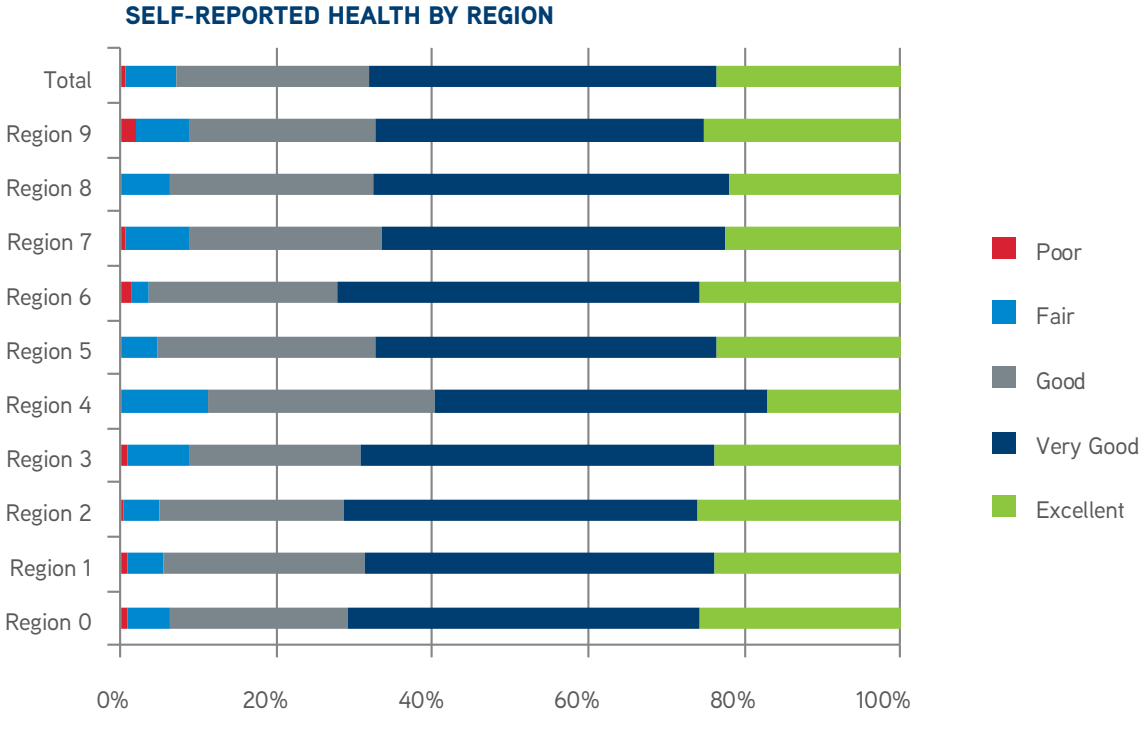


Figure 62

VETERINARY MARKET KEY PERFORMANCE INDICATOR: NET PRESENT VALUE

In 2017 there is an increase in the value of the NPV degree for both men and women, and for the first time since 2013, male NPV is positive.

The discussion of the veterinary incomes, unemployment, underemployment, applicant-to-jobs ratio and wellbeing provides an indication of the internal function of the market for veterinarians. The change to each of these measures over time provides an overview of how the market is changing and the direction the market is headed. But these measures only provide a view of how well the market is functioning internally, not how well the market is performing within the vertically related veterinary markets.

The output of the market for veterinarians is the capacity to provide veterinary services. The performance of this market is the efficiency with which veterinary resources are used to produce veterinary services that are valued by society at or above the cost of producing them, and, one of the main costs is veterinary compensation. An efficient market would enable veterinarians to receive a normal economic return on the cost of becoming a veterinarian. A normal economic return is a percent return on the investment for comparable investments.

Given money to invest, the decision on where to invest is based on how much money can be made by investing in alternative opportunities. The opportunity that provides the greatest return for every dollar invested may be the best investment choice.

Money spent on the DVM degree is an investment and the return is the increased future earnings. Taking a closer look, the DVM degree investment includes three components:

- actual cost of the education including tuition and fees, books, supplies and equipment needed for the education and any other expenses that were required to obtain the degree;
- the interest on any money borrowed to pay these education expenses; and
- income not earned while in veterinary school, an "opportunity cost" that is considered part of the investment.

The value of the investment in veterinary education is the sum of all costs to obtain the DVM: the actual costs to attend veterinary college, the interest on any money borrowed, and the income foregone while in veterinary college and not working.

The returns, as noted earlier, are the lifelong earnings received as a result of the DVM degree. This is not the total income received as a veterinarian, but the income received that is above what might have been earned with a bachelor's degree. This is the value-added earnings that can be attributed to the DVM degree.

The difference between the returns and the total investment over the lifetime of veterinary work is the net value of the DVM degree: Considering the returns a percent of the total investment provides a measure of the returns on investment.

Because most people prefer current rewards over future rewards, however, the value of an earnings dollar declines each year. This conversion of dollars received or spent in the future to a current value is known as "discounting," and reflects the social time-preference of money. Another way to look at discounting is to ask, "how much would I have to offer to pay you a year from now to not pay you $100 today?" If you replied $110, then you have indicated that next year's dollar has to be discounted by 10 percent to be equal to the value of a dollar today.

When both returns and investment are discounted, the net value of the DVM degree becomes the net present value (NPV) of the DVM degree and provides an indication of the value of increased earnings resulting from obtaining the DVM degree in today's dollars. The average NPV of the DVM (or VMD) degree varies greatly by location, practice type, hours worked, specialization and other factors.

Of course, there are also non-measurable benefits and costs that can be attributed to the DVM degree, such as the benefits of daily interaction with animals and the satisfaction of helping animals and animal owners, or the costs of client conflicts. So, the NPV represents only the measurable value of the DVM degree and not the total value.

Knowing the NPV of the DVM degree enables a comparison of alternative careers and career paths, just as one compares alternative investment opportunities. This measure can be used with the perceived non-measurable benefits and costs to make more informed career choices and track the performance of the veterinary profession over time.

The NPV of the DVM is calculated by estimating the income received from the veterinary career less the compensation that might have been received without the DVM degree and the costs of obtaining the DVM degree. Consider the following measures for the 2017 graduating class from the 28 U.S. veterinary colleges:

- Mean total debt (debt plus the servicing costs) of a 2017 graduating veterinarian is $266,870;
- Mean lifetime income of 2017 graduates (26-75 years old) was estimated at $5,429,896;
- NPV for men is estimated at $117,235;
- NPV for women is estimated at $497,546.

The NPV hit a low in 2014 for women and in 2015 for men. The difference in the NPV for men and women is due to the higher debt and lower incomes of women at graduation and the higher opportunity costs of pursuing a veterinary education for men as compared to women. In 2017 there is an increase in the value of the NPV degree for both men and women, and for the first time since 2013, male NPV is positive (Figure 63).

The opportunity costs refer to the lifetime income earning potential had veterinarians pursued an alternative career prior to entering veterinary college. The lifetime mean earnings of a typical bachelor's degree recipient are used to estimate the opportunity costs. The alternative earning profile begins at graduation and thus a veterinarian gave up four years of alternative earning potential while in veterinary school, and this must be overcome before there is a positive gain in earnings with the DVM versus the Bachelor's degree only.

The difference in the NPV of the DVM for women and men is mostly a result of the higher opportunity costs for men compared to women. The difference between the starting salary of a DVM and a Bachelor's degree has increased for women and for the first time since 2011, increased for men. The increase in the difference of DVM and Bachelor's degrees for men from $21,132 to $21,786 indicates that the opportunity cost of men to gain a DVM is decreasing, making the economic decision to obtain a DVM slightly easier than before; however, the cost is still greater than it is for women. For women, the opportunity cost of obtaining the DVM is declining, as the difference between the DVM and Bachelor starting salary has increased from $27,739 to $29,184 (Figure 64)[10]. The positive NPV for men yields a return on the DVM in 2017, compared to 2016; the NPV for women continues to indicate a positive return on investment.

[10] Salary Trends Through Salary Survey: A Historical Perspective on Starting Salaries for New College Graduates. (2017). Naceweb.org. Retrieved 5 January 2017, from https://www.naceweb.org/job-market/compensation/salary-trends-through-salary-survey-a-historical-perspective-on-starting-salaries-for-new-college-graduates/#appendix

NET PRESENT VALUE OF THE DVM DEGREE

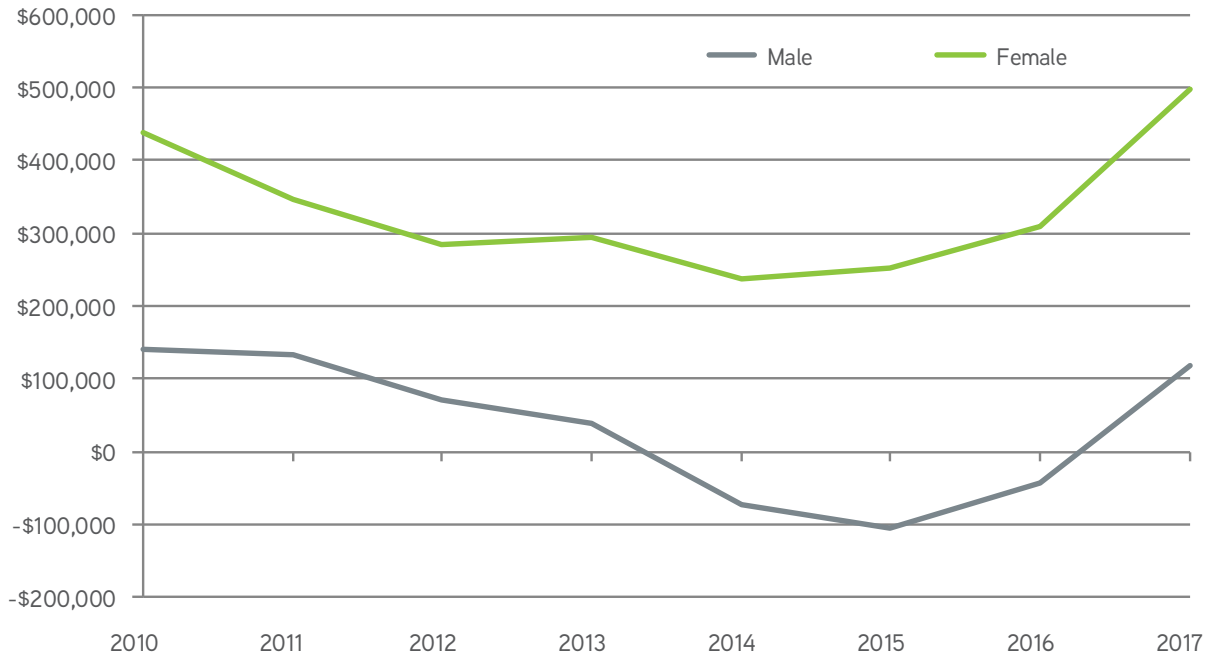


Figure 63

STARTING SALARIES BY DEGREE AND GENDER

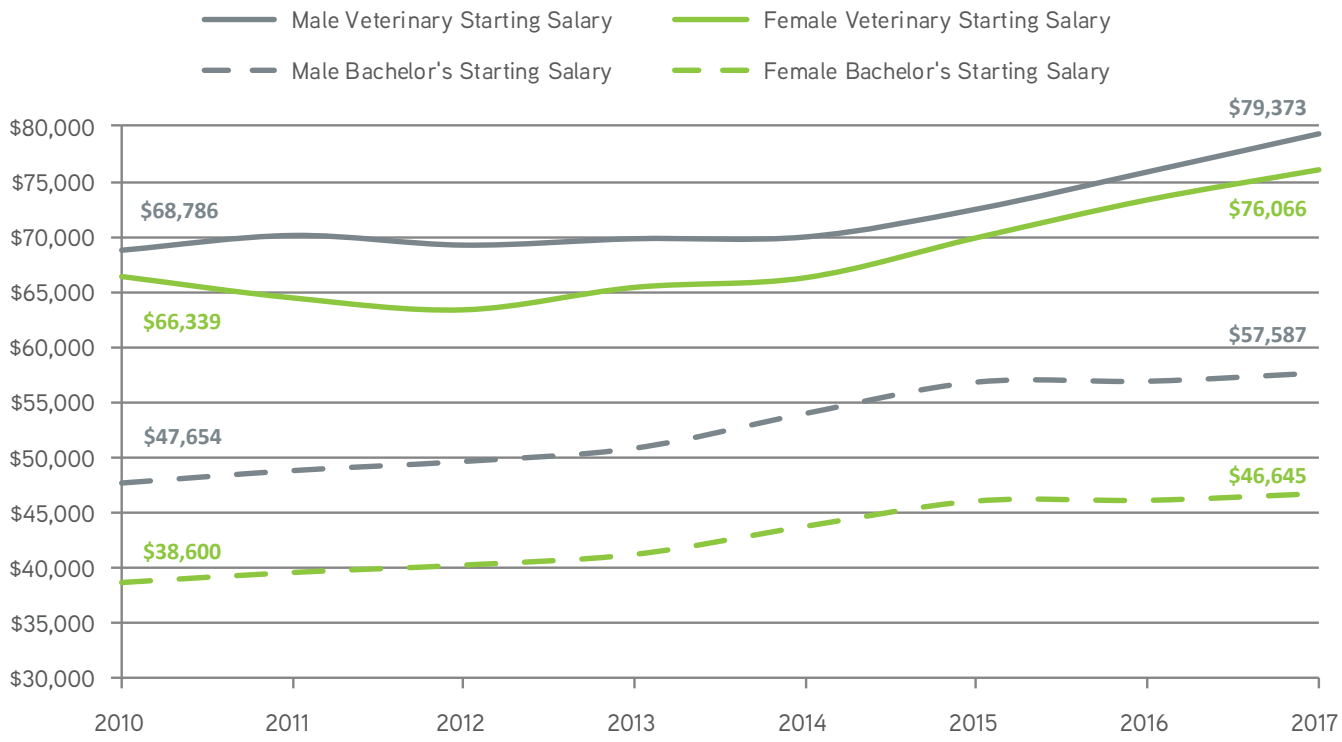


Figure 64

OWNERS' VS. ASSOCIATES' NPV

For many veterinarians, owning a practice is a primary career objective. But what exactly are the financial incentives, and how much is it worth, on average? Using the 2002-2017 compensation data from AVMA surveys that include roughly 26,000 full-time private practice veterinarians, some 10,000 of whom are practice owners and some 16,000 associates, the effect of practice ownership on NPV of the DVM can be estimated (Table 40).

NUMBER OF OBSERVATIONS USED IN ANALYSIS

		Number of Owners	Number of Associates
Companion Animal	Male	2,722	3,007
	Female	2,348	7,074
Food Animal	Male	1,529	1,129
	Female	239	514
Mixed Animal	Male	1,364	1,158
	Female	546	1,474
Equine	Male	836	776
	Female	483	1,071
Total		**10,067**	**16,203**

Table 40

DIFFERENCE IN ANNUAL INCOME

The difference in the mean income between practice owners and associates could be due to factors other than practice ownership. In this dataset the difference in the mean income of all owners to all associates is approximately $20,000; owners earn almost 25 percent more than associates. But there are many factors that are different among owners and associates. For example, owners tend to be older and have more experience. The survey data indicate that owners are on average six years older and have five more years of experience. In addition, though the sample has only slightly more men than women, 37 percent of men are owners compared to 22 percent of women. Each all of these factors, and others, have an impact on veterinary income and thus might explain at least a part of the difference in income between practice owners and associates.

To separate the effect of the various potential factors from strictly the effect of practice ownership on incomes, four separate regression models were estimated. The other factors that affect income were discussed previously and listed in the experienced veterinary salary calculator (Table 41).

EFFECT OF OWNERSHIP ON ANNUAL INCOME BY GENDER AND PRACTICE TYPE

		Effect	Coefficient	Std. Err.	t-statistic	p-value
Companion Animal	Male	9.42%	0.094	0.014	6.81	0.000
	Female	n/a	0.017	0.014	1.26	0.207
Food Animal	Male	9.98%	0.100	0.019	5.14	0.000
	Female	n/a	0.020	0.040	0.5	0.614
Mixed Animal	Male	6.25%	0.063	0.021	3.02	0.003
	Female	n/a	-0.004	0.027	-0.14	0.886
Equine	Male	n/a	0.021	0.027	0.79	0.427
	Female	n/a	0.006	0.032	0.19	0.853

Note: Estimates in this table are based on a statistical analysis that controls for relevant correlates. Data are from 2002-2017 AVMA surveys. Incomes are deflated to be in real 2015 dollars.

Table 41

As Table 41 indicates, when controlling for relevant factors, most owners do indeed still earn more than associates. The income difference between owners and associates, however, varies across gender and practice type. Male practice owners earn a higher premium for ownership compared to women. By practice type, female food animal, female mixed animal, and female and male equine practice owners do not appear to make statistically significant different income from associates.

These estimates of the income premium to practice ownership are based on the sample collected and could change from year to year. For example a drought could greatly affect the compensation for food animal veterinarians in a specific year. However, the length of the dataset, spanning 16 years, should minimize any sector-specific, year-to-year variation in income.

Lastly, these estimates might be overestimating the effect of practice ownership, due to what is termed "omitted variable bias." An extensive body of literature in the field of Labor Economics details this potential for omitted variable bias. The omitted variable here is something like "business acumen." Veterinarians with a high degree of business acumen might earn a higher income, and the effect of this factor on income may not be captured by any other factor other than practice ownership; veterinarians with high levels of business acumen might be more likely to own a veterinary practice. The AVMA surveys have no measure of business savviness, and had it been included in the statistical models, might have reduced the effect of practice ownership on incomes.

DIFFERENCE IN LIFETIME INCOME

Using the regression equations that produced the salary calculator, along with the 2016 reported starting salaries of new veterinary graduates, age-earnings profiles are examined by gender, practice type, and ownership status. These are estimates, based on what veterinarians earn with different levels of experience, which is calculated as the year the survey was administered, minus the veterinarian's year of graduation, minus the number of years spent out of the labor force. If we assume a 40-year-long career with an age at graduation of 27, and retirement at 67, with practice owners owning a practice immediately upon graduation, we can estimate the additional lifetime income received from practice ownership (Figures 65-68) .

LIFETIME INCOME OF COMPANION ANIMAL PRACTITIONERS

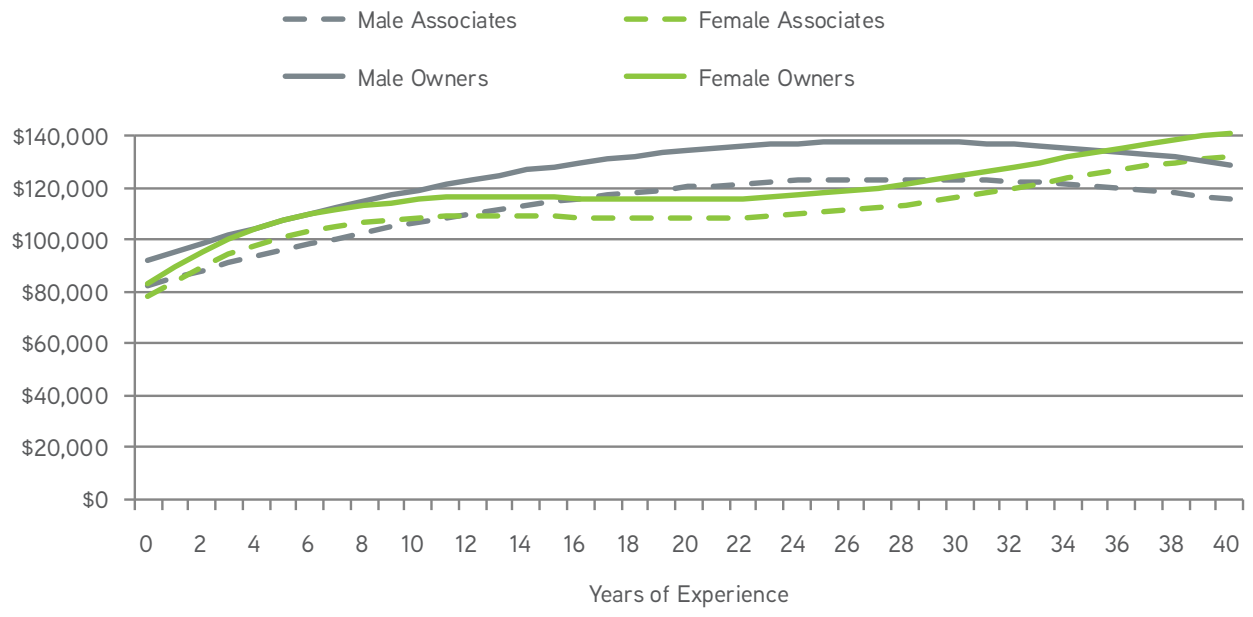


Figure 65

LIFETIME INCOME OF FOOD ANIMAL PRACTITIONERS

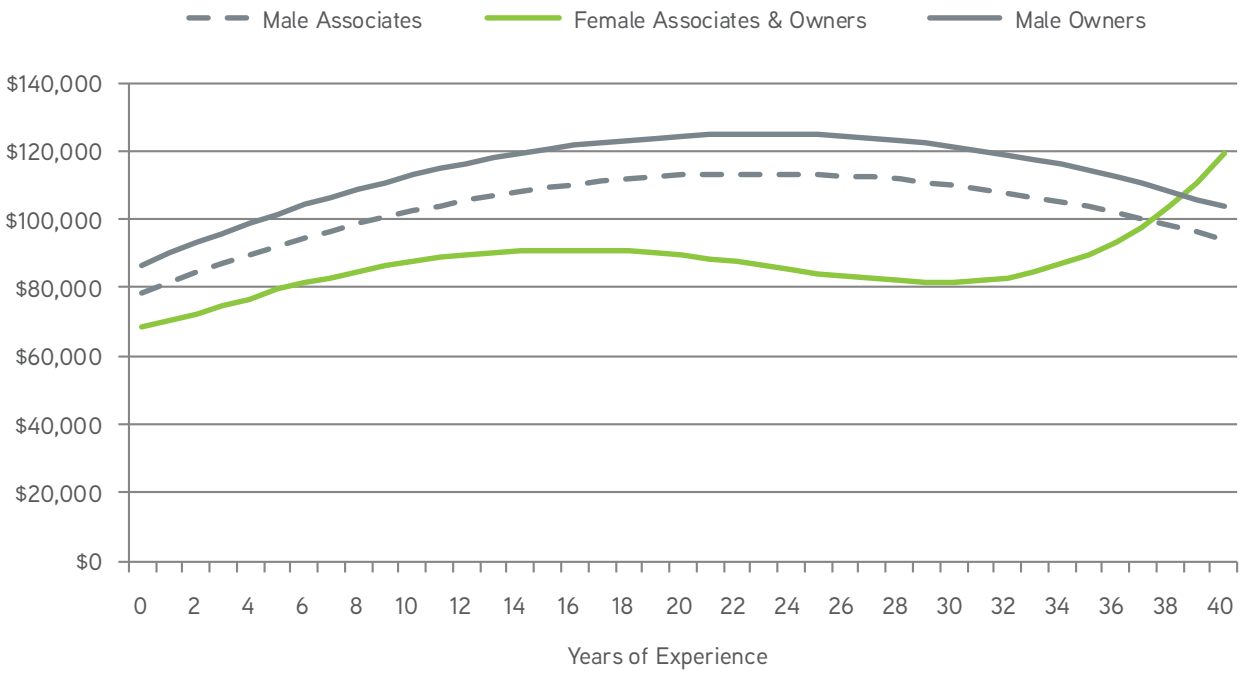


Figure 66

LIFETIME INCOME OF MIXED ANIMAL PRACTITIONERS

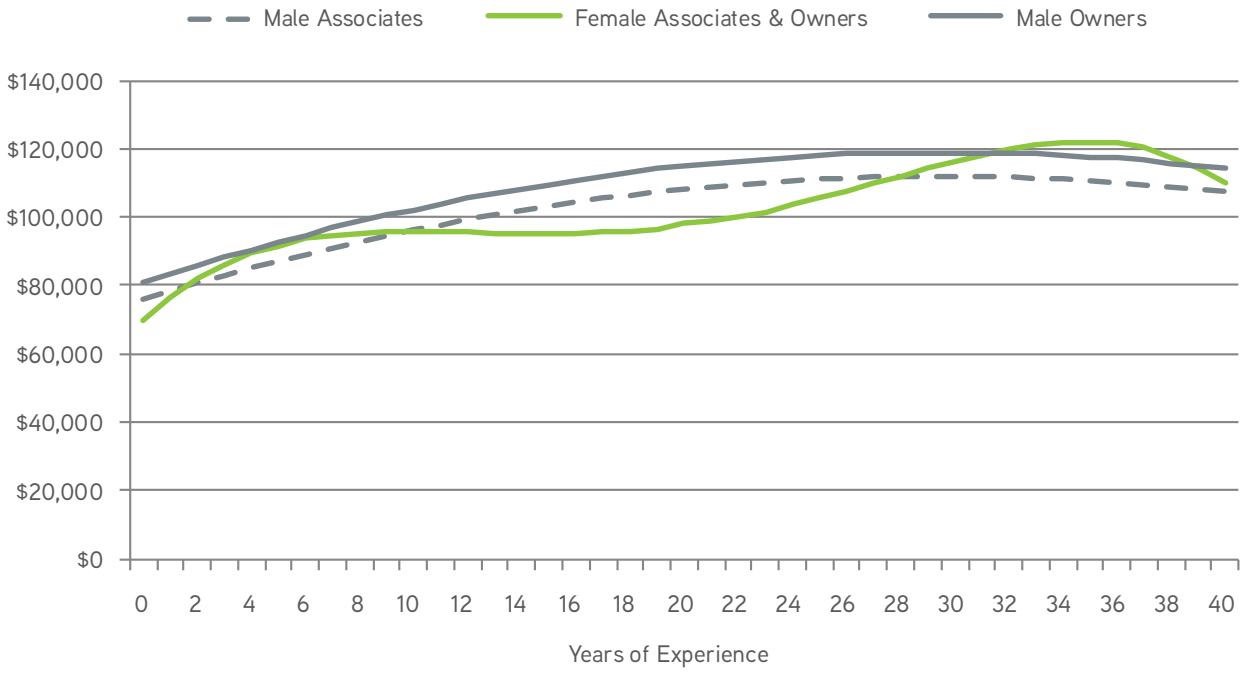


Figure 67

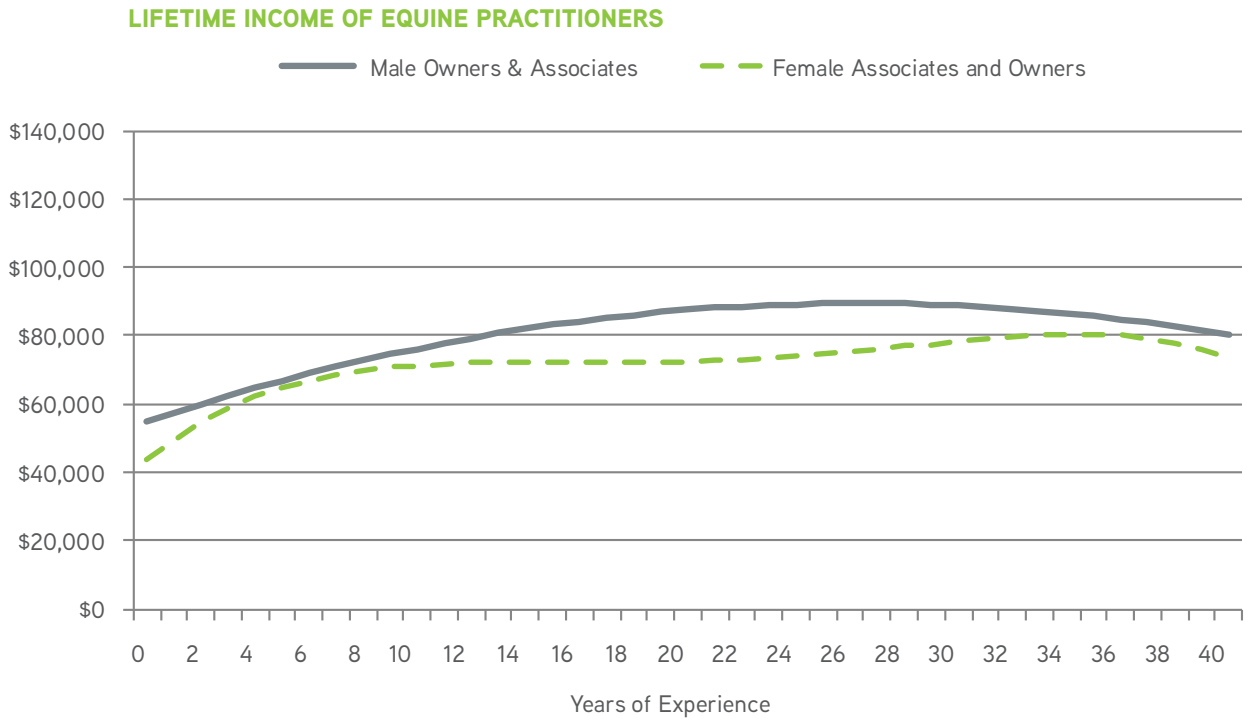


Figure 68

This analysis describes the difference in income between owners and associates, all other factors held constant. However, this analysis doesn't account for the potential wealth aspect or non-measurable benefits of practice ownership. In many businesses an integral part of the business plan, "asset rich and cash poor," is achieved by drawing the income that is necessary to meet lifestyle expectations and putting the other earnings back into the business to grow wealth for retirement.

There are other non-measurable benefits to being a practice owner such as increased work schedule flexibility. Studies like Goldin (2014) illustrate the relationship between flexibility and compensation: Careers that offer greater flexibility are more evenly compensated between genders, whereas careers with less flexible work schedules – where business depends on the relationship between a professional and his or her clients (like that of a veterinarian) – tend to have larger gender-wage gaps. If, as Goldin asserts, women tend to more highly value flexibility in their time, then it would make sense that they would become practice owners. Being a practice owner would increase their overall income to offset the effect of their desire for flexibility.

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Goldin Claudia. (2014) "Grand Gender Convergence: Its Last Chapter" American Economic Review 104(4):1091-1119.

DISCUSSION

This report has provided information on the market for veterinary labor, nationally, regionally and by practice type. Key indicators of the health of the market are unemployment rate, underemployment rate, income, wellbeing and satisfaction, and net present value. But these key indicators for a given year only provide a snapshot in time and provide neither a rear-view mirror to see where you have been nor a windshield to see where you are going. An understanding of trends developed over a long period can only be obtained through the continued collection of the data and annually reporting of each indicator in a time series. In addition, knowing what has happened, what is happening and what might happen is not useful without knowing how to change course. Forecasting a course-change to date requires the econometric analysis of the factors that affect each of these indicators. The importance of the econometric analysis is not just to determine the factors that affect the indicators but the relative importance of those factors. This knowledge allows a focus on the most important factor that drives change to produce the best results for the markets.

Over the last four years, the key indicators have been reported and each year, and across the board the indicators generally point to an improving market for veterinary labor. Unemployment remains below national levels, underemployment is negative, indicating an overall need for additional veterinarians in the workforce, the applicant-to-job ratio is below 1, incomes continue to rise and wellbeing is generally good throughout the profession.

The market still has considerable maldistribution problems, however, both between larger areas like regions and states and within states and metropolitan centers. Underemployment differs by gender and as the profession increasingly becomes largely female this difference in desired hourly work week may have implications for the number of veterinarians needed to provide the level of services demanded and the price of those services.

While wellbeing is generally good in the profession, there is clearly a percentage of the profession that is dissatisfied with their employment, compensation, the profession and their lifestyle and we have identified individuals' perception of their college preparation and their satisfaction with their current employment (the culture of the practice) as being statistically significant in explaining burnout. The ProQOL tool consists of three subscales that measure facets of wellbeing – compassion satisfaction, burnout, and secondary traumatic stress. Other tools are available to measure rates of depression, anxiety, substance abuse, suicidal ideation and other barriers to wellbeing. We suggest that identifying the appropriate professionals to develop the best tools for measurement and determining the factors that contribute to thriving professionals remain a priority for the profession.

The NPV of a DVM has been on a downward trend since 2010. This indicator provides a window into the value society places on veterinarians versus the investment required to become a veterinarian, and currently for males the investment cost exceeds the social value. Men's opportunity cost to attend veterinary college is high in comparison to women's, as men's earning potential with a bachelor's degree is much higher than for women. If the earnings from a STEM (Science, Technology, Engineering and Math) Bachelor's degree were considered instead of an average across all bachelor's degrees (general) the opportunity cost would be considerably higher and the NPV more negative. This represents a market failure to produce veterinarians at a cost society is willing to pay and points to a problem embedded in the cost of education as well as in the value assigned to veterinary services.

The cost of education has changed rapidly over the last two decades as society has made a fundamental shift away from support of college education that serves to foster a more enlightened populace, embracing the idea that college grads earn more than other workers and thus should pay for their own college. This change in thinking will take time to work through the different markets (market for education, market for veterinarians and market for veterinary services) to shift support of the veterinarian supply chain from the taxpayer to the animal owner support.

The value of veterinary services creates the demand for veterinarians. This is the main factor in determining veterinary salaries. The focus on medical care rather than preventative care may have influenced the animal owner's perception of value. This will be discussed in the following report in this series, the report on the market for veterinary services.

The market for veterinarians continues to improve and is considered to be robust. As the economy has improved and household incomes have risen, so too has the demand for veterinary services and hence the demand for veterinarians. During this economic expansion, veterinarians are likely to be busy, some of them extremely busy, as the large negative underemployment number would suggest. Unfortunately, this may lead some to forget the lessons of the last recession and remove any urgency at improving value or reducing education costs. This is exactly the wrong message to draw from industry observation, and these problems should be addressed when resources are available – not when resources become scarce.

THE AVMA 2018 ECONOMIC REPORTS INCLUDE:

The AVMA & AAVMC Report on the Market for Veterinary Education:

The market for veterinary education is the beginning of the pipeline to the market for veterinary services. This report examines the characteristics of veterinary college applicants, the supply of and demand for veterinary education, and the performance of the market in providing new veterinarians.

The AVMA Report on the Market for Veterinarians:

This report explores the demographics and employment of the veterinary profession: where they are located, what type of work they do, how much they are compensated, and how they are managing their educational debt. The report also measures unemployment and underemployment and identifies the contributing factors, and explores the performance of the market based on the value of the DVM degree.

The AVMA Report on the Market for Veterinary Services:

The demand for veterinarians and veterinary education begins with the demand for veterinary services. This report provides an overview of the veterinary workforce and projections for the supply and demand for veterinary services using recent AVMA Pet Demographics and Ownership study data. The report also presents the results of an efficiency analysis of the veterinary practices. In addition, the economic impact of veterinary businesses on a national scale is discussed.

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2018 AVMA Report on

THE MARKET FOR VETERINARY SERVICES

2018 AVMA Report on

THE MARKET FOR VETERINARY SERVICES

Veterinary Economics Division
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October 2018

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SUMMARY

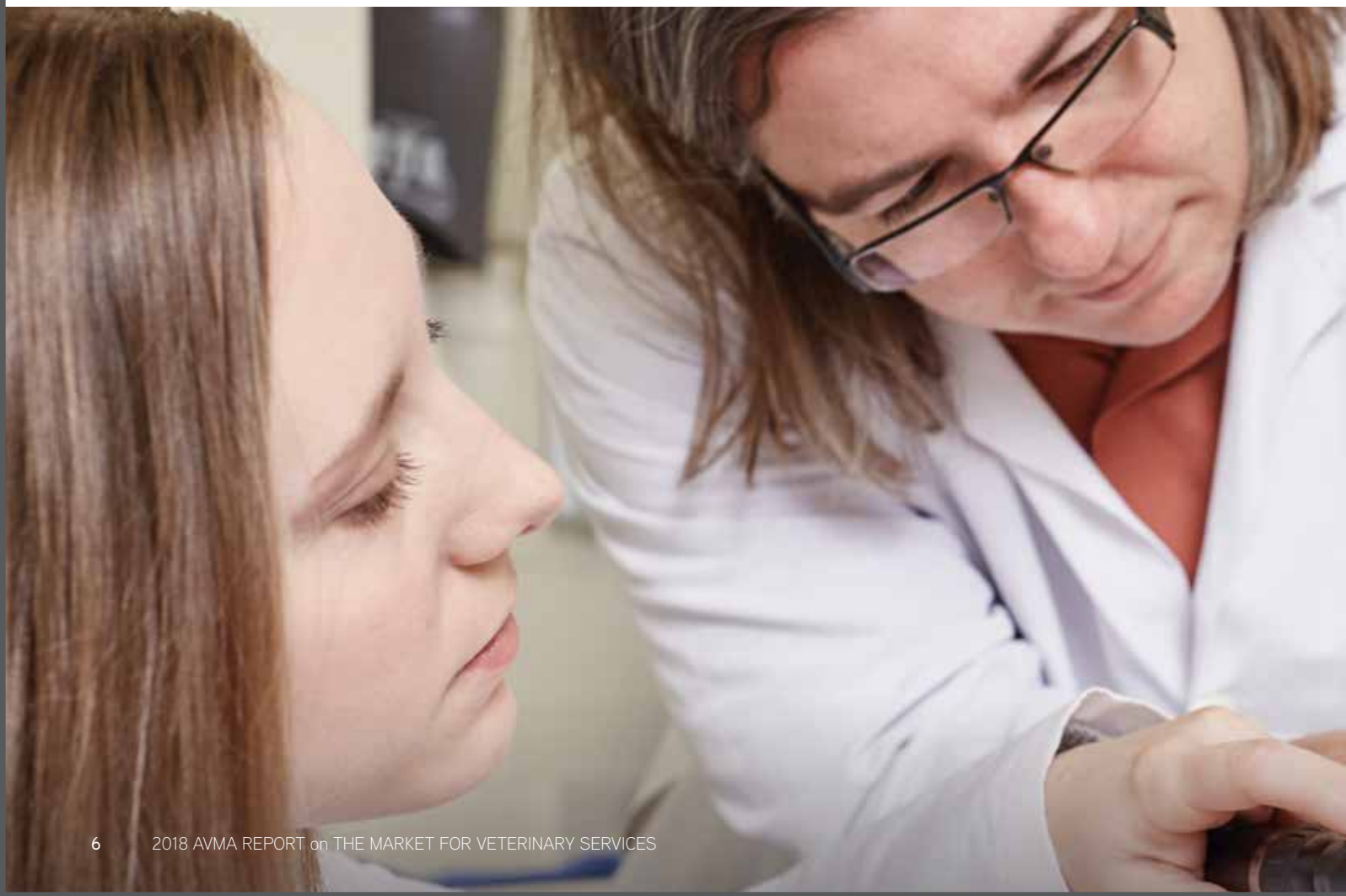
The U.S. population of veterinarians has witnessed an approximate 32 percent increase during the past decade, going from 83,730 in 2007 to 110,531 in 2017. On average, the U.S. veterinary population has grown by 2.8 percent per year during the period 2007- 2017. While the proportion of men entering the profession has declined by an average annual rate of 2.7 percent, that for women increased by 2.2 percent annually. In 2017, women represented about 60 percent of U.S. veterinarians, and this trend is expected to continue as the number of female graduates from veterinary colleges is still way above that of males. Using the current veterinarian population, the analysis reveals that the population of veterinarians in the United States will reach 124,257 by 2027.

The mean earnings (in real value) for associate veterinarians exhibit a declining pattern while that for practice owners has shown an increasing trend during the period 2010-2016. In 2016, the real mean income varied between $66,000 and $90,000 for associate veterinarians, with the highest mean income obtained by companion animal exclusive practitioners. For practice owners, the highest mean income ($162,000) is obtained by companion animal exclusive veterinarians, followed by mixed animal practitioners ($134,000). The lowest mean income goes to food animal predominant practice owners ($92,000).

Usually populated areas with a large number of households, and high-income areas, report the greatest number of private practitioners. The South Atlantic Region (20.7 percent), the East North Central Region (15 percent), the Pacific Region (14.4 percent), and the West South-Central Region (11.3 percent) encompass more than 60 percent of the U.S. veterinarians.

KEY FINDINGS ON VETERINARY PRACTICES

Between 2011 and 2017, the average gross revenue for all type of practices except for equine practices has increased. The largest share of practice revenues is attributable to wellness, followed by drug sales and laboratory services. For companion animal exclusive practices, small to medium-size practices are getting the largest share of their revenues from wellness exams (23 percent to 30 percent). The larger practices (eight or more veterinarians) receive the largest share of their revenues from laboratory services.



VETERINARIANS AND VETERINARY EMPLOYMENT

In 2017, the large majority (79.3 percent) of U.S. veterinarians were employed in private practices. Of the 79.3 percent employed in private practices, more than 80 percent (N = 61,606) practice general medicine/surgery. The number of private practice veterinarians has increased by 9.4 percent between 2007 and 2012 and by 7 percent during the period 2012-2017.

MARKET FOR VETERINARY SERVICES

Considering the legal form of the practices, the analysis shows that the number of S-corporations have increased by 11 percent between 2010 and 2013 and by 12 percent between 2013 and 2016. Between 2010 and 2013, partnerships, and not-for-profit organizations have increased by 3 percent and 21 percent, respectively. The percentage change between 2016 and 2013 was 6 percent for partnerships and 10 percent for not-for-profit organizations. Not all types of businesses have increased in number: Individual proprietorships have declined by 11 percent between 2010 and 2013, and by 12 percent between 2013 and 2016. The number of corporations has increased slightly (2 percent) between 2010 and 2013 but has drastically decreased (14 percent) between 2013 and 2016. In terms of size, the analysis shows that the number of practices that employ 10 employees or more has sharply increased during the period 2010- 2016.

ECONOMIC IMPACT OF VETERINARY PRACTICES

Economic Impact Analysis (EIA) aims to provide a comprehensive assessment of the economic impacts of veterinary businesses on the local economy. The results of such an analysis are summarized below:

- Veterinary practices generate a total of 458,800 direct jobs, and support 135,000 indirect and 231,500 induced jobs, leading to a total effect of 825,353 jobs nationwide.
- The direct effect on labor income is estimated at $18.5 billion.
- Total value added as a result of private practice veterinary activity is estimated at $18.8 billion.
- Direct effect on output is estimated at $38.4 billion.
- Federal and state revenues are estimated at $4.6 billion and $4.7 billion, respectively.

INTRODUCTION

This report mainly focuses on the market for veterinary services but provides and overview of the two other vertically related markets (market for veterinary education and market for veterinarians). The market for veterinary services is a combination of the need for veterinary medical services or other skills and training that veterinarians have to offer, and the ability of the profession to provide these services by educating, training and certifying veterinary medical professionals. The demand for veterinary services comes from a variety of sources: households, government, firms, and foreign entities.

The report starts with an overview of the veterinary workforce. The workforce analysis is important to understand the dynamics of the veterinary profession and to explain the changes that occur in each of the three markets. Trends in age and gender distribution of veterinarians are presented and discussed. The current situation of the veterinary profession is also discussed by showing statistics about the veterinary population and the work conditions in veterinary practices.

The second part of this report focusses on the demand for veterinary services. A large share of this section presents the summary statistics of the most recent U.S. Pet Ownership and Demographics Survey. The statistics presented include the pet population, the veterinary medical use and expenditures. This section also describes the level of competition on the market for veterinary services using statistics from the AVMA 2017 Capacity Survey.

The third part of the report assesses the economic impact of the veterinary businesses on the U.S. economy. The analysis uses IMPLAN 2013 data to estimate the economic impact of the veterinary sector on the national economy. These incidences are classified into five groups: the effect on the employment, the effect on income, the effect on output, the effect on value added, and the effect on federal and state revenues.

In addition to these three report sections, a fourth section that summarizes the key findings from the study on the effect of pet health insurance on veterinary service use and expenditure conducted with the collaboration of Mississippi State University was added.

VETERINARIANS AND VETERINARY PRACTICES

This section describes the veterinary workforce over the past 10 years (2007- 2017), presents key statistics about workforce changes, and provides a projection of the veterinary population for the next 10 years (2017- 2027). The AVMA membership database was used as a sample frame and the results were then extrapolated to the entire population of veterinarians in the United States.

The AVMA membership data were obtained from the APTIFY database for year 2007 to year 2017. APTIFY data sets contained information on membership demographics and employment-related characteristics. The total number of U.S. veterinarians was obtained from the Market Research Statistics (MRS) annual reports. The analysis consists of determining the distribution of the sample for selected characteristics and applying the sample distribution to the population. Variables under examination are gender, age, type of position and employment, earnings and location.

In addition to the demographic variables, key statistics about veterinary practices are presented in this section. The mean number of exam rooms per type of practice, the average number of DVM and non-DVM full-time equivalents (FTE) per practice, the average number of operation days per week, the average number of animals seen per DVM per day, and the mean revenues per practice as well as the main sources of revenues are discussed in this section.

Workforce Demographics

One of the major components of the veterinary workforce analysis that calls for special focus is the gender distribution and its movement over time. The veterinary profession is one of the rare professional sector to have witnessed a gender shift. This gender shift could have some social and economic implications for the entire profession. This report, however presents facts about the gender shift, but will not discuss potential consequences of this change.

In 2017, the MRS estimated the total number of active veterinarians in the United States at 110,531 veterinarians, equivalent to a 32 percent increase (or about 26,000 more veterinarians) over the 2007 estimates. On average, the U.S. veterinary population has grown by 2.8 percent per year during the period 2007- 2017.

Currently, about six out of 10 veterinarians in the United States are women, according to the MRS (2017) estimates. Figure 1 shows the gender distribution of U.S. veterinarians between 2007 and 2017. The distribution has shifted from majority male to majority female in 2009. Since then, the proportion of males has consistently declined at an average annual rate of 2.7 percent while the proportion of females has increased by 2.2 percent on average per year during the same period. The trend in the gender distribution is expected to continue as the proportion of female graduates from veterinary colleges remains considerably higher than that of males. In early 2000s, the proportion of women population in the veterinary medical colleges was estimated at around 80 percent of the total DVM student population (Slater & Slater, 2000).

GENDER DISTRIBUTION OF THE U.S. VETERINARIAN WORKFORCE

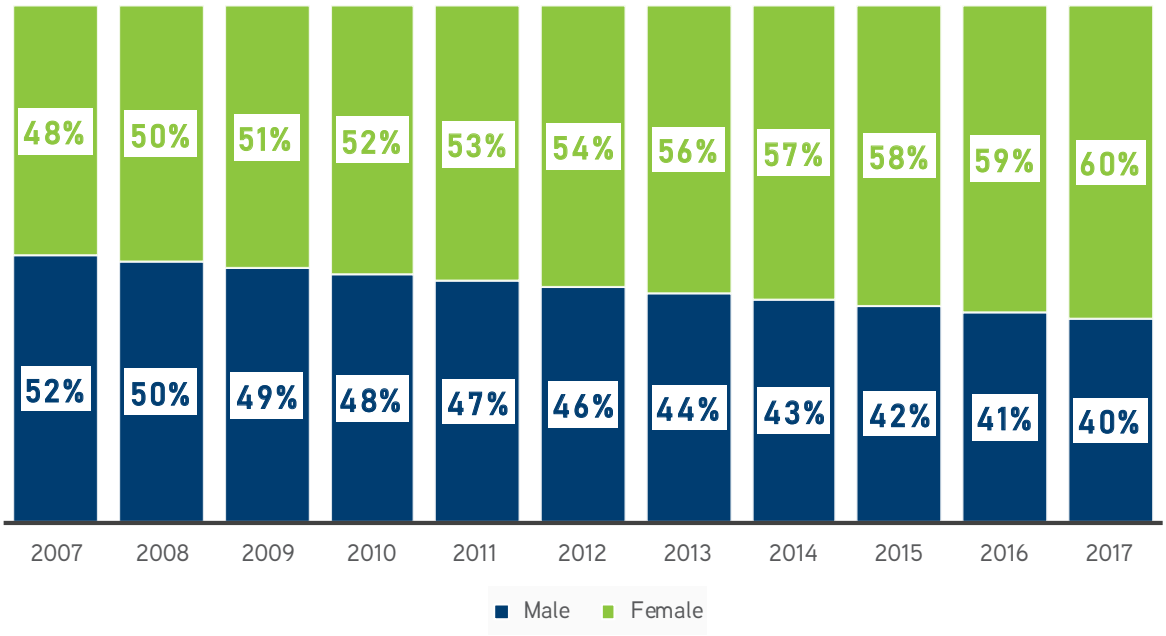
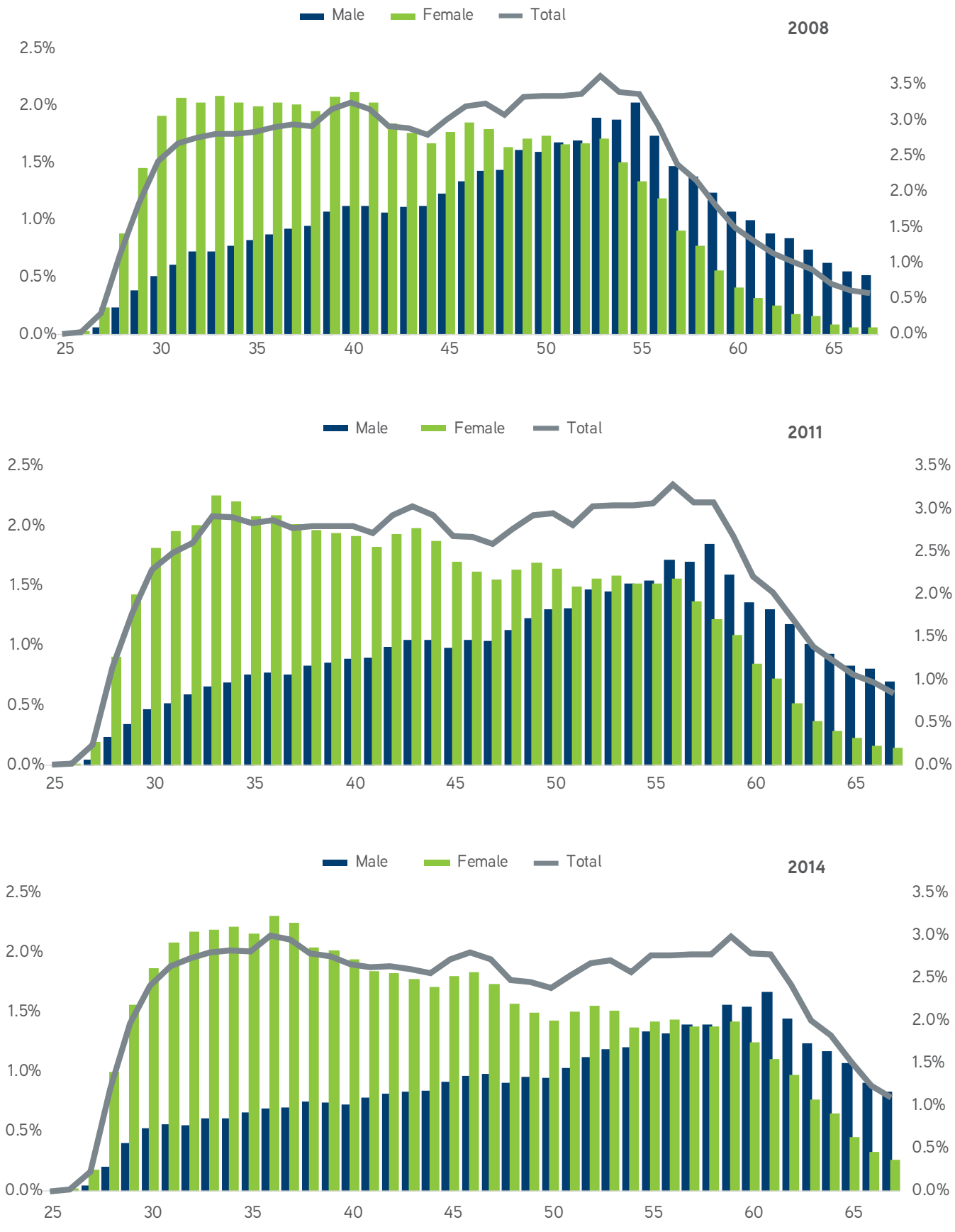


Figure 1

Another component of the workforce that will be discussed is the age distribution. Non-normality in the age distribution (skewed distribution) could have significant implications for the veterinary profession. A left-skewed distribution implies that there are more older veterinarians than younger ones. This situation could eventually lead to a workforce shortage due to a high rate of retirement. A right-skewed distribution implies that the profession is losing employees (early retirement or changing career).

The age distribution of AVMA members was used as a proxy to represent the age distribution of the U.S. veterinarians. Theoretically, three out of four U.S. veterinarians are AVMA members. Figure 2 shows the age distribution of veterinarians for four selected years between 2007 and 2017. Age distribution of females is skewed to the right while that for men is skewed to the left. But overall, the age distribution of U.S. veterinarians exhibits two modes: one for people aged between 30 and 45 (majority female) and another for people between 55 and 60 years of age (majority male).

CHANGE IN GENDER-AGE DISTRIBUTION



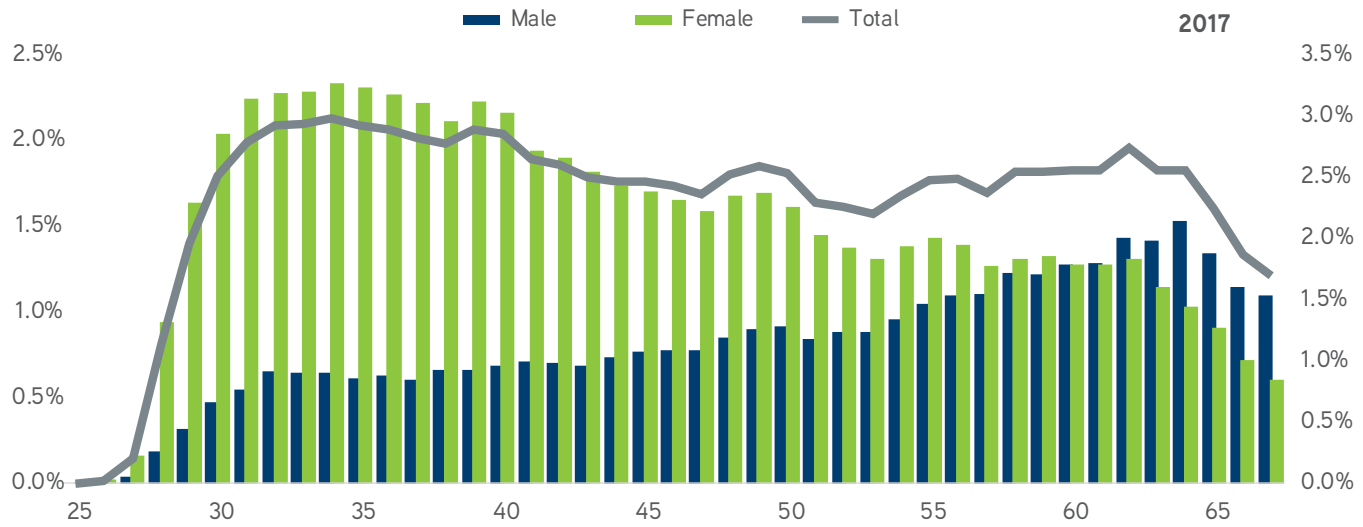


Figure 2

Using the age distribution of veterinarians for the past 10 years, a prediction model was developed to determine the total number of veterinarians for the next decade. The model for estimating the current population of veterinarians (P_t) uses information from the previous year as estimated by the MRS (P_t-1) plus the total number of new graduates (G_t-1) who have accepted a position in the United States, minus the total number of veterinarians who retired from the veterinary profession workforce (R_t-1).

The problem with these estimates is that the number of new graduates relies on the assumption that the number of seats remains unchanged between 2017 and 2027, which is not necessarily true because schools are expending their capacity and new veterinary colleges are entering the market for veterinary education. In addition, it is assumed that 90 percent of new graduates accept a position at graduation and the rest either continue in higher education or are unemployed at least during their first year after graduation. The 90 percent is the average rate observed between 2001 and 2016 and is based on the Senior Survey responses, which capture about 90 percent of all DVM graduates from U.S. veterinary colleges. One of the shortcomings of this estimation is that it does not account for veterinarians who graduated from non-AAVMC member institutions, but who eventually make their way to become licensed veterinarians practicing veterinary medicine in the United States.

The model's form: $P_t = P_{t-1} + G_{t-1} - R_{t-1}$

The result of the prediction is presented in Figure 3. The green part of the figure represents the predicted population for the upcoming decade (2017-2027). The veterinary workforce will grow on average by 1.3 percent between 2017 and 2027, reaching 124,257 veterinarians by 2027.

PROJECTION OF NUMBER OF VETERINARIANS IN THE UNITED STATES (2007-2027)

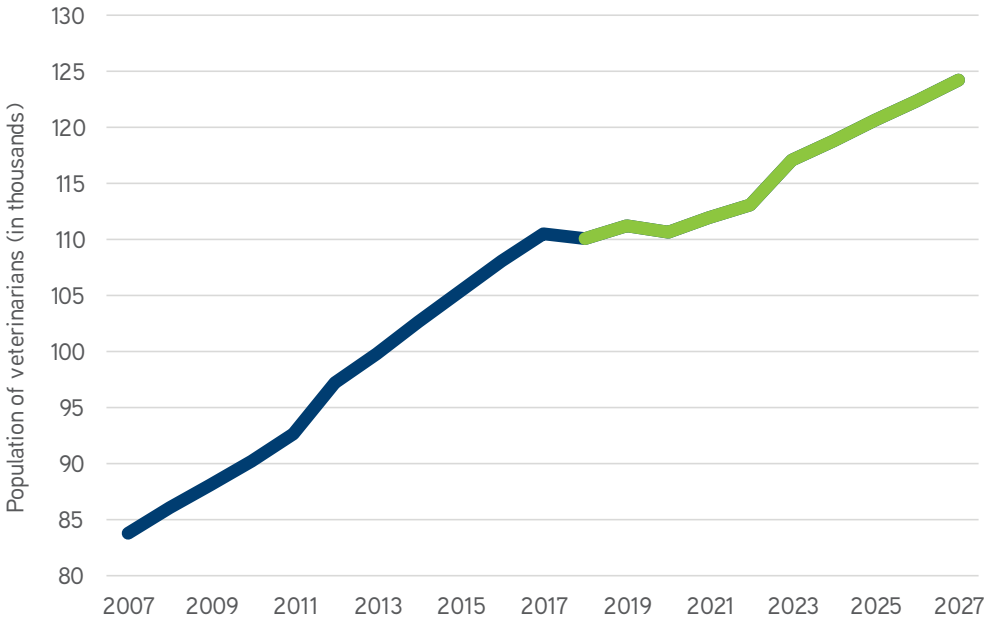


Figure 3

VETERINARY EMPLOYMENT

The trends indicate an increase in the number of veterinarians during the period 2012-2017, except for veterinary medical college/school and veterinary science departments, which witnessed a population decline of 5.2 percent and 16 percent, respectively.

Veterinarians perform in various sectors of activities. In 2017, the large majority of U.S. veterinarians were employed in private practices (79.3 percent). Of these, more than 80 percent (N = 61,606) practice general medicine/surgery. Emergency/critical care medicine (6.1 percent, N = 4,637), referral/specialty medicine (5.7 percent, N = 4,336), and production veterinary medicine (5.6 percent, N = 4,318) come in second, third and fourth, respectively. About 2.2 percent work in all other private practices not listed above.

In terms of percentage change, the population of private practice veterinarians has increased by 9.4 percent between 2007 and 2012 and by 7 percent during the period 2012-2017. This increase in the population has been detrimental to the production medicine group, which has witnessed a drop of 8.5 percent between 2007 and 2012 and 8.2 percent between 2012 and 2017. Referral/specialty medicine has made the largest change with an approximately 90 percent increase between 2007 and 2012 and a 33.8 percent increase during the period 2012- 2017. Emergency and critical care medicine, and general medicine and surgery have increased by 20 percent and 5.4 percent, respectively, during the period 2012- 2017.

VETERINARIANS IN PRIVATE PRACTICES

	2007	2012	2017	2007-2012	2012-2017
General medicine/surgery	55,380	58,460	61,606	5.6%	5.4%
Production medicine	5,141	4,702	4,318	-8.5%	-8.2%
Referral/specialty medicine	1,708	3,240	4,336	89.8%	33.8%
Emergency/critical care medicine	2,360	3,861	4,637	63.6%	20.1%
Other private clinical practice	781	1,270	1,656	62.7%	30.4%
Total/private practices	**65,369**	**71,534**	**76,552**		

Table 1

Academia is the second sector behind private practice in employing the largest number of veterinarians. In 2017, 7.3 percent of U.S. veterinarians were employed at animal health-related colleges. The largest share of those veterinarians is found in veterinary medical colleges (76.5 percent, N = 5,409), followed by veterinarians employed in veterinary technician programs (N = 454), and those employed in veterinary science departments (N = 116). Notice that 965 veterinarians (13.6 percent) are employed in academic sectors other than those listed. The trends indicate an increase in the number of veterinarians during the period 2012-2017, except for veterinary medical college/school and veterinary science departments, which witnessed a population decline of 5.2 percent and 16 percent, respectively. The population of veterinarians in academia increased by 5.3 percent during the period 2007-2012 but stayed the same during the period 2012-2017.

VETERINARIANS IN ACADEMIA

	2007	2012	2017	2007-2012	2012-2017
Veterinary medical college/school	5,753	5,704	5,409	-0.8%	-5.2%
Veterinary science department	113	138	116	22.1%	-16.0%
Veterinary technician program	246	356	454	44.8%	27.5%
Animal science department	53	91	128	73.3%	40.8%
Other academia	554	784	965	41.5%	23.1%
Total/academia	**6,719**	**7,074**	**7,072**		

Table 2

Government (federal, state, or local) employs approximately 4.3 percent (N = 4,115) of the veterinary workforce. The distribution of veterinarians in government positions by type of employment is presented in Table 3. The federal government employees represent nearly 48 percent of all veterinarians employed in government agencies. State governments represent 20.4 percent, followed by the U.S. Army (16.7%). The rest (18.2 percent) encompasses local government, air force, public health commission corps, foreign, and other government positions.

The population of veterinarians employed by government has increased by 5.6 percent between 2007 and 2012 and then declined by 2 percent between 2012 and 2017. Except for federal government, local government, and foreign services, all other groups have witnessed a decline in their population.

VETERINARIANS IN PUBLIC SECTORS

	2007	2012	2017	2007-2012	2012-2017
Federal	1,641	1,818	1,838	10.8%	1.1%
State	912	861	841	-5.6%	-2.4%
Local	214	247	300	15.5%	21.3%
Foreign	15	14	20	-7.3%	43.0%
Army	591	734	689	24.2%	-6.2%
Air force	126	120	114	-4.2%	-5.5%
Public health commission corps	61	70	65	15.9%	-7.5%
Other government	414	332	249	-19.9%	-25.0%
Total public sector	**3,975**	**4,198**	**4,115**		

Table 3

Industry employed 3.9 percent (N = 3,793) of U.S. veterinarians in 2017. The largest industrial employers are the pharmaceutical and biological sectors (37.1 percent, N = 1,406). Business and consulting services represented 16 percent (N = 980), laboratory employed 354 (9.3 percent), agriculture and livestock production employed 248 veterinarians (6.5 percent), and feed/nutrition companies employed 197 veterinarians (5.2 percent). All other commercial industries represent 25.9 percent.

The population of veterinarians employed in industry has increased by 3.7 percent between 2007 and 2012 and by 2.7 percent between 2012 and 2017. The largest increase comes from agriculture and livestock production, with a 65 percent increase between 2007 and 2012 and a 41 percent increase between 2012 and 2017.

VETERINARIANS IN INDUSTRIES

	2007	2012	2017	2007 - 2012	2012 - 2017
Pharmaceutical/biological	1,040	1,289	1,406	23.9%	9.1%
Feeds/nutrition	127	177	197	39.1%	11.3%
Laboratory	209	301	354	44.3%	17.7%
Agriculture/livestock production	106	176	248	65.0%	41.2%
Business/consulting services	677	627	607	-7.5%	-3.1%
Other industry/commercial	1,401	1,125	980	-19.7%	-12.8%
Total industry	**3,560**	**3,694**	**3,793**		

Table 4

The share of the U.S. veterinarian population at not-for-profit organizations in 2017 was about 2.7 percent. The majority of those employed in non-profit organizations are in humane organizations (50.4 percent), followed by wildlife (17.2 percent), and zoo/aquarium institutions (14.1 percent). Membership associations, professional societies, foundations, charitable organizations, and missionary services represent about 18 percent of this subpopulation.

Although not-for-profit organizations represent the smallest group, this category has had the largest percentage change over the period 2007-2012 and 2012-2017. In fact, the population of not-for-profit veterinarians has grown by 21.3 percent and 22 percent during the two periods of time listed above. The largest change came from foundation or charitable organizations and humane organizations.

VETERINARIANS IN NOT-FOR-PROFIT ORGANIZATIONS

	2007	2012	2017	2007 - 2012	2012 - 2017
Humane organization	667	907	1,331	35.9%	46.8%
Membership assn./professional society	192	206	192	7.4%	-6.9%
Foundation/charitable organization	86	149	218	73.5%	46.8%
Missionary/service	64	69	72	8.9%	4.5%
Zoo/aquarium	243	323	372	32.8%	15.3%
Wildlife	532	509	453	-4.4%	-11.0%
Total not-for-profit organization	**1,784**	**2,163**	**2,639**		

Table 5

Not all the veterinarians are employed full time. Table 6 expresses the total number of full-time and part-time veterinarians employed in the private sector in 2017. Note that some veterinarians might have held more than one position, hence, the possibility of double counting could yield an overestimation of the population.

PRIVATE PRACTICE VETERINARIANS BY FULL-TIME STATUS

	Full-time	Part-time	Total
Food animal exclusive	1,217	120	**1,338**
Food animal predominant	3,128	309	**3,437**
Mixed animal	4,096	405	**4,501**
Companion animal predominant	6,180	611	**6,790**
Companion animal exclusive	46,143	4,560	**50,703**
Equine	3,923	388	**4,311**
Other	285	28	**313**
Total	**64,972**		**71,393**

Table 6

PROFESSIONAL INCOME OF VETERINARIANS

Figures 4 and 5 present the average real professional income for associate veterinarians and practice owners, respectively, for each type of private practice in 2010, 2012, 2014 and 2016. The mean income for associate veterinarians has shown a declining pattern for all groups. Practice owners on the other hand have witnessed a somewhat increasing trend. In 2016, companion animal exclusive reported the highest mean income with $90,000 among associate veterinarians working in private practices. The group with the lowest mean earnings was equine veterinarians with roughly $66,000. Among practice owners, companion animal practice owners have the highest mean income ($162,000), followed by mixed animal practice owners ($134,000).

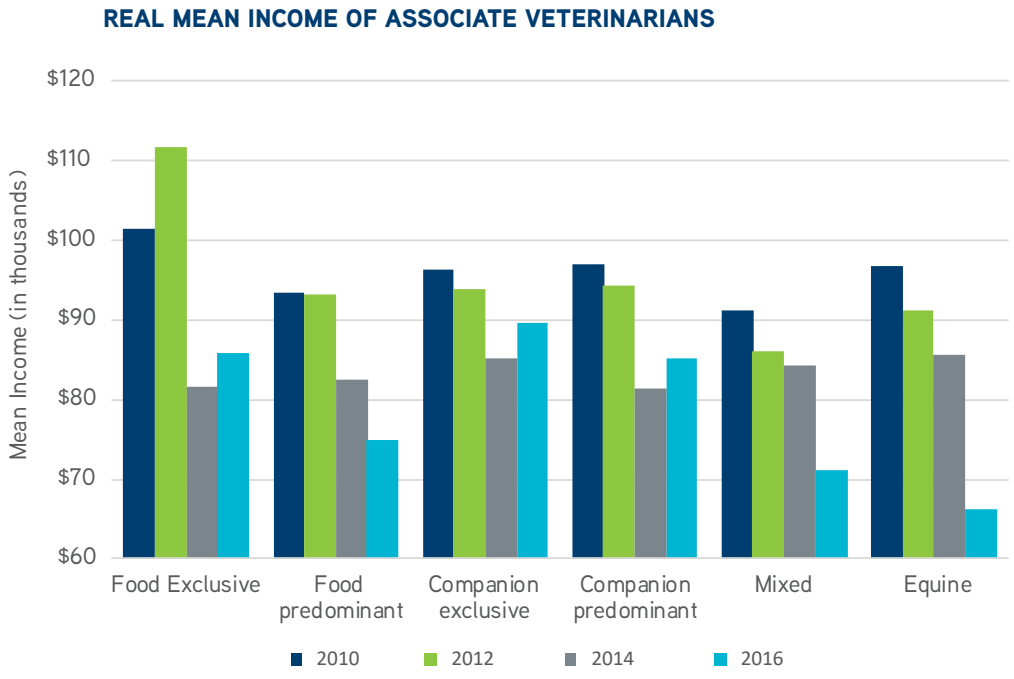


Figure 4

REAL MEAN INCOME OF PRACTICE OWNERS

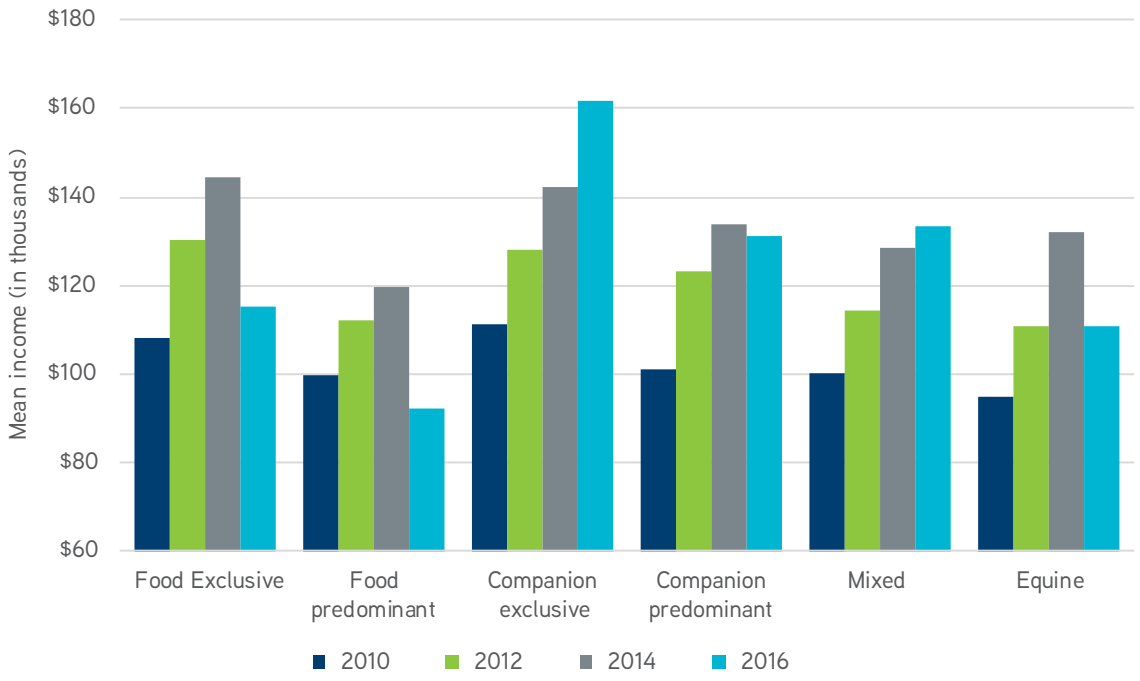


Figure 5

LOCATION OF VETERINARIANS

The last part of this section analyzes the location of veterinarians across the United States. Demand for private veterinarians depends on the size of the local market. Regions with a high demand for veterinary services are more attractive to private veterinarians. Usually populated areas with a large number of households and high-income areas report the highest number of private practitioners. The South Atlantic Region (20.7 percent), the East North Central Region (15 percent), the Pacific Region (14.4 percent), and the West South-Central Region (11.3 percent) comprise more than 60 percent of U.S. veterinarians. These four regions also represent the most populated regions in the country, with approximately 62 percent of the U.S. population (U.S. Census Bureau, 2010).

DISTRIBUTION OF VETERINARIANS BY CENSUS REGION

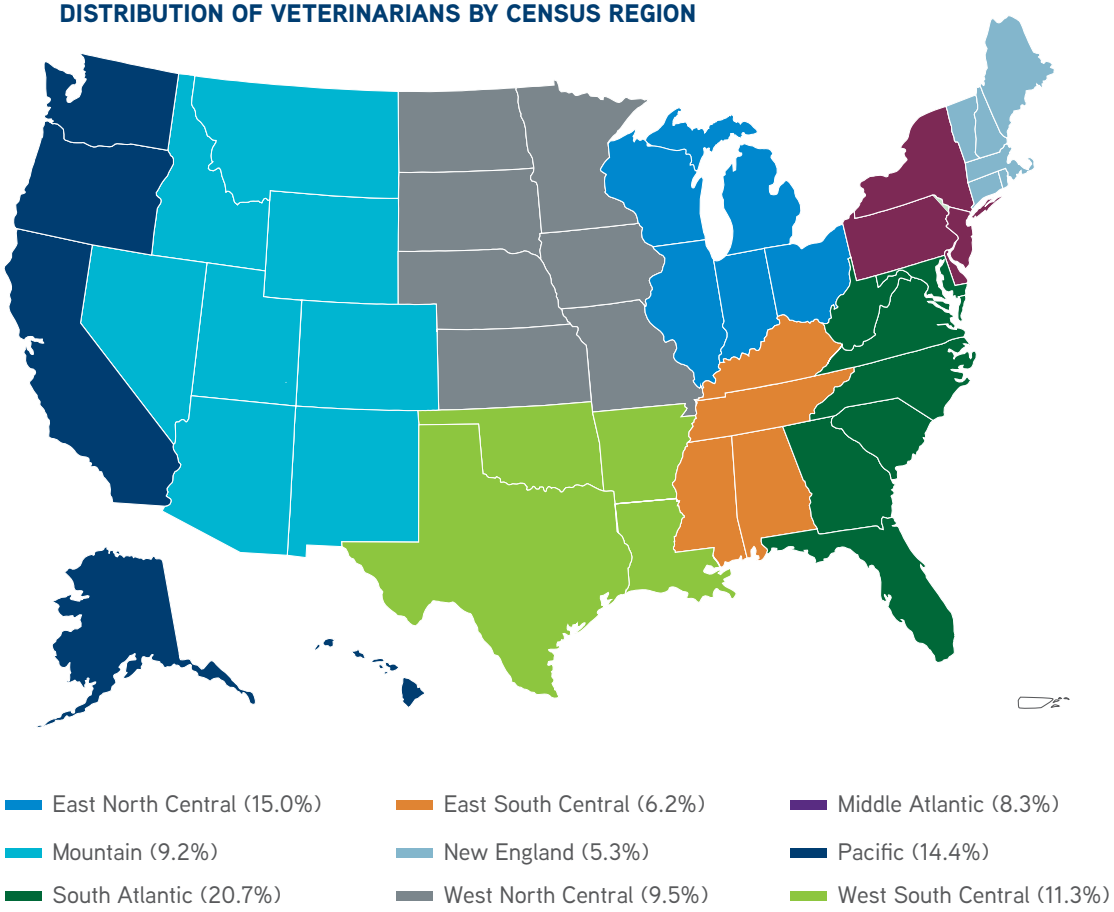


Figure 6

VETERINARY PRACTICES

This section provides a benchmark analysis of the work conditions and work environment inside veterinary practices. Due to the lack of observations, only selected types of practices will be considered. According to the 2017 Barnes Reports on U.S. Industry & Market Outlook, there were in total 44,301 veterinary establishments across the nation. Veterinary establishment in the Barnes Reports is defined as "a single physical location at which business is conducted and/or services are provided." The AVMA 2017 Capacity Survey collected information from a sample of this population of veterinary establishments. The capacity survey divided the establishments into four groups: hospitals, mobile practices, ambulatory/emergency practices, and both ambulatory and hospitals. In addition, establishments were classified into four major employment sectors: private practices, private referral practices, corporate owned practices, and other private practices. From the 1,344 observations that returned useful responses, 95 percent were private practices, 2.4 percent private referral practices, 1.9 percent corporate-owned practices, and 0.5 percent other types. Three respondents (0.2%) did not provide information about their employment sector and were excluded from the analysis. In addition to their sector of employment, respondents were asked to specify their practice's primary focus. The summary statistics indicate that 64 percent (860 establishments) are in companion animal exclusive medicine, 16.7 percent are in companion animal predominant medicine, 8.7 percent in mixed animal health care, and 10.3 percent in the care of all other types of animals. The section below presents the key findings for each type of establishments.

General Characteristics of Veterinary Practice

For private companion animal exclusive, the descriptive statistics show that in 2017 the mean square footage for hospitals, ambulatory and hospitals, and mobile practices was 4,340 sq. ft., 4,309 sq. ft., and 382 sq. ft., respectively. The average number of exam rooms was approximately three for hospitals; 1.8 for ambulatory and hospitals; and one for mobile practices.

Businesses in this category are open 5.2 days to 5.8 days a week on average for approximately nine hours each day for hospitals and eight hours a day for mobile practices. Exam rooms are utilized more than 80 percent of the time during the operating hours of hospitals.

The maximum number of patients that each FTE veterinarian could see per week was estimated at 103, 90 and 40, respectively, for each of these three business types. The number of animals that each FTE veterinarian should see is around 81, 77 and 34 animals, respectively, and the average number of animals that each FTE veterinarian saw in 2016 was 73 animals a week for veterinarians in hospitals, 76 animals for veterinarians in both ambulatory and hospitals, and 30 animals for mobile practitioners.

The number of veterinarians per hospital was estimated at around 2.5 veterinarians working with two certified vet technician FTEs, three non-certified vet technician FTEs, and three other non-technician staffs. In term of ratio, a typical hospital was characterized by one veterinarian for three non-veterinarian staff. In ambulatory and hospitals, the number of FTEs veterinarians was estimated at around 1.8 veterinarians working with 6.2 non-veterinarian staffs, a ratio of about 1:3.

CHARACTERISTICS OF COMPANION EXCLUSIVE PRACTICES

	Hospitals	Ambulatory & hospitals	Mobile
Square footage of the practice	4,340.0	4,309.5	382.2
Number of exam rooms	3.5	3.1	0.3
Maximum number of patients per DVM FTE	102.6	89.7	40.0
Ideal number of patients per DVM FTE	80.7	76.9	33.6
Actual number of patients per DVM FTE	73.2	76.1	30.2
Days open per week	5.8	5.6	5.2
Hours open per week	55.8	50.5	41.9
Hours exam rooms are used per week	44.4	41.2	13.2
FTEs veterinarians	2.5	1.8	0.9
FTEs certified vet. technicians	2.0	1.8	0.3
FTEs non-certified vet. technicians	3.0	2.1	0.3
FTEs non-technical staff	3.3	2.3	0.2
Total number of veterinarians	2.5	1.8	0.9
Total number of non-veterinarians	8.3	6.2	0.9
Total number of non-medical staffs	3.3	2.3	0.2
Number of co-owners	1.0	0.8	0.8
Number of associate veterinarians	1.8	1.1	0.2

Table 7

For private companion animal predominant, the descriptive statistics show that the mean square footage in 2017 was approximately 3,600 sq. ft. for hospitals and 664 sq. ft. for mobile practices. The average number of exam rooms was three rooms for hospitals and 2.7 for ambulatory and hospitals.

Businesses are open for six days a week on average for all types of businesses. Average hours of operation per day was estimated at nine for hospitals and seven for mobile practices.
As for companion exclusive, mobile practices are open for about 40 hours a week, but exam rooms are used about 30 percent of the total time.

The maximum number of patients that each FTE veterinarian could see per week was estimated at 97, 121 and 37, respectively, for hospitals, ambulatory and hospitals, and mobile practices.

The number of animals that each FTE veterinarian should see is around 82, 101 and 31 animals, respectively, and the average number of animals that each FTE veterinarian saw in 2016 was about 76 animals a week for veterinarians in hospitals, 88 animals for veterinarians in both ambulatory and hospitals, and 19 animals for mobile practitioners.

The number of veterinarians per hospital was estimated at around 2.1 veterinarians working with 1.5 certified vet technician FTEs, 2.4 non-certified vet technician FTEs, and 2.4 other non-technician staff. In term of ratio, a typical hospital was characterized by one veterinarian for three non-veterinarian staff. In ambulatory and hospitals, the number of FTEs veterinarians was estimated at approximately two veterinarians working with 6.2 non-veterinarian staff, a ratio of about 1:3.

CHARACTERISTICS OF COMPANION PREDOMINANT PRACTICES

	Hospitals	Ambulatory & hospitals	Mobile
Square footage of the practice	3,605.1	3,607.5	664.0
Number of exam rooms	3.0	2.7	0.7
Maximum number of patients per FTE	97.4	121.5	36.8
Ideal number of patients per FTE	82.1	101.4	30.8
Actual number of patients per FTE	76.1	88.0	19.0
Days open a week	5.7	5.8	5.4
Hours open per week	51.1	50.8	40.0
Hours exam rooms are used per week	39.6	37.9	12.0
FTEs veterinarians	2.1	2.0	1.0
FTEs certified vet. technicians	1.5	1.2	0.1
FTEs non-certified vet. technicians	2.4	2.7	0.5
FTEs non-technical staff	2.4	2.2	0.4
Total number of veterinarians	2.1	2.0	1.0
Total number of non-veterinarians	6.3	6.2	1.0
Total number of non-medical staff	2.4	2.2	0.4
Number of co-owners	0.9	1.0	0.5
Number of associate veterinarians	1.2	1.2	0.0

Table 8

For mixed animal practices, the descriptive statistics show that the mean square footage for hospitals in 2017 was approximately 2,920 sq. ft., for ambulatory and hospitals, 5,646 sq. ft., and for mobile practices, 1,437 sq. ft. The average number of exam rooms was 2.3 for hospitals and 2.6 for ambulatory and hospitals.

All types of businesses in the profession are open for about six days a week on average. The average hours of operation per day was estimated at eight hours for hospitals and 12 for mobile practices. While at hospitals exam room are used more than 70 percent of the time the facility is open time, at mobile practices, exam rooms are used less than 20 percent of the time.

The maximum number of patients that each FTE veterinarian could see per week was estimated at 115, 120 and 94, respectively for each of these business types. In 2016, the ideal number of animals that each FTE veterinarian at these types of businesses should see is around 100, 83 and 70, respectively, and the average number of animals that each FTE veterinarian was seeing per week in 2016 was about 96 at hospitals, 78 in both ambulatory and hospitals, and 60 at mobile practices.

The number of veterinarians per hospital was estimated at around 1.3 who are working with 1.8 certified vet technician FTEs, 0.3 non-certified vet technician FTEs, and 0.5 other non-technician staffs. In terms of ratio, a typical hospital was characterized by 1 veterinarian for 1.9 non-veterinarian staff. In ambulatory and hospital operations, the number of FTE veterinarians was estimated at around 2.6 veterinarians working with 5.7 non-veterinarian staff members, about a 1:2.2 ratio.

CHARACTERISTICS OF MIXED PRACTICES

	Hospitals	Ambulatory & hospitals	Mobile
Square footage of the practice	2,920.0	5,646.2	1,437.4
Number of exam rooms	2.3	2.6	0.7
Maximum number of patients per FTE	115.0	119.8	94.1
Ideal number of patient per FTE	100.0	83.0	70.5
Actual number of patient per FTE	96.3	78.5	60.0
Days open a week	6.0	5.8	5.7
Hours open per week	48.0	49.2	70.2
Hours exam rooms are used per week	36.3	36.2	13.0
FTEs veterinarians	1.3	2.6	1.7
FTEs certified vet. technicians	1.8	1.1	0.1
FTEs non-certified vet. technicians	0.3	2.2	0.8
FTEs non-technical staff	0.5	2.4	0.1
Total number of veterinarians	1.3	2.6	1.7
Total number of non-veterinarians	2.5	5.7	1.0
Total number of non-medical staffs	0.5	2.4	0.1
Number of co-owners	1.0	0.9	0.8
Number of associate veterinarians	0.3	1.3	0.3

Table 9

The descriptive statistics show that the mean square footage of space at food animal exclusive practices in 2017 was approximately 625 sq. ft. for ambulatory and hospitals, and 280 sq. ft., for mobile practices. Business are open for more than six days a week on average for all types of businesses. Average hours of operation per day was estimated at 18 hours at ambulatory and hospital establishments and 11 at mobile practices.

The maximum number of patients that each FTE veterinarian could see per week was estimated at 345 for ambulatory and hospital businesses and 28 for mobile practices. The ideal number of animals that each FTE veterinarian should see is around 153 and 35, respectively, for ambulatory and hospitals, and mobile practices.

CHARACTERISTICS OF FOOD EXCLUSIVE PRACTICES

	Ambulatory & hospitals	Mobile
Square footage of the practice	625.0	280.0
Number of exam rooms	0.0	0.0
Maximum number of patients per FTE	345.5	28.3
Ideal number of patient per FTE	153.4	35.0
Actual number of patient per FTE	196.8	217.0
Days open a week	6.6	6.3
Hours open per week	119.6	70.0
Hours exam rooms are used per week	0.0	0.0
FTEs veterinarians	1.0	1.4
FTEs certified vet. technicians	0.0	0.0
FTEs non-certified vet. technicians	0.0	0.1
FTEs non-technical staff	0.1	0.1
Total number of veterinarians	1.0	1.4
Total number of non-veterinarians	0.1	0.3
Total number of non-medical staffs	0.1	0.1
Number of co-owners	1.0	1.0
Number of associate veterinarians	0.2	0.5

Table 10

For food animal predominant practices, the descriptive statistics show that the mean square footage in 2017 was approximately 7,133 sq. ft. for ambulatory and hospitals, and 667 sq. ft., for mobile practices. Business are open for about six days a week on average for all types of businesses. Average hours of operation per day was estimated at nine for ambulatory and hospitals and 10 for mobile practices.

The maximum number of patients that each FTE veterinarian could see per week was estimated at 210 for ambulatory and hospitals and 19 for mobile practices. The ideal number of animals that each FTE veterinarian should see is around 214 and 16, respectively for ambulatory and hospitals and mobile practices.

The number of veterinarians per hospital was estimated at around 2.8 veterinarians working with 0.6 certified vet technician FTEs, 0.8 non-certified vet technician FTEs, and 1.1 other non-technician staffs. In terms of ratio, a typical hospital was characterized by one veterinarian for one non-veterinarian staff. In ambulatory and hospitals, the number of FTEs veterinarians was estimated at around 7.7 veterinarians working with 0.1 non-veterinarian staff, a ratio of about 1:0.4.

CHARACTERISTICS OF FOOD PREDOMINANT PRACTICES

	Ambulatory & hospitals	Mobile
Square footage of the practice	7,133.4	666.7
Number of exam rooms	1.3	0.2
Maximum number of patients per FTE	210.0	18.8
Ideal number of patient per FTE	214.2	16.3
Actual number of patient per FTE	172.1	13.0
Days open a week	6.1	6.3
Hours open per week	55.5	63.3
Hours exam rooms are used per week	15.4	3.3
FTEs veterinarians	2.8	7.7
FTEs certified vet. technicians	0.6	0.1
FTEs non-certified vet. technicians	0.8	0.1
FTEs non-technical staff	1.1	0.1
Total number of veterinarians	2.8	7.7
Total number of non-veterinarians	2.5	0.3
Total number of non-medical staffs	1.1	0.1
Number of co-owners	1.5	1.9
Number of associate veterinarians	1.1	0.1

Table 11

For equine practices, the descriptive statistics indicate that the mean square footage at a facility in 2017 was approximately 4,067 sq. ft. for ambulatory and hospitals, 5,852 sq. ft., for mobile practices, and 837 sq. ft. for ambulatory/emergency practices. All of the types of practices are open about six days a week on average. The average hours of operation per day was estimated at 11 for ambulatory and hospitals, 12 for mobile practices, and 11 for ambulatory/emergency practices.

The maximum number of patients that each FTE veterinarian could see per week was estimated at 77 for ambulatory and hospitals, 101 for mobile practices, and 62 for ambulatory/emergency practices. The ideal number of animals that each FTE veterinarian should see is around 67, 60 and 50, respectively. The ratio of veterinarians to non-veterinarians is 1:1.5 for ambulatory and hospitals, 1:0.5 for mobile practices, and 1:0.7 for ambulatory/emergency practices.

CHARACTERISTICS OF EQUINE PRACTICES

	Ambulatory & hospitals	Mobile	Ambulatory / emergency
Square footage of the practice	4,067.4	5,852.4	837.5
Number of exam rooms	1.4	0.2	0.3
Maximum number of patients per FTE	77.0	100.7	62.4
Ideal number of patient per FTE	66.5	59.6	50.2
Actual number of patient per FTE	43.2	52.7	46.9
Days open a week	5.9	5.9	6.3
Hours open per week	65.0	71.8	71.6
Hours exam rooms are used per week	19.2	4.2	1.0
FTEs veterinarians	4.8	1.5	1.2
FTEs certified vet. technicians	0.7	0.1	0.0
FTEs non-certified vet. technicians	4.0	0.4	0.6
FTEs non-technical staff	2.6	0.3	0.2
Total number of veterinarians	4.8	1.5	1.2
Total number of non-veterinarians	7.4	0.8	0.8
Total number of non-medical staffs	2.6	0.3	0.2
Number of co-owners	2.0	2.9	0.5
Number of associate veterinarians	4.3	1.3	0.3

Table 12

For specialty/exotic practices, the descriptive statistics show that the mean square footage in 2017 was approximately 7,089 sq. ft. for hospitals and 2,450 sq. ft. for ambulatory and hospitals. Business are open for about 5.6 to six days a week on average. The average hours of operation per day was estimated at 11 for hospitals and eight for ambulatory and hospitals.

The maximum number of patients that each FTE veterinarian could see per week was estimated at 80 for hospitals and 35 for ambulatory and hospitals. The ideal number of animals that each FTE veterinarian should see is 70 and 26, respectively. The ratio of veterinarians to non-veterinarians is 1:6.4 for hospitals and 1:2.2 for ambulatory hospitals.

CHARACTERISTICS OF EXOTIC/SPECIALTY PRACTICES

	Hospitals	Ambulatory & hospitals
Square footage of the practice	7,088.9	2,450.0
Number of exam rooms	6.1	2.0
Maximum number of patients per FTE	80.3	35.0
Ideal number of patient per FTE	69.8	26.0
Actual number of patient per FTE	72.1	23.5
Days open a week	5.6	6.0
Hours open per week	62.0	50.5
Hours exam rooms are used per week	49.7	45.5
FTEs veterinarians	7.2	2.5
FTEs certified vet. technicians	30.4	3.0
FTEs non-certified vet. technicians	4.8	0.0
FTEs non-technical staff	10.7	2.5
Total number of veterinarians	7.2	2.5
Total number of non-veterinarians	45.9	5.5
Total number of non-medical staffs	10.7	2.5
Number of co-owners	1.4	0.5
Number of associate veterinarians	6.2	1.5

Table 13

Revenues and Revenue Components

The chart summarizes the trend in mean gross revenue between 2011 and 2017 by type of private practices. The chart indicates that for companion exclusive, the gross revenue has increased by approximately 17 percent between 2011 and 2017. For mixed animal practices, the average revenue has grown from $604,000 in 2011 to more than $700,000 in 2017, equivalent to a 32 percent increase. Companion predominant has witnessed a modest but positive increase in gross revenue. Gross revenue has declined for both equine and food predominant practices.

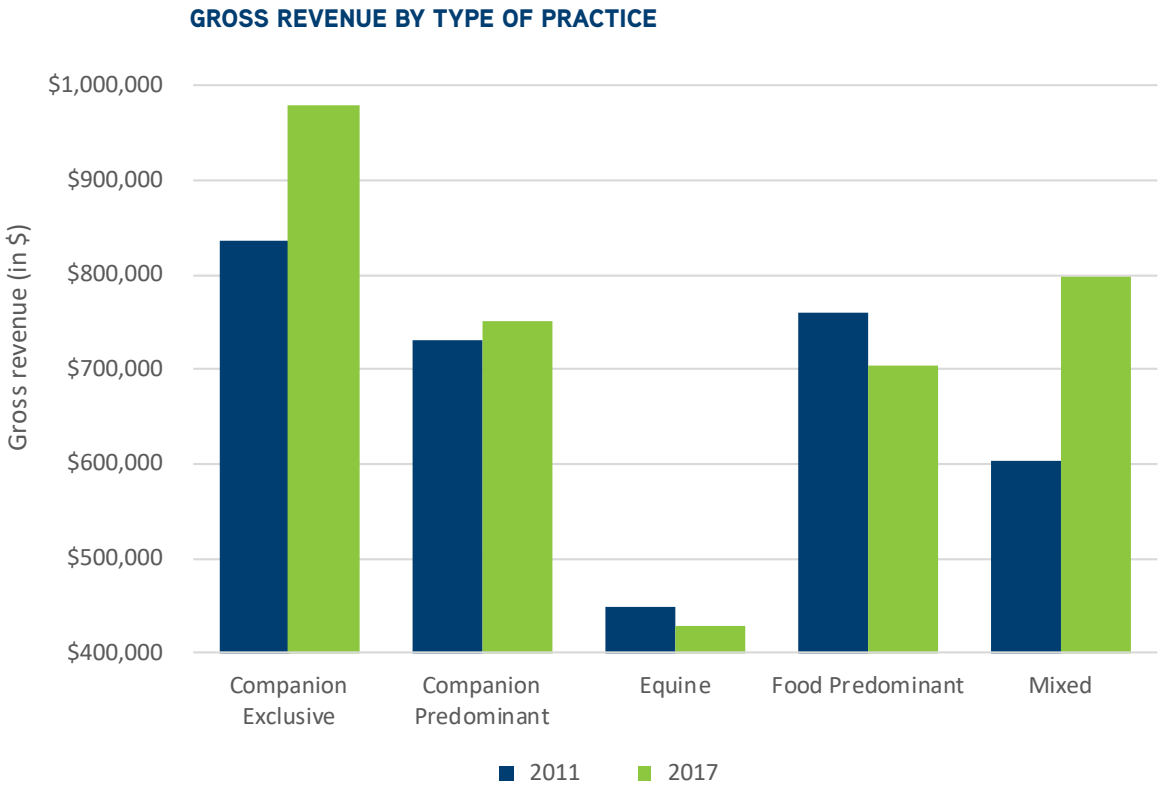


Figure 7

Figure 8 presents survey findings to give an understanding of the market for veterinary services and products, and to cast light on the revenue components of veterinary practices. Owners were asked to report the percentage of revenue attributable to the following categories: imaging, laboratory, wellness exam and vaccinations, prescription drug sales, food and feed sales, dentistry, surgery and anesthesia, and others. The results, organized by practice type, show the largest share of practice revenue is attributable to wellness exams and vaccinations followed by drug sales. For equine practices, imaging is also one of the largest contributors to the practice gross revenue.

SOURCES OF PRACTICE REVENUES

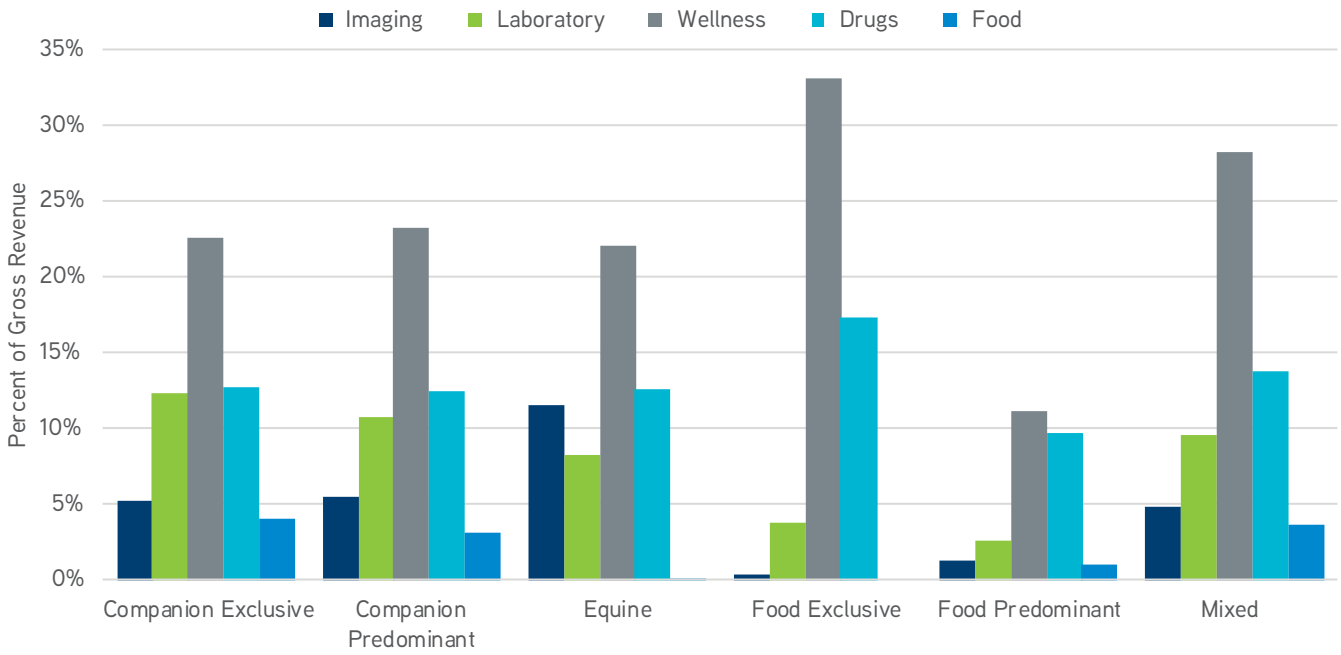


Figure 8

The same analysis was applied to companion animal exclusive and companion animal predominant practices, but this time, controlling for the size of the practice. These two types of practices were selected for analysis, due to their large number of observations.

Among companion exclusive practices, larger ones (more than eight veterinarians) tend to receive the greatest share of revenue from laboratory services, whereas practices with fewer than eight veterinarians get the largest share of their revenues from wellness exams and vaccinations. In both cases, food and feed sales represent between 3 percent and 7 percent of the gross revenue.

SOURCES OF PRACTICE REVENUES BY PRACTICE SIZE (COMPANION EXCLUSIVE PRACTICES)

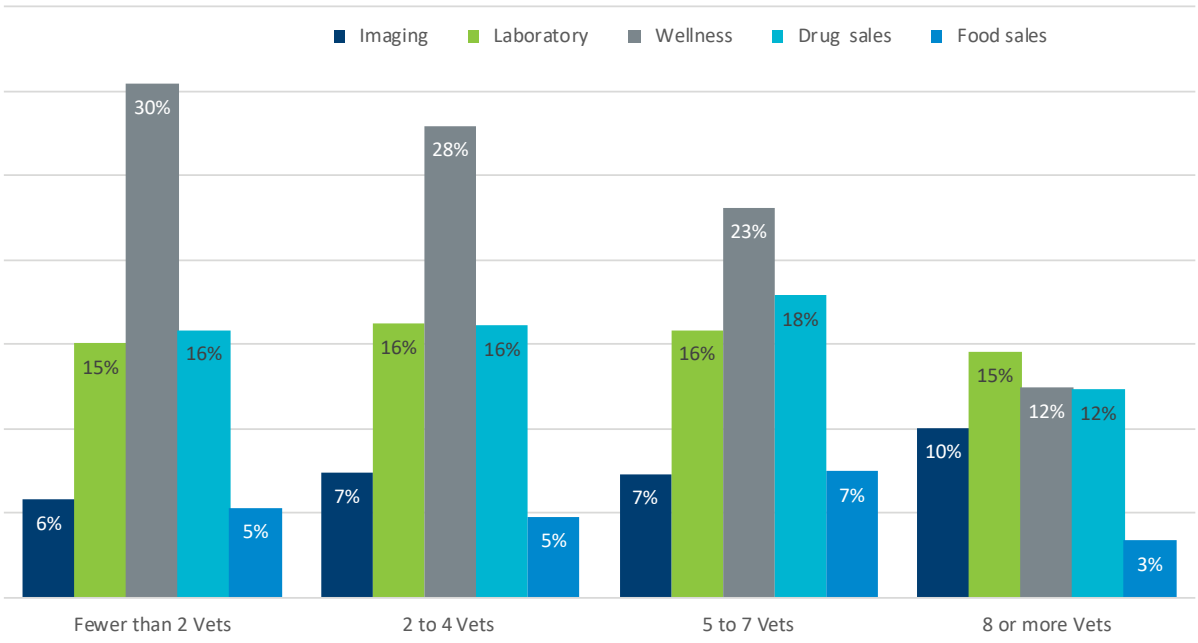


Figure 9

SOURCES OF PRACTICE REVENUES BY PRACTICE SIZE (COMPANION PREDOMINANT PRACTICES)

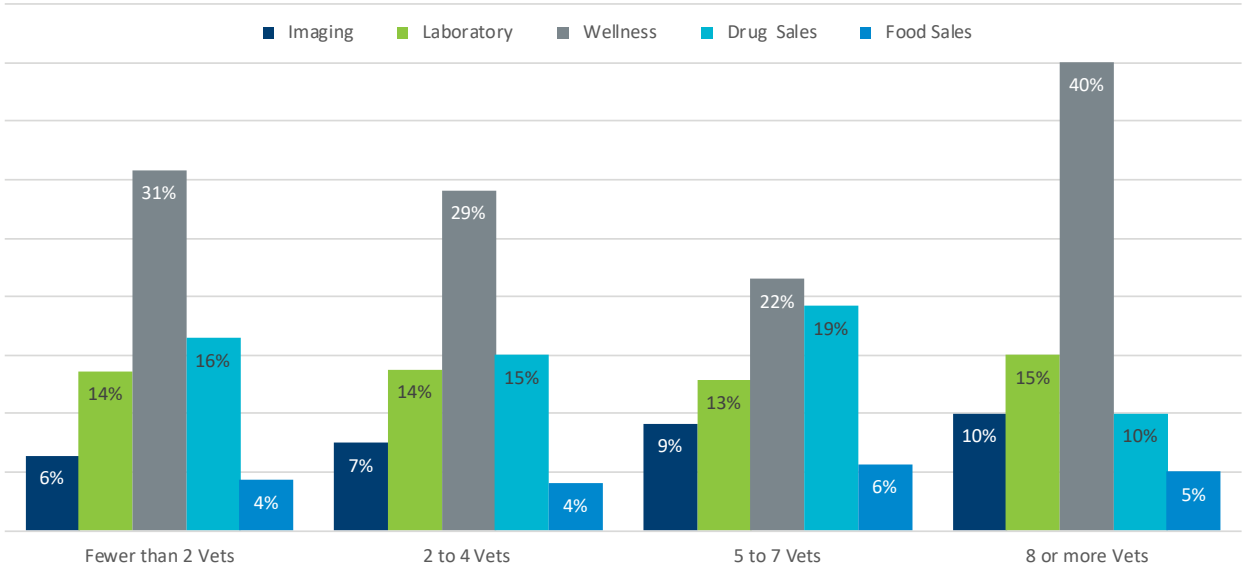


Figure 10

MARKET FOR VETERINARY SERVICES

This section presents the economic impacts of veterinary practices on the United States economy. Using the North American Industry Classification System (NAICS), the U.S. Department of Commerce (DOC) surveys, tracks and reports on each "industry" sector in the nation's economy, both for goods produced and services provided. According to the DOC, "Developed in cooperation with Canada and Mexico, the North American Industry Classification System (NAICS) represents one of the most profound changes for statistical programs focusing on emerging economic activities. NAICS uses a production-oriented conceptual framework to group establishments into industries based on the activity in which they are primarily engaged. Establishments using similar raw material inputs, similar capital equipment, and similar labor are classified in the same industry. In other words, establishments that do similar things in similar ways are classified together. NAICS was introduced in 1997 and is periodically revised to reflect changes in the industrial structure of the U.S. and North American economy."[1]

Each of the segments of the nation's economy are identified with a NAICS number that reflects the larger sector, specific subsector within the sector, and industries within the subsector. The Veterinary Service Industry is identified as NAICS 541940. The first two digits, 54, refer to the Professional, Scientific and Technical Services Sector.

Subsector 541, also identified as Professional, Scientific, and Technical Services, groups "establishments engaged in processes where human capital is the major input. These establishments make available the knowledge and skills of their employees, often on an assignment basis, where an individual or team is responsible for the delivery of services to the client. The individual industries of this subsector are defined on the basis of the particular expertise and training of the services provider. The distinguishing feature of the Professional, Scientific, and Technical Services subsector is the fact that most of the industries grouped within have production processes that are almost wholly dependent on worker skills. In most of these industries, equipment and materials are not of major importance, unlike health care, for example, where 'high-tech' machines and materials are important collaborating inputs to labor skills in the production of health care. Thus, the establishments classified in this subsector sell expertise."[2]

The NAICS 541940 category includes establishments of licensed veterinary practitioners (primarily engaged in the practice of veterinary medicine, dentistry, or surgery for animals) and establishments primarily engaged in providing testing services for licensed veterinary practitioners. A number of sectors typically related to pet care, however, were excluded from NAICS 541940. These entities are establishments whose main focus is to provide veterinary research and development services, to conduct research and development in the physical, engineering, and life sciences, to provide non-veterinary pet care services, such as boarding or grooming pets, and to provide animal breeding services or horse boarding.

[1] https://www.bls.gov/bls/naics.htm
[2] https://www.census.gov/eos/www/naics/2017NAICS/2017_NAICS_Manual.pdf

Data collected through surveys and records from the establishments in the veterinary services industry are integrated into an "input-output" model of the U.S. economy. This model is known as IMPLAN and is available as IMPLAN software. IMPLAN contains an abbreviated set of industries and only the industry coded "459" corresponds to the definition of the veterinary services as provided by the NAICS 541940.

The first part of this report section provides an overview of the veterinary practices in the United States, and the second part focuses on the contributions of these practices to the state and national economy.

Private Veterinary Businesses in the United States

Veterinary practices data used in this analysis come from the United States Census Bureau. Information on veterinary businesses classified by size and type of business at the county, state and national level is available through the American Fact Finder (https://factfinder.census.gov). In 2016 the number of veterinary businesses (included in the NAICS 541940) in the United States was estimated at approximately 31,205 establishments corresponding to a .0 percent increase from 2015 and a 12.7 percent increase from 2006. Veterinary businesses were categorized into six legal forms of organizations (corporations, S-corporations, individual proprietorships, partnerships, not-for-profit organizations, and all other noncorporate legal forms of organizations). Figure 11 shows the number of businesses by legal form of organization in 2010, 2013 and 2016. S-corporations, partnerships, and not-for-profit organizations exhibit an increasing trend. The number of S-corporations has increased by 11 percent between 2010 and 2013 and by 12 percent between 2013 and 2016. Between 2010 and 2013, partnerships, and not-for-profit organizations increased by 3 percent and 21 percent, respectively. The percentage change between 2013 and 2016 was 6 percent for partnerships and 10 percent for not-for-profit organizations.

Not all types of businesses have increased in number. Individual proprietorships have declined by 11 percent between 2010 and 2013, and by 12 percent between 2013 and 2016. The number of corporations has increased slightly (2 percent) between 2010 and 2013 but drastically decreased (14 percent) between 2013 and 2016.

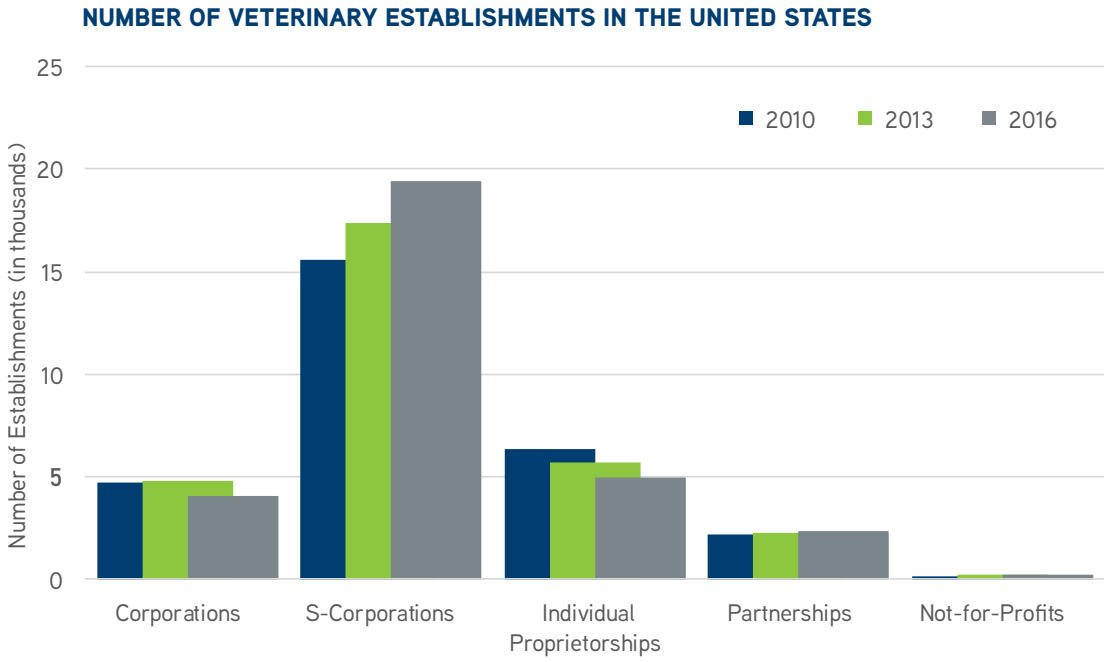


Figure 11

Accounting for the size of the business, the results show that all groups have increased in number between 2010 and 2013. Between 2013 and 2016, however, the number of establishments that employ one to four people has neither increased nor declined. The number of practices that employ between five and nine employees has decreased by 3 percent. The rest of the groups of businesses have grown sharply. Large businesses (more than 100 employees) have increased in number by 51 percent and businesses that employ 50 to 99 people have grown by 31 percent. This indicates that either medium-size businesses have merged to create larger firms, or that large corporations have bought medium-size practices.

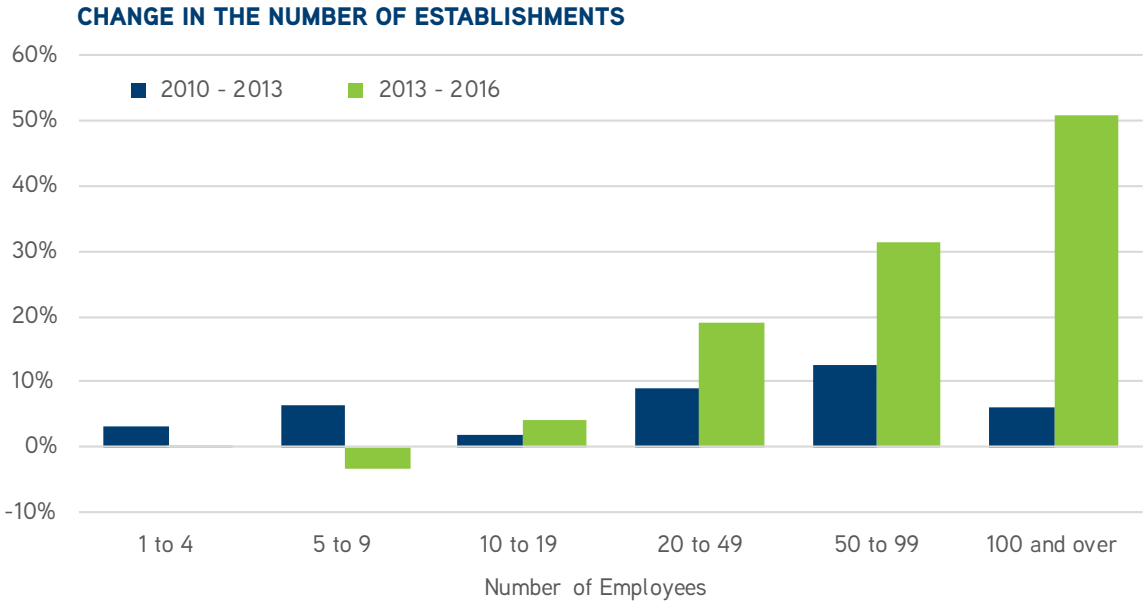
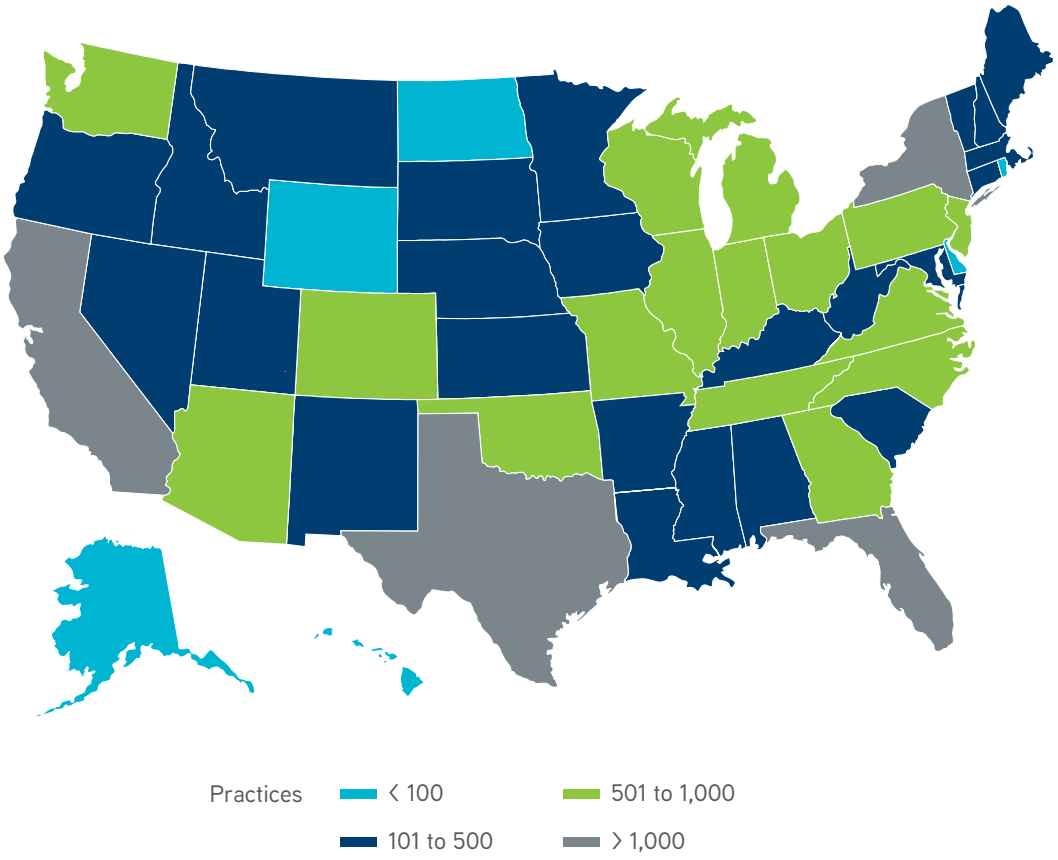


Figure 12

Figures 13 and 14 show the location of veterinary establishments in the United States by size (smaller practices employ fewer than 20 employees and larger practices employ 20 or more employees). States were categorized based on the number of establishments. The three states with the largest number of establishments are California, Texas and Florida. Establishments that employ at least 100 people are more numerous in California, Texas, Washington, Illinois, New York, Pennsylvania and Massachusetts.

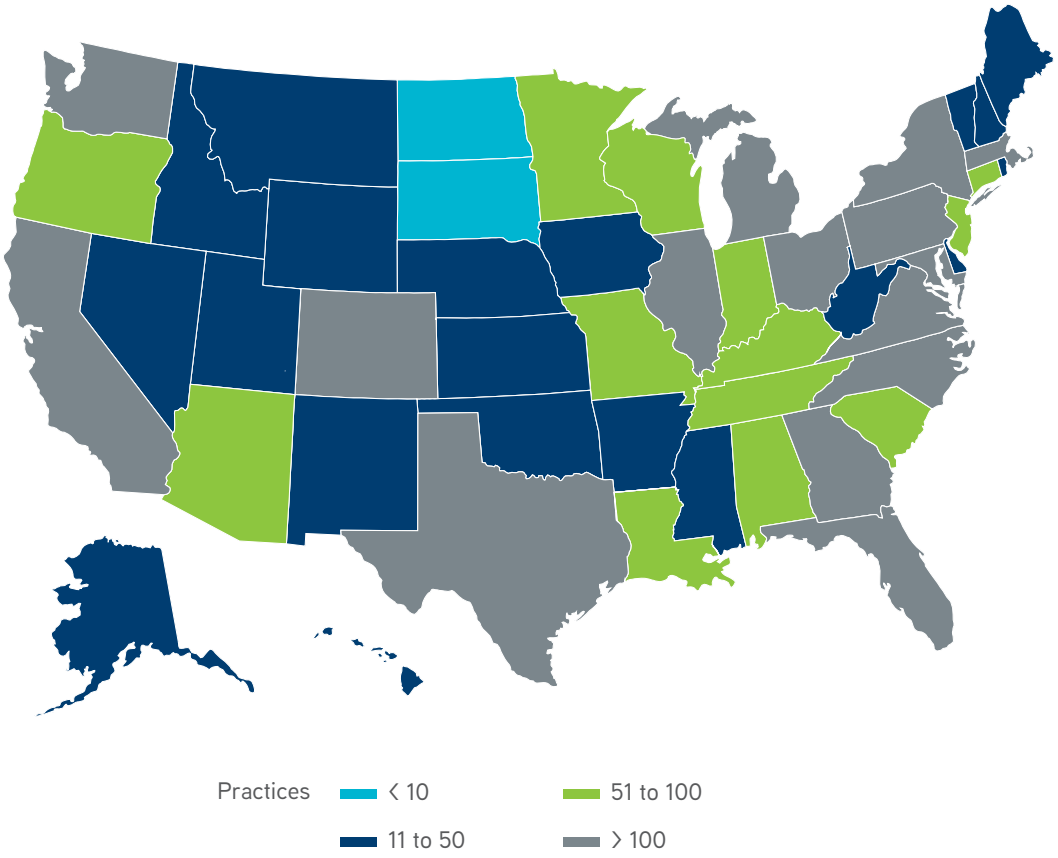
DISTRIBUTION OF ESTABLISHMENTS (FEWER THAN 20 EMPLOYEES)



Source: U.S. Census Bureau (2016 data)

Figure 13

DISTRIBUTION OF ESTABLISHMENTS (20 EMPLOYEES OR MORE)

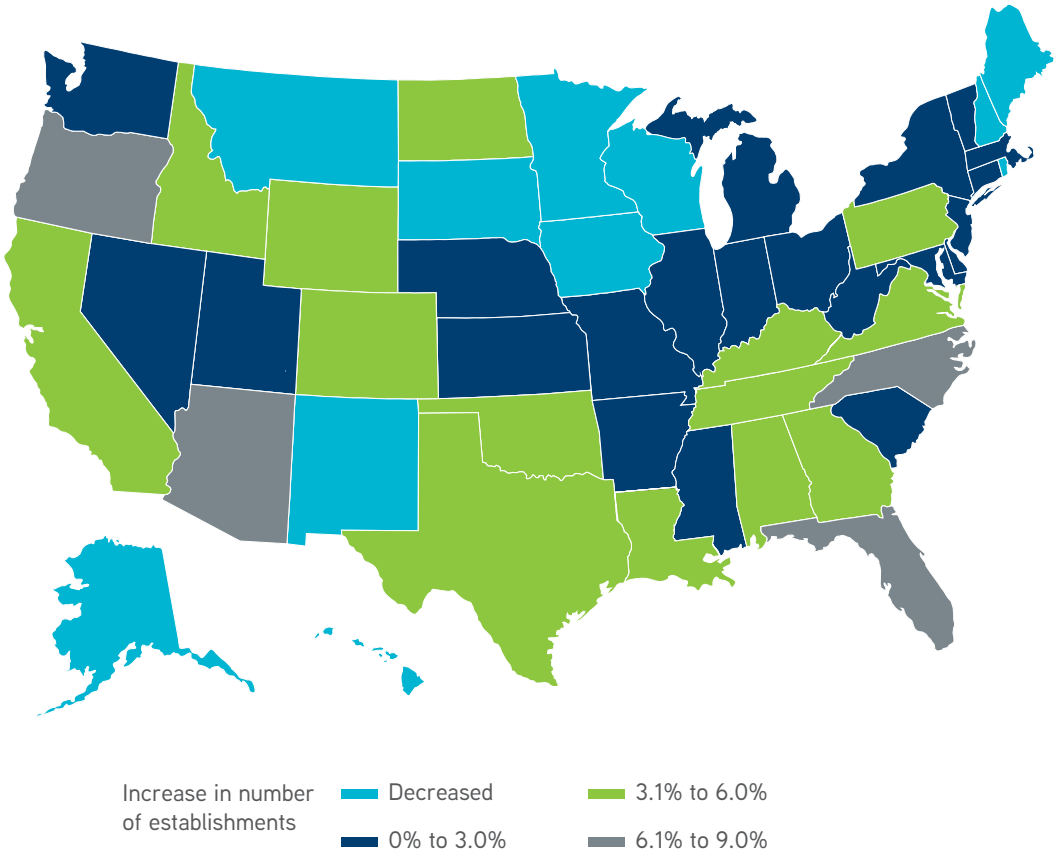


Source: U.S. Census Bureau (2016 data)

Figure 14

Figure 15 depicts the dynamics in the number of veterinary practices across the country. The highest percentage change (more than 6 percent) in the number of establishments between 2012 and 2016 is reported in Oregon, Arizona, Florida, and North Carolina. The change has been negative in some states such as Alaska, Hawaii, Montana, South Dakota, Minnesota, Iowa, Wisconsin, Maine, New Hampshire and Rhode Island.

CHANGE IN THE NUMBER OF ESTABLISHMENTS



Source: U.S. Census Bureau (2016 data)

Figure 15

DEMAND FOR VETERINARY SERVICES

The U.S. veterinarians produce veterinary services worth $30 billion or more a year (IMPLAN, 2013) to meet the local demand with a supply/demand ratio of 1.

Intermediate Demand

Intermediate demand refers to demand made by other industries that use veterinary output as their production inputs. The intermediate demand represents less than 10 percent of total demand. The top industries with the highest demand in veterinary services are presented in Table 14. Animal hospitals are the largest consumers of veterinary services with more $1 billion (64 percent of total intermediate demand) a year. Poultry and egg production account for 19 percent of the total demand for industries, and the remaining seven industries represent together about 17 percent.

DEMAND FOR VETERINARY SERVICES – INTERMEDIATE INDUSTRIES

	Gross Commodity Demand	Local Commodity Demand
Hospitals	$1,134,878,000	$1,134,878,000
Poultry and egg production	$330,345,200	$330,345,200
Scientific R&D services	$86,078,310	$86,078,300
Commercial hunting and trapping	$66,567,030	$66,567,030
Dairy cattle and milk production	$50,198,860	$50,198,860
Animal production, except cattle and poultry and eggs	$43,032,030	$43,032,030
Beef cattle ranching and farming,	$41,806,420	$41,806,410
Investigation and security services	$13,688,170	$13,688,170
Management of companies	$3,913,065	$3,913,065
Total intermediate demand	**$1,770,507,085**	**$1,770,507,065**

Source: IMPLAN, 2013

Table 14

Institutional Demand

Institutional demand is also known as "final demand," and represents the total amount spent by end-users such as dog owners. The consumer pool encompasses households, federal government agencies, and state/local non-education government entities. The statistics are presented in Table 15. Household demand represents approximately 98 percent of total demand and the rest is shared by state/local government non-education (2 percent) and federal government defense (less than 1 percent). A close look at household consumption reveals that more than three-quarters of the total household demand comes from households with an annual income of at least $75,000. Households with annual income no more than $15,000 represent less than 5 percent of the total household demand.

DEMAND FOR VETERINARY SERVICES – FINAL USERS

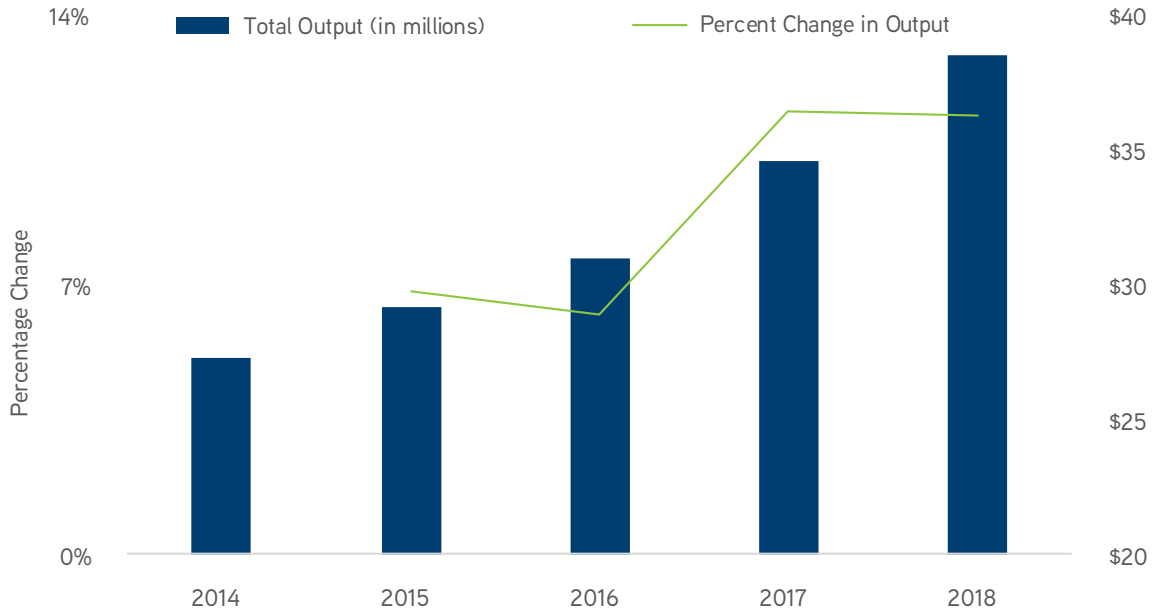
	Gross Commodity Demand	Local Commodity Demand
Households 150k+	$7,037,447,000	$7,037,446,000
Households 100-150k	$5,644,909,000	$5,644,908,000
Households 50-75k	$4,635,204,000	$4,635,204,000
Households 75-100k	$3,901,789,000	$3,901,789,000
Households 35-50k	$2,591,726,000	$2,591,726,000
Households 25-35k	$1,705,185,000	$1,705,185,000
Households 15-25k	$1,357,094,000	$1,357,094,000
Households LT10k	$653,215,700	$653,215,700
State/local govt non-education	$592,870,000	$592,870,000
Households 10-15k	$565,564,400	$565,564,400
Federal government defense	$110,474,000	$110,474,000
Total institutional demand	**$28,795,478,100**	**$28,795,476,100**

Source: IMPLAN, 2013

Table 15

The 2017 Barnes *U.S. Industry & Market Outlook* show that the market for veterinary services has consistently increased in size since 2014 (Figure 20). According to their estimations, U.S. veterinary services have increased on average by 8 percent between 2014 and 2017, with an 11 percent increase expected between 2017 and 2018. In 2017, the total veterinary industry output was estimated at around $35 billion.

VALUE AND PERCENTAGE CHANGE OF VETERINARY SERVICES OUTPUT



Source: Barnes Report 2017

Figure 16

THE PET OWNERSHIP, DEMOGRAPHICS, AND DEMAND FOR PET CARE

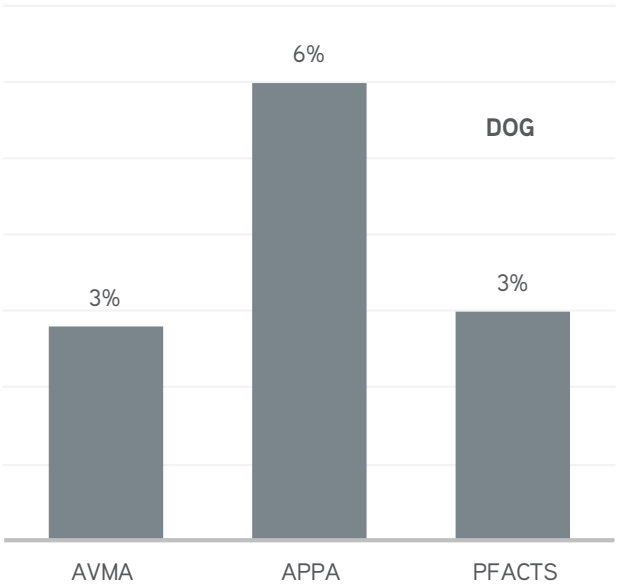
This section summarizes key findings from the AVMA 2017 U.S. Pet Ownership and Demographics Survey (PDS). For more detailed information, refer to the forthcoming *Sourcebook*. Key findings from the PDS, such as pet population, average number of veterinary visits per pet, and average expenditure on pet health per household, will be compared with findings from similar studies.

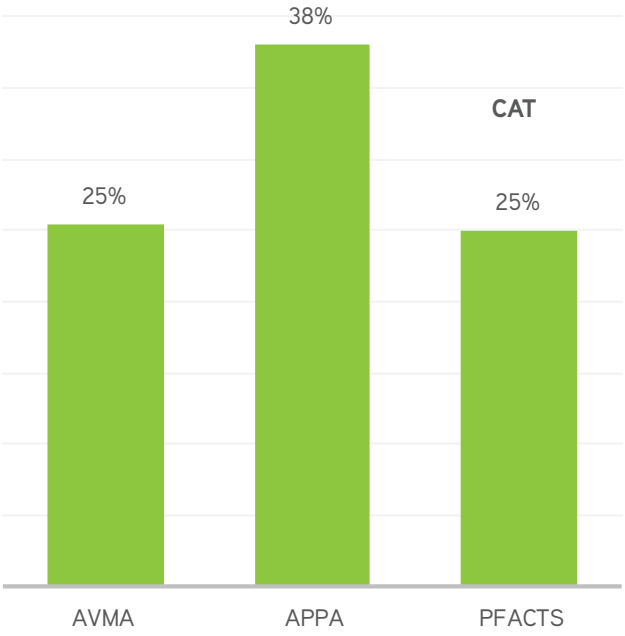
Pet Population and the Demand for Veterinary Services

There are currently three major studies that estimate the U.S. pet population and the demand for pet health care services in the United States. Packaged Facts (PFACTS) releases on an annual basis the report on the U.S. Pet Market Outlook. This report mostly focuses on the market for pet products, and presents trends on the demand for pet food, veterinary services, non-food pet supplies, and non-medical pet supplies. In addition, this report highlights trends in the drivers of the demand, including changes in the pet population. The American Pet Product Association (APPA) also releases each year its Pet Owners' Survey results. This report presents statistics on pet ownership and the demand/supply for pet health services in the United States. The AVMA Pet Ownership Demographics Sourcebook reports on the pet population, pet owner demographics, and demand for veterinary services.

Figure 17 summarizes key findings of these three reports with respect to the percentage of U.S. households that own pets at the end of 2016. Both AVMA and Packaged Facts report that approximately 38 percent of U.S. households owned at least one dog in 2016, 25 percent owned at least one cat, and 3 percent owned at least one type of bird during the same period. The values of the APPA are slightly higher than those of the two other sources. In fact, the APPA estimates that the rates of pet ownership in 2016 were 48 percent for dogs, 38 percent for cats, and 6 percent for birds.

PET OWNERSHIP RATES





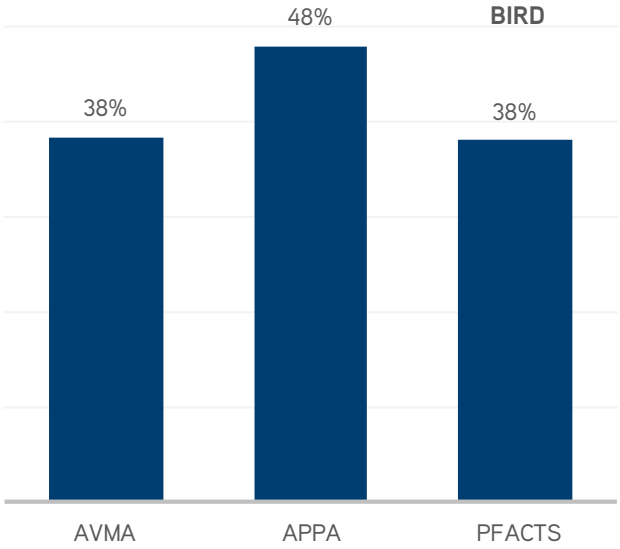


Figure 17

The U.S. dog population was estimated at approximately 77 million in 2016 (AVMA, 2018). Approximately 38 percent of U.S. households owned dogs at the year-end 2016, with an average of 1.6 dogs per household. Figure 18 shows the distribution of dog-owning households by census regions in 2016. For more details or for state-level statistics, purchase the 2017 edition of the AVMA U.S. Pet Ownership and Demographic Sourcebook (PDS).

The East South Central Region has the highest percentage of households (47.4 percent) with dogs followed by West South Central Region (43.9 percent), and the Mountain Region (43.0 percent). More than 66 percent of respondents in all age groups surveyed reported that they consider their dogs as family members, while about 33 percent consider them as companions, and fewer than 1 percent as property.

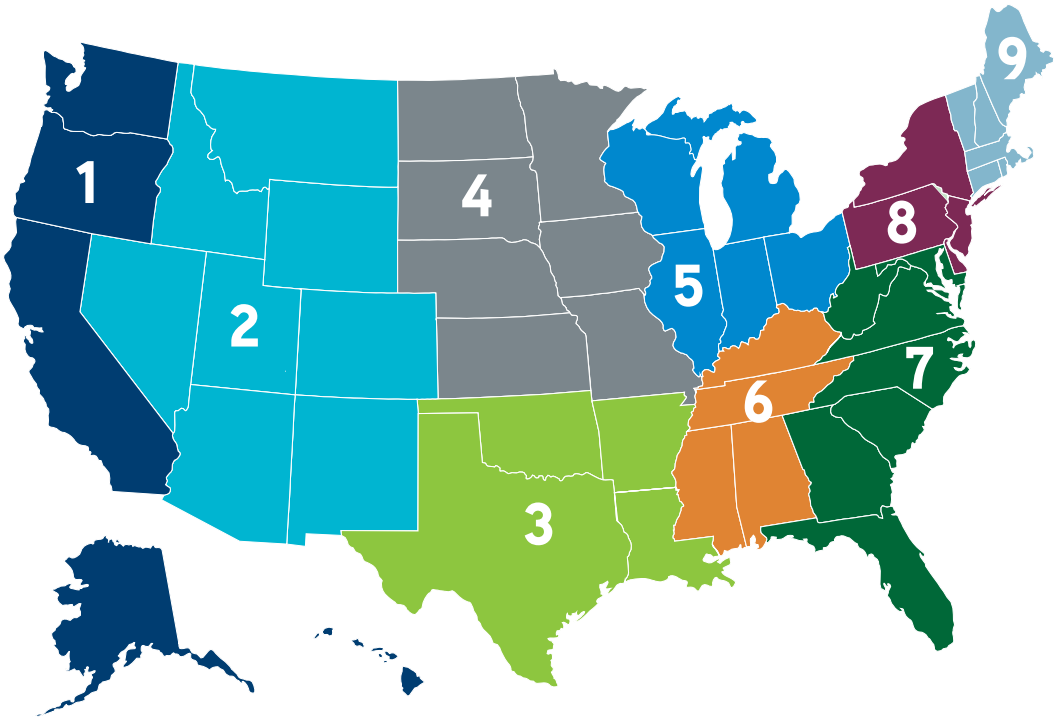
Cats are the second most popular household pets in the United States. In 2016, 25.4 percent of households in the United States owned at least one cat, and the population of cats at year end 2016 was estimated at approximately 58 million.

The East South Central Region (29.9 percent), the West North Central region (29.5 percent), and the East North Central Region (29.3 percent) had the highest percentage of households owning cats at year end 2016. The South-Atlantic with 28.5% households maintains the lowest rate of cat ownership. As with dog owners, a majority (more than 56 percent) of cat owners consider their cats to be family members. The study revealed that 78 percent of owners consider their cats to be average weight, 16.5 percent think their cats are overweight, and about 6 percent see their cats as underweight.

About 3 percent of U.S. households owned birds at year end 2016. The bird population in the United States was estimated at 3.5 million in 2016 (AVMA, 2018). The distribution of bird ownership by census region is summarized in Figure 18. Bird ownership varies between 1 percent (West North Central Region) and 3.1 percent (New England Region). Some 57 percent of respondents consider their birds to be family members, while 9.6 percent of the respondents see their birds as property under their care.

The 2017 PDS reported that 0.7 percent of U.S. households owned pet horses at the end of 2016. The regions with the highest percentage of horse-owning households are West South-Central Region (1.3 percent), and the Mountain Region (1.1 percent); the regions with the largest number of household that owned horses are the South Atlantic with about 25 million households, the East North Central with 18.9 million households, and the Pacific with approximately 18 million households. The lowest population of pet horses was found in New England (27,000 horses) and the Middle Atlantic (98,000 horses). Approximately 47 percent of pet-horse owners consider their horses to family members and 11 percent consider them to be property.

PET OWNERSHIP RATES BY CENSUS REGION



1. PACIFIC
   - Dog: 40%
   - Cat: 24%
   - Bird: 3%
   - Horse: 1%

2. MOUNTAIN
   - Dog: 43%
   - Cat: 26%
   - Bird: 2%
   - Horse: 1%

3. WEST SOUTH CENTRAL
   - Dog: 44%
   - Cat: 22%
   - Bird: 3%
   - Horse: 1%

4. WEST NORTH CENTRAL
   - Dog: 40%
   - Cat: 29%
   - Bird: 1%
   - Horse: 1%

5. EAST NORTH CENTRAL
   - Dog: 38%
   - Cat: 29%
   - Bird: 3%
   - Horse: 1%

6. EAST SOUTH CENTRAL
   - Dog: 47%
   - Cat: 30%
   - Bird: 2%
   - Horse: 1%

7. SOUTH ATLANTIC
   - Dog: 39%
   - Cat: 24%
   - Bird: 3%
   - Horse: 1%

8. MIDDLE ATLANTIC
   - Dog: 31%
   - Cat: 23%
   - Bird: 3%
   - Horse: 0.3%

9. NEW ENGLAND
   - Dog: 27%
   - Cat: 27%
   - Bird: 3%
   - Horse: 0.3%

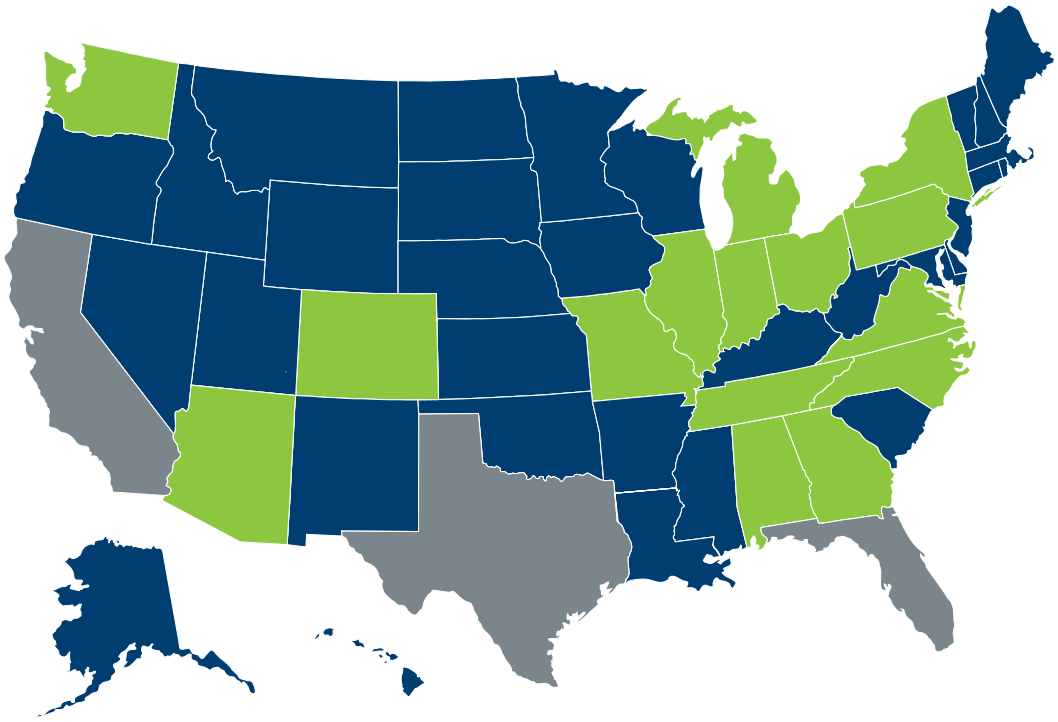
Figure 18

VETERINARY MEDICAL USE AND EXPENDITURES

Veterinary visits come with costs and pet owners spend substantial amount of money each year on their animals' wellbeing. Figures 19-22 summarize the total expenditures on dogs, cats, birds and horses for each state in 2016. The values for each type of pet were estimated by multiplying the average expenditure per pet by the total number of pets in the state. This captures the potential size of the market assuming that no pet is left untreated, and that all pets in the state visit a veterinary clinic or other healthcare facility at least once a year.

The statistics show that the size of the market for dog veterinary services is above $1 billion in Texas, California and Florida, and ranges between $100 million and $999 million in most states. The size of the market for cats is over $1 billion in California, between $400 million and $999 million in Texas, Florida, Ohio, Pennsylvania, and New York. For the rest of the states, the majority have a market size of between $100 million and $399 million. The majority of the states have a potential market of $10 million or more for each of these two market segments.

ESTIMATED TOTAL EXPENDITURES FOR DOG VETERINARY SERVICES



Veterinary Service Expenditure ($ million)

10 to 499 500 to 999 1,000 and over

Figure 19

ESTIMATED TOTAL EXPENDITURES FOR CAT VETERINARY SERVICES

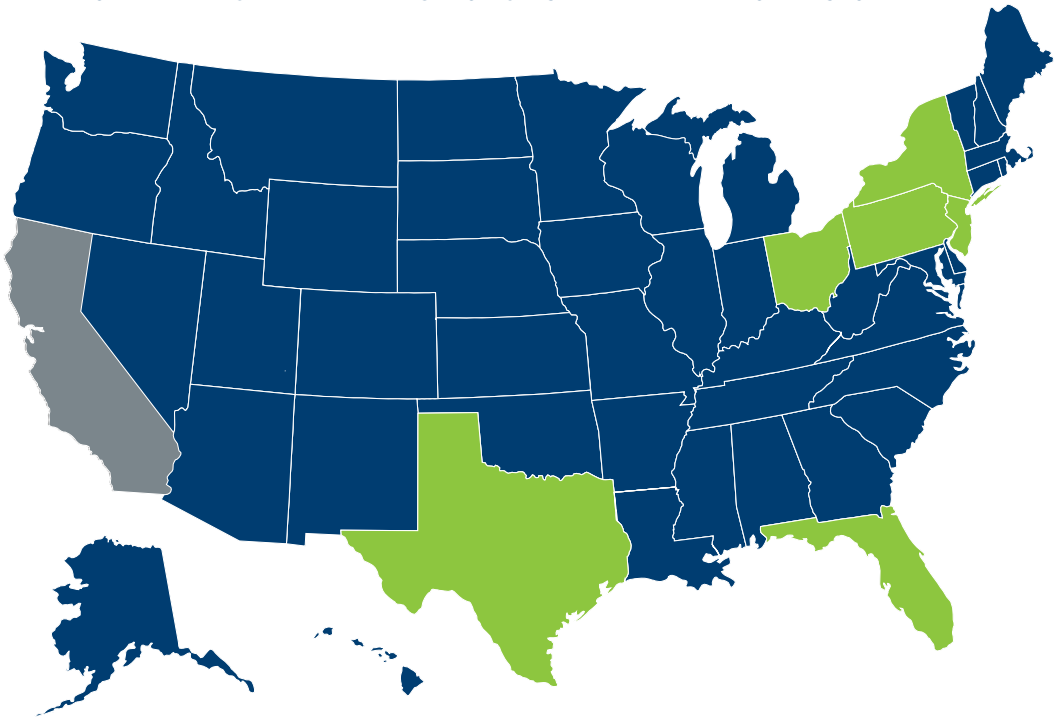


Figure 20

ESTIMATED TOTAL EXPENDITURES FOR BIRD VETERINARY SERVICES

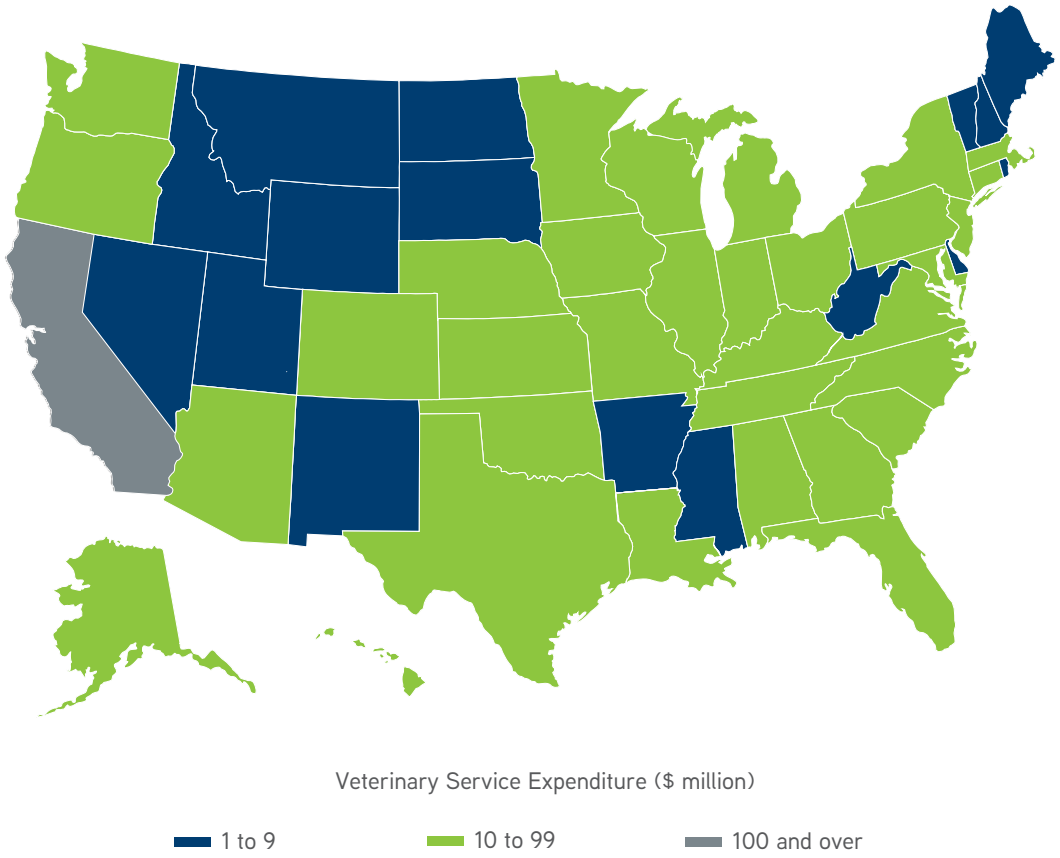


Figure 21

ESTIMATED TOTAL EXPENDITURES FOR HORSE VETERINARY SERVICES

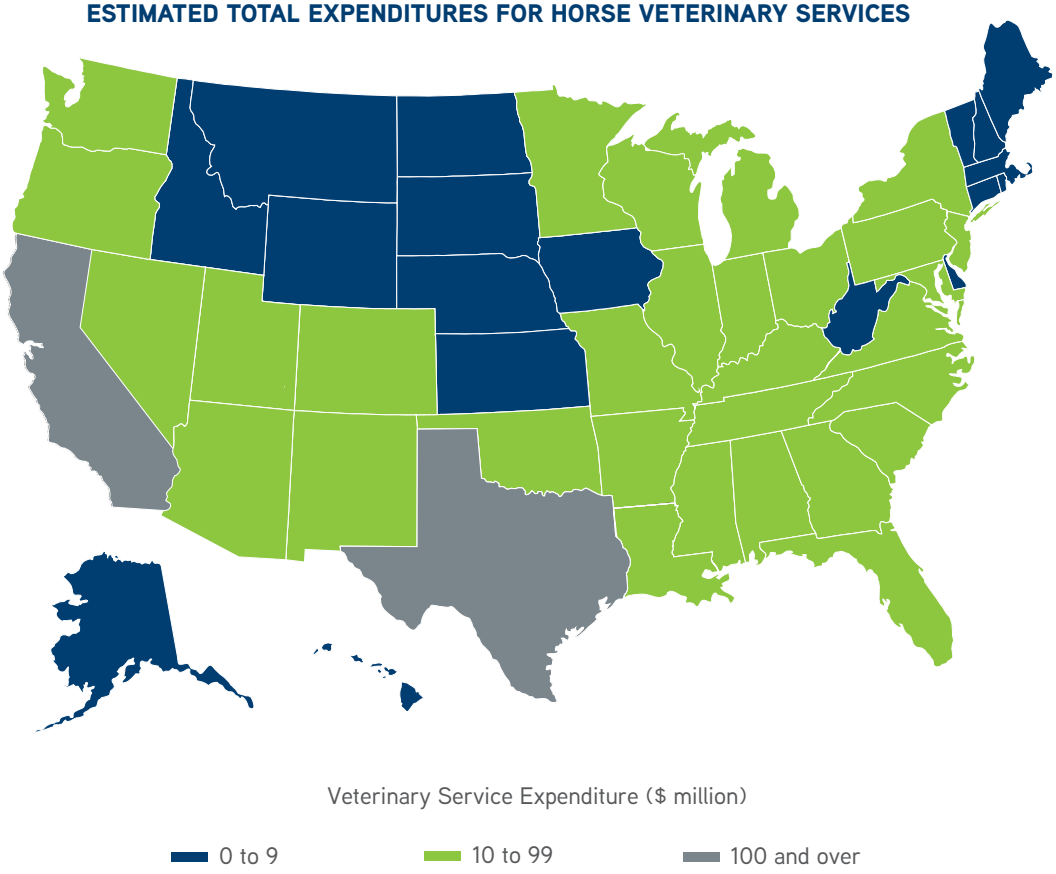


Figure 22

STRUCTURE OF AND COMPETITION IN THE U.S. MARKET FOR VETERINARY SERVICES

Among the small animal practice owners surveyed, about half believe that the number of veterinarians in their business area is just right.

The performance of the veterinary industry depends in large part on economic conditions, but also on the business environment in the market for veterinary services. The level of competition in the market has significant impact on the quality of services delivered, as well as the quantity and thus the price of the services. To determine the level of the competition, data from the AVMA 2017 Capacity Survey were used.

The competition in the market refers to the interactions between businesses in their local environment. Typically, it expresses the market power that some big firms apply to small firms in order to increase their share of the pie. In this analysis, rather than assessing the indices of market influence, the ability of veterinary businesses to supply more services is examined.

Competition in the Market for Veterinary Services

Practices owners were asked to categorize on a five-level scale (1 = far too few, 2 = too few, 3 = just right, 4 = too many, and 5 = far too many) their estimate of the number of veterinarians and the number of veterinary practices serving the same animal population in their business area. The responses were summarized by business type and are presented in Figures 23-25.

The majority of the large animal practice owners (58.8 percent) believe that the number of veterinarians serving the same animal population in their business areas is just right. More than 60 percent of them believe that the number of competing practices in their business area is just right.

PERCEIVED COMPETITION ON THE MARKET FOR LARGE ANIMAL VETERINARY SERVICES

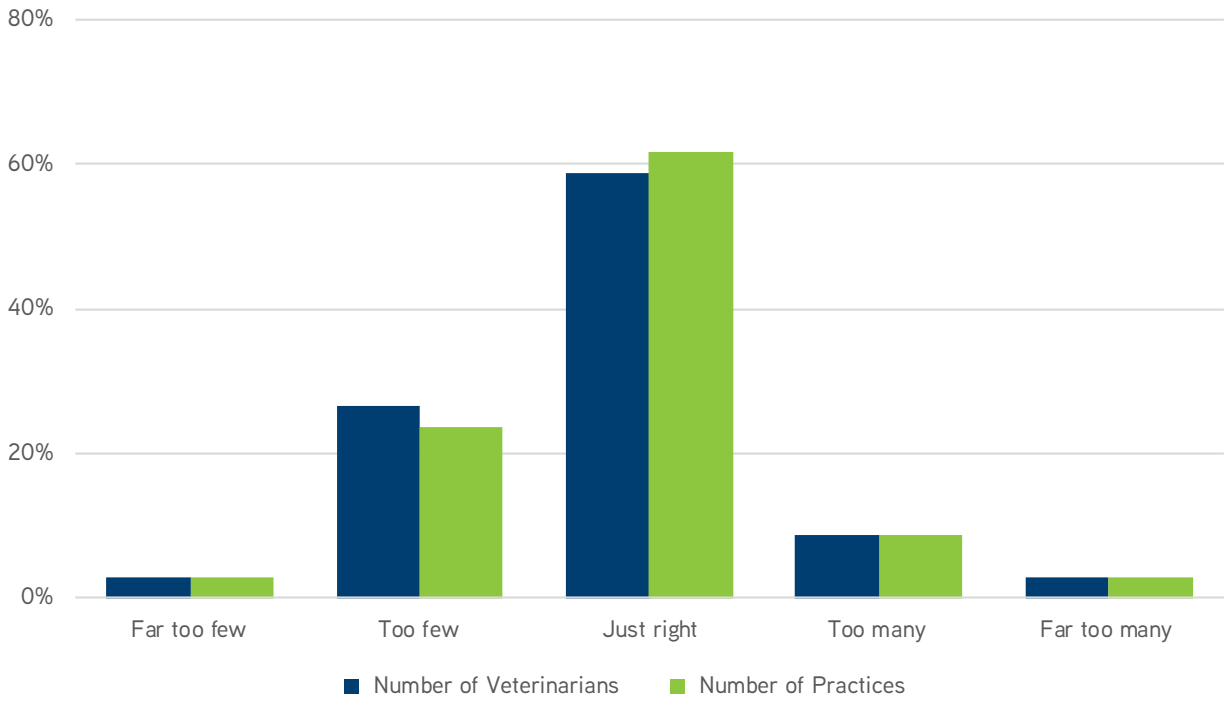


Figure 23

Among the small animal practice owners surveyed, about half believe that the number of veterinarians in their business area is just right. Approximately 37 percent believe there are too many or far too many veterinarians in their area and nearly 45 percent believe that the number of practices in the local market is exceeding the market capacity.

PERCEIVED COMPETITION ON THE MARKET FOR SMALL ANIMAL VETERINARY SERVICES

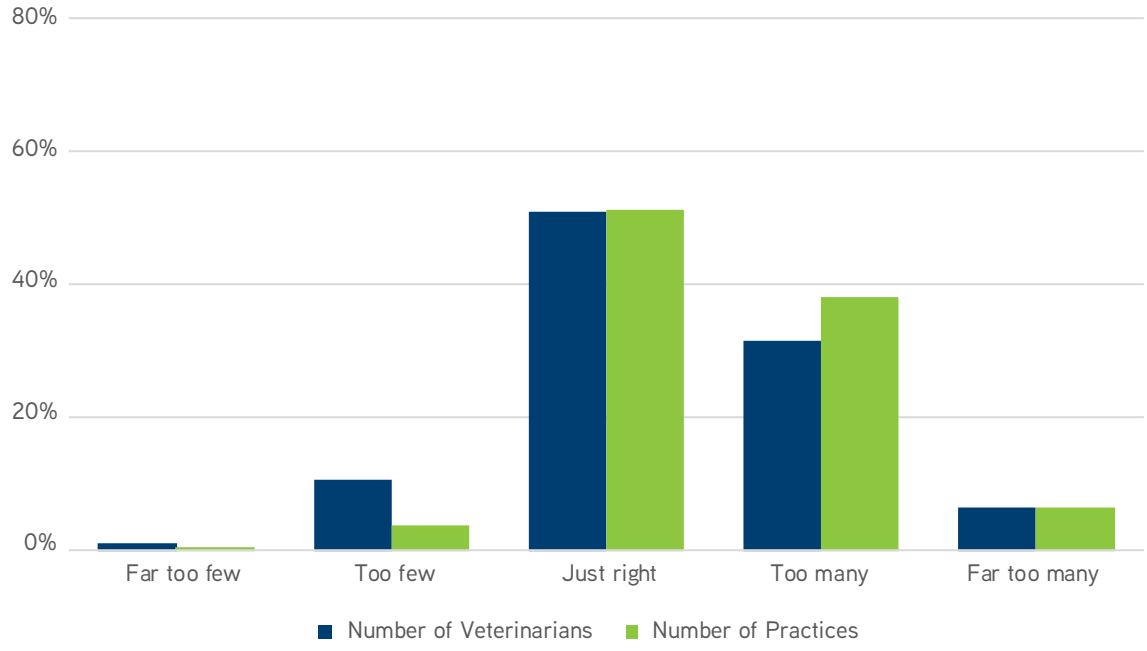


Figure 24

In the market for equine veterinary services, 44% of respondents believe that the number of service providers in the market is just right while 46% believe they are facing too many competitor veterinarians. Nearly 55 percent of the respondents indicated there are more practices than is acceptable. Only 6 percent believe there are too few practices in their business areas.

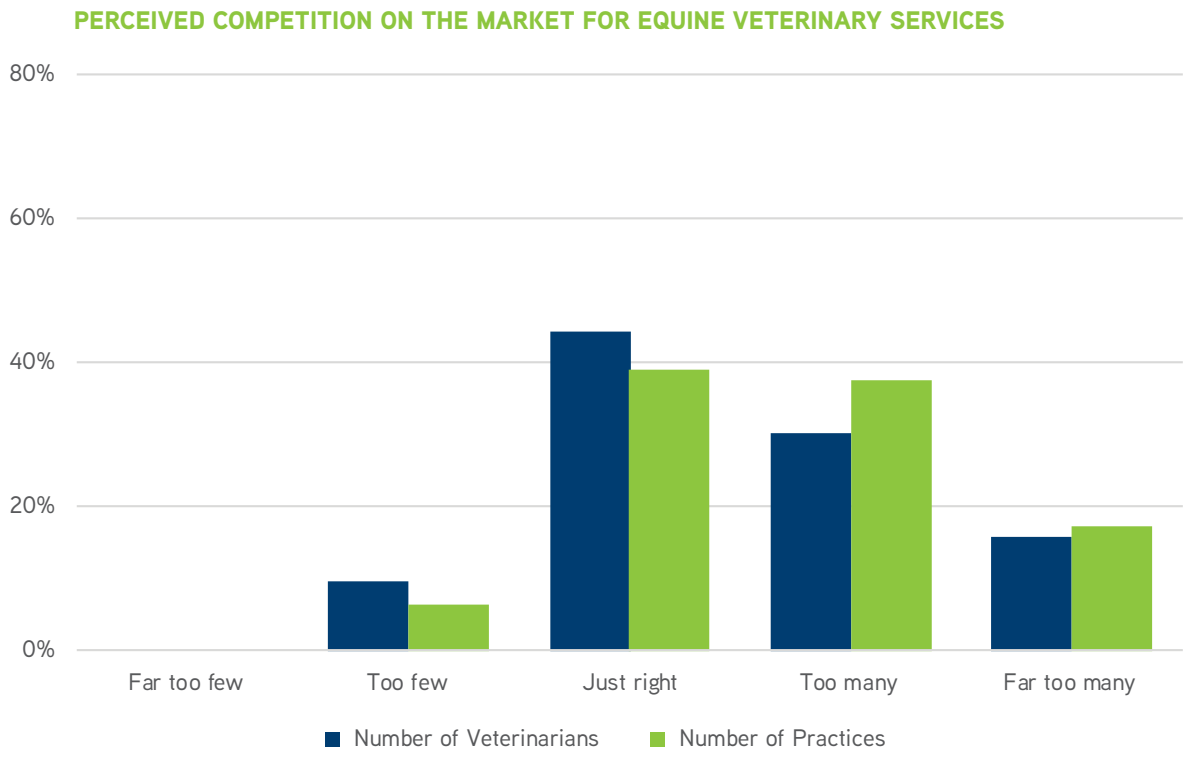


Figure 25

Competition in the Bovine Veterinary Services Market

To determine the potential sources of competition and the extent to which each of them affect the bovine veterinary sector, a set of questions was asked to bovine practice owners who took part in the AVMA 2017 Census of Veterinarians. Statistics from the survey are summarized below. In total, 3.8 percent (104 observations) of the respondents said they are practice owners and their practices treat bovines. Of those included who met the criteria, 70.2 percent acknowledged that they are experiencing competition from non-veterinary service providers (Figure 26). Compared to 2015, it is easy to see that the percentage of practitioners affected by non-veterinary service providers has increased.

COMPETITION WITH NON-PRACTITIONERS IN THE MARKET FOR BOVINE VETERINARY SERVICES

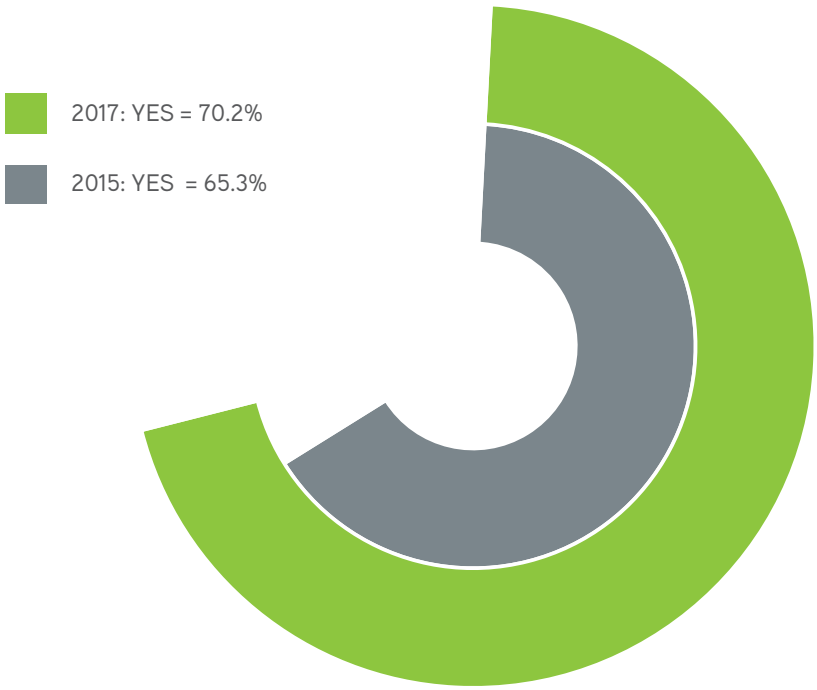


Figure 26

Of those affected by parallel service providers, approximately 54 percent point to non-licensed practitioners as their main competitors. The second major group of competitors is the route trucks operators who deliver supplies to farms. More than 44 percent of practice owners who indicate they are confronted with parallel competition believe that this category of competition represents the main challenge they face. Consultant veterinarians are cited by more than 36 percent of practice owners, technical service veterinarians account for 18.3 percent and university staff represent 13.5 percent.

POTENTIAL COMPETITORS OF BOVINE PRACTITIONERS

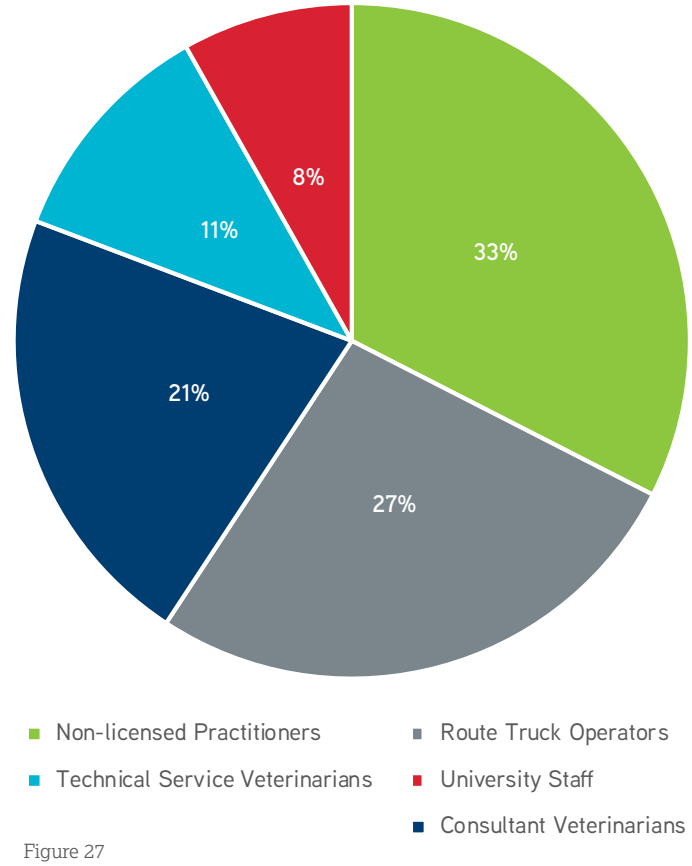


Figure 27

Competition in the Equine Veterinary Services Market

In total, 420 equine practitioners were surveyed. A large majority (78.5 percent) of them said they are losing revenue due to competition.

COMPETITION WITH NON-PRACTITIONERS IN THE MARKET FOR EQUINE VETERINARY SERVICES

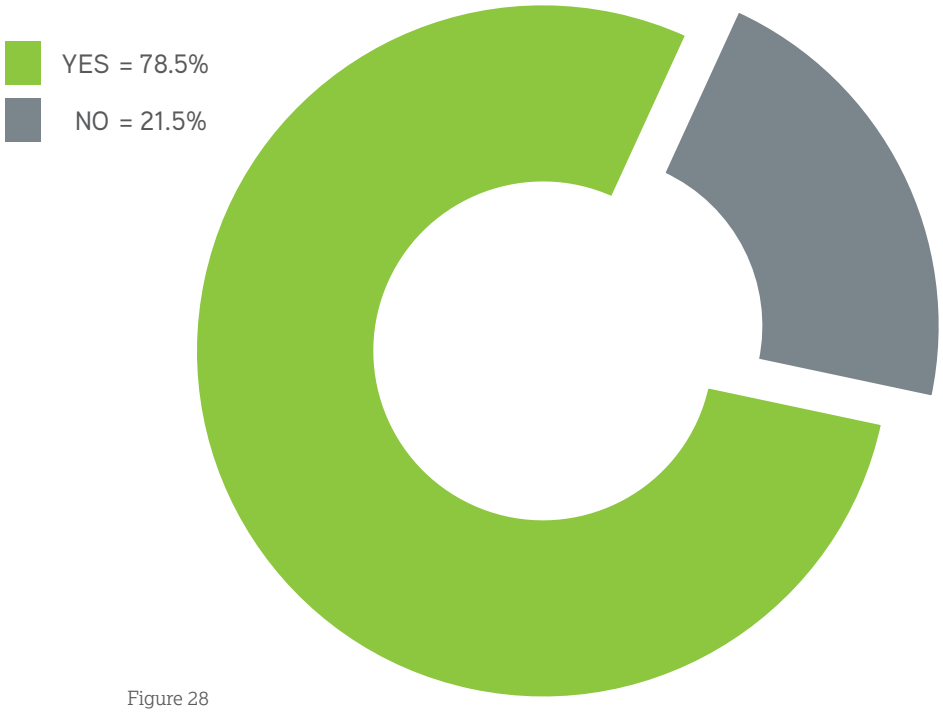


Figure 28

The biggest challenge for equine veterinarians comes from online pharmacies. About 55 percent of respondents who said they are losing revenue report internet pharmacies as the main cause. Lay practitioners are also frequently cited as competitors in the equine veterinary sector. Show veterinarians, traveling pharmacies and university staff who practice at university hospitals or at satellite locations are also included.

POTENTIAL COMPETITORS OF EQUINE PRACTITIONERS

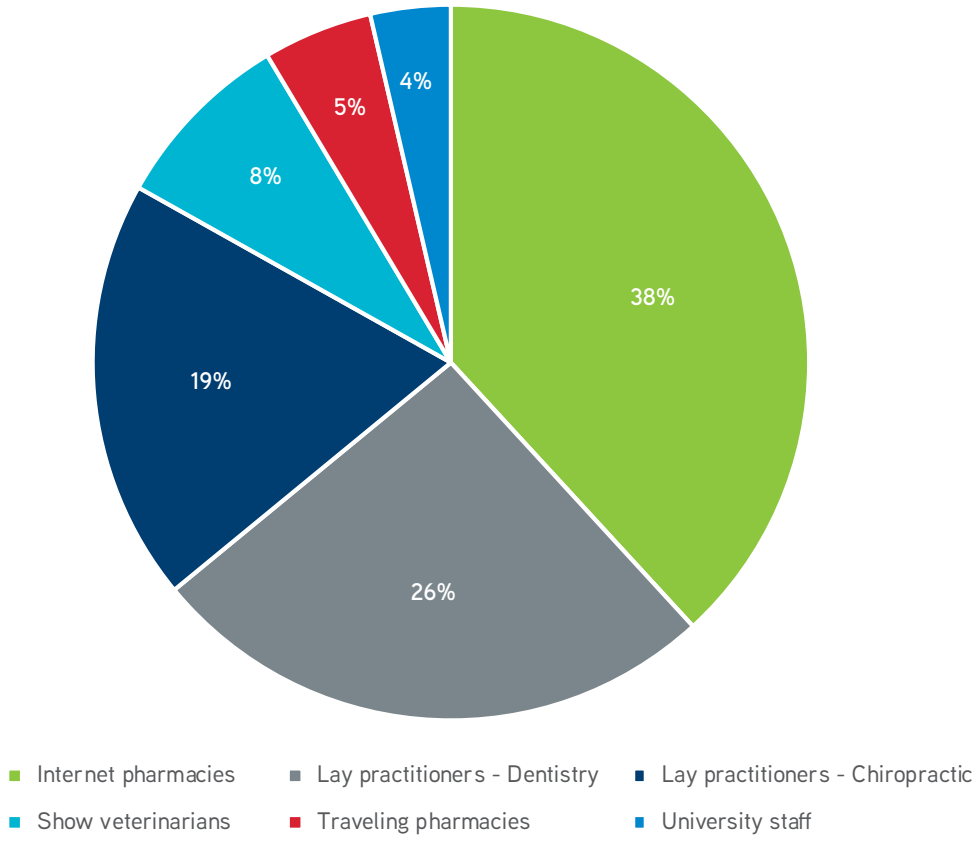


Figure 29

Ability to Increase Supply of Veterinary Services

To determine the capability of practices to expend, two scenarios were considered. For the first scenario, it is assumed that (1) there are no changes in the way the practice is organized, (2) there are no changes in the number of veterinarians or support staff, and (3) there are no changes to the physical structure of the practice. The second scenario assumed that (1) the practice manager is able to hire additional well-trained veterinarians, technicians and support staff, but (2) the physical structure of the facility remains unchanged. The question being asked now is, "If there were an unlimited supply of clients and patients, by what percent could your practice increase the number of patients per week relative to the current number of patients your practice typically receives per week?" The responses by type of practice are summarized below.

Under the first scenario, 48.5 percent of the large animal practitioners believe they are already working at nearly full capacity and can only expand their production by up to 10 percent. Under the second scenario, 41.4 percent said they cannot expand their production at all or they can do so up to 10 percent but no more than that. Fewer than 10 percent of practices are able to expand their production by more than 75 percent.

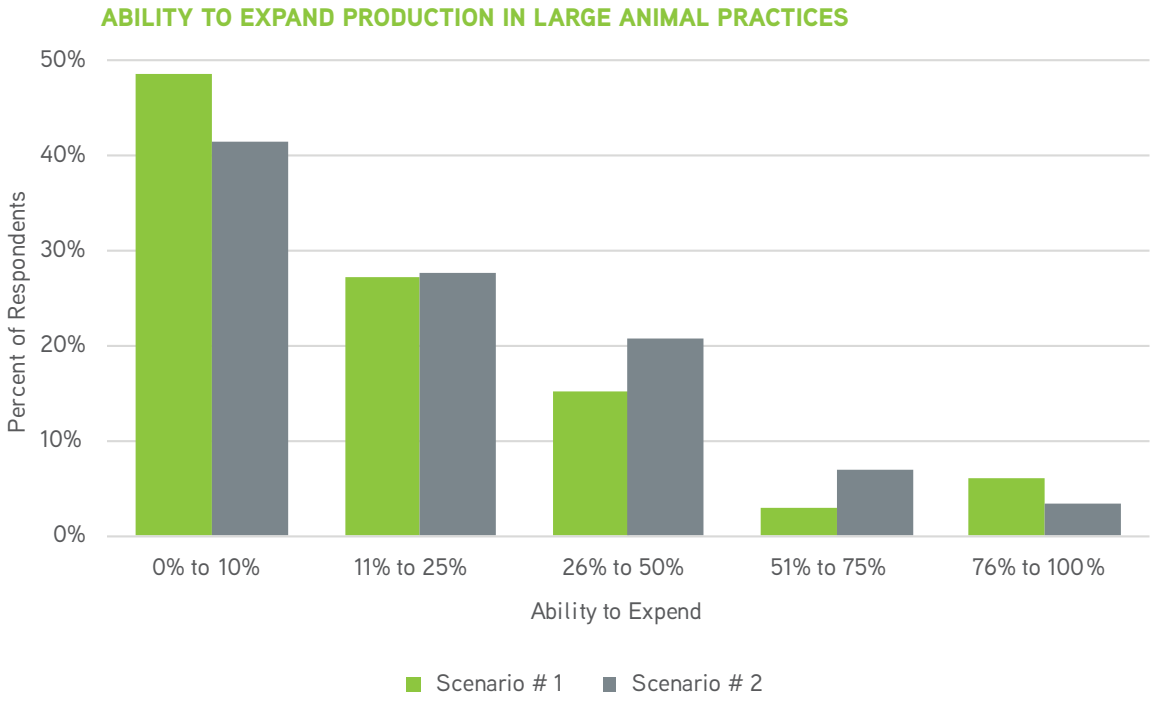


Figure 30

Under the first scenario, 83.4 percent of the small animal practitioners believe they cannot increase their current production beyond 25 percent. This indicates that the large majority of small animal practices perform at 75 percent of their full capacity and that an increase in the demand for small animal veterinary services will result in shortages of veterinary services in some areas. Under the second scenario, 86.4 percent said they can expand their production by 10 percent to 50 percent.

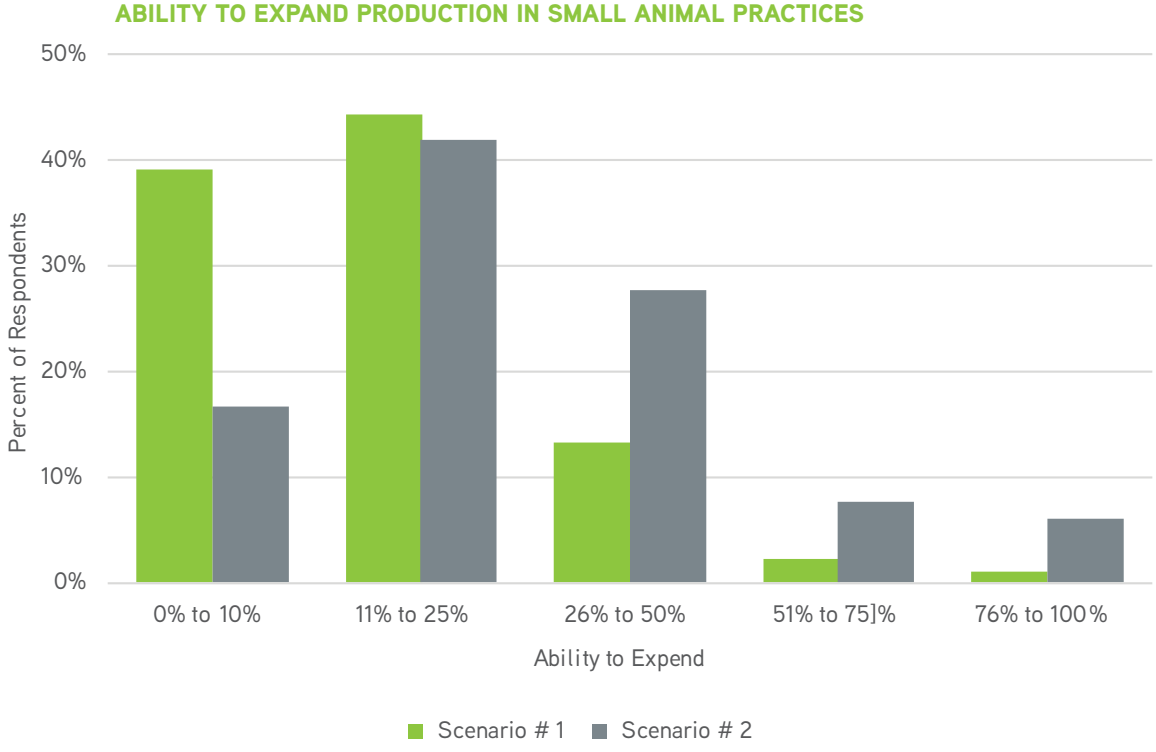


Figure 31

For equine practices, 82 percent believe they could increase their production up to 25 percent under the first scenario. About 22 percent said that under the second scenario, they could expend their production by 76 percent to 100 percent.

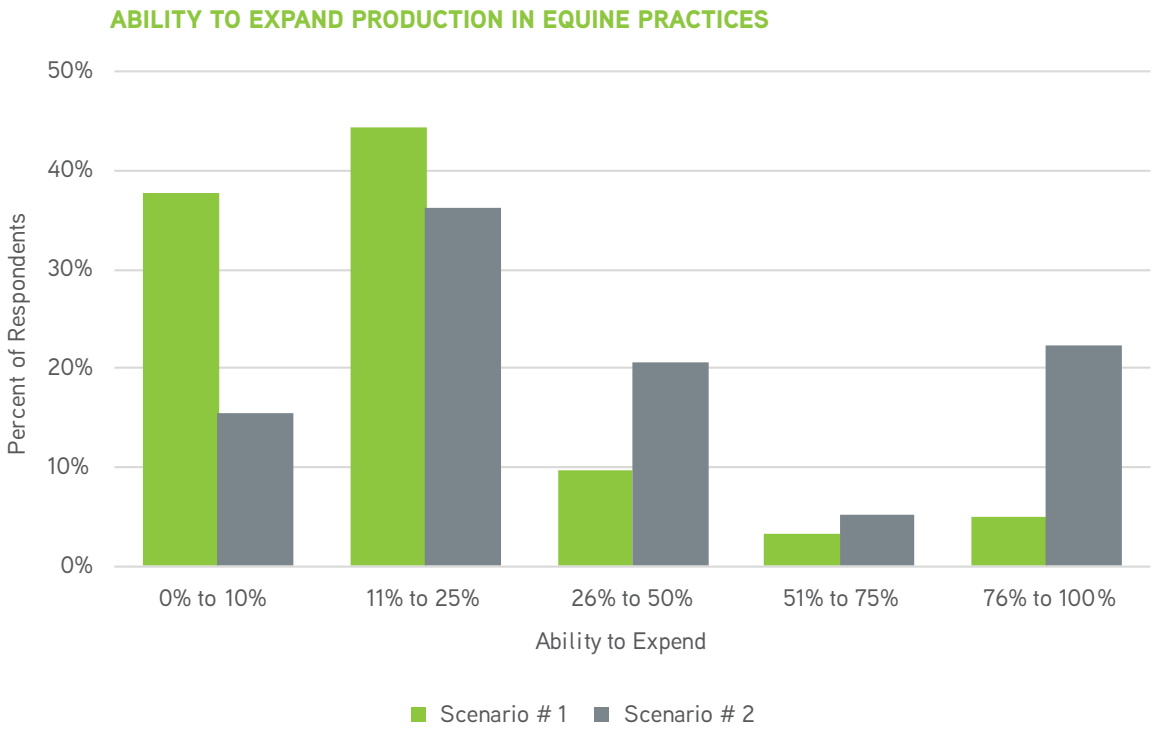


Figure 32

Mixed animal practices are also working at nearly full capacity. More than 84 percent said they are working at 75 percent capacity or above and could only expand under the first scenario by no more than 25 percent. Under the second scenario, 59.4 percent believe they could increase their production up to 25 percent.

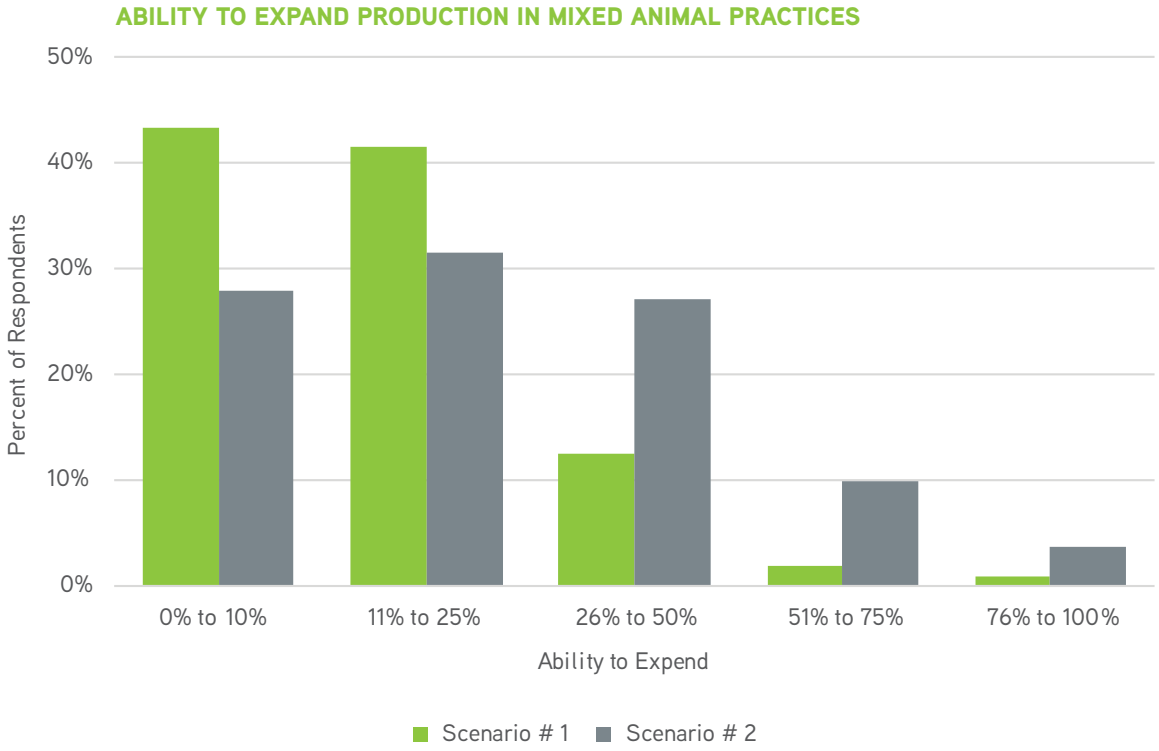


Figure 33

Estimating Need for Veterinarians

Excess capacity is by definition a situation in which the demand for the good or service is below the amount that the business could potentially supply to the market. In this section of this report, the total number of veterinarians required to meet the demand for veterinary services is estimated by state and compared to the actual number of veterinarians currently practicing in the state. A negative difference (Require–Actual) implies that there are more veterinarians than needed, and a positive difference indicates that more veterinarians are needed to meet the state demand. In the case of negative difference, because the demand for veterinarians is below the supply for veterinarians, there exist an excess capacity. The objective of this section is to identify these states that do not have enough veterinarians to meet the local demand. The analysis was conducted for the companion animal sector, the food animal sector, and the equine sector.

For the equine sector, the analysis shows 22 out of 50 states need equine veterinarians. These states are mainly located in the central regions of the country. Texas, for example, needs at least 113 equine veterinarians to meet the state's demand. But overall, the United States has enough equine veterinarians to cover the demand for equine veterinary services.

ESTIMATED NUMBER OF EQUINE VETERINARIANS NEEDED TO MEET THE LOCAL DEMAND

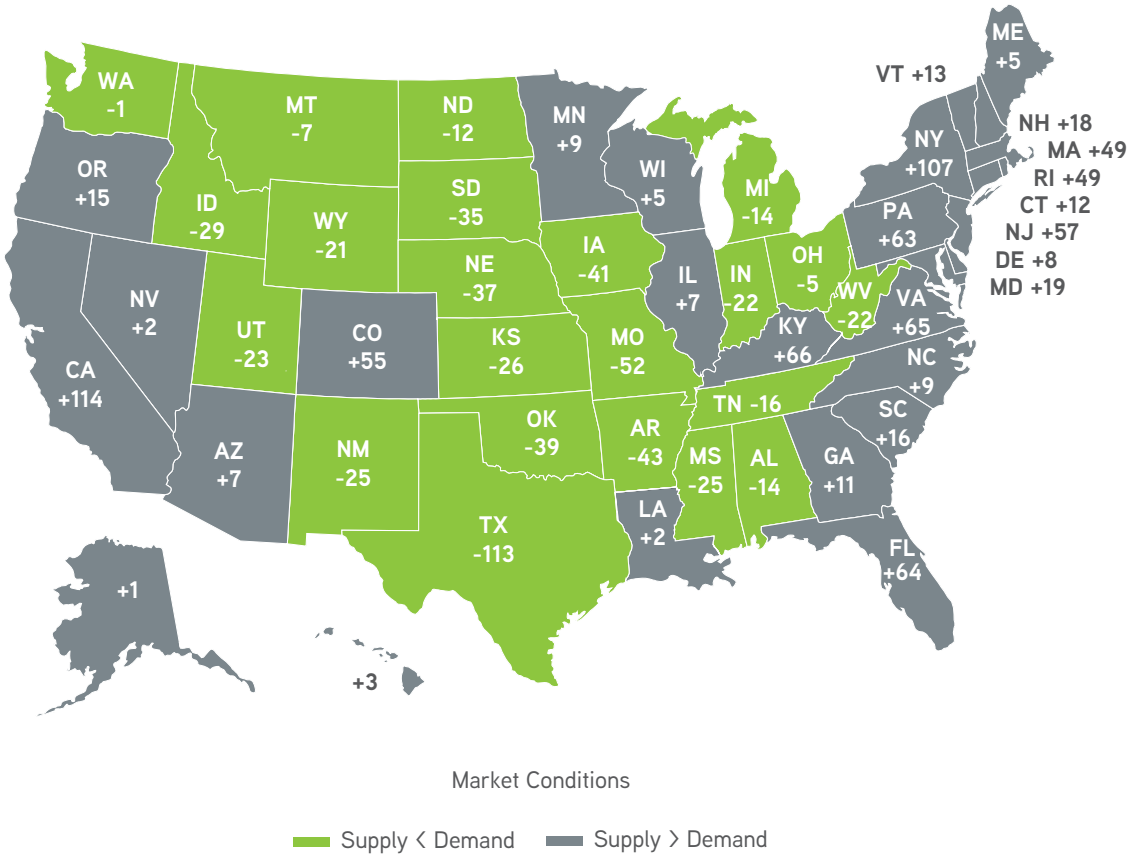


Figure 34

The states bearing positive numbers are those in which there are more veterinarians than needed, given the demand for food animal veterinary services. The values represent the total number of veterinarians needed or in excess in each state. In California, for example, the results indicate that approximately 314 more food animal veterinarians than needed to meet the state demand. The states in potential shortage situation are the largest cattle producing states.

ESTIMATED NUMBER OF FOOD ANIMAL VETERINARIANS NEEDED TO MEET THE LOCAL DEMAND

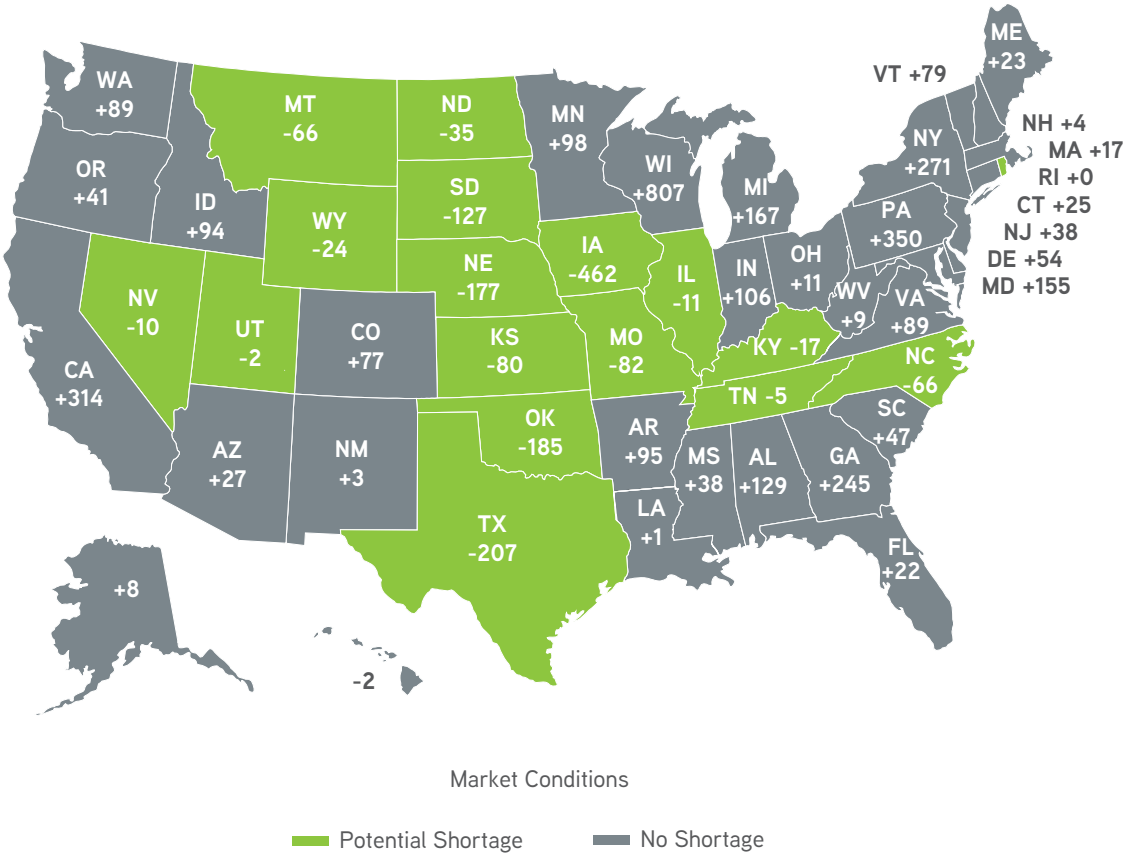


Figure 35

For the companion animal veterinary sector, only a few states need more veterinarians to satisfy the state demand. The states that need the most veterinarians are Mississippi (139 veterinarians), Kentucky (126 veterinarians), and Arkansas (122 veterinarians).

ESTIMATED NUMBER OF COMPANION VETERINARIANS NEEDED OR IN EXCESS

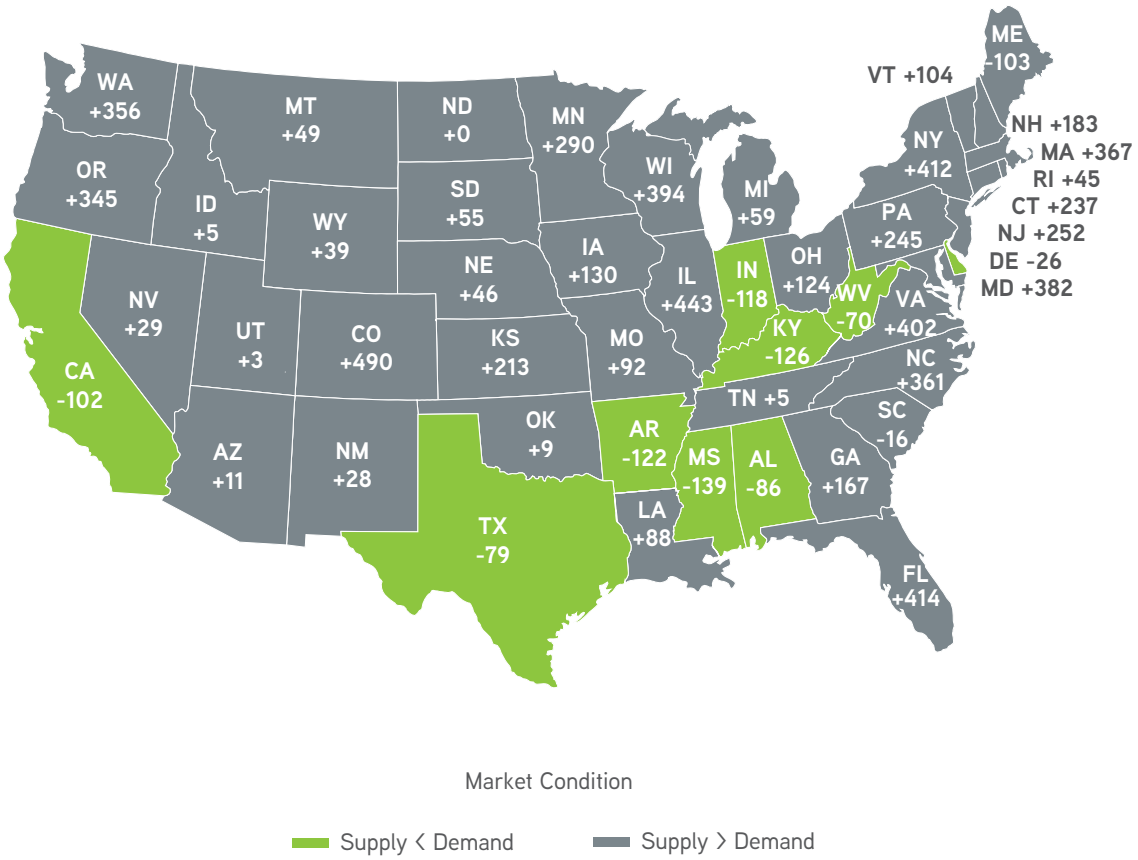


Figure 36

BENCHMARK ANALYSIS OF VETERINARY PRACTICES

For this analysis, a Data Envelopment Analysis (DEA) method was used. DEA methodology was originally developed to benchmark the performance of not-for-profit and public organizations (Charnes, Cooper and Rhodes. 1978). With the development of statistical software applications capable of handling more complex computations. DEA compares veterinary practices and identifies the most efficient, and the inefficient practices in which efficiency improvements are possible.

Once the efficiency coefficients are determined, the analysis consists of determining the major differences between the most efficient practices, and the other practices with respect to the amount of inputs used. If the number of DVM FTEs was the only input that determined production, it would be easy to conclude that the most efficient practices are those practices with no more than two DVM FTEs.

The results from the DEA analysis show that only 16 percent of companion exclusive practices are 100 percent efficient (efficiency index = 1). In addition, the results indicate that 22 percent of companion animal practices are efficient at a rate of 90 percent or more, and 8 percent of practices are operating at an inefficiency rate of 80 percent or more.

An analysis of efficiency with respect to the veterinarian-to-non-veterinarian ratio shows that efficiency of practices improves with an increase in the number of non-veterinarians per unit of DVM (Figure 37). More than 80 percent of practices with a veterinarian-to-non-veterinarian ratio greater than 1:6 have an efficiency index of 0.5 or more.

EFFICIENCY WITH RESPECT TO THE RATIO OF VETERINARIAN TO NON-VETERINARIAN

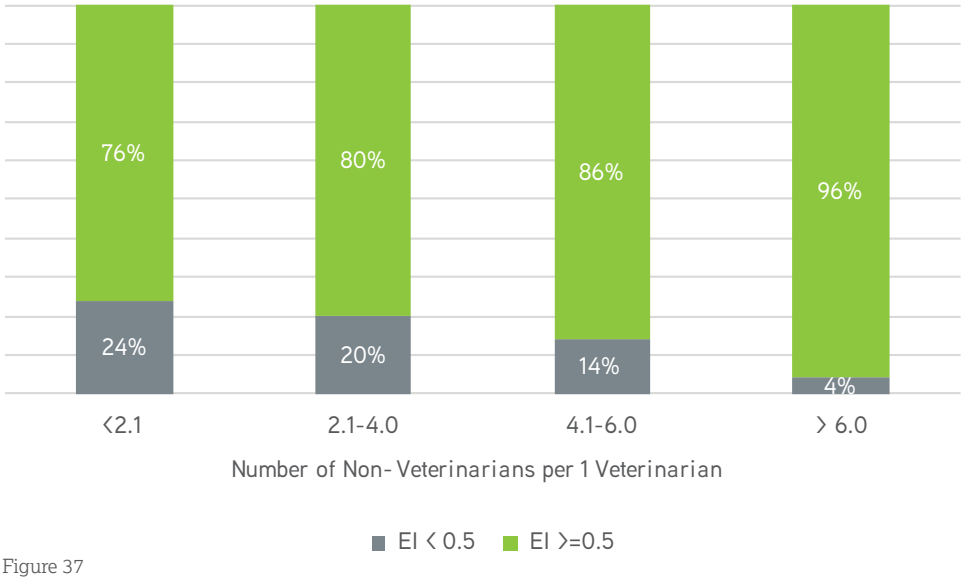


Figure 37


OXYGEN SUPPLY
LINE PRESSURE
REGULATED PRESSURE
CHAMBER PRESSURE
UFVH
REGULATOR
NEVER OVERTIGHTEN!
PORTABLE
82.4
ANALOX

The DEA results did not find any a clear relationship between efficiency and number of exam rooms. Hence, no clear pattern is depicted in Figure 38. When looking at the characteristics of the most efficient practices (practices with EI = 1), however, the statistics indicate that 70 percent of these practices have fewer than three exam rooms.

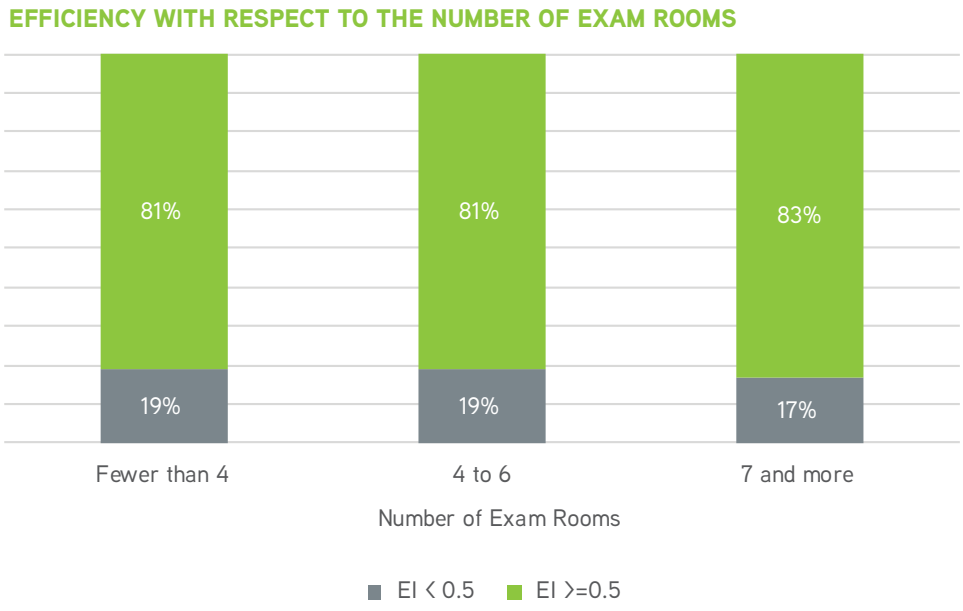


Figure 38

The analysis of the relation between efficiency and veterinarian-to-certified vet technician ratio also did not show any clear pattern. The statistics pertaining to the most efficient practices, however, indicate that 85 percent of these practices have a ratio greater than 1.

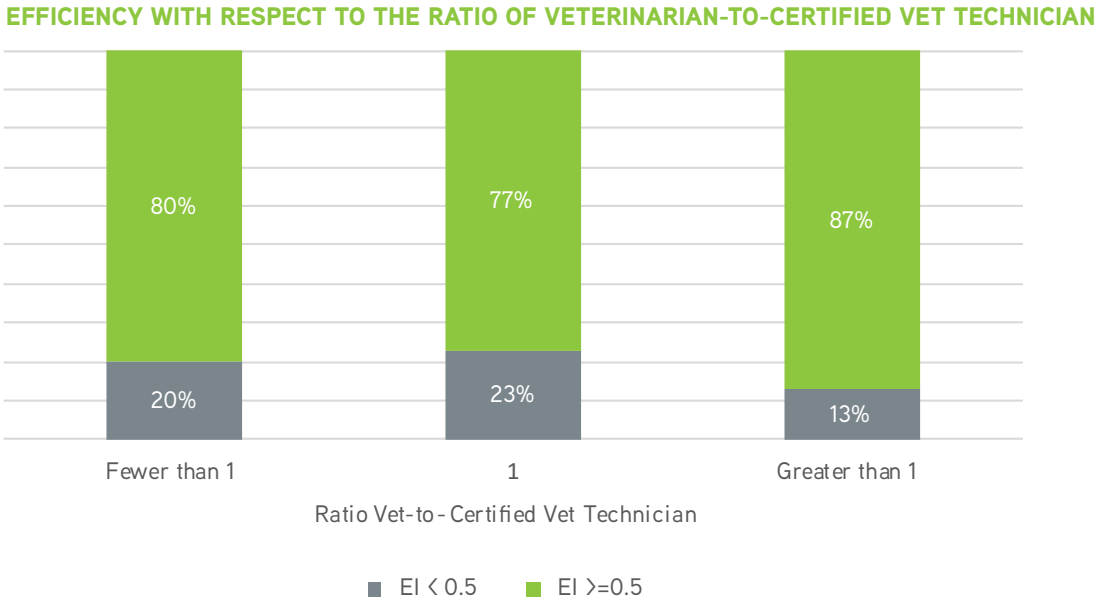


Figure 39

ECONOMIC IMPACT OF THE VETERINARY INDUSTRY IN THE UNITED STATES

The estimated impacts that occurred as a result of expenditures by the veterinary services industry exceed $107 billion.

About IMPLAN

IMPLAN software is an economic tool developed by the Minnesota IMPLAN Group in 1993 and which has since become one of the most widely used tools for economic analysis. The IMPLAN system combines data from different sources including the U. S. Department of Commerce, the U.S. Bureau of Labor Statistics, and other federal and state government agencies to compute multipliers that are used to estimate the impacts of exogenous factors on the local economy. Data in IMPLAN are collected for every geographic region in the United States – from small cities to the entire nation. The IMPLAN application also facilitates regional analyses where multiple counties or states are grouped into one entity. The economic impact analysis captures the economic implications of a new or existing activity, policy or project. The entry of a new veterinary practice in a community, for example, sparks change in the local economy: Construction of a facility requires workers; and staff needed to operate the facility will be spending part of their income in local markets.

The IMPLAN system estimates the multiplier effects of changes in final demand for one sector on all other industries within a local area and provides the results in terms of total changes in employment, income, output and value added.

In an economic impact analysis, the results are presented in the context of three different impacts: direct effects, indirect effects and induced effects. Putting the results in the context of a veterinary practice, the direct effect refers to the impacts created directly by the practice's activity. A new

veterinary practice that opens in Des Plaines, Il., for example, employs 10 workers and records sales of $500,000. The direct impact of this practice on Des Plaines' economy is $500,000, indicating that the total gross output of business in the community has increased by $500,000. In terms of impact on employment, the direct effect of the veterinary facility on local employment will be the creation of the 10 new jobs.

The indirect effect refers to those effects generated by the producers of intermediate goods and services purchased by the practice. Suppose that Des Plaines already has one veterinary practice that purchases medical supplies from a local medical supplies manufacturer. The entry of the new practice increases the demand for medical supplies and requires the local manufacturer to increase its production in order to meet the new demand. The increase in the number of employees due to the increased demand is recorded as the indirect effect of the new veterinary practice. Similarly, the increase in the total gross output of the medical supplies producer will be recorded as the indirect effect of the new veterinary practice on gross output. Other industries affected by the new veterinary practice and subject to the indirect effect are utilities, construction and landscaping, delivery services and other businesses that provide inputs to the new practice. Induced effect refers to the subsequent round of spending in the local economy made by the employees of veterinary practices and those of intermediate input suppliers.

IMPLAN Results

The results indicate that the veterinary services industry has generated 458,827 jobs in 2018, supported more than 135,000 jobs, and induced 231,507 jobs throughout the United States for estimated total of 825,353 employees. It is important here to make the distinction between direct and total effect. The 458,827 jobs are people who are employed by veterinary businesses (direct effect). The 135,019 jobs (indirect effect) correspond to employees who sector of activities is somehow related to the veterinary industry. These indirectly affected industries are those that supply intermediate inputs to the veterinary industry. The 231,507 induced jobs come from all industries that sell goods and services to veterinary employees.

The employment in the veterinary industry will result in an increase in the total labor income of more than $39 billion, from which approximately $18.5 billion are from the direct employees' payroll. The total value added of such practices is estimated at more than $56.2 billion. The estimated impacts that occurred as a result of expenditures by the veterinary services industry exceed $107 billion. State government revenues from these practices are estimated at around $4.4 billion while the federal government receives more than $4.6 billion.

ECONOMY-WIDE IMPACT OF VETERINARY PRACTICES IN THE UNITED STATES

Effect	Employment (Jobs)	Labor Income	Total Value Added ($ Millions)	Output
Direct	458,827	18,505	18,804	38,433
Indirect	135,019	8,623	15,807	29,741
Induced	231,507	12,299	21,644	39,294
Total	**825,353**	**39,427**	**56,255**	**107,468**

Table 16

PET HEALTH INSURANCE AND VETERINARY EXPENDITURES

The main objective of a study that was a joint effort of the American Veterinary Medical Association and the Mississippi State University Department of Agricultural Economics was to determine whether having a pet health care insurance lowers pet owners burden of health care bills. More specifically, the research provides an answer to the following questions:

- What impact does insurance have on the frequency of veterinary visits and on total veterinary expenditures?
- Does the presence of insurance provide incentive for pet owners to rush their pets to the veterinarian's office at the first sign of illness rather than wait and see if the condition resolves on its own?
- Does the presence of pet health insurance drive pet owners toward more expensive treatment options?

The results indicate that people with pet health care insurance spend a significantly higher amount on their pet care than owners without pet health insurance. Insurance does not have significant impact on the frequency of visits to veterinary clinics. The study found that frequency of visits is more influenced by health history of the pet, perceived risk of future illness, wellness plan, and expenditures on non-health-related areas. Level of education has a significantly negative impact on frequency of visits. In addition, age and frequency of visits have a negative relationship. Pets with a wellness plan visit a clinic 1.2 times more than pets without a wellness plan. The human-animal bond is also a significant determination of demand for animal health care plan. Pets who sleep in the owner's bedroom visit clinics 20 percent more times than those that sleep outside the room.

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AVMA Census of Veterinarians

AVMA Capacity Survey

IMPLAN Group LLC data 2013, www.IMPLAN.com

THE AVMA 2018 ECONOMIC REPORTS INCLUDE:

The AVMA & AAVMC Report on the Market for Veterinary Education:

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The AVMA Report on the Market for Veterinarians:

This report explores the demographics and employment of the veterinary profession: where they are located, what type of work they do, how much they are compensated, and how they are managing their educational debt. The report also measures unemployment and underemployment and identifies the contributing factors, and explores the performance of the market based on the value of the DVM degree.

The AVMA Report on the Market for Veterinary Services:

The demand for veterinarians and veterinary education begins with the demand for veterinary services. This report provides an overview of the veterinary workforce and projections for the supply and demand for veterinary services using recent AVMA Pet Demographics and Ownership study data. The report also presents the results of an efficiency analysis of the veterinary practices. In addition, the economic impact of veterinary businesses on a national scale is discussed.

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