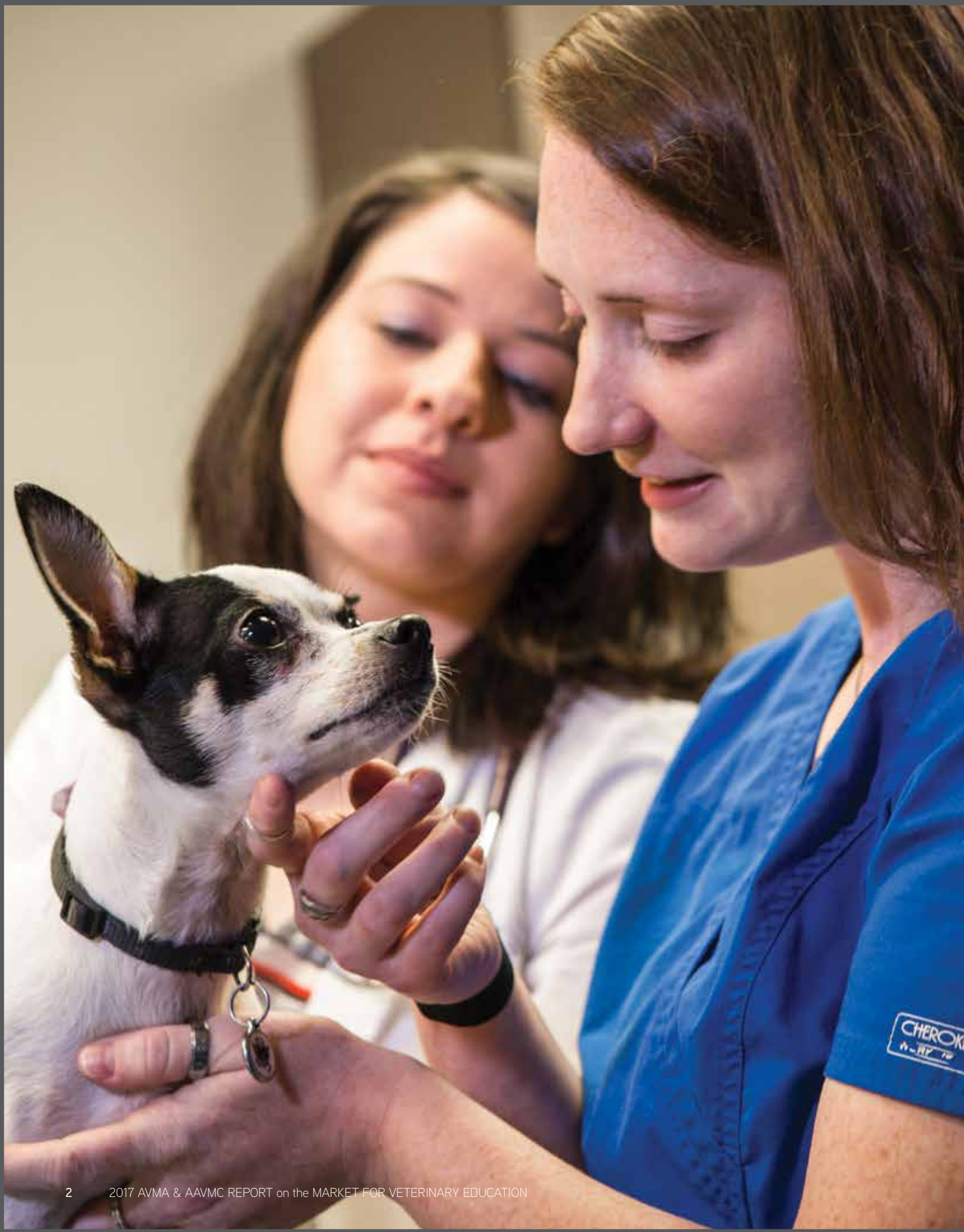
2017 AVMA & AAVMC Report on

THE MARKET FOR VETERINARY EDUCATION

AAVMC

AVMA® Veterinary Economics



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THE MARKET FOR VETERINARY EDUCATION

Veterinary Economics Division
American Veterinary Medical Association
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SUMMARY

Examining — and ultimately enhancing — the economics of any profession demands an understanding of its financial underpinnings and overall trends, as well as the ability to visualize the direction it is heading. Recording the profession's current economic position and then being able to measure change from this baseline is enabled by analyzing key performance indicators (KPI). By identifying points along the profession's progression, KPIs can help determine whether efforts made are moving it closer to desired outcomes.

In gauging the condition of the veterinary profession, the AVMA's Economics Division has identified as an important KPI, the industry's prevailing debt-to-income ratio (DIR). This ratio, as explained in this *2017 AVMA & AAVMC Report on the Market for Veterinary Education*, helps establish a picture of the connection between the demand and supply of new veterinarians through understanding the cost to obtain a DVM degree, and the subsequent income that is the payback to the veterinarian for acquiring it.

The AVMA computes the DIR using data drawn from a survey of graduating veterinary school seniors that asks about post-graduate plans, educational debt, starting salaries and other demographic information. While the DIR can vary due to differing levels of debt and salaries, and how the ratio is calculated, the AVMA's computed DIR reflects values held to a constant demographic distribution over time to account for changes in these. Survey respondents gave answers that are rounded estimates of what they *think* their debt to be, however, the actual value of the DIR is not as important as the magnitude of annual change and the direction of the DIR over time.

Some 14 percent of students surveyed by the AVMA in 2016 reported no debt, and 6.8 percent reported having obtained no job offers or invitations to pursue continuing education at the time the survey was conducted. Others elected to pursue additional education (35.6 percent reported getting an offer to pursue an internship, residency or continuing education) and about 7 percent did not answer the questions about their debt, income or other specific and relevant information. The AVMA has determined that the DIR in 2016 was 2.00; a rate that will create a financial hardship for graduates electing to service the debt with traditional repayment terms. Hence, a 1.4:1 debt to income ratio was determined as a rational goal for the profession.

WILLING APPLICANTS

Examining the extent that the pipeline to the veterinary field has been filled in recent years, the report notes that the number of applicants to veterinary medical colleges increased slightly in 2016, to 6,667, and increased even further in 2017 to 7,071-the highest since 1981. The report concludes that this change may indicate that the number of applicants no longer seems to be in a decline spotted in previous years.

How might pricing affect the demand for a veterinary education? In 2014, 53.3 percent of veterinary school applicants were willing to pay up to $150,000 for a seat, while in 2015 only 37.1 percent of the applicants were. In 2016, the percentage rose to 40.2. As strategies to improve the financial literacy of pre-veterinary students are implemented, measurement of the demand for veterianry college seats will be vital.

Based on Veterinary Medical College Application System (VMCAS) records of U.S. citizens who applied for seats at the 30 AVMA-accredited veterinary colleges in the United States, three AVMA-accredited Caribbean colleges, and 16 AVMA-accredited veterinary colleges in other countries, the applicant-to-seat ratio is determined to have remained relatively constant over the last four years — hovering at around 1.6:1 In 2016, U.S. veterinary colleges turned out more than 2,900 new veterinarians.

Equilibrium exists in a market when demand and supply curves intersect. At the point of intersection of these curves in the market for education, the willingness of the applicants to pay for seats is equal to the number of seats the colleges are willing to provide at that price. The equilibrium quantity and price for the 2015 applicants were 1,384 seats at a mean total cost of $197,242. In 2016 demand increased and the cost per seat increased. The number of lower-cost seats, however, increased: Applicants were willing to occupy 1,860 seats at a mean total cost of $180,590.

Although applicants have access to information on the costs of attending various schools, the factors that have bearing on their decision whether or where to attend are unknown. Additionally, not tracked are data comparing the difference between what applicants were willing to pay, and what graduates *actually* paid. When the 2016 applicants were asked, however, to estimate the debt load of the 2015 graduates, they had a relatively accurate idea of the debt load of new veterinarians.

FINDING WORK

The percentage of graduating veterinary students finding full-time employment or getting offers to pursue post-graduate education in the 2016 graduating class was 93.1 percent, the highest rate for the entire period under examination. Although the Great Recession had a direct impact on the number of students securing post-employment plans, the increasing number of new graduates finding employment or educational opportunities suggests that the economy has been gaining strength.

Also noteworthy is that the percent of graduates receiving some type of income opportunity is steadily increasing even though the number of graduates is concurrently increasing over the period. The number of new veterinarians finding full-time employment grew to 54.9 percent in 2016, from 48.9 percent in 2015. The number of new veterinarians not finding employment or receiving an invitation to pursue continuing education decreased from 11.9 percent in 2015 to 6.9 percent in 2016. In 2016 a record number of graduates found full-time employment prior to graduation!

Market distinctions among specialties were observed. From 2001 through 2016 the majority of new veterinarians reported finding full-time employment in the companion animal exclusive sector. New entrants into this sector declined throughout the period 2004 to 2012, however, with a slight increase between 2012 and 2014, followed by a downward turn in 2015. This trend took a turn in 2016 with an increase to 30.4 percent. Though the trend climbed from 2015 to 2016, the highest point, at 42 percent, occurred in 2004. Noteworthy is that the loss in the percent of graduates obtaining full-time employment in companion animal practices was offset by the 10 percent increase in graduates electing an internship opportunity.

New entrants into other sectors such as food animal, companion animal predominant, mixed practice and equine practice remained almost steady in the same period. The percentage of new veterinarians finding full-time positions in public practice has been consistently small but steady during this time. Between 2015 and 2016, the number of new veterinarians heading into federal government, college or university, and not-for-profit organizations increased while the number heading into uniformed services, state and local government, and industry declined.

NEW VETERINARIANS' EARNINGS – AND DEBT

From 2001 through 2016, the mean starting salary for new graduates increased from just under $40,000 to more than $58,000 – a mean increase of $1,220 per year over the period. Since 2009, private practice has offered the highest starting salaries. Salaries in public practice began lagging with the 2007-2009 financial crisis. Prior to that, salaries of new veterinarians in public practice and private practice were even. The effect of the recession on state and federal budgets has had a large impact on public practice incomes compared to the impact of the recession on private practice incomes.

Although starting salaries among new veterinarians in private practice have been on a steady incline, new veterinarians pursuing employment in the equine industry have consistently experienced the lowest starting salaries. For new veterinarians in 2016, food animal exclusive practice yielded the highest income, with those in companion animal exclusive practice and companion animal predominant practice following closely behind. New veterinarians employed at colleges or universities report the lowest starting salary among those in public practice.

When it comes to new veterinarian debt, the report indicates that over the last 16 years, the DVM degree debt of all veterinary students has been increasing at about $5,400 per year; for those reporting non-zero debt, the annual increase has been approximately $6,200. Between 2015 and 2016 mean DVM degree debt of all veterinary students increased by only $1,363 compared to an increase of $7,111 between 2014 and 2015. DVM debt incurred by new veterinarians varies by post-graduation plans.

Over the period 2001 through 2016 new veterinarians finding employment in public practice consistently had the lowest debt load, while new veterinarians pursuing internships and residencies had the highest. For each sector, whether public practice, private practice, advanced education, internships or residencies, however, the growth rate of DVM debt has continued to outpace the growth rate of starting salaries. To respond to the challenge that a considerable DIR presents to veterinary graduates, the report points to strategies to move the profession toward the goal of reaching a 1.4:1 DIR, and issues a call to every corner of the profession to make it happen.

INTRODUCTION

This report on the market for veterinary education is part of what is now the third edition of a series of annual reports, and offers updates on the first market along the supply chain culminating in veterinarians providing veterinary services. A sequel to last year's report, this report provides updates on the debt and income of new veterinarians along with information on veterinary college applicants, a breakdown of tuition, fees, living expenses by veterinary college and year, debt and income levels of new veterinarians, (demand for and supply of seats) and the important key performance indicator, the debt-to-income ratio.

Also continuing last year's collaboration, this report engages the Association of American Veterinary Medical Colleges (AAVMC) to produce a joint publication, a relationship through which we obtain applicant information from the VMCAS, and data on tuition, fees and estimated living expenses from the veterinary colleges. The primary goal of this partnership is to provide consistent data reporting across multiple channels along with convenient access to data in a single location.

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

Controlling for a changing demographic became critical when analysis revealed that several demographic factors affected the starting salary of new veterinarians. Among these are gender, age, practice type, location of place of employment, debt load and work hours per week. For instance, new female veterinarians earn significantly less than new male veterinarians, holding all else constant. As a result, a profession with an increasing female population may appear to have a decreasing mean salary or at least decreasing with respect to the rate of inflation. The phenomenon, however, is an increase in the number of lower earning, female veterinarians entering the profession and deflating starting salaries, a trend independent of national veterinary labor market conditions involving the price and quantity demanded. This is just one example, but many demographic factors affect starting salaries and need to be controlled to attain an unbiased picture of the relationship between prices and quantity demanded in the national labor market for new veterinarians.

Although this process is relatively new to the veterinary profession it is a standard in economics. This analytical process to control for the characteristics of a good or bundle of goods to measure the impact of the quantity of supply and demand on price is a common practice in economics, producing what is termed a Laspeyres index, more commonly known as the Consumer Price Index. Such an index holds steady the quantity of a specific number and type of goods (basket of goods) purchased annually by consumers, creating an "apples-to-apples" comparison to determine 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.

Also tracked extensively in this report is the DIR, one of the KPIs for the veterinary profession. The ratio does not only measure the performance of the market for new veterinarians but also allows us to quantify the success of programs and strategies implemented to improve the economic performance of the market for veterinary education. As with the examination of income trends, the factors that affect the DIR are identified in the report to inform the profession of potential strategies for reducing the DIR to improve the performance of the profession.

The last section of this report focuses on the starting point of the supply side for the market for veterinary services, the market for education. The three vertically related markets of which the market for education is the starting point are the market

for education, the market for veterinarians and the market for veterinary services. These markets are separate but vertically related through inputs and price signals. That is, the triggers that stir demand for veterinary students should receive a signal from the prices paid for veterinarians and likewise the market for veterinarians should be signaled by the price of and demand for veterinary services signaled by the market for veterinary services. In addition, the cost for veterinary services is related to the costs of veterinary labor, which is related to the cost of veterinary education. And, the demand for seats at veterinary colleges, by applicants, which comes from the demand by animal owners for veterinary services, interacts with the supply of seats (price and quantity) to determine the number of students and the future supply of veterinarians.

The market for education is a complex market consisting of 30 AVMA-accredited veterinary colleges located in the United States, 19 AVMA-accredited colleges located outside the United States and dozens of other veterinary colleges not accredited by the AVMA, but graduates are able to enter the market for veterinarians through various channels.

In addition to an analysis of tuition and fees across colleges this report will analyze the student debt incurred by recent graduates as a result of tuition and fees, living expenses, and interest on student loans while in veterinary college. This distinction is made because the cost of living cannot be quantified as opportunity cost, or cost foregone to become a veterinarian as one has to "live" and incur living expenses whether or not they attend veterinary college. This report does, however, present a detailed description of the cost of living in various regions of the country as well as the tuition incurred to matriculate through veterinary college.

To create the largest impact on the economics of the profession, it is most effective to attack the debt challenges of new veterinarians, and the DIR, by engaging pre-veterinary students. Oftentimes, cautioning veterinary students about the impact of high debt levels and an unsustainable DIR is less effective because most have already secured large loans and can do very little about their circumstances at that time. On the other hand, while educating pre-veterinary students can be helpful, these students may not understand the effect of substantial debt on their anticipated lifestyle. These pre-veterinary students find the warnings illusory and remote from their present situation, but as the high DIR becomes more prominent among veterinarians across the profession, more of the pre-veterinary students will, through their increased contact with practitioners with a high DIR, begin to better understand the role of debt on lifestyles. Today's pre-veterinary students appear to know they may have excessive debt upon graduation, but they cannot pinpoint what that feels like when translated into daily life, such as having a used car long after graduation, the inability to own a home, or working long hours merely to make loan payments.

KPIs measuring the market for a veterinary education, mainly the DIR, are of particular importance to measuring the impact of implemented strategies. At the most basic level, the income awarded to veterinarians is indicative of animal owners' willingness to pay for veterinary services. This, in turn, represents consumers' willingness to pay for costs to train veterinarians to care for pet owners' animals. Essentially, the fact that the DIR is above 2.0 indicates that it costs a veterinarian twice as much to become trained than the cost in aggregate that animal owners are willing to pay for their services. In other words, the market is signaling that the actual cost of producing veterinarians exceeds the value society places on veterinay services. This report will also highlight strategies that, if implemented, could alleviate the high DIR challenge.

MARKET FOR EDUCATION KPI

The DIR is a snapshot in time of the state of new entrants into the profession. And, with a wide range of salaries and an ever wider range of debt levels, the DIR can vary immensely.

KPIs are of particular importance to determining whether a strategy or protocol is effective. For example, the charge of the AVMA Economics division is to enhance the economics of the veterinary profession. To enhance the economics of the profession requires knowledge of the current situation and expectations for the future. The KPIs provide a measure of the change from the baseline situation to the current situation to understand whether the profession's efforts are moving it closer to the desired outcomes.

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

To most accurately develop an index and determine a trend for the DIR requires that several current constraints be removed. The DIR that the AVMA calculates is derived from analyzing AVMA's senior survey. The senior survey is distributed each spring to the graduating seniors of the AVMA-accredited U.S. colleges. The survey asks seniors to report their post-graduate plans, educational debt, starting salaries and other basic demographic information. Some of the individual responses, however, are estimates rather than true values. Questions such as the number of hours expected to work per week, educational debt incurred, and annual

production expected are estimates made by students based on the information they have available. Students either don't have the exact values for specific data points or they have not made the effort to identify these values. For instance, respondents are unlikely to know precisely how many hours they will work per week and, as such, are even less likely to know what their level of production will be, as this will depend not only on hours worked, but on the availability of clients and the efficiency with which as veterinarians they are able to provide the services required. The level of debt at graduation can be determined, but respondents have provided answers that are clearly rounded estimates of what they believe their debt to be. Consequently, it is important to note that the actual value of the DIR is less important than the magnitude of annual change and the direction of the DIR over time.

The DIR is a snapshot in time of the state of new entrants into the profession. And, with a wide range of salaries and an ever wider range of debt levels, the DIR can vary immensely. Some students report no debt (14.2 percent of the 2016 graduating class), others report having obtained no job offers or invitations to pursue continuing education at the time the survey was distributed (6.8 percent in the 2016 graduating class). Others elect to pursue additional education (35.6 percent of the 2016 class reported receiving an offer to pursue an internship, residency or continuing education) and then there are some (an additional 7.0 of the 2016 graduating class) who simply do not answer the questions pertaining to their debt, income or other specific and relevant information.

In addition, the DIR has been calculated with many different formulas in the past. Some methods removed those respondents with zero debt, others included all respondents regardless of employment opportunity, and yet other methods simply found the mean debt from all those reporting debt and divided the mean income from all those reporting incomes regardless of whether each individual included had provided both an estimate of debt and income. How should interns, residents, those in continuing education programs receiving only a stipend or, of equal importance, those who failed to respond to the pertinent question, be classified? Should those who did not answer the debt or income questions be distributed as those who did? Ultimately, the method chosen to compute the DIR stems from the objective for the measure. To effectively improve the economics of the veterinary profession, a measure must accurately describe the current state of the profession consistently and uniformly over time so that trends can be identified. Again, it is important to understand that there are many possible methods for computing the DIR. The method used in this report was developed to provide the best indication of the state of the market for veterinary education and to measure the impacts on the performance of this market from the most encompassing strategies. For example, if the respondents with zero debt are not included, then any strategy that brings a veterinary graduate's debt to zero will be seen as having no effect on the DIR (and may show a negative impact), as once the respondent achieves a zero debt that observation is no longer included in the calculation.

The mean debt figure is computed by aggregating all the reported debt numbers and dividing the sum by the number of respondents reporting a debt number, including those reporting zero debt. There has been some talk about excluding those with zero debt, however, zero is well within a 95 percent confidence interval around the mean debt, and higher debt levels that lie outside the high end of the 95 percent confidence interval are included in the descriptive statistic.

The descriptive statistic for income reflects only those respondents reporting full-time employment. To identify the mean salary for new veterinarians, those pursuing internships or residencies and those receiving stipends from continuing education programs were omitted. Nonetheless, as mentioned in previous reports, if the compensation received for completing internships becomes identified 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 along 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 of the graduates who reported a value for debt and full-time employment income. And these values are held to a constant demographic distribution over time so that there is no effect on the DIR as a result of changing demographics.

THE APPLICANT POOL FOR VETERINARY COLLEGES

As mentioned in previous reports, the market for veterinary services is the final entity in the vertically related veterinary markets. Applicants to the veterinary colleges represent the beginning of the supply chain, and for every applicant in VMCAS there are many potential applicants who have elected not to apply, but may do so as the conditions for entry change.

Over the last couple of years, the AVMA 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. In 2016, however, the number of applicants increased slightly to 6,667 and increased even further in 2017 to 7,071. Although the peak during the last cycle occurred in 1998 at 6,783 applicants, the number of applicants in 2017 has been the highest since 1981. While we have been unable to determine a specific factor, or set of factors, potentially responsible for the cycle of applicants, the number of applicants may not follow a cyclical pattern or that pattern may need to be better defined. Regardless, the number of applicants no longer seems to be on a decline, at least not since 2015.

AAVMC VETERINARY SCHOOL APPLICANT FIGURES

AAVMC Internal Data Reports, 1980-2016

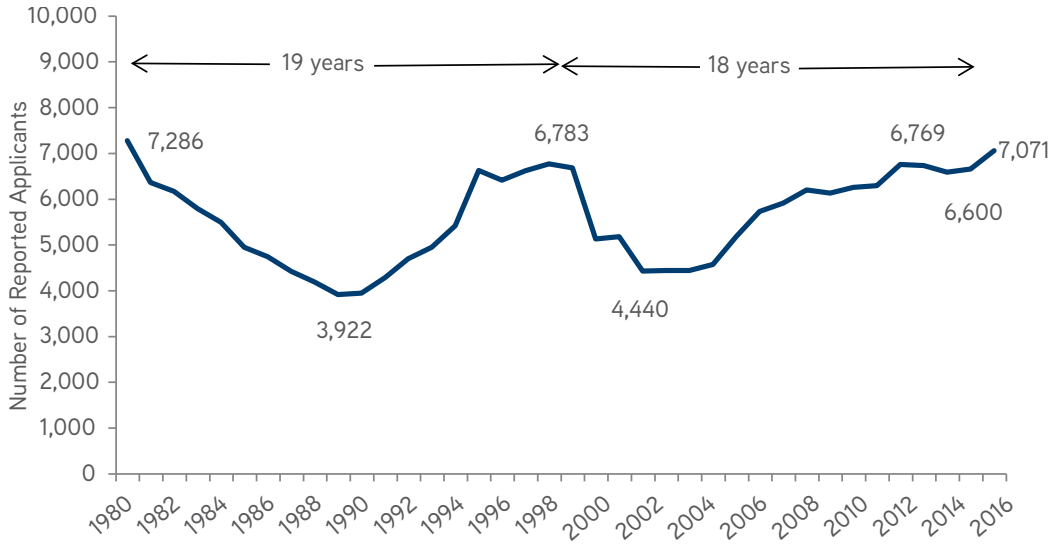


Figure 1

DEMAND FOR VETERINARY COLLEGE SEATS

Using the survey of the VMCAS applicants, the demand for veterinary college seats was determined. In this system, the applicants are able to, and often do, apply for multiple seats with the hopes of securing an agreement with at least one institution. Furthermore as a result, each veterinary college may face several applicants vying for one seat. 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 expressed by each applicant for a seat yields a locus of price and quantity points that describes 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.

In the period of 2014 through 2016 the demand for a veterinary education has decreased then increased to below the starting point at constant price levels. This is illustrated in a shift to the left from 2014 to 2015 then a shift to the right in 2016, ending between the 2014 and 2015 curves.

The implication of this shift is that from 2014 to 2015, at the same price, fewer market participants (applicants) are demanding a veterinary education seat. More specifically, in 2014, 53.3 percent of applicants were willing to pay up to $150,000 for a veterinary education, while in 2015 only 37.1 percent of the applicants were willing to pay up to $150,000 for a veterinary education. In 2016, however, 40.2 percent of applicants were willing to pay up to $150,000 for a veterinary education, as depicted by a shift to the right of the demand curve. Measurement of this demand curve will be important as strategies to improve the financial literacy of pre-veterinary students are implemented. Will these strategies affect a shift in the applicant demand? More importantly, to track our potential successes, we must be able to measure the impact of strategies already employed.

APPLICANT DEMAND, 2014, 2015 & 2016

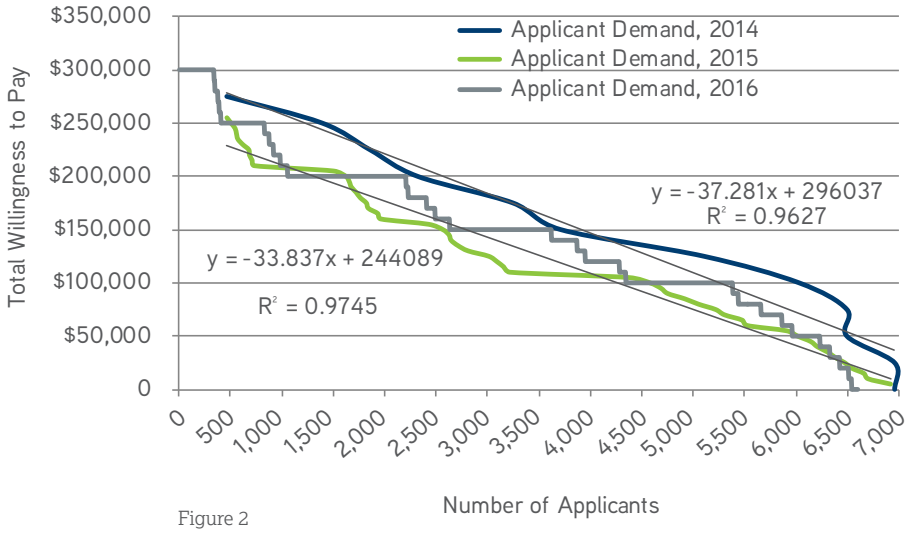


Figure 2

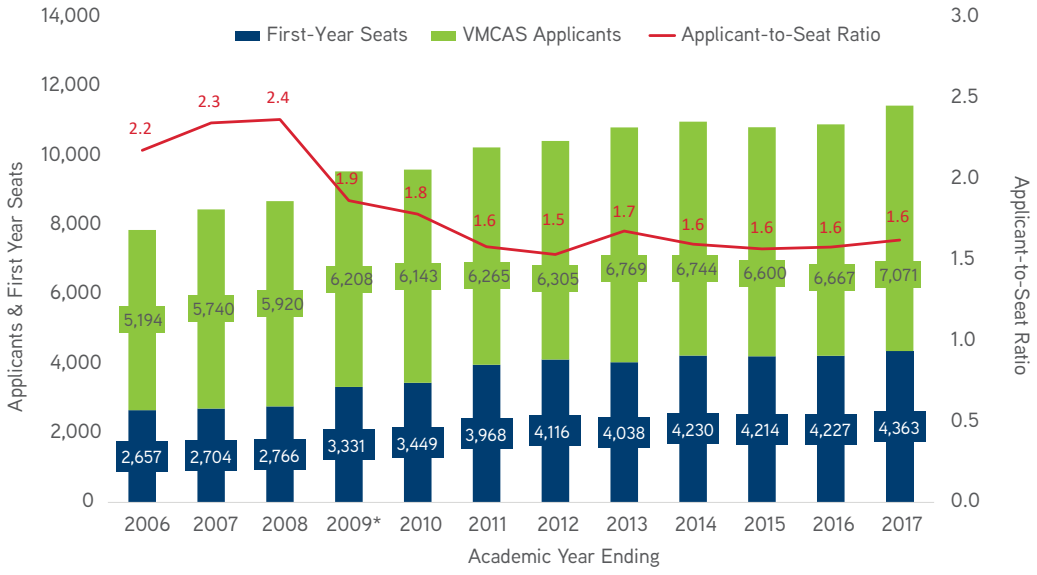
APPLICANT-TO-SEAT RATIO

Over the last four years, the applicant-to-seat ratio has remained relatively constant at 1.6. In 2016 there were 6,667 applicants through the VMCAS system and 4,227 available seats yielding an applicant-to-seat ratio of 1.57; and in 2017 there were 7,071 applicants and 4,363 available seats, producing an applicant-to-seat ratio of 1.62.

The seats available are located both within the United States and at foreign veterinary colleges and are occupied by U.S. first-year students. It is important to note, however, that the dip in the applicant-to-seat ratio in 2009 was primarily as a result of adding the U.S.-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

As found in previous years, the gradually declining applicant-to-seat ratio has yet to translate into an applicant pool of diminished quality. Over the period 2005 through 2017 there has been no significant difference in applicants' GPA or GRE scores. Simultaneously, there has also been no significant change in the North American Veterinary License Exam (NAVLE) pass rate.

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%
2017	3.55	66%	57%

Table 1

VETERINARY COLLEGES SUPPLY OF SEATS

The number of seats available to U.S. students includes those seats available at the 30 AVMA-accredited veterinary colleges in the United States, three AVMA-accredited Caribbean Colleges, 16 AVMA-accredited veterinary colleges in other countries, and numerous other veterinary colleges across the globe. While the AVMA has members who graduated from more than 225 veterinary colleges, the VMCAS tracks only U.S. citizens who apply for seats at AVMA-accredited veterinary colleges. The seats currently occupied include the 2017 through 2020 graduating classes. Using the estimated number of graduates by source, there are currently an estimated 4,363 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 500 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.

U.S. VETERINARY GRADUATES, ALL SOURCES

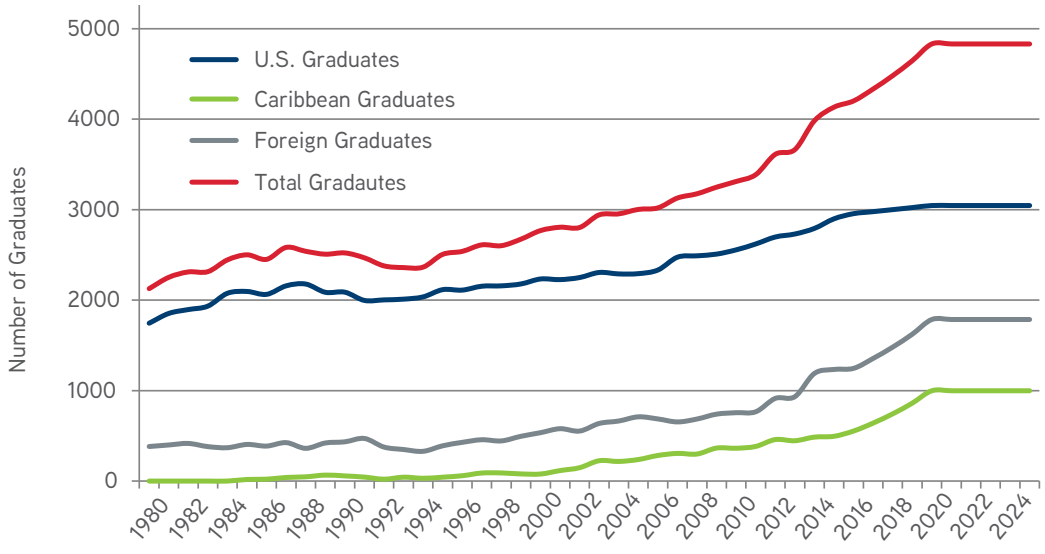


Figure 4

In 2016, veterinary colleges in the United States produced more than 2,900 new veterinarians. With colleges averaging four classes in the DVM program at any given point, equating to roughly 13,000 seats, the income generated by this sector is certainly sustainable at least for the next four years. For 2016 U.S. graduates, tuition and fees ranged from more than $69,000 to almost $225,000 for four years of matriculation through the DVM program. Western University supplied non-discounted seats at the highest prices while the Kansas State University supplied discounted seats at the least expensive prices. In the past, seats were separated by in-state (resident) and out-of-state (non-resident) designations. In-state seats were discounted based on the amount of state appropriations the college of veterinary medicine received either separately or through the general university. Out-of-state seats were considered non-discounted as these students were not provided the subsidy from the state appropriation. However, the designation of in-state and out-of-state is no longer appropriate for a number of reasons. Out-of-state student are able to gain state residency at some colleges. Others, who are considered out-of-state students, hold contract seats for which their home state pays the college for some, or all, of the out-of-state component of tuition and fees. Yet other out-of-state students receive scholarships or regional contract reimbursements for some or all of the out-of-state tuition and fees.

SUPPLY OF VETERINARY EDUCATION: TUITION & FEES AND TOTAL COST, 2016

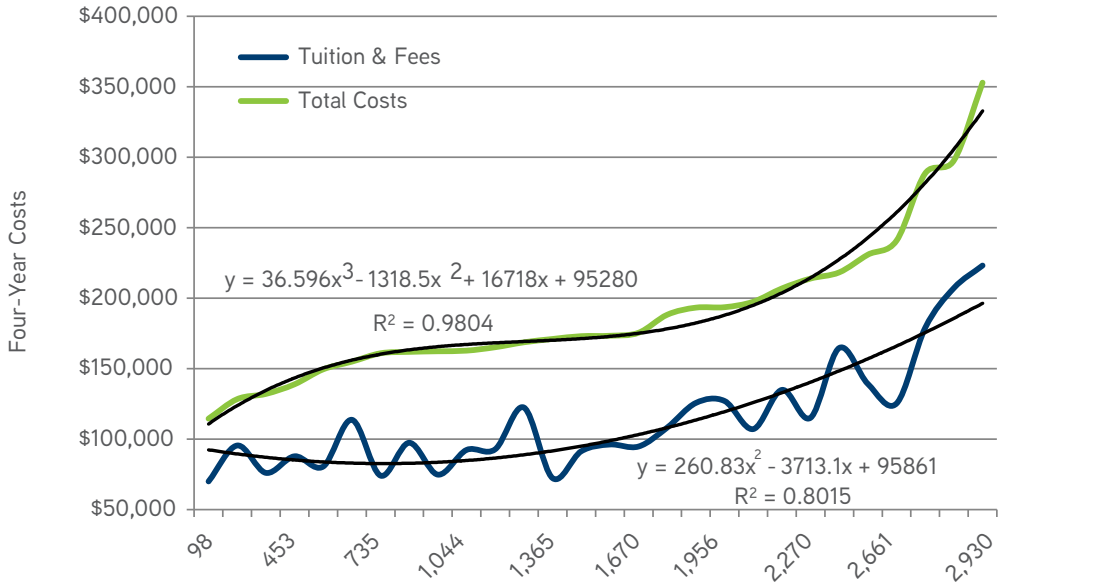


Figure 5

Equilibrium exists in a market at the point where the demand and supply curves intersect. At the point of intersection of the demand and supply curves in the market for education, the willingness of the applicants to pay for seats is just equal to the number of seats the colleges are willing to provide at that price. The equilibrium price and quantity for the 2015 applicants were 1,384 seats at a mean total cost of $197,242. In 2016, demand increased and the cost per seat increased but the number of lower-cost seats increased (supply shifted right). As a result, applicants were willing to occupy 1,860 seats at a mean total cost of $180,590. At present there are nearly 3,300 seats to be filled and a steady applicant pool. That Figure 6 represents what the 2016 applicants (2020 graduates) indicated they were willing to pay for a seat at a veterinary college and the actual cost of the seats available suggests expectations of costs that are below actual costs. Debt levels suggest that there is a considerable difference between what applicants report as their willingness to pay to attend veterinary school and what they will actually pay. Although applicants have access to information on the costs of attending various schools, the factors that are important in their decision to attend veterinary school or a specific veterinary college are unknown. Furthermore, those who seek education at an "in-state" school and those who are eligible for a discounted rate (contract seat or other form of scholarship) may well indicate a willingness to pay that is well below what they must accept to attend an out-of-state school. We are unable to track applicants to graduates to determine the difference between what the applicant was willing to pay and what they actually paid. The difference currently measured may simply be related to the selection of applicants that are willing to pay more for a seat.

SUPPLY AND DEMAND FOR VETERINARY EDUCATION, 2015 & 2016

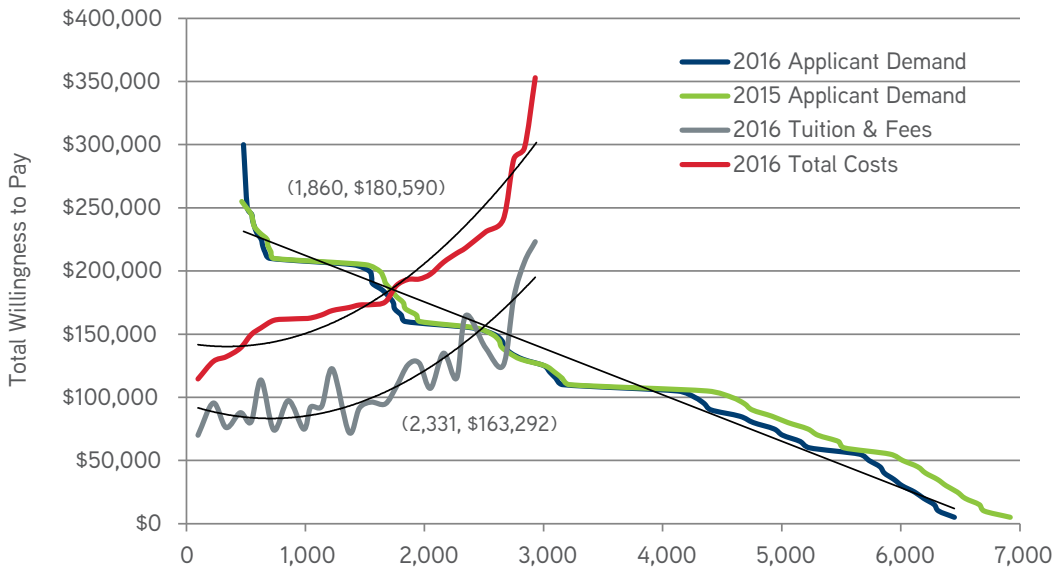


Figure 6

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

SUPPLY OF VETERINARY EDUCATION AND DVM DEBT, 2016

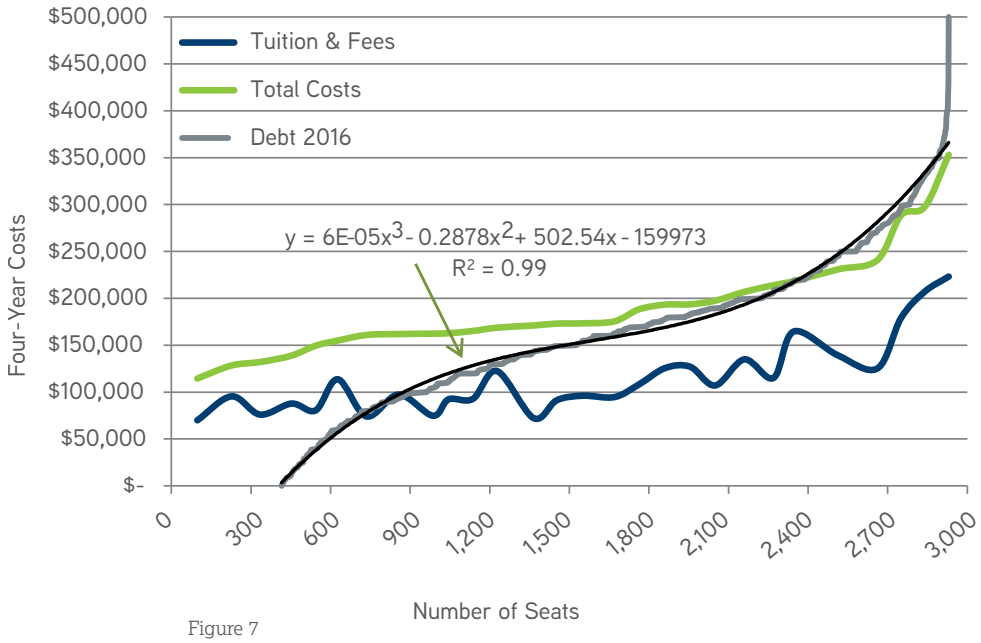


Figure 7

APPLICANTS ESTIMATE OF THE DVM DEBT

The 2016 applicants were asked to estimate the debt load of the 2015 graduates. The following chart depicts their responses. As a comparison, the actual 2015 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.

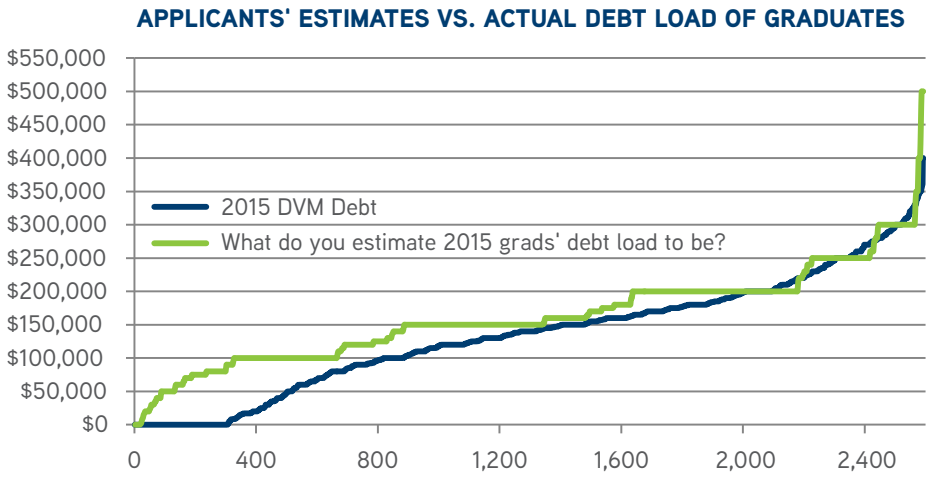


Figure 8

IN 2016 LESS THAN 1 PERCENT OF THE GRADUATING CLASS HAD DEBT LEVELS MORE THAN $450,000.

THE 2016 GRADUATING CLASS

In 2016, the senior survey was sent to 28 AVMA-accredited U.S. veterinary colleges and four U.S. accredited veterinary colleges located outside of the United States that had graduating seniors. The following table shows the response rates by school for the 2016 graduating class.

RESPONSE RATE BY VETERINARY COLLEGE, 2016

School Name	# of Graduates	Responses	Response Rate
Auburn University	116	116	100.0%
Colorado State University	130	85	65.4%
Cornell Veterinary College	100	99	99.0%
Cummings SVM at Tufts University	93	80	86.0%
Iowa State University	142	107	75.4%
Kansas State University	112	89	79.5%
Louisiana State University	85	85	100.0%
Michigan State University	109	83	76.1%
Mississippi State University	83	83	100.0%
North Carolina State University	98	98	100.0%
Oklahoma State University	88	88	100.0%
Oregon State University	55	53	96.4%
Purdue University	82	82	100.0%
Texas A&M University	130	124	95.4%
The Ohio State University	157	150	95.5%
Tuskegee University	69	69	100.0%
University of California-Davis	134	134	100.0%
University of Florida	110	99	90.0%
University of Georgia	98	98	100.0%
University of Illinois	116	82	70.7%
University of Minnesota	97	90	92.8%
University of Missouri-Columbia	108	107	99.1%
University of Pennsylvania	117	81	69.2%
University of Tennessee	79	75	94.9%
University of Wisconsin	79	79	100.0%
Virginia-Maryland College	117	116	99.1%
Washington State University	122	110	90.2%
Western University-California	104	81	77.9%
Total U.S. Schools	**2,930**	**2,643**	90.2%
Foreign Schools			
Ross University	255	121	47.5%
St. George's University	98	51	52.0%
University of Edinburgh	106	14	13.2%
University College, Dublin	103	10	9.7%

Table 2

As a result of the low participation rates of U.S. graduates at the foreign veterinary schools, we omitted these data from our analysis. Insufficient data inhibits identifying with certainty the statistical validity of these data with respect to representing the population of foreign graduates. Future reports will highlight the magnitude of data currently available on graduates of foreign institutions.

DESCRIPTIVE STATISTICS OF GRADUATES

From 2012 through 2016 the percentage of the graduating class reporting finding offers for jobs or to continue their education has been steadily increasing.

A major component of the senior survey addresses 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 any 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 some students reported finding no employment at the time the survey was distributed, evidence from other AVMA surveys suggest that many of these new veterinarians found employment within a year of graduating.

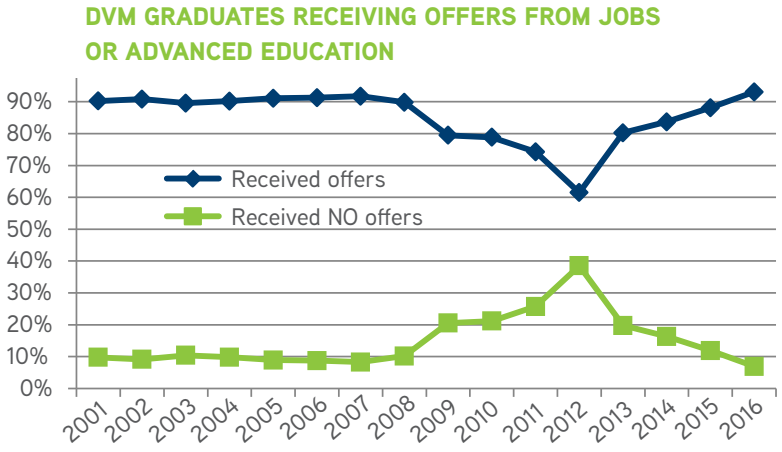


Figure 9

The percentage of graduating veterinary students finding full-time employment or getting offers to pursue post-graduate education in the 2016 graduating class was 93.1 percent, the highest rate for the entire period under examination. Although the recent economic recession had a direct impact on the number of students securing post-employment plans, the economy has been regaining ground, reflected in the increasing number of new graduates finding employment or educational opportunities. Also noteworthy is that the percent of graduates receiving some type of income opportunity is steadily increasing even though the number of graduates is simultaneously increasing over the period. The number of new veterinarians finding full-time employment showed an increase to 54.9 percent in 2016, from 48.9 percent in 2015. The number of new veterinarians not finding employment or receiving an invitation to pursue continuing education decreased from 11.9 percent in 2015 to 6.9 percent in 2016. Even more important is that in 2016 a record number of graduates found full-time employment prior to graduation – 64.4 percent – the second year in a row that a new record number of full-time employment was attained.

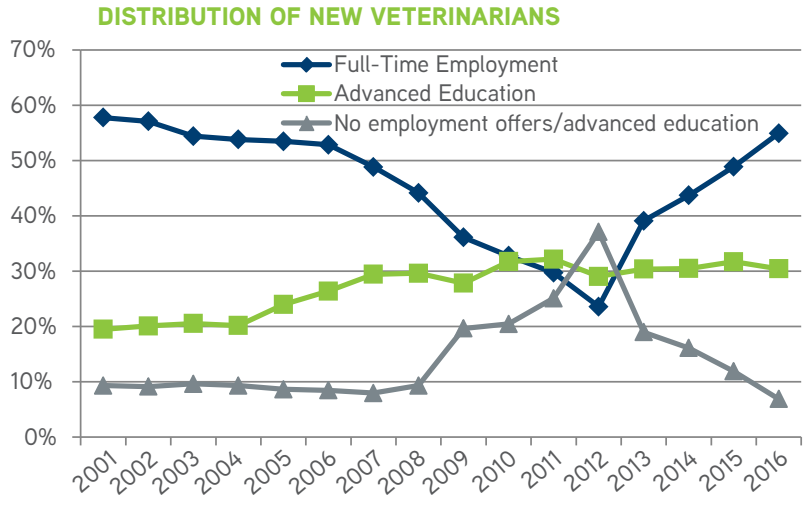


Figure 10

Throughout the period 2001 through 2016 the majority of new veterinarians reported finding full-time employment in the companion animal exclusive sector. New entrants into this sector declined throughout the period 2004 to 2012, however, with a slight increase between 2012 and 2014, followed by a downward turn in 2015. This trend took a turn in 2016 with an increase to 30.4 percent. Though the trend was upward from 2015 to 2016, the highest point was 42 percent in 2004. Of note is that the loss in the percent of graduates obtaining full-time employment in companion animal practices was offset by the 10 percent increase in graduates electing an internship opportunity.

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

DISTRIBUTION OF NEW VETERINARIANS: PRIVATE PRACTICE

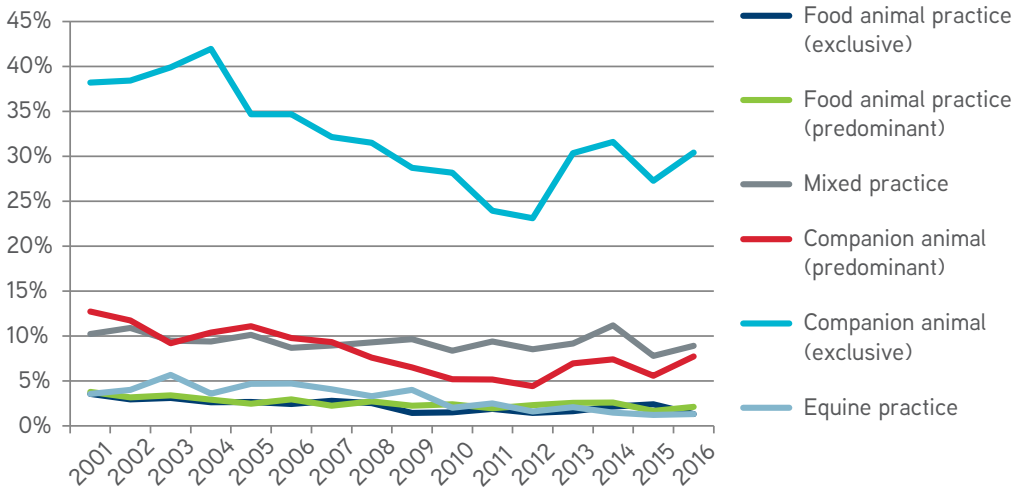


Figure 11

Over the period under examination, the percentage of new veterinarians finding full-time positions in public practice has been consistently small but steady. Between 2015 and 2016, the number of new veterinarians going into federal government, college or university, and not-for-profit organizations increased while the number of new veterinarians going into uniformed services, state and local government, and industry decreased.

DISTRIBUTION OF NEW VETERINARIANS: PUBLIC PRACTICE

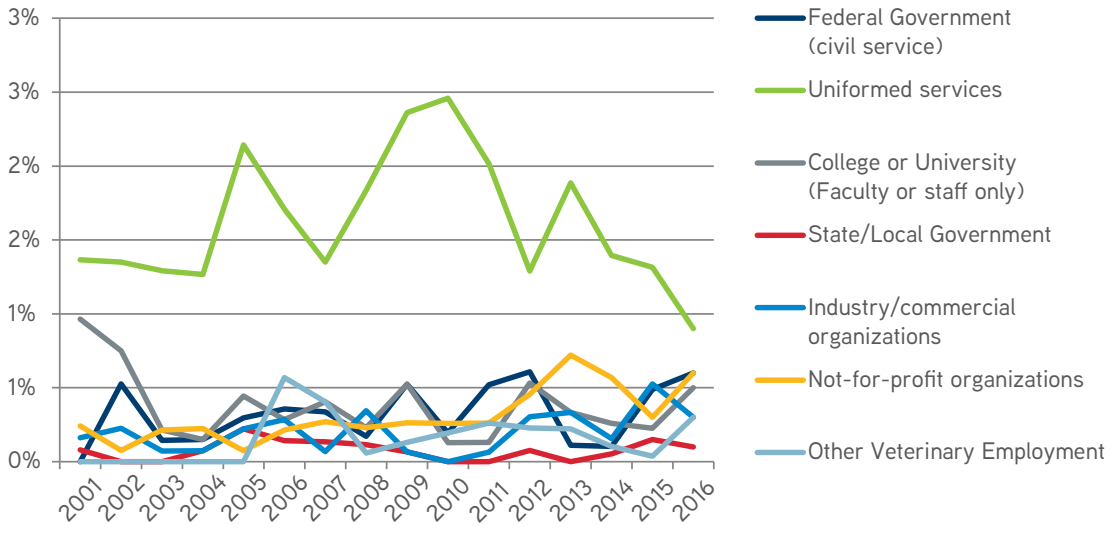


Figure 12

The percentage of new veterinarians pursuing career opportunities in private practice has increased from 56.9 percent in 2015 to 60.5 percent in 2016 while the percentage pursuing careers in public practice remained steady. Internship participation, however, has decreased from 35.6 percent in 2015 to 31.6 percent in 2016. As previously noted, the tradeoff between internships and private practice continues to be evident with the number of public practice entrants unaffected by changes in internship participation.

DISTRIBUTION OF NEW VETERINARIANS: PRIVATE, PUBLIC AND INTERNSHIPS

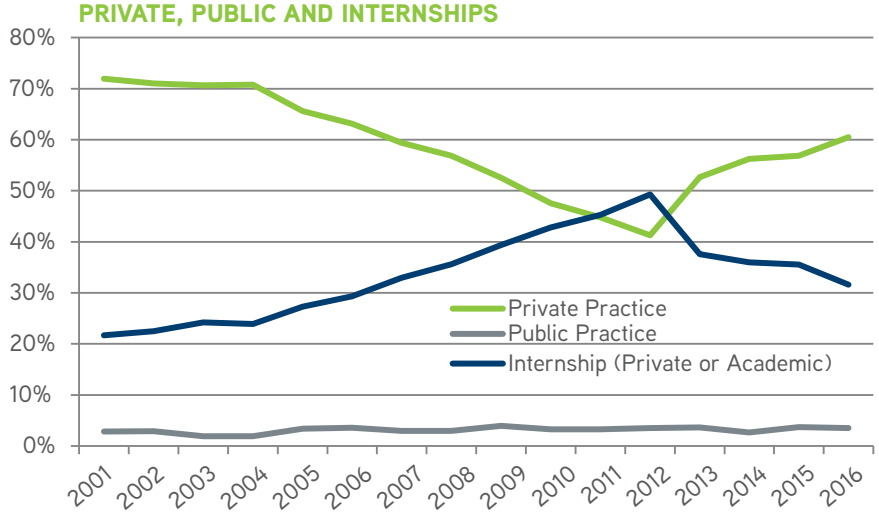


Figure 13

Although companion animal practice comprises more than two-thirds of the profession, over the last eight years, 75 percent of new veterinarians pursuing internships reported being in a companion animal focused internship. There has generally been no change in the distribution of new graduates pursuing the various species of internships. Over the last eight years, the second highest type of internships pursued by new veterinarians is equine focused with an average of 20 percent of those pursuing internships post-graduation.

SPECIES FOCUS OF INTERNSHIP

The percentage of new graduates pursuing advanced education after veterinary college has remained relatively constant between 2015 and 2016. After internships, the second largest group of continuing education activity is residency programs.

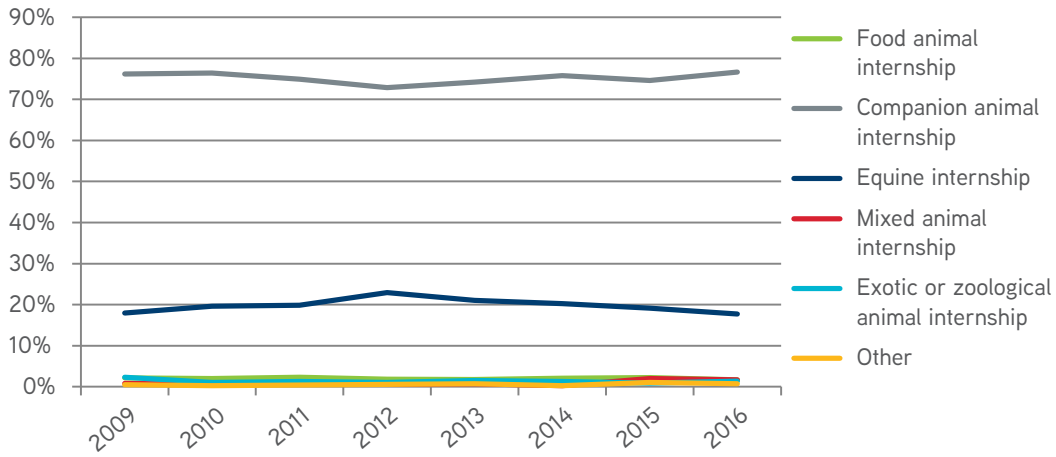


Figure 14

DISTRIBUTION OF NEW VETERINARIANS: ADVANCED EDUCATION

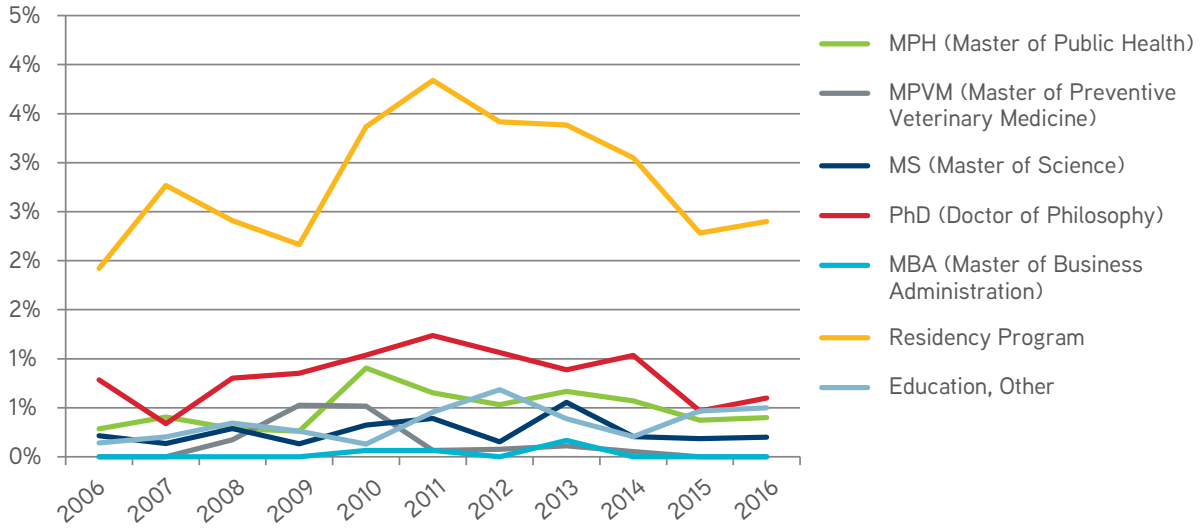


Figure 15

NEW VETERINARIAN INCOMES

Veterinarians in full-time positions in private practice have since 2010 consistently been the highest compensated group among the class, with veterinarians in public practice following close behind.

From 2001 through 2016, the mean starting salary for new graduates increased from just under $40,000 to more than $58,000. 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 $1,220 per year over the 16-year period, an increase from the estimated $1,050 per year increase over the 15-year period evaluated in 2015. More specifically, over the same period, those in private practice and public practice experienced an annual increase of $1,873 and $1,201, respectively.

Veterinarians in full-time positions in private practice have since 2010 consistently been the highest compensated group among the class, with veterinarians in public practice following close behind. The lowest compensated group within the class was of those pursuing internships, with mean annual earnings of $30,829 in 2016 and an annual increase of $522 per year (between 2006 and 2016).

Since 2009, private practice has offered 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. The effect of the recession on state and federal budgets has had a large impact on public practice incomes compared to the impact of the recession on private practice incomes. Currently, as mentioned in previous reports, both are below their long-term trend but following a similar direction in terms of growth.

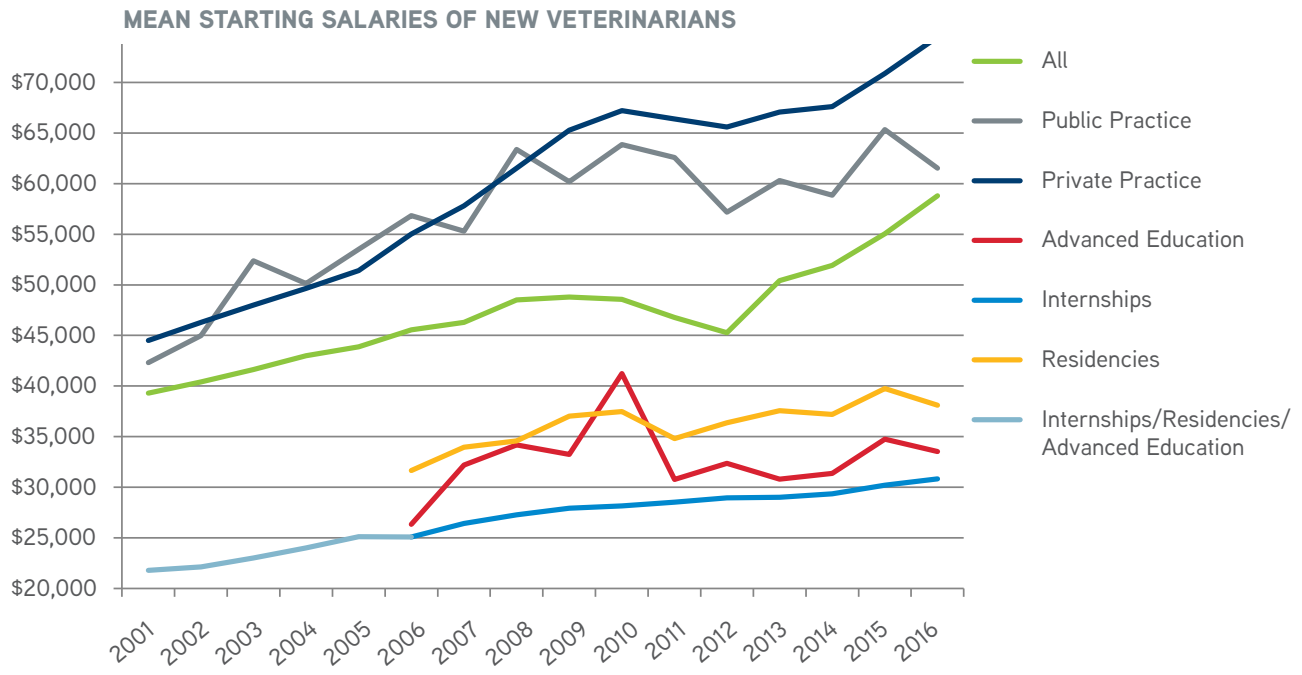


Figure 16

The weighted, mean starting salary for 2016 graduates finding full-time employment prior to graduation was $73,380, up from $70,117 in 2015. Figure 17 illustrates the mean starting salary. The amount of variation in salaries, one standard deviation around the mean, is indicated by the perforated lines on either side of the mean line. That is, 68 percent of new veterinarians employed in full-time positions earned between $57,000 and $89,000 in 2016.

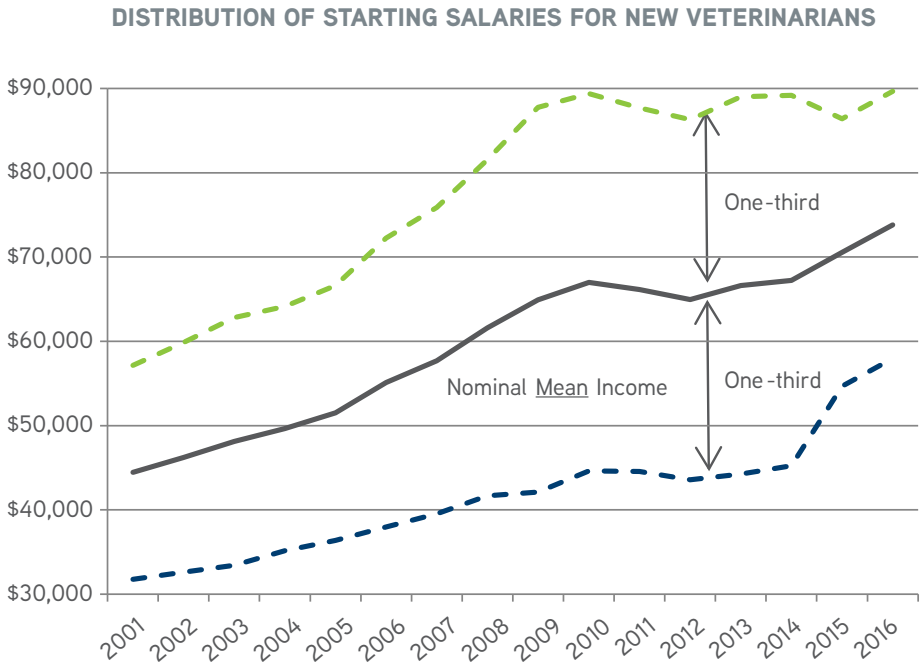


Figure 17

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

MEAN STARTING SALARIES: PRIVATE PRACTICE

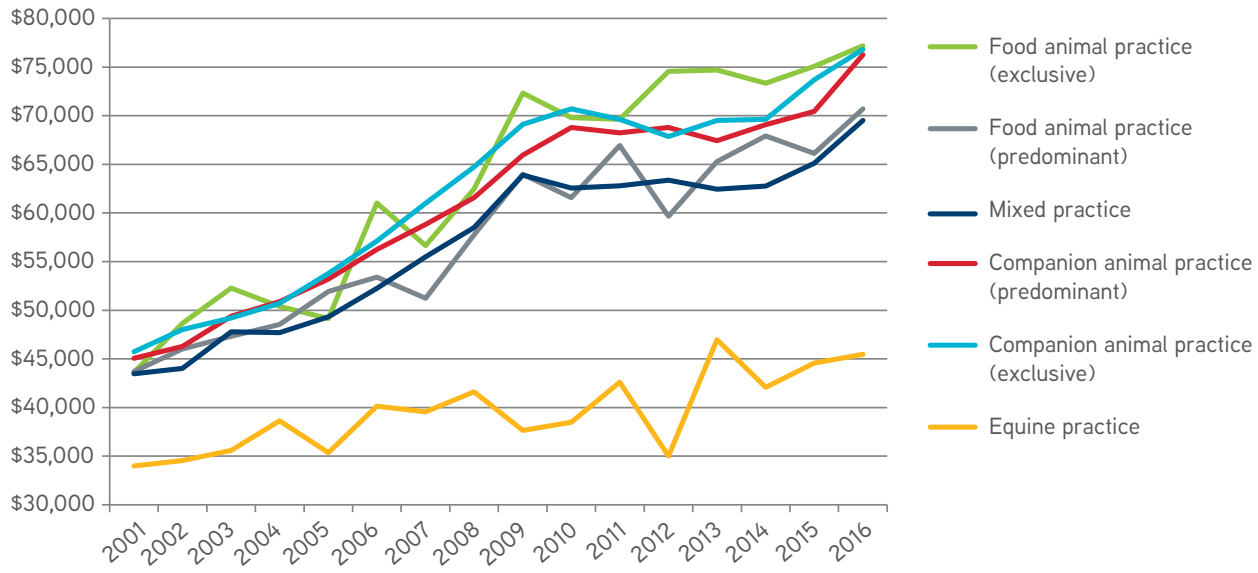


Figure 18

Since relatively few graduates reported finding employment in the public sector, the variability in incomes is much larger than that of private practice. As in previous years, 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.

MEAN STARTING SALARIES: PUBLIC PRACTICE

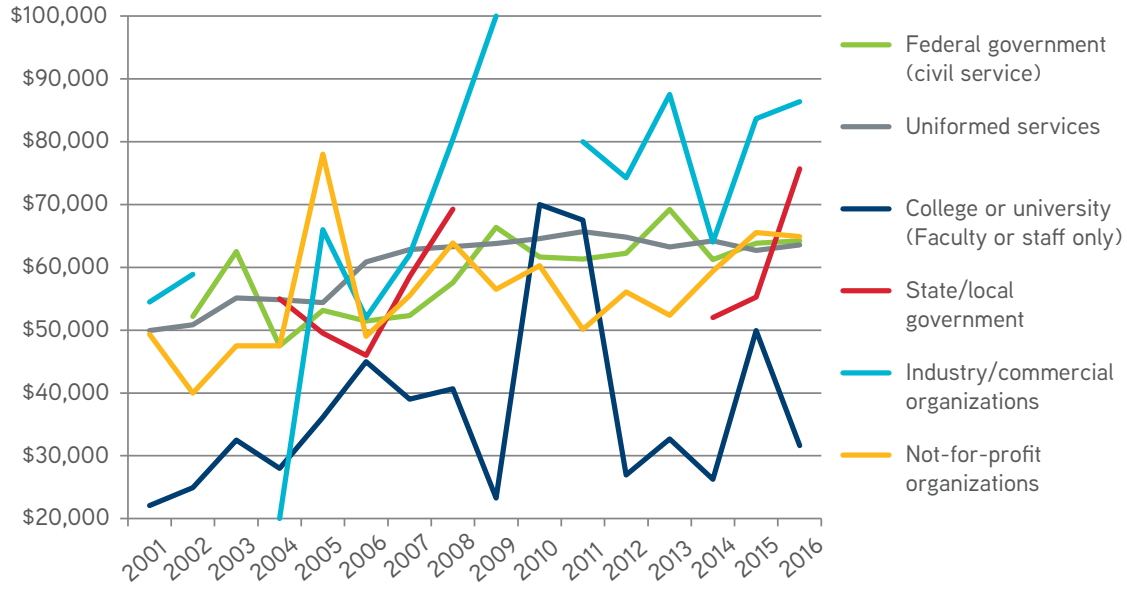


Figure 19

The variation in incomes among the various types of advanced education options 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.

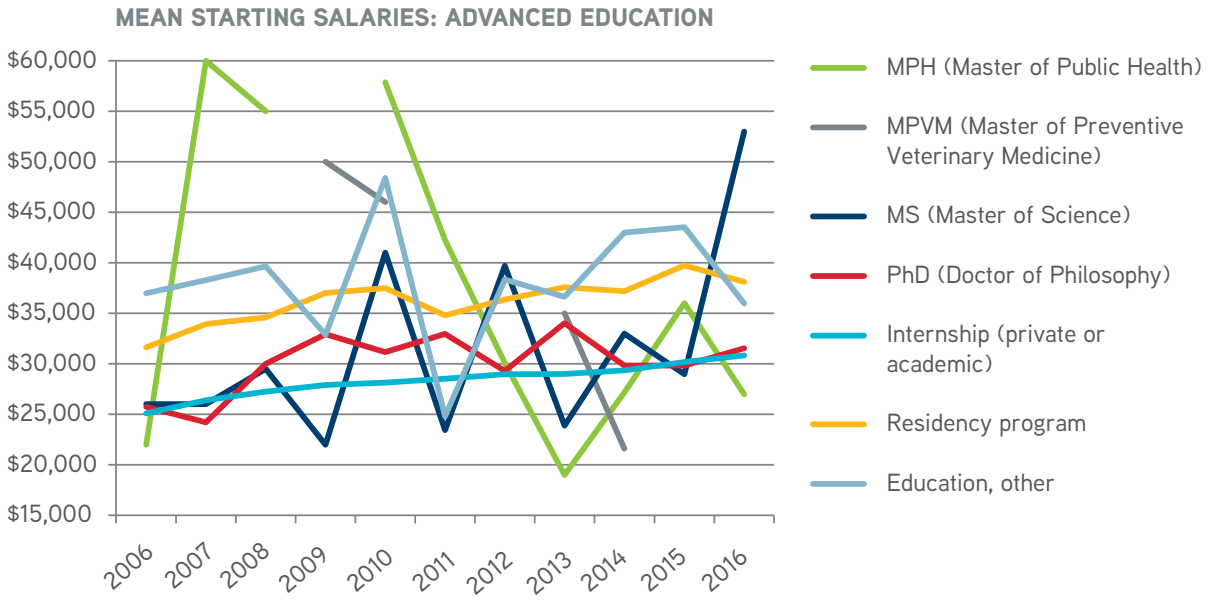


Figure 20

Numerous factors affect starting salaries: Outside of the economy, starting salaries can be influenced by the number of new veterinarians pursuing internships, a change in the gender distribution among new veterinarians, variation in the distribution of practice types new veterinarians pursue, and as a result of changing the location of employment. To accurately identify the trends in starting salaries impacted only by economic factors (general economic growth, the quantity of veterinarians supplied), an index is created to control for all other factors (changes in demographic characteristics, inflation).

The value of starting salaries, known as the real weighted mean income Index (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 who received full-time employment prior to graduation.

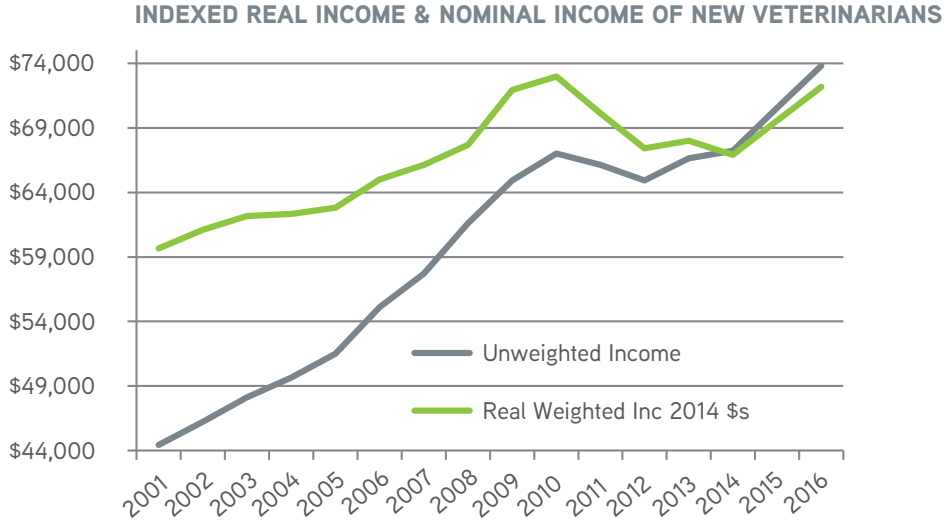


Figure 21

FACTORS AFFECTING INCOMES FOR NEW VETERINARIANS

Numerous factors explain the variation in income. The following table describes the effect on starting salaries of various factors identified by analyzing these starting salaries through a multiple linear regression in which the dependent variable is the starting salary of new veterinarians. The data used in this analysis comprise 16 years of responses from more than 92 percent of all graduates of the 28 U.S. veterinary colleges (35,056 total observations). The college, from which they graduated, 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; were all factors analyzed to understand impact on salaries.

The non-standardized coefficient indicates the dollar-value impact of the corresponding variable. Starting with a constant of $54,719.91, for example, the value of the coefficients (times the value of the factor) are added. For instance, a graduate in 2017 would have an estimated mean income of $82,495.53 ($54,719.91 plus 17 times 1,633.86).

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 and significantly different from '0.' For instance, for Region 4 the p value is 0.927; this means it is not statistically and significantly different from the baseline, Region 3.

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

The unstandardized coefficient for the variable "year" is $1,633.86 and indicates that the mean starting salary for new veterinarians increases by $1,633.86 every year. This is the trend increase, however, and does not consider a change in the number of new veterinarians or a change in the general economic conditions (e.g., Gross Domestic Product [GDP]).

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

The factors that were included in this model produced an R square of 0.728. This indicates that the inclusion of all of these factors were able to explain 72.8 percent of the variation between the individually reported salaries and the estimated mean starting salary for all new graduates between 2001 and 2016.

NEW VETERINARIANS GOING INTO INTERNSHIPS MAKE MORE THAN $35,000 LESS THAN THOSE GOING INTO COMPANION ANIMAL EXCLUSIVE.

FACTORS AFFECTING STARTING SALARIES OF NEW VETERINARIANS

			Unstandardized Coefficients		Standardized Coefficients		
			B	Std. Error	Beta	T	Sig.
Demographics	Basic Info	(Constant)	54,719.91	812.932		67.312	0.000
		Year (Use Last 2 Digits of Grad Year)	1,633.86	19.160	.366	85.274	0.000
		Age	43.47	22.133	.007	1.964	.050
		Gender: F=1, M=0	-2,386.49	169.855	-.051	-14.050	.000
		Anticipated Hours per Week	-121.85	6.888	-.085	-17.689	.000
		Dvm Debt in Thousands	7.40	1.133	.026	6.531	.000
	Region (First Digit of Zip Code)	Region 0	1,639.68	319.404	.022	5.134	.000
		Region 1	2,656.51	313.630	.036	8.470	.000
		Region 2	1,380.24	285.920	.021	4.827	.000
		Region 3	0.00	0.000	0.000	0.000	0.000
		Region 4	26.89	292.721	.000	.092	.927
		Region 5	-888.74	343.266	-.011	-2.589	.010
		Region 6	-476.65	311.944	-.007	-1.528	.127
		Region 7	1379.71	289.721	.021	4.762	.000
		Region 8	2,225.67	304.669	.031	7.305	.000
		Region 9	4,370.12	285.263	.069	15.320	.000
		Outside of the U.S.	620.12	894.126	.003	.694	.488
	Additional Degrees Held	Admitted to DVM Program before Degree Earned	-69.58	229.629	-.001	-.303	.762
		Bachelors Degree					
		Masters Degree	439.57	301.491	.005	1.458	.145
		Doctorate Degree	-688.86	890.579	-.003	-.773	.439
		Other Professional Degree (MD, JD, Etc)	483.80	1366.533	.001	.354	.723
		Other Degree	-1,674.10	1040.275	-.006	-1.609	.108
Post-Graduate Plans	Private Practice	Food Animal (Exclusive)	810.85	517.430	.006	1.567	.117
		Food Animal (Predominant)	-3,022.06	475.340	-.024	-6.358	.000
		Mixed Practice	-4,247.25	265.994	-.062	-15.967	.000
		Companion Animal (Exclusive)					
		Companion Animal (Predominant)	-1165.31	276.886	-.016	-4.209	.000
		Equine	-19,065.10	444.506	-.161	-42.891	0.000
	Public Practice	Federal Government	-4,490.12	1239.928	-.013	-3.621	.000
		Uniformed Services	-1527.33	578.289	-.010	-2.641	.008
		College or University	-28,808.17	1226.762	-.083	-23.483	.000
		State or Local Government	-7714.21	2837.336	-.010	-2.719	.007
		Industry	8,978.44	1661.549	.019	5.404	.000
		Not-For-Profit	-9,616.10	1232.096	-.028	-7.805	.000
	Other	Other Veterinary Employment	-3,360.91	1939.756	-.006	-1.733	.083
	Enrolling in an Educational Progam	Masters of Public Health	-28,698.11	1911.078	-.053	-15.017	.000
		Masters of Preventative Veterinary Medicine	-27,232.01	4743.074	-.020	-5.741	.000
		Masters of Science	-35,238.42	1749.471	-.071	-20.142	.000
		PhD	-34,988.01	952.599	-.131	-36.729	.000
		MBA	-30,427.21	7497.996	-.014	-4.058	.000
		Internship	-35,627.23	244.469	-.781	-145.733	0.000
		Residency	-29,712.41	515.194	-.210	-57.672	0.000
		Education (Other)	-30,785.17	1 522.986	-.072	-20.214	.000

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

	Sum of Squares	df	Mean Square	F	Sig.	
Regression	6.59E+12	41	160815331881	1432.140	.000b	
Residual	2.47E+12	21978	112290235			
Total	9.06E+12	22019				

R	R Square	Adjusted R Square	Std. Error of the Estimate
.853A	.728	.727	10596.70867

Table 3

THE IMPACT OF GDP AND N ON STARTING SALARIES OF NEW VETERINARIANS

As estimated in the above table, several demographic variables are significant in explaining the variation in the starting salaries of veterinarians. Salaries are not solely a function of location, practice type and gender, however, but also a function of the demand for veterinarians, which is driven by the demand for veterinary services. Consequently, GDP and the number of new veterinarians entering the workforce each year (N) also affect starting salaries. Real weighted income closely mirrors the predicted income that is a function of year, GDP and N, with a two-year to three-year lag. This lag is partially in response to an inefficient market caused by adaptive expectations that are typically a product of information asymmetry. That is, each year, instead of veterinary employers anticipating the upcoming year's market and acting accordingly, they react to last year's market causing a lag. This happens as a result of insufficient economic information or more accurately insufficient understanding of available economic information.

According to the *dvm360* article, "Starting salaries are up! (Let's not get too excited)," forming rational expectations to create better coordination among the veterinary markets will provide more sustainable growth in veterinary services, leading to reduced volatility in veterinary incomes.

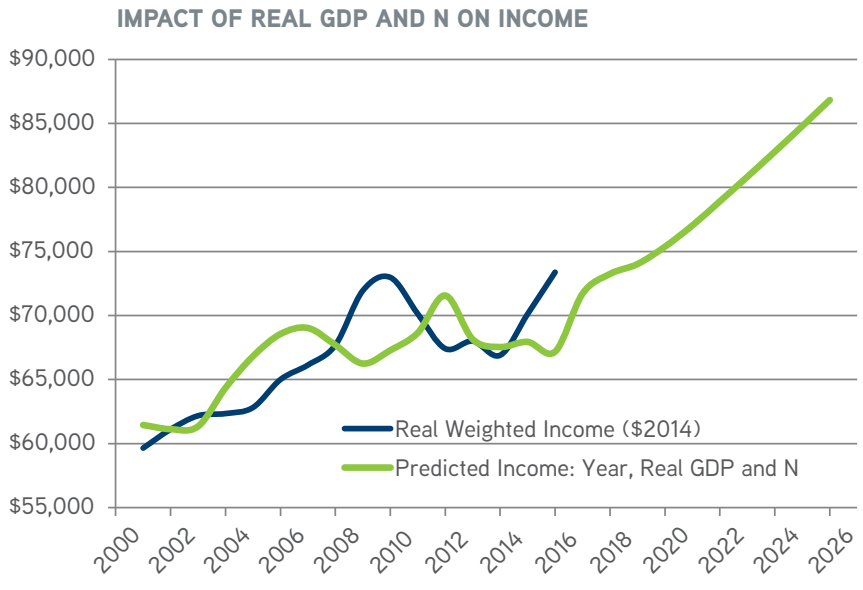


Figure 22

NEW VETERINARIAN DEBT

DVM debt incurred by new veterinarians varies by post-graduation plans.

Over the last 16 years, the DVM degree debt of all veterinary students has been increasing at approximately $5,400 per year; for those reporting non-zero debt, the annual increase has been approximately $6,200. Between 2015 and 2016 mean DVM degree debt of all veterinary students increased by only $1,363 compared to an increase of $7,111 between 2014 and 2015.

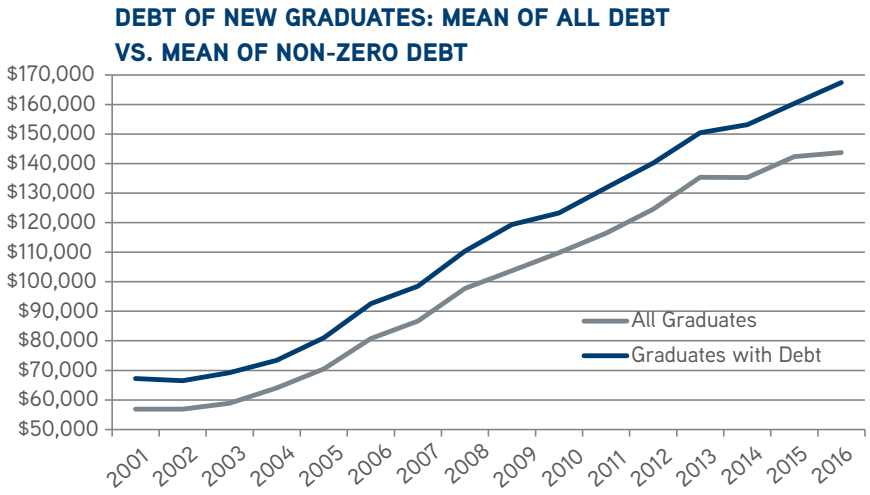


Figure 23

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. In 2016, the mean debt of all students was $23,777 less than the mean debt of graduates reporting zero debt, a group that represents 14 percent of the population. This $23,777 is a 16.5 percent difference in debt.

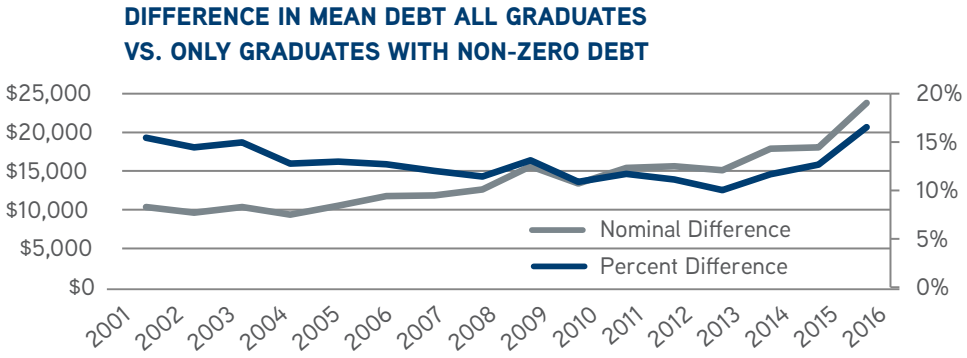


Figure 24

DVM debt incurred by new veterinarians varies by post-graduation plans. Over the period 2001 through 2016 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. As noted in previous reports, it is beyond the scope of this report to identify a research hypothesis as to why a significant difference exists in the DVM debt of new graduates based on post-graduation plans. We can hypothesize that perhaps veterinary students predisposed to public practice are more financially savvy. Or perhaps those with lower debt feel less constrained to enter lower paying careers in public practice. We can even also surmise that maybe those with higher debt feel more obligated to pursue higher paying careers through specialization that requires internships and residencies. There are certainly many plausible hypotheses to explain the larger differences in debt by post-graduate plans, but research on the factors that influence the career choices of graduating seniors is certainly needed.

DVM DEBT BY POST-GRADUATE PLANS

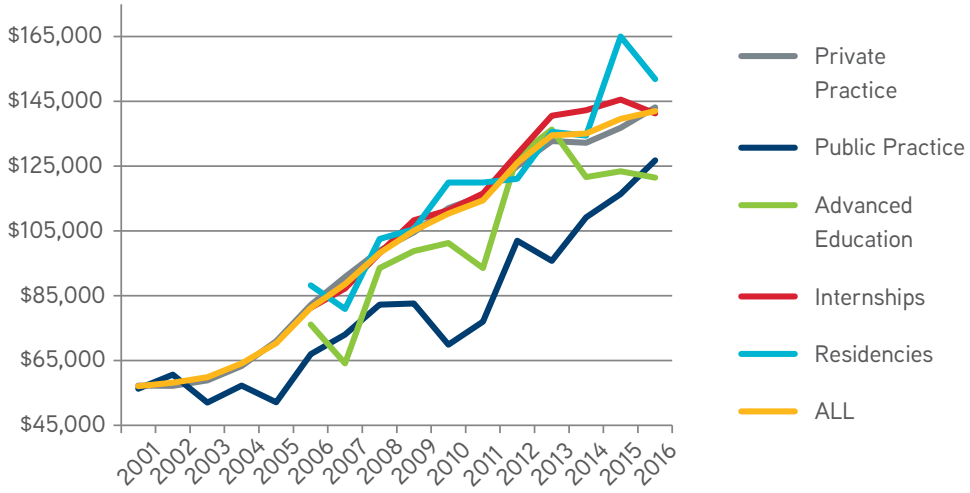


Figure 25

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 more than $321,000. In 2016, the variation in DVM debt, within two standard deviations of the mean, ranged from $0 to more than $330,000. While those with zero debt are well within two standard deviations of the mean, 2.3 percent who are outside of two standard deviations have more than $320,000 in debt. The following table depicts the distribution, by school, of the 2.3 percent of the 2015 and 2016 classes who have more than $320,000 in debt.

From 2015 to 2016, Western University, University of Minnesota, Michigan State University, The Ohio State University, University of Tennessee and University of Pennsylvania had a reduction in the percentage of the class whose debt levels was more than $320,000. Tuskegee University and Kansas State University had large increases in the percentage of their graduating class with debt levels more than $320,000 from 2015 to 2016. Colorado State University, Iowa State University, Oklahoma State University, University of Georgia and Purdue University had a percentage of their class with debt more than $320,000 in 2016 from 0 percent in 2015; and Auburn University, Tufts University and North Carolina State University decreased the percentage of their class with more than $320,000 debt to 0 percent in 2016.

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

	2015	2016
Western University-California	43.7%	35.6%
Tuskegee University	15.5%	22.1%
Kansas State University	2.8%	8.7%
University of Minnesota	14.1%	4.8%
Michigan State University	5.6%	4.8%
University of Tennessee	4.2%	3.8%
University of Pennsylvania	4.2%	2.9%
Louisiana State University	2.8%	2.9%
Colorado State University	0.0%	2.9%
Virginia-Maryland College	1.4%	1.9%
Iowa State University	0.0%	1.9%
Mississippi State University	0.0%	1.9%
Oklahoma State University	0.0%	1.9%
University of Georgia	0.0%	1.9%
The Ohio State University	1.4%	1.0%
Purdue University	0.0%	1.0%
Auburn University	1.4%	0.0%
Cummings SVM at Tufts University	1.4%	0.0%
North Carolina State University	1.4%	0.0%
Total	100.0%	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 $222,500. Comparatively, for the 2016 class, 68 percent of graduates within private practice had a debt load between $54,500 and $232,000. Approximately 16 percent carry a debt load of more than $231,700, while the lowest 16 percent had debt below $54,000.

MEAN DVM DEBT: PRIVATE PRACTICE

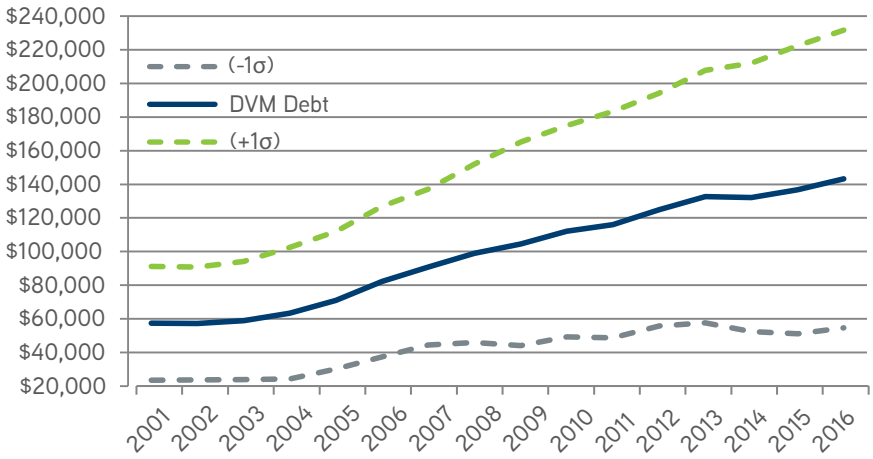


Figure 26

The variation in debt among new veterinarians pursuing public practice was also relatively large. Within the 2015 class, 68 percent incurred DVM debt between $35,000 and $198,000, however, in the 2016 class, 68 percent incurred debt between $37,000 and $216,000. Evidently, in the 2016 class more graduates pursuing public practice had larger debt levels, a range of $178,700 compared to the range of the debt levels of 2015 graduates, $161,210.

MEAN DVM DEBT: PUBLIC PRACTICE

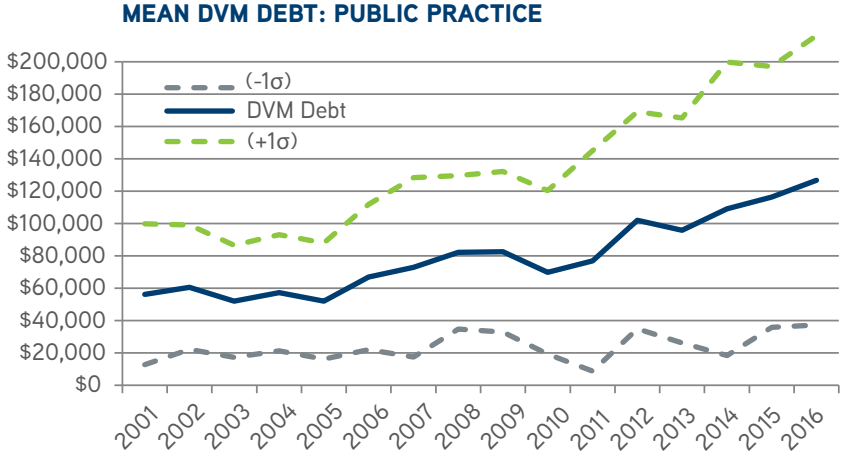


Figure 27

For each sector, whether public practice, private practice, advanced education, internships or residencies, the growth rate of DVM debt has continued to outpace 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 2016. The largest factor in the increasing debt is the cost of education. This increased cost of education is tied closely to the declining amount of state and federal funding received by the veterinary colleges. In addition, the proportion of female veterinarians, whose debt is significantly higher than male veterinarians, has increased over time, and now comprises more than 80 percent of each new class of veterinarians.

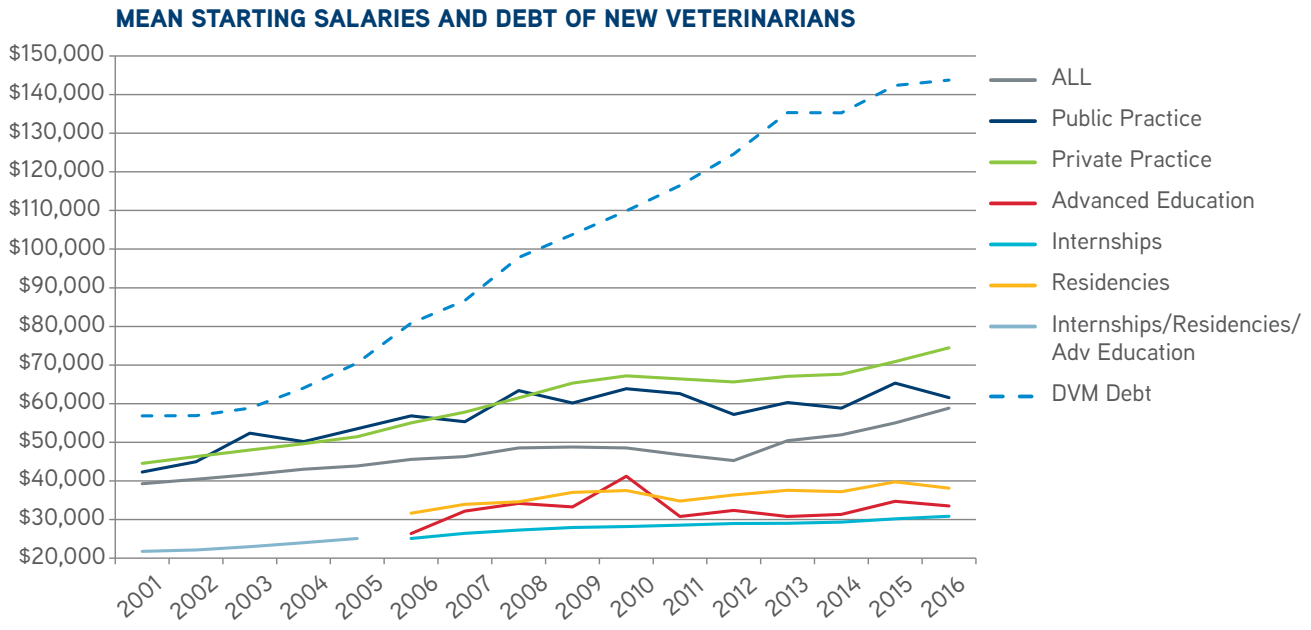


Figure 28

Not only are the starting salaries of female veterinarians significantly lower than those for men, in 2015, new female veterinarians had an average debt load of $7,500 more than new male veterinarians and $7,000 more in 2016. Female graduates have had higher veterinary college debts than their male counterparts throughout the observed period.

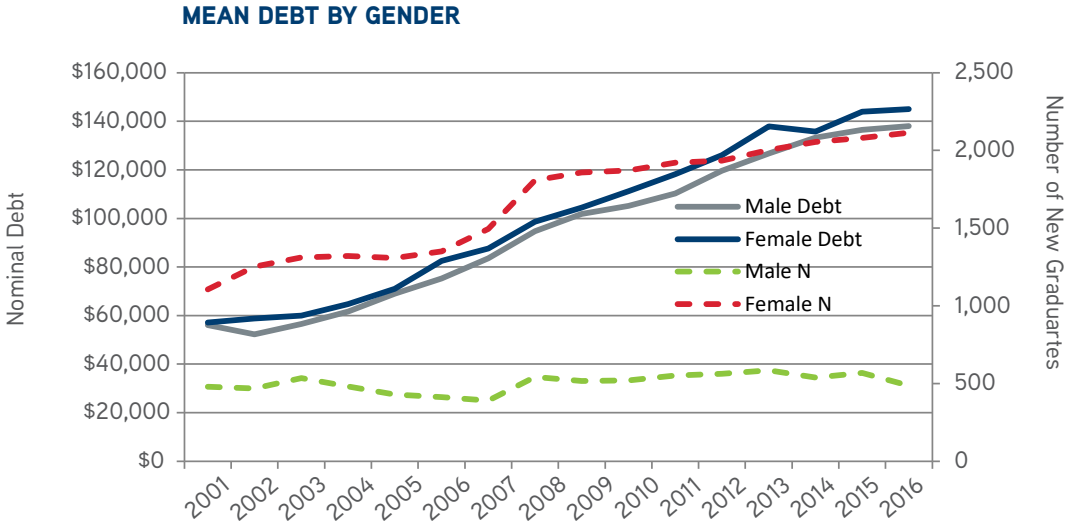


Figure 29

Over the last 16 years, discounted tuition and fees across veterinary colleges have increased by more than 400 percent. This increase was not steady across all colleges. The University of Pennsylvania increased tuition by 67 percent since 2000 while Kansas State University saw an increase of 418 percent. The average increase across all schools from 1999 through 2016 was 210 percent.

U.S. VETERINARY COLLEGES: TUITION AND FEES

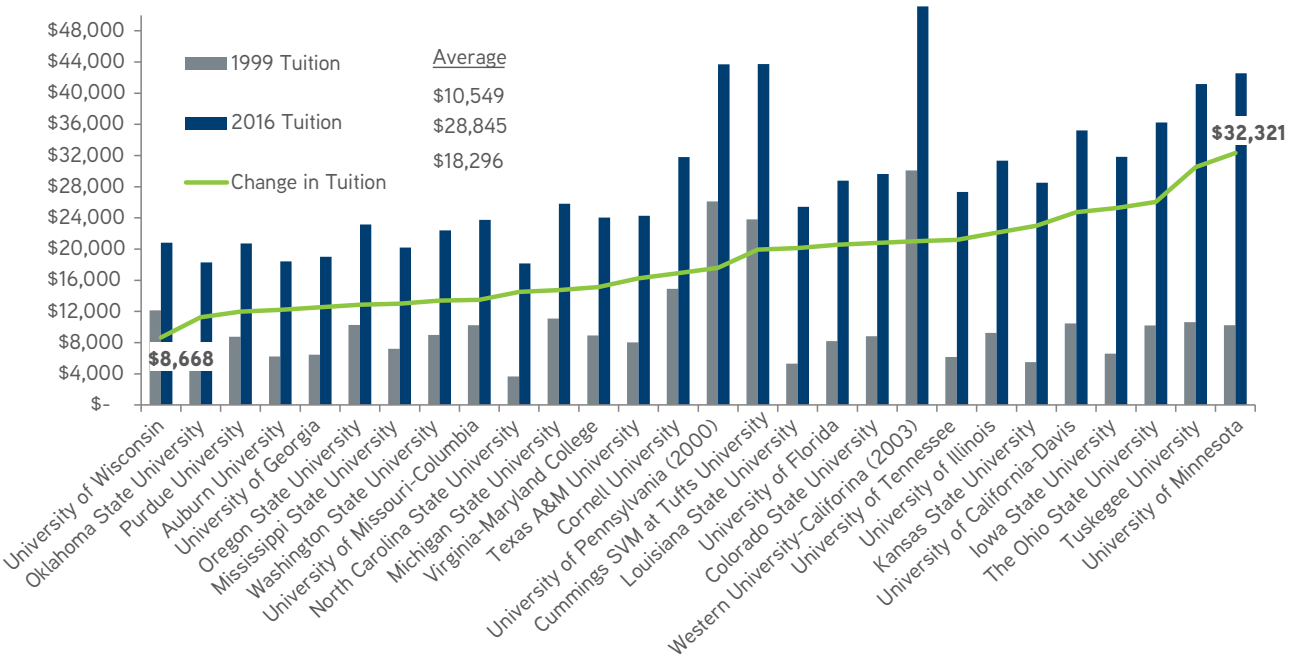


Figure 30

One significant factor contributing to the variation in the debt level of new veterinarians is their residency status. Residents are those who attend veterinary college in the state where they reside while non-residents are those who attend veterinary colleges outside of the state of their primary residence. At some institutions, however, students who entered the college as a non-resident may be able to attain residency status after their first year in veterinary college. As such, 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 more than $30,000 less than the mean debt of graduating veterinary students reporting non-resident status. In 2016, students graduating with residency status incurred a mean debt load that was almost $60,000 less than those graduating with non-residency status.

RESIDENT AND NON-RESIDENT DEBT

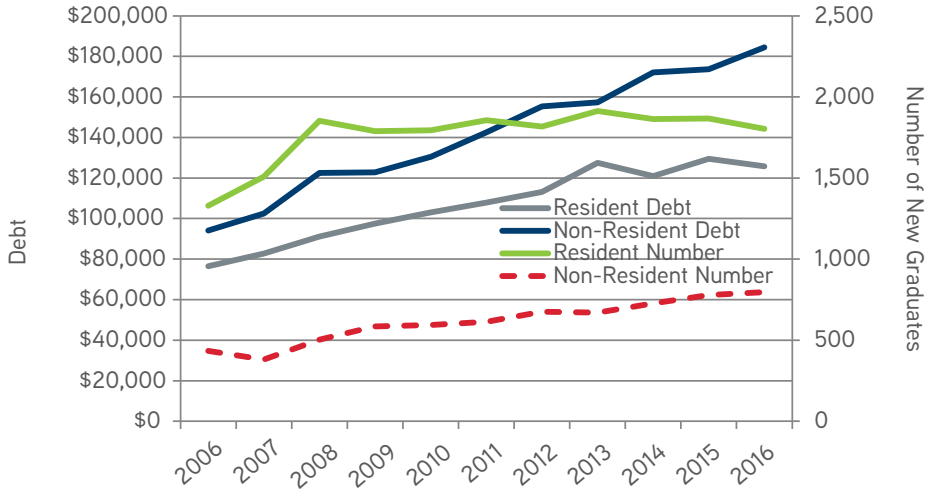


Figure 31

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 from 2001 through 2015, 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. A large increase occurred in 2016, however, with just more than 14 percent of the graduating class reporting having no educational debt. This is the highest percent since 2003.

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

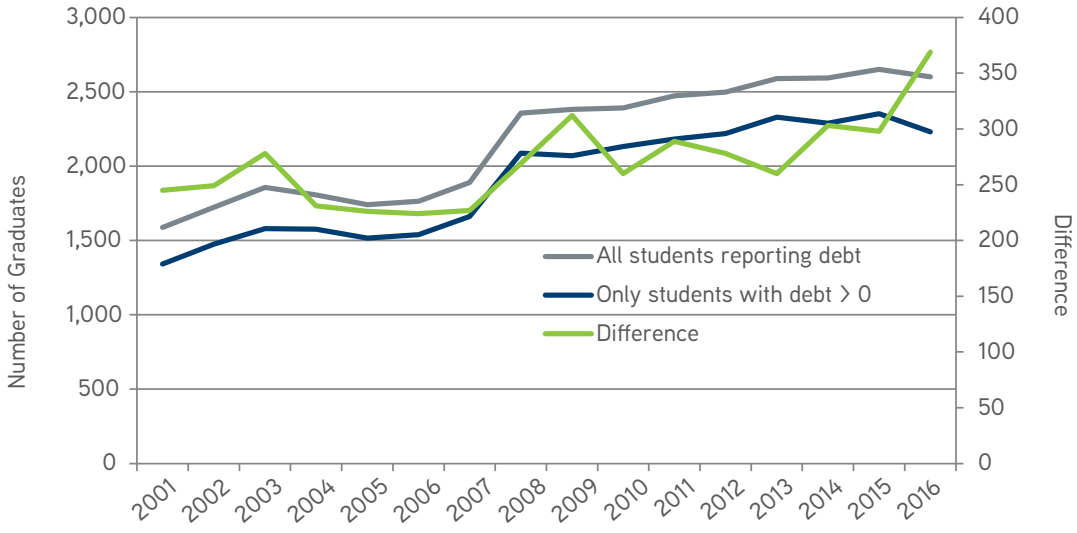


Figure 32

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

NEW VETERINARIANS WITH NO DVM DEBT

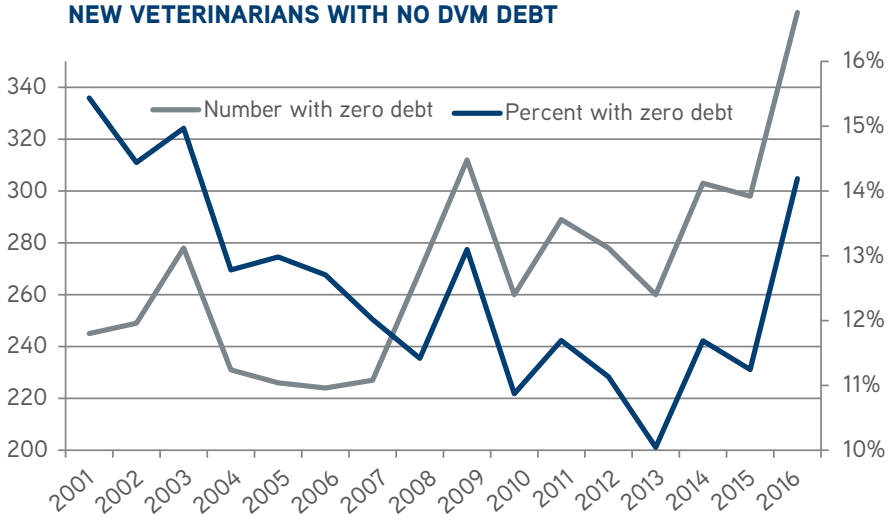


Figure 33

Similar to the methods used to determine the real weighted mean income index, we determine the real weighted mean DVM debt index (RWD) by measuring the annual change in the debt load of a constant cohort of graduates and adjusting for inflation. In 2014 dollars, The RWD nearly doubled from slightly more than $75,000 in 2001 to slightly more than $142,000 in 2016. To determine this measure the following were held constant: 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 AND UNWEIGHTED DEBT

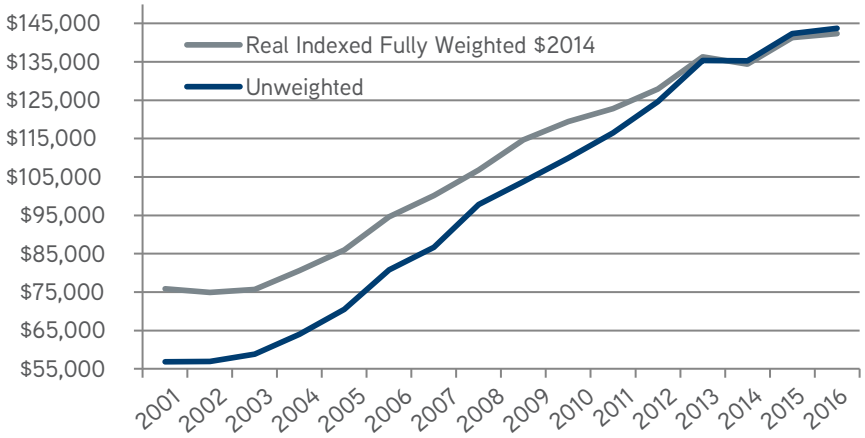


Figure 34

FACTORS AFFECTING DEBT FOR NEW VETERINARIANS

Similar to the methods used to determine the factors explaining the variation in income, a multiple linear regression was calculated 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 those located in an area with a ZIP code beginning with 3. To determine tuition grade, we determined by year, the mean tuition and categorized as "low tuition" those schools with tuition falling within two standard deviations below the mean, "median tuition" those schools with tuition above the mean tuition but within two standard deviations above the mean, and schools labeled "pricey tuition" those with tuition two standard deviations above the mean tuition.

According to our regression model, new veterinarians graduating from schools in Region 6 had $8,794 more debt than new veterinarians graduating from schools in Region 3, and new veterinarians graduating from schools with "pricey tuition" had $67,410 more debt than those graduating from schools with "low tuition." Subsequent charts will illustrate the relationship between cost of living and student debt.

Female veterinarians graduated with more than $6,200 more debt, on average, than male veterinarians, and non-residents graduated with an average of $37,315 more debt than residents. In addition, each year, mean DVM debt increased by about $5,772.

As in the regression explaining the variation in income, the non-standardized coefficients in this regression explaining the variation in debt represents the dollar value attached to the variable in question whereas the standardized coefficients represents the relative value of each coefficient. For example, the standardized coefficient for "pricey tuition," 0.201, indicates that the debt incurred from graduating from a school that has pricey tuition carries more than six times more weight than the debt incurred from going to a school in Region 0, represented by a coefficient of 0.032.

Of importance is the unstandardized coefficient for year of the survey that indicates the mean value of costs has increased by nearly $5,800 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 explaining the variation in debt among 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. Efforts to reduce the debt of graduates may not be successful until the factors that explain more of the variation in debt among graduates are discovered.

FACTORS AFFECTING DEBT OF NEW VETERINARIANS

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	$(11,644,493.8)	333,161		-34.952	.000
	Year of the survey	$5,772.4	166	.240	34.829	.000
	Region of School 0	$(13,360.7)	3,236	-.032	-4.129	.000
	Region of School 1	$(20,001.3)	2,448	-.068	-8.169	.000
	Region of School 2	$(3,768.3)	2,338	-.012	-1.612	.107
	Region of School 4	$10,600.7	2,043	.045	5.189	.000
	Region of School 5	$6,805.8	1,991	.027	3.419	.001
	Region of School 6	$8,794.0	1,965	.036	4.476	.000
	Region of School 7	$(13,864.8)	1,959	-.058	-7.078	.000
	Region of School 8	$(545.7)	2,748	-.001	-.199	.843
	Region of School 9	$3,290.1	2,048	.014	1.607	.108
	Median Tuition	$22,113.9	1,350	.136	16.386	.000
	Pricey Tuition	$67,410.2	2,665	.201	25.299	.000
	Age	$2,848.7	163	.120	17.507	.000
	Gender	$6,206.0	1,250	.034	4.966	.000
	Income	$0.10	0	.028	4.025	.000
	Resident/Non Resident	$37,315.2	1,222	.211	30.547	.000

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	19996734882114	16	1249795930132	254.920	.000b
	Residual	88278114406640	18006	4902705454		
	Total	108274849288755	18022			

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.430a	.185	.184	70019.322

Table 5

EACH YEAR, MEAN DVM DEBT INCREASED BY ABOUT $5,772.

NEW VETERINARIAN DEBT-TO-INCOME RATIO

The debt-to income ratio ties together the market for education and the market for new veterinarians.

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

A 1.4:1 debt-to-income ratio was determined as a first goal for the profession, as this level of debt to income is appropriate under projections of income and a standard repayment plan that translates into less than 10 percent of the graduate's disposable income being used to service the education debt five years after graduation.

The following chart illustrates 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 (including a zero value). The AVMA DIR that is used as a KPI is the fully weighted, individual DIR or the RWI. The real weighted DIR in 2016 at 2.00 was not significantly different to that of 2015, 1.99.

DEBT-TO-INCOME RATIO MEASURES

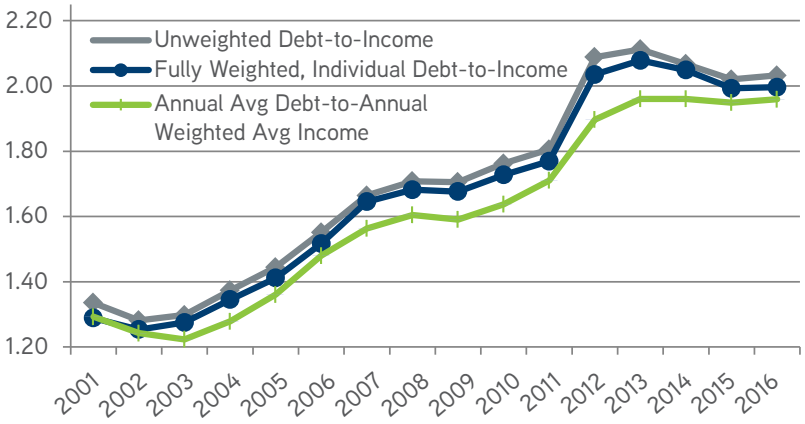


Figure 35

The debt-to-income ratio varies significantly by graduates' post-graduate plans. This is somewhat expected since 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. This method prevents observing the effects of a changing demographic and attributing these to economic factors.

New veterinarians pursuing public practice have had, on average, the lowest debt-to-income ratio for most of the period, 2001 through 2016. However, in 2016 new veterinarians pursuing employment in private practice reported a debt-to-income ratio of 1.99, the lowest of the group, while new veterinarians pursuing employment in public practice had an increase in DIR from 1.85 in 2015 to 2.5 in 2016. On the other hand, new veterinarians pursuing internships had the highest debt-to-income ratio for most of the same period, with a mean debt-to-income ratio of 4.89 in 2015 and 4.69 in 2016, almost double that of those pursuing employment in public practice. The debt-to-income ratio of those pursuing full-time employment in private practice was the lowest among all practice type and continuing education categories.

DEBT-TO-INCOME RATIO BY POST-GRADUATE PLANS

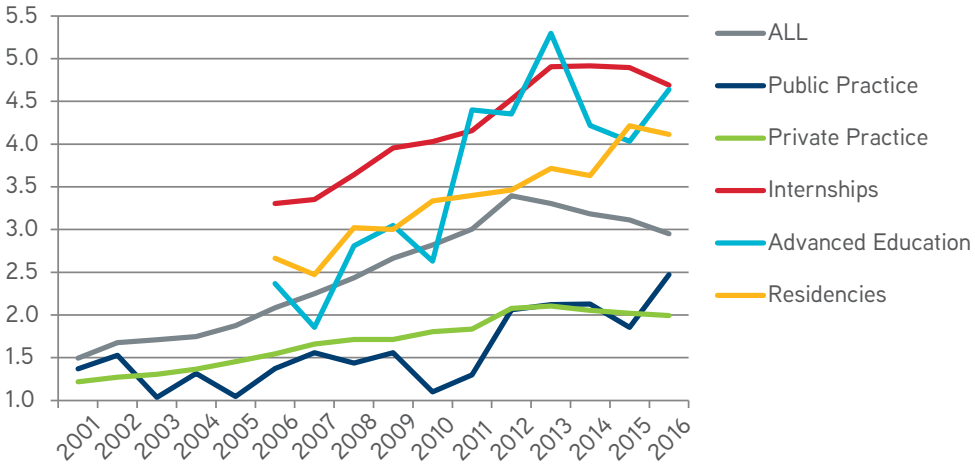


Figure 36

FACTORS SIGNIFICANT IN EXPLAINING THE DEBT-TO-INCOME RATIO

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, GDP lagged one year, and veterinary college, was performed. Results are provided in the table below.

The Ohio State University and companion animal predominant (the most populated sector for full-time employment) were omitted from the model as baselines.

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, hours they expect to work, GDP lagged one year, a few practice types (food animal, companion animal, mixed practice, equine, government services, industry and not-for profit) and the college of graduation. Out of 28 universities, 22 were significantly different from The Ohio State University in identifying the variation in the debt-to-income ratio as a result of the school. Veterinary colleges at Tuskegee University, Kansas State University, Tufts University, Michigan State University and University of Pennsylvania were not statistically different from The Ohio State University.

The unstandardized coefficient indicates the change to the constant debt-to-income ratio attributable to each characteristic (variable). For instance, women have a .185 higher mean debt-to-income ratio than men over the 2001 to 2016 period and each year of age adds .039 to the mean DIR.

FACTORS AFFECTING THE DEBT-TO-INCOME RATIO

		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
Basic Information	(Constant)	.043	.761		.057	.954
	Last 2 digits of grad year	.141	.015	.261	9.541	.000
	Age	.039	.004	.059	9.217	.000
	Gender: Female=1	.185	.032	.035	5.830	.000
	Have children: No=1	-.001	.055	.000	-.013	.989
	Seeking employment or adv educ	-.152	.153	-.006	-.990	.322
	Received offers	.232	.379	.004	.613	.540
	Anticipated work hours/week	.024	.001	.147	21.210	.000
	Work at least 48 weeks/year	.095	.103	.005	.920	.358
	GDP lagged 1 year	-2.560E-05	.000	-.061	-2.229	.026
Additional Degrees	Admitted before earning degree	.320	.307	.045	1.041	.298
	Bachelors degree	.586	.305	.101	1.920	.055
	Masters degree	.575	.310	.061	1.856	.064
	Doctorate degree	.206	.346	.007	.595	.552
	Other professional degree	-.060	.401	-.001	-.149	.882
	Other degree	.860	.360	.026	2.387	.017
Region of College	Region 0	.553	.286	.066	1.933	.053
	Region 1	.283	.286	.034	.989	.323
	Region 2	.146	.285	.020	.514	.607
	Region 3	.198	.284	.030	.695	.487
	Region 4	.036	.285	.005	.127	.899
	Region 5	.003	.289	.000	.011	.991
	Region 6	.142	.287	.017	.496	.620
	Region 7	.244	.286	.033	.852	.394
	Region 8	.154	.285	.019	.540	.589
	Region 9	-.023	.285	-.003	-.082	.934
	Region 10	.405	.324	.014	1.249	.212

Practice Type	Food animal practice (exclusive)	-1.559	.093	-.100	-16.722	.000
	Food animal practice (predominant)	-1.467	.089	-.100	-16.520	.000
	Mixed practice	-1.303	.050	-.167	-26.244	.000
	Companion animal practice (exclusive)	-1.293	.035	-.263	-36.758	.000
	Equine practice	-.727	.079	-.054	-9.223	.000
	Federal government (civil service)	-1.508	.229	-.038	-6.585	.000
	Uniformed services	-2.036	.105	-.114	-19.402	.000
	College or university (faculty or staff only)	-.278	.244	-.007	-1.140	.254
	State or local government	-.247	.516	-.003	-.479	.632
	Industry or commercial organizations	-1.645	.288	-.033	-5.708	.000
	Not-for-profit organizations	-1.130	.237	-.027	-4.760	.000
University	Auburn University	-.871	.090	-.070	-9.648	.000
	Tuskegee University	.044	.109	.003	.400	.689
	University of California-Davis	-.717	.099	-.055	-7.262	.000
	Colorado State University	-.485	.087	-.044	-5.581	.000
	University of Florida	-.455	.095	-.035	-4.779	.000
	University of Georgia	-1.118	.089	-.096	-12.634	.000
	University of Illinois	-.564	.087	-.052	-6.457	.000
	Iowa State University	-.338	.091	-.029	-3.733	.000
	Kansas State University	-.053	.088	-.005	-.601	.548
	Louisiana State University	-.797	.094	-.064	-8.443	.000
	Cummings SVM at Tufts University	-.031	.093	-.003	-.339	.734
	Michigan State University	.050	.084	.004	.593	.553
	University of Minnesota	.508	.096	.041	5.302	.000
	Mississippi State University	-.203	.100	-.015	-2.032	.042
	Purdue University	-.648	.106	-.040	-6.125	.000
	Cornell University	-.778	.086	-.070	-9.072	.000
	Oklahoma State University	-.776	.097	-.061	-8.036	.000
	University of Pennsylvania	.106	.097	.008	1.094	.274
	Texas A&M University	-1.280	.087	-.131	-14.791	.000
	Washington State University	-.717	.095	-.056	-7.532	.000
	University of Missouri-Columbia	-.663	.099	-.049	-6.671	.000
	Oregon State University	-.376	.128	-.019	-2.934	.003
	University of Tennessee	-.592	.098	-.043	-6.066	.000
	Virginia-Maryland College	-.586	.089	-.050	-6.574	.000
	North Carolina State University	-1.146	.095	-.088	-12.118	.000
	University of Wisconsin	-.407	.096	-.031	-4.249	.000
	Western University-California	2.035	.110	.129	18.496	.000

Table 6

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.554a	.307	.305	1.92345

Graduates of Western University have a mean DIR of 2.035 more than graduates of The Ohio State University, while graduates of Tuskegee, Kansas State, Tufts, Michigan State and the University of Pennsylvania have a DIR that is not significantly different from the DIR of graduates of Ohio State. This reflects the difference in costs across colleges. However, new veterinarians in the baseline practice type, companion animal predominant, had the highest mean DIR, with uniform services having the lowest mean DIR, 2.036 less than companion animal predominant. This reflects the difference in starting salary across different occupational paths.

DEBT AND INCOME OF THE 2016 GRADUATING CLASS

Among the respondents, 68 percent had a debt between $50,114 and $237,401 and 95 percent of the respondents had debt under $331,045.

The mean debt of all U.S. respondents reporting debt for the 2016 graduating class was $143,757.82 with a standard deviation of $93,646.57. The following chart illustrates the distribution of debt for the 2016 graduating class.

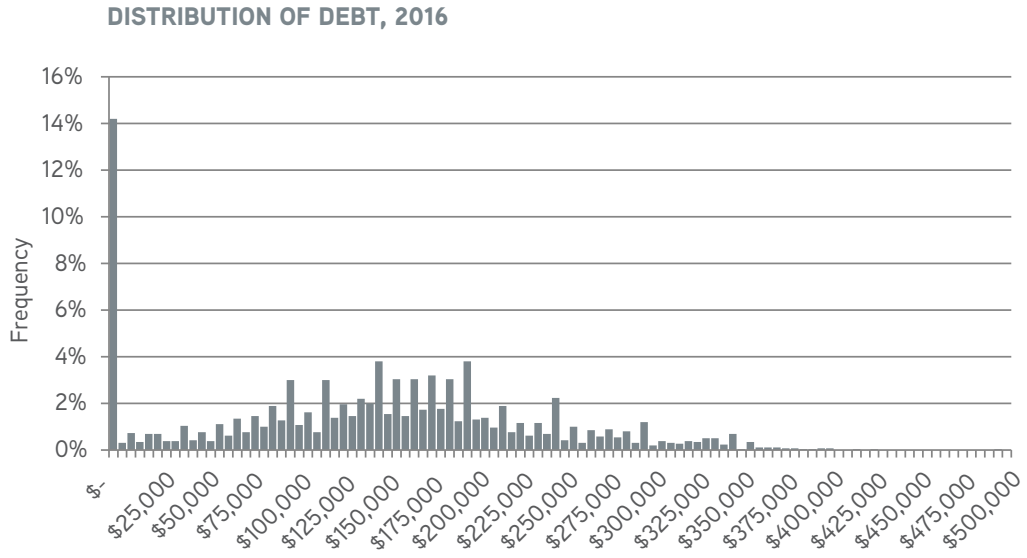


Figure 37

Among the respondents, 68 percent had a debt between $50,114 and $237,401 and 95 percent of the respondents had debt under $331,045. 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 $331,045 was $159,064 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.

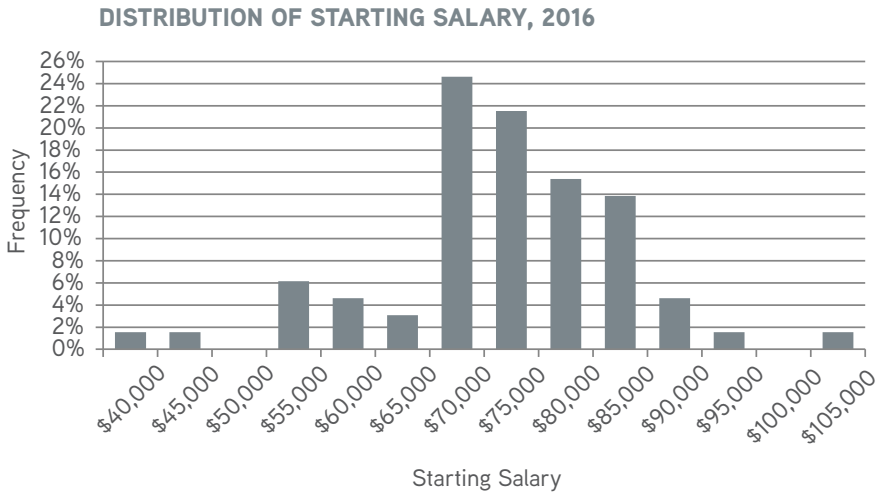


Figure 38

The distribution of starting salaries presented represents 55 percent of the 2016 graduating class. At the time the survey was distributed, only a portion of veterinary students had secured full-time employment or advanced education. The following chart, however, shows data from AVMA's employment survey that was sent to all 2014 graduates in March of 2016. These graduates have approximately one year of experience.

The mean income of new veterinarians with one year of experience is $68,696 with a 95 percent confidence interval of $38,019. That is, statistically, we are 95 percent confident that the mean income of veterinarians with one year of experience lies within plus or minus $38,019 of $68,696. This is reasonable since there is such a wide variation in types of practices coupled with types of continuing education segments.

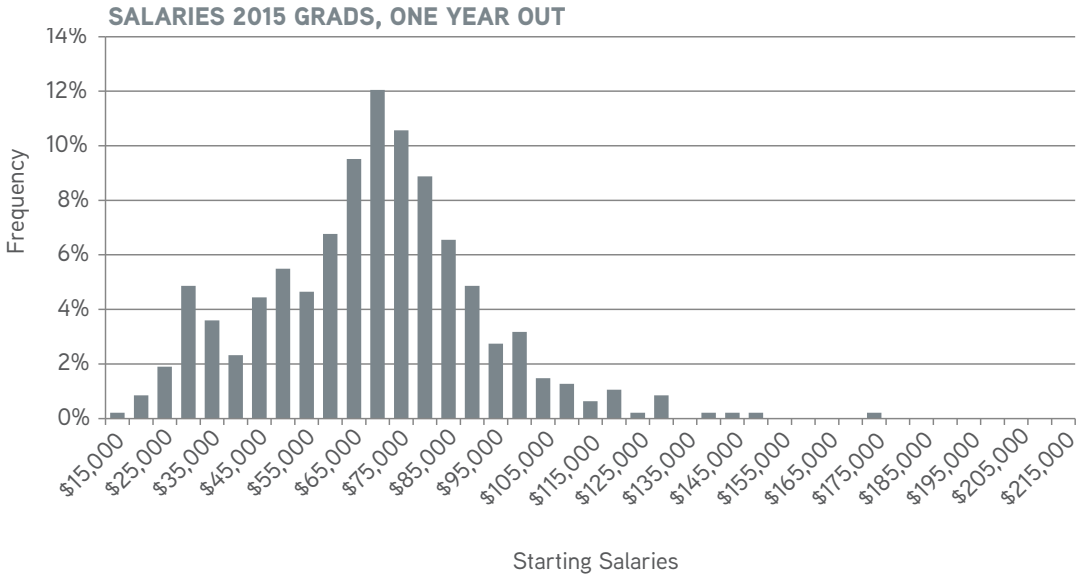


Figure 39

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 (68.2%) 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 boundary for "acceptable" levels of financial stress.

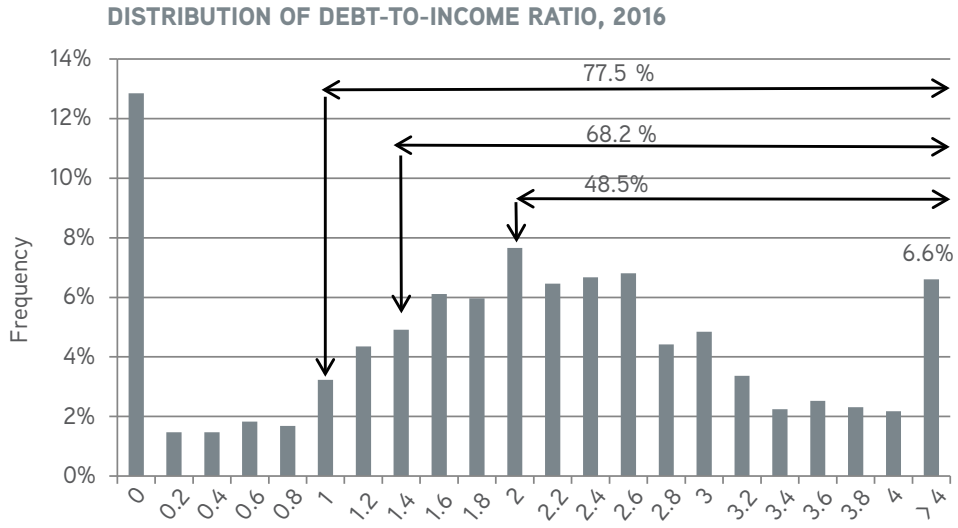


Figure 40

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. These trends have been similar in past years.

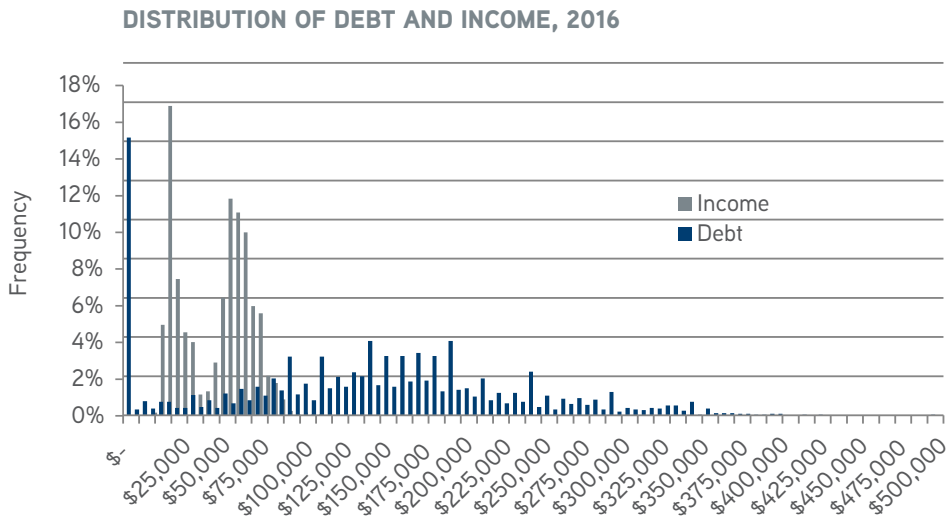


Figure 41

Since the income and debt data from the 2016 class only represents a portion of the class, the following chart 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 the senior survey results.

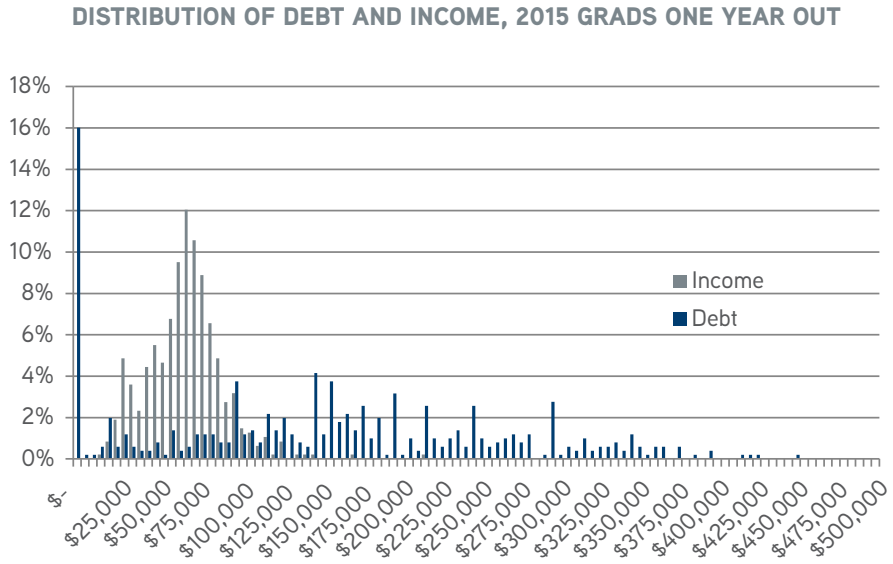


Figure 42

Mean debt for graduates of each of the U.S. veterinary colleges varied from slightly more than $80,000 to almost $260,000 in 2016. The mean debt for all graduates across all of the U.S. veterinary colleges was just more than $143,000. The school with the highest reported mean debt for 2016 was Western University and the lowest was Texas A&M. Each school had reported a mean debt that was significantly lower than Western University at a 5 percent level of significance, except Tuskegee University.

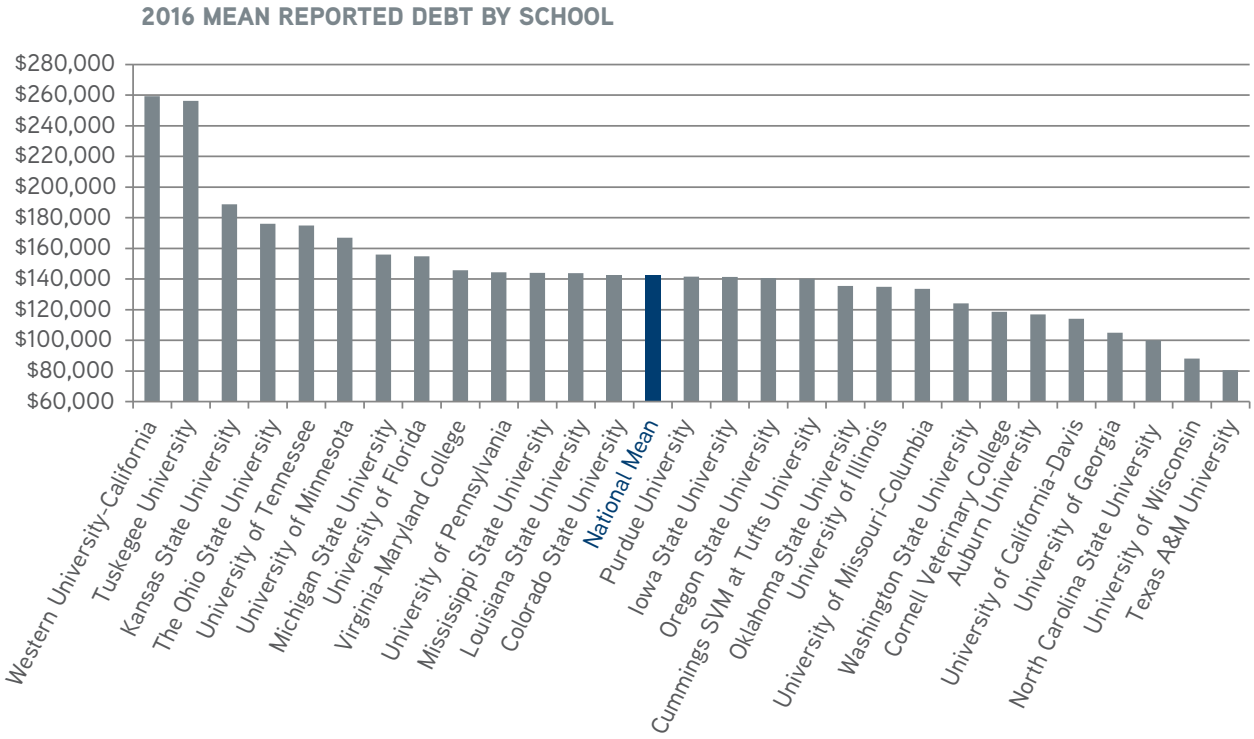


Figure 43

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

For students graduating as residents, or paying discounted tuition, the schools with the largest mean debt load above tuition are Tuskegee University, with a mean debt load of $125,000 above tuition, The Ohio State University, Western University and University of Tennessee with mean debt loads of $50,000 more than tuition. Schools with residents graduating with debt loads below tuition are Tufts University, at $50,000 below tuition, University of Pennsylvania, Cornell and UC-Davis, all with debt levels below tuition costs.

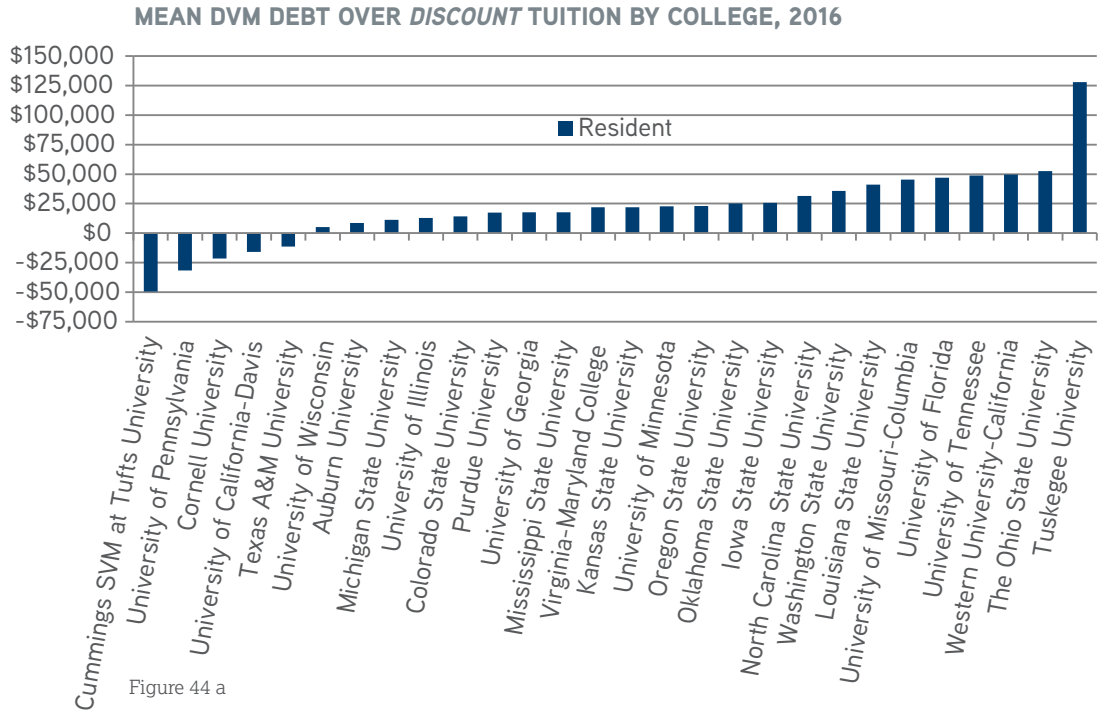


Figure 44 a

For students graduating with non-resident tuition, the schools with the highest mean debt load over tuition were Tuskegee, Western University, Oregon State University and University of Tennessee. Ohio State University, Texas A&M and University of Missouri-Columbia had non-resident students graduating with a mean debt load below the cost of tuition. Noteworthy, however, is that there are no discounted seats at Tuskegee and Western Universities.

MEAN DVM DEBT OVER *NON-DISCOUNT* TUITION BY COLLEGE, 2016

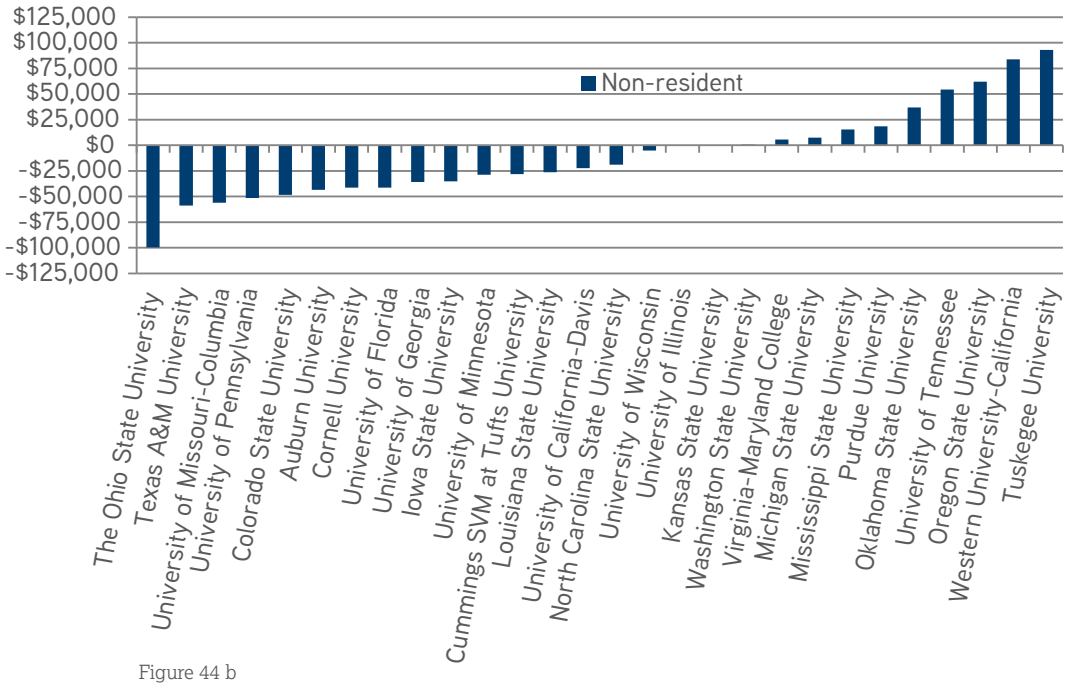


Figure 44 b

While mean debt over tuition (i.e., mean debt in dollar value greater than tuition) may be considered as an indication of how much money veterinary students may have potentially spent on living expenses. But, 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 2016. In addition, according to the *JAVMA* article, "Are students accumulating unreasonable amounts of debt?" the mean expenditure incurred by students for living expenses, by school, was generally less than the living expenses amount recommended by the respective schools.

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 we 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, two years in a row, is Mississippi State University where only $42,950 is necessary to maintain the standard of living that $50,000 would provide on average in the United States. The most expensive veterinary schools with respect to cost of living are University of California-Davis and Western University-California, where $67,950 is necessary to maintain the standard of living that $50,000 would provide on average in the United States. The college of veterinary medicine with a cost of living closest to the U.S. average is the University of Minnesota where $50,400 is necessary to sustain a lifestyle afforded to the average U.S. resident with $50,000 of disposable income.

THIRD QUARTER 2016 COST OF LIVING

	Index	Baseline ($50,000)	College of Veterinary Medicine
Alabama	91.2	$45,600	Auburn University, Tuskegee University
Alaska	131.1	$65,550	
Arizona	98	$49,000	
Arkansas	87.1	$43,550	
California	135.9	$67,950	University of California-Davis, Western University-California
Colorado	103.8	$51,900	Colorado State University
Connecticut	127.7	$63,850	
Delaware	101.4	$50,700	
District of Columbia	151.6	$75,800	
Florida	98.3	$49,150	University of Florida
Georgia	91.4	$45,700	University of Georgia
Hawaii	167.9	$83,950	
Idaho	92.1	$46,050	
Illinois	94.6	$47,300	University of Illinois
Indiana	89.5	$44,750	Purdue University
Iowa	91	$45,500	Iowa State University
Kansas	89.9	$44,950	Kansas State University
Kentucky	90.5	$45,250	
Louisiana	94.8	$47,400	Louisiana State University
Maine	110.8	$55,400	
Maryland	125.5	$62,750	
Massachusetts	133.4	$66,700	Cummings SVM at Tufts University
Michigan	89	$44,500	Michigan State University
Minnesota	100.8	$50,400	University of Minnesota
Mississippi	85.9	$42,950	Mississippi State University
Missouri	90.4	$45,200	University of Missouri-Columbia
Montana	100.8	$50,400	
Nebraska	91.6	$45,800	
Nevada	103.3	$51,650	
New Hampshire	117	$58,500	
New Jersey	121.9	$60,950	
New Mexico	96.5	$48,250	
New York	131	$65,500	Cornell Veterinary College
North Carolina	93.9	$46,950	North Carolina State University
North Dakota	99.4	$49,700	
Ohio	93.8	$46,900	The Ohio State University
Oklahoma	89.2	$44,600	Oklahoma State University
Oregon	115.6	$57,800	Oregon State University
Pennsylvania	101.4	$50,700	University of Pennsylvania
Rhode Island	120.7	$60,350	
South Carolina	99.2	$49,600	
South Dakota	103.7	$51,850	
Tennessee	89.4	$44,700	University of Tennessee
Texas	90.7	$45,350	Texas A&M University

Utah	93	$46,500	
Vermont	121.1	$60,550	
Virginia	100.8	$50,400	Virginia-Maryland College
Washington	105.2	$52,600	Washington State University
West Virginia	93.4	$46,700	
Wisconsin	96.8	$48,400	University of Wisconsin
Wyoming	91.8	$45,900	
Grand Total	**100**	**$50,000**	

Table 7

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.

For the non-discount seats which are primarily made up of non-residents there is a large distribution of debt around the cost of tuition. Namely, The Ohio State University has mean debt levels of almost $100,000 less than the cost of tuition whereas graduates of Tuskegee University report mean debt levels of almost $100,000 more than the cost of tuition. Furthermore, as mentioned, debt levels above tuition may be an indication of the cost of living. However, the cost of living at The Ohio State University, Ohio, and Tuskegee University, Alabama, are both below the mean cost of living at the national level. This leaves more questions as to explaining the variation in the debt levels above cost of living at these institutions.

MEAN DVM DEBT OVER *NON-DISCOUNT* TUITION BY COLLEGE AND COST OF LIVING, 2016

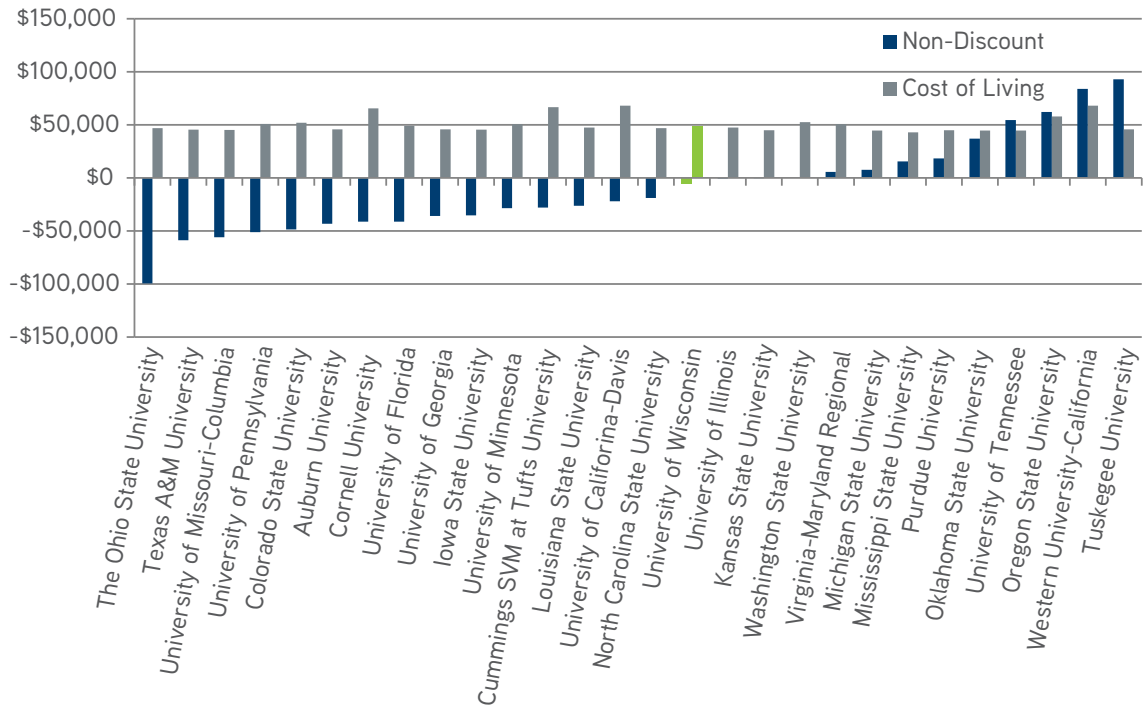


Figure 45a

For discounted seats, primarily comprised of residents and students whose home states hold contracts with their college to ensure they pay resident tuition, the mean debt load ranges from almost $50,000 below the cost of tuition at Tufts University and almost $120,000 above the cost of tuition at Tuskegee University.

MEAN DVM DEBT OVER *DISCOUNT* TUITION BY COLLEGE AND COST OF LIVING, 2016

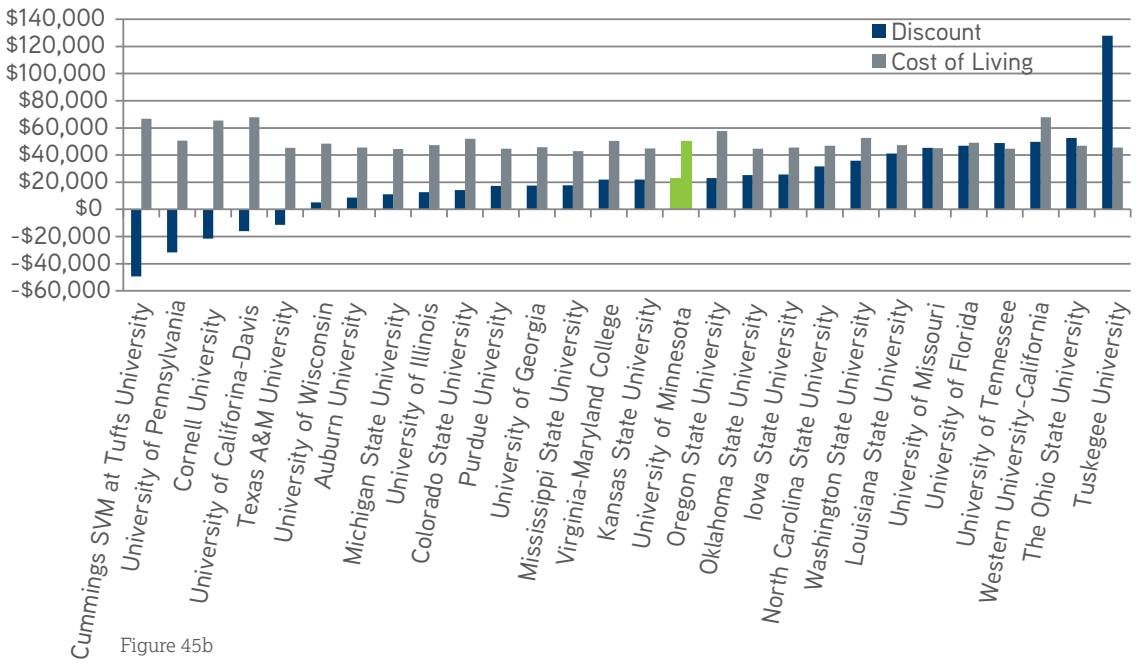


Figure 45b

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

In 2016, UC-Davis had the largest percentage of the class pursuing advanced education, inclusive of internships and residencies, at 61 percent. Purdue University had the highest proportion of new graduates pursuing public practice at 9 percent of the class, and Washington State University had the highest percentage new veterinarians reporting pursuing full-time employment in private practice at 84 percent of the class.

DEBT LEVELS ABOVE TUITION MAY BE AN INDICATION OF THE COST OF LIVING.

NUMBER OF GRADUATES, POST-GRADUATION PLANS AND MEAN DEBT AND INCOME BY SCHOOL, 2016

Veterinary Medical College	2016 Grads	Mean Debt upon Entering Veterinary College			Mean Debt upon Graduating from Veterinary College		
	N	Mean	N	Std. Deviation	Mean	N	Std. Deviation
Washington State University	110	$9,507	110	$24,605	$133,650	110	$78,286
University of Missouri-Columbia	107	$10,778	107	$17,837	$144,277	107	$78,390
University of Florida	99	$7,632	95	$16,807	$162,364	95	$94,955
Iowa State University	107	$16,950	105	$21,624	$158,391	105	$83,489
Texas A&M University	124	$9,942	124	$20,447	$90,476	124	$67,480
Oregon State University	53	$14,679	53	$23,127	$155,349	53	$90,838
Oklahoma State University	88	$8,699	88	$16,224	$144,196	88	$91,627
Louisiana State University	85	$5,855	83	$13,892	$149,629	84	$89,560
Virginia-Maryland College	116	$13,370	115	$20,855	$160,556	114	$108,534
Michigan State University	83	$9,480	81	$15,759	$165,346	82	$97,709
Auburn University	116	$9,487	116	$17,280	$126,342	116	$89,875
Kansas State University	89	$10,881	84	$16,571	$199,445	86	$104,438
Mississippi State University	83	$14,341	82	$28,325	$158,109	83	$119,787
Colorado State University	85	$18,390	84	$27,935	$161,083	85	$98,979
University of Georgia	97	$8,760	97	$17,253	$113,778	97	$86,496
The Ohio State University	150	$18,419	146	$33,250	$194,363	147	$96,227
Tuskegee University	69	$26,112	67	$42,514	$282,368	67	$112,045
Purdue University	82	$11,818	80	$19,364	$153,178	82	$87,751
University of Illinois	82	$14,677	82	$18,682	$149,651	82	$91,458
University of Wisconsin	79	$10,949	79	$18,794	$99,142	79	$60,782
University of Tennessee	75	$14,208	74	$23,222	$189,050	74	$100,654
North Carolina State University	97	$12,653	97	$21,310	$112,616	97	$64,947
University of Minnesota	89	$13,809	89	$23,957	$180,672	89	$101,719
University of Pennsylvania	81	$16,514	80	$29,337	$160,767	81	$118,432
Cummings SVM at Tufts University	80	$17,758	80	$36,042	$158,016	80	$116,208
Western University-California	81	$15,386	79	$26,515	$277,952	79	$125,763
Cornell Veterinary College	99	$12,478	96	$22,793	$130,931	98	$87,907
University of California-Davis	134	$9,265	133	$24,235	$123,327	134	$98,810
Total	**2,640**	**$12,741**	**2,606**	**$23,762**	**$155,291**	**2,618**	**$102,633**

Table 8

Veterinary Medical College	Mean Starting Salary			Distribution of Post-Graduate Plans			
	Mean	N	Std. Deviation	Private Practice	Public Practice	Advanced Education	Total
Washington State University	$67,780	91	$19,123	77	4	11	92
University of Missouri-Columbia	$63,045	101	$20,278	78	1	21	100
University of Florida	$67,903	90	$24,681	69	3	18	90
Iowa State University	$63,403	94	$19,424	71	3	19	93
Texas A&M University	$67,782	98	$23,433	74	1	22	97
Oregon State University	$60,891	51	$22,847	37	0	14	51
Oklahoma State University	$61,549	73	$22,690	51	3	19	73
Louisiana State University	$64,705	65	$23,732	44	1	19	64
Virginia-Maryland College	$64,026	100	$24,021	67	4	28	99
Michigan State University	$58,736	70	$21,285	46	5	19	70
Auburn University	$60,559	98	$22,045	65	4	30	99
Kansas State University	$60,051	76	$23,525	48	5	24	77
Mississippi State University	$58,187	69	$24,705	42	3	23	68
Colorado State University	$58,620	79	$26,277	47	1	30	78
University of Georgia	$56,100	86	$24,006	50	2	31	83
The Ohio State University	$58,679	129	$25,504	78	6	46	130
Tuskegee University	$62,687	47	$27,554	28	4	15	47
Purdue University	$59,029	57	$23,616	33	5	18	56
University of Illinois	$56,221	73	$22,059	43	2	28	73
University of Wisconsin	$53,268	69	$23,464	38	0	30	68
University of Tennessee	$54,731	55	$24,810	30	2	22	54
North Carolina State University	$53,306	83	$23,093	46	4	33	83
University of Minnesota	$56,283	78	$23,237	40	6	32	78
University of Pennsylvania	$51,272	78	$25,720	32	1	45	78
Cummings SVM at Tufts University	$48,334	67	$21,730	27	2	38	67
Western University-California	$52,339	68	$24,153	26	0	39	65
Cornell Veterinary College	$48,522	86	$23,419	33	5	47	85
University of California-Davis	$51,690	114	$26,041	44	1	70	115
Total	**$58,746**	**2,245**	**$23,996**	**1,364**	**78**	**791**	**2,233**

The following table highlights veterinary competencies and skill sets based on the respondent's perceived preparation by their veterinary college, labelled as "expectation" followed by the respondent's experience while on the job, labelled as "experience." Ultimately, the table illustrates, by school, whether the respondents' perceived preparation by their college, or expectation, is aligned with their findings while on the job, or experience.

Among the tasks measured were doing a physical exam, conducting a history taking, diagnosing lameness, and giving anesthesia.

CLINICAL COMPETENCIES, EXPECTATION AND EXPERIENCE BY SCHOOL

		Auburn University		Tuskegee University		University of California-Davis		Colorado State University		University of Florida		University of Georgia	
		Mean	N	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N
Do a physical examination	Expectation	4.00	29	4.42	12	3.97	39	3.98	60	4.04	24	4.13	30
	Experience	4.38	29	4.58	12	4.26	39	4.37	60	4.25	24	4.70	30
Do history taking	Expectation	3.97	29	4.17	12	4.28	39	4.23	60	4.38	24	4.27	30
	Experience	4.41	29	4.50	12	4.46	39	4.53	60	4.13	24	4.73	30
Diagnose lameness	Expectation	3.48	29	3.42	12	3.41	39	3.23	60	3.48	23	3.00	30
	Experience	3.69	29	3.83	12	3.82	39	3.78	60	4.25	24	3.87	30
Diagnose and prescribe treatment for parasitic diseases	Expectation	3.93	29	4.42	12	3.59	39	3.23	60	3.63	24	4.03	30
	Experience	4.48	29	4.25	12	3.97	39	4.02	59	4.13	24	4.50	30
Give anesthesia	Expectation	3.45	29	3.17	12	3.79	39	4.02	60	3.88	24	3.67	30
	Experience	4.14	29	3.92	12	4.13	39	4.33	60	4.29	24	4.27	30
Do fluid therapy	Expectation	3.66	29	3.25	12	3.74	39	3.83	60	3.88	24	3.83	30
	Experience	4.31	29	3.92	12	4.10	39	4.30	60	4.21	24	4.43	30
Give an intravenous injection	Expectation	4.14	29	4.42	12	4.26	39	3.97	60	4.50	24	3.60	30
	Experience	4.62	29	4.67	12	4.47	38	4.58	60	4.50	24	4.60	30
Develop/adapt vaccination protocols	Expectation	3.90	29	4.17	12	3.51	39	3.68	60	3.75	24	4.07	30
	Experience	4.52	29	4.50	12	4.77	39	4.38	60	4.25	24	4.80	30
Advise clients on nutrition	Expectation	2.76	29	3.33	12	3.08	39	2.67	60	2.96	24	2.90	30
	Experience	3.62	29	3.67	12	3.85	39	3.30	60	3.33	24	3.93	30
Develop diagnostic plans for difficult cases	Expectation	3.52	29	3.25	12	3.72	39	3.20	60	3.63	24	3.27	30
	Experience	4.14	29	4.00	12	4.08	39	4.15	60	4.00	24	4.07	30
Investigate potential toxin exposure	Expectation	3.21	29	2.92	12	3.21	39	2.63	60	2.88	24	2.53	30
	Experience	3.79	29	3.50	12	3.85	39	3.68	60	3.46	24	3.70	30
Prescribe medications	Expectation	3.69	29	3.58	12	3.72	39	3.53	59	4.13	24	3.37	30
	Experience	4.34	29	4.42	12	4.51	39	4.35	60	4.42	24	4.70	30
Interpret cytologic specimens	Expectation	3.03	29	3.33	12	3.00	39	3.13	60	3.50	24	3.00	30
	Experience	3.34	29	3.75	12	3.67	39	3.77	60	3.50	24	3.23	30
Interpret post-mortem specimens	Expectation	3.21	29	4.50	12	3.51	39	3.47	60	3.42	24	3.13	30
	Experience	3.55	29	4.25	12	4.18	39	4.35	60	3.79	24	3.57	30
Interpret ultrasound examinations	Expectation	3.07	29	3.00	12	3.41	39	2.43	60	3.04	24	2.17	30
	Experience	3.55	29	4.50	12	3.59	39	3.90	60	3.88	24	3.10	30
Interpret radiographs	Expectation	3.38	29	3.17	12	3.67	39	3.18	60	3.42	24	2.93	30
	Experience	3.66	29	3.92	12	3.71	38	3.92	60	3.63	24	3.53	30
Interpret hematologic values	Expectation	3.86	29	3.92	12	4.00	39	3.77	60	4.17	24	3.70	30
	Experience	4.10	29	4.00	12	3.97	39	4.35	60	4.17	24	4.03	30
Diagnose/prescribe therapy for gastrointestinal disease	Expectation	3.59	29	3.83	12	3.77	39	3.54	59	3.71	24	3.62	29
	Experience	4.24	29	4.17	12	4.13	39	4.20	59	4.25	24	4.34	29
Diagnose/prescribe therapy for dermatological disease	Expectation	3.86	29	3.33	12	3.56	39	3.36	59	3.83	24	3.14	29
	Experience	4.03	29	3.83	12	3.56	39	4.05	59	4.38	24	4.03	29
Diagnose/prescribe therapy for endocrine disease	Expectation	3.48	29	3.50	12	3.44	39	3.20	59	3.54	24	3.38	29
	Experience	3.97	29	3.67	12	3.97	39	4.08	59	4.00	24	3.86	29
Diagnose/prescribe therapy for cardiac disease	Expectation	3.14	29	2.67	12	2.77	39	3.10	59	3.21	24	3.00	29
	Experience	3.66	29	3.33	12	3.54	39	4.03	59	3.75	24	3.55	29

University of Illinois		Iowa State University		Kansas State University		Louisiana State University		Cummings SVM at Tufts University		Michigan State University		University of Minnesota		Mississippi State University		Purdue University		Cornell University	
Mean	N	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N
4.18	33	4.09	34	3.91	32	3.78	27	3.94	36	4.00	35	4.00	34	4.08	26	4.29	24	4.04	24
4.36	33	4.32	34	4.34	32	4.12	26	4.46	35	4.34	35	4.44	34	4.23	26	4.42	24	3.92	24
4.18	33	4.18	34	3.97	32	4.19	27	4.03	36	4.06	35	4.30	33	4.27	26	4.29	24	4.17	24
4.48	33	4.24	34	4.28	32	4.23	26	4.49	35	4.43	35	4.53	34	4.27	26	4.42	24	4.58	24
3.27	33	3.06	34	2.97	31	3.52	27	3.47	36	3.23	35	3.24	34	3.12	26	3.42	24	3.13	24
3.85	33	3.35	34	3.56	32	4.00	26	3.88	34	3.66	35	3.50	34	3.73	26	3.83	24	3.75	24
3.55	33	3.50	34	3.72	32	3.96	27	3.36	36	3.03	35	3.41	34	3.92	26	4.04	24	3.29	24
4.36	33	3.79	34	3.97	32	4.42	26	4.03	34	4.31	35	4.12	34	4.15	26	4.33	24	3.88	24
3.73	33	3.65	34	3.63	32	3.85	27	4.03	36	3.80	35	3.74	34	4.00	26	3.83	24	3.54	24
4.06	33	4.00	34	3.78	32	4.35	26	4.29	35	4.29	35	4.32	34	4.04	26	4.08	24	4.13	24
3.55	33	3.74	34	3.44	32	3.81	27	4.06	36	3.69	35	3.68	34	3.92	26	3.75	24	3.67	24
4.03	33	4.03	34	3.72	32	4.35	26	4.11	35	4.00	35	4.24	34	4.27	26	4.08	24	4.17	24
4.09	33	3.94	34	4.00	32	4.15	27	4.11	36	3.77	35	4.18	34	4.46	26	4.33	24	4.08	24
4.69	32	4.47	34	4.63	32	4.81	26	4.71	35	4.46	35	4.53	34	4.50	26	4.54	24	4.42	24
2.79	33	3.53	34	3.44	32	3.59	27	3.28	36	3.23	35	3.41	34	3.77	26	3.63	24	3.83	24
4.33	33	4.24	34	4.53	32	4.69	26	4.51	35	4.54	35	4.62	34	4.12	26	4.50	24	4.25	24
2.61	33	2.26	34	2.06	32	3.11	27	3.56	36	2.60	35	3.41	34	2.65	26	2.75	24	3.04	24
3.45	33	3.06	34	3.19	32	3.88	26	4.03	35	3.86	35	3.82	34	3.27	26	3.13	24	3.79	24
3.33	33	3.26	34	3.13	32	3.56	27	4.06	36	3.57	35	3.56	34	3.50	26	3.79	24	3.50	24
3.91	33	3.65	34	3.94	32	4.12	26	4.23	35	4.26	35	4.26	34	3.81	26	3.79	24	4.29	24
3.06	33	2.94	34	2.22	32	2.89	27	3.11	36	2.63	35	3.06	34	2.88	26	3.29	24	2.88	24
3.36	33	3.29	34	3.28	32	3.54	26	3.80	35	3.66	35	3.53	34	3.42	26	3.75	24	3.58	24
3.67	33	3.50	34	3.47	32	3.52	27	4.00	36	3.60	35	3.79	34	3.58	26	4.00	24	3.54	24
4.58	33	4.15	34	4.13	32	4.15	26	4.46	35	4.29	35	4.47	34	4.27	26	4.33	24	4.46	24
3.21	33	3.09	34	2.88	32	3.59	27	3.53	36	2.89	35	3.47	34	3.12	26	3.13	24	3.38	24
3.42	33	3.38	34	3.31	32	4.08	26	3.58	36	3.37	35	3.82	34	3.31	26	3.13	24	3.46	24
3.48	33	3.97	34	3.13	32	3.26	27	3.47	36	3.37	35	3.53	34	3.54	26	3.00	24	3.04	24
4.06	33	4.09	34	3.63	32	4.62	26	5.00	36	4.46	35	4.32	34	3.88	26	4.17	24	4.08	24
2.85	33	2.38	34	2.44	32	2.74	27	3.19	36	3.06	35	2.71	34	2.19	26	2.04	24	3.08	24
3.70	33	3.74	34	3.50	32	3.96	26	3.83	36	4.06	35	4.21	34	3.19	26	3.71	24	4.13	24
3.27	33	3.44	34	3.41	32	3.52	27	3.36	36	3.29	35	3.32	34	3.04	26	3.50	24	3.50	24
3.67	33	3.88	34	3.50	32	3.73	26	3.86	36	3.66	35	3.71	34	3.54	26	3.58	24	4.13	24
3.70	33	4.00	34	3.66	32	4.07	27	3.81	36	3.77	35	4.06	34	3.62	26	4.21	24	3.92	24
4.00	33	4.26	34	3.88	32	4.31	26	3.92	36	4.14	35	4.15	34	3.81	26	4.04	24	4.17	24
3.36	33	3.21	33	3.34	32	3.77	26	3.75	36	3.34	35	3.74	34	3.69	26	3.96	24	3.54	24
4.00	33	4.06	33	3.91	32	4.38	26	4.06	36	4.06	35	4.06	34	4.50	26	4.08	24	4.38	24
3.28	32	3.85	33	3.22	32	4.00	26	3.00	36	3.00	35	4.03	34	3.42	26	2.58	24	3.42	24
4.15	33	3.91	33	3.44	32	4.35	26	3.81	36	3.71	35	4.03	34	4.08	26	3.79	24	3.67	24
3.34	32	3.28	32	3.22	32	3.54	26	3.78	36	3.29	35	3.50	34	3.58	26	3.96	24	3.50	24
3.82	33	3.73	33	3.68	31	3.96	26	3.78	36	3.77	35	3.82	34	4.19	26	4.08	24	4.04	24
2.38	32	2.91	33	2.78	32	3.27	26	3.64	36	3.26	35	3.15	34	2.65	26	3.00	24	3.46	24
3.48	33	3.28	32	3.48	31	3.38	26	3.67	36	3.80	35	3.33	33	3.58	26	3.33	24	4.08	24

		Oklahoma State University		University of Pennsylvania		Texas A&M University		Washington State University		University of Missouri-Columbia		The Ohio State University		Oregon State University	
		Mean	N	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N
Do a physical examination	Experience	3.79	24	4.11	35	4.39	71	4.00	23	3.97	34	4.00	39	3.81	21
	Expectation	4.08	24	4.60	35	4.55	71	4.26	23	4.41	34	4.45	38	4.48	21
Do history taking	Experience	3.96	24	4.09	35	4.56	71	4.17	23	4.09	34	4.33	39	3.90	21
	Expectation	4.21	24	4.54	35	4.59	71	4.17	23	4.38	34	4.50	38	4.38	21
Diagnose lameness	Experience	3.29	24	3.26	35	3.48	71	2.87	23	3.12	33	3.38	39	3.29	21
	Expectation	3.83	24	4.20	35	3.96	71	3.30	23	3.79	33	4.05	38	3.86	21
Diagnose and prescribe treatment for parasitic diseases	Experience	4.29	24	3.46	35	4.15	71	3.74	23	3.62	34	3.74	39	3.24	21
	Expectation	4.29	24	4.14	35	4.38	71	4.26	23	4.15	34	4.50	38	3.81	21
Give anesthesia	Experience	3.46	24	3.31	35	4.15	71	3.83	23	3.70	33	3.90	39	4.29	21
	Expectation	3.92	24	4.11	35	4.41	71	4.22	23	3.71	34	4.37	38	4.95	21
Do fluid therapy	Experience	3.58	24	3.54	35	4.04	71	3.35	23	3.71	34	3.69	39	3.71	21
	Expectation	4.46	24	4.37	35	4.46	71	4.22	23	4.12	34	4.32	38	4.48	21
Give an intravenous injection	Experience	3.96	24	3.94	35	4.34	71	3.87	23	4.03	34	4.26	39	4.14	21
	Expectation	4.63	24	4.83	35	4.72	71	4.39	23	4.62	34	4.82	38	5.00	21
Develop/adapt vaccination protocols	Experience	3.67	24	3.15	34	4.01	71	3.78	23	3.32	34	4.05	39	3.14	21
	Expectation	4.25	24	4.57	35	4.79	71	4.65	23	4.03	34	4.76	38	4.62	21
Advise clients on nutrition	Experience	2.29	24	2.91	35	3.35	71	2.70	23	2.50	34	3.10	39	2.38	21
	Expectation	3.33	24	3.89	35	3.92	71	3.43	23	3.47	34	3.84	38	3.90	21
Develop diagnostic plans for difficult cases	Experience	3.13	23	3.83	35	3.99	71	3.70	23	3.32	34	3.49	39	3.33	21
	Expectation	3.88	24	4.26	35	4.27	71	3.96	23	3.85	34	4.18	38	4.10	21
Investigate potential toxin exposure	Experience	2.91	23	3.14	35	3.24	71	3.17	23	2.79	34	2.74	39	2.71	21
	Expectation	3.33	24	3.80	35	3.77	71	3.57	23	3.35	34	3.53	38	3.33	21
Prescribe medications	Experience	3.52	23	3.40	35	4.01	71	3.74	23	3.65	34	3.90	39	3.62	21
	Expectation	4.38	24	4.37	35	4.66	71	4.17	23	4.41	34	4.65	37	4.43	21
Interpret cytologic specimens	Experience	2.83	24	2.89	35	3.48	71	3.13	23	3.59	34	3.08	39	3.57	21
	Expectation	3.57	23	3.29	35	3.59	70	3.48	23	3.85	34	3.29	38	3.76	21
Interpret post-mortem specimens	Experience	2.92	24	3.37	35	3.55	71	3.00	23	3.32	34	3.45	38	3.62	21
	Expectation	3.43	23	4.09	35	4.34	70	3.96	23	4.12	34	3.95	38	3.71	21
Interpret ultrasound examinations	Experience	2.17	24	2.89	35	2.62	71	2.61	23	2.27	33	2.41	39	2.71	21
	Expectation	3.61	23	3.97	35	4.11	70	4.74	23	3.26	34	3.24	38	4.71	21
Interpret radiographs	Experience	3.58	24	3.60	35	3.68	71	3.43	23	3.15	34	3.67	39	3.19	21
	Expectation	4.00	23	3.97	35	3.89	70	3.57	23	3.74	34	4.13	38	4.05	21
Interpret hematologic values	Experience	3.50	24	3.94	35	4.23	71	3.70	23	3.85	34	3.79	39	4.05	21
	Expectation	4.13	23	4.11	35	4.43	70	3.96	23	3.97	34	4.32	38	4.38	21
Diagnose/prescribe therapy for gastrointestinal disease	Experience	3.46	24	3.56	34	4.00	70	3.61	23	3.62	34	3.46	39	3.38	21
	Expectation	4.17	24	4.63	35	4.44	70	4.30	23	4.06	34	4.26	38	4.19	21
Diagnose/prescribe therapy for dermatological disease	Experience	3.13	24	3.41	34	3.80	70	3.22	23	3.62	34	3.74	39	2.57	21
	Expectation	4.00	24	4.03	35	4.17	70	4.17	23	4.00	34	3.95	38	3.86	21
Diagnose/prescribe therapy for endocrine disease	Experience	3.25	24	3.50	34	3.69	70	3.61	23	3.47	34	3.54	39	3.10	21
	Expectation	3.87	23	4.34	35	4.13	70	3.96	23	3.68	34	4.11	38	3.95	21
Diagnose/prescribe therapy for cardiac disease	Experience	3.00	24	3.44	34	3.77	70	3.74	23	3.12	34	3.62	39	3.43	21
	Expectation	3.79	24	4.09	35	4.04	70	4.00	23	3.59	34	3.97	38	3.81	21

University of Tennessee		Virginia-Maryland College		North Carolina State University		University of Wisconsin		Western University-California		Ross University		St. George's University		Other		St. Matthew's University		National	
Mean	N	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N
3.85	27	3.91	35	4.05	22	4.29	24	4.41	27	4.23	80	4.23	26	4.23	86	4.83	6	4.09	1079
4.26	27	4.46	35	4.36	22	4.50	24	4.59	27	4.46	80	4.62	26	4.40	85	4.50	6	4.40	1075
4.00	26	4.31	35	4.32	22	4.50	24	4.52	27	4.28	80	4.35	26	4.31	86	4.83	6	4.24	1077
4.37	27	4.63	35	4.41	22	4.71	24	4.41	27	4.45	80	4.46	26	4.41	85	4.67	6	4.45	1075
3.04	27	3.66	35	3.05	22	3.29	24	3.70	27	3.43	80	3.88	26	3.24	85	4.00	6	3.32	1075
4.07	27	4.03	35	3.64	22	3.63	24	4.00	27	3.96	79	4.46	26	3.75	85	3.83	6	3.84	1072
3.81	27	3.80	35	3.68	22	3.63	24	3.56	27	3.79	80	3.65	26	3.69	86	3.67	6	3.68	1079
4.22	27	4.51	35	4.09	22	4.38	24	4.33	27	4.30	80	4.58	26	4.34	85	4.33	6	4.24	1073
3.70	27	4.03	35	3.91	22	4.17	24	3.52	27	4.08	80	3.65	26	3.50	86	4.00	6	3.80	1078
3.85	27	4.51	35	4.23	22	4.38	24	4.30	27	4.31	80	4.15	26	4.12	84	4.33	6	4.21	1074
3.67	27	3.80	35	3.55	22	3.79	24	3.67	27	3.80	80	3.65	26	3.58	86	4.33	6	3.73	1079
4.04	26	4.37	35	3.95	22	4.29	24	4.44	27	4.26	80	4.24	25	4.27	84	4.67	6	4.23	1072
4.15	27	4.21	34	4.09	22	3.83	24	4.33	27	4.25	80	4.27	26	3.92	86	4.67	6	4.11	1078
4.22	27	4.68	34	4.36	22	4.57	23	4.85	27	4.62	79	4.62	26	4.63	84	4.83	6	4.61	1069
3.59	27	4.20	35	4.23	22	3.75	24	4.22	27	3.66	80	3.69	26	3.62	86	3.83	6	3.66	1078
4.07	27	4.74	35	4.27	22	4.75	24	4.89	27	4.46	80	5.08	26	4.43	84	4.50	6	4.52	1074
3.48	27	3.60	35	3.45	22	2.83	24	3.22	27	3.28	80	2.96	26	2.65	86	4.17	6	2.94	1079
3.56	27	4.11	35	3.91	22	3.75	24	3.93	27	3.90	80	4.08	26	3.33	84	4.17	6	3.67	1074
3.19	27	3.66	35	3.77	22	3.92	24	3.78	27	3.44	80	3.54	26	3.31	86	4.17	6	3.53	1078
3.89	27	4.23	35	4.27	22	4.38	24	4.22	27	4.04	80	4.04	26	3.94	84	4.67	6	4.08	1074
2.56	27	3.00	35	3.18	22	2.67	24	3.19	27	3.15	80	2.88	26	2.71	86	3.50	6	2.92	1078
3.33	27	3.94	35	3.59	22	3.54	24	3.78	27	3.79	80	4.00	26	3.60	84	4.17	6	3.62	1074
3.41	27	3.89	35	3.82	22	3.92	24	3.70	27	3.86	80	3.69	26	3.62	86	4.50	6	3.71	1077
4.26	27	4.63	35	4.45	22	4.75	24	4.48	27	4.41	80	4.50	26	4.49	83	4.83	6	4.44	1072
3.11	27	2.97	35	3.41	22	3.46	24	3.59	27	3.13	80	3.38	26	3.11	85	3.50	6	3.21	1078
3.37	27	3.54	35	4.14	22	4.00	24	4.00	27	3.49	80	3.31	26	3.40	84	4.00	6	3.54	1073
3.11	27	3.43	35	3.18	22	3.88	24	3.48	27	3.44	80	3.54	26	3.38	85	3.50	6	3.41	1077
3.74	27	4.40	35	3.14	22	4.25	24	4.11	27	4.16	80	4.38	26	4.13	84	3.50	6	4.10	1073
2.48	27	2.83	35	2.32	22	2.88	24	3.41	27	2.66	80	2.50	26	2.54	85	3.83	6	2.68	1077
3.37	27	3.74	35	3.73	22	3.88	24	4.07	27	4.00	80	3.77	26	3.49	84	4.00	6	3.79	1073
3.74	27	3.83	35	3.55	22	3.54	24	3.63	27	3.45	80	3.35	26	3.25	85	4.00	6	3.43	1078
3.63	27	3.97	35	4.09	22	3.88	24	3.96	26	3.79	80	3.92	26	3.62	84	4.00	6	3.79	1071
3.93	27	4.11	35	4.18	22	4.42	24	3.93	27	3.89	80	3.81	26	3.69	84	4.33	6	3.90	1077
3.85	27	4.29	35	4.50	22	4.21	24	4.22	27	4.16	80	4.27	26	3.99	84	4.50	6	4.14	1073
3.41	27	4.00	34	3.67	21	3.63	24	3.59	27	3.59	80	3.65	26	3.65	85	4.17	6	3.63	1070
4.19	26	4.50	34	4.25	20	4.13	24	4.15	27	4.28	80	4.35	26	4.38	85	4.83	6	4.25	1068
3.59	27	3.68	34	3.76	21	4.08	24	3.26	27	3.40	80	3.46	26	3.45	85	3.67	6	3.47	1069
3.73	26	4.32	34	4.05	20	4.13	24	4.19	27	3.96	80	3.58	26	4.01	84	4.33	6	3.99	1067
3.35	26	3.82	34	3.76	21	3.79	24	3.67	27	3.51	80	3.31	26	3.55	85	3.83	6	3.50	1067
3.73	26	4.24	34	3.95	20	3.92	24	4.07	27	3.98	80	3.88	26	3.88	84	4.50	6	3.95	1065
2.69	26	3.47	34	3.52	21	3.33	24	3.33	27	3.13	80	2.92	26	3.42	85	4.33	6	3.21	1068
3.23	26	3.97	34	3.80	20	3.71	24	3.85	27	3.68	80	4.00	26	3.76	83	4.50	6	3.73	1063

CLINICAL COMPETENCIES, EXPECTATION AND EXPERIENCE BY SCHOOL

		Auburn University		Tuskegee University		University of California-Davis		Colorado State University		University of Florida		University of Georgia	
		Mean	N	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N
Diagnose/prescribe therapy for respiratory disease	Expectation	3.24	29	3.08	12	3.18	39	3.02	59	3.21	24	3.07	29
	Experience	3.76	29	3.67	12	3.62	39	3.85	59	3.75	24	3.72	29
Diagnose/prescribe therapy for renal disease	Expectation	3.55	29	3.42	12	3.62	39	3.58	59	3.63	24	3.28	29
	Experience	3.93	29	4.08	12	4.18	39	4.33	58	4.13	24	3.90	29
Diagnose/prescribe therapy for neurological disease	Expectation	3.24	29	2.83	12	3.44	39	3.12	59	3.13	24	3.34	29
	Experience	3.93	29	3.42	12	3.59	39	3.81	59	3.29	24	3.69	29
Diagnose/prescribe therapy for ocular disorders	Expectation	2.62	29	3.58	12	3.79	39	2.81	58	2.96	24	3.14	29
	Experience	3.24	29	3.83	12	3.77	39	3.54	59	3.46	24	3.59	29
Perform orthopedic surgery	Expectation	2.14	29	3.67	12	1.87	39	2.14	59	2.46	24	2.50	30
	Experience	4.76	29	6.50	12	5.15	39	4.73	59	4.83	24	4.27	30
Perform soft tissue surgery	Expectation	2.93	29	3.50	12	2.92	39	2.78	59	3.50	24	2.60	30
	Experience	3.93	29	4.33	12	3.82	39	3.83	59	4.25	24	4.00	30
Spay or neuter	Expectation	3.45	29	4.33	12	3.62	39	3.19	59	4.00	24	3.13	30
	Experience	4.41	29	5.17	12	4.31	39	4.51	59	4.63	24	4.07	30
Manage reproductive programs	Expectation	3.28	29	4.00	12	3.13	39	2.80	59	3.38	24	3.17	30
	Experience	4.24	29	5.17	12	4.87	39	4.90	59	4.54	24	5.00	30
Evaluate disease outbreaks	Expectation	3.69	29	4.50	12	3.21	39	2.73	59	2.79	24	3.07	30
	Experience	4.28	29	5.42	12	5.15	39	4.85	59	3.75	24	4.30	30
Evaluate new drugs/products	Expectation	3.45	29	3.25	12	3.13	39	3.07	59	3.58	24	3.10	30
	Experience	3.90	29	3.83	12	3.85	39	3.69	59	3.96	24	4.03	30
Interpret medical literature	Expectation	3.62	29	3.50	12	3.77	39	3.15	59	3.79	24	3.62	29
	Experience	3.83	29	4.42	12	4.00	39	3.56	59	3.88	24	4.07	30
Deal with people	Expectation	3.21	29	3.83	12	3.56	39	3.78	60	3.46	24	3.40	30
	Experience	4.00	29	4.42	12	4.21	39	4.25	60	4.17	24	4.03	30
About veterinary medicine as a business	Expectation	1.76	29	2.00	12	2.59	39	2.67	60	2.79	24	2.57	30
	Experience	3.31	29	3.17	12	3.51	39	3.13	60	3.88	24	3.60	30
Giving educational presentations to the community	Expectation	2.59	29	3.92	12	2.97	39	2.98	60	3.13	24	2.67	30
	Experience	3.90	29	4.83	12	4.54	39	4.80	60	4.50	24	4.37	30
Communicating with clients	Expectation	3.24	29	3.83	12	3.62	39	3.77	60	3.54	24	3.57	30
	Experience	4.07	29	4.50	12	4.26	39	4.25	60	4.21	24	4.53	30

University of Illinois		Iowa State University		Kansas State University		Louisiana State University		Cummings SVM at Tufts University		Michigan State University		University of Minnesota		Mississippi State University		Purdue University		Cornell University	
Mean	N	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N
2.78	32	2.94	33	2.81	32	3.31	26	3.36	36	3.06	35	3.12	34	3.15	26	3.29	24	3.38	24
3.76	33	3.50	32	3.55	31	3.88	26	3.61	36	3.66	35	3.64	33	3.85	26	3.46	24	4.17	24
3.34	32	3.42	33	3.63	32	3.58	26	3.97	36	3.60	35	3.79	34	3.42	26	4.00	24	3.75	24
3.97	33	3.84	32	3.87	31	4.19	26	4.08	36	4.03	35	4.00	33	4.08	26	3.96	24	4.54	24
2.63	32	3.18	33	2.75	32	3.08	26	3.83	36	2.89	35	3.12	34	2.81	26	3.83	24	3.42	24
3.67	33	3.19	32	3.45	31	3.46	26	3.72	36	3.43	35	3.52	33	3.38	26	3.58	24	4.17	24
3.56	32	3.30	33	3.41	32	3.54	26	3.25	36	2.86	35	3.21	34	2.38	26	3.38	24	3.33	24
3.82	33	3.41	32	3.97	31	3.65	26	3.75	36	3.17	35	3.75	32	3.35	26	3.88	24	3.96	24
1.79	33	1.61	33	1.84	32	3.27	26	3.17	36	2.66	35	3.15	34	2.35	26	2.92	24	2.25	24
4.73	33	4.61	33	3.88	32	4.92	26	6.56	36	5.40	35	5.91	34	3.38	26	6.46	24	6.29	24
2.88	33	3.45	33	2.78	32	3.58	26	2.83	36	2.74	35	3.00	34	3.69	26	3.71	24	3.17	24
4.09	33	4.13	32	3.91	32	4.38	26	4.03	36	3.74	35	3.68	34	4.12	26	4.25	24	5.21	24
3.52	33	4.03	33	3.50	32	4.08	26	3.58	36	3.49	35	3.65	34	4.81	26	4.58	24	3.75	24
4.45	33	4.82	33	4.50	32	4.81	26	4.69	36	4.54	35	4.45	33	4.81	26	4.83	24	5.54	24
3.21	33	3.18	34	3.50	32	3.19	26	2.78	36	2.20	35	2.71	34	3.54	26	3.42	24	2.96	24
5.44	32	4.26	34	5.50	32	4.88	26	5.22	36	4.57	35	4.85	34	4.69	26	4.88	24	4.46	24
3.12	33	3.03	34	3.72	32	2.69	26	2.92	36	2.86	35	2.76	34	3.96	26	3.13	24	2.79	24
5.22	32	4.03	34	4.91	32	4.42	26	5.20	35	4.29	35	4.79	34	4.73	26	4.75	24	3.25	24
2.94	33	3.12	33	2.69	32	2.69	26	3.53	36	2.66	35	3.18	34	3.23	26	3.33	24	3.21	24
3.82	33	3.64	33	3.72	32	3.38	26	3.72	36	3.77	35	3.67	33	3.88	26	3.67	24	4.08	24
3.36	33	3.55	33	3.03	32	3.12	26	3.67	36	3.09	35	3.79	34	3.73	26	3.75	24	3.42	24
3.88	33	3.88	33	3.56	32	3.69	26	3.72	36	3.97	35	3.65	34	3.92	26	4.00	24	3.71	24
2.79	33	3.15	33	2.75	32	2.96	26	3.25	36	3.06	35	3.71	34	2.73	26	3.29	24	3.21	24
4.09	33	4.00	33	3.75	32	3.85	26	4.00	36	4.03	35	3.91	34	3.54	26	3.79	24	3.92	24
2.15	33	2.36	33	1.94	32	2.50	26	2.47	36	2.26	35	2.71	34	2.62	26	2.63	24	2.21	24
3.39	33	3.21	33	3.34	32	3.23	26	3.19	36	3.57	35	3.32	34	2.81	26	2.92	24	3.58	24
2.67	33	2.85	33	2.97	32	2.81	26	2.81	36	2.86	35	3.24	34	3.35	26	3.00	24	2.83	24
4.52	33	4.58	33	3.88	32	4.92	26	5.08	36	4.34	35	4.15	34	4.77	26	4.04	24	4.33	24
2.94	33	3.33	33	3.09	32	3.00	26	3.31	36	3.31	35	3.76	34	3.42	26	3.42	24	3.50	24
4.18	33	3.94	33	3.97	32	4.19	26	4.08	36	4.00	35	4.18	34	3.81	26	3.79	24	4.46	24

		Oklahoma State University		University of Pennsylvania		Texas A&M University		Washington State University		University of Missouri-Columbia		The Ohio State University		Oregon State University	
		Mean	N	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N
Diagnose/prescribe therapy for respiratory disease	Experience	3.00	24	3.24	34	3.40	70	3.09	23	3.03	34	3.26	39	3.05	21
	Expectation	3.54	24	4.09	35	3.96	70	3.70	23	3.56	34	3.76	38	3.90	21
Diagnose/prescribe therapy for renal disease	Experience	3.42	24	3.59	34	3.74	70	3.78	23	3.68	34	3.67	39	3.33	21
	Expectation	4.54	24	4.37	35	4.24	70	4.43	23	4.24	34	4.13	38	4.29	21
Diagnose/prescribe therapy for neurological disease	Experience	2.88	24	3.21	34	3.67	70	3.57	23	3.26	34	3.36	39	2.90	21
	Expectation	3.33	24	3.97	35	3.93	70	3.52	23	3.41	34	3.76	38	3.33	21
Diagnose/prescribe therapy for ocular disorders	Experience	3.42	24	3.18	34	2.16	70	3.48	23	3.50	34	3.31	39	2.19	21
	Expectation	3.96	23	3.94	35	3.36	69	3.78	23	3.65	34	3.47	38	3.29	21
Perform orthopedic surgery	Experience	1.46	24	2.97	35	2.63	70	2.70	23	1.76	34	1.92	39	2.19	21
	Expectation	4.96	24	5.80	35	4.33	70	4.17	23	4.12	34	4.58	38	5.48	21
Perform soft tissue surgery	Experience	2.88	24	3.11	35	3.51	70	3.43	23	2.68	34	3.59	39	3.00	21
	Expectation	4.13	24	4.34	35	4.26	70	4.13	23	4.18	34	4.53	38	4.67	21
Spay or neuter	Experience	3.83	24	3.34	35	4.36	70	3.91	23	3.09	34	4.45	38	4.24	21
	Expectation	4.67	24	5.00	35	4.84	69	4.74	23	4.62	34	5.24	38	5.05	20
Manage reproductive programs	Experience	3.00	24	2.86	35	3.21	70	3.17	23	2.79	34	2.92	39	3.19	21
	Expectation	4.96	24	5.26	35	5.34	70	5.17	23	4.68	34	4.37	38	4.86	21
Evaluate disease outbreaks	Experience	2.79	24	2.94	35	3.63	70	3.30	23	2.74	34	3.26	39	3.19	21
	Expectation	4.13	23	5.37	35	4.97	70	4.35	23	4.53	34	5.42	38	5.19	21
Evaluate new drugs/ products	Experience	3.00	24	3.34	35	3.50	70	3.17	23	3.15	34	3.36	39	3.48	21
	Expectation	3.79	24	3.71	35	4.06	70	3.52	23	3.94	34	4.18	38	3.95	21
Interpret medical literature	Experience	3.29	24	3.80	35	3.86	70	3.57	23	3.50	34	3.74	39	3.76	21
	Expectation	3.67	24	3.60	35	3.96	70	3.52	23	3.82	34	4.03	38	3.81	21
Deal with people	Experience	3.04	24	3.00	35	3.40	70	3.61	23	3.00	34	3.54	39	3.10	21
	Expectation	4.00	24	4.46	35	4.14	70	3.96	23	3.74	34	4.29	38	4.62	21
About veterinary medicine as a business	Experience	1.83	24	2.97	35	2.79	70	2.57	23	1.97	34	2.90	39	2.33	21
	Expectation	3.29	24	3.51	35	3.89	70	3.43	23	2.91	34	3.50	38	4.57	21
Giving educational presentations to the community	Experience	2.42	24	3.17	35	3.04	70	2.70	23	2.29	34	2.77	39	3.10	21
	Expectation	4.92	24	5.60	35	4.71	70	4.48	23	3.62	34	4.21	38	4.95	21
Communicating with clients	Experience	3.29	24	3.00	35	3.51	70	3.86	22	3.29	34	3.87	39	3.14	21
	Expectation	4.00	24	4.43	35	4.22	69	3.96	23	4.00	34	4.29	38	4.81	21

Table 9

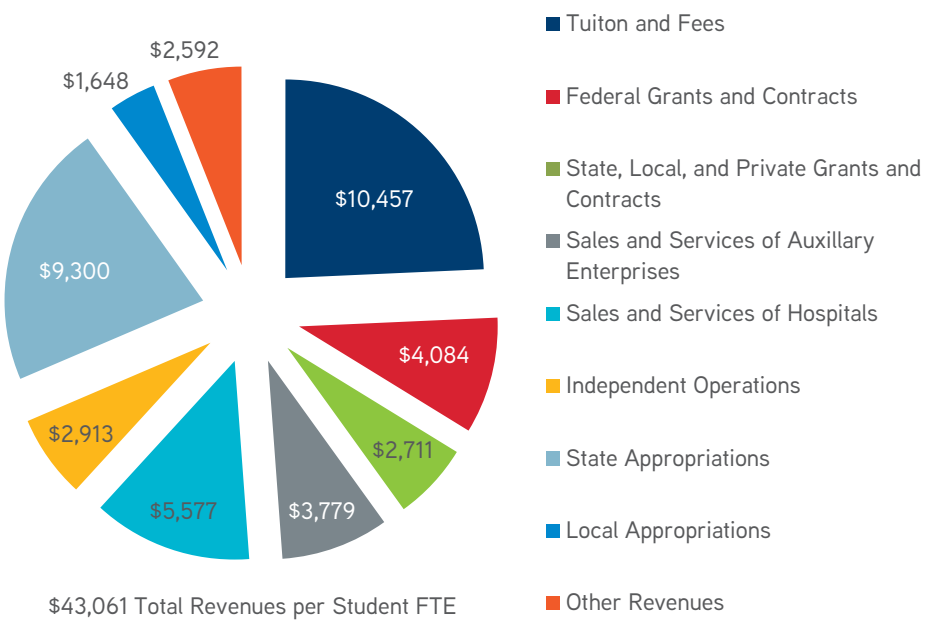
University of Tennessee		Virginia-Maryland College		North Carolina State University		University of Wisconsin		Western University-California		Ross University		St. George's University		Other		St. Matthew's University		National	
Mean	N	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N
3.04	26	3.64	33	3.33	21	3.29	24	3.22	27	3.25	80	3.27	26	3.36	85	4.00	6	3.20	1067
3.38	26	3.91	34	3.75	20	3.83	24	3.67	27	3.75	80	3.73	26	3.87	82	4.67	6	3.76	1062
3.81	26	4.18	34	3.95	20	4.17	24	4.07	27	3.61	80	3.58	26	3.73	85	4.50	6	3.68	1067
4.00	26	4.47	34	4.45	20	4.29	24	4.41	27	4.03	80	4.12	26	4.15	82	4.83	6	4.16	1061
3.23	26	3.65	34	3.33	21	3.67	24	3.19	27	2.98	80	3.46	26	3.18	85	4.00	6	3.24	1068
3.31	26	3.71	34	3.65	20	4.04	24	3.56	27	3.34	80	3.69	26	3.62	82	4.33	6	3.61	1062
3.65	26	3.56	34	3.70	20	3.83	24	2.89	27	2.69	80	2.85	26	2.92	85	3.67	6	3.09	1066
3.62	26	3.94	34	3.90	20	4.17	24	3.30	27	3.23	80	3.62	26	3.52	82	4.33	6	3.60	1059
2.00	27	2.26	34	3.59	22	1.83	24	2.52	27	2.35	80	2.58	26	2.40	84	1.83	6	2.38	1072
3.93	27	5.44	34	5.95	22	5.58	24	4.81	27	4.29	79	5.04	26	4.20	84	2.17	6	4.85	1070
2.93	27	3.06	34	3.27	22	3.04	24	3.26	27	3.43	80	3.50	26	3.06	83	3.67	6	3.15	1071
4.00	27	4.18	34	4.68	22	4.58	24	4.26	27	4.00	80	4.08	26	3.81	83	3.67	6	4.12	1069
3.48	27	3.56	34	3.77	22	3.71	24	4.30	27	3.91	80	4.08	26	3.48	82	3.83	6	3.77	1069
4.37	27	4.62	34	5.09	22	5.33	24	4.78	27	4.65	80	4.50	26	4.35	83	4.00	6	4.67	1067
2.67	27	3.29	34	3.23	22	3.96	24	2.96	27	2.95	80	2.81	26	3.04	85	2.50	6	3.06	1074
3.56	27	5.03	34	5.82	22	6.25	24	5.52	27	4.50	80	4.50	26	4.61	85	3.67	6	4.86	1072
2.92	26	3.44	34	3.50	22	3.50	24	3.38	26	3.14	80	2.96	26	3.50	84	3.00	6	3.19	1071
4.00	27	4.94	34	5.27	22	5.42	24	5.38	26	4.06	80	4.04	26	4.77	84	3.17	6	4.68	1068
3.04	27	3.41	34	3.14	21	3.67	24	3.44	27	3.24	79	2.85	26	3.27	85	3.17	6	3.21	1071
3.96	27	3.97	34	4.24	21	4.13	24	4.15	27	3.97	78	3.81	26	3.77	84	3.83	6	3.86	1067
3.44	27	3.71	34	3.86	21	3.67	24	4.30	27	3.57	79	3.35	26	3.64	84	3.83	6	3.58	1069
3.93	27	4.15	34	4.19	21	3.75	24	4.26	27	3.85	79	3.73	26	3.98	83	5.33	6	3.87	1068
3.41	27	3.40	35	3.14	21	3.58	24	4.19	27	3.25	80	3.31	26	3.44	84	3.17	6	3.32	1073
3.96	27	4.29	35	4.38	21	4.38	24	4.37	27	4.23	80	4.19	26	4.16	83	4.33	6	4.11	1071
2.33	27	2.66	35	3.05	20	2.42	24	2.93	27	2.48	80	2.35	26	2.55	83	2.33	6	2.49	1071
2.78	27	3.74	35	4.24	21	3.33	24	3.52	27	3.56	80	3.38	26	3.53	83	3.17	6	3.44	1071
2.85	27	3.00	35	2.67	21	3.17	24	3.19	27	2.89	80	2.69	26	3.08	83	3.00	6	2.92	1072
4.22	27	4.77	35	4.33	21	4.08	24	4.89	27	3.96	80	4.15	26	4.51	83	5.67	6	4.48	1071
3.63	27	3.66	35	3.62	21	3.79	24	4.04	27	3.48	80	3.15	26	3.46	83	3.50	6	3.47	1071
4.00	27	4.60	35	4.48	21	4.42	24	4.56	27	4.25	80	4.19	26	4.16	82	4.33	6	4.21	1069

FACTORS THAT REDUCE THE COSTS OF VETERINARY EDUCATION

As noted previously, numerous factors reduce the veterinary student's costs of veterinary education. These include regional exchanges and state-to-state contractual arrangements, changing residency status, and scholarships.

The public universities and colleges receive funds from state and local governments to assist state resident students with the cost of education. The National Center for Educational Statistics provides information on the number of students, faculty and staff, degrees granted and finances of public and private degree-granting and non-degree-granting institutions in the United States, both nationally and by state. Revenues from non-operating (state and local appropriations and other non-operating sources) and operating sources (tuition and fees, grants and contracts, and sales of products and services) are tracked by academic year. These "non-operating" sources of revenue as a percent of the total revenue comprised just fewer than 40 percent of the total national average revenue per full-time equivalent (FTE) student, or roughly $43,000 in 2014.

PER-STUDENT REVENUES FOR FOUR-YEAR PUBLIC INSTITUTIONS, 2014



$43,061 Total Revenues per Student FTE

Figure 46

While tuition and fees comprise approximately $10,500 per student FTE of the total revenue for these four-year public institutions, the expenditures on instruction per student FTE was roughly $9,900 in 2014, a total expenditure per FTE student of $40,033.

PER-STUDENT EXPENDITURES FOR FOUR-YEAR PUBLIC INSTITUTIONS, 2014

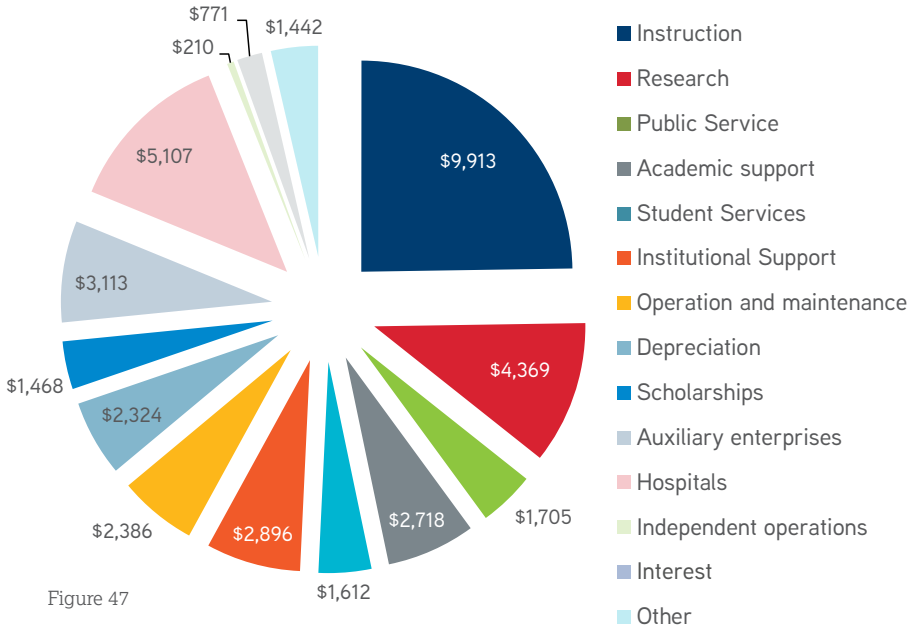


Figure 47

The state and local contribution to the total revenues of the four-year public institutions vary considerably by state from a low of 15.2 percent in Colorado to a high of 58.2 percent in Wyoming.

NON-OPERATING REVENUE AS A PERCENT OF TOTAL REVENUE FOR PUBLIC POST-SECONDARY INSTITUTIONS, 2014

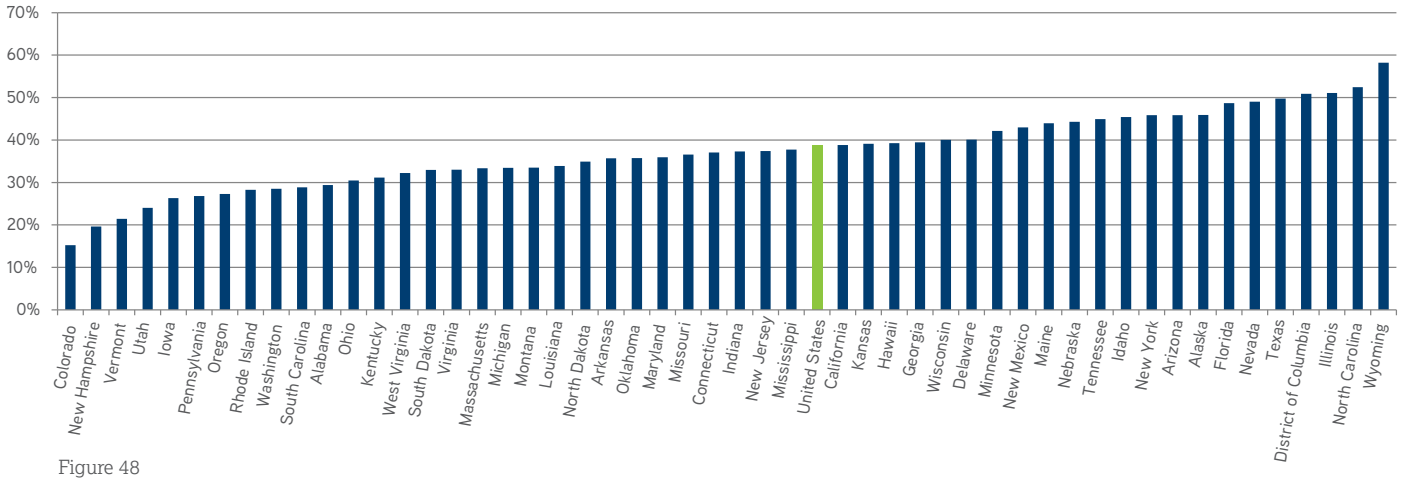


Figure 48

If non-operating revenues were an important factor in the price of a DVM seat, the share of the non-operating revenue as a percent of total revenue would be expected to be closely aligned with the annual level of tuition and fees charged by the colleges of veterinary medicine in each state. However, there is no statistical relationship between these two variables. In fact, some of the veterinary colleges in states where the share of non-operating revenues is higher than the national average (e.g., Florida) also have higher than average veterinary college tuition rates while other states where the share of non-operating revenues is lower than the national average (e.g., Alabama) have veterinary college tuition rates that are below the average for all veterinary colleges. This suggests that there may be reasons internal to the various public colleges that are driving the tuition rates for the veterinary colleges.

OPERATING REVENUE AS A PERCENT OF TOTAL REVENUE FOR PUBLIC POST-SECONDARY INSTITUTIONS, 2014

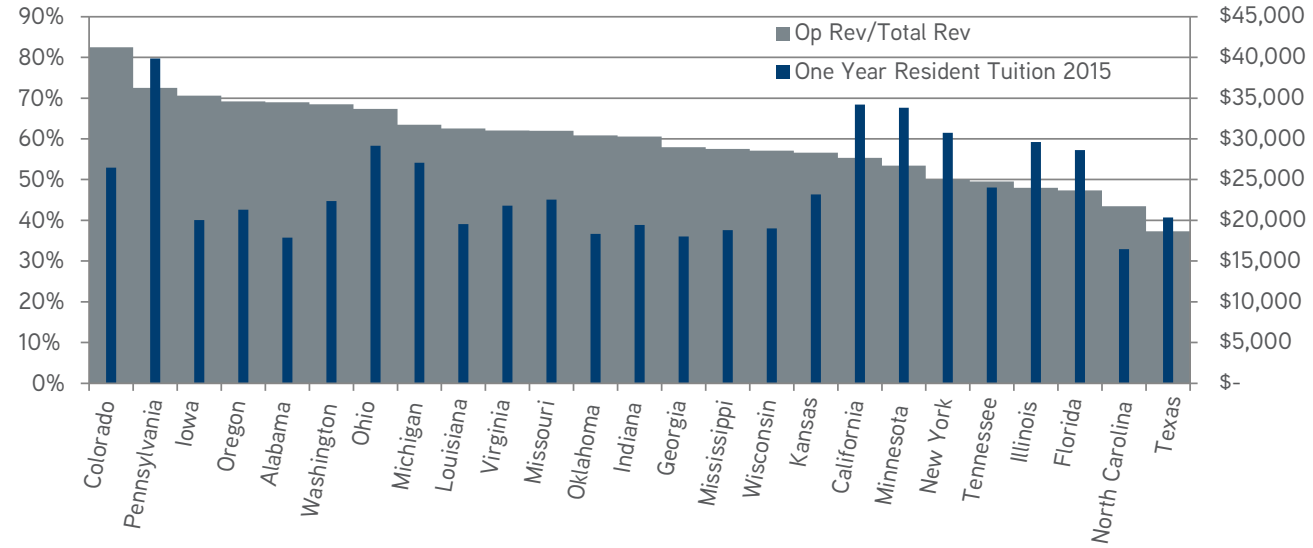
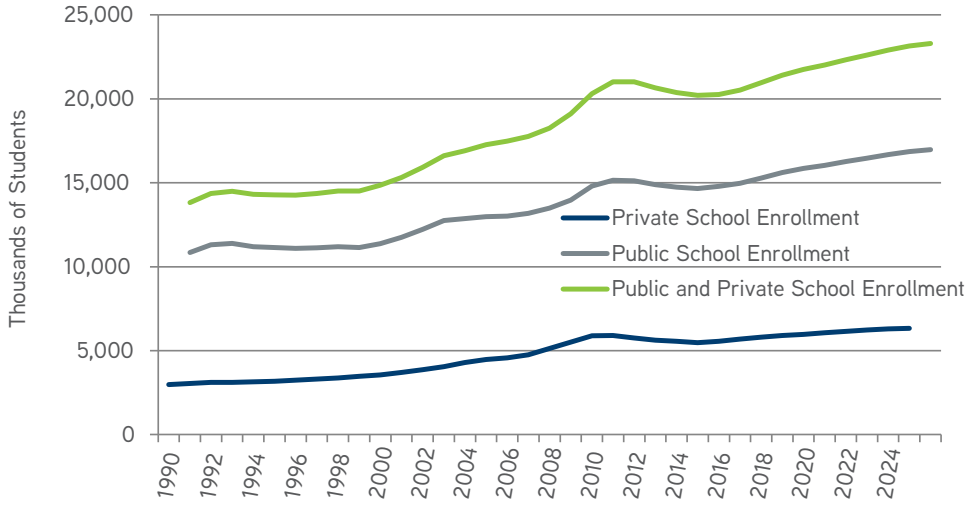


Figure 49

ENROLLMENT IN DEGREE-GRANTING POST-SECONDARY INSTITUTIONS

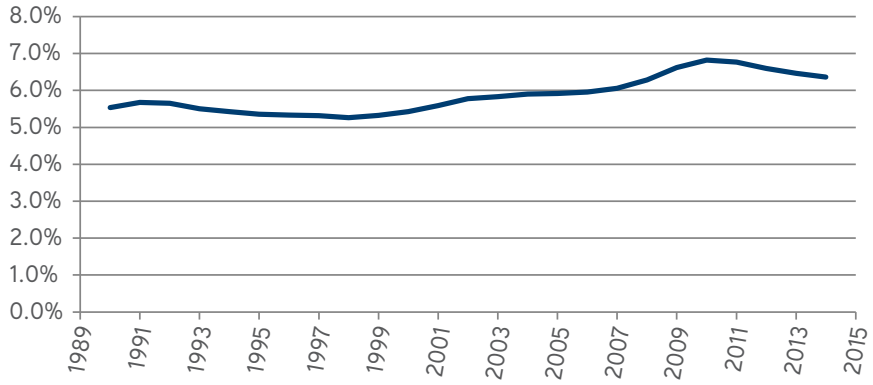


Reference: National Center for Educational Statistics

Figure 50

The enrollment levels did decline during the post-recession period from 2010 to 2014, however, reducing the share of operating revenue and increasing the costs per student FTE. And, because the non-operating revenues also declined during the same period, public institutions were faced with a decline in both operating and non-operating revenue and were required to either cut expenditures or increase tuition and fees (and/or other operating sources of revenue such as scholarship funding or grants and contracts), or do both.

ENROLLMENT IN POST-SECONDARY EDUCATION AS A PERCENT OF POPULATION



Reference: National Center for Educational Statistics

Figure 51

Considering only the revenues from tuition and fees and state appropriation, this cycle of reduced revenue per student FTE at each period of economic recession can be seen along with the declining share of state appropriations and the increasing share of tuition and fees. More important is the contrast with the total revenue from these two revenue sources compared to the level of FTE enrollment over time. The total revenue from these two major sources of funding for public education have remained nearly flat for almost three decades at $12,000 per student FTE while the total number of student FTEs over the same period has risen by 50 percent, an additional 4 million student FTEs.

EDUCATIONAL APPROPRIATIONS AND NET TUITION REVENUE

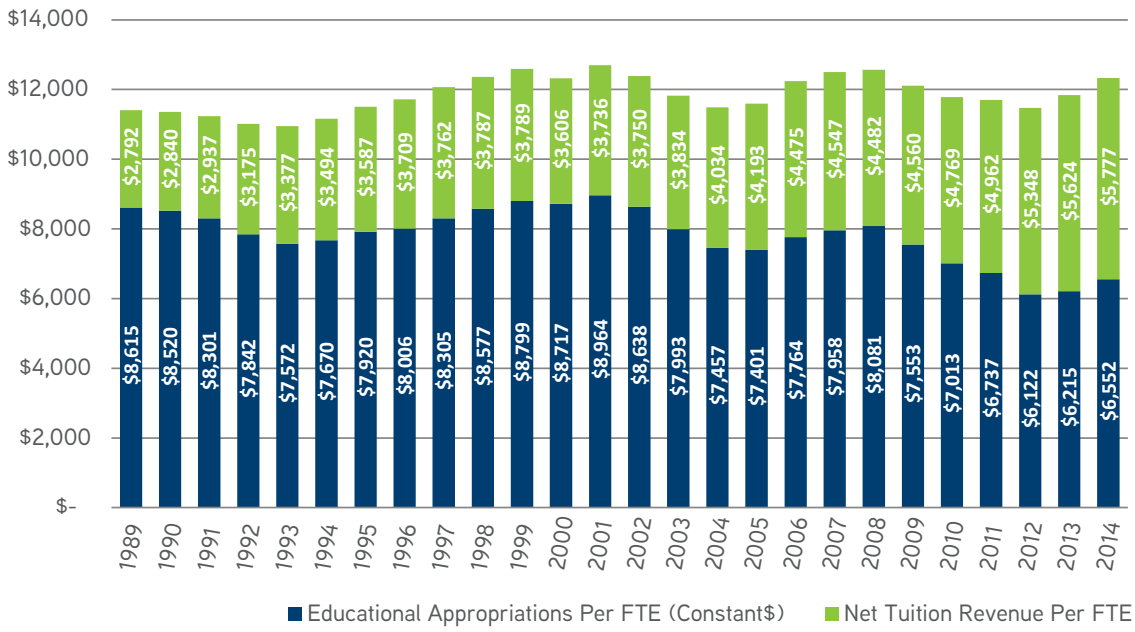


Figure 52

Also, during the last three decades the graduation rate has increased across bachelors, masters and doctorial levels. In 1990, only one in nine of the total enrolled students graduated with one of the three degrees, while today that number has improved to one in seven. However, even this graduation rate is inefficient as administrators attempt to spread costs evenly across remaining students.

ENROLLMENT AND GRADUATES AS A PERCENT OF U.S. POPULATION

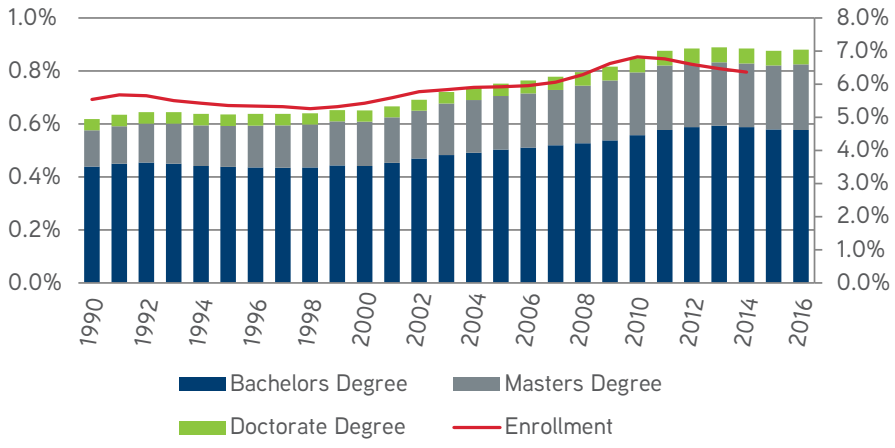


Figure 53

The dollars spent per student enrolled today is two and a half times what it was in 1990. In real 2010 dollars, the total cost of public education per student has risen by $10,000, from just more than $15,000 in 1990 to roughly $25,000 today. The reasons for this increasing cost per student are many but certainly include those that are common problems in today's economy, such as the rising costs of retirement and health care, the increased financial burden associated with regulations and accountability requirements, and the cost of staying current with the latest technology.

DOLLARS SPENT PER STUDENT ENROLLED

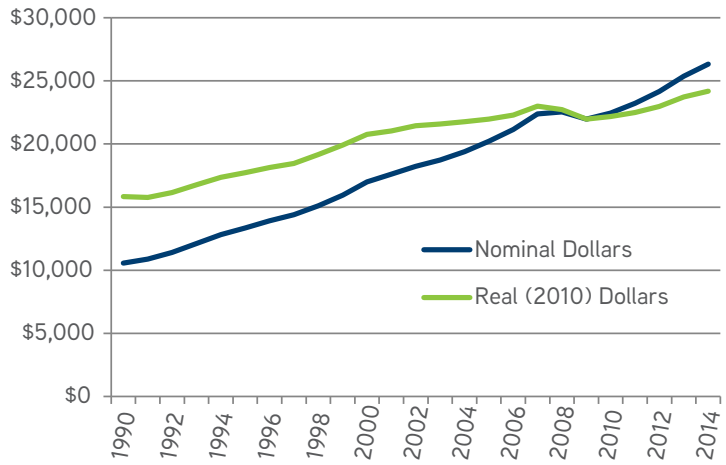


Figure 54

The cost for a college degree, however, is seven times greater than the cost per student enrolled. And, this points to a larger problem in our educational system that is driving costs: efficiency in production. That students require more years to obtain a degree than a degree program warrants, and that less than 40 percent of students obtain a degree is an indication of an inefficient system. The capacity required to provide education to those enrolled is considerably greater than what is needed to graduate students. This excessive capacity is expensive to maintain and places upward pressure on the costs of education.

A school that is staffed for 20,000 students, for example, would consider having four classes of 5,000 students each and the costs of providing this education less sources of non-operating income could be allocated across these students. As the initial class of 5,000 declines each year over the four-year period, however, costs will have to rise as there are fewer students over which to spread the same costs. First-year student retention rates vary from 60 percent to more than 90 percent and represent a large loss in revenues that can only be translated into higher tuition for those remaining.

DOLLARS SPENT PER COLLEGE DEGREE

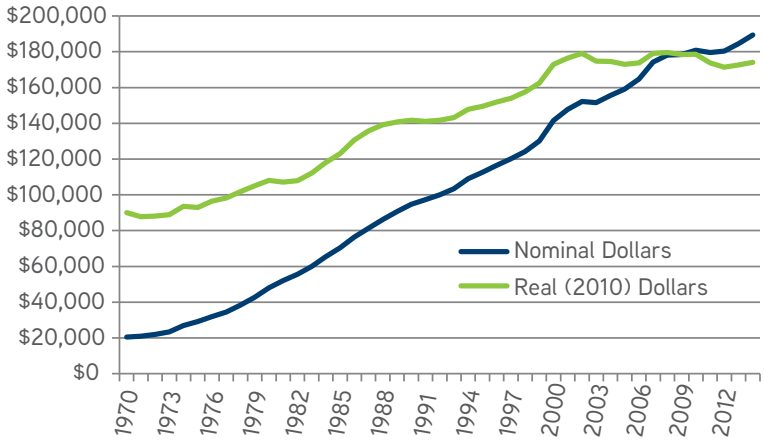


Figure 55

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 different rates for resident and non-resident tuition. The need for differences in tuition and fees were developed long ago and based on the non-resident's home state sharing the funding of the 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 upon completion of their education most would probably return to the state from which they came. 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 these costs. Today, the 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.

In the late 1940s and 1950s, several regional compacts were formed in order to share publicly 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 New England Board of Higher Education (NEBHE; www.nebhe.org) and the Midwest Higher Education Compact (MHEC; www.mhec.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 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 2016-17 academic year, seven WICHE states without public veterinary colleges (Arizona, Hawaii, Montana, Nevada, New Mexico, North Dakota and Wyoming) spent $5.38 million to reduce tuition costs for 167 new and continuing DVM students studying at one of the five fully-accredited cooperating veterinary colleges in the western U.S. states. Western states supporting DVM students paid $32,400 per student in 2016-17. Institutions participating in WICHE's Professional Student Exchange Program (PSEP) for veterinary medicine are Colorado State University, Oregon State University, Washington State University, Western University of Health Sciences, and the University of California-Davis.

In the 2016-17 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 309 new and continuing DVM students studying at one of the six fully-accredited participating veterinary colleges. In the SREB region, the veterinary medicine program rate is $31,100 per student for academic year 2016-17. 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 states without public veterinary colleges. These arrangements often lower educational costs or simply provide access to non-residents.

IMPROVING THE DEBT-TO-INCOME RATIO

There has been very little connection between the market for education and the market for graduates with respect to relative price and quantities.

The debt-to-income problem in the veterinary profession is not new, having been discussed numerous times over the past five decades. What is new, however, 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 more than 4:1 for nearly 7 percent and greater than 1.4 for more than 68 percent of U.S. graduates. And, this does not include the U.S. students from foreign veterinary colleges where the debt-to-income ratio is likely to be well over the mean.

The rise in tuition and the increased emphasis on recruiting and retention by universities was certainly (at least in part) a response to reduced public (state and federal) 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 to increasing efforts to enroll more students (increased seats) – and to ensuring that students 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 to animal owners. 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 based on the current business models of veterinary practices. 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 for veterinary services. More importantly, there has been very little connection between the market for education and the market for graduates with respect to relative price and quantities.

HISTORICAL PERSPECTIVE

Before assigning blame for the high DIR that plagues the veterinary profession, a review of the decisions by and overall conditions at the colleges should be considered. And, the outcomes of today need to be considered in the context of decisions that were made in the early part of the new millennium.

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.

As noted earlier, 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 1989-2015

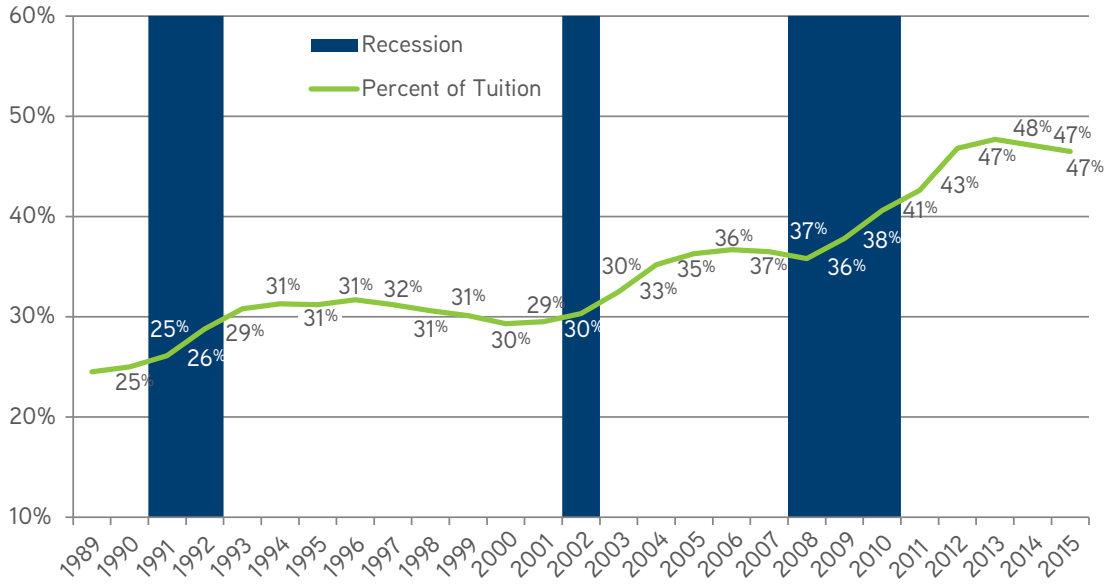


Figure 56

A deeper look at the budgets of the universities finds that growth in professional staff between 2001 and 2014 occurred at a rate of 41.3 percent for all higher education institutions, but only at a rate of 29.5 percent for public institutions. At the same time, there has been an overall decline in non-professional staff at both institutions of higher education and public institutions. Faculty has been the main component of increased staffing, adding nearly 400,000 positions, while roughly 400,000 other professionals have been added between 2001 and 2014. 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

	2014	2011	2001	
All institutions	**3,969,226**	**3,840,980**	**3,083,353**	**28.7%**
Professional staff	**3,011,700**	**2,923,961**	**2,132,150**	**41.3%**
Executive/administrative/managerial	259,646	238,718	206,292	25.9%
Faculty (instruction/research/public service)	1,582,360	1,523,615	1,113,183	42.1%
Graduate assistants	363,416	355,916	261,136	39.2%
Other professional	806,278	805,712	551,539	46.2%
Non-professional staff	**957,526**	**917,019**	**951,203**	**-3.6%**
Technical and para-professionals	155,804	196,651	202,283	-2.8%
Clerical and secretarial	480,789	426,174	452,948	-5.9%
Skilled crafts	76,412	60,664	64,801	-6.4%
Service and maintenance	244,521	233,530	231,171	1.0%

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

During the 2001 to 2014 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. Reduced clerical and secretarial staff in public institutions resulted from the adoption of improved communication and word processing technology, and the transfer of some duties to professional staff occurred as budget constraints were imposed.

DISTRIBUTION OF FACULTY AT PUBLIC INSTITUTIONS

	2014	2011	2001	
All public institutions	**2,527,284**	**2,484,820**	**2,136,970**	**18.3%**
Professional staff	**1,913,785**	**1,865,269**	**1,477,953**	**29.5%**
Executive/administrative/managerial	139,745	112,473	107,288	30.3%
Faculty (instruction/research/public service)	968,734	953,230	771,124	25.6%
Graduate assistants	287,852	285,905	219,475	31.2%
Other professional	517,454	513,661	380,066	36.1%
Non-professional staff	**613,499**	**619,551**	**659,017**	**-6.0%**
Technical and para-professionals	95,984	145,098	148,116	-2.0%
Clerical and secretarial	301,625	273,357	305,067	-10.4%
Skilled crafts	55,470	45,597	48,975	-6.9%
Service and maintenance	160,420	155,499	156,859	-0.9%

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

Over the period from 2001 to 2014, the full-time equivalent enrollment increased from just fewer than 16 million to nearly 20.7 million students, a 30 percent increase. As mentioned earlier, there has been a decline in full-time equivalent student enrollment since 2010 as the economy has improved. During the same period, professional and non-professional staff increased from just more than 3 million to nearly 4 million, a 28.7 percent increase. The combination of more students and increased staff led to an increasing student to staff ratio of 5.2:1 to 5.5:1 by 2011, but this has returned to the level of 5.2:1 in 2014, with the number of students to faculty falling from 14.3:1 to 13.8 to 1 by 2011 and further declining to 13.1:1 in 2014. Even more remarkable is the rate at which the student to non-professional staff has increased from 16.7:1 in 2001 to 22.9:1 in 2011 and then falling to 21.6:1 by 2014.

DISTRIBUTION OF FACULTY AND TOTAL STUDENTS

Total Students	20,663,464	20,994,113	15,927,987	31.8%
	2014	2011	2001	
All institutions	**5.2**	**5.5**	**5.2**	**0.8%**
Professional staff	6.9	7.2	7.5	-8.2%
Executive/administrative/managerial	79.6	87.9	77.2	3.1%
Faculty (instruction/research/public service)	13.1	13.8	14.3	-8.7%
Graduate assistants	56.9	59	61	-6.8%
Other professional	25.6	26.1	28.9	-11.3%
Non-professional staff	**21.6**	**22.9**	**16.7**	**28.9%**
Technical and para-professionals	132.6	106.8	78.7	68.4%
Clerical and secretarial	43.0	49.3	35.2	22.2%
Skilled crafts	270.4	346.1	245.8	10.0%
Service and maintenance	84.5	89.9	68.9	22.6%

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 12

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

	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 13

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.

NUMBER OF SEATS IN U.S. VETERINARY COLLEGES

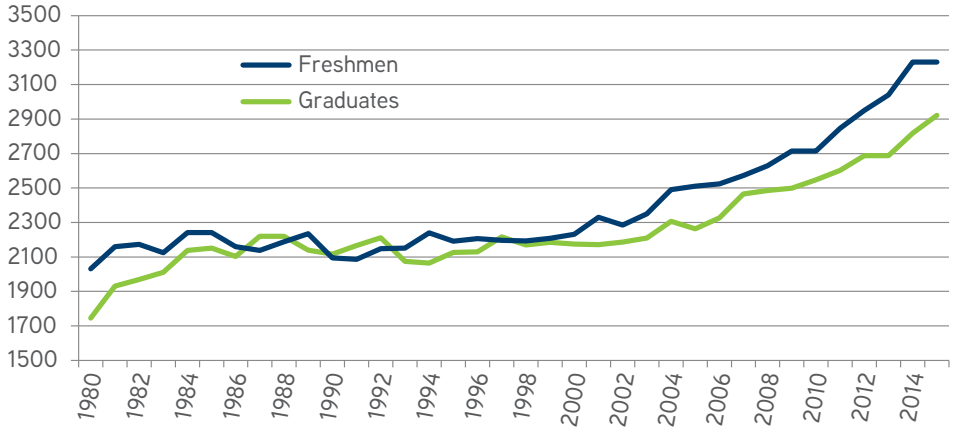


Figure 57

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 for a share of shrinking real disposable income with 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: By 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 perform both a private and a public service and thus should receive compensation from both entities. The compensation from the public occurred in the past through the public support of veterinary education. This support reduced the cost of education to the veterinary student and allowed the student to attain a standard of living that was somewhat unfettered by student debt. Today this scenario no longer exists and, in fact, many veterinarians now pay the full cost of their education, receiving no public support and still provide public services. In economics this is known as a market failure: Consumers are obtaining benefits without paying for them. And, the first role of government is to ensure against 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 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

As mentioned in previous reports, 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. Before we begin to discuss the strategies to reduce the debt to income ratio, however, closer look at the source of the debt is in order.

The values for debt and income are reported by students prior to graduation, and for 2016, out of 2,932 graduates, 2,600 reported a value (including zero) for debt, but only 1,424 reported both a debt and income from full-time employment. Using these data, the DIR was computed 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. The following table illustrates the mean DIR of 2016 graduates, by school, who secured full-time employment.

DEBT-TO-INCOME RATIO BY SCHOOL, 2016, FULL-TIME ONLY

Veterinary Medical College	Mean	N	Std. Deviation
Tuskegee University	3.6613	32	2.44716
Western University - California	3.2289	26	1.69348
Kansas State University	2.6916	52	1.64776
University of Minnesota	2.5659	46	1.57459
Michigan State University	2.5294	50	1.94381
The Ohio State University	2.4450	81	1.47246
Colorado State University	2.2650	47	1.61308
University of Pennsylvania	2.2447	33	1.30823
University of Illinois	2.1566	44	1.59330
University of Florida	2.1508	68	1.55781
University of Tennessee	2.1062	32	1.15614
Oregon State University	2.0765	37	1.46118
Mississippi State University	2.0743	46	2.23513
Total/National Mean	**2.0322**	**1,424**	**1.49291**
Louisiana State University	2.0278	44	1.17456
Virginia-Maryland College	2.0207	69	1.32811
Cummings SVM at Tufts University	1.9863	29	1.41549
Washington State University	1.9681	80	1.22865
University of Missouri-Columbia	1.9120	79	1.03730
Oklahoma State University	1.9075	53	1.21615
Iowa State University	1.8884	73	1.00137
University of California-Davis	1.7925	44	1.15669
University of Georgia	1.7831	52	1.69783
Cornell Veterinary College	1.7586	38	1.67597
Purdue University	1.6145	39	1.02890
Auburn University	1.5967	67	1.21627
North Carolina State University	1.5291	50	1.14030
University of Wisconsin	1.4167	38	1.14020
Texas A&M University	1.0212	75	.77726

Table 14

DEBT-TO-INCOME RATIO BY SCHOOL, 2016 ALL GRADUATES

	Mean	N	Std. Deviation
Western University - California	6.0337	67	3.76665
Tuskegee University	5.3852	48	4.25297
University of Tennessee	4.2311	55	3.5571
Kansas State University	3.8177	75	2.93959
The Ohio State University	3.7849	128	3.24625
University of Minnesota	3.5101	78	2.6809
University of Pennsylvania	3.4653	79	3.16399
Mississippi State University	3.3524	73	3.31999
Cummings SVM at Tufts University	3.3102	69	3.02122
Michigan State University	2.9771	71	2.50379
Cornell Veterinary College	2.9687	87	2.75478
Oregon State University	2.9414	51	2.45222
Total/National Mean	**2.9274**	**2,257**	**2.70727**
Colorado State University	2.9009	78	2.27205
University of Illinois	2.8038	70	2.26365
University of Florida	2.7657	85	2.25526
Purdue University	2.7611	59	2.69455
Virginia-Maryland College	2.6399	99	2.36174
University of California-Davis	2.6389	120	2.54839
Iowa State University	2.5975	94	2.13256
Oklahoma State University	2.5488	73	1.94725
Louisiana State University	2.5138	66	1.89737
University of Missouri-Columbia	2.4868	100	2.02123
University of Georgia	2.2739	89	2.29146
North Carolina State University	2.2713	84	1.83083
Auburn University	2.2214	98	2.17841
Washington State University	1.9503	92	1.45572
University of Wisconsin	1.9035	68	1.67982
Texas A&M University	1.3606	101	1.58046

Table 15

Schools with the highest DIR for the 2016 graduating class were Western University, Tuskegee University and University of Tennessee. Conversely, schools with the lowest DIR for 2016 graduates were Washington State University, University of Wisconsin and Texas A&M University.

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

TOTAL COST-TO-INCOME RATIO BY SCHOOL, 2016

	Mean	N	Std. Deviation
University of Pennsylvania	9.3593	78	4.21400
Cummings SVM at Tufts University	7.5144	67	3.13049
Western University - California	6.8158	68	2.60808
Cornell Veterinary College	6.0165	86	2.87891
University of California-Davis	5.9106	114	2.61559
Kansas State University	5.1517	76	3.08381
The Ohio State University	5.0581	129	2.81320
Colorado State University	4.9549	79	2.32411
Mississippi State University	4.7351	69	2.96055
Total/National Mean	**4.5481**	**2,245**	**2.82381**
University of Minnesota	4.5399	78	2.13014
Michigan State University	4.4790	70	2.36858
University of Wisconsin	4.4072	69	2.20797
University of Tennessee	4.3204	55	2.68309
Auburn University	4.2734	98	2.36879
Louisiana State University	4.2603	65	2.06156
Oklahoma State University	4.2359	73	3.20224
University of Florida	4.0234	90	2.07610
Purdue University	4.0005	57	2.52685
University of Illinois	3.8192	73	1.77621
North Carolina State University	3.7328	83	1.72852
Oregon State University	3.7092	51	2.15914
Iowa State University	3.5470	94	1.94674
University of Missouri-Columbia	3.3494	101	1.64864
Washington State University	3.3344	91	1.88168
University of Georgia	3.2778	86	1.96670
Virginia-Maryland College	3.2065	100	1.87515
Texas A&M University	3.1233	98	1.77524
Tuskegee University	2.0029	47	2.13073

Table 16

Only the survey responses were used 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) is not ascertained. 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 BY SCHOOL, 2016

	Mean	N	Std. Deviation
University of Pennsylvania	10.8500	78	4.88517
Cummings SVM at Tufts University	8.7112	67	3.62910
Tuskegee University	8.1590	47	4.33549
Western University - California	7.9014	68	3.02348
Cornell Veterinary College	6.9747	86	3.33744
University of California-Davis	6.8520	114	3.03219
Kansas State University	5.9722	76	3.57498
The Ohio State University	5.8637	129	3.26126
Colorado State University	5.7441	79	2.69428
Mississippi State University	5.4893	69	3.43208
Total/National Mean	**5.3947**	**2245**	**3.30963**
University of Minnesota	5.2630	78	2.46942
Michigan State University	5.1924	70	2.74583
University of Wisconsin	5.1092	69	2.55964
University of Tennessee	5.0086	55	3.11044
Auburn University	4.9540	98	2.74607
Louisiana State University	4.9388	65	2.38991
Oklahoma State University	4.9106	73	3.71227
University of Florida	4.6642	90	2.40676
Purdue University	4.6377	57	2.92931
University of Illinois	4.4275	73	2.05911
North Carolina State University	4.3273	83	2.00383
Oregon State University	4.3000	51	2.50304
Iowa State University	4.1119	94	2.25681
University of Missouri-Columbia	3.8829	101	1.91123
Washington State University	3.8655	91	2.18138
University of Georgia	3.7999	86	2.27995
Virginia-Maryland College	3.7172	100	2.17381
Texas A&M University	3.6207	98	2.05798

Table 17

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 attendance? 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.

In general, the tables above would indicate that the DIR is certainly a problem with 25 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 among the schools.

However, looking at the distribution of debt to total costs for each reporting student by college indicates that some students 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 group comprises nearly 10 percent of the reporting students (254) who had full-time employment with just 13 schools having a percentage of students with "excessive" debt greater than the average of all 28 U.S. colleges (9.6 percent).

DEBT-TO-COST AND DEBT-TO-COST PLUS INTEREST BY SCHOOL, 2016

	D:C Ratio	D:(C+I) Ratio
University of Tennessee	.9635	.8311
Western University - California	.8708	.7512
Virginia-Maryland Regional	.8574	.7396
Tuskegee University	.8031	.6361
University of Minnesota	.7918	.6830
Iowa State University	.7596	.6552
The Ohio State University	.7539	.6503
University of Illinois	.7535	.6500
Kansas State University	.7527	.6493
University of Missouri-Columbia	.7482	.6454
Oregon State University	.7437	.6415
Purdue University	.7327	.6320
University of Georgia	.7277	.6278
University of Florida	.6952	.5996
Oklahoma State University	.6916	.5966
Michigan State University	.6858	.5915
Washington State University	.6781	.5849
Total/National Mean	**.6671**	**.5740**
Mississippi State University	.6591	.5686
Louisiana State University	.6352	.5479
North Carolina State University	.6177	.5328
Colorado State University	.6109	.5269
Auburn University	.5400	.4658
Cornell Veterinary College	.5110	.4408
University of Wisconsin	.4745	.4093
University of California-Davis	.4718	.4070
Cummings SVM at Tufts University	.4675	.4033
Texas A&M University	.4631	.3995
University of Pennsylvania	.3816	.3292

Table 18

Although all schools report an average debt-to-cost ratio below 1, many schools have a proportion of the students graduating with debt above the respective schools' reported total cost of attendance plus interest. University of Tennessee and Virginia-Maryland College veterinary colleges both have more than 35 percent of their students graduating with more debt than total cost of attendance plus interest. Tufts University, Cornell University, University of Pennsylvania, Texas A&M University and the University of Wisconsin had no graduates in 2016 in this category.

DEBT BELOW AND ABOVE TOTAL COST PLUS INTEREST BY SCHOOL, 2016

	Is my debt greater than total cost plus interest?			
	Debt Below Total Cost Plus Interest	Debt Above Total Cost Plus Interest	Total	Percent (Debt Over TC + Int)
University of Tennessee	46	29	75	38.7%
Virginia-Maryland College	72	44	116	37.9%
Western University - California	63	18	81	22.2%
Oklahoma State University	69	19	88	21.6%
University of Georgia	78	19	97	19.6%
University of Illinois	68	14	82	17.1%
University of Minnesota	74	15	89	16.9%
Mississippi State University	72	11	83	13.3%
Oregon State University	47	6	53	11.3%
University of Missouri-Columbia	95	12	107	11.2%
Iowa State University	96	11	107	10.3%
Washington State University	99	11	110	10.0%
The Ohio State University	135	15	150	10.0%
Purdue University	77	5	82	6.1%
Louisiana State University	80	5	85	5.9%
University of Florida	94	5	99	5.1%
Kansas State University	85	4	89	4.5%
Auburn University	112	4	116	3.4%
North Carolina State University	95	2	97	2.1%
University of California-Davis	132	2	134	1.5%
Tuskegee University	68	1	69	1.4%
Michigan State University	82	1	83	1.2%
Colorado State University	84	1	85	1.2%
Cummings SVM at Tufts University	80	0	80	0.0%
Cornell Veterinary College	99	0	99	0.0%
University of Pennsylvania	81	0	81	0.0%
Texas A&M University	124	0	124	0.0%
University of Wisconsin	79	0	79	0.0%
Total/National Mean	**2,386**	**254**	**2,640**	**9.6%**

Table 19

We can apply the same criteria to all students who reported debt inclusive of those who did not secure 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, The Ohio State University and Tuskegee, moved their position relative to the national average. 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 students (10.3 percent) 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.

FIX THE DEBT

The AVMA and AAVMC are attempting to tackle the high DIR through a collaborative Fix the Debt initiative. Launched back in April during a summit hosted by the Michigan State University College of Veterinary Medicine, the initiative has really taken shape, moving from discussion to action.

They are tackling the issue from a variety of angles, each of which is being addressed by strategic working groups comprised of representatives from across the profession, including veterinary students, colleges of veterinary medicine, state and allied associations, practice owners and other experts. Their collective goal is to reduce the debt-to-income ratio, which now stands at about 2:1, to 1.4:1. It's not going to be easy getting there, but their strategy is designed to help gradually reduce the ratio to a more manageable level that will lead to a better place for young professionals both professionally and personally.

The working groups are focused on two areas – reducing debt and increasing income – but rest assured that each group is working toward the collective goal of reducing that debt-to-income ratio. The focus areas and the strategies associated with each are:

Reducing debt:

- Increasing scholarship endowments
- Enhancing student financial literacy
- Streamlining the veterinary school curriculum
- Advocating to governments
- Minimizing the cost of borrowing
- Increasing income:
- Building professional skills and competencies
- Improving workplace on-boarding
- Focusing on preventive medicine
- Increasing practice ownership literacy
- Expanding career option awareness

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 applicant and the provision of veterinary services where costs are added, as well as consider 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 hit the proposed DIR target. Specific strategies that may be used to accomplish each of the goals noted in this paragraph are suggested below and delineated into one of the major goal areas:

- general public strategies;
- veterinary college applicant and student strategies;
- veterinary college strategies; and
- 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 precise 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 measurable progress made towards its 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 Sates that range from one-doctor- to multiple-doctor-practices, from private to public to corporate practices, 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 of costs, too many seats, or too many non-discounted seats; or one of 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 more than 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 ability needed 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 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 developed to better prepare students acquire 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 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, more than 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 (e.g., 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) Mandate 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 of attaining it. Ideally, the long-term goal would be for faculty to teach practice economics within rotations. Short-term, efforts may require a combination of prerequisites and/or an online or certificate course run by AVMA/Veterinary Managment Groups. Another side of this is to work to help the veterinary teaching hospitals increase efficiency. Perhaps veterinary colleges willing to participate in a pilot could be identified.

6) Encourage 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) Improve veterinary graduate readiness/confidence.

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.

PUBLIC AND PRIVATE PRACTICE STRATEGIES

1) Increase 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 charged 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 animal health care shortfalls should be a top priority for the profession so that strategies can be developed to reach specific goals with respect to both the percentage of animals unseen by veterinarians and the percentage that are seen but have not received the minimum standard of health care.

DISCUSSION

This report takes an exploratory and analytical approach to the market for new veterinarians and the market for education, honing in on veterinary education. Observed are new veterinarians over the period 2001 through 2016, including their post-graduate plans, their income levels, debt levels and their debt-to-income ratios.

New veterinarians are a subset of students who are identified through the survey of VMCAS applicants. The AAMVC 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.

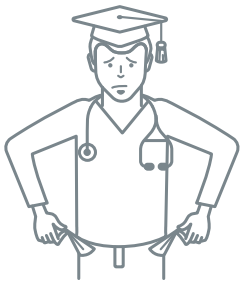
As applicants matriculate veterinary college they eventually graduate and become new veterinarians. The main source of data for new veterinarians is AVMA's senior survey, which is distributed to graduating seniors just a few weeks before graduation. This survey solicits information on veterinary students' 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: not on 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, limited information is available 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. This information will be important in developing strategies to reduce the DIR.

The senior survey has been distributed by the AVMA for decades and although the organization has made attempts to expand the respondent pool to AVMA-accredited institutions outside the United States, the data so far gathered are primarily comprised of responses from the 28 U.S.-located veterinary colleges. This is a shortcoming in this research piece since a proportion of U.S. students attend AVMA-accredited foreign colleges and return to the United States to find jobs and repay student loans. As might be expected, these students tend to have significantly larger debt loads and consequently present higher debt-to-income ratios. The AVMA will continue to work with the AAVMC to collect data on the graduates from the AVMA-accredited foreign veterinary colleges.

This report, which is a follow up to the *2016 AVMA & AAVMC Report on the Market for Veterinary Education*, is in large part a replacement for AVMA's "Facts and Figures" feature report previously published in *JAVMA*. The intention here is to go beyond a year-to-year comparison of mean income and toward the use of an index that measures the impact of the economy on a constant cohort of veterinarians. Annual updates on the model of new graduates' starting salaries, debt, and debt-to-income levels will also be provided. 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 strategies and multiple tactics for our goal to reduce the DIR over time. Each of these strategies is 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 new veterinarians are ill-prepared for the financial stress that awaits them; and the percentage of consumers who are unwilling to pay a price for their services in line with veterinarians' education costs continues to decline. The result will continue to be an increase in untreated animals that also pose a threat to human health. In attempting to select 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.



MANY NEW VETERINARIANS ARE ILL-PREPARED FOR THE FINANCIAL STRESS THAT AWAITS THEM.

NOTES

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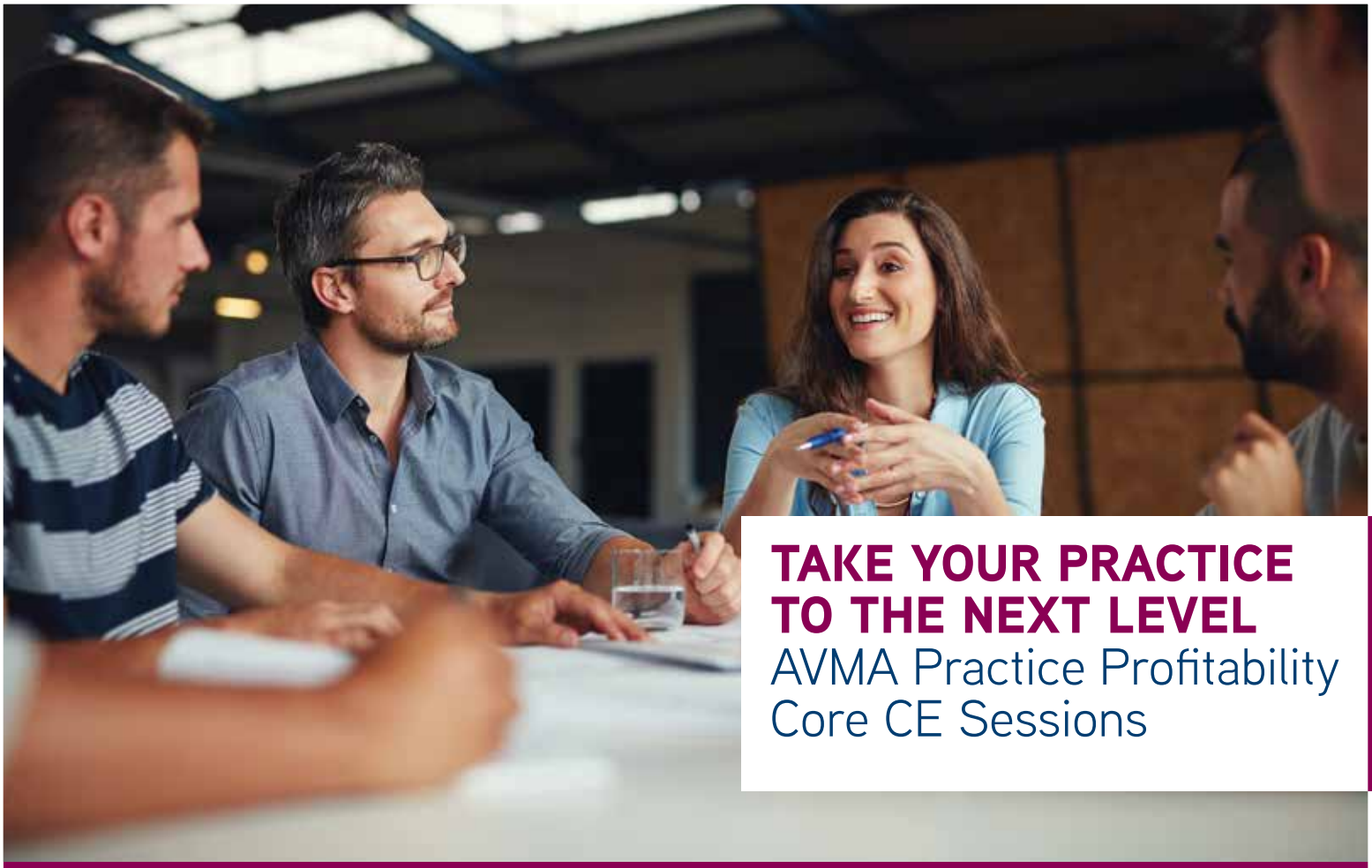

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