



2016 AVMA & AAVMC Report on

THE MARKET FOR VETERINARY EDUCATION



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THE MARKET FOR VETERINARY EDUCATION

Veterinary Economics Division
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SUMMARY

The market for veterinary education is the first market in the supply chain of veterinarians to provide veterinary services. The willingness of veterinary college applicants to pay for seats represents the demand for veterinary college seats, and the willingness to supply those seats at a certain price by the various colleges, both domestic and foreign, represents the supply.

In a perfectly competitive market, all seats would have equal characteristics. The only differentiating factor would be the price (tuition and fees) for those seats. But the various colleges do not offer seats with equal characteristics, even though they all must meet a minimum standard. Each college operates with some monopoly power (in-state colleges for residents), as oligopolies (such as the five Western colleges in the same 16 Western states alliance), and as monopolistic competitors (domestic colleges). Thus, the supply and demand for these seats is much more complicated than the simple perfectly competitive market illustrated in this report. However, the perfectly competitive market model allows for a year to year comparison to determine how equilibrium price and quantity are moving.

The number of applicants has been cyclical over the last five decades and may well be at the top of that cycle today. If so, the level of competition between veterinary colleges for students may become more intense in the near term. The high mark for the number of applicants was 6,769 in 2013.

While the number of applicants peaked in 2013, the number of seats available may be leveling off by 2019, as there are to date no new schools approved to begin in 2016 and there has been little expansion in the number of seats at the existing colleges.

The applicant-to-seat ratio has stabilized at roughly 1.6:1 and is forecast to decline through 2025 even though the number of seats has stabilized because the number of applicants continues to decline. However, new schools, greater expansion of seats at current schools, continued increases in debt-to-income ratios, and an economic downturn have the potential to further reduce the applicant-to-seat ratio.

Starting salaries for new graduates and the number of new graduates that are obtaining full-time employment opportunities prior to graduation are increasing. These changes are due to an increase in disposable income that occurs in an economic expansion. The real (2014\$) weighted mean income (RWI) for new veterinarians receiving full-time employment prior to graduation was \$69,558 in 2015, an increase of approximately 4.5 percent over 2014. Even more impressive was the more than 10 percent increase in full-time employment positions obtained before

graduation to an all-time high of approximately 1,300. These two statistics suggest that the demand for veterinarians in 2015 was very strong in comparison to recent years.

The most important factors affecting the starting salaries of new veterinarians were gender, type of practice, and region of the country where the employment was located. These factors created considerable variation in starting salaries for new graduates. This was illustrated by a distribution of incomes that varied by approximately \$30,000 for the roughly two-thirds of new graduates that were within one standard deviation of the mean.

While incomes posted a strong increase in 2015, student debt also rose and continued along the longer-term trend of a more than \$6,000 increase per year. The real (2014\$) weighted mean debt (RWD) for the new graduates was \$141,354 in 2015. And just as there was great variation in the income for new veterinarians, there was even greater variation in debt for new veterinarians, from zero debt to more than \$450,000 in debt. Two-thirds of the new veterinarians had debt between \$51,000 and \$222,000, with roughly 16 percent of new veterinarians reporting debt obtained in veterinary college in excess of \$222,000.

The continued increase in debt for new graduates was sufficient to offset the gains in starting salary to hold the debt-to-income ratio at 1.99:1. This level of debt-to-income ratio (DIR) is unsustainable. More importantly, the fact that this ratio is not improving during the economic expansion may not bode well for how this ratio will fare in the longer term as the economic expansion reaches its end.

The DIR is an important indicator of both the economic performance of the market for veterinary education and the economics of the profession generally. The DIR provides one type of measure of the cost to the profession of providing veterinary services (debt) and the willingness of consumers of veterinary services to pay those costs. Currently, some of the veterinary colleges have costs that push the net present value of the veterinary medical degree to less than zero based on the current starting salaries. This suggests that some veterinarians are already being produced at a higher cost than the price consumers are willing to pay. The continued increase in the DIR increases the risk of a market correction that may produce outcomes that are not beneficial to the veterinary profession, animal owners or the general public.

A more sustainable DIR (although certainly not optimal) would be 1.4:1, and the profession, in total, must begin to develop strategies to move in this direction to avoid a market correction. While colleges and students are doing what is necessary to ensure that

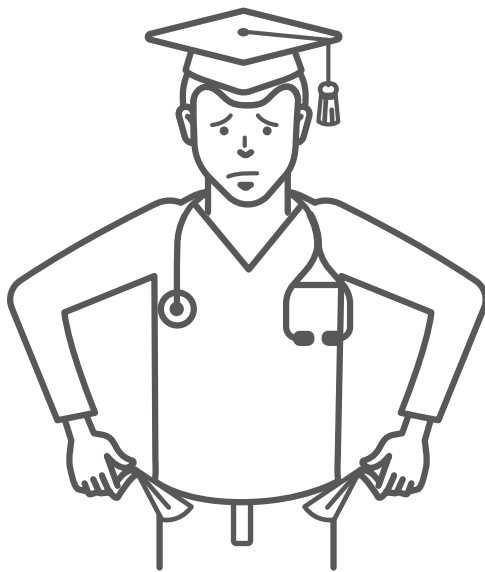
the ability to provide veterinary services is sufficient to meet the needs of the public and consumers, the profession is failing to provide these services at prices that allow consumers to obtain the level of veterinary services that are needed and provide the public health protection demanded by the general public.

Politically, there is an important message here. For at least the last three decades the public has been defunding public education at the same time the real costs of operating these schools has risen. In short, for the veterinary profession this has shifted the burden of providing animal health from the taxpayer to the animal owner. The food animal owner has faced considerable friction in passing these increased veterinary costs to animal protein consumers as they are constrained by the competition from other protein providers. For the pet owner, the pet health expenditures compete with a shrinking real disposable income and other expenditures that have risen for reasons similar to those of veterinary services.

Veterinarians provide both a private service and a public service and thus should receive compensation from both. The compensation from the public occurred in the past through the

public support of the veterinary education. This support reduced the cost of education to the veterinary student and allowed them to obtain a standard of living that was somewhat unfettered by student debt. Today that no longer occurs and, in fact, many veterinarians now pay the full cost of their education, receiving no public support but are still providing public services. In economics this is known as a market failure, consumers are obtaining benefits without paying for them.

Strategies to improve the DIR for veterinary graduates must come from every corner of the profession and address each point in the supply chain between applicant and the provision of veterinary services where costs are added, as well as the components of demand for veterinarians and veterinary services. Successful strategies will reduce education costs and increase starting salaries for new veterinarians while at the same time increase the private and public value of veterinary services.



WHILE INCOMES POSTED A STRONG INCREASE IN 2015, STUDENT DEBT ALSO ROSE AND CONTINUED ALONG THE LONGER-TERM TREND OF A MORE THAN \$6,000 INCREASE PER YEAR.

INTRODUCTION

This report combines and updates the information previously detailed in two separate reports, the 2015 Report on Veterinary Debt and Income and the 2015 Report on the Market for Veterinary Education. Data and analyses on the market for veterinary education includes information about veterinary college applicants, a breakdown of tuition, fees and living expenses by veterinary college and year, debt and income levels of new veterinarians, demand for and supply of seats, and the cautiously monitored debt-to-income ratio.

Information on veterinary college applicants is obtained from the Veterinary Medical College Application System (VMCAS), and the data on tuition, fees and estimated living expenses is obtained from the veterinary colleges. Because of the inclusion in this report of information on applicants and colleges that is obtained from the Association of American Veterinary Medical Colleges (AAVMC), for the first time, this report is a joint effort and product of AVMA and AAVMC. This collaborative effort between the two associations will provide more consistent reporting of the data and enable the access of data on the market for veterinary education to be obtained from one location.

Since the early 1980s, the AVMA has annually produced mean debt and income figures developed from data collected through the 'Senior Survey' to keep the profession informed about the economic temperature of the market for new veterinarians. However, after the AVMA established the Veterinary Economics Division in 2013, additional research and data enquiry led to a more precise estimation and meaningful, analytical presentation of the data to better understand the performance of the market for veterinary education over time.

Analysis of the Senior Survey data revealed that there are several statistically significant factors (e.g., demographic characteristics of veterinary graduates) that explain the variation in mean income. The factors which we include are: gender; age; practice type; location of place of employment; debt accumulated in graduate school; and anticipated work hours per week. As a result, we were able to determine that a change in these demographics would easily change the mean starting salary and thereby enable the reader to conclude that perhaps this change is attributable to market conditions. That is, an increase in starting salary indicated an increased demand for

new veterinarians and a decrease in starting salary indicated a decreased demand for new veterinarians. However, demand is the relationship between price and quantity, all other things being equal. Without controlling for the changing demographic characteristics of the graduates, a change in mean starting salary may be a result of the changing population of new veterinarians, rather than a change in the number of new graduates.

This analytical process of controlling the characteristics of a good or bundle of goods to measure the market impact is a common practice in economics and is best known as 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, (i.e., a constant percentage of a certain gender, practice type and distribution by region) allows for the examination of how the changing number of graduates affects the income they receive.

The debt-to-income ratio, a key performance indicator (KPI) for the profession, is also extensively discussed in this report. The debt-to-income ratio is of most value to the profession when it is tracked continuously, consistently and correctly. The debt-to-income ratio is used by the AVMA as a key indicator of the annual performance of the market for new veterinarians. Also, it enables us to measure the effectiveness of strategies implemented to improve the economics of the profession.

In this report, we also identify factors significant in explaining the variation in the debt-to-income ratio. Controlling for these factors allows us to more accurately measure the change in this Key Performance Indicator (KPI) over time and identify strategies that would have maximum impact.

The last sections of the report will focus on the market for education. As we've discussed in previous reports, the market for education is the starting point of the supply side for the market for veterinary services. The three, vertically related markets - the market for education, the market for veterinarians and the market for veterinary services - are integrated by price signals communicated through the market for veterinary education. Furthermore, this market for education is not a singular entity; there are 30 AVMA accredited veterinary colleges located within the U.S. and 19 AVMA accredited

IN THIS REPORT, WE ALSO IDENTIFY FACTORS SIGNIFICANT IN EXPLAINING THE VARIATION IN THE DEBT-TO-INCOME RATIO. CONTROLLING FOR THESE FACTORS ALLOWS US TO MORE ACCURATELY MEASURE THE CHANGE IN THE KPI OVER TIME AND IDENTIFY STRATEGIES THAT WOULD HAVE MAXIMUM IMPACT.

veterinary colleges located outside the U.S., as well as many other veterinary colleges not accredited by the AVMA.

The demand for seats at a veterinary college by consumers (veterinary student applicants), can be measured by the price points, set by the veterinary colleges, that veterinary students are willing to pay.

While the 2015 AVMA Report on the Market for Education focused on tuition and fees, a differentiator for most colleges, this report will describe the debt load incurred by new veterinarians and how it compares to the tuition and fees they pay in addition to the cost of living. Consequently, although veterinary students forego lost wages to pursue a career in veterinary medicine, the cost of living cannot be considered as a foregone expense, as a market participant has to “live” whether or not they attend veterinary college.

Ultimately, the veterinary student’s role in educational debt can be tackled most effectively if addressed among pre-veterinary students. Although warnings about the level of debt and the debt-to-income ratio that waits upon one’s graduation are becoming well known by applicants, these statistics may still not provide applicants with insight into the financial stress that is associated with varying levels of debt or debt-to-income. And, once enrolled in veterinary college, there is little opportunity to impact their financial outcome at graduation.

Most importantly, the performance of the market for veterinary education, because this market is connected to the market for veterinarians and the market for veterinary services, provides some measure of the relative willingness of animal owners to pay for the cost of veterinary education. The demand for veterinary services fuels the demand for veterinarians, and this demand combined with the additional supply of veterinarians from the veterinary colleges, determines the price or income level of new graduates that the demand for veterinary services will support. Because the current cost of veterinary education is roughly twice the level of the starting salary, the market is signaling that the price of veterinary services is too high relative to the cost of producing them, or that animal owners are unwilling to pay for veterinary services at a price that is able to support the high cost to produce veterinarians. The final section of this report will attempt to define strategies to ameliorate the difference between what animal owners are willing to pay and what it costs to produce veterinary graduates.



MARKET FOR EDUCATION KPI



The question becomes, “What values to report?” Do we include those who have zero debt in our mean figures? Should we include those who are pursuing continuing education? Do we assume that those graduates not responding are distributed in a similar manner to those who have responded?

In previous reports, we’ve discussed the importance of Key Performance Indicators, or KPIs. As the old saying goes, if you can’t measure it, you don’t know if it’s working! The AVMA Veterinary Economics Division was founded to enhance the economics of the veterinary profession and improve practice profitability. Needless to say, we must determine a suitable measure for the “economics of the profession” in order to determine if strategies employed are making steps in the direction of economic improvement.

One important KPI developed by the AVMA’s Veterinary Economics Division is the debt-to-income ratio (DIR). At the most basic level, the DIR is computed by dividing an individual’s reported debt by their reported income. However, aggregating these and presenting a fair and representative DIR quickly becomes complicated.

First and foremost, the DIR is the KPI that ties together the market for education and the market for veterinarians. The debt is directly related to the costs incurred to earn a DVM degree, while the income is the payoff that a veterinarian receives upon completion of their DVM degree program.

There are several scenarios that must be considered when calculating the DIR. The DIR that the AVMA produces 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. A major caveat, particularly among reported debt figures, is that students report their best estimate of the information

solicited. Questions such as the number of hours they expect to work each week, their post-graduate plans and their educational debt are often rough estimates of the true value. Students still in a DVM degree program, with a job offer, do not actually know how many hours they may end up working per week. Also, they cannot pinpoint the annual income they will earn that would be based on production. Some report that they are yet to receive an offer (although based on our other surveys we know that most who were without jobs at the time the survey was administered find gainful employment within one year of graduation). In light of these issues, we must emphasize that raw numbers are not nearly as significant as trends or the direction of these numbers over time.

Essentially, we must first identify the objective of the DIR. When calculated each year, the DIR is a snapshot, frozen in time, of the current state of new graduates. And, this snapshot comprises vast variations in both debt and income. Some students report no debt (11.2 percent in the 2015 graduating class); others report having obtained no job offers or invitations to pursue continuing education at the time the survey was distributed (11.9 percent in the 2015 graduating class). Others elect to pursue additional education (31.7 percent of the 2015 class reported receiving an offer to pursue an internship, residency or continuing education) and then there are some (an additional 12.2 percent in the 2015 graduating class) who simply do not answer the questions pertaining to their debt, income or other specific and relevant information.

The question becomes, "What values to report?" Do we include those who have zero debt in our mean figures? Should we include those who are pursuing continuing education? Do we assume that those graduates not responding are distributed in a similar manner to those who have responded? The question is answered

best based upon the objective for reporting the values. Again, the objective of the AVMA Veterinary Economics Division is to improve the economics of the profession. To do so requires a measuring stick that provides the best indication of the economics of the profession, and does so uniformly through time so that year to year comparisons can be made.

The descriptive statistic for debt is the sum of all debt divided by a count of all the students reporting debt. Some have argued that those reporting zero debt should be excluded, but this is difficult to justify on a statistical basis. There are graduates with a debt level that is positioned in the range from zero debt to the mean debt of all the students surveyed, and those with zero debt are well within the 95 percent confidence interval around the mean. Moreover, some of the higher debt observations are well outside the 95 percent confidence interval at the other end of the distribution of students surveyed.

For income, only the income of those pursuing full-time employment is considered and not those who receive a stipend that is associated with continued education. However, if the compensation received for completing internships becomes defined as an economic decision to clear the markets of available new veterinarians, then the observations of income of new veterinarians completing internships will need to be included with full-time employment opportunities.

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 all the graduates that reported a value for debt and full-time employment. And these values are held to a constant demographic distribution over time so that there is no impact on the DIR as a result of changing demographics.



THE APPLICANT POOL FOR VETERINARY COLLEGES

Applicants to the veterinary colleges represent the beginning of the supply chain for veterinary services. And for every applicant in the VMCAS, there are many potential applicants who began their college career and have elected not to apply, but who may apply as the conditions for entry change.

Last year, we reported that the number of applicants to colleges of veterinary medicine was cyclical. In 2013, the number of applicants peaked at 6,769, dropped slightly to 6,744 in 2014 and dropped again in 2015 to 6,600. However, for 2016, the number

of applicants increased slightly to 6,667. As noted in the chart below, the peak during the last cycle occurred in 1998 at 6,783 applicants. While we have been unable to determine a specific factor, or set of factors, that may be responsible for the cycle of applicants, by observation, the cycle may have reached its zenith in 2013. The rise in the number of applicants that began in 2002 has shown no increase since 2013. If the previous pattern in applicant numbers persists, then we could expect the number of applicants to continue to fall at least over the next decade.

COLLEGES SUPPLY OF SEATS

**AAVMC VETERINARY SCHOOL APPLICANT FIGURES,
AAVMC INTERNAL DATA REPORTS, 1980-2015**

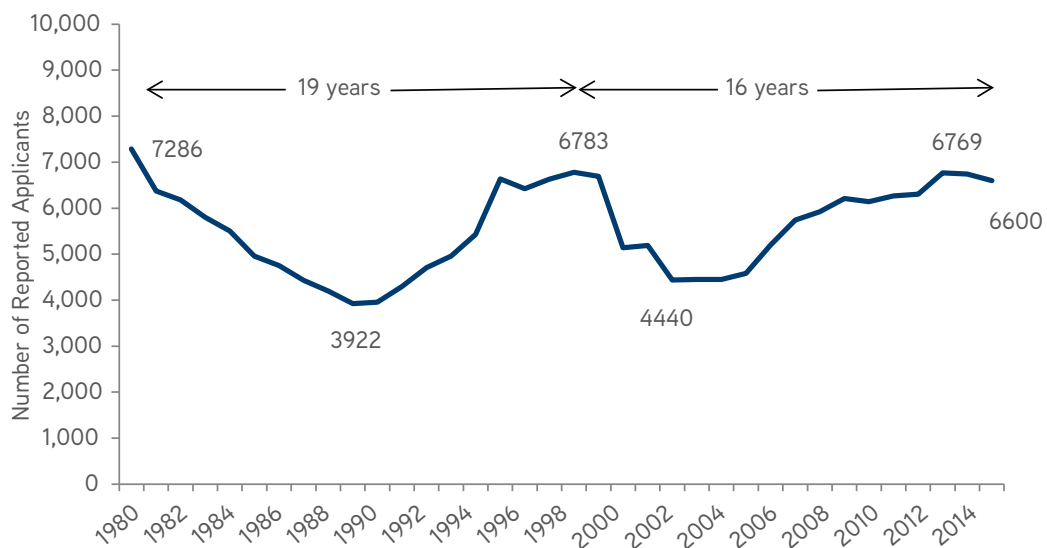
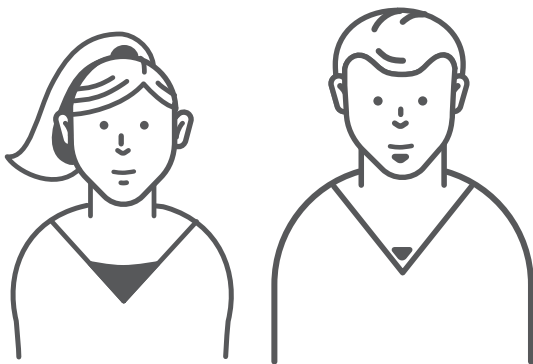


Figure 1

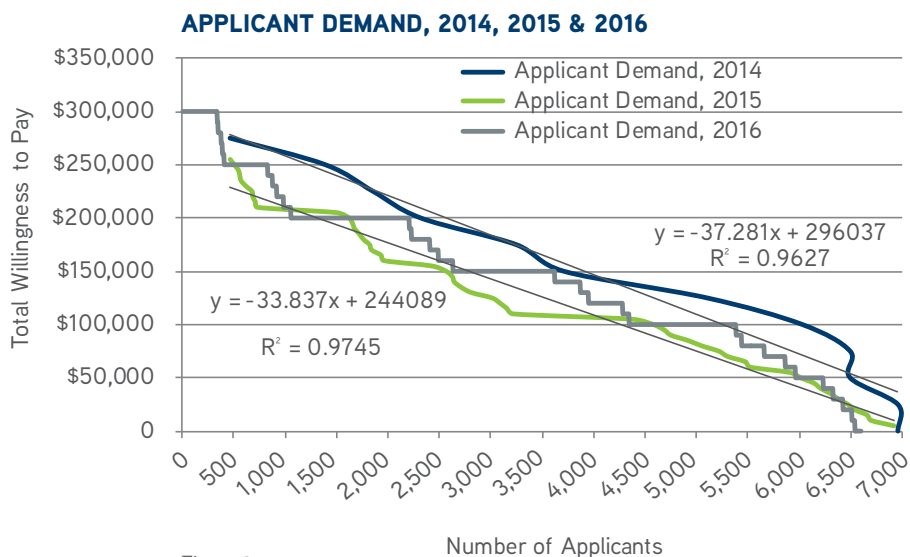


IF THE PREVIOUS PATTERN IN APPLICANT NUMBERS PERSISTS, THEN WE COULD EXPECT THE NUMBER OF APPLICANTS TO CONTINUE TO FALL AT LEAST OVER THE NEXT DECADE.

DEMAND FOR VETERINARY COLLEGE SEATS

The VMCAS applicants represent the demand for veterinary college seats. Each applicant may elect to pay for the veterinary college seat at more than one veterinary college. Each veterinary college may face many more applicants than they have seats available because applicants generally apply to more than one veterinary college. Each year since 2014, the VMCAS applicants are surveyed to determine (among other factors) what they are willing to pay for the veterinary education. The willingness to pay provided by all the applicants provides a description of the demand for veterinary education – the relationship between the quantity of seats demanded and the price for each seat that the applicants are willing to pay.

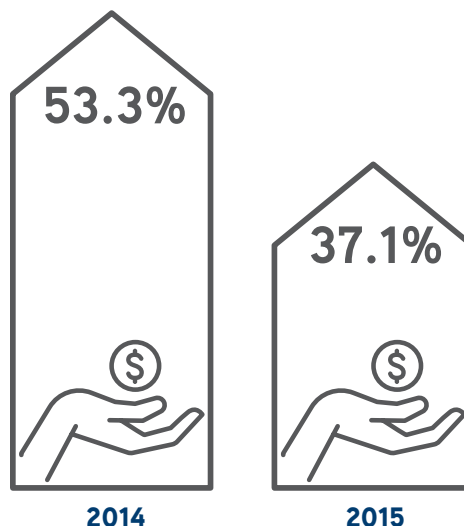
Between the period 2014 and 2015, the demand curve in the market for veterinary education shifted to the left. The implication of this shift is that at the same price fewer market participants (applicants) are demanding a veterinary education. More specifically, in 2014, 53.3 percent of applicants were 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. At this rate the colleges would either have to reduce tuition to fill seats or have a shrunken pool of applicants from which to select first year veterinary students.



However, the willingness to pay indicated by the 2016 applicants shifted back slightly to the right and lies between the willingness to pay indicated by the 2014 and 2015 applicants. Most interesting is that again, none of the applicants responding to the

survey indicated a willingness to pay more than \$300,000 and the mean was \$149,716. For the most part, this is an accurate reflection of the upper bound and mean costs for a veterinary education at the U.S. colleges.

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.

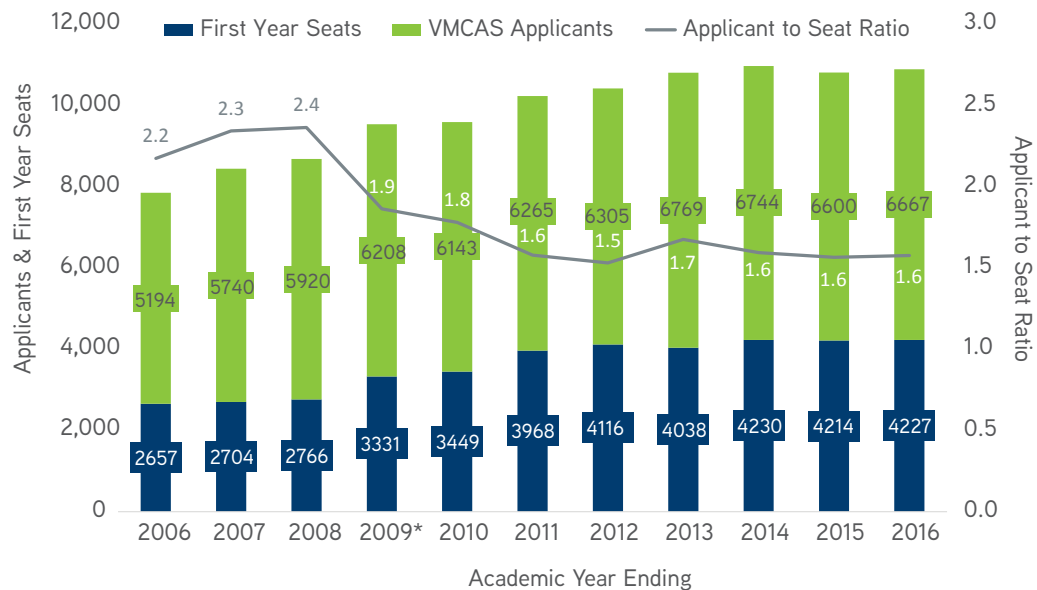


APPLICANT-TO-SEAT RATIO

Over the last three years, the applicant-to-seat ratio has remained relatively constant at 1.6:1. In 2015 there were 6,600 applicants through the VMCAS system and 4,214 available seats, yielding an applicant-to-seat ratio of 1.57:1, and in 2016 there were 6,667 applicants and 4,227 available seats, producing an applicant-to-seat ratio of 1.58:1.

The seats available are located both within the U.S. 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 AVMA-accredited foreign schools 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 SEATS, U.S. AND INTERNATIONAL INSTITUTIONS, AAVMC INTERNAL REPORTS, 2006-2016



*2009 is the first year data is available for AAVMC International Members

Figure 3

In addition, although the applicant-to-seat ratio has been steady to slightly declining over the last 7 years, there are no data to indicate that the quality of the applicant pool is declining. Over

the last 11 years there have been no significant differences in applicants' GPA and GRE scores. Also, there has been no decline in the North American Veterinary License Exam pass rate.

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. AVMA ACCREDITED FOREIGN SCHOOLS AND NOT REFLECTIVE OF ANY MAJOR DIFFERENCE IN THE NUMBER OF AVMA APPLICANTS OR U.S. VETERINARY COLLEGE SEATS.

HISTORICAL ANALYSIS OF THE APPLICANT POOL

	Pre-vet GPA	GRE Verbal	GRE Quantitative
2005	3.53	63%	45%
2006	3.55	63%	45%
2007	3.54	63%	45%
2008	3.57	63%	45%
2009	3.57	59%	40%
2010	3.57	54%	40%
2011	3.59	59%	40%
2012	3.59	63%	48%
2013	3.6	72%	64%
2014	3.59	72%	64%
2015	3.56	65%	54%
2016	3.55	66%	58%

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 US, 3 AVMA-accredited Caribbean Colleges, 16 AVMA accredited veterinary colleges in other countries, and numerous other veterinary colleges across the globe. The AVMA has members that graduated from more than 225 veterinary colleges. However, VMCAS tracks only U.S. citizens who apply for seats at AVMA accredited veterinary colleges. The seats currently occupied include the 2016 through 2019 graduating

classes. Using the estimated number of graduates by source, there are currently just over 4,500 seats per year available to U.S. students, roughly 3,300 at the 30 U.S. colleges, 490 at the three Caribbean colleges and just more than 700 at the 16 AVMA accredited foreign colleges. Because we have no information to suggest that any of these 49 veterinary colleges are planning to increase enrollments, we have forecast a constant number of seats beyond 2019.

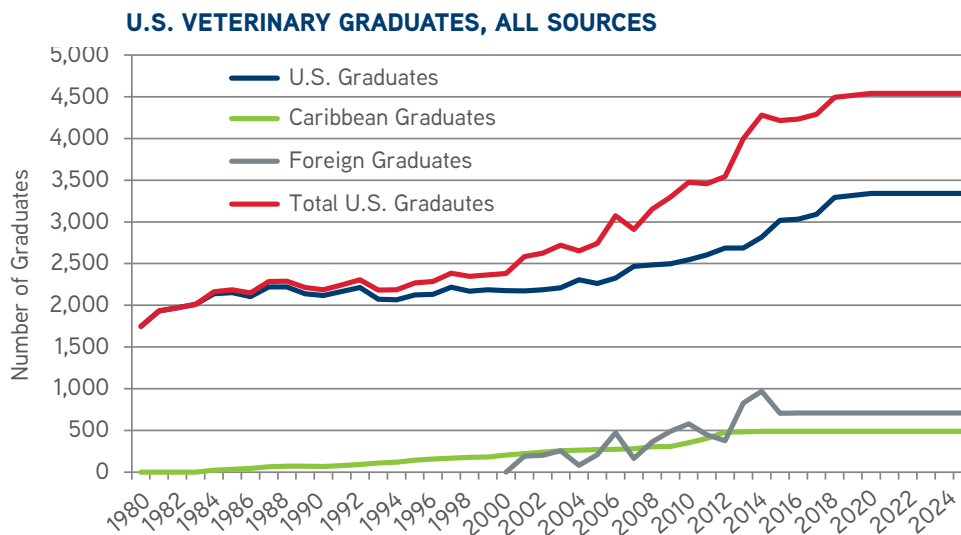


Figure 4

In 2015, veterinary colleges supplied nearly 3,300 annual seats (roughly 13,000 seats for all four years) with the total, four-year cost of tuition and fees for the last seat surpassing \$250,000. The University of Minnesota supplied seats at the lowest cost,

while Tufts University supplied seats at the highest costs. For 2015 graduates, the total cost to attend veterinary college was a mean of \$66,671 more than the mean cost of tuition and fees.

SUPPLY OF EDUCATION: TUITION & FEES AND TOTAL COST, 2015

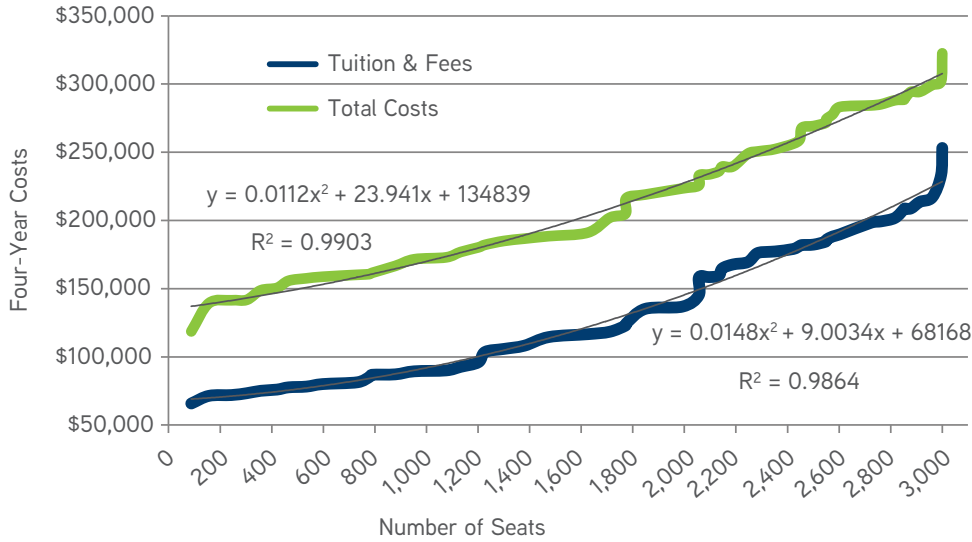


Figure 5

Equilibrium exists in a market at the point where the demand and supply curves intersect. When we intersect the demand and supply curves in the market for education, the equilibrium points suggest that the 2015 applicants were willing to occupy 1,384 seats at a mean total cost of \$197,242. In 2014, when demand was greater, applicants were willing to occupy 1,793 seats at a mean total cost of \$229,166. At present there are nearly 3,300 seats to be filled and, at best, a steady applicant pool. This chart represents what the 2015 applicants (2019 graduates) indicated they were willing to pay for a seat at a veterinary college.

The actual cost of the seats available suggests applicants' expectations of costs were below actual costs. Applicants have access to information on the costs of attending various schools, and we have no research on what factors are important in their decision to attend veterinary school or a specific veterinary college. Those that seek education at an in-state school and those that are eligible for a discounted rate (contract seat or other form of scholarship) may well indicate a willingness to pay that is well below what they must accept to attend an out-of-state school.

SUPPLY AND DEMAND FOR VETERINARY EDUCATION, 2014 & 2015

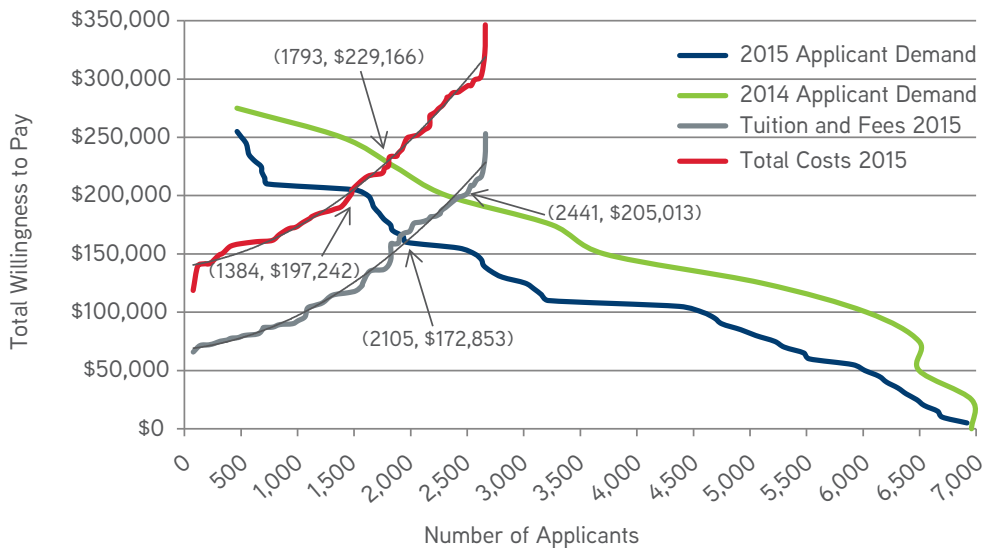


Figure 6

The following chart illustrates the aggregate, comprehensive value of tuition and fees, total cost and self-reported DVM debt. Overall, the majority of the graduating class had debt levels that lie below the total cost of matriculation through veterinary school. While less than 2 percent of students had debt levels

reaching more than \$450,000, about 11 percent reported having zero debt. Determining what factors affect the debt-to-cost ratio for individual students will be important to develop strategies to assist all students in having debt that is less than the cost of their education.

SUPPLY OF EDUCATION AND DVM DEBT, 2015

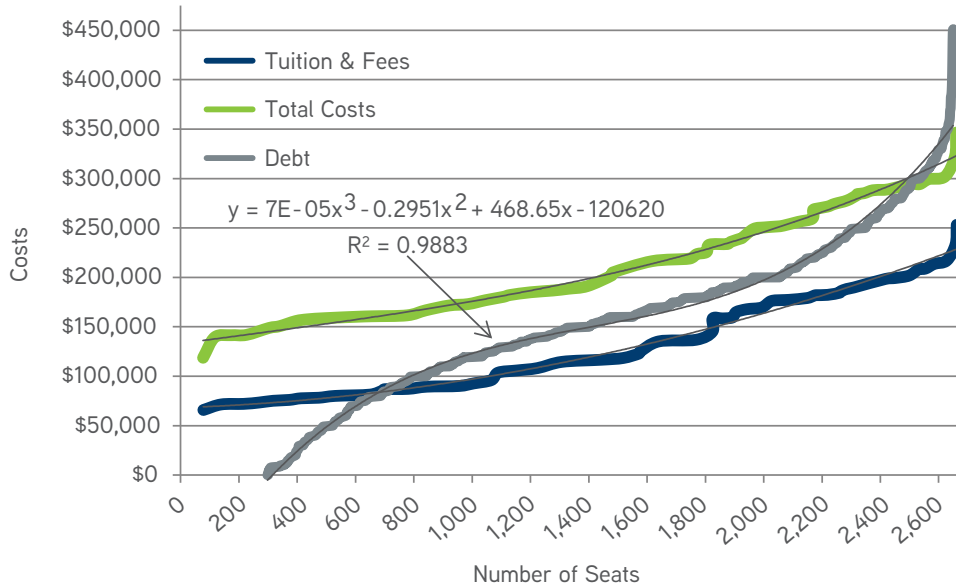


Figure 7

THE APPLICANTS' ESTIMATE OF THE DVM DEBT

The 2015 applicants were asked to estimate what they thought the debt load of the 2014 graduates debt load was. The following chart depicts their responses. As a comparison, the actual 2014 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. This debt load, based on the starting salaries for new veterinarians is high, but not high enough to have deterred applicants from pursuing veterinary college.

APPLICANTS' ESTIMATES VERSUS ACTUAL DEBT LOAD OF GRADUATES

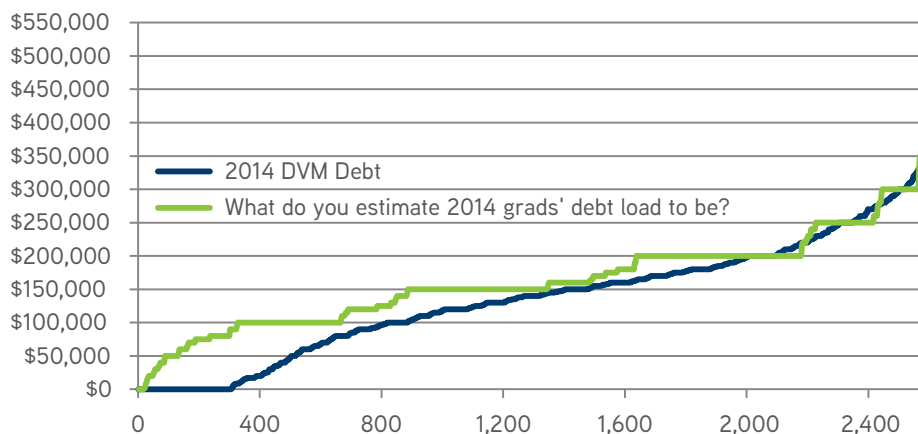


Figure 8

Although the applicants have a relatively accurate idea of the accumulated debt incurred by new veterinarians, tuition alone is not sufficient to signal the debt levels new veterinarians might

have. Since some states do not have a veterinary college, there are programs put in place to subsidize tuition for those for whom resident tuition rates are just not possible.



THE 2015 GRADUATING CLASS

In 2015, the senior survey was sent to 28 AVMA accredited U.S. veterinary colleges and 4 U.S. accredited veterinary colleges

outside the U.S. that had graduating seniors. The following table shows the response rates by school for the 2015 graduating class.

2015 RESPONSE RATE OF SENIOR SURVEY BY SCHOOL

U.S. Schools		2015	
School Name	Class	# Returned	% Completed
Auburn University	112	112	100.0%
Colorado State University	129	107	82.9%
Cornell University	95	94	98.9%
Tufts University	95	79	83.2%
Iowa State University	147	118	80.3%
Kansas State University	113	98	86.7%
Louisiana State University	84	84	100.0%
Michigan State University	110	93	84.5%
Mississippi State University	80	80	100.0%
North Carolina State University	79	79	100.0%
Oklahoma State University	88	88	100.0%
Oregon State University	58	53	91.4%
Purdue University	77	77	100.0%
Texas A & M University	123	123	100.0%
The Ohio State University	152	139	91.4%
Tuskegee University	65	65	100.0%
University of California-Davis	130	130	100.0%
University of Florida	102	91	89.2%
University of Georgia	102	102	100.0%
University of Illinois	121	97	80.2%
University of Minnesota	100	95	95.0%
University of Missouri-Columbia	114	111	97.4%
University of Pennsylvania	120	68	56.7%
University of Tennessee	93	93	100.0%
University of Wisconsin	79	79	100.0%
VA Tech & University of Maryland	105	105	100.0%
Washington State University	99	96	97.0%
Western University	110	107	97.3%
Total	2882	2663	92.4%
Foreign Schools			
Ross University	236	111	47.0%
St. George's University	123	26	21.1%
St. Matthew's University	29	10	34.5%
University of Edinburgh	77	16	20.8%
Total for Foreign Schools	465	163	35.1%

Table 2

As a result of the low participation rates of U.S. graduates at the foreign veterinary schools, we omitted that data from our analysis. Because of the insufficient data, we are uncertain as to

the statistical validity of this data with respect to representing the population of foreign graduates. Additional statistical tests would be required to test the validity of the data.



DESCRIPTIVE STATISTICS FOR GRADUATES



The number of new veterinarians finding full-time employment showed an increase to 48.9 percent in 2015, from 43.7 percent in 2014.

A major component of the Senior Survey is the post-graduate plans of the graduating veterinary students. Students were asked to report their plans after graduating, 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, there is evidence to suggest that many of those new veterinarians found employment within a year of graduating. Because the 2015 Senior Survey was our first effort to collect the data from foreign AVMA accredited veterinary colleges, we hope to improve the response rates for this group of colleges going forward.

DVM GRADUATES RECEIVING OFFERS FOR JOBS OR ADVANCED EDUCATION

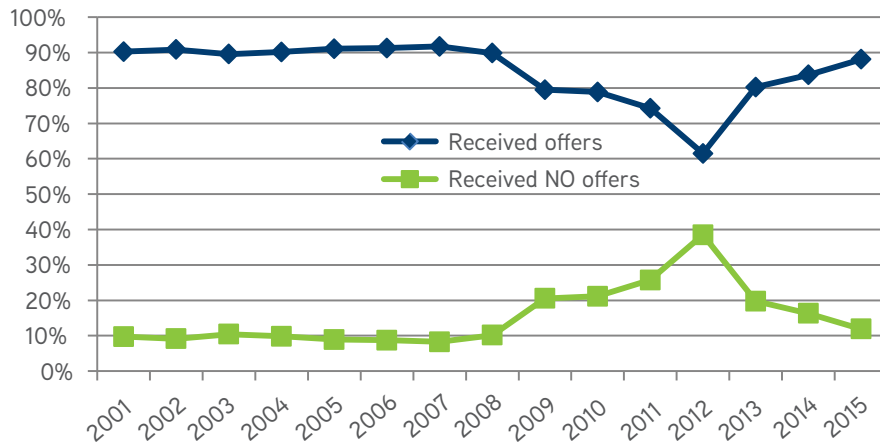


Figure 9

The percentage of graduating veterinary students finding full-time employment or getting offers to pursue post-graduate education in the 2015 graduating class was 88.1 percent, the highest rate since 2008. Clearly, the recent economic recession had a strong negative impact on the number of graduates receiving an income-earning opportunity prior to graduation. The percent of graduates receiving some type of income opportunity returned to the long-run average in 2015, with a steady increase

since 2012, even though the number of graduates increased considerably over the period. The number of new veterinarians finding full-time employment showed an increase to 48.9 percent in 2015, from 43.7 percent in 2014. The number of new veterinarians not finding employment or receiving an invitation to pursue continuing education decreased from 16.1 percent in 2014 to 11.9 percent in 2015.

DISTRIBUTION OF NEW VETERINARIANS

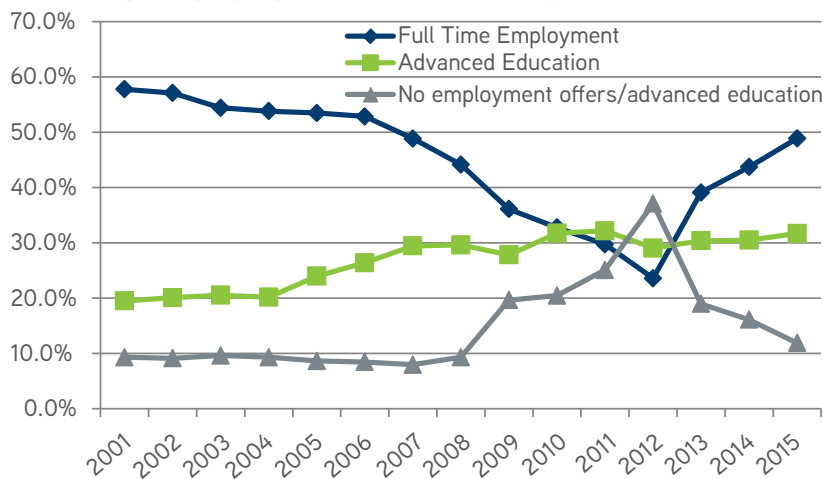


Figure 10

Throughout the period 2001 through 2015, the majority of new veterinarians reported finding full-time employment in the companion animal exclusive sector. However, new entrants into this sector declined throughout the period between 2004 and 2012, with a slight increase between 2012 and 2014, followed by a downward turn in 2015, with a reported 27.3 percent of applicants in 2015 from a high of 42.0 percent in 2004.

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 we noted in previous reports, this 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

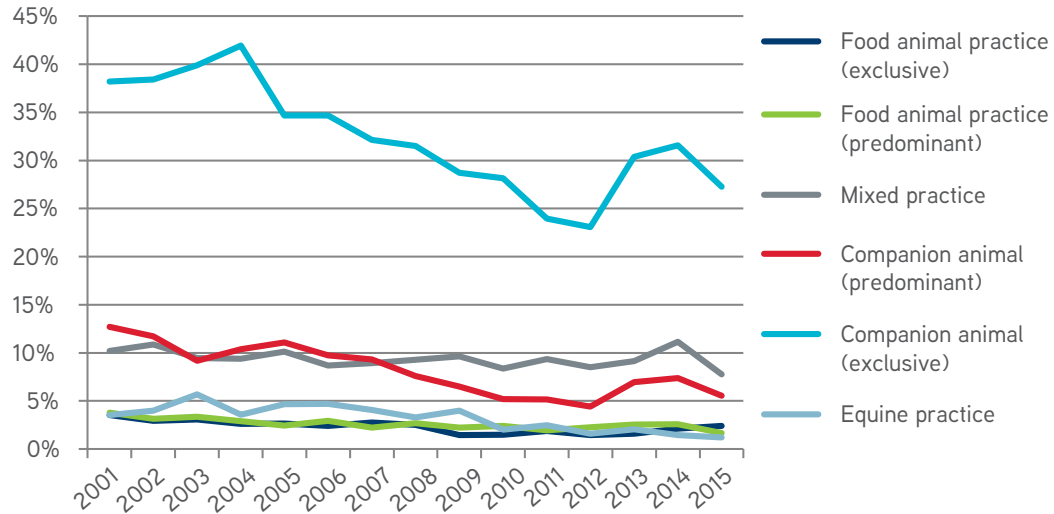


Figure 11

Over the period under observation, the percentage of new veterinarians finding full-time positions in public practice has been consistently small but steady. Between 2014 and 2015, the number of new veterinarians going into federal government, state

and local government, and industry increased, while the number of new veterinarians going into uniformed services, college or university, and not-for-profit entities decreased.

DISTRIBUTION OF NEW VETERINARIANS: PUBLIC PRACTICE

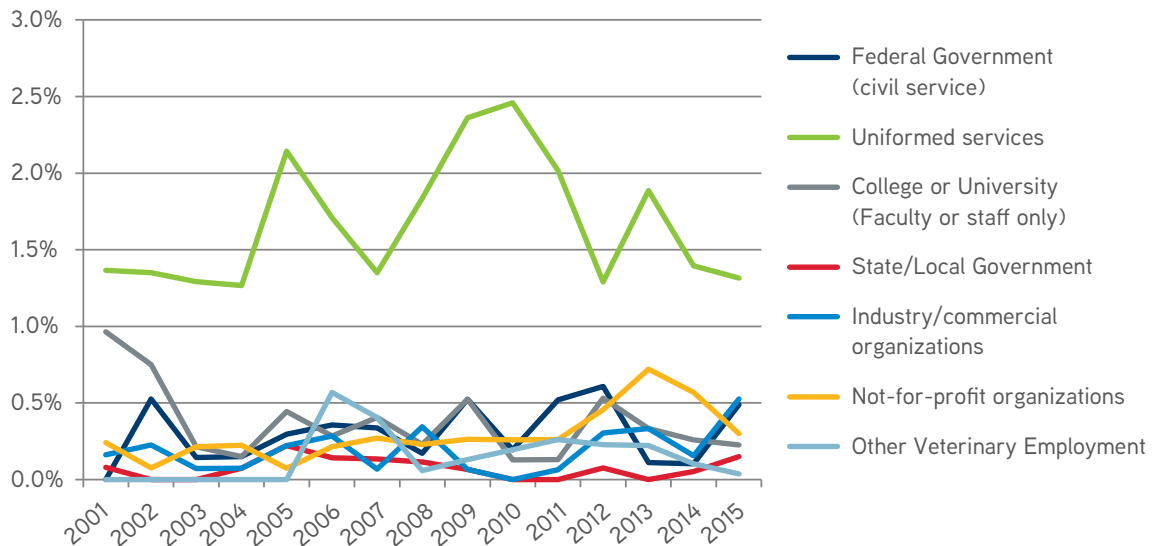


Figure 12

The percentage of new veterinarians pursuing career opportunities in private practice, public practice and internships remained constant between 2014 and 2015. However, the trade off between internships and private practice continues to be evident, with public practice entrants steadily flat lined.

Over the last six years, 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.

The percentage of new graduates pursuing advanced education after veterinary college remained relatively constant between 2014 and 2015. After internships, the second largest group for continuing education is residency programs.

DISTRIBUTION OF NEW VETERINARIANS: PRIVATE, PUBLIC AND INTERNSHIPS

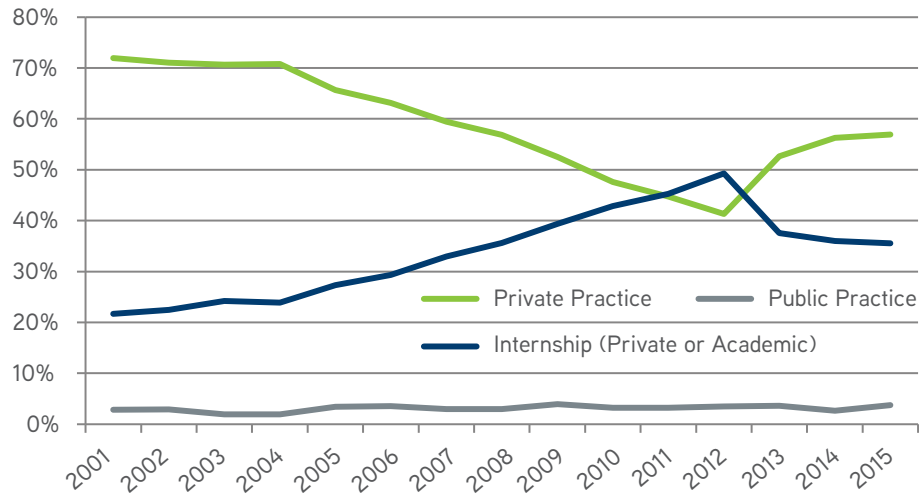


Figure 13

SPECIES FOCUS OF INTERNSHIP

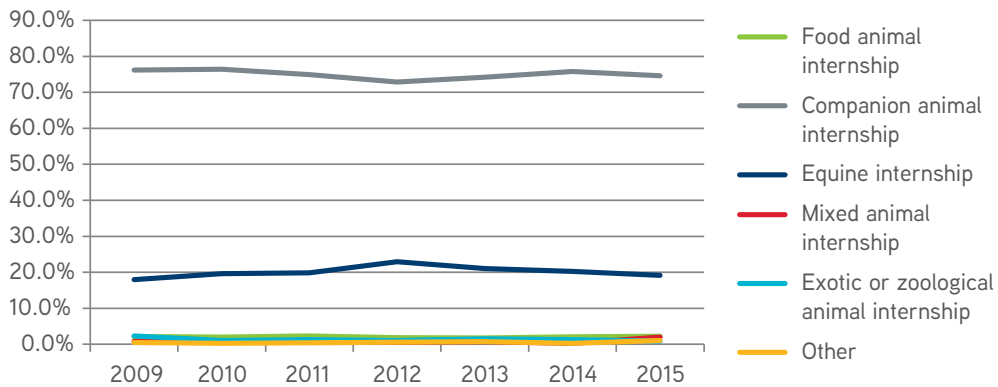


Figure 14

DISTRIBUTION OF NEW VETERINARIANS IN ADVANCED EDUCATION

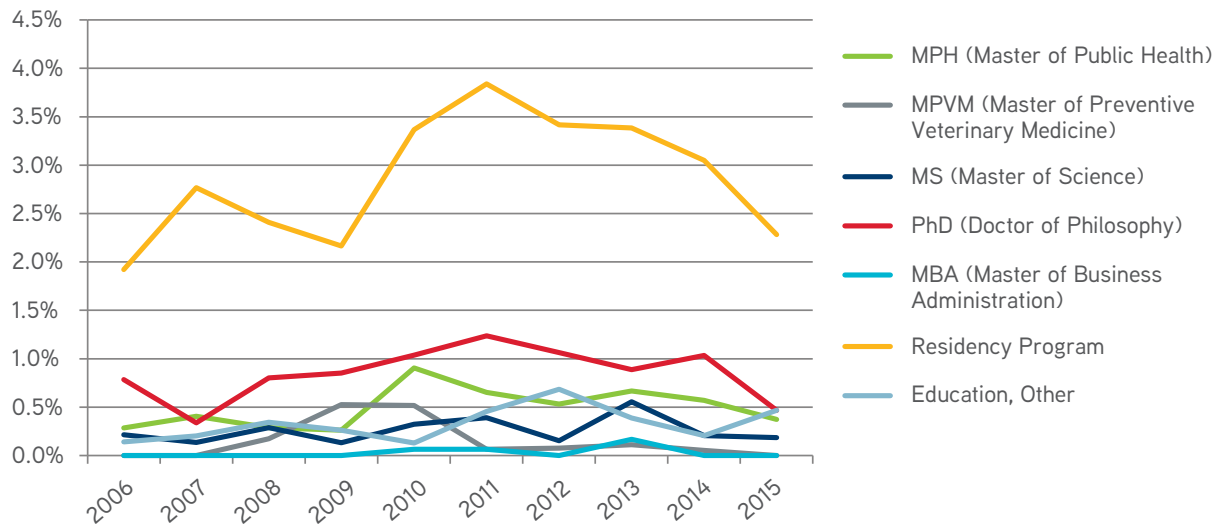


Figure 15



NEW VETERINARIAN INCOMES



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.

From 2001 through 2015, the mean starting salary for new graduates increased from just under \$40,000 to more than \$55,000. These numbers are inclusive of those finding full-time employment along with those pursuing internships, residencies and advanced education. This is a mean increase of \$1,050 per year over the 15-year period. More specifically, over the same period, those in private practice and public practice experienced an annual increase of \$1,758 and \$1,535, respectively.

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 those pursuing internships, with mean annual earnings of \$28,312 and an average annual increase of \$510 per year (between 2006 and 2015).

Although private practice has the highest starting salaries, 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 toe-to-toe. 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 a similar direction.

MEAN STARTING SALARIES OF NEW VETERINARIANS

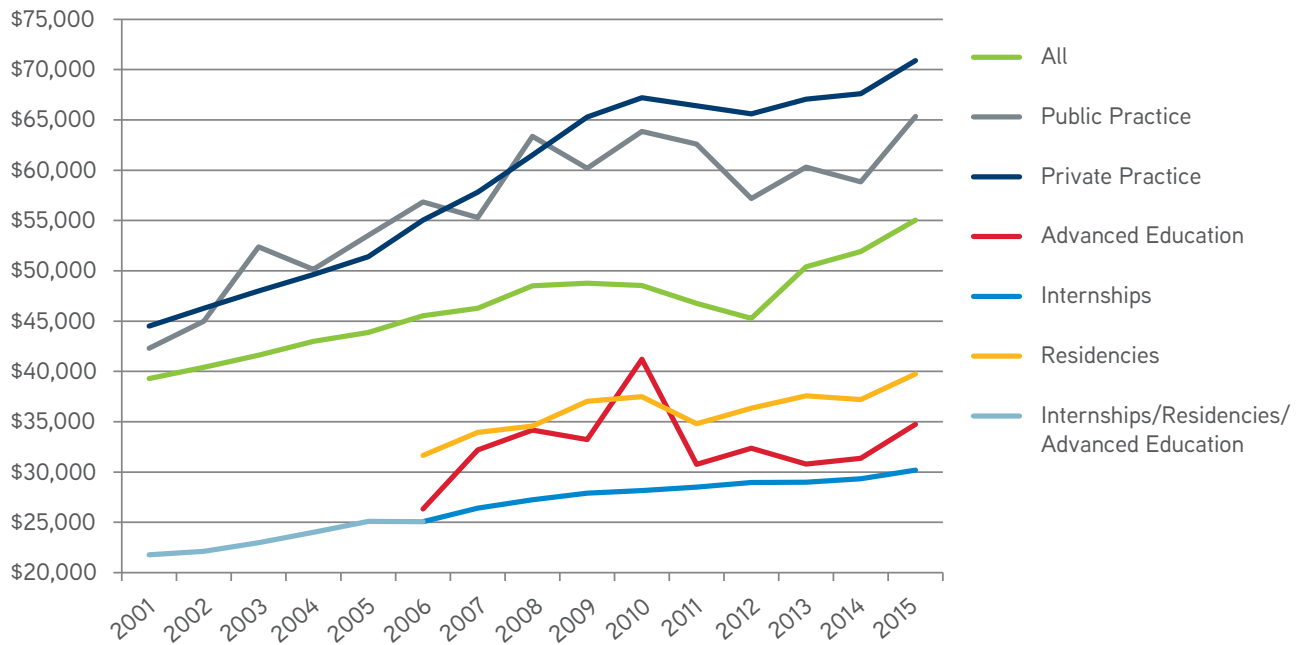


Figure 16

The real (2014\$'s) mean starting salary for 2015 graduates finding full-time employment prior to graduation was \$70,117, up from \$66,897 in 2014. The following chart illustrates the mean starting salary. The amount of variation in salaries is indicated by

one standard deviation of the mean. That is, 68 percent of new veterinarians employed in full-time positions earned between \$55,000 and \$86,000 in 2015.

DISTRIBUTION OF STARTING SALARIES FOR NEW VETERINARIANS

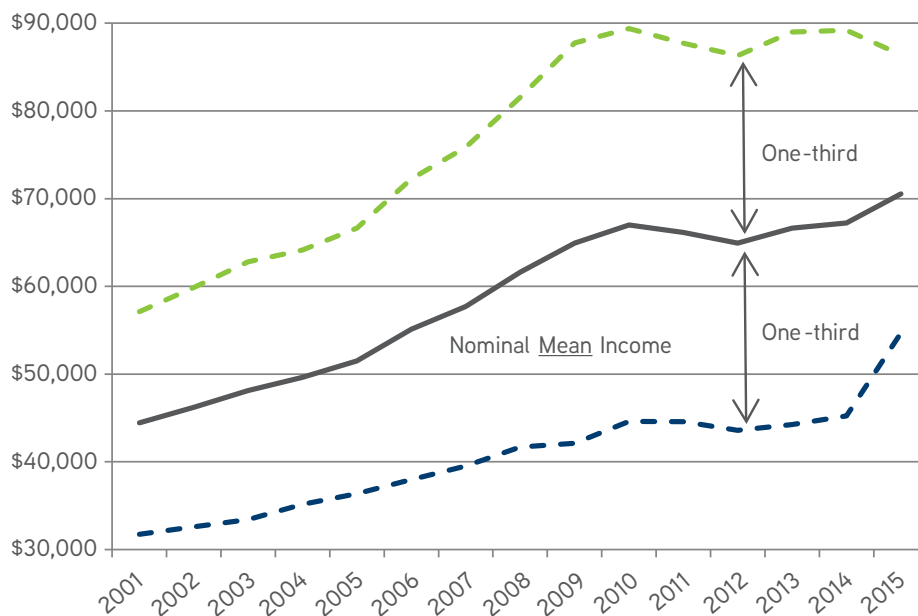


Figure 17

As we noted in the previous chart, the mean starting salaries for two-thirds of the new veterinarians pursuing full-time employment had a range of over \$30,000. This variation in starting salaries is prominent both among those in private practice

as well as those in public practice. Starting salaries among new veterinarians in private practice have been on a steady incline. For 2015 graduates, food animal exclusive practice yielded the highest income, and equine practice yielded the lowest.

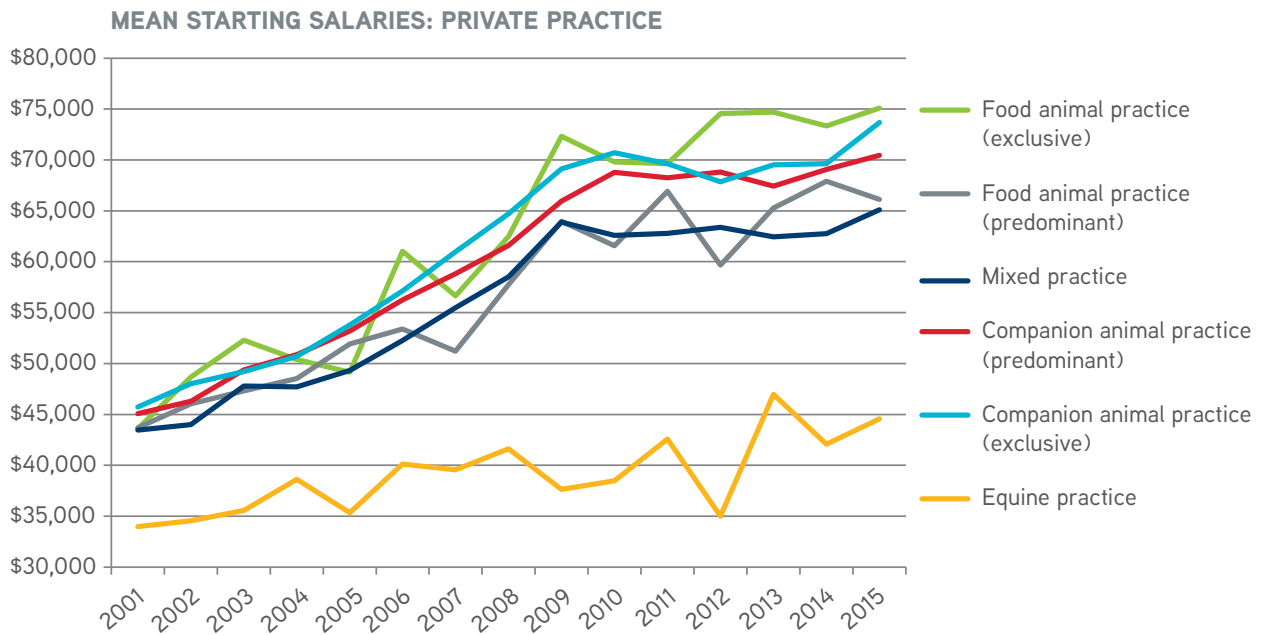


Figure 18

Since relatively few graduates reported finding employment in the public sector, the variability in incomes is much larger than that of private practice. However, starting salaries in industry continue to have the highest values versus other employment

options in the public sector, with new veterinarians employed at colleges or universities reporting the lowest starting salary among those in public practice.

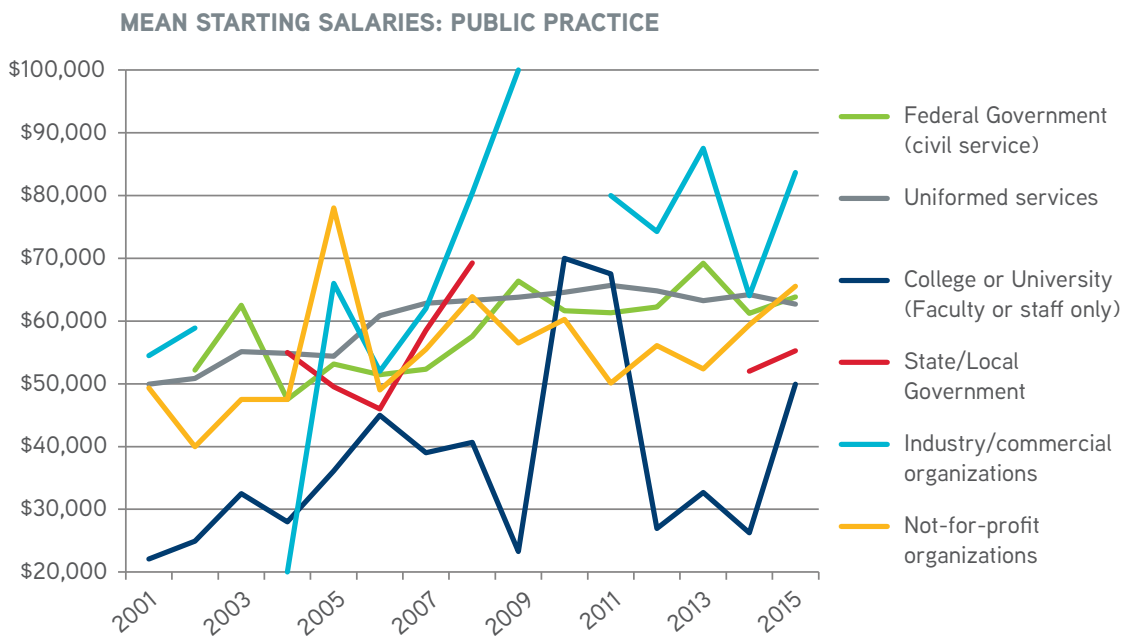


Figure 19

The variation in incomes among the various types of “advanced education” is also large. While the income of those pursuing

internships, residencies and PhD degrees are relatively stable, the income of those pursuing MS degrees is more volatile.

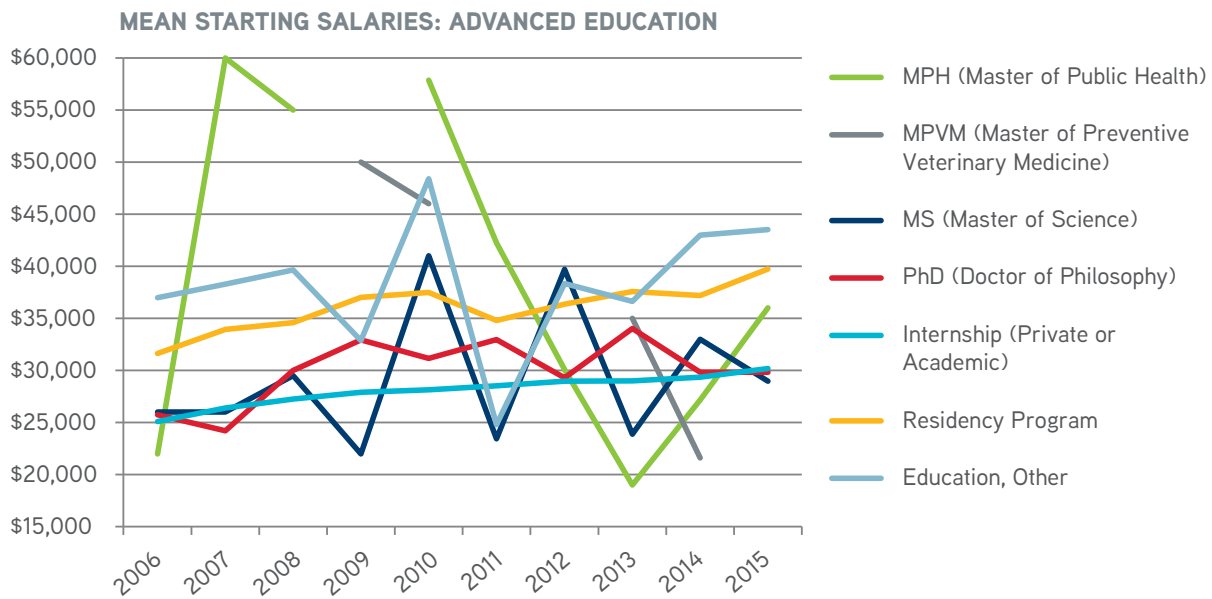


Figure 20

There are numerous factors that affect starting salaries. Outside of the economy, 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 from 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 indexed Real Weighted mean Income (RWI), measures the change in salary of a constant cohort of veterinarians holding variables such as gender, practice type and location constant and controlling for 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 that received full-time employment prior to graduation.

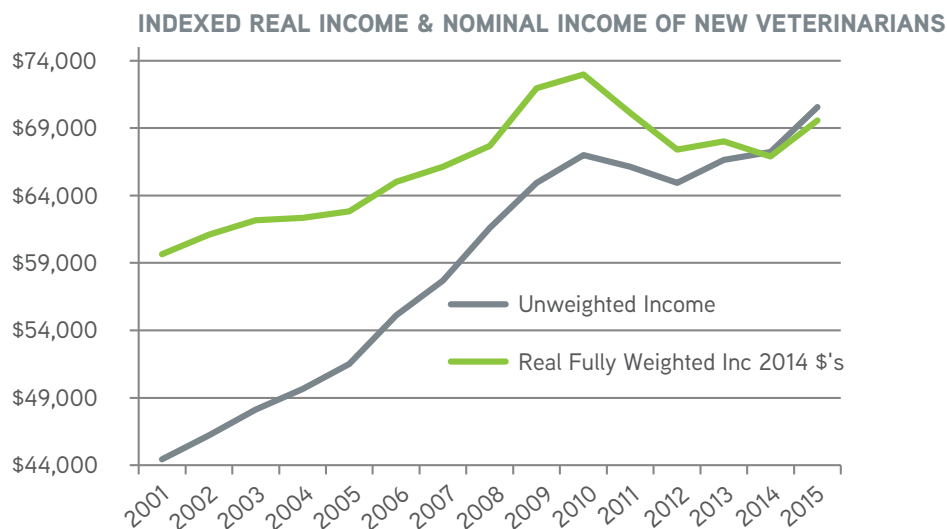


Figure 21



FACTORS AFFECTING INCOMES FOR NEW VETERINARIANS

There are numerous factors that explain the variation in income. The following table describes the effect of various factors on starting salaries 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 comprised 15 years of responses from over 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, advanced education and board certification.

The non-standardized coefficient indicates the dollar value impact of the corresponding variable. For instance, starting with a constant of \$54,463, the value of the coefficients (times the value of the factor) are added. That is, a graduate in 2017 would have an estimated mean income of \$82,847 (\$54,463 plus 17 times 1669.642).

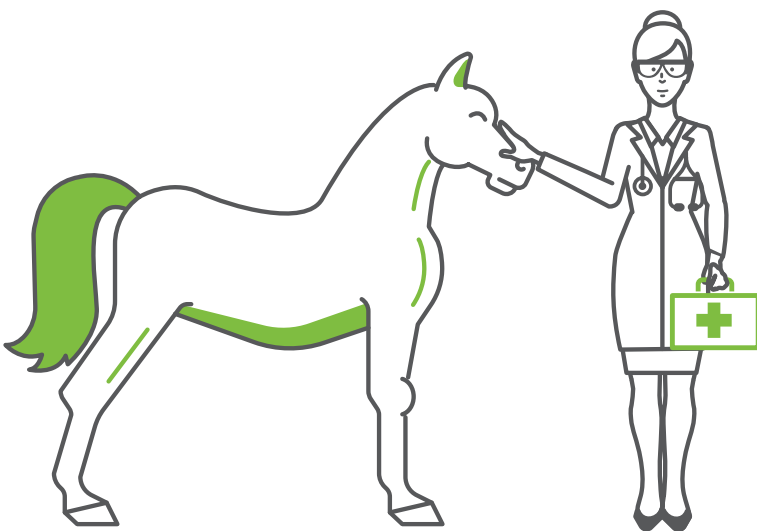
The final column labelled “sig” represents the significant variables. These values, also known as the p-values, are such that for a “sig” less than 0.05, the coefficient of “B” is statistically, significantly different from “0.” For instance, for Region 4 the p value is 0.927; this means it is not statistically, significantly different from the baseline, Region 3.

The standardized coefficients tell us the relative weight of each variable within the equation. For instance, the grad year with a standardized coefficient of 0.348 is more than 3 times as important as the anticipated work hours per week, which has a standardized coefficient of 0.092.

The unstandardized coefficient for the variable “year” is \$1,669.64 and indicates that the mean starting salary for new veterinarians increases by \$1,670 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., GDP).

The coefficient for equine, \$18,327, indicates that on average new veterinarians entering equine practice will receive a starting salary that is \$18,327 less than new veterinarians going into a companion animal exclusive practice, the baseline variable. And new veterinarians going into internships make almost \$35,000 less than those going into companion animal exclusive.

The factors that were included in this model produced an R square of 0.713. This indicates that the inclusion of all of these factors were able to explain 71.3 percent of the variation between the individually reported salaries and the estimated mean starting salary for all new graduates between 2001 and 2015.



THE COEFFICIENT FOR EQUINE, \$18,327, INDICATES THAT ON AVERAGE NEW VETERINARIANS ENTERING EQUINE PRACTICE WILL RECEIVE A STARTING SALARY THAT IS \$18,327 LESS THAN NEW VETERINARIANS GOING INTO A COMPANION ANIMAL EXCLUSIVE PRACTICE, THE BASELINE VARIABLE.

FACTORS AFFECTING INCOMES FOR NEW VETERINARIANS

			Unstandardized Coefficients		Standardized Coefficients		
			B	Std. Error	Beta	t	Sig.
Demographics	Basic Info	(Constant)	54463.305	835.028		65.223	0.000
		Year (use last 2 digits of grad year)	1669.642	22.753	.348	73.380	0.000
		Age	43.327	22.699	.008	1.909	.056
		Gender: F=1, M=0	-2406.972	174.493	-.054	-13.794	.000
		Anticipated Hours Per Week	-125.910	7.125	-.092	-17.672	.000
		DVM debt in thousands	8.017	1.256	.027	6.382	.000
	Region (first digit of zip code)	Region 0	1599.374	329.664	.023	4.852	.000
		Region 1	2588.278	324.951	.037	7.965	.000
		Region 2	1443.722	295.861	.023	4.880	.000
		Region 3	Baseline				
		Region 4	-27.744	302.357	.000	-.092	.927
		Region 5	-938.862	357.365	-.012	-2.627	.009
		Region 6	-465.860	323.207	-.007	-1.441	.149
		Region 7	1191.462	300.042	.019	3.971	.000
		Region 8	2058.721	316.733	.030	6.500	.000
		Region 9	3872.580	296.927	.063	13.042	.000
		Outside of the U.S.	623.988	918.198	.003	.680	.497
	Additional Degrees Held	Admitted to DVM Program Before Degree Earned	-130.751	233.188	-.002	-.561	.575
		Bachelors Degree	Baseline				
		Masters Degree	341.875	313.460	.004	1.091	.275
		Doctorate Degree	-673.862	913.284	-.003	-.738	.461
Other Professional Degree (MD, JD, etc)		570.631	1377.996	.002	.414	.679	
Other Degree		-1172.217	1043.320	-.004	-1.124	.261	
Post-Graduate Plans	Private Practice	Food Animal (exclusive)	939.994	529.983	.007	1.774	.076
		Food Animal (predominant)	-2768.907	492.122	-.023	-5.626	.000
		Mixed Practice	-3985.551	276.811	-.061	-14.398	.000
		Companion Animal (exclusive)	Baseline				
		Companion Animal (predominant)	-1206.119	288.366	-.017	-4.183	.000
		Equine	-18327.186	449.193	-.166	-40.800	0.000
	Public Practice	Federal Government	-2808.375	1364.046	-.008	-2.059	.040
		Uniformed Services	-675.495	589.266	-.004	-1.146	.252
		College or University	-26312.371	1313.331	-.077	-20.035	.000
		State or Local Government	-10191.407	3147.683	-.012	-3.238	.001
		Industry	8672.428	1793.587	.018	4.835	.000
		Not-for-Profit	-9457.058	1365.103	-.027	-6.928	.000
	Other	Other Veterinary Employment	-3629.995	2089.726	-.007	-1.737	.082
	Enrolling in an Educational Program	Masters of Public Health	-24699.686	2051.352	-.046	-12.041	.000
		Masters of Preventative Veterinary Medicine	-26991.166	4664.910	-.022	-5.786	.000
		Masters of Science	-36539.651	1795.282	-.078	-20.353	.000
		PhD	-34196.197	981.457	-.134	-34.842	.000
		MBA	-30322.257	7373.994	-.016	-4.112	.000
Internship		-34604.421	256.230	-.787	-135.052	0.000	
Residency		-28686.508	540.724	-.209	-53.052	0.000	
Education (other)		-27995.164	1723.393	-.062	-16.244	.000	

Table 3

	Sum of Squares	df	Mean Square	F	Sig.
Regression	5.34E+12	41	130251837332	1199.614	.000 ^a
Residual	2.15E+12	19775	108578141		
Total	7.49E+12	19816			

R	R Square	Adjusted R Square	Std. Error of the Estimate
.845a	.713	.713	10420.08354

a. Dependent Variable: Sum of Base, Starting and Prod bonus incomes

Table 3 Cont'd.

See the new Graduate Starting Salary Calculator at www.avma.org/About/SAVMA/StudentFinancialResources.





NEW VETERINARIAN DEBT



Over the period 2001 through 2015, new veterinarians finding employment in public practice consistently had the lowest debt load, while new veterinarians pursuing internships and residencies had the highest debt loads.

Over the last 15 years, the DVM degree debt of all veterinary students has been increasing at approximately \$5,700 per year; for those reporting non-zero debt, the annual increase has been approximately \$6,200. Between 2014 and 2015, mean DVM degree debt of all veterinary students increased by \$7,111.

In 2015, the mean debt of all students was \$18,041 less than the mean debt of persons reporting non-zero debt, with 11.9 percent of students reporting having no debt from veterinary college in 2015. This \$18,041 is a 12 percent difference in debt.

DEBT OF NEW GRADUATES: MEAN OF ALL DEBT VS. MEAN OF NON-ZERO DEBT

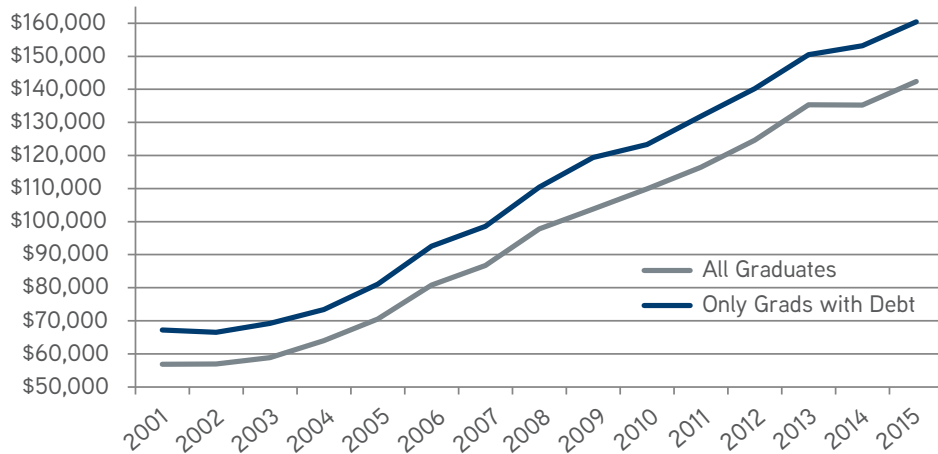


Figure 22

DIFFERENCE IN MEAN DEBT ALL GRADUATES VS. ONLY GRADUATES WITH NON-ZERO DEBT

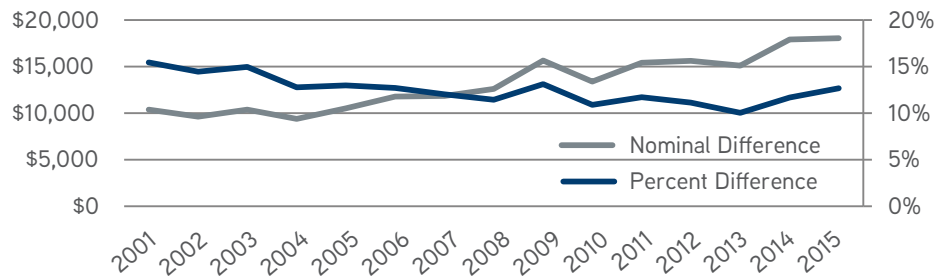


Figure 23

DVM debt incurred by new veterinarians varies by post-graduation plans. Over the period 2001 through 2015, new veterinarians finding employment in public practice consistently had the lowest debt load, while new veterinarians pursuing internships and residencies had the highest debt loads. Beyond the scope of this report is the identification of a research hypothesis to identify why a significant difference exists in the DVM debt of new graduates based on post-graduation plans. Perhaps veterinary students predisposed to public practice are

more financially savvy. Or perhaps those with lower debt feel less constrained to enter lower-paying careers in public practice. Perhaps 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, and research on the factors that influence the career choices of graduating seniors is certainly needed.

DVM DEBT BY POST-GRADUATE PLANS

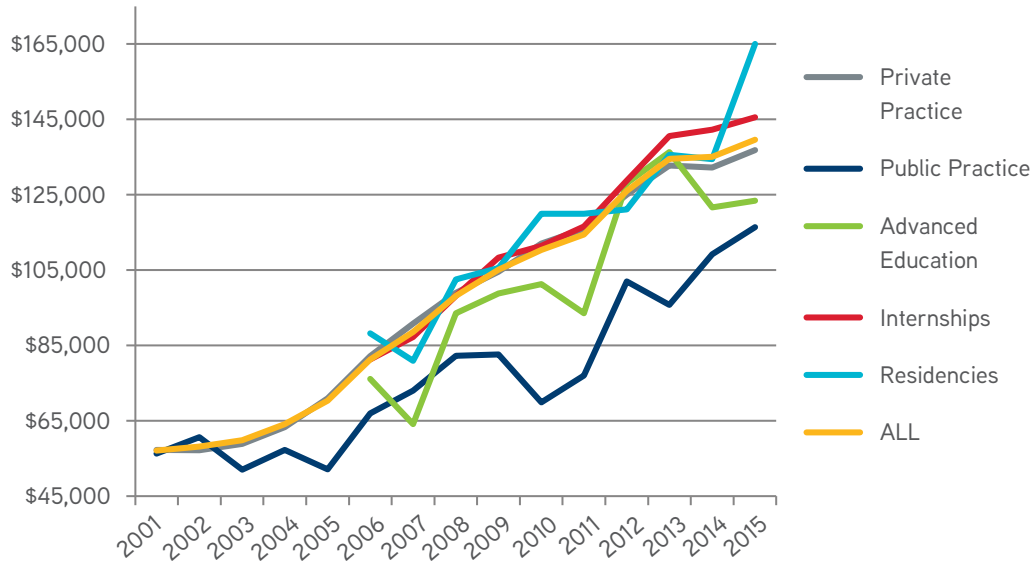


Figure 24

In 2015, the variation in DVM debt, within two standard deviations of the mean (95 percent of all new veterinarians) ranged from \$0 to just over \$321,000. Thus, while those with zero debt are well within two standard deviations of the mean, 2.3 percent that are

outside of two standard deviations have over \$320,000 in debt. The following table depicts the distribution, by school, of the 2.3 percent of the 2015 class who have over \$320,000 in debt.

THE DISTRIBUTION OF STUDENTS WITH OVER \$320,000 DVM DEBT BY COLLEGE

Western University - California	43.7%
Tuskegee University	15.5%
University of Minnesota	14.1%
Michigan State University	5.6%
University of Pennsylvania	4.2%
University of Tennessee	4.2%
Kansas State University	2.8%
Louisiana State University	2.8%
Auburn University	1.4%
Cummings SVM at Tufts University	1.4%
The Ohio State University	1.4%
Virginia-Maryland Regional College	1.4%
North Carolina State University	1.4%
Total	100.0%

Table 4

Even within public and private practice, the DVM debt owed by new veterinarians varied greatly. For the 2015 graduating class, within private practice, 68 percent had a debt load between

\$50,000 and \$225,000. Approximately 16 percent carry a debt load of over \$222,500, while the lowest 16 percent have debt below \$50,000.

MEAN DVM DEBT: PRIVATE PRACTICE

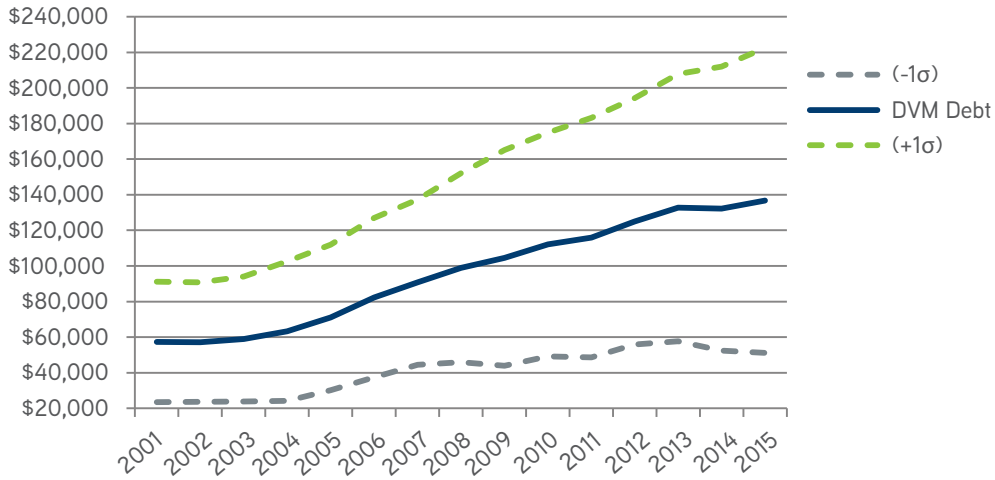


Figure 25

The variation in debt among new veterinarians pursuing public practice is also relatively large. Within the 2015 class, 68 percent incurred DVM debt between \$35,000 and \$198,000, 16 percent

had debt below \$35,000 and an additional 16 percent had debt over \$197,000.

MEAN DVM DEBT: PUBLIC PRACTICE

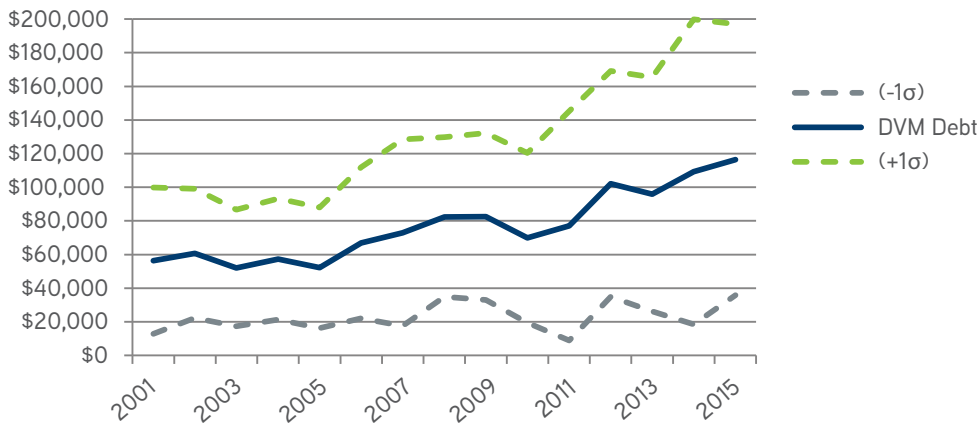


Figure 26

For each sector, whether public practice, private practice, advanced education, internships or residencies, the growth rate of DVM debt has outpaced the growth rate of the 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 2015.

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 over 80 percent of each new class of veterinarians.

MEAN STARTING SALARIES & DEBT OF NEW VETERINARIANS

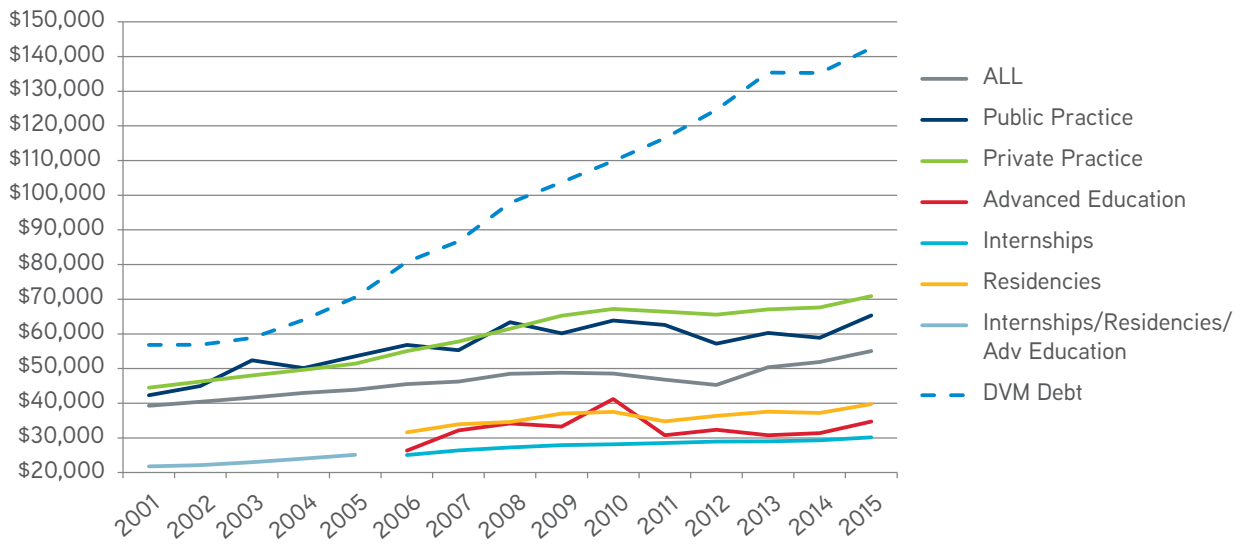


Figure 27

Not only are the starting salaries of female veterinarians significantly lower than those for men, new female veterinarians in 2015 had an average debt load of \$7,500 more than new male

veterinarians. Female graduates have had higher veterinary college debts than their male counterparts throughout the observed period.

MEAN DEBT BY GENDER

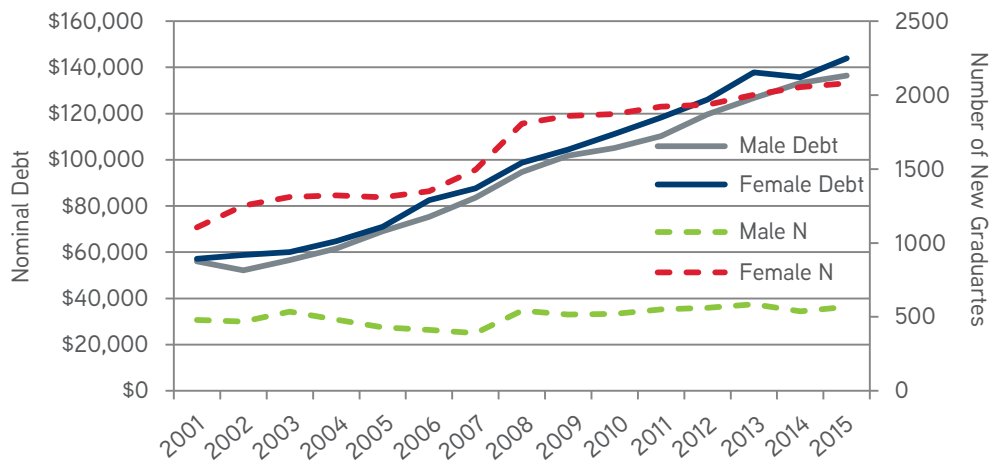


Figure 28

Over the last 16 years, in-state resident tuition and fees across veterinary colleges have increased by up to 300 percent. This increase was not steady across all colleges. The University of

Minnesota increased tuition by only 35 percent over the 16-year period, while Tuskegee University saw an increase of 287 percent.

U.S. VETERINARY COLLEGES: TUITION & FEES

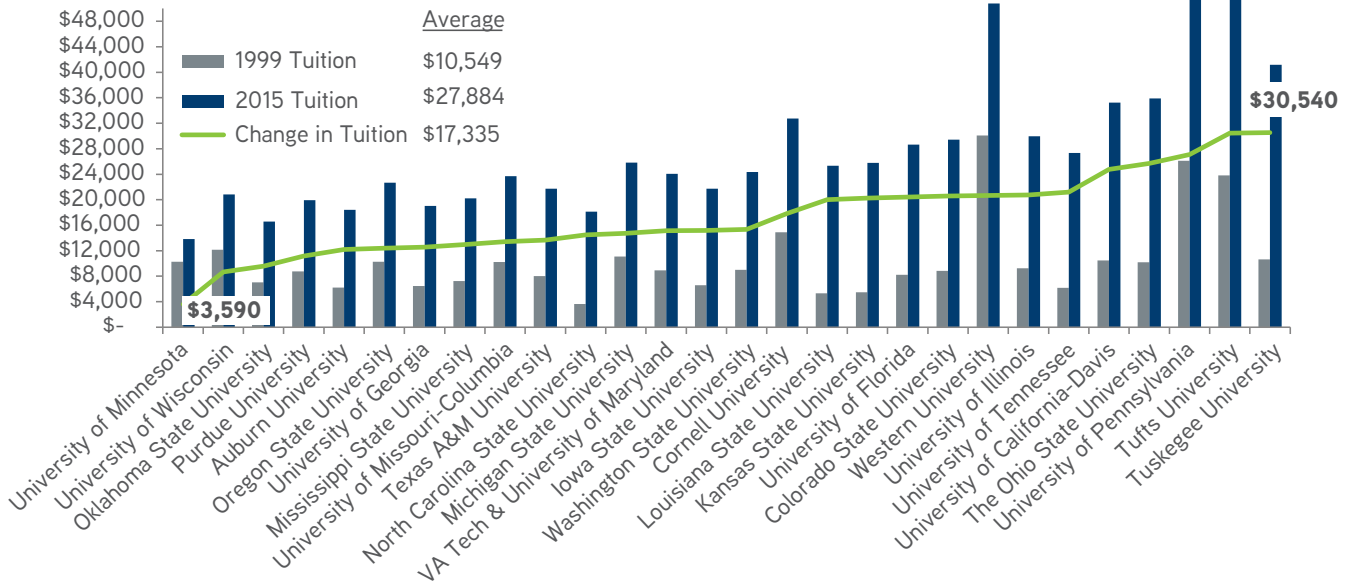


Figure 29

One significant factor contributing to the variation in the debt level of new veterinarians is their residency status, i.e., resident is in state, non-resident is out of state. Residents are those that attend veterinary college in the state where they reside while non-residents are those that attend veterinary colleges outside of the state of their primary residence. However, some students may be able to attain residency status after their first year in veterinary college. More appropriately, 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 pay the out-of-state (non-residency) tuition and fees. Over the last 10 years, the mean debt of graduating veterinary students reporting resident status was over \$30,000 less than the mean debt of graduating veterinary students reporting non-resident status.

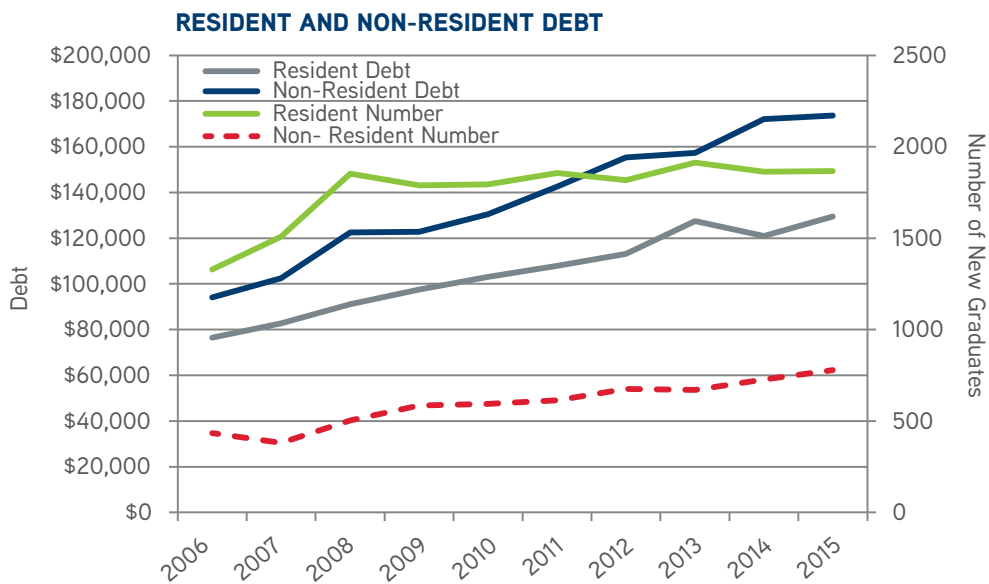


Figure 30

The following chart illustrates the number of new veterinarians graduating with debt and those graduating with no debt. Although the number of students with no debt has 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.

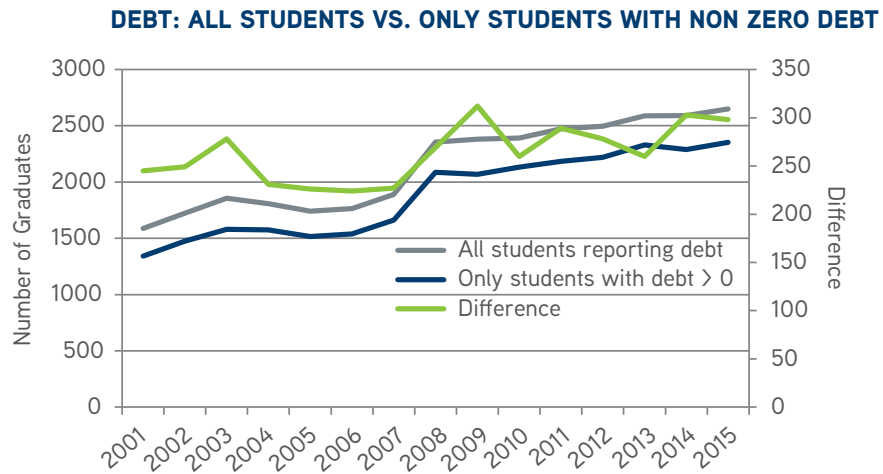


Figure 31

The following chart shows the decreasing proportion of new veterinarians with no debt.

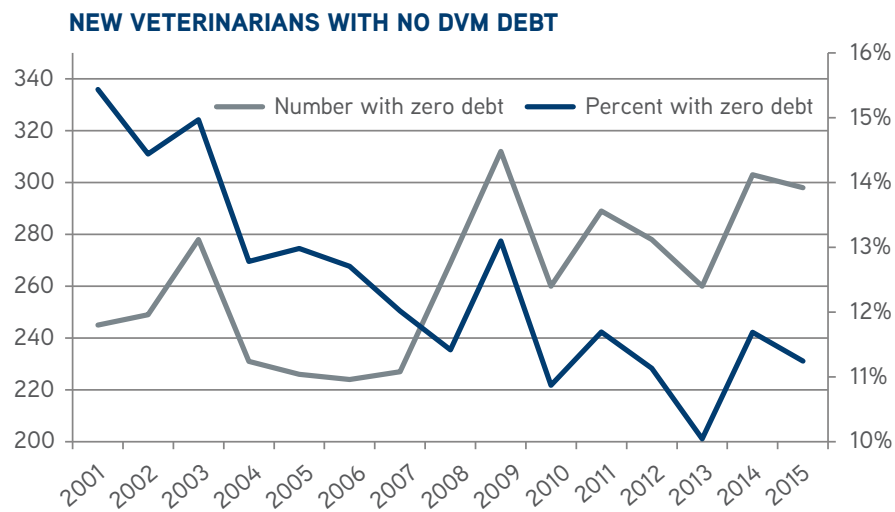


Figure 32

Similar to the methods used to determine the index of real weighted mean income (RWI), we determine an index of Real Weighted mean DVM Debt (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 just over

\$75,000 in 2001 to approximately \$142,000 in 2015. 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.

REAL INDEXED DVM DEBT & UNWEIGHTED DEBT

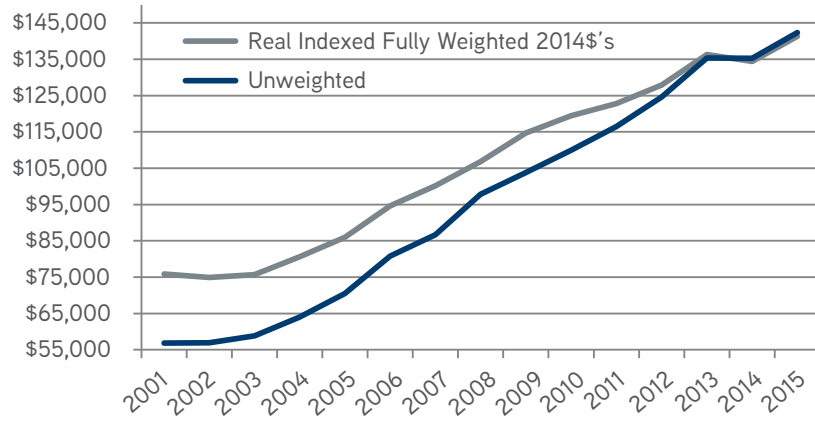


Figure 33



FACTORS AFFECTING DEBT FOR NEW VETERINARIANS

Similar to 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 that are located in an area with a zip code beginning with 3. To determine tuition grade, we determined by year the mean tuition and categorized “low tuition” as those schools whose tuition that was within 2 standard deviations below the mean, “median tuition” were those schools whose tuition was above the mean but within two standard deviations above the mean, and schools labeled “pricey tuition” were those whose tuition was above two standard deviations above the mean tuition.

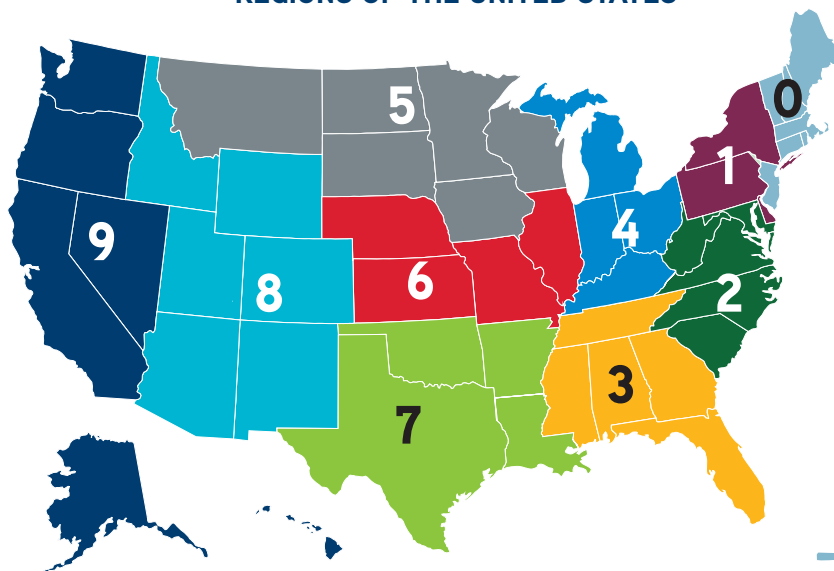
According to our regression model, new veterinarians graduating from schools in Region 6 had \$8,604 more debt than new veterinarians graduating from schools in Region 3, and new veterinarians graduating from schools with “pricey tuition” had \$66,793 more debt than those graduating from schools with “low tuition.”

Female veterinarians graduated with almost \$6,000 more debt, on average, than male veterinarians, and non-residents graduated with an average of \$35,079 more debt than residents. In addition, each year, mean DVM debt increased by about \$6,182.

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 of 0.221 for “pricey tuition” indicates that the debt incurred from graduating from a school who has pricey tuition carries almost 10 times more weight than the debt incurred from going to a school in Region 0, coefficient 0.025.

Of importance is the unstandardized coefficient for year of the survey that indicates the mean value of costs has increased by nearly \$6,200 per year. An additional finding of importance is that while the model explaining the variation in income was able to explain 71 percent of the variation with the factors available, this model to explain the variation in debt amongst students at graduation was only able to explain roughly 20 percent of the variation with the same set of variables. Thus, there are important variables that determine how much debt each student has at graduation that have not been included.

REGIONS OF THE UNITED STATES



ACCORDING TO OUR REGRESSION MODEL, NEW VETERINARIANS GRADUATING FROM SCHOOLS IN REGION 6 HAD \$8,604 MORE DEBT THAN NEW VETERINARIANS GRADUATING FROM SCHOOLS IN REGION 3, AND NEW VETERINARIANS GRADUATING FROM SCHOOLS WITH “PRICEY TUITION” HAD \$66,793 MORE DEBT THAN THOSE GRADUATING FROM SCHOOLS WITH “LOW TUITION.”

FACTORS AFFECTING DEBT OF NEW VETERINARIANS

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
	(Constant)	\$(12,465,440.86)	368524.623		-33.825	.000
Region of School	Schools in Region 0	\$(9,973.32)	3262.217	-.025	-3.057	.002
	Schools in Region 1	\$(16,753.18)	2494.616	-.060	-6.716	.000
	Schools in Region 2	\$(1,729.99)	2405.703	-.006	-.719	.472
	Schools in Region 4	\$11,888.11	2062.470	.053	5.764	.000
	Schools in Region 5	\$11,204.57	2015.239	.048	5.560	.000
	Schools in Region 6	\$8,604.32	1992.730	.037	4.318	.000
	Schools in Region 7	\$(12,447.70)	1985.092	-.055	-6.271	.000
	Schools in Region 8	\$1,463.56	2763.026	.004	.530	.596
	Schools in Region 9	\$3,721.04	2108.934	.016	1.764	.078
Tuition	Median Tuition	\$20,985.57	1390.198	.134	15.095	.000
	Pricey Tuition	\$66,793.17	2604.240	.221	25.648	.000
	Age	\$2,784.30	164.120	.123	16.965	.000
	Gender	\$5,956.75	1258.709	.034	4.732	.000
	Income	\$0.11	.025	.032	4.345	.000
	Resident/Non Resident	\$35,079.64	1251.209	.206	28.037	.000
	Year of the survey	\$6,182.90	183.299	.245	33.731	.000
Model		Sum of Squares	df	Mean Square	F	Sig.
	Regression	16789871026585.700	16	1049366939162	238.149	.000 ^b
	Residual	69280981901786.000	15723	4406346238		
	Total	86070852928371.600	15739			
	R	R Square	Adjusted R Square	Std. Error of the Estimate		
	.442 ^a	.195	.194	66380.315		

Table 5





NEW VETERINARIAN DEBT-TO-INCOME RATIO



in order to portray an accurate picture of the debt-to-income ratio of the profession it is necessary to observe a constant cohort of veterinarians. In this way, we avoid observing the effects of a changing demographic and attributing these to economic factors.

The debt-to-income ratio (DIR) 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 veterinarians. By definition, the debt-to-income ratio measures the percentage of debt that is 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 are 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. During the period 2001 through 2015, the mean change in the debt-to-income ratio is 30.9 percent per annum.



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.

DEBT-TO-INCOME MEASURES

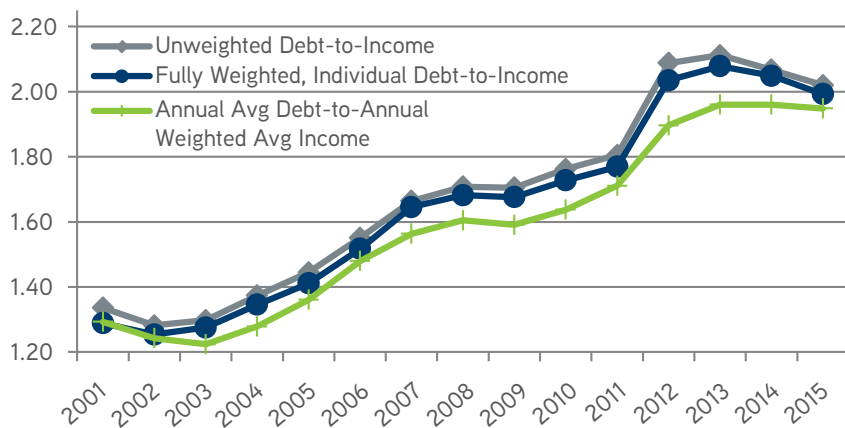


Figure 34

The debt-to-income ratio varies significantly by graduates' post-graduate plans. This is somewhat intuitive since we know that practice type is significant in explaining the variation in incomes. The variation in income can also be explained by the shifting demand for veterinarians in the respective sectors. Consequently, in order to portray an accurate picture of the debt-to-income ratio of the profession it is necessary to observe a constant cohort of veterinarians. In this way, 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 2015. In 2015 they reported a debt-to-income ratio of 1.85:1. 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 4.89:1 in 2015, more than double that of those pursuing employment in public practice. The debt-to-income ratio of those pursuing full-time employment in private practice was relatively low compared to other sectors, with a ratio of 2.02:1 in 2015.

DEBT-TO-INCOME BY POST-GRADUATE PLANS

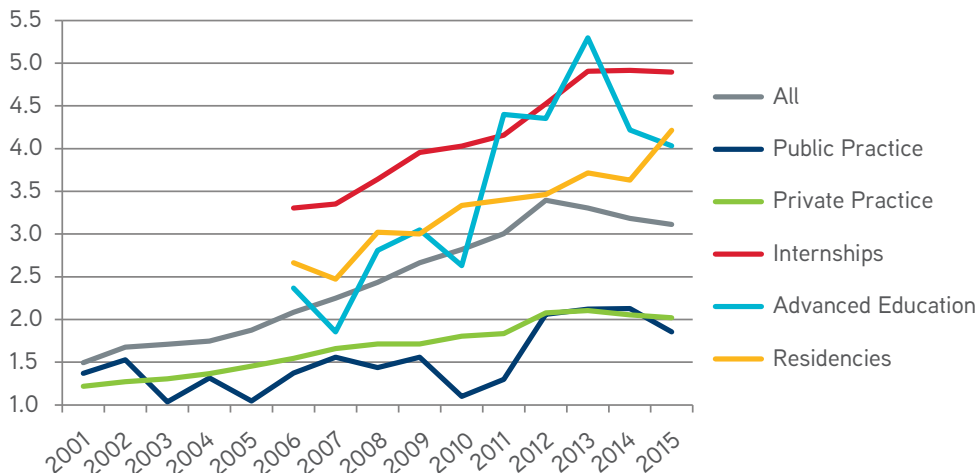


Figure 35

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 2015 have been illustrated previously. This analysis illustrates 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 2015 that reported income and debt. A regression of debt-to-income as a function of year, age, gender, whether the respondent had children, sought employment, received any offers, number of hours and weeks expecting to work, additional degrees held, location of anticipated place of employment, practice type, Gross Domestic Product (GDP) lagged one year, and veterinary college was performed. Results are provided in the table below.

As a baseline for comparison with the other variables in the respective groups, Texas A & M University (the university with the lowest mean debt, by school) and companion animal exclusive (the most populated sector for full-time employment) were omitted from the model.

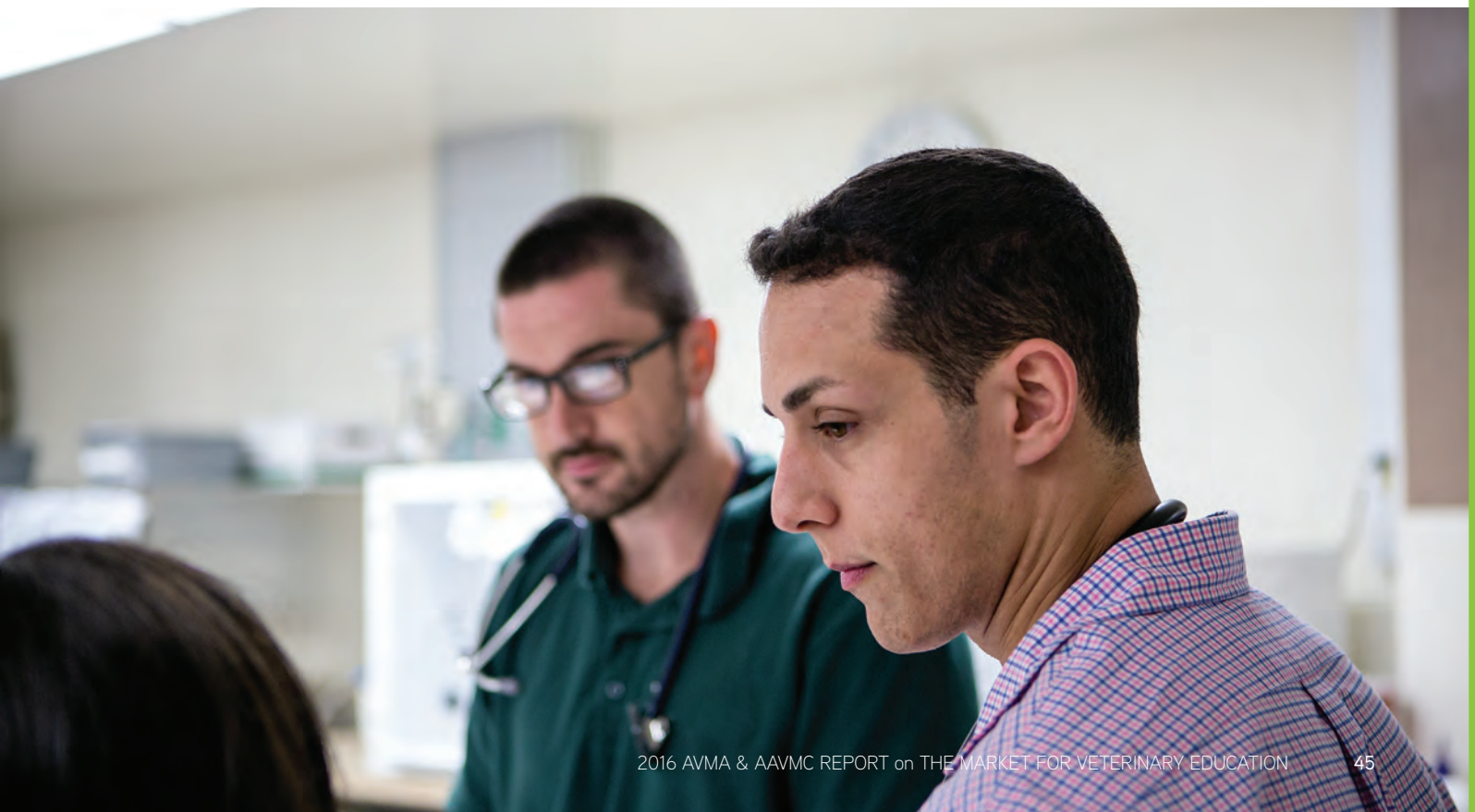
The following factors were statistically significant in explaining the variation in the debt-to-income ratio of survey respondents, at a 5 percent level of significance: year of graduation, age, gender, whether or not respondent has children, hours they expect to work, practice type (food animal, equine, government services and university employee) 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 Texas A & M in explaining the variation in the debt-to-income ratio as a result of the school. Veterinary colleges at the University of Georgia, Purdue University and North Carolina State University had debt-to-income ratios that were not statistically different from Texas A & M.

The unstandardized coefficient indicates the change to the constant debt-to-income ratio (-1.098) attributable to each characteristic (variable). For instance, women have a .199 higher mean debt-to-income ratio than men over the 2001 to 2015 period, and each year of age adds .018 to the mean DIR.

Attending Western University adds 2.214 to the mean DIR, while attending Texas A & M, Purdue, Georgia or North Carolina State adds nothing to the mean DIR, reflecting the difference in costs of attending the colleges. However, equine practice adds .627 to the mean DIR, while taking a job in academia adds 1.262 to the mean DIR, reflecting the difference in starting salary in these different occupational paths.

The coefficients would differ considerably if only computed from the 2015 graduates, as there have been considerable changes in relative costs of education across the colleges and the starting salaries by practice types over time. The cost of tuition, living expenses and interest accumulated on debt will be compared across colleges in the following section.



FACTORS AFFECTING THE DEBT-TO-INCOME RATIO

		Unstandardized Coefficients		Standardized Coefficients		Sig.
		B	Std. Error	Beta	t	
Basic Information	(Constant)	-1.098	0.557		-1.973	0.049
	Last 2 digits of Grad Year	0.056	0.012	0.178	4.864	0
	Age	0.018	0.003	0.053	5.69	0
	Gender: Female=1	0.199	0.025	0.071	7.963	0
	Have children : No=1	-0.134	0.038	-0.032	-3.549	0
	Seeking Employment or Adv Educ	-0.118	0.1	-0.01	-1.183	0.237
	Received offers	0.318	0.246	0.011	1.293	0.196
	Anticipated Work hours/ week	0.013	0.001	0.101	10.649	0
	Work at least 48 weeks/ year	0.064	0.071	0.008	0.904	0.366
	GDP lagged 1 year	7.05E-06	0	0.029	0.797	0.425
Additional Degrees	Admitted Before earning degree	0.018	0.219	0.005	0.08	0.936
	Bachelors degree	0.178	0.218	0.059	0.816	0.415
	Masters degree	0.171	0.222	0.033	0.77	0.441
	Doctorate degree	-0.043	0.261	-0.003	-0.166	0.868
	Other Professional degree	-0.186	0.292	-0.008	-0.635	0.525
	Other degree	0.367	0.253	0.024	1.447	0.148
Region of College	Region 0	0.165	0.247	0.029	0.67	0.503
	Region 1	0.091	0.245	0.018	0.37	0.711
	Region 2	-0.125	0.243	-0.031	-0.516	0.606
	Region 3	-0.06	0.243	-0.017	-0.248	0.804
	Region 4	-0.1	0.244	-0.025	-0.411	0.681
	Region 5	-0.146	0.246	-0.033	-0.594	0.553
	Region 6	-0.178	0.244	-0.042	-0.729	0.466
	Region 7	-0.144	0.244	-0.039	-0.59	0.555
	Region 8	-0.138	0.244	-0.031	-0.565	0.572
	Region 9	-0.236	0.244	-0.054	-0.965	0.334
Region 10	0.209	0.286	0.011	0.731	0.465	
Practice Type	Food animal practice (exclusive)	-0.249	0.061	-0.036	-4.044	0
	Food animal practice (predominant)	-0.156	0.057	-0.025	-2.752	0.006
	Mixed practice	-0.012	0.032	-0.003	-0.361	0.718
	Companion animal practice (predominant)	0.054	0.033	0.014	1.65	0.099
	Equine practice	0.627	0.053	0.11	11.799	0
	Federal Government (civil service)	-0.163	0.151	-0.009	-1.081	0.28
	Uniformed services	-0.712	0.066	-0.093	-10.718	0
	College or University (Faculty or staff only)	1.262	0.154	0.069	8.207	0
	State or Local Government	0.951	0.364	0.022	2.612	0.009
	Industry or commercial organizations	-0.125	0.201	-0.005	-0.621	0.535
	Not-for-profit organizations	0.149	0.151	0.008	0.984	0.325

Table 6

		Unstandardized Coefficients		Standardized Coefficients		Sig.
		B	Std. Error	Beta	t	
University	Auburn University	0.267	0.078	0.042	3.433	0.001
	Tuskegee University	0.543	0.091	0.061	5.948	0
	University of California-Davis	0.451	0.095	0.054	4.744	0
	Colorado State University	0.549	0.077	0.089	7.123	0
	University of Florida	0.417	0.086	0.056	4.857	0
	University of Georgia	0.037	0.08	0.006	0.46	0.646
	University of Illinois	0.408	0.076	0.073	5.373	0
	Iowa State University	0.559	0.078	0.092	7.139	0
	Kansas State University	0.663	0.075	0.108	8.857	0
	Louisiana State University	0.154	0.068	0.024	2.254	0.024
	Tufts University	0.956	0.097	0.111	9.86	0
	Michigan State University	0.739	0.081	0.115	9.08	0
	University of Minnesota	1.138	0.085	0.171	13.368	0
	Mississippi State University	0.589	0.082	0.079	7.171	0
	Purdue University	0.14	0.093	0.016	1.502	0.133
	Cornell University	0.284	0.083	0.042	3.436	0.001
	Oklahoma State University	0.343	0.067	0.052	5.086	0
	University of Pennsylvania	0.896	0.098	0.099	9.175	0
	Washington State University	0.45	0.081	0.067	5.552	0
	University of Missouri-Columbia	0.487	0.084	0.068	5.785	0
	Ohio State University	0.673	0.072	0.137	9.354	0
	Oregon State University	0.552	0.11	0.05	5.013	0
	University of Tennessee	0.302	0.084	0.041	3.575	0
	Virginia-Maryland Regional College	0.352	0.079	0.057	4.453	0
North Carolina State University	0.089	0.086	0.012	1.039	0.299	
University of Wisconsin	0.691	0.087	0.093	7.911	0	
Western University - California	2.214	0.116	0.187	19.047	0	

	Sum of Squares	df	Mean Square	F	Sig.
Regression	3474.653	64	54.291	41.264	.000
Residual	15285.8	11618	1.316		
Total	18760.453	11682			

R	R Square	Adjusted R Square	Std. Error of the Estimate
.430	.185	.181	1.14704

Table 6 cont'd.



DEBT AND INCOME OF THE 2015 GRADUATING CLASS



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.

The mean debt of all U.S. respondents reporting debt for the 2015 graduating class was \$142,394.03, with a standard deviation of \$89,595.70. The following table illustrates the distribution of debt for the 2015 graduating class.

DISTRIBUTION OF 2015 STUDENT DEBT

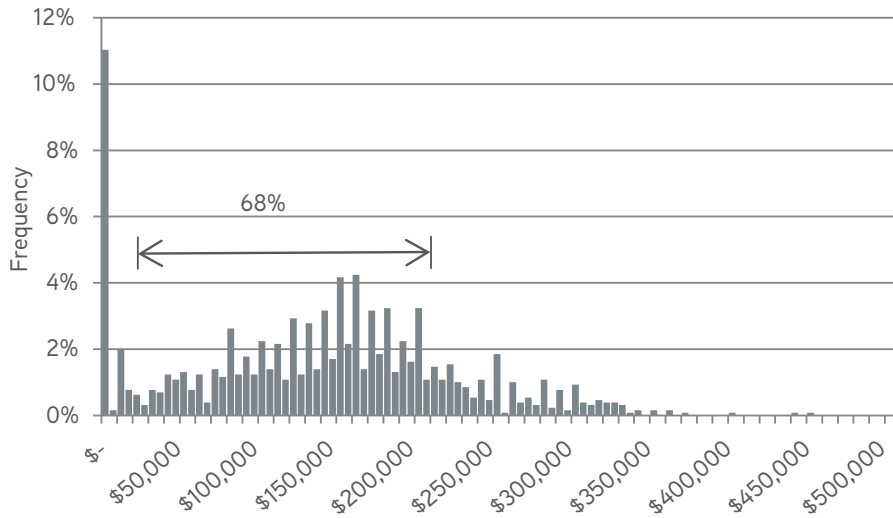


Figure 36

Sixty-eight percent of the respondents had a debt between \$50,088 and \$221,024, and 95 percent of the respondents had debt under \$306,492. Observations beyond \$350,000 may be considered statistical outliers (a point which falls more than 1.5 times the interquartile range above the third quartile or below the first quartile).

The mean debt of persons with debt under \$306,492 was \$146,633, excluding those with zero debt. We chose not to use

the statistical definition of outlier and included all values of debt in the estimate of mean debt pending further review of these debt outliers.

The following chart illustrates the distribution of reported starting salaries, excluding internships and residencies. Internships, residencies and advanced education are all considered subsets of continuing education.

DISTRIBUTION OF 2015 STARTING SALARY



Figure 37

The distribution of starting salaries presented represents 48 percent of the 2015 graduating class. At the time the survey was distributed, only a proportion of veterinary students had secured full-time employment or advanced education. However, the following table shows data from AVMA's employment survey, which was sent to all 2013 graduates in March of 2015. These graduates have approximately 1 year experience.

The mean income of new veterinarians with one year experience is \$61,725, with a 95 percent confidence interval of \$1,769. That is, statistically, we are 95 percent confident that the mean income of veterinarians with one year experience lies within \$1,769 of \$61,725.

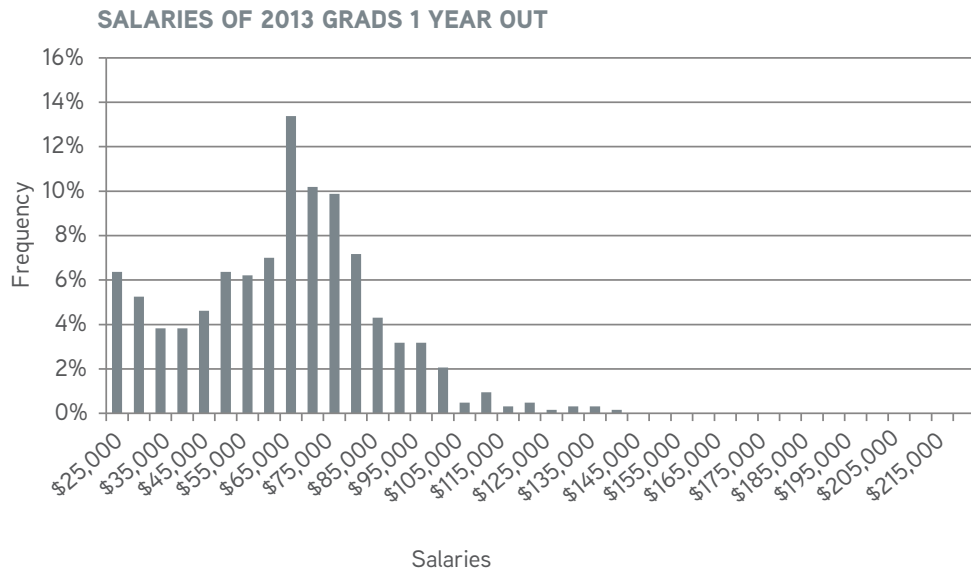


Figure 38

Using the individual reported debt and income, the distribution of the debt-to-income ratio is computed for all of those graduates who provided a value for debt and had indicated a starting salary for full-time employment prior to graduation. 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.

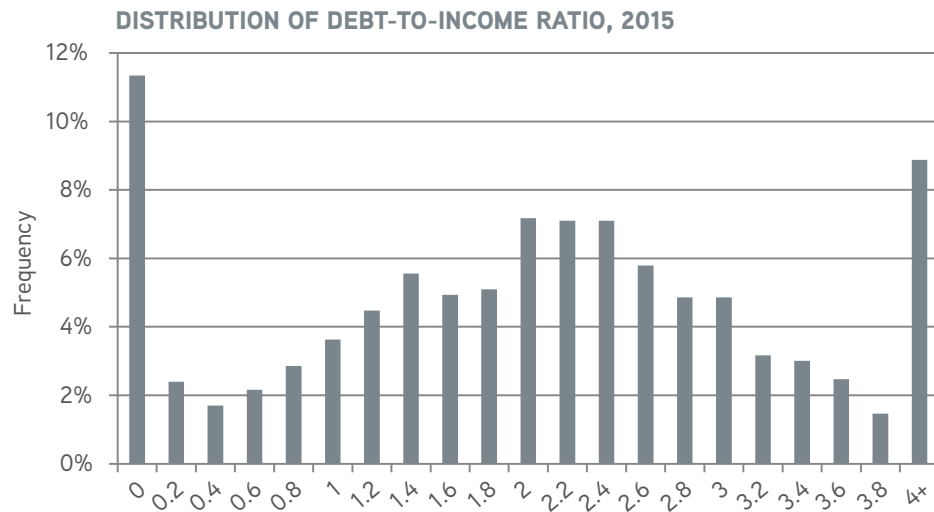


Figure 39

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 condensed around the mean, while the distribution of debt is more widely dispersed.

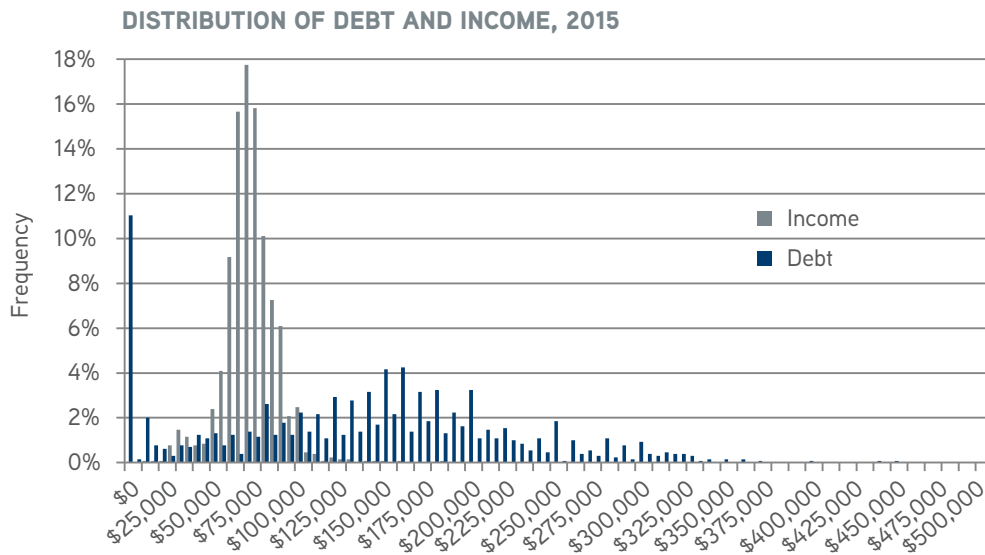


Figure 40

Since the income and debt data from the 2015 class only represents a proportion of the class, the following table is 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.

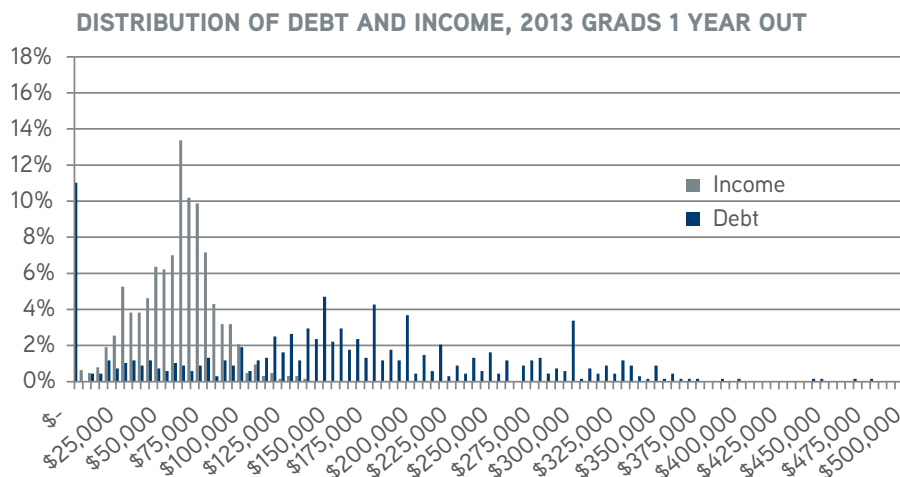


Figure 41



Mean debt for graduates of each of the U.S. veterinary colleges varied from just under \$83,000 to more than \$266,000 in 2015. The mean debt for all graduates across all of the U.S. veterinary colleges was just under \$136,000. The school with the highest

reported mean debt for 2015 was Western University - California and the lowest was Texas A & M. Each school had reported a mean debt that was significantly lower than Western at a 5 percent level of significance, except Tuskegee University.

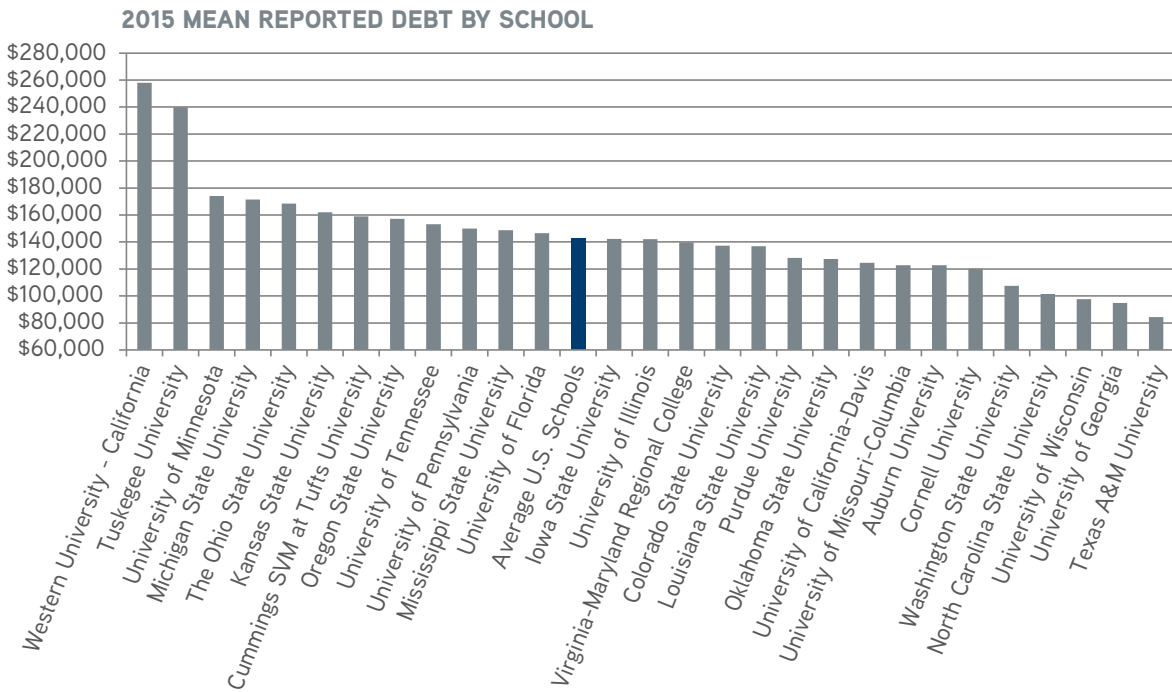


Figure 42

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. For example, if the reported tuition for four years was \$80,000 and the DVM debt reported for

four years was \$170,000, 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.

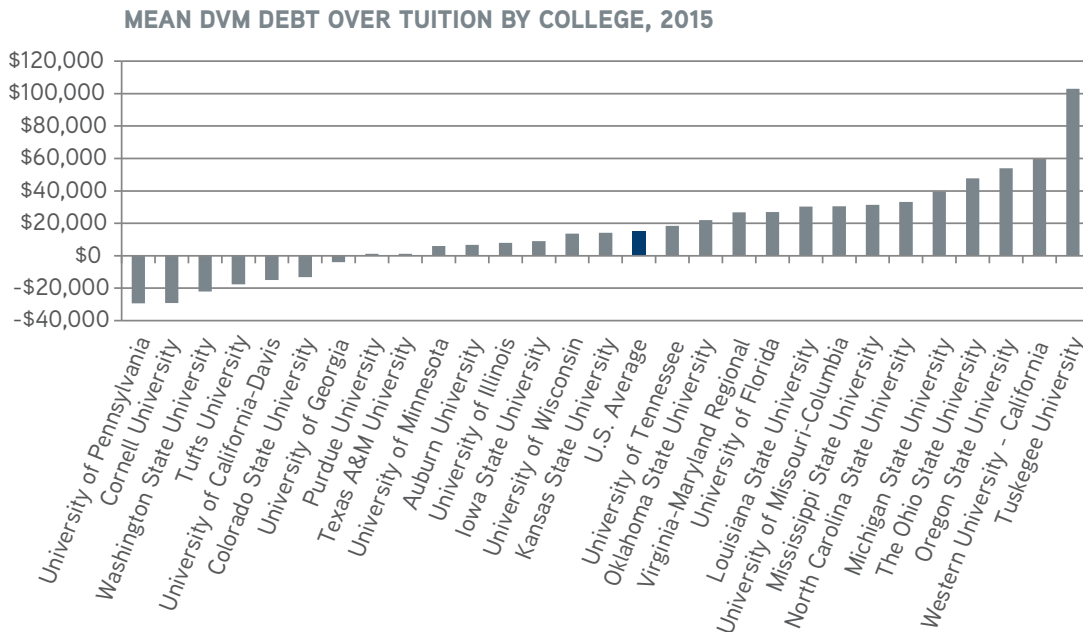


Figure 43

While 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 2015.

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 figure below. As an example, for this illustration we assume a student budgets \$12,500 per year for four years, as a baseline (national

average), then determine how much this would be in the other states to maintain the same standard of living as would be provided by \$50,000 in the national average. The most affordable veterinary school with respect to cost of living is Mississippi State University, where only \$41,700 is necessary to maintain the standard of living that \$50,000 would provide, on average in the U.S. The most expensive veterinary school with respect to cost of living is Cornell University, where \$71,750 is necessary to maintain the standard of living that \$50,000 would provide, on average, in the U.S. The college of veterinary medicine whose cost of living is closest to the U.S. average is the University of Minnesota, where \$50,100 is necessary to sustain a lifestyle afforded to the average U.S. resident with \$50,000.

COST OF LIVING CENSUS

THIRD QUARTER 2015 COST OF LIVING

	Index	Baseline (\$50,000)	College of Veterinary Medicine
Alabama	90.2	\$45,100	Auburn University, Tuskegee University
Alaska	131.3	\$65,650	
Arizona	98.6	\$49,300	
Arkansas	91.1	\$45,550	
California	135.3	\$67,650	University of California-Davis, Western University - California
Colorado	103.4	\$51,700	Colorado State University
Connecticut	130.8	\$65,400	
Delaware	102	\$51,000	
District of Columbia	149.3	\$74,650	
Florida	99.5	\$49,750	University of Florida
Georgia	91.6	\$45,800	University of Georgia
Hawaii	167.4	\$83,700	
Idaho	87.1	\$43,550	
Illinois	96.5	\$48,250	University of Illinois
Indiana	87.6	\$43,800	Purdue University
Iowa	91.9	\$45,950	Iowa State University
Kansas	91	\$45,500	Kansas State University
Kentucky	90.8	\$45,400	
Louisiana	93	\$46,500	Louisiana State University
Maine	113.1	\$56,550	
Maryland	123	\$61,500	
Massachusetts	130.6	\$65,300	Tufts University
Michigan	91.5	\$45,750	Michigan State University
Minnesota	100.2	\$50,100	University of Minnesota
Mississippi	83.4	\$41,700	Mississippi State University
Missouri	91.2	\$45,600	University of Missouri-Columbia
Montana	102.9	\$51,450	
Nebraska	91.1	\$45,550	

Table 7

	Index	Baseline (\$50,000)	College of Veterinary Medicine
Nevada	107.4	\$53,700	
New Hampshire	119.1	\$59,550	
New Jersey	124.7	\$62,350	
New Mexico	95.6	\$47,800	
New York	143.5	\$71,750	Cornell University
North Carolina	94.6	\$47,300	North Carolina State University
North Dakota	101.8	\$50,900	
Ohio	93.8	\$46,900	The Ohio State University
Oklahoma	89.5	\$44,750	Oklahoma State University
Oregon	126.7	\$63,350	Oregon State University
Pennsylvania	102.6	\$51,300	University of Pennsylvania
Rhode Island	123.1	\$61,550	
South Carolina	97.1	\$48,550	
South Dakota	106.3	\$53,150	
Tennessee	90.1	\$45,050	University of Tennessee
Texas	91.6	\$45,800	Texas A&M University
Utah	92.5	\$46,250	
Vermont	124.1	\$62,050	
Virginia	94.4	\$47,200	Virginia-Maryland Regional
Washington	107.8	\$53,900	Washington State University
West Virginia	102.9	\$51,450	
Wisconsin	98.3	\$49,150	University of Wisconsin
Wyoming	93.5	\$46,750	
Grand Total	100	\$50,000	

Table 7 cont'd.

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

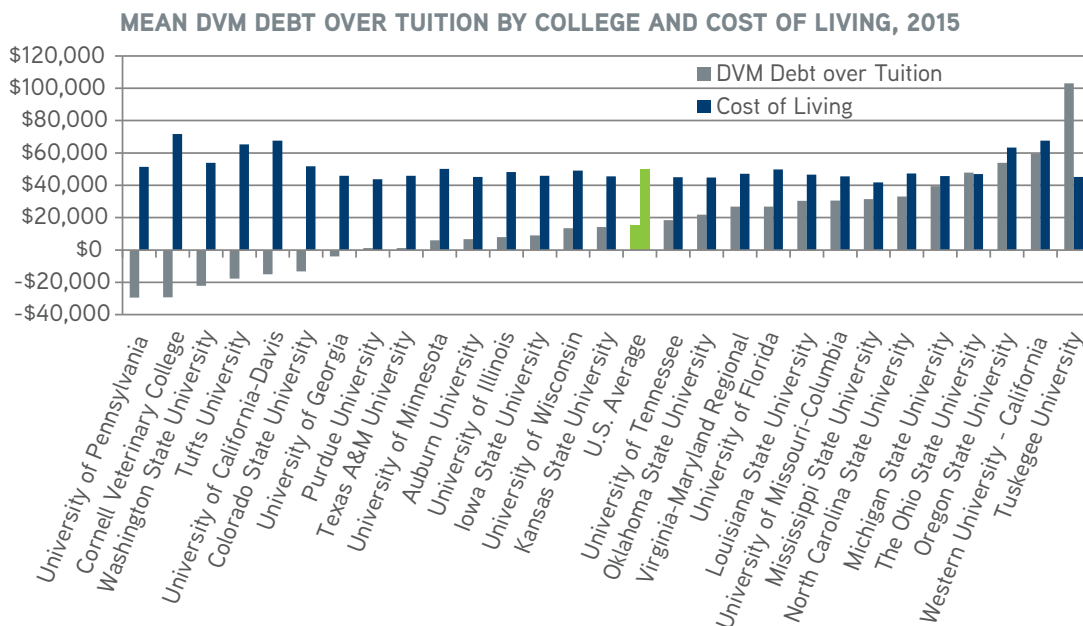


Figure 44

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

In 2015, U.C.-Davis had the most students pursuing advanced education, inclusive of internships and residencies, at 76 percent

of the class. Michigan State had the highest reports of new graduates pursuing public practice, at 10 percent of the class, and LSU had the highest number of new veterinarians reporting pursuing full-time employment in private practice at 78 percent of the class.

DISTRIBUTION OF GRADS BY COLLEGE, DEBT & INCOME

Veterinary Medical College	2015 Grads		Mean Debt Upon Entering Veterinary College		Mean Debt Upon Graduating From Veterinary College		
	N	Mean	N	Std. Deviation	Mean	N	Std. Deviation
Auburn University	112	\$8,830	112	\$16,773	\$131,592	112	\$84,267
Tuskegee University	65	\$23,186	65	\$34,114	\$263,149	65	\$ 88,260
University of California-Davis	130	\$5,885	125	\$14,225	\$129,475	128	\$83,479
Colorado State University	107	\$17,533	106	\$32,633	\$154,685	107	\$97,229
University of Florida	91	\$8,211	90	\$19,059	\$154,715	91	\$81,617
University of Georgia	102	\$5,766	102	\$10,768	\$100,505	101	\$77,074
University of Illinois	97	\$14,050	97	\$25,568	\$156,208	97	\$93,184
Iowa State University	118	\$17,636	117	\$25,292	\$159,604	117	\$79,398
Kansas State University	98	\$13,067	97	\$24,328	\$173,062	98	\$106,352
Louisiana State University	84	\$7,857	84	\$29,070	\$144,666	84	\$99,957
Tufts University	79	\$18,095	79	\$27,711	\$177,113	79	\$97,958
Michigan State University	93	\$17,804	93	\$22,403	\$189,306	93	\$89,993
University of Minnesota	95	\$10,489	95	\$18,915	\$182,549	95	\$106,904
Mississippi State University	80	\$10,080	80	\$27,581	\$156,705	80	\$99,746
Purdue University	77	\$10,617	77	\$18,954	\$136,879	77	\$88,388
Cornell University	94	\$10,753	94	\$29,503	\$129,553	94	\$98,780
Oklahoma State University	88	\$12,609	87	\$25,380	\$139,799	88	\$90,015
University of Pennsylvania	68	\$9,972	66	\$23,714	\$159,718	68	\$128,123
Texas A&M University	123	\$12,596	123	\$29,663	\$95,745	123	\$63,639
Washington State University	96	\$9,339	96	\$18,327	\$116,754	96	\$67,634
University of Missouri-Columbia	111	\$11,909	110	\$20,115	\$133,450	111	\$78,153
The Ohio State University	139	\$14,187	139	\$27,002	\$182,560	139	\$90,785
Oregon State University	53	\$20,196	53	\$25,809	\$177,421	53	\$68,795
University of Tennessee	93	\$11,765	93	\$25,164	\$164,983	93	\$100,600
Virginia-Maryland Regional	105	\$12,435	105	\$21,602	\$150,592	105	\$86,250
North Carolina State University	79	\$13,892	79	\$29,169	\$113,092	79	\$73,159
University of Wisconsin	79	\$10,044	78	\$14,198	\$107,505	79	\$56,157
Western University - California	107	\$15,492	107	\$33,927	\$273,462	107	\$115,336
Total	2663	\$12,450	2649	\$24,746	\$154,160	2659	\$97,835

Table 8

IN 2015, U.C.-DAVIS HAD THE MOST STUDENTS PURSUING ADVANCED EDUCATION, INCLUSIVE OF INTERNSHIPS AND RESIDENCIES, AT 76 PERCENT OF THE CLASS.

Veterinary Medical College	Mean Starting Salary			Distribution of Post Graduate Plans			
	Mean	N	Std. Deviation	Private Practice	Public Practice	Advanced Education	Total
Auburn University	\$68,389	60	\$12,250	60	1	25	86
Tuskegee University	\$75,331	16	\$14,874	15	1	24	40
University of California-Davis	\$86,570	27	\$21,850	26	1	84	111
Colorado State University	\$60,274	42	\$15,283	38	4	39	81
University of Florida	\$70,239	48	\$14,815	46	2	32	80
University of Georgia	\$66,953	53	\$17,480	49	4	26	79
University of Illinois	\$71,281	64	\$10,056	61	3	26	90
Iowa State University	\$68,889	72	\$12,639	66	6	25	97
Kansas State University	\$66,708	59	\$17,756	52	7	21	80
Louisiana State University	\$75,408	51	\$15,634	49	2	12	63
Tufts University	\$75,742	36	\$14,543	35	1	27	63
Michigan State University	\$71,121	49	\$19,934	42	7	22	71
University of Minnesota	\$71,561	44	\$16,709	40	4	30	74
Mississippi State University	\$75,292	56	\$18,031	53	3	18	74
Purdue University	\$70,722	36	\$14,513	33	3	21	57
Cornell Veterinary College	\$70,852	29	\$20,433	27	2	51	80
Oklahoma State University	\$72,082	49	\$14,780	46	3	22	71
University of Pennsylvania	\$71,635	20	\$17,692	20	0	42	62
Texas A&M University	\$72,299	67	\$12,296	66	1	39	106
Washington State University	\$75,441	59	\$17,930	55	4	14	73
University of Missouri-Columbia	\$70,114	64	\$11,341	65	1	24	90
The Ohio State University	\$68,173	69	\$11,096	64	5	44	113
Oregon State University	\$66,038	26	\$11,561	23	3	18	44
University of Tennessee	\$64,405	38	\$16,228	35	4	33	72
Virginia-Maryland Regional	\$67,032	60	\$14,853	57	3	28	88
North Carolina State University	\$73,221	32	\$17,979	29	3	31	63
University of Wisconsin	\$67,713	38	\$12,964	37	1	17	55
Western University - California	\$71,625	32	\$22,122	32	2	49	83
Total	\$70,543	1296	\$15,861	1221	81	844	2146

REGIONAL EXCHANGES AND STATE-TO-STATE ARRANGEMENTS

There are 25 U.S. public colleges of veterinary medicine, and because two of these are in a single state (Auburn University and Tuskegee University in Alabama), the majority of states do not have a state-supported, lower-cost veterinary college available for their residents. The public colleges charge substantially different rates for resident and non-resident tuition. These differences in tuition and fees were developed long ago and based on the non-resident students sharing the funding of total cost. The rationale was that taxpayers in the state in which the college was located should not have to bear the cost of providing an education to students who were not from that state, since most would probably return to the state from which they came upon completion of their education. Because the state would receive no benefit from the public expenditure of funds for a non-resident's education, taxpayers should not be required to pay those costs. Today, the enormous decline in state support for public education, combined with the fact that some non-resident students are remaining in the

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.

In the 2015-16 academic year, 7 WICHE states without public veterinary colleges (Arizona, Hawaii, Montana, Nevada, New Mexico, North Dakota South Dakota and Wyoming) spent more than \$5.4 million to reduce tuition costs for 170 new and continuing DVM students studying at one of the five fully accredited cooperating veterinary colleges in the Western U.S. Western states supporting DVM students paid \$31,900 per student in 2015-16.

Institutions participating in WICHE's Professional Student Exchange Program (PSEP) for veterinary medicine are Colorado State University, Oregon State University, University of California, Davis, Washington State University and Western University of Health Sciences.

IN THE 2015-2016 ACADEMIC YEAR, FIVE SREB STATES WITHOUT PUBLIC VETERINARY COLLEGES (ARKANSAS, DELAWARE, KENTUCKY, SOUTH CAROLINA AND WEST VIRGINIA*) SPENT MORE THAN \$9 MILLION TO REDUCE TUITION COSTS FOR 311 NEW AND CONTINUING DVM STUDENTS STUDYING AT ONE OF THE SIX FULLY-ACCREDITED PARTICIPATING VETERINARY COLLEGES.

state where they obtain their education, requires new justification for the large discrepancy between resident and non-resident tuition in some states.

In the late 1940s and 1950s, several regional compacts were formed in order to share publically funded higher education resources. The Southern Regional Education Board (SREB; www.sreb.org) was created in 1948 by Southern governors and legislators, and the Western Interstate Commission for Higher Education (WICHE; www.wiche.edu) was established in 1953 by Western governors. More than 65 years later, both compacts continue to operate 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 fields). Two additional regional compacts serve the Midwest and the Northeast: the Midwest Higher Education Compact (MHEC; www.mhec.org), and the New England Board of Higher Education (NEBHE; www.nebhe.org), but neither operate a similar program for DVM education.

Without these regional programs, non-resident students would be required to pay much higher tuition and would be at a distinct disadvantage upon graduation. Instead, the student's home state

In the 2015-2016 academic year, 5 SREB states without public veterinary colleges (Arkansas, Delaware, Kentucky, South Carolina and West Virginia*) spent more than \$9 million to reduce tuition costs for 311 new and continuing DVM students studying at one of the six fully-accredited participating veterinary colleges. In the SREB region, participating states paid \$29,100 per student in academic year 2015-2016. Institutions participating in SREB's Regional Contract Program (RCP) for veterinary medicine are Auburn University, Louisiana State University, Mississippi State University, Oklahoma State University, Tuskegee University and University of Georgia. *West Virginia is phasing out participation in the RCP program.

Many veterinary colleges, both public and private, have contractual arrangements with other veterinary colleges and states without public veterinary colleges. These arrangements often lower educational costs or simply provide access to non-residents.



Today, the enormous decline in state support for public education, combined with the fact that some non-resident students are remaining in the state where they obtain their education, requires new justification for the large discrepancy between resident and non-resident tuition in some states.



IMPROVING THE DEBT-TO-INCOME RATIO



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.

The debt-to-income problem in the veterinary profession is not new, having been discussed numerous times over the past five 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. However, the mean obscures the fact that the debt-to-income ratio is over 4:1 for more than 9 percent of U.S. graduates.

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

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

A considerable body of research has indicated that the rise in tuition, as a percent of public higher education revenue, over the last two decades 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. The result of the reduced public support was the increasing share of the total cost that was paid by students as indicated below. It must be noted that during each recession federal and state budgets were cut or held constant in nominal dollars and thus public education, which is a large share of most state budgets, had to be cut. But during the economic expansions following each recession, education budgets rarely returned to where they had been prior to the recession. The result was the step increase in the percent of public higher education that tuition accounted for, each step up resulting from the recession that occurred before it.

NET TUITION AS A PERCENT OF PUBLIC HIGHER EDUCATION TOTAL EDUCATIONAL REVENUE, U.S., FISCAL 1989-2014

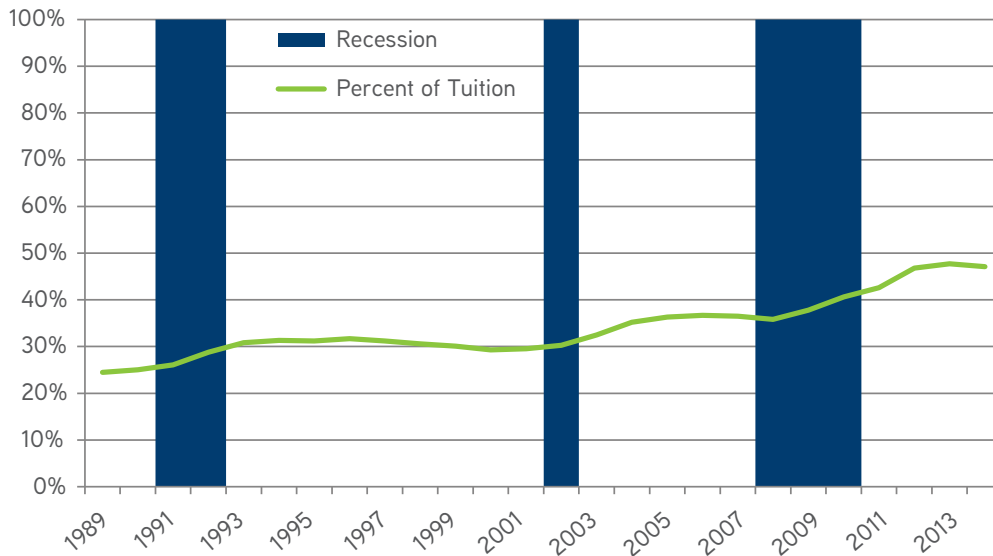


Figure 45

DURING THE ECONOMIC EXPANSIONS FOLLOWING EACH RECESSION, EDUCATION BUDGETS RARELY RETURNED TO WHERE THEY HAD BEEN PRIOR TO THE RECESSION.

A deeper look at the budgets of the universities finds that growth in professional staff between 2001 and 2011 occurred at a rate of 37.1 percent for all higher education institutions, but only at a rate of 26.2 percent for public institutions. At the same time, there has been an overall decline in nonprofessional staff at both institutions of higher education and public institutions. Faculty has been

the main component of increased staffing, adding over 400,000 positions, while roughly 250,000 other professionals have been added. The increasing number of graduate assistants and other professionals may well reflect the growing trend for non-tenure track teaching and research positions, and the need for professional services to manage federal and state reporting requirements.

DISTRIBUTION OF FACULTY AT UNIVERSITIES

	2011	2001	Percentage Change
All institutions	3,840,980	3,083,353	24.60%
Professional staff	2,923,961	2,132,150	37.10%
Executive/administrative/managerial	238,718	206,292	15.70%
Faculty (instruction/research/public service)	1,523,615	1,113,183	36.90%
Graduate assistants	355,916	261,136	36.30%
Other professional	805,712	551,539	46.10%
Nonprofessional staff	917,019	951,203	-3.60%
Technical and paraprofessionals	196,651	202,283	-2.80%
Clerical and secretarial	426,174	452,948	-5.90%
Skilled crafts	60,664	64,801	-6.40%
Service and maintenance	233,530	231,171	1.00%

SOURCE: U.S. Department of Education, National Center for Education Statistics, Integrated Postsecondary Education Data System (IPEDS), Winter 2011-12, Human Resources component, Fall Staff section.

Table 9

During the 2001 to 2011 time period, employment growth in private institutions occurred at a faster rate than that for public institutions of higher education. Non-professional staff saw greater reduction in the public versus the private institutions. A major component of the reduction in non-professional

staff was the reduction in clerical and secretarial staff at the public institutions. The reduced clerical and secretarial staff resulted from the adoption of improved communication and word processing technology, and the transfer of some duties to professional staff.

DISTRIBUTION OF FACULTY AT PUBLIC INSTITUTIONS

	2011	2001	Percentage Change
All public institutions	2,484,820	2,136,970	16.30%
Professional staff	1,865,269	1,477,953	26.20%
Executive/administrative/managerial	112,473	107,288	4.80%
Faculty (instruction/research/public service)	953,230	771,124	23.60%
Graduate assistants	285,905	219,475	30.30%
Other professional	513,661	380,066	35.20%
Nonprofessional staff	619,551	659,017	-6.00%
Technical and paraprofessionals	145,098	148,116	-2.00%
Clerical and secretarial	273,357	305,067	-10.40%
Skilled crafts	45,597	48,975	-6.90%
Service and maintenance	155,499	156,859	-0.90%

SOURCE: U.S. Department of Education, National Center for Education Statistics, Integrated Postsecondary Education Data System (IPEDS), Winter 2011-12, Human Resources component, Fall Staff section.

Table 10

Over the period from 2001 to 2011, the full-time equivalent enrollment increased from just fewer than 16 million to nearly 21 million students, a 32 percent increase. During the same period, professional and non-professional staff increased from just over

3 million to roughly 3.8 million, a 24.6 percent increase. The combination of increasing students and increased staff led to an increasing student-to-staff ratio of 5.2:1 to 5.5:1, with the number of students to faculty falling from 14.3:1 to 13:8 to 1.

DISTRIBUTION OF FACULTY AND TOTAL STUDENTS

Total Students	20,994,113	15,927,987	31.80%
	2011	2001	
All institutions	5.5	5.2	5.80%
Professional staff	7.2	7.5	-3.90%
Executive/administrative/managerial	87.9	77.2	13.90%
Faculty (instruction/research/public service)	13.8	14.3	-3.70%
Graduate assistants	59	61	-3.30%
Other professional	26.1	28.9	-9.80%
Nonprofessional staff	22.9	16.7	36.70%
Technical and paraprofessionals	106.8	78.7	35.60%
Clerical and secretarial	49.3	35.2	40.10%
Skilled crafts	346.1	245.8	40.80%
Service and maintenance	89.9	68.9	30.50%

SOURCE: U.S. Department of Education, National Center for Education Statistics, Integrated Postsecondary Education Data System (IPEDS), Winter 2011-12, Human Resources component, Fall Staff section.

Table 11

In real dollars, annual tuition costs actually fell between 2001 and 2014, from \$12,664 to \$12,266 per student as the real dollar

value of state support for public higher education fell from \$86 billion to \$77 billion.

REVENUES AND STATE SUPPORT

State	FY	State Support for Public and Independent Higher Education	Net Tuition	Total Educational Revenues	FTE Enrollment Net of Medical Students	Tuition as a Percent of Total Educational Revenue	Tuition per Student FTE
U.S.	2001	86,119,423,844	32,331,485,498	109,760,257,081	8,667,368	29.50%	12,664
U.S.	2014	76,948,133,078	64,343,050,029	136,608,613,721	11,137,541	47.10%	12,266

Table 12



In many institutions, the protection of undergraduates from tuition and fee increases as a matter of political necessity shifted more of the burden for off-setting declining public revenues and increasing cost to the graduate and professional programs. The only source of revenue that was available to these programs was tuition and fees, and this could be gained through raising the price

of a seat or increasing the number of seats without increasing staff or fixed expenses. While the colleges have continually been admonished by members of the veterinary profession for increasing the number of seats, failure to have done so would have driven the costs of seats considerably higher.

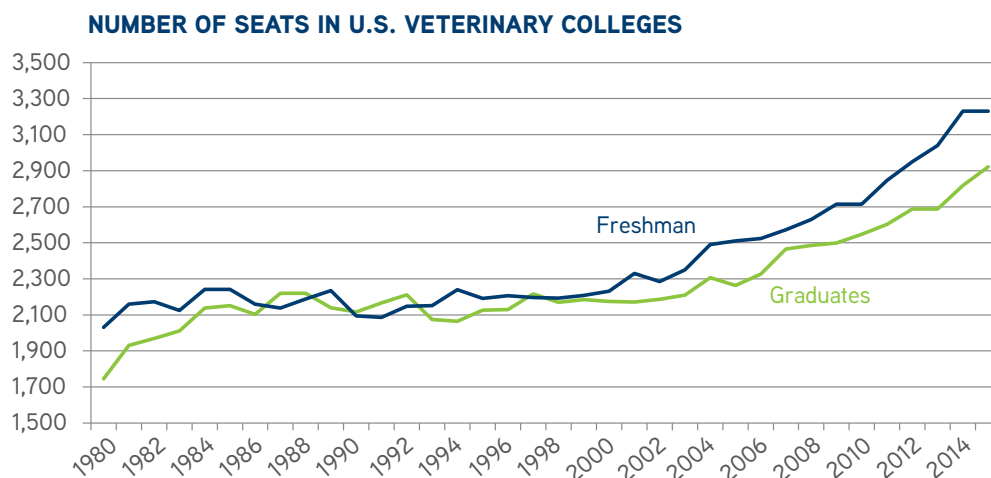


Figure 46

Politically, there is an important message here. For at least the last three decades the public has been defunding public education at the same time the real costs of operating these schools has risen. In short, for the veterinary profession this has shifted the burden of providing animal health from the taxpayer to the animal owner. The food animal owner has faced considerable friction in passing these increased veterinary costs to animal protein consumers, as they are constrained by the competition from other protein providers. For the pet owner, pet health expenditures compete with a shrinking real disposable income and other expenditures that have risen for reasons similar to those of veterinary services.

Clearly the subsidization of animal health care services by the public funding of the institutions that produce veterinarians has benefited animal owners in the past and now these owners will be required to pay a larger share of the cost of maintaining the health of their animals. But veterinary medicine is not only a private good, but a public good: ensuring that all pets have rabies vaccinations reduces the risk that any member of society (pet owner or not) contracts rabies; and ensuring that some major zoonotic disease does not become a spillover event that severely reduces the supply of animal protein ensures that every American (and in fact every human) has the cheapest access to any source of protein.

Veterinarians provide both a private service and a public service and thus should receive compensation from both. The

compensation from the public occurred in the past through the public support of the veterinary education. This support reduced the cost of education to the veterinary student and allowed them to obtain a standard of living that was somewhat unfettered by student debt. Today that no longer occurs and, in fact, many veterinarians now pay the full cost of their education, receiving no public support, but are still providing public services. In economics this is known as a market failure: consumers are obtaining benefits without paying for them. And, the role of government is to insure against certain market failures. Hence, we have rules to prevent market failure (anti-trust laws, fines for pollution, regulations to prevent pollution, and taxation to provide for important public goods such as national defense).

Clearly, the emphasis on lower taxes and declining public services has shifted the costs of various goods and services from taxpayers to the consumers of those goods and services. The rise in human health care costs, for example can find a source in the reduced public support for medical education. And this is true for nearly every product and service that requires a college educated employee to develop, manufacture, sell or deliver. The question is why this cascading effect of lower taxes and public support of education hit the veterinary profession so hard? The debt is only one half of the equation. The other half is income. So while all professions have had the same problem with cost of education and the associated student debt, the only remaining answer is that the veterinary profession must have a much more severe problem with income.

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 2:1 to 1.4:1. There are four groups that must be involved in this effort: the general public, veterinary colleges, veterinary students, and veterinary employers. However, before we begin to discuss the strategies to reduce the debt-to-income ratio, 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, and, for 2015, out of 3,018 graduates, 2,661 reported a value (including zero) for debt, but only 1,292 reported both a debt and income from full-time employment. Using these data we compute the debt to income ratio (DIR) for each school. Assuming there is no difference in income of the graduates of each school, the higher the DIR the greater the cost of tuition and fees.

DEBT-TO-INCOME RATIO

	Mean	N	Std. Deviation
Western University - California	4.0261	33	2.29603
Tuskegee University	3.7642	16	1.45772
University of Minnesota	2.6063	44	1.89029
Kansas State University	2.6019	58	2.21985
University of Florida	2.3609	48	1.26969
The Ohio State University	2.3473	69	1.37353
Virginia-Maryland Regional	2.3180	59	1.60806
Colorado State University	2.3117	42	1.74799
Cornell Veterinary College	2.1684	29	2.57024
Oregon State University	2.1422	26	.97726
Michigan State University	2.1301	49	1.15181
Iowa State University	2.0653	72	1.09553
University of Tennessee	2.0639	39	1.43077
University of Pennsylvania	2.0638	20	1.47725
Total Mean	2.0201	1292	1.48221
Cummings SVM at Tufts University	1.9986	36	1.13681
Mississippi State University	1.9166	55	1.34295
University of Illinois	1.9140	64	1.10000
Auburn University	1.8973	60	1.27368
Louisiana State University	1.8818	51	1.36608
Oklahoma State University	1.8017	49	1.16729
University of Missouri-Columbia	1.8003	63	1.08674
University of California-Davis	1.5207	27	1.07458
University of Wisconsin	1.5155	38	1.33927
Washington State University	1.4931	59	.93367
North Carolina State University	1.4909	32	.77108
Purdue University	1.4342	36	.93896
University of Georgia	1.4187	52	1.30638
Texas A&M University	1.1737	66	.84530

Table 13

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

	Mean	N	Std. Deviation
Western University - California	4.7315	32	2.25485
University of Pennsylvania	4.6429	20	1.97244
Tuskegee University	4.0615	16	1.35172
Colorado State University	3.8718	42	1.54179
Tufts University	3.7295	36	1.58174
Kansas State University	3.6294	59	3.27894
University of Tennessee	3.5876	38	1.63259
The Ohio State University	3.3602	69	.79707
Cornell University	3.3515	29	2.12491
University of Minnesota	3.3263	44	1.55653
Virginia-Maryland Regional	3.1474	60	1.31621
Auburn University	3.1203	60	.92031
University of Florida	3.0968	48	1.06534
Total Mean	3.0448	1294	1.43992
Washington State University	3.0230	59	1.07507
University of Illinois	2.9152	64	.83354
Michigan State University	2.8918	49	.82804
Iowa State University	2.8733	72	1.01814
Louisiana State University	2.8556	51	.96348
Mississippi State University	2.8128	56	.93409
Purdue University	2.7474	36	1.36127
University of California-Davis	2.7338	27	.73237
Oregon State University	2.7139	26	.78580
University of Wisconsin	2.5925	38	1.08360
University of Georgia	2.5441	53	1.51533
Oklahoma State University	2.4450	48	.76544
University of Missouri-Columbia	2.3417	64	.36632
Texas A&M University	2.3270	67	.59772
North Carolina State University	2.1551	31	.58591

Table 14

There is no method, 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 can be estimated, assuming that the total costs were distributed over the total number of semesters and a 7.0 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

	Mean	N	Std. Deviation
Western University - California	5.3535	32	2.55128
University of Pennsylvania	5.2532	20	2.23173
Tuskegee University	4.5955	16	1.52941
Colorado State University	4.3807	42	1.74448
Tufts University	4.2198	36	1.78967
Kansas State University	4.1066	59	3.70999
University of Tennessee	4.0592	38	1.84721
The Ohio State University	3.8020	69	.90185
Cornell University	3.7921	29	2.40425
University of Minnesota	3.7635	44	1.76115
Virginia-Maryland Regional	3.5611	60	1.48924
Auburn University	3.5305	60	1.04129
University of Florida	3.5039	48	1.20539
Total Mean	3.4450	1294	1.62921
Washington State University	3.4205	59	1.21640
University of Illinois	3.2984	64	.94312
Michigan State University	3.2720	49	.93689
Iowa State University	3.2510	72	1.15199
Louisiana State University	3.2310	51	1.09014
Mississippi State University	3.1826	56	1.05689
Purdue University	3.1085	36	1.54023
University of California-Davis	3.0931	27	.82864
Oregon State University	3.0707	26	.88911
University of Wisconsin	2.9333	38	1.22605
University of Georgia	2.8786	53	1.71454
Oklahoma State University	2.7664	48	.86606
University of Missouri-Columbia	2.6496	64	.41448
Texas A&M University	2.6329	67	.67630
North Carolina State University	2.4384	31	.66294

Table 15

The tables above 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 attending?

This should not be used as an indicator of the students' ability to manage their finances, but rather an indication of the ability of the students to draw upon other sources of income or be frugal in managing their finances.

THIS SHOULD NOT BE USED AS AN INDICATOR OF THE STUDENTS' ABILITY TO MANAGE THEIR FINANCES, BUT RATHER AN INDICATION OF THE ABILITY OF THE STUDENTS TO DRAW UPON OTHER SOURCES OF INCOME OR BE FRUGAL IN MANAGING THEIR FINANCES.

TOTAL COST PLUS INTEREST/INCOME

	Mean	N	Std. Deviation
Western University - California	5.3535	32	2.55128
University of Pennsylvania	5.2532	20	2.23173
Tuskegee University	4.5955	16	1.52941
Colorado State University	4.3807	42	1.74448
Tufts University	4.2198	36	1.78967
Kansas State University	4.1066	59	3.70999
University of Tennessee	4.0592	38	1.84721
The Ohio State University	3.8020	69	.90185
Cornell University	3.7921	29	2.40425
University of Minnesota	3.7635	44	1.76115
Virginia-Maryland Regional	3.5611	60	1.48924
Auburn University	3.5305	60	1.04129
University of Florida	3.5039	48	1.20539
Total Mean	3.4450	1294	1.62921
Washington State University	3.4205	59	1.21640
University of Illinois	3.2984	64	.94312
Michigan State University	3.2720	49	.93689
Iowa State University	3.2510	72	1.15199
Louisiana State University	3.2310	51	1.09014
Mississippi State University	3.1826	56	1.05689
Purdue University	3.1085	36	1.54023
University of California-Davis	3.0931	27	.82864
Oregon State University	3.0707	26	.88911
University of Wisconsin	2.9333	38	1.22605
University of Georgia	2.8786	53	1.71454
Oklahoma State University	2.7664	48	.86606
University of Missouri-Columbia	2.6496	64	.41448
Texas A&M University	2.6329	67	.67630
North Carolina State University	2.4384	31	.66294

Table 16

In general, the tables above would indicate that the DIR is certainly a problem, with 15 schools having a DIR of 2:1 or higher. 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 amongst the schools.

However, looking at the distribution of debt to total costs for each reporting student by college indicates that there are some students who have not found sufficient outside resources or are not frugal in their finances such that their debt exceeds the total cost of the education. This comprises more than 10 percent of the reporting students (138) who had full-time employment, with just 11 schools having a percentage of students with “excessive” debt greater than the average of all 28 U.S. colleges (10.6 percent).

DEBT BELOW AND ABOVE TOTAL COST PLUS INTEREST, FULL TIME ONLY

	Is my debt greater than total cost plus interest?			
	Debt below TC + int	Debt over TC + int	Total	Percent (Debt over TC + int)
University of Georgia	36	17	53	32.1%
University of Missouri-Columbia	48	18	66	27.3%
Oklahoma State University	39	10	49	20.4%
Tuskegee University	13	3	16	18.8%
Western University - California	28	6	34	17.6%
Michigan State University	41	8	49	16.3%
Mississippi State University	48	8	56	14.3%
Iowa State University	62	10	72	13.9%
Kansas State University	52	7	59	11.9%
Oregon State University	23	3	26	11.5%
University of Minnesota	39	5	44	11.4%
Total Mean	1164	138	1302	10.6%
University of Tennessee	35	4	39	10.3%
North Carolina State University	29	3	32	9.4%
The Ohio State University	63	6	69	8.7%
Auburn University	56	5	61	8.2%
Washington State University	55	4	59	6.8%
Virginia-Maryland Regional	56	4	60	6.7%
University of Illinois	60	4	64	6.3%
Louisiana State University	48	3	51	5.9%
Tufts University	34	2	36	5.6%
Purdue University	34	2	36	5.6%
Colorado State University	40	2	42	4.8%
University of Florida	46	2	48	4.2%
University of Wisconsin	37	1	38	2.6%
Texas A&M University	66	1	67	1.5%
University of California-Davis	27	0	27	0.0%
Cornell University	29	0	29	0.0%
University of Pennsylvania	20	0	20	0.0%

Table 17

We can apply the same criteria to all students that reported debt, inclusive of those that did not report having taken a full-time employment opportunity prior to graduation (2,661 of 3,018). There remain 11 colleges that exceed the national average percent of students with excessive debt, but two schools moved their position relative to the national average, Ohio State University and Tuskegee. On the basis of all students reporting debt, the percent of Ohio State students with excessive debt is

now larger than the national average; while Tuskegee now has less than the national average percent of students with excessive debt. Using all students reporting debt, we found that 273 out of 2,661 (10.3 percent) students had excessive debt. That is, these 273 students had more debt than was estimated for the cost from tuition and fees, living expenses and interest charges. The total amount of excessive debt was \$9,181,367.99.

DEBT BELOW AND ABOVE TOTAL COST PLUS INTEREST

	Debt below TC+int	Debt above TC + int	Total	Percent (Debt above TC+ int)
University of Georgia	69	33	102	32.4%
University of Missouri-Columbia	85	26	111	23.4%
Western University - California	88	19	107	17.8%
Oregon State University	44	9	53	17.0%
Kansas State University	82	16	98	16.3%
University of Minnesota	80	15	95	15.8%
Iowa State University	100	18	118	15.3%
Mississippi State University	68	12	80	15.0%
Oklahoma State University	75	13	88	14.8%
Michigan State University	80	13	93	14.0%
The Ohio State University	121	18	139	12.9%
Total Mean	2388	273	2661	10.3%
University of Tennessee	83	9	92	9.8%
Tuskegee University	59	6	65	9.2%
University of Florida	84	7	91	7.7%
Virginia-Maryland Regional	97	8	105	7.6%
Colorado State University	99	8	107	7.5%
University of Illinois	90	7	97	7.2%
Auburn University	104	8	112	7.1%
North Carolina State University	73	5	78	6.4%
Louisiana State University	79	5	84	6.0%
Purdue University	73	4	77	5.2%
Washington State University	92	4	96	4.2%
Tufts University	76	3	79	3.8%
University of Pennsylvania	66	2	68	2.9%
University of California-Davis	128	2	130	1.5%
University of Wisconsin	78	1	79	1.3%
Cornell University	93	1	94	1.1%
Texas A&M University	122	1	123	0.8%

Table 18

These estimates of debt, tuition and fees, living expenses and interest charges provide information 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.

Total debt for the 2015 graduates from the U.S. Veterinary colleges was estimated at \$427,502,116. The estimate of the total cost of tuition and fees for 2015 is \$382,559,375, with another \$240,623,655 in estimated living expenses for a total estimated

cost of \$623,183,030 for all of the 3,018 U.S. veterinary college graduates in 2015. The interest expense for borrowing these funds would have been an additional \$81,924,168, bringing the total cost of the education to \$705,107,198. However, students applied various outside sources of funds to pay for some or all of these expenses and thus total debt was only 61 percent of total cost. This total debt can be partitioned as \$396,300,563 for tuition and living expenses, \$22,020,185 in interest expenses and \$9,181,368 from all expenditures beyond what was necessary to meet the costs of tuition, living expenses and interest.

A partnership between the public, veterinary colleges, students, and veterinary employers can provide the framework for reducing the debt-to-income level from the current 2:1 to less than 1.4. This strategy would involve the four major goals:

1. ELIMINATE THE INTEREST ON STUDENT LOANS WHILE THE STUDENT IS IN SCHOOL.

Savings of \$22,020,185 and a reduction to 1.89 in the Debt-to-Income ratio.

2. ELIMINATE THE EXCESSIVE DEBT OF STUDENTS THROUGH BETTER MANAGEMENT OF EXPENDITURES.

SAVINGS OF \$9,181,368 AND A REDUCTION TO 1.95 IN THE DEBT-TO-INCOME RATIO.

3. REDUCE EDUCATION OUTLAYS OF STUDENTS BY 10 PERCENT.

SAVINGS OF \$39,630,056 AND A REDUCTION TO 1.79 IN THE DEBT-TO-INCOME RATIO.

4. INCREASE STARTING SALARIES BY 10 PERCENT.

INCREASE REVENUE \$21,482,518.38 AND A REDUCTION TO 1.81 IN THE DEBT-TO-INCOME RATIO.

The combination of these goals will reduce the mean debt to income ratio from 2:1 to 1.38:1.

STRATEGIES TO REACH THE GOAL

As noted above, strategies to improve the DIR for veterinary graduates must come from every corner of the profession and address each point in the supply chain between the applicant and the provision of veterinary services, as well as the components of demand for veterinarians and veterinary services. While we have made a case in this report for moving the profession to a 1.4:1 DIR target, and provided four major goals for doing so, we have yet to provide any specific strategies for the profession to consider in attempting to reach the proposed DIR target. Specific strategies that may be used to accomplish each of the goals above are suggested below and delineated into one of the major goal areas:

- general public strategies;
- veterinary college applicant and student strategies;
- veterinary college strategies;
- public and private practices strategies.

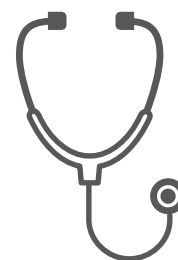
This should not be considered either as a complete list or a list of definitive solutions. These are suggested strategies that should be evaluated based on their ability to achieve a desired level of DIR reduction against the overarching mission of providing a well-defined future role of veterinarians in society.

First and foremost is the need to quickly begin to collect detailed data on education costs per discounted and non-discounted seat at each of the 49 AVMA accredited colleges of veterinary medicine. The exact values of expenditures for each student, as well as the amount borrowed and the interest payment for each amount borrowed must be tracked. Starting salaries for all new veterinarians must be collected so that a more exact debt-to-

income ratio can be determined and progress made towards its measured reduction.

Second is the need to also quickly begin to collect a standard set of financial data on veterinary practices to enable the evaluation of financial performance standards for veterinary practices. There are an estimated 25,000 to 30,000 veterinary practices in the United States that range from one-doctor to multiple-doctor practices, from private to public to corporate practice, and from less than \$500,000 to many millions in gross sales.

Third is the need to gain a profession-wide referendum on the debt-to-income ratio so that every veterinary professional understands that they own the problem. This is not just a public tax/revenue problem, a problem of veterinary colleges having too high costs, too many seats, too many non-discounted seats, or veterinary practices leaving too much demand unrealized. The high debt-to-income ratio is a problem for the profession and of the profession. The DIR KPI should be considered by every veterinarian in their business and professional decisions.



THE GENERAL PUBLIC STRATEGIES

1. Eliminate the interest payment on student loans while in school

This is not just a veterinary profession problem but a problem that permeates society. Veterinary medicine can provide the leadership to develop a legislative initiative for federal and state legislatures.

2. Reduce the interest rate to be more in line with the risk of the loan

Information on veterinary student loan defaults should be collected and, based on the findings of this research, a case made to prevent charging interest rates for veterinary student loans in excess of the rates charged for loans with similar default rates.

VETERINARY COLLEGE APPLICANT AND STUDENT STRATEGIES

1. Reduce the hours of potential veterinary applicants' unpaid experience

The average applicant has over 2,000 hours of "service" hours that may be paid or unpaid. The willingness of pre-veterinary students to accept unpaid opportunities provides the wrong message (providing free services) and steals their income earning needs to prepare for the financial obligation of their education.

2. Increase the awareness of the cost of veterinary education

While many potential applicants to veterinary college have information on the costs of attending veterinary school and the associated student loan debt, most are quick to agree that they have little understanding of what these levels of student debt mean to their future standard of living. Programs that provide examples of the consequences of high debt on living standards of current veterinarians and strategies to assist potential applicants in saving funds and/or acquiring outside resources to bring to veterinary college can be used to better prepare students with the finances required to reduce the student loan burden.

3. Reduce the cost of living expenses of veterinary college students

Provide average expenditure information for each veterinary college to each student to help them understand how their expenditure pattern compares to their peers. Few students understand the importance of small decisions to overall debt obligations.

VETERINARY COLLEGE STRATEGIES

1. Institutionalize a connection between the education and veterinary markets

Currently there is no connection between the markets for veterinary education and the market for veterinarians. That is, veterinary colleges are currently tasked with producing veterinarians that meet veterinary medical competencies. There is no requirement that these graduates are able to meet economic standards. The gainful employment provision in the Higher Education Act is such a requirement. Schools are held accountable for meeting a mean DIR for their graduates. While the gainful employment provision is currently only applicable to private foreign for profit institutions, this provision may find its way into all colleges, public and private.

2. Conduct research to develop the same or better quality treatments at lower cost

In one recent study in North Carolina, over 75 percent of veterinary clients had household incomes in excess of \$100,000 and yet this level of income represents only roughly 10 percent of all U.S. households. Our veterinary medical research institutions must help to discover veterinary techniques that enable veterinarians to provide veterinary services at lower costs.

3. Develop pilot projects to measure the economic implications of new teaching models

Can the length of time in school be shortened or the cost per year reduced? What are the costs and benefits of the new 2+2 programs such as the joint program between Alaska and Colorado State University or the distributive model of several of the newer veterinary colleges? Compare the costs of providing education across different educational models already in use. Data on impact on debt load for the reduction of the pre-vet to three years may already be available from schools that offer early-entry type programs (i.e., Purdue has a 3+1 system already). The need exists to identify all the schools that offer similar programs.

4. Explore the differences between schools that have highest/lowest internship rates among their graduates

While internships are not included in the current DIR, the lost income and the interest on loans during the internship certainly increase the post graduate DIR of new veterinarians. The profession needs to understand the benefits and costs of internships and the factors associated with veterinary graduate decisions to seek an internship opportunity.

5. Financial education requirements for faculty to improve awareness of economics of practice

For several decades, veterinarians both within and external to academia have proposed adding financial education to the veterinary curriculum. Integrating finance within the current

veterinary curriculum and providing incentives to discuss costs of treatments may produce greater innovation in cost-reducing practices from veterinary students not bound by tradition. A first effort for the profession is to define financial literacy and ensure that both faculty and students achieve the goal. Ideally, the long-term goal would be for faculty to teach practice economics within rotations. Short-term, efforts may require a combination of pre-requisites and/or an online or certificate course run by AVMA/VMGs. Another side of this is to work to help the Veterinary Teaching Hospitals increase efficiency; perhaps we could identify veterinary colleges willing to participate in a pilot.

6. Economies of size and/or specialization of schools

The improvement of distance education technology offers an opportunity to veterinary colleges to evaluate opportunities to share faculty. In addition, schools may be able to reduce costs by collectively sharing specialization. For instance, several schools could share services of one school that has a specialization in dairy, another has specialization in equine, and yet another in small ruminates.

7. Veterinary graduate readiness/confidence improvement

Regardless of the degree program, students' greatest impediment at graduation is self-confidence. Confidence is gained from experience. Veterinary graduates must be prepared to enter public or private practice with the knowledge and ability to improve the value of veterinary medicine. The goal of a 1.4:1 DIR will only be accomplished by increasing the starting salaries of graduates. This can only be accomplished if new graduates are prepared and confident in their ability to improve the value they bring to their employer.

INTEGRATING FINANCE WITHIN THE CURRENT VETERINARY CURRICULUM AND PROVIDING INCENTIVES TO DISCUSS COSTS OF TREATMENTS MAY PRODUCE GREATER INNOVATION IN COST-REDUCING PRACTICES FROM VETERINARY STUDENTS NOT BOUND BY TRADITION.

PUBLIC AND PRIVATE PRACTICE STRATEGIES

1. Increased financial literacy of veterinary practice owners

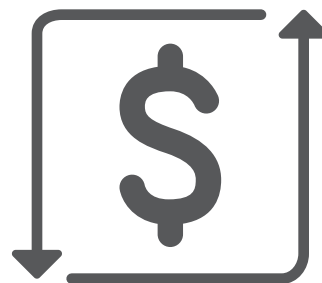
While the veterinary colleges may be tasked with ensuring economic viability of their graduates, practice owners must be tasked with ensuring they have the ability to reward the success of the colleges' programs. If graduates are not rewarded for their contribution to the value of a practice, veterinary colleges cannot be successful in ensuring an economically sustainable graduate. The profession must develop standards of financial performance of veterinary practices to enable veterinary colleges to evaluate the performance of their graduates.

2. Enhance the demand for Veterinarians

Veterinarians play a critical role in animal health and welfare that spills over into human health. The role of veterinarians in the surveillance and management of zoonotic diseases, food security and areas such as the importance of the human-animal bond on human health are not well understood by the general public or those tasked with making the resource-allocation decisions. All practicing (public and private) veterinarians may improve the demand for veterinarians by working together and, with industry partners, bringing economic analysis to decision makers on the benefits and costs to society of increased veterinary professionals in providing public services. While the veterinary profession has long extolled the "need" for more veterinary professionals in the public practice areas, little action has occurred, as these expressions of need have not included measures of benefits and costs associated with the increased involvement of veterinarians.

3. Increase the value of graduates

How many animals are not receiving the level of care necessary to ensure good health is certainly unknown, but it is clear that some animals have not been seen by a veterinarian and others have not received all of the care required to guarantee good health. Quantifying the amount and location of the health care shortfall of animals should be a top priority for the profession so that strategies can be developed to reach specific goals with respect to both the percent of animals unseen by veterinarians and the percent that are seen but have not received the minimum standard of health care.



DISCUSSION

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.

This report takes an exploratory and analytical approach to the market for new veterinarians. We observe new veterinarians over the period 2001 through 2015, including their post-graduate plans, their income levels, debt levels and their debt-to-income ratios.

New veterinarians come from a pool of applicants that we are just beginning to study through the survey of VMCAS applicants. AAVMC has just begun its study of these applicants' decision process and willingness to pay for veterinary education. This is an important area of research that will be productive over time and is necessary to better understand how to aid these potential veterinary students in preparing for the financial requirements of their education.

As applicants matriculate veterinary college, they eventually 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 specific demographics. However, the survey data has limitations. There is no 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 an exact estimate of costs per student or the amount paid per student. In developing strategies to reduce the DIR, this information will be important.

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 U.S., our data are primarily comprised of responses from the 28 U.S.-located veterinary colleges. This is a caveat in this research piece, since a proportion of U.S. students attend AVMA accredited foreign colleges and return to the U.S. to find jobs and repay student loans. Intuitively, these students 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 from the AVMA accredited foreign veterinary colleges.

This report, which combines the 2015 Report on Debt and Income and the Market for Veterinary Education, is 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 annually an update on the model of new graduates' starting salaries, debt, and debt-to-income level. These models will help us and veterinary applicants and students predict their starting salary and debt at graduation and assist them in developing personal strategies for managing their post-graduate finances to maximize their standard of living.

We pose four major goals and multiple strategies for each goal to reduce the DIR over time. Each of these strategies are based on economic concepts, but while some have current evidence to support their implementation, others will require further research to determine their economic feasibility. As noted, the list is not exhaustive and we have received a number of alternative strategies, such as substituting the seats available to U.S. veterinary applicants for proposed veterinary assistants or foreign nationals. These additional strategies require the development of new programs rather than the restructuring or reorganizing of existing programs.

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



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Main focus areas:

- **Finance** will include basic accounting principles and the use of financial ratios to provide guidelines for tracking financial performance.
- **Operations** will include all areas that pertain to the internal operations of the practice including staffing, staff assignments, team building, and goal implementation.
- **Strategies** will focus on various approaches for improving the financial performance of the practice that impact client relationships and improve the internal functioning of the practice.
- **Economics/Marketing** will include information on the general U.S. economy and how the veterinary practice interacts with that economy and how to determine the size and competitiveness of local veterinary service markets.

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THE AVMA 2016 ECONOMIC REPORTS INCLUDE:

The AVMA Report on Veterinary Markets:

This report summarizes the economics and finance research presented at the annual AVMA Economic Summit and provides information about general U.S. economic conditions and the markets for veterinary education, veterinarians and veterinary services, and the performance of veterinary practices.

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:

All demand for veterinarians and veterinary education begins with the demand for veterinary services. This report provides the latest information on the price of veterinary services, price and income elasticity, and the financial performance of veterinary practices. Our forecasts of capacity utilization and excess capacity for regions and types of practices provide an indication of the performance of this market.