



2017 AVMA Report on
**VETERINARY
MARKETS**



2017 AVMA Report on **VETERINARY MARKETS**

Veterinary Economics Division
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SUMMARY

Once again, the AVMA Economics Division ushers in the year by issuing the first in a series of four annual reports examining economic conditions as they relate to business trends, and, in turn, management challenges and potential opportunities for the veterinary profession. Looking through a lens that not only examines professional sectors within the veterinary industry, the four reports in their totality analyze the various veterinary markets identified by the Economics Division's team of economists:

- The Market for Veterinary Education;
- The Market for Veterinarians; and
- The Market for Veterinary Services.

This first report, as with previous editions, sets the stage for the year's coverage by the AVMA of key economic indicators relative to these three markets, summarizing the economics and finance research presented at the association's annual Economic Summit held that prior autumn; discussing U.S. general economic conditions; and offering perspectives relative to the performance of veterinary practices in the country.

This initial 2017 report, *The AVMA Report on Veterinary Markets*, leads off with background on AVMA Economics initiatives, including projects associated with the recent launch of the Economic Advisory Research Council (EARC), and the advancement of the Practice Management Core Continuing Education pilot by the AVMA Veterinary Economics Strategy Committee. The report moves on to present an assessment of directions in the general economy.

Professing that the performance of the veterinary profession is inextricably linked to the economy's ability to generate disposable income for U.S. residents, the report looks at the measure of Gross Domestic Product (GDP) and notes a year-on-year growth rate of 3.2 percent as of the third quarter of 2016 over the same period in 2015, or, after adjusting for inflation, what represents a more modest 1.5 percent increase. And, though still registering below their pre-recession high, real median household incomes have climbed from a post-recession low of \$52,666 to a high of \$56,516 in 2015. More expected increases suggest a continued growth in GDP into 2017 and further increases in the demand for veterinary services. On the other hand, January 2017 marked 91 months of the current business cycle's expansion period – longer than the 61-month average period of expansion since the 1950s. While an expansion's duration does not necessarily portend recession, those factors leading to a downturn tend to crop up within a

10-year timeframe. This suggests that the likelihood of continued expansion will decline with each passing month.

To show the difference between early expansion and current expectations, we compared the last four 10-year U.S. Congressional Budget Office (CBO) forecasts, detecting that some economic relationships over the last four years have fundamentally changed. Additionally, while the CBO 10-year outlook forecasted strong early economic growth diminishing to a longer term growth rate of 2.2 percent, the 2016 forecast points to a lessening in GDP growth rates below 2 percent in the near term and lower in the longer term. The upshot: Slower growth in the demand for veterinary services means more modest growth in veterinary incomes. This slowing growth will likely diminish the growth rate for veterinarian salaries in the next few years.

GETTING EDUCATED – AND PAYING TO DO SO

Well before new veterinarians enter the field, they are applicants who apply for the seats available at colleges of veterinary medicine that supply the industry with talent. Data gathered from the Association of American Veterinary Medical Colleges (AAVMC) on applicants pertain to U.S. applicants and draw information from U.S. veterinary colleges and foreign, AVMA-accredited colleges. At the 30 AVMA-accredited U.S. schools in the 2015-16 academic year, applicants applied for 3,219 seats, comprised of 1,798 resident, 1,226 non-resident and 195 contract seats. In 2016 the 28 U.S. veterinary medical colleges with graduates had a combined class size of 2,930.

Whereas the AAVMC provides an estimate of the number of total graduates from all AVMA-accredited U.S. veterinary colleges, the North American Veterinary Licensing Exam (NAVLE) provides an estimate of the number of graduates from all AVMA-accredited colleges of veterinary medicine – both domestic and foreign. The total number of new veterinarians entering the field in 2016 is denoted by the number passing the NAVLE: 4,477 – about the same number as the previous year, and includes graduates seeking licensure in Canada and Australia in addition to the United States.

What does it take financially to get to exam time? Estimates of living expenses for a four-year education include housing, food and transportation, and interest payments on associated loans give an answer. Tuition, fees and living expenses combined made up the cost of a seat taken by the 2016 graduates from the 28 U.S. colleges. The four-year total cost ranged from \$127,138 for “discounted” seats, or those for which students do not pay full price, to a high of \$363,972 for a non-discounted one.

Fortunately, some students receive tuition assistance, manage to live on the cheap, or can save on interest expenses. Among 2016 graduates, the mean debt acquired while in veterinary college was reported as \$141,000. While some schools apparently have maintained a modest number of graduates with debt exceeding total costs at graduation and yet others have had a larger percent of students in this situation, the year-to-year variation in their percentages suggests that the problem might be attributed more to student choices than associated with the specific institution.

How much applicants are willing to pay for a seat at a school reflects the demand for veterinary education. For the 2016 fall enrollment, 6,667 applicants applied to veterinary college through the Veterinary Medical College Application System (VMCAS). The number of applications denotes a cyclical pattern over the past three decades: almost 7,000 in 1980, 1999 and 2014, but in 1990 and 2002 drops to about 4,000. A continuation of this cycle would yield a near-term fall in the number of applicants, though specific factors causing the cycle have not been identified. More significant than the total number of applicants, however, is the number of applicants per available seat – a number also observed to be cyclical. The current ratio of total applicants to the number of seats at the 30 U.S. colleges of veterinary medicine is approximately 2.25:1. If the seats available to U.S. students at both domestic and foreign U.S.-accredited schools are considered, however, the ratio plunges to 1.52:1 for 2016. The number of available seats will exceed the number of applicants should the latter again dip to 4,000. Based on the willingness to borrow expressed, and the cost per seat provided by the colleges, the total number of seats applicants are willing to buy in 2016 was estimated at 2,331 at an average price of \$163,292. This estimate assumes a willingness to pay only for tuition and fees. Add in living expenses and interest, and the estimated number of seats drops to 1,606, with an average total cost of \$189,912.

WORKING, AND WORKING HAPPILY

The report includes surveys of veterinary incomes, including a breakdown by sector, reporting that veterinarians employed in industry and academia have the highest mean incomes, while those in predominately food animal practice and non-veterinary employment have the lowest. For the years 2013-2015, unemployment in the profession has remained low – with the mean unemployment rate near 4 percent – while the amount of negative underemployment has increased. Underemployment occurred for men in 2013 and 2014 but became negative in 2015. Also of note, is a significant decline in

the percent of veterinarians who want to work a longer hourly work week in 2015 compared to 2013 and 2014 – a change indicative of the growth in demand for veterinary services. A desire by veterinarians to increase their hours is a sign that some practices are operating at less-than-optimal capacity. Conversely, practices with veterinarians wishing to work fewer hours suggest that practices might be working beyond optimum capacity. Unemployment levels could also be symptomatic of the concentration of veterinarians in a particular geographic location. Merely looking at the concentration of veterinarians may not give the whole picture of variations in unemployment, underemployment and incomes, however, since the demand for veterinary services is affected by a host of demographic factors.

The report concludes that the year ahead could present a continuation of challenges in finding candidates to fill vacancies for veterinarians, and with it mounting pressure to increase compensation to hire new employees.

Another section of the report looks at wellness among veterinarians, discussing in particular compassion fatigue, and its two sources: burnout and secondary traumatic stress. Also, links between career concerns and compassion satisfaction – gratification drawn from work – were subjects of investigation, which found that satisfaction with current employment and veterinarians' perspectives as to how prepared they were for their vocation – both factors positively associated with compassion satisfaction – to be statistically significant in both 2015 and 2016. Also statistically significant in 2016 were negative associations with lower income and hourly compensation. Factors positively associated with compassion satisfaction were: being older, living in a smaller community, and working in academia.

What is the state of the return on investment – or the economic return on cost to attain the educational credentials to pursue a career as a veterinarian? One way to evaluate this is by looking at what is termed the net present value (NPV) of the DVM degree to see how the investment stacks up against other investment opportunities. NPV is the difference between the income earned over a veterinary career and the sum of both the direct cost to earn the degree and the indirect cost of the salary that might have been earned without it. For men, mean NPV is estimated to be -\$43,038, while for women it is estimated to be \$308,892. This gender difference is interesting because women incur higher educational debt and have lower mean starting salaries compared to men, but these are more than offset by the lower indirect cost.

VETERINARY PRODUCTS AND SERVICES

The market for veterinary services is complex, with both public and private sectors featuring a range of offerings. The market for private veterinary services, for example, delivers wellness, emergency, and specialty services associated with equine, food, and companion animals. The public sector includes government, education and research, and industry applications as well.

The relationships among factors that determine the level and type of services “demanded” in the market are yet to be comprehensively understood. Although the AVMA Pet Demographic Survey (PDS) conducted every five years seeks to help stakeholders in the companion animal veterinary industry make informed decisions by developing a better understanding of pet-owning households, information necessary to gauge demand has been lacking. At the end of 2015, however, through a process with potential for incorporation into the PDS, an independent consulting group specializing in demand analysis, under the direction from the AVMA, studied demand in one metropolitan market. This pilot study looked deeper into alternatives from which canine care services, specifically in the form of routine check-ups, were obtained. Some 13 percent of respondents reported taking their dog for a routine check-up to a facility other than a veterinary hospital or clinic. The study also elicited information as to price paid for the routine check-up and number of annual care visits made.

Pharmaceutical products constitute a substantial business in the veterinary industry. A quarter of all product purchases tracked by Animalytix, a data firm that collects information on sales by manufacturers of animal health products, perhaps not surprisingly, were made by fewer than 6 percent of practices, while 60 percent of practices accounted for another 25 percent of the product market.

Research relative to demand is also discussed in the *2017 AMVA Report on Veterinary Markets* in the context of calculating the optimum quantity of veterinary services – in terms of number of veterinarians – advisable for governments to cost-effectively combat zoonotic diseases.





INTRODUCTION

This report provides an overview of the research findings presented at the 2016 AVMA Economic Summit. Each year, in October, AVMA economists and collaborators from academia, industry, and the veterinary profession provide a summary of the economics and finance research conducted over the previous 12 months to identify problems or evaluate strategies to improve the efficiency of the veterinary markets or the financial performance of veterinary practices. This year, five economists from the AVMA Veterinary Economics Division along with 17 other professionals provided research findings and observations about the veterinary markets and practices.

As we pass 90 months of economic expansion, the U.S. economy remains on a slow growth path that shows continued signs of weakening but no clear indication that a recession is pending in the next six to eight months. The steady economic growth and tight job market suggests continued increase in consumer expenditures, which comprise two thirds of the U.S. economy. But, continued weakness in both exports and government spending are putting a drag on GDP growth and neither is likely to change anytime soon. The tightening job market, lethargic exports and government spending will continue to dampen investment in new production capacity, leaving an economy that will continue to struggle to reach growth rates above 2 percent. For some communities, with GDP growth rates under 2 percent, a recession may already be occurring. The slow GDP growth will also mean lower state government revenues, less public support of education and thus higher education costs for students in response to higher costs of operations.

The demand for veterinary education increased in 2016, with more than 7,000 applicants seeking fewer than 4,400 seats at U.S. and foreign colleges of veterinary medicine. The general characteristics of this group of applicants seeking a 2017 seat remain similar to years past. Academic performance, the number of service hours, and willingness to pay, are consistent with the recent years of applicants, while the percentage of female and minority applicants continues to increase. But the gap between what applicants indicate they are willing to pay and the cost of the veterinary education continues to widen. If students were held to what they indicated they are willing to pay for their veterinary education, less than half the total available seats would be occupied.

The debt-to-income ratio (DIR) for graduating veterinary students continues to be a major problem for the profession. Although starting salaries rose by an average of more than

\$3,200 (roughly 4.7 percent for 2016 over 2015), debt rose slightly faster and thus the DIR continues at roughly 2:1. More importantly, approximately 12 percent of the graduates report having veterinary college debt that exceeds the total costs (tuition and fees, living and interest on borrowed funds) of their education – a portion of the debt that comprises 3 percent (\$10 million) of the total debt of the 2016 graduating class. While the mean DIR remains at 2:1, 56 percent of the graduates start their careers with a DIR greater than 2:1.

In response to the DIR problem in the profession, the Association of American Veterinary Medical Colleges, AVMA and Michigan State's College of Veterinary Medicine, held the first "Fix the Debt" summit in April of 2016. We noted that in 2015, U.S. veterinary graduates started their careers with roughly \$428 million dollars of debt and an average DIR of 2:1. While the current robust market for veterinarians will likely continue to provide strong increases in starting salaries, no reduction in the debt-to-income ratio is likely. At the "Fix the Debt" summit AVMA introduced the target DIR of 1.4:1. This target represents the amount of debt that can be serviced with 10 percent of the mean disposable income of a veterinarian five years post-graduation. For the class of 2016, nearly 70 percent have a DIR in excess of 1.4:1, and even if the profession is able to reduce the mean DIR to 1.4:1, a large number will still have debt that exceeds twice their income. And, these statistical descriptions do not include the higher debt students from the U.S.-accredited foreign colleges of veterinary medicine. Thus, it is imperative that strategies to reduce costs of education, assist students in accumulating funds to offset education and living expenses, and raise incomes of graduates be identified and implemented quickly.

While our research has identified only an indirect relationship between the DIR and veterinary wellness, this topic warrants further, deeper investigation. We have identified a relationship between higher incomes and employment satisfaction and between employment satisfaction and compassion fatigue. While the veterinary profession generally appears to be no different than other professions with respect to the health of its professionals, there are signs that compassion fatigue in the profession may be more widespread than in other professions. More research is needed to understand what factors are leading to the numbers of veterinarians with high levels of compassion fatigue and understanding the relationship between financial stress, compassion fatigue, mental illness and suicide.

The accuracy of our forecasts depends on the near future representing the recent past. Thus, forecasts that seem pessimistic can be altered by changing current behaviors. Excess capacity, increasing competition, levels of unemployment and underemployment, type of labor markets and higher DIRs are all factors that will produce behavioral change in the profession that, in turn, could generate changes throughout the supply chain, closing the gap between need and demand for veterinary services. Our forecasts don't include "what might happen," but merely point to where we are headed based on current behavior. In her presentation on the market for veterinary education, Dr. Eleanor Green, dean at the Texas A&M College of Veterinary Medicine, noted that, "Veterinary medicine is on the precipice of significant disruption;" and the question for the profession is whether the profession will lead this disruption for positive change or react to it and hope for the best.

Better Understanding the Diversity

The market for veterinarians was exceedingly robust in 2016, with the number of applicants less than the number of available jobs for the first time since before the last recession. A greater number of jobs found no applicants over the previous year. While maldistribution and sharply increasing demand for veterinary services during the last year may be the two factors that have led to the location-specific shortage of veterinarians, no evidence suggests a national shortage of veterinarians.

In 2016 we began to examine specific veterinary markets such as the bovine veterinary profession, lab animal veterinary profession, equine veterinary profession, and the state veterinary professions of Arizona, Colorado, Indiana and Texas. This new effort was to better understand the diversity within the veterinary profession across states and practice types and to understand the relationship of the markets for specific practice types and locations to national veterinary labor markets. The research certainly indicates that considerable variation in the labor markets exists between geographical locations and practice types.

The AVMA's Veterinary Economic Strategy Committee (VESC) brought forward the Practice Profitability Management Core Continuing Education pilot program at the AVMA Convention 2016. After more than a year in planning with the assistance of Banfield Veterinary Hospitals, Henry Schein Animal Health, Katz, Sapper and Miller (KSM), Veterinary Management Groups, and VetPartners, the AVMA Veterinary Economics Division

implemented a 16-hour, four-day experiential learning platform that focused on 16 key action items to assist veterinary practices improve financial performance. Practice owners and managers from 57 practices attended what could only be described as an extremely successful event. But, as Dr. Karen Felsted of PantheraT Veterinary Management Consulting, Dallas, noted, we have always had plenty of resources to assist veterinarians to improve their financial performance but we still see the majority of practices underperforming. Thus, the importance of the new AVMA program will be the impact it has on the 57 practices, and this will be measured and reported on next year.

The practice finance focus in 2016 was a new direction for AVMA's VED. The AVMA Board of Directors created the VED with the vision of ensuring, through the work of the VED, that every veterinarian would find the veterinary profession to be personally and financially rewarding. We conceived the Economic Advisory Research Council to provide critical oversight of the data analytics of the veterinary profession. Data analytics is the process of identifying what measures are important to track the performance of the profession; determining what data must be collected to compute those measures; and the management of the data and methods to ensure the availability of both to the general profession. While past efforts to improve financial performance in veterinary practices were somewhat successful, without these data analytics methods in place, noted Tracy Dowdy, past president of Villanova, Pa.-based VetPartners, we are unlikely to have a more far reaching impact on financial performance in the profession.

Another new initiative this year was the EARC, which met for the first time at the AVMA Convention 2016 in August. The EARC currently is comprised of several research groups: the Pet Demographics Research Group (PDRG), the Pet Insurance Research Group (PIRG), the Practice Finance Research Group (PFRG), and within the PFRG, the Veterinary Procedural Terminology Council (VPTC). The collection of 73 individuals representing 62 entities from across the profession provided at the organizing meeting of the EARC an excellent start to profession-wide participation in developing the data analytics for the profession – an important first for the profession.

Two other initiatives of the PFRG will be the development of a standard curriculum for financial literacy and practice financial performance. And, one of the key components of this new thrust into practice financial performance will be the focus on key performance indicators (KPI) from the Dupont method

of financial analysis. Currently the profession is focused only on practice profitability rather than the more comprehensive, financial performance. Financial performance includes both profitability – an indicator of the effectiveness of pricing and cost control strategies; and asset turnover – an indicator of how efficiently assets are used to generate sales. And, these two indicators of performance are important not only for every practice but for every profit center within practices to determine relative financial performance.

The Pet Demographics Research Group is developing the data collection and management processes for more targeted collection of information about pet owners, methodology that may be available profession-wide, specifically in the areas of price and income effects on the demand for veterinary products and services. This group will be evaluating all avenues that have the potential for improving the demand for veterinary services and veterinarians, such as the economics of zoonotic diseases, One Health, and the human-animal bond. But most importantly, the new survey is specifically designed to help us better understand how pricing strategies can be used to maximize earnings or turns depending on the demographics of the local market.

The Pet Insurance Research Group is sharing research with the goal of providing guidance to veterinary practitioners on the role of risk management strategies for pet owners to avoid making economic decisions that are not in the best interest of the health and welfare of the pet, as a means to control the personal one-time outlays of medical services and to boost the level of care provided to pets. Most importantly, this group seeks to be able to provide the profession with statistically valid evidence as to whether risk management strategies can improve the demand for veterinary services.

In 2017, the AVMA's Economics program will focus on data analytics, personal and practice finance and developing an outreach program. It is imperative that the profession develop best methods for collecting and managing the information of the profession and providing a means for its widespread use. These best methods comprise a data analytics process, a process that includes the collection, management and sharing of data pertaining to the veterinary profession. This process will reduce duplication of efforts and enhance the exchange of research findings and research cooperation. The process will also include ongoing audits of survey design and methods to ensure the validity of the information provided to the veterinary profession.

REGIONS OF THE UNITED STATES

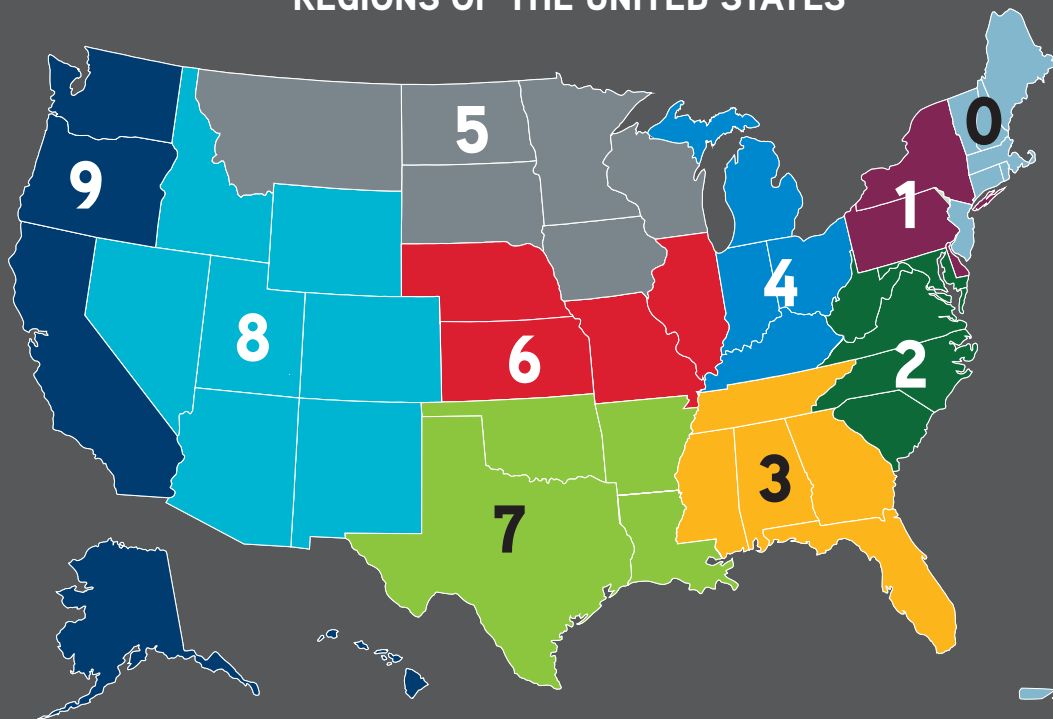


Figure 1

FINANCIAL LITERACY PROGRAM

Practice Financial Performance

This component will provide information that veterinarians can access based on their needed application, when they want the information, and delivery in the format that want – and with help in how to use it.

Outreach

The AVMA Economic Report Series provides a comprehensive source of pertinent knowledge obtained through collecting and analyzing millions of pieces of data from veterinarians, veterinary employers and consumers of veterinary services. The 2017 report series will present four reports:

- *Report on Veterinary Markets*
- *Report on the Market for Veterinary Education*
- *Report on the Market for Veterinarians*
- *Report on the Market for Veterinary Services*

The purpose of this first report is to provide a concise overview of the economy, veterinary markets and veterinary firms, drawing from key information in the presentations delivered at the 2016 AVMA Economic Summit. This information was supplied by analysts from entities outside of the AVMA in addition to that provided by AVMA. Much of the work from the entities outside of the AVMA was acquired in response to research priorities established by the volunteer members of the VESC. After each year's Summit the VESC meets to review the research priorities established by the Workforce Advisory

Group's 2013 Workforce Study, and the requests for economic analysis received from numerous other veterinary entities. The VED attempts to collect proposals for research areas that the VESC considers of highest priority and present these proposals to the VESC at its spring meeting where research projects are selected. Thus, the research presented in this report, in essence, provides an overview of the research priorities established by the VESC. More detailed data, methods and results will be provided in the three reports to follow.

This report is divided into four sections:

- The first section looks at the general economy and provides information about the general climate, the current business cycle, and how veterinary markets are affected by the business cycle.
- The second section provides research results on the market for veterinary education, the market for veterinarians, and the market for veterinary services.
- The third section provides the most recent research on veterinary firms or practices.
- Finally, the last section will provide a summary of general trends in the profession and how the AVMA research effort will be developed to better evaluate these trends.

Throughout the report we will refer to regions within the United States, which are identified in the figure opposite depicting these regions on a map.





THE U.S. GENERAL ECONOMY



The performance of the U.S. economy, specifically the U.S. economy's ability to create disposable income for residents of the United States, has a major impact on the performance of the veterinary profession.

Animal owners are the driving force for demand in the veterinary services markets. And like all consumers, their willingness to pay for goods and services is influenced by their level of income. Assuming that animal owners' demographic characteristics cannot be distinguished from those of non-animal owners, national information on disposable income and personal consumption expenditures provides us with an accurate picture of their economic condition. Because there is generally a very close relationship between the growth in the general economy and growth in household disposable income and personal consumption expenditures, changes to the general U.S. economy over a long period of time serve as an important indicator of changes to the demand for veterinary services.

The performance of the U.S. economy, specifically the U.S. economy's ability to create disposable income for residents of the United States, has a major impact on the performance of the veterinary profession. As of the third quarter of 2016, the Gross Domestic Product (GDP) for the U.S. economy stood at \$18.651 trillion, a growth of 3.2 percent over the same period in 2015, but only a 1.5 percent increase after adjusting for inflation. The real growth in the GDP is the KPI for the U.S. economy, and over the last six years (since the recovery began) the average annual rate of growth has been 2.2 percent, which can be seen to be low in comparison to previous economic expansions.

Expenditures on goods and services accounted for \$12.693 trillion, with services alone accounting for \$8.607 trillion. Government spending and investments account for closely equal shares of the remaining roughly \$6 trillion (\$3.262 and \$2.987, respectively).



U.S. REAL GDP GROWTH RATE, 1930-2015

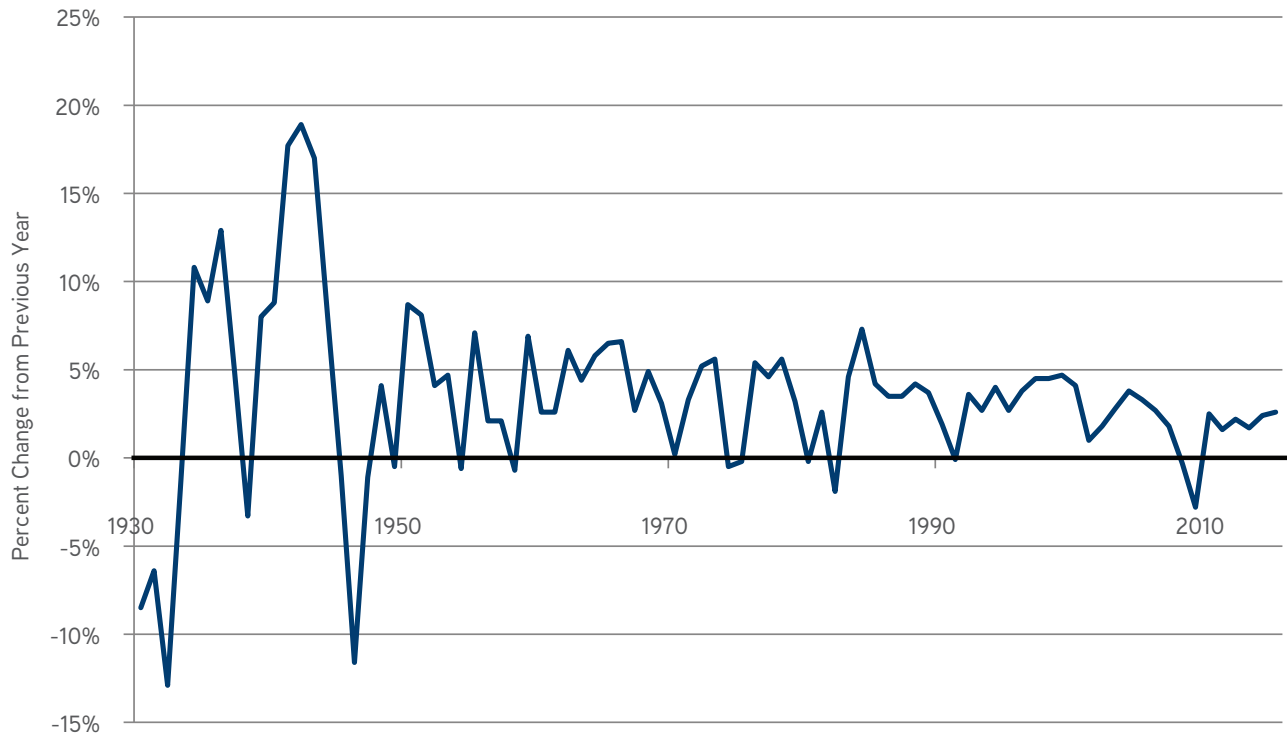


Figure 2

BUSINESS CYCLE

The U.S. economy and all sectors within it experience periods of contraction (recessions) and expansion (growth). A contraction technically occurs when the economy experiences two consecutive quarters of negative GDP growth and remains until the economy experiences a quarter of positive GDP growth.

Historically, the average period of contraction has been 11 months and the average period of expansion has been 61 months for an average length of cycle (peak to peak) of 72 months. The last recession began in December of 2007 and ended in June of 2009

(18 months), making this the longest recessionary period in the last 10 business cycles. The current expansion period has reached 91 months (as of January 2017), well above the 61-month average period of expansion but still below the expansion period of recent economic expansions. While the length of the expansion should not be seen to be a predictor of a recession, the factors that lead to a recession do appear to occur generally within a decade. At this point in the current economic expansion, the probability of continued expansion will decline with each month.

LENGTH OF U.S. BUSINESS CYCLES, 1953-2009

Recession Periods	Peak to trough	Previous trough to this peak
July 1953 - May 1954	10	45
August 1957 - April 1958	8	39
April 1960 - February 1961	10	24
December 1969 - November 1970	11	106
November 1973 - March 1975	16	36
January 1980 - July 1980	6	58
July 1981 - November 1982	16	12
July 1990 - March 1991	8	92
March 2001 - November 2001	8	120
December 2007 - June 2009	18	78
Average, 1953-2009 (10 cycles)	11	61

Table 1



Personal consumption expenditures comprise two-thirds of the U.S. economy, representing roughly \$12 trillion of the \$18 trillion economy. As noted earlier, services make up two-thirds of personal consumption expenditures at roughly \$8 trillion while goods comprise the remaining third at roughly \$4 trillion. Goods can be further disaggregated into non-durable goods (e.g., food and clothing) and durable goods (e.g., automobiles and appliances). Non-durable goods represented \$2.3 trillion of personal consumption expenditures in the third quarter of 2015 and durable goods represented just more than \$1.3 trillion. The durable goods component of the economy, while relatively small, is an important component influencing the business cycle. Services and non-durable goods are items that consumers need continuously and thus are unable to eliminate entirely during a recession. However, durable goods purchases can be minimized by extending the life of current durable items through repairs.

The business cycle can be described simply as the build-up and draw-down of inventories. At the bottom of a recession businesses have more excess capacity than optimum. They may have laid-off employees or reduced employee hours in an attempt to reduce production until accumulated inventories are drawn down. As inventories are reduced such that production plus inventories can no longer meet demand the business must begin

to increase production. The increased production will require increased work hours or number of employees and reducing the amount of excess production capacity of the firm. The increasing number of employees and hours worked stimulates the demand for more products and the business must increase production again. During this economic expansion, firms work to fill orders, increasing economic activity. Eventually, consumers have all the new durable goods they need and inventories start to accumulate sending a signal to businesses to begin to cut back production, and a new economic contraction occurs. This business cycle is highly dependent on the demand for durable goods and the amount of inventories of these goods relative to that demand. And, as noted earlier this demand depends on consumer or household incomes.

Real median household incomes have risen sharply from the post-recession low of \$52,666 to a high of \$56,516 in 2015. While this is still below the pre-recession high of \$57,909, the increasingly tight labor market with an unemployment rate reaching 4.9 percent in October of 2016 suggests further advances in median household incomes. Increasing household incomes contribute to GDP growth, and recessions only occur as household incomes fall. This would suggest that GDP will continue to grow into 2017 until household incomes reach a peak and begin to decline.

REAL MEDIAN HOUSEHOLD INCOME IN THE UNITED STATES, 1984-2015

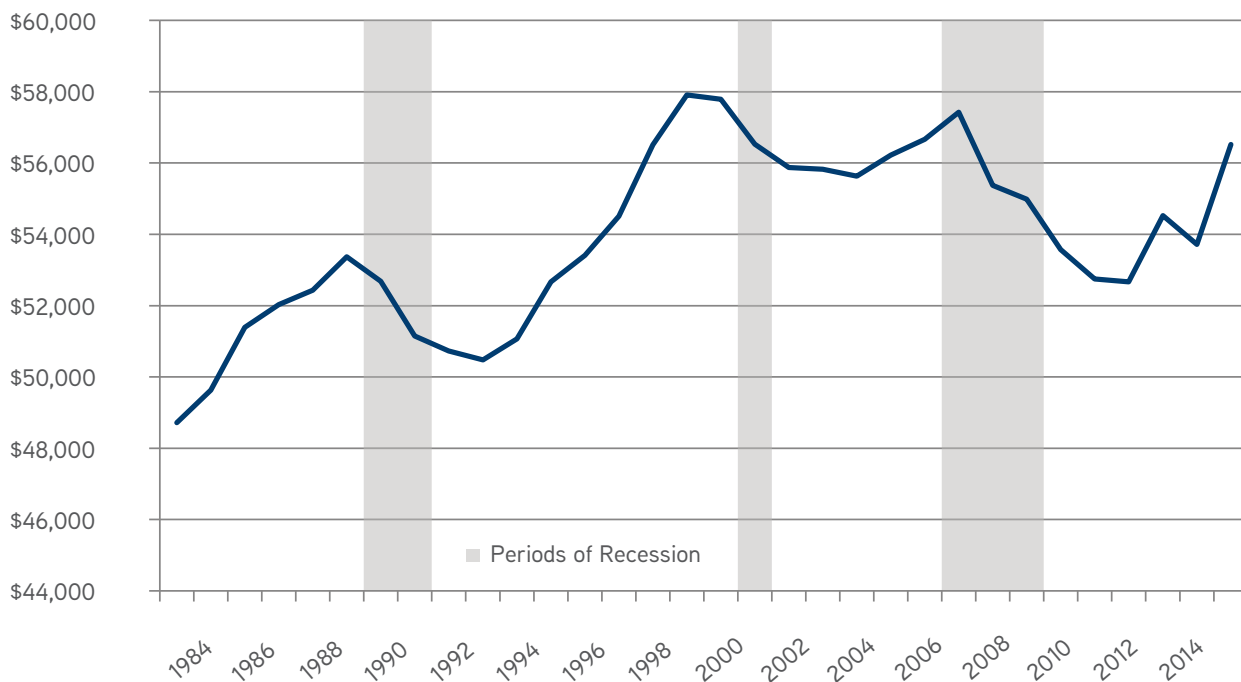


Figure 3

INDEX OF LEADING ECONOMIC INDICATORS

While the rate of growth in real GDP provides the best indicator of the health of the general economy currently, the Conference Board's Leading Economic Index (LEI) may provide the best indicator of the near future performance of the general economy.

Shortly after the Great Depression of the 1930s, economists were eager to identify an early warning system that would enable businesses and governments to prepare for an impending recession. In the mid-1940s several economists identified repeating periods of business expansion and contraction and called them "business cycles." The National Bureau of Economic Research began to research the development of a Business Cycle Indicator (BCI) to predict the turning points in business cycles.

Three BCIs are currently provided by the Conference Board, a global, independent business membership and research association working in the public interest. The three indicators – leading, coincident and lagging – provide a forward, current, and past look at the performance of the economy, respectively.

The Index of LEIs incorporates the data from 10 different economic data time series that have been demonstrated to have peaked or bottomed in advance of economic expansions or contractions.

Each of the 10 economic series is weighted based on its relative predictive strength to produce the index of indicators. The Conference Board produces a monthly value for the LEI and reports this normally on the third Thursday of every month.

The chart below shows the LEI for the most recent 17-year period, with the gray vertical bars indicating periods of recession. The most recent recession began in December of 2007 and ended June of 2009. The LEI peaked in March of 2006 and thus the decline in the LEI began 21 months prior to the last recession. The LEI continued to advance through November, 2005 exceeding the peak before the last recession. The rate of increase in the LEI, however has declined over the last two years and may foretell the reaching of the apex in the business cycle. But, the continued rise in the LEI through November of 2017 would indicate that the economy is likely to continue to expand into 2017 but also that without some major change in the economy (e.g., government stimulus or increased exports) the probability of a recession is beginning to increase with each passing month beyond the summer of 2017.

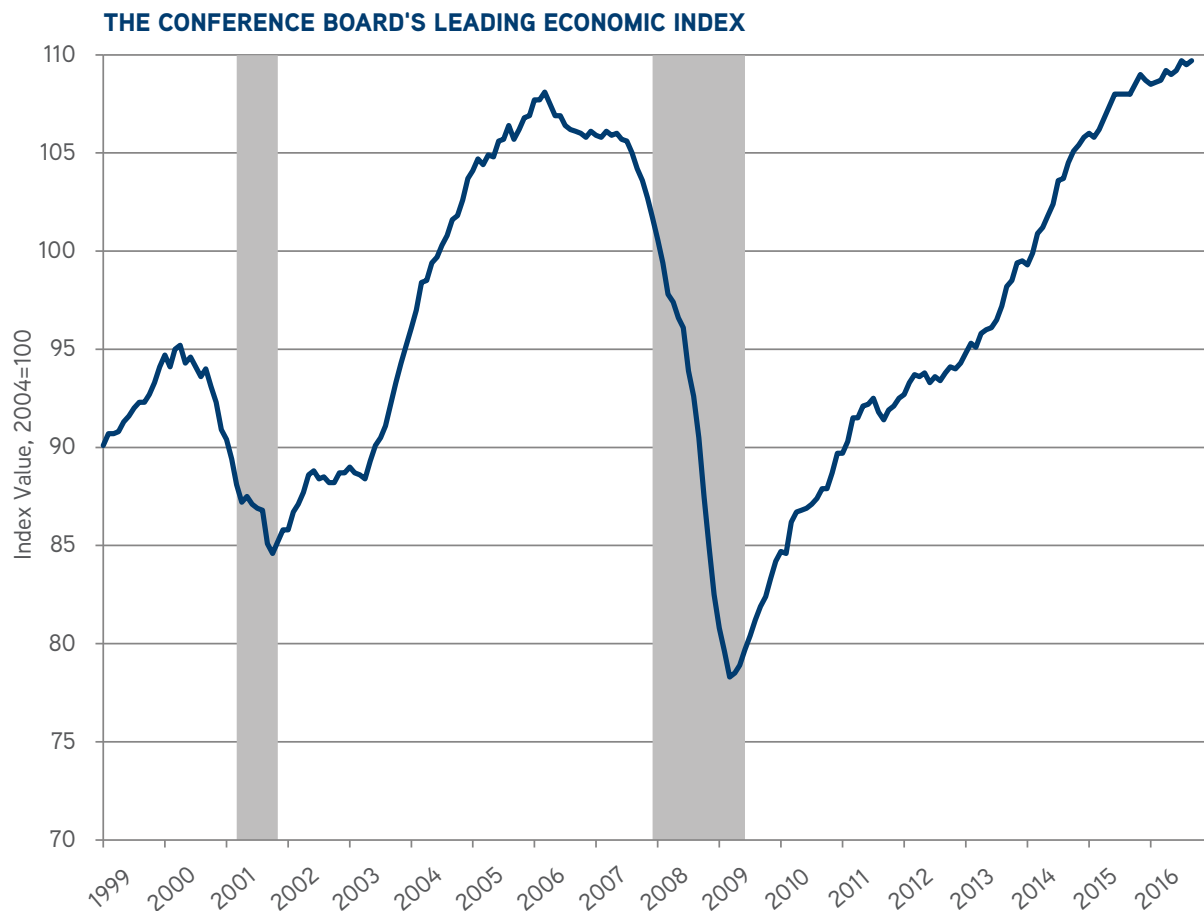


Figure 4

The Federal Reserve Bank of Philadelphia has a leading economic indicator that is also used to predict turning points in the business cycle. The post-recession movement of this indicator appears to be

relatively flat following the post-recession rise. Following previous post-recession periods the Federal Reserve indicator maintained a value between 1 and 2 for the duration of the economic expansion.

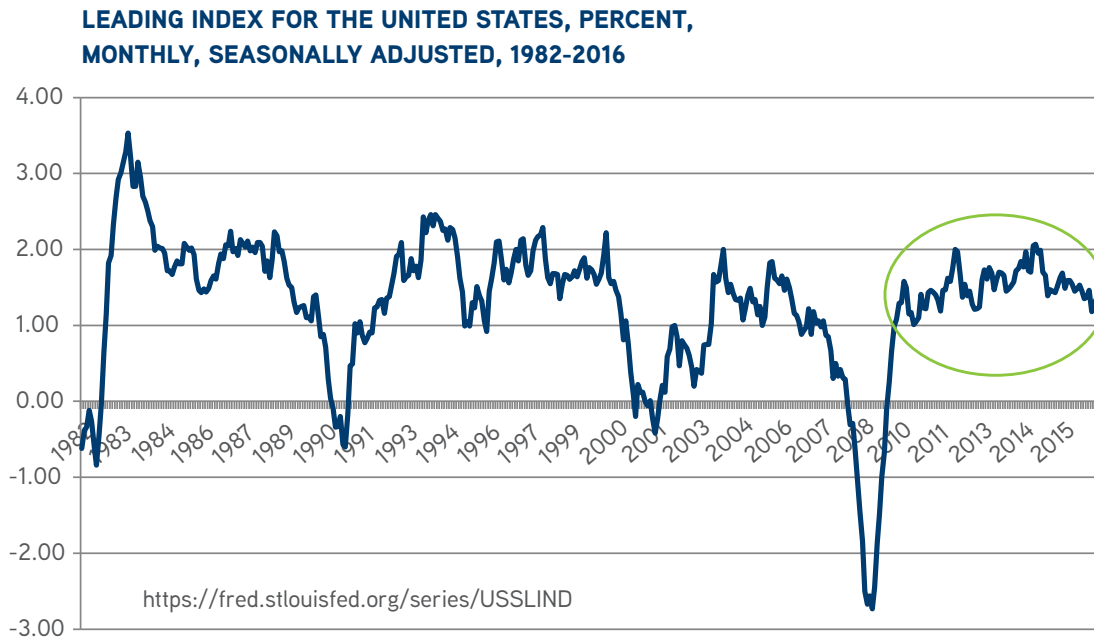


Figure 5

On closer examination of the Federal Reserve indicator over the post-recession period, however, a change in direction of the indicator can be seen to have occurred after reaching a peak in August of 2014. Since reaching the apex, the indicator has been on

a definitive downward path suggesting that the economic expansion may have reached or is reaching its peak and the growth in GDP has been continuing to decline.

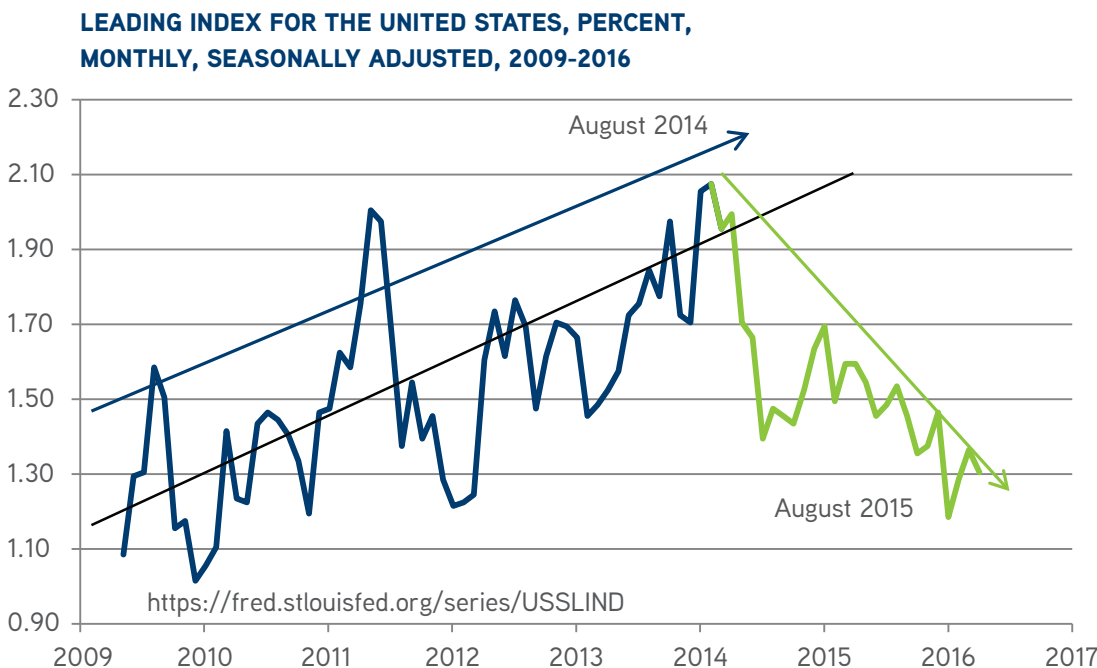


Figure 6

To forecast the change in economic factors in the veterinary markets (e.g., veterinary incomes) we use the forecast of GDP, interest rates and other economic factors from the Congressional Budget Office. The CBO is a non-partisan congressional support agency tasked with producing the 10-year forecasts of economic variables specifically for the use of determining the effect of changes in federal government policies on the federal budget. The CBO extends current policies 10 years into the future to produce its 10-year trends, "snapshots" used to develop the forecasts.

The CBO provides a 10-year forecast each January and a mid-term forecast in August of each year, and these forecasts are publically available. We have compared the last four 10-year CBO forecasts to illustrate the difference between early expansion and current expectations. The 2013 forecast expected that, under

current policies, the economic growth rate would accelerate to 4.4 percent annual growth by 2016. Yet, each year the forecast for 2016 was reduced until the January 2016 forecast expects the 2016 annual GDP growth rate of just 2.4 percent, well off the early prediction of 4.4 percent. This suggests that based on historic responses to economic conditions and with the economy not performing as expected under current policy, that some historic economic relationships have not held over the last four years. Further, while the CBO 10-year forecast predicted strong economic growth early and then moderating to a longer term growth rate of 2.2 percent, the 2016 forecast indicates a decline in GDP growth rates below 2 percent in the near term and lower longer term growth rates. These lower estimates of future GDP growth rates suggest slower growth in the demand for veterinary services and lower veterinary incomes.

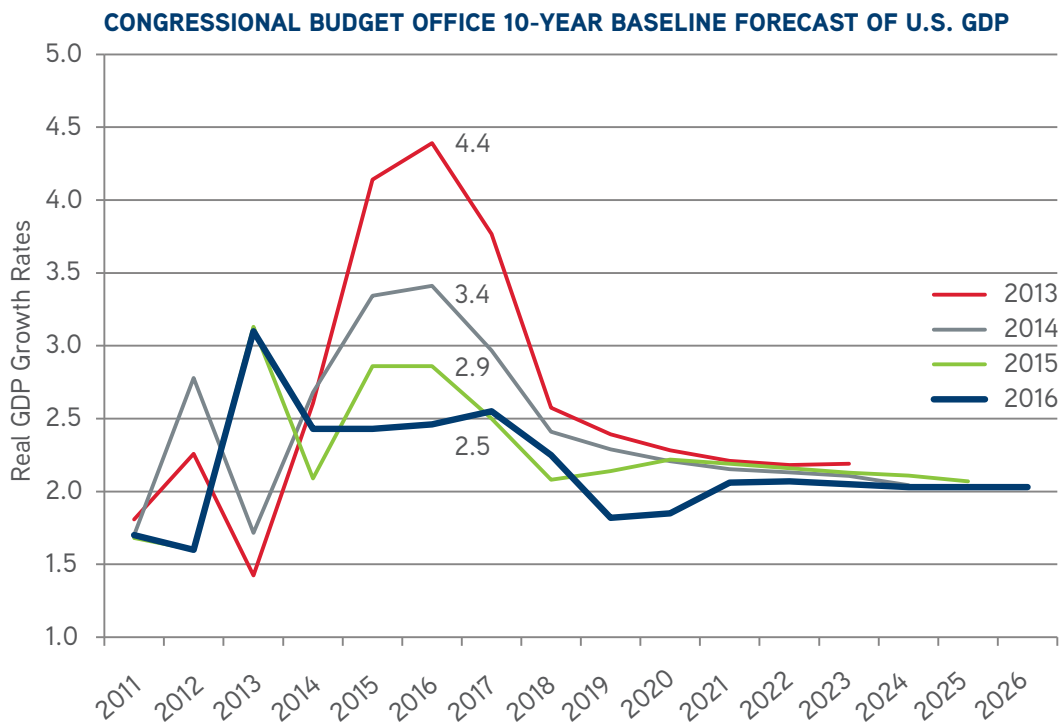


Figure 7

**AT CURRENT GDP, WHEN THE MARKET IS IN EQUILIBRIUM,
THE MEAN 2016 STARTING SALARY IS ESTIMATED TO BE \$72,229.**



GROSS DOMESTIC PRODUCT AND STARTING SALARIES

The model of starting salaries requires two steps and comprises two main components. These two components are GDP and demographic data of the new entrants into the market for veterinarians, including the number of new veterinarians each year.

In the first step, we use regression analysis on a repeated cross-sectional data set comprised of 17 years' worth of information on DVM graduates. This regression explains the variation in income (starting salaries) as determined by the variation in the explanatory variables of year, practice type, hours worked per week, gender, region and DVM debt. The resulting coefficients from this estimation are then used to estimate a time series of real weighted income, one for each of the 16 years of observations.

In the second step, we determine how the relationship between the number of graduates per year and real weighted income changes as GDP changes. Using this relationship we can estimate how incomes might change as the number of veterinarians and GDP

change. Using the CBO forecast of GDP and our forecast of the number of new veterinarians we can forecast new veterinarians' incomes (i.e., starting salaries) and the impact of GDP on these incomes.

At current GDP, when the market is in equilibrium, the mean 2016 starting salary is estimated to be \$72,229. If the market were to return to potential GDP, we estimate that the mean 2016 starting salary would be \$73,774. Consequently, GDP not only affects demand for veterinary services as stated above, but this in turn increases the number of new veterinarians able to find employment and thus increases mean starting salaries. According to our model, a 3.3 percent increase in GDP, from current to potential, would result in a 2.1 percent increase in the mean starting salary, based on the projected number of graduates.



THE MARKET FOR VETERINARY EDUCATION



The ability to provide veterinary services begins in the market for veterinary education, the source of labor in the veterinary markets supply chain.

The ability to provide veterinary services begins in the market for veterinary education, the source of labor in the veterinary markets supply chain. The supply of veterinary services begins with the applicants who apply for the available veterinary medical college seats. Data on applicants are obtained from the Association of American Veterinary Medical Colleges Veterinary Medical College Application System and information provided to AAVMC by member colleges. As a result, our data are limited to U.S. resident applicants and the information available from the 30 U.S. colleges of veterinary medicine and the 19 foreign, U.S.-accredited colleges.

Additional sources of information for the market for veterinary education are two AVMA surveys: the senior survey and the census of veterinarians. The senior survey is completed by senior veterinary college students just prior to graduation and provides information on debt and future employment. The census of veterinarians provides both information on compensation and subjective information on student outcomes.

SUPPLY OF VETERINARY EDUCATION

Veterinary education is provided by U.S.-accredited domestic and foreign schools, as well as non-U.S.-accredited foreign schools. These schools are both non-profit and for-profit institutions. For the 28 U.S. veterinary colleges (excludes the new schools, Lincoln Memorial and Midwestern, which to date have no graduates), the average tuition and fees have nearly

tripled, from \$10,549 in 1999 to \$28,845 in 2016. As the graph below indicates, this increase has not been equal across all colleges. The growth in tuition over the 18-year period has ranged from \$8,668 to \$32,321, with an average increase of \$18,296 (10.2 percent per year).

U.S. VETERINARY COLLEGES: RESIDENT TUITION & FEES

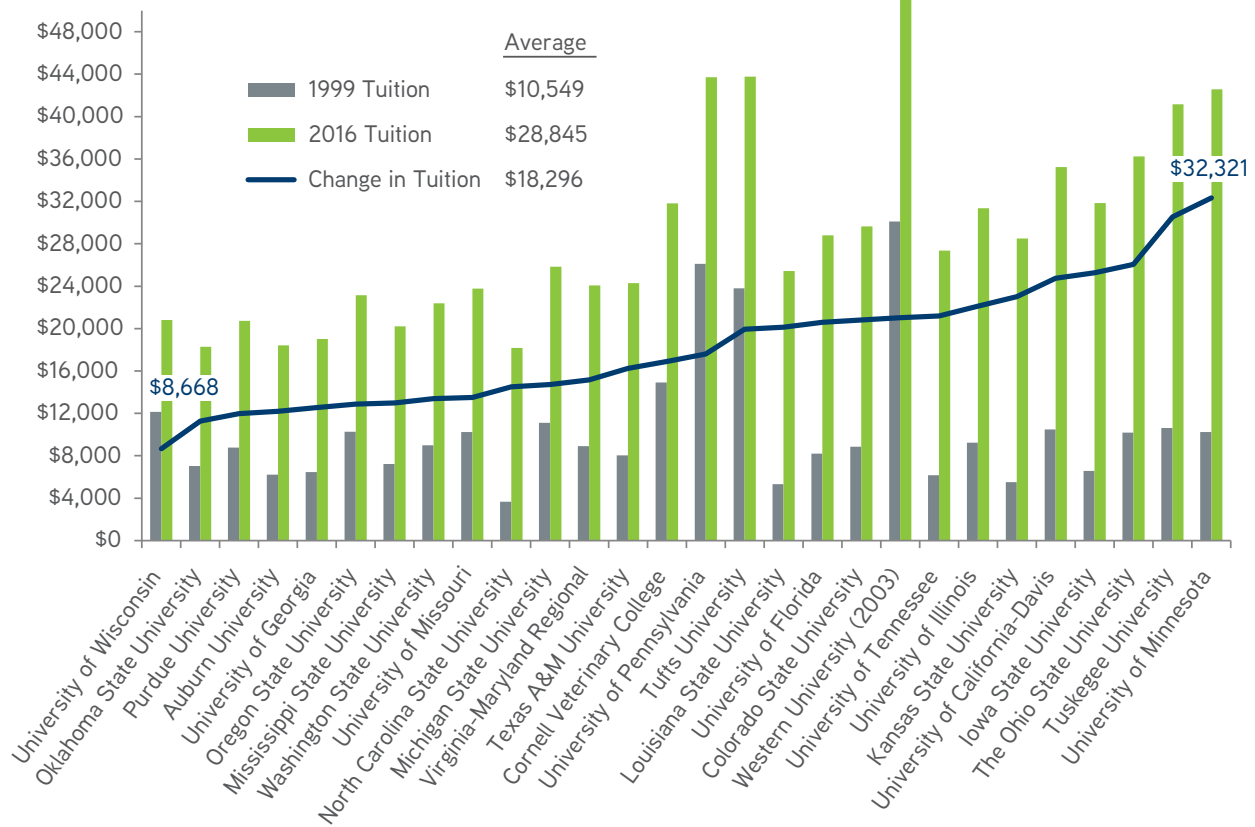


Figure 8

FOR THE 28 U.S. VETERINARY COLLEGES (EXCLUDES THE NEW SCHOOLS, LINCOLN MEMORIAL AND MIDWESTERN, WHICH TO DATE HAVE NO GRADUATES), THE AVERAGE TUITION AND FEES HAVE NEARLY TRIPLED, FROM \$10,549 IN 1999 TO \$28,845 IN 2016.

SUPPLY OF U.S. ACCREDITED DOMESTIC SCHOOLS

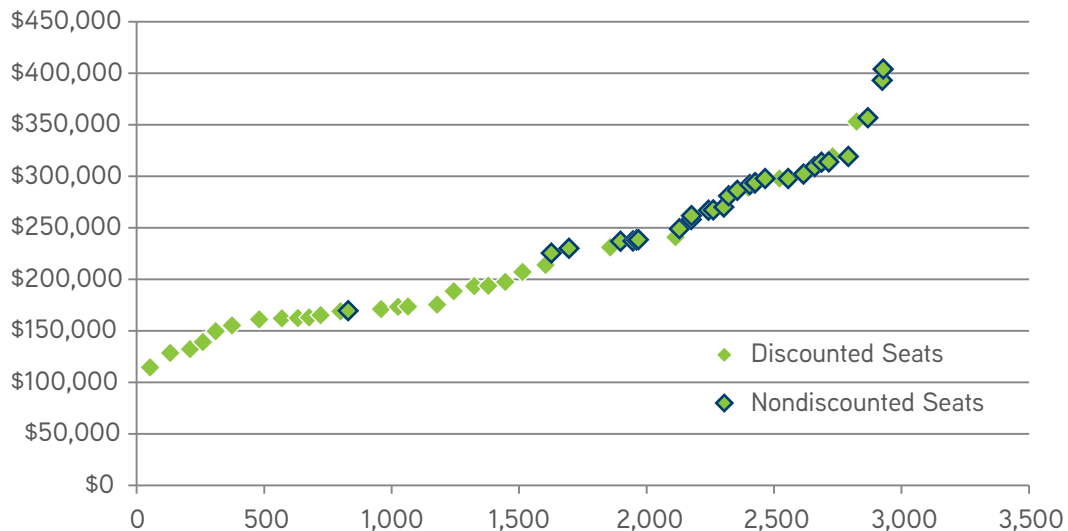
The supply schedule (or curve) for veterinary education is the cost of each seat provided. In the 2015-16 school year there were 3,219 seats at the U.S. veterinary medical colleges, with 1,798 resident, 1,226 non-resident and 195 contract seats. However, not all resident seats are “discounted” (tuition and fees reduced for residents). There were 1,881 discounted seats and 1,338 non-discounted seats. The mean four-year tuition and fees of the 28 U.S. schools for 1999 and 2016 are provided in the previous table.

In 2016 there were 2,930 graduates from the 30 U.S. veterinary medical colleges. A survey of these graduates in the spring of 2016 by the AVMA garnered 2,640 responses (a 90.1 percent response rate). The basis for a supply curve is the production function. How many units of veterinary education

(seats) can be provided given the resources available (structures, equipment, faculty)? The number of seats is the quantity of output the veterinary colleges are willing to provide, while the tuition and fees represent the price at which they are willing to offer those seats.

The four-year cost of each seat (tuition and fees) is reported for U.S. colleges of veterinary medicine for 2016 graduates. The four-year cost is an estimate, and likely over-estimates the actual price that students pay for all of the seats. While the colleges report the number of resident and non-resident students each year, they don’t report the actual price paid for each seat. Various state and regional contracts and scholarships reduce the price actually paid by students.

TOTAL AGGREGATED FOUR-YEAR COST PER AVAILABLE SEAT, 2016 GRADUATES OF U.S. COLLEGES



While data for the number of seats available for U.S. residents at veterinary colleges outside the United States have not been collected in the past, AAVMC provides an estimate of the number of total graduates from all U.S.-accredited veterinary colleges, and the North American Veterinary Licensing Exam (NAVLE) provides the number of graduates from all AVMA-accredited colleges of veterinary medicine both in the U.S. and abroad. The number of students passing the NAVLE provides some indication of the number of seats available for U.S. students both domestically and internationally. In the chart below, the total number of students passing the NAVLE is compared to the number that has passed the NAVLE from AVMA-accredited U.S. colleges of veterinary medicine on their first attempt (the

“criterion group”), the number that has passed the NAVLE from AVMA-accredited colleges of veterinary medicine after more than one attempt (the “non-criterion group”), and the number of graduates from non-accredited veterinary colleges. In the 2015-16 school year, 5,521 NAVLE exams were given. The criterion group-NAVLE candidates from U.S.-accredited colleges of veterinary medicine who passed the exam on their first attempt-counted 4,091 examinees. The non-criterion group, those from U.S.-accredited schools taking the exam for a second time, had 825 examinees. The non-accredited group had 605 examinees. Of the 5,521 examinees, 4,477 passed the exam and thus represent the total number of new veterinarians entering the profession in 2016, nearly identical to 2015.

NUMBER OF TEST-TAKERS PASSING NAVLE

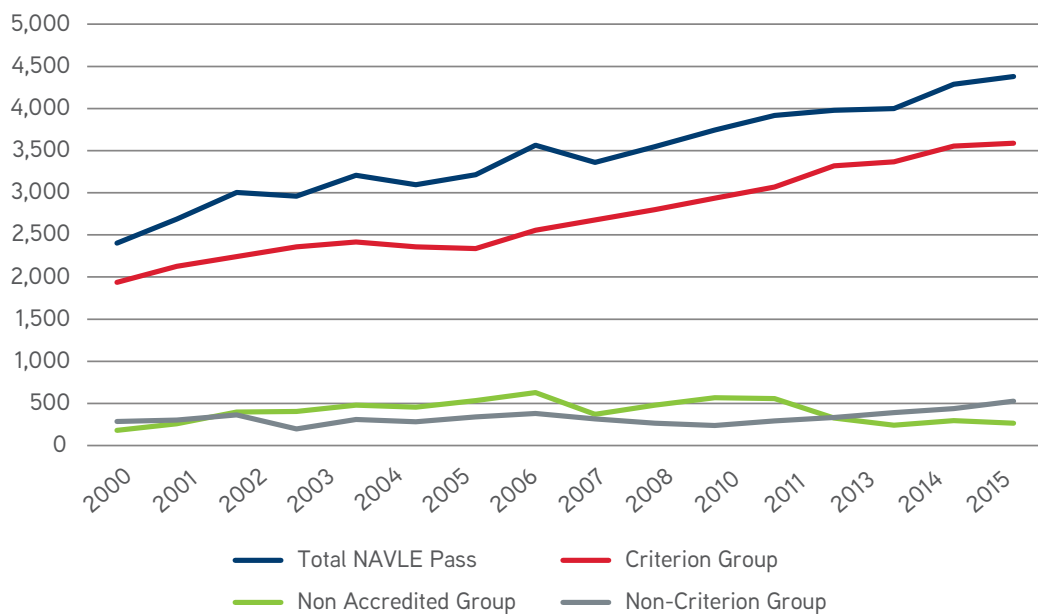


Figure 10

OF THE 5,521 EXAMINEES, 4,477 PASSED THE EXAM AND THUS REPRESENT THE TOTAL NUMBER OF NEW VETERINARIANS ENTERING THE PROFESSION IN 2016, NEARLY IDENTICAL TO 2015.



The cost of each seat that was occupied by the 2016 class of graduates from the 28 U.S. colleges is the tuition and fees plus the living expenses. Using the estimates of living expenses from the colleges for the four-year education, including housing, food

and transportation, and an estimate of the interest payment on loans to cover all costs, provides an estimate of the expenditures that veterinary students were required to pay to occupy a seat at a U.S. veterinary college.

TOTAL COST OF ATTENDANCE AT U.S. COLLEGES, 2016

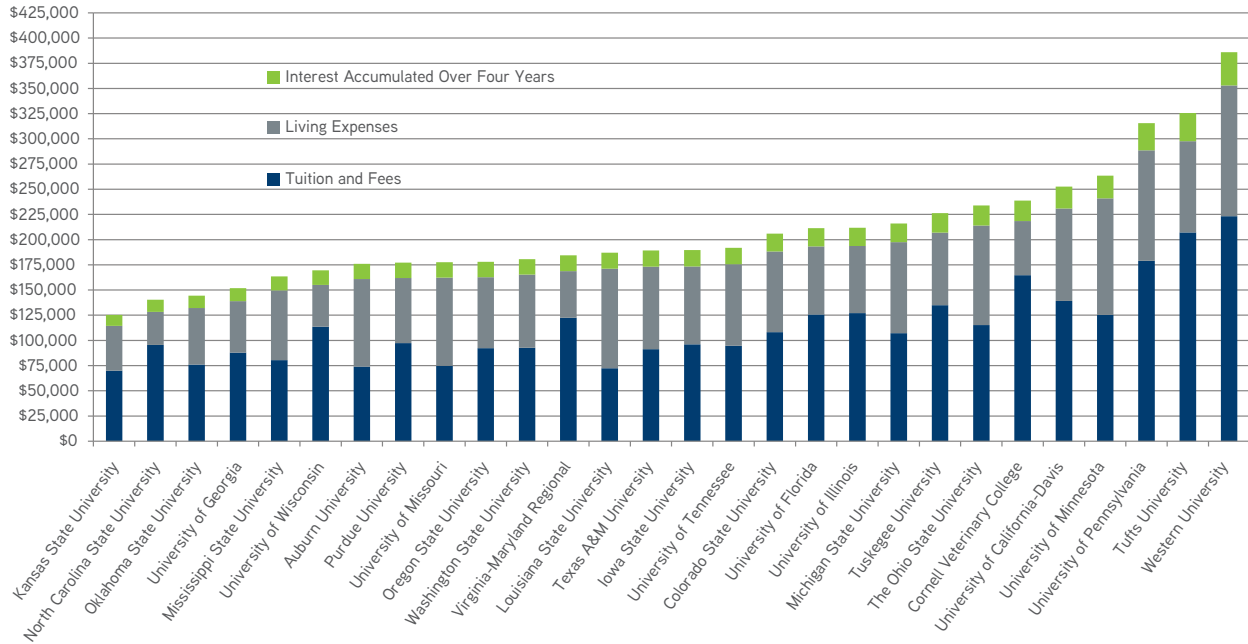


Figure 11

The four-year total cost ranged from a low of \$127,138 for discounted seats at Kansas State University to a high of \$363,972 for a non-discounted seat at Western University. Because not all colleges reduce the tuition and fees for residents, we have used “discounted seats” to indicate those seats where the students are not required to pay the full cost and “non-discounted seats” to indicate those seats where the students must pay the full, total costs of the seat. These costs

represent a maximum and not all students pay the indicated costs either because they have tuition assistance through state contracts, receive scholarships, are able to live cheaper than estimated by the school, and/or because with some form of financial assistance the students are able save on interest expenses. The difference in the average cost of discounted versus non-discounted seats is illustrated in the following figure.

THESE COSTS REPRESENT A MAXIMUM AND NOT ALL STUDENTS PAY THE INDICATED COSTS EITHER BECAUSE THEY HAVE TUITION ASSISTANCE THROUGH STATE CONTRACTS, RECEIVE SCHOLARSHIPS, ARE ABLE TO LIVE CHEAPER THAN ESTIMATED BY THE SCHOOL, AND/OR BECAUSE WITH SOME FORM OF FINANCIAL ASSISTANCE THE STUDENTS ARE ABLE SAVE ON INTEREST EXPENSES.

TOTAL FOUR-YEAR COST PER AVAILABLE SEAT, 2016 GRADUATES OF U.S. COLLEGES

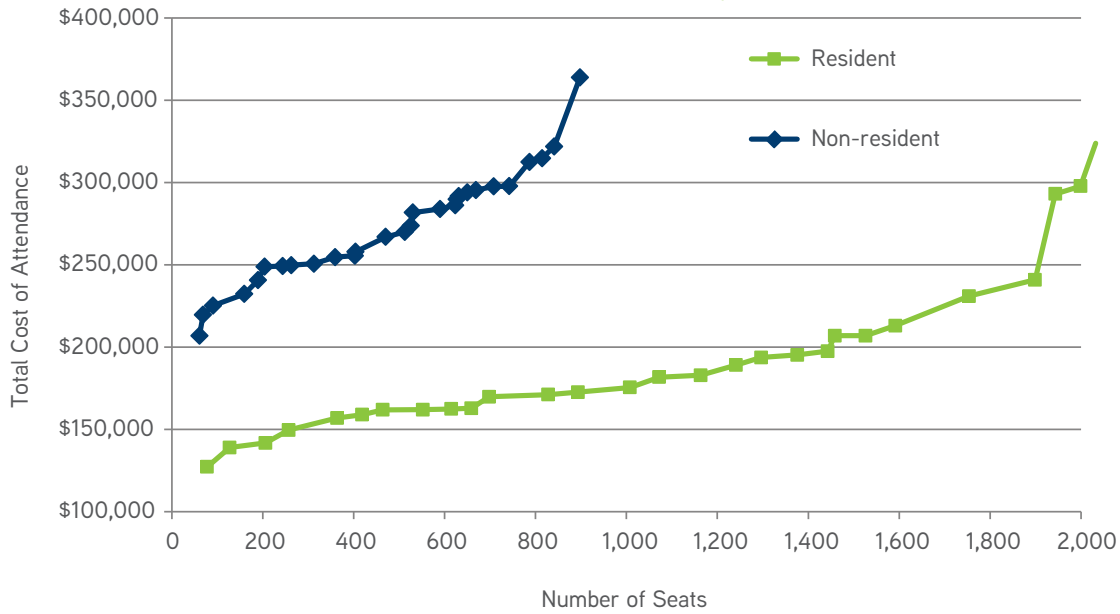


Figure 12

The combination of the discounted and non-discounted seats provides the total supply curve for veterinary education in the United States. The supply of veterinary education has changed over time, expanding the number of seats and increasing the cost

per seat. Comparing only the tuition and fees for each seat at the U.S. veterinary schools for 2006, 2011 and 2016 illustrates both the expansion in the number of seats and the annual costs of each of these seats.

SUPPLY OF EDUCATION, U.S. COLLEGES

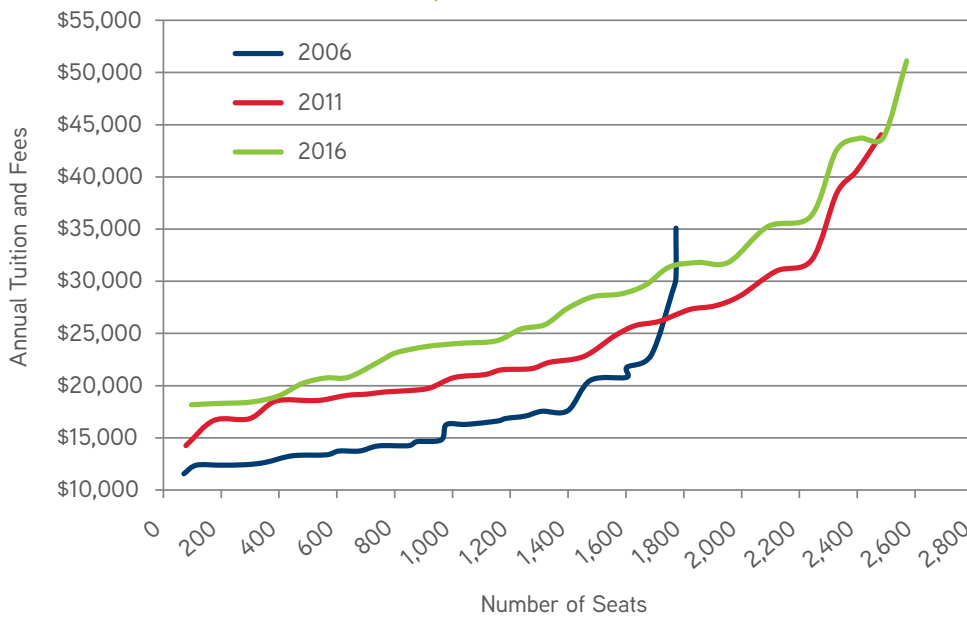


Figure 13

As a result of scholarships, various state and regional contracts, and other sources of assistance with education costs, the amount of debt that veterinary students acquire while attending veterinary college is, for roughly 88 percent of the students, less than the cost for each seat as estimated by the U.S. colleges. The figure below indicates the debt per student, the tuition and fees per seat, and the total costs (tuition and fees, living expenses and interest costs) of each seat. However, the debt per student is not matched to the cost per seat. For instance, in 2016 there were 416 graduates with no debt at graduation as indicated in the figure below. These graduates with no debt were distributed across all of the U.S. colleges.

Tuition and fees have been increasing over the last two decades. One of the largest sources of this increase has been the decline in state and federal government support for public education. Additionally colleges and universities have experienced rising costs of as a result of increasing government accountability requirements, increased labor costs (salary and benefits), declining support for extension and research, and increasing costs of equipment and facilities. These increasing costs and declining public funding have forced colleges to reduce costs, increase enrollment and raise the price of their seats.

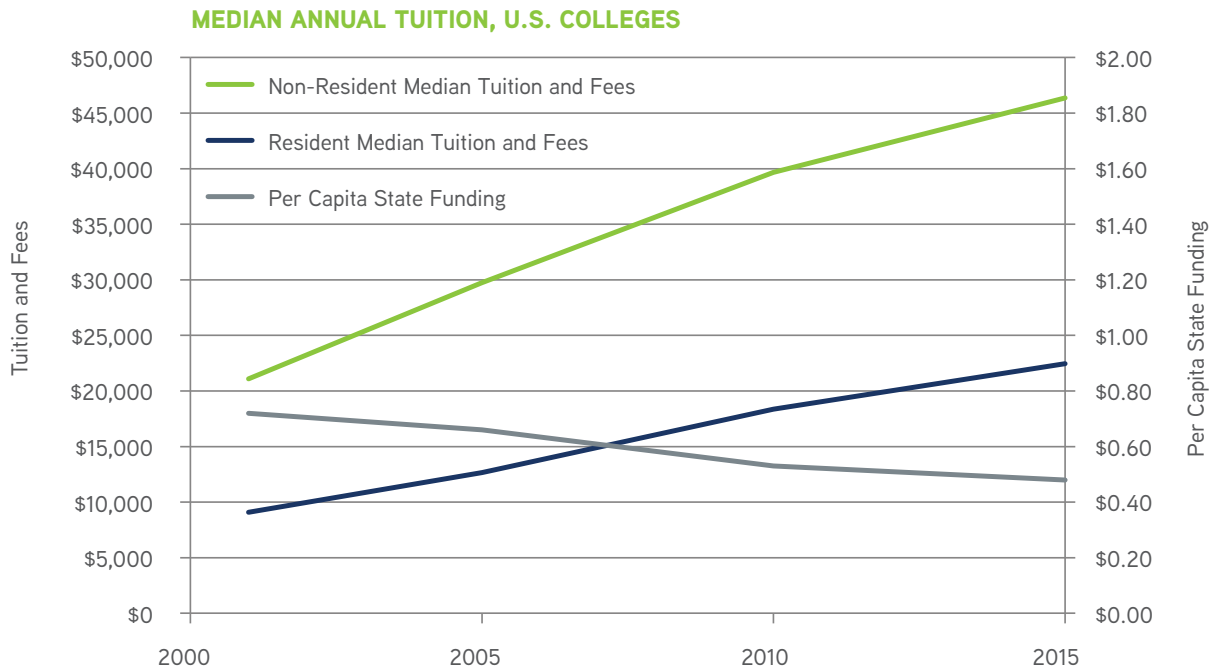


Figure 14

Mean debt acquired while in veterinary college reported by the 2016 graduates was \$141,000, with a range of \$0 (11.2 percent) to greater than \$300,000 (5.0 percent). Overlaying the debt reported by the 2015 graduates with the four-year cost of tuition and fees, and then total costs with living expenses added, would indicate that the students are generally managing their finances within reason

and providing some level of contribution to offset costs. However, some students have debt in excess of the total costs. Again, these “excess” expenditures could be the result of interest expenses, health issues, pet or animal expenses, or family emergencies. They may also just be due to meeting living standards above what the colleges have considered in estimating costs.

ADDITIONALLY COLLEGES AND UNIVERSITIES HAVE EXPERIENCED RISING COSTS OF AS A RESULT OF INCREASING GOVERNMENT ACCOUNTABILITY REQUIREMENTS, INCREASED LABOR COSTS (SALARY AND BENEFITS), DECLINING SUPPORT FOR EXTENSION AND RESEARCH, AND INCREASING COSTS OF EQUIPMENT AND FACILITIES.

SUPPLY OF VETERINARY EDUCATION COST FOR 2016 GRADUATES

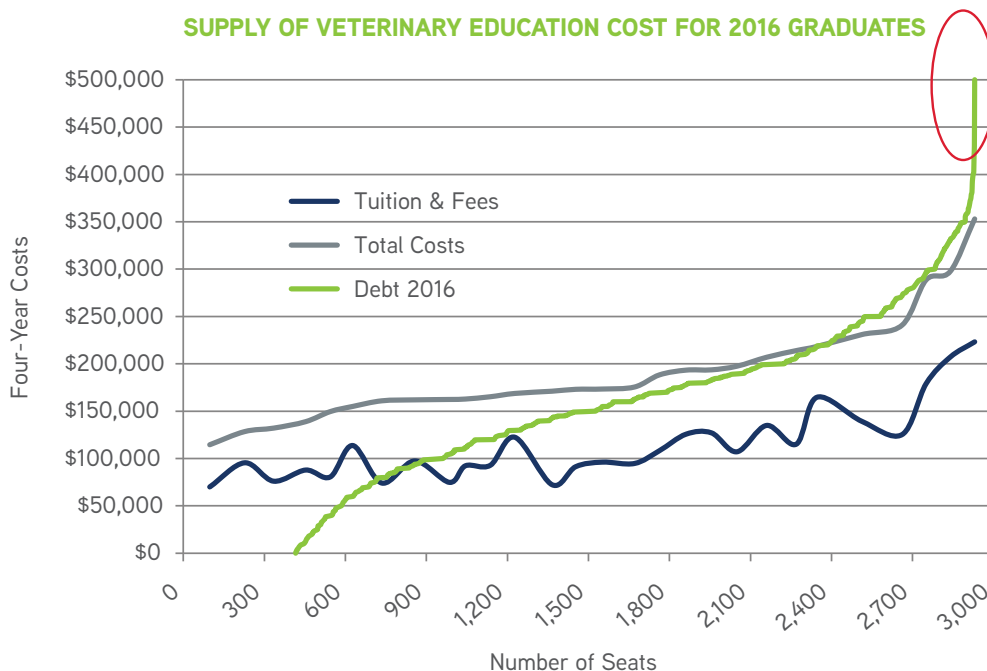


Figure 15

To examine the amount debt that each student had in comparison to the total cost of their veterinary college seat, we estimated for each senior survey respondent the total cost of their specific seat (tuition and fees, living expenses and interest

costs) to determine how many students graduated with more debt than the actual costs (as estimated by the colleges) of their college of veterinary medicine seat.

STUDENTS WITH DEBT IN EXCESS OF TOTAL COST PLUS INTEREST

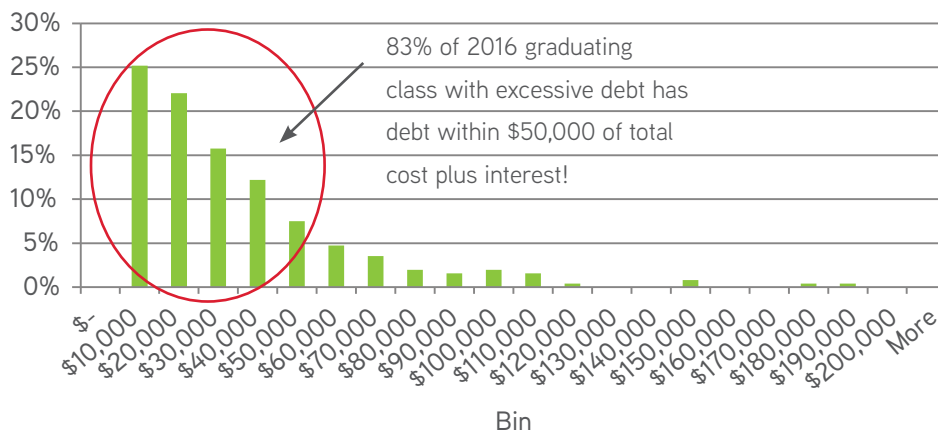


Figure 16

There were 254 graduates with debt that exceeded the total estimated costs of their seat and this excess of debt over total costs ranged from just a few dollars to nearly \$200,000, and totalled \$10.3 million compared to \$8.1 million in 2015. Of those with debt in excess of the total costs, 83 percent had debt levels of less than \$50,000 more than the total costs. The total costs do not include the costs of externships, professional or student meeting attendance or other expenditures that may be deemed necessary for the degree. The costs of these additional activities should be estimated in the future by each of the colleges and reported as a separate category but included in the total estimated costs of their seats.

The distribution of students with debt that exceeds total costs at graduation for 2015 and 2016 indicates that while some schools

have maintained a low number of graduates with debt exceeding total costs and others have had a larger percent of students with excess debt, the variation year to year in the percent of students with excess debt at each school would suggest that this problem may not be tied to the specific college but rather is more dependent on student choices. Many factors, however, influence the determination of the excess debt including the actual and true cost of the seat, additional professional and educational costs, and the costs of special living needs that need to be determined to provide a more exact estimate of the amount of excess debt graduates have upon starting their careers. This will be an important determination in understanding the role of financial literacy in reducing the debt-to-income ratio of new graduates.

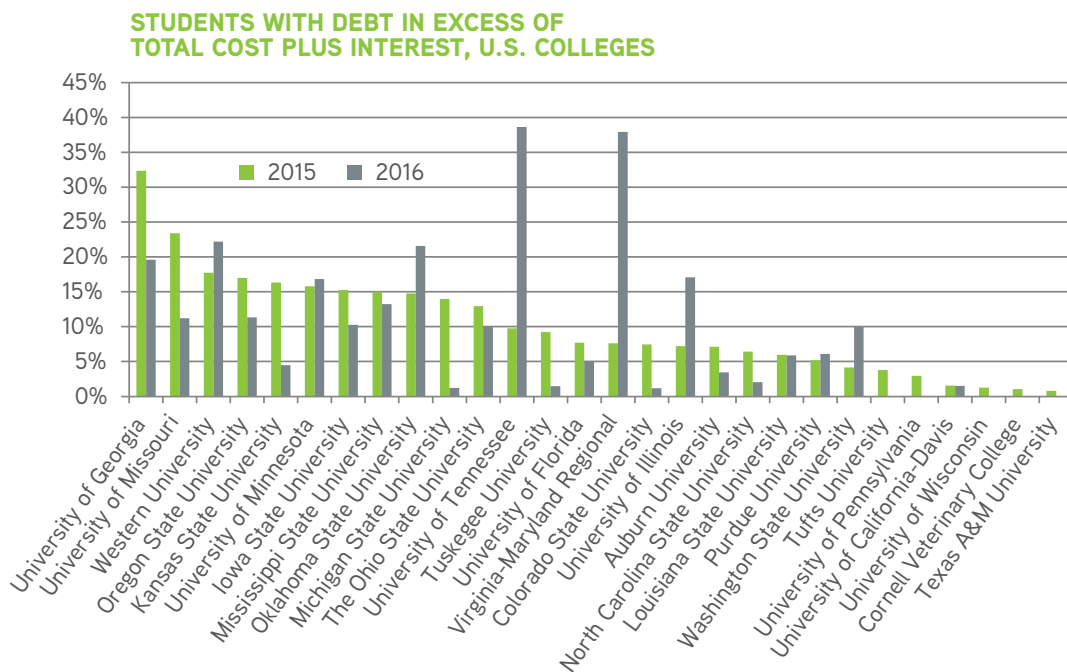


Figure 17

The mean value of living expenses for four years across all U.S. veterinary colleges was estimated at \$75,988 for 2016 graduates, or \$18,997 per year. Some students may have higher living costs, due to health issues, family emergencies, interest expenses on borrowed funds, expenses for pets or other animals

and other personal needs. The mean discounted tuition paid by 2016 graduates (based on rates provided by each school) was \$114,064, and \$184,099 for non-discounted seats. Thus, the mean value of total costs was \$190,052, and \$260,087 for non-discounted seats.

DEMAND FOR VETERINARY EDUCATION

The demand for veterinary education is the price applicants are willing to pay for each seat. For the 2016 fall enrollment there were 6,667 total applicants to veterinary college who applied through the Veterinary Medical College Application System (VMCAS). An annual survey of the VMCAS applicants was initiated in 2014 with one set of questions to determine what applicants would be willing to pay to attend veterinary college. The relationship between the number of applicants and their willingness to pay defines the demand for veterinary medical college. Understanding and measuring this relationship and how the income of veterinarians and the cost of becoming a veterinarian affect the relationship are important in estimating the future demand for veterinary education.

The number of applications for veterinary colleges that have been recorded through the VMCAS has been cyclical over the last three decades, with peaks near 7,000 applicants in 1980, 1999 and 2014 and troughs around 4,000 in 1990 and 2002. This is illustrated in the accompanying chart. If this cycle continues into the future, the number of applicants should begin to fall in the near term. However, no statistical relationship has yet been identified that would suggest that specific factors cause this cycle and they may be unrelated events. Determining what factors affect the number of applicants will be important to predicting future market demand for veterinary college seats.

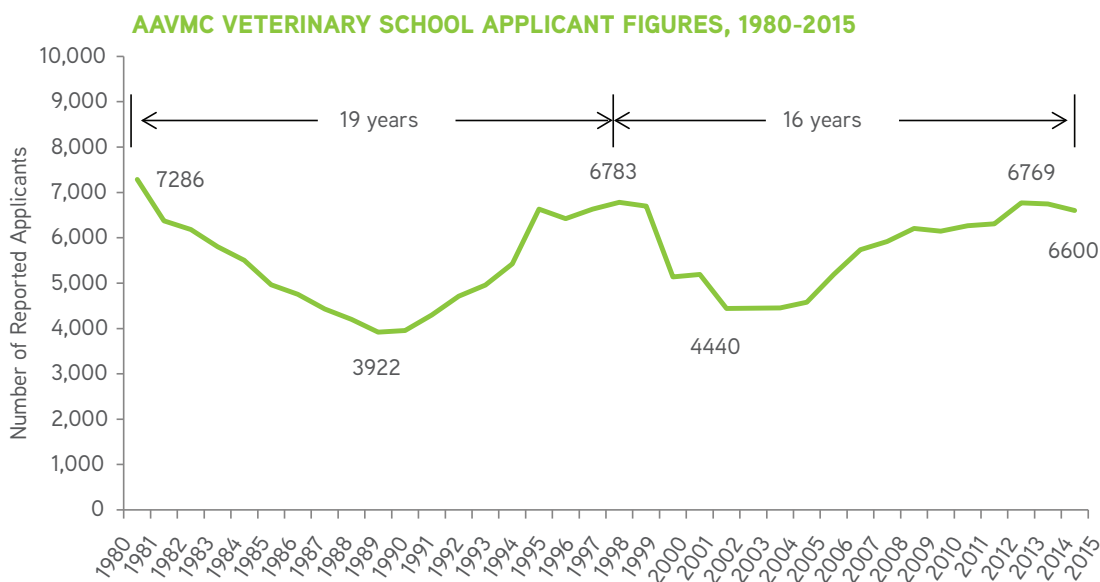


Figure 18

Veterinary School Applicant Figures

AAVMC Internal Data Reports 1977-2014

More important than the total number of applicants is the number of applicants per available seat. Here again, even with the expansion of the number of schools and the number of seats at each school, the number of applicants per seat is cyclical. The peaks in this cycle have been declining over time while the bottom of the cycle has been roughly constant. The current ratio of total applicants to the number of seats at the 30 U.S. colleges is roughly 2.25:1. But if the seats available to U.S. students at both domestic and foreign U.S.-accredited schools are considered, that ratio drops to 1.52:1 for 2016. If the cycle in applicants follows past trends and the number of applicants drops into the range of

4,000, the number of available seats will exceed the applicants. Further exacerbating this potential situation is the fact that not all applicants meet the current eligibility requirements for veterinary school. Those requirements are necessary to ensure a sufficient NAVLE pass rate which ultimately allows the veterinary college to continue to receive accreditation. Thus, the total number of applicants to the number of available seats will be an important indicator of the demand for an increased number of seats. Increasing the supply of seats at a rate that exceeds the rate of growth in demand for those seats will increase the competition for quality students amongst schools. This increased competition may increase the difficulty of filling the higher cost seats with high-quality students.

VMCAS APPLICANTS AND FIRST-YEAR SEATS, U.S. AND INTERNATIONAL INSTITUTIONS, 2012-2017

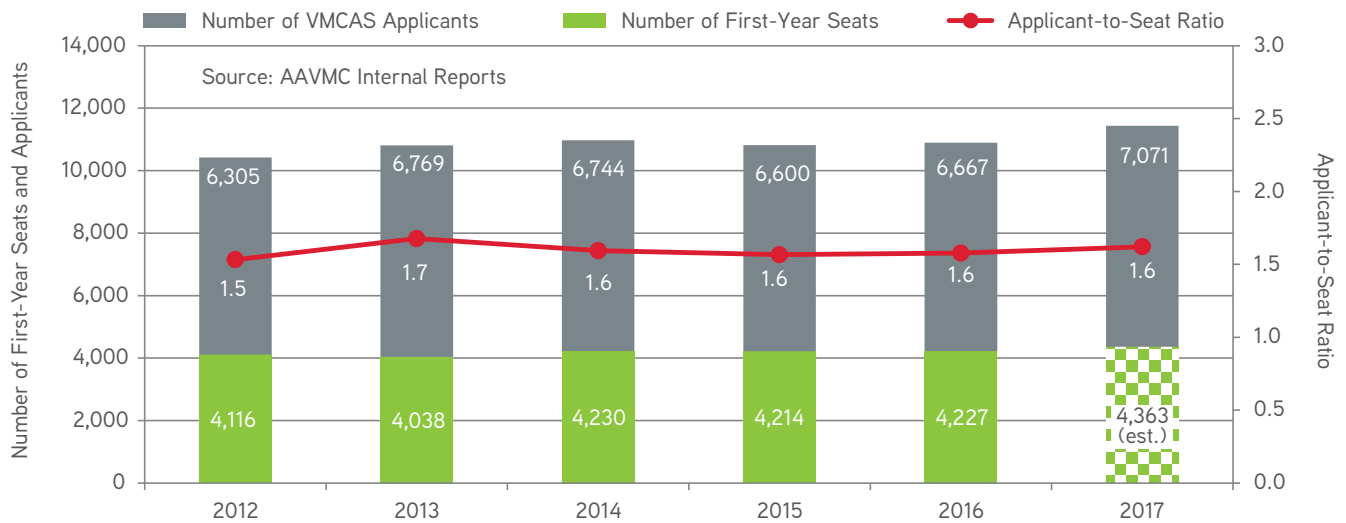


Figure 19

Our forecast is for a constant number of seats and a relatively constant number of applicants in the near term, maintaining the applicant to seat ratio in the range of 1.5-1.6:1. However, as the cost of education continues to climb, and as college students become increasingly knowledgeable of the financial hardships associated with the profession's high debt-to-income ratio, this applicant-to-seat ratio may be expected to decline over the longer term even with a constant number of available seats through 2025.

If the rate of increase in the number of seats at existing schools continues the long-term trend and two new schools are added, however, then the combination of new seats and declining applicants will bring the applicant-to-seat ratio to an estimated 1.2:1 by 2025. While this is likely to be a worst-case scenario, with the competitive environment among veterinary schools currently increasing from highly competitive to extremely competitive, veterinary schools will in the near term have to

compete for students. With the addition of even more seats, the market for veterinary education would become a buyer's market, meaning that each applicant (the buyers in this case) would face less competition for seats at veterinary colleges (the sellers).

There is likely a threshold value for tuition costs that the average student is willing to pay (discussed below). Above this threshold, the number of applicants decreases, and recent analysis has shown that this threshold may be declining. Those schools whose total costs falling in the top 20th percentile are currently above that threshold. Thus, the addition of new seats that cost more than the threshold in this increasingly competitive market is likely to be unsustainable. This analysis assumes that no change from the baseline occurs in the applicant pool. But because the applicant pool will be adversely impacted by an increasing debt-to-income ratio, this assumption likely won't hold. Therefore, the estimate presented is essentially a conservative scenario.

HOWEVER, AS THE COST OF EDUCATION CONTINUES TO CLIMB, AND AS COLLEGE STUDENTS BECOME INCREASINGLY KNOWLEDGEABLE OF THE FINANCIAL HARDSHIPS ASSOCIATED WITH THE PROFESSION'S HIGH DEBT-TO-INCOME RATIO, THIS APPLICANT-TO-SEAT RATIO MAY BE EXPECTED TO DECLINE OVER THE LONGER TERM EVEN WITH A CONSTANT NUMBER OF AVAILABLE SEATS THROUGH 2025.



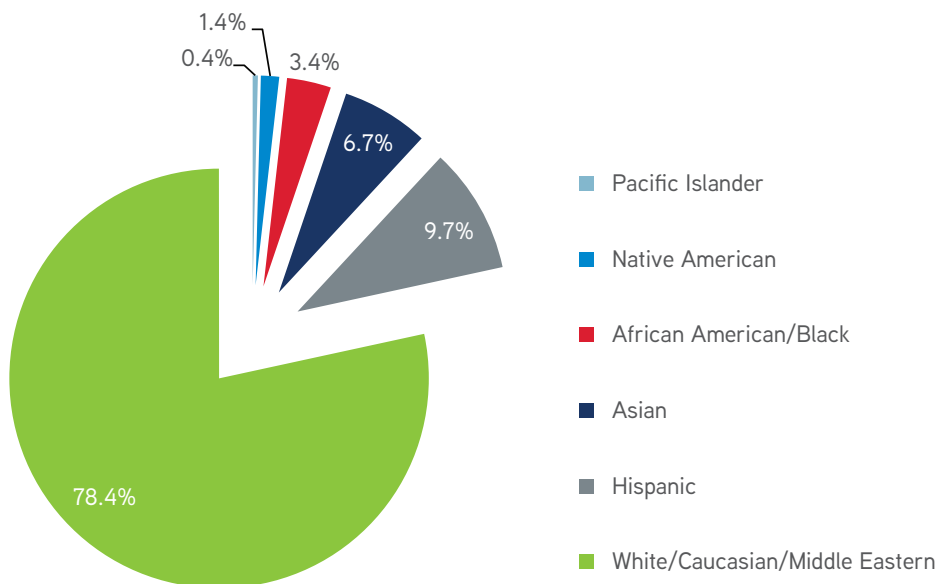


Veterinary School Applicant Characteristics

The characteristics of the applicant pool have changed little over time. The average grade point average (GPA) of the applicants

remains near 3.5 with less than 20 percent having GPAs below 3.0. The percentage of women applicants remains above 80 percent with roughly 78 percent of the applicants white Caucasians.

RACIAL AND ETHNIC DEMOGRAPHICS OF APPLICANTS TO THE CLASS OF 2020



Source: AAVMC Internal Reports

Figure 20

Although companion animal private practice is the most frequently cited number-one goal, the interests of the applicants is diverse. Large animal, equine and shelter medicine all share the second spot for the most common career interest at the time of application.

As in previous years, roughly 75 percent of the applicants attended a public university; 21 percent are first-generation college students; and 27 percent are Pell grant eligible (financial need and no bachelor or professional degree). The largest proportion of applicants grew up in the suburbs and wish to return there to work. More than 80 percent are working and one-third of the applicants are working full time.

CAREER INTERESTS AT THE TIME OF APPLICATION FOR CLASS OF 2020 VETERINARY SCHOOL APPLICANTS

Ranked 1 - 10

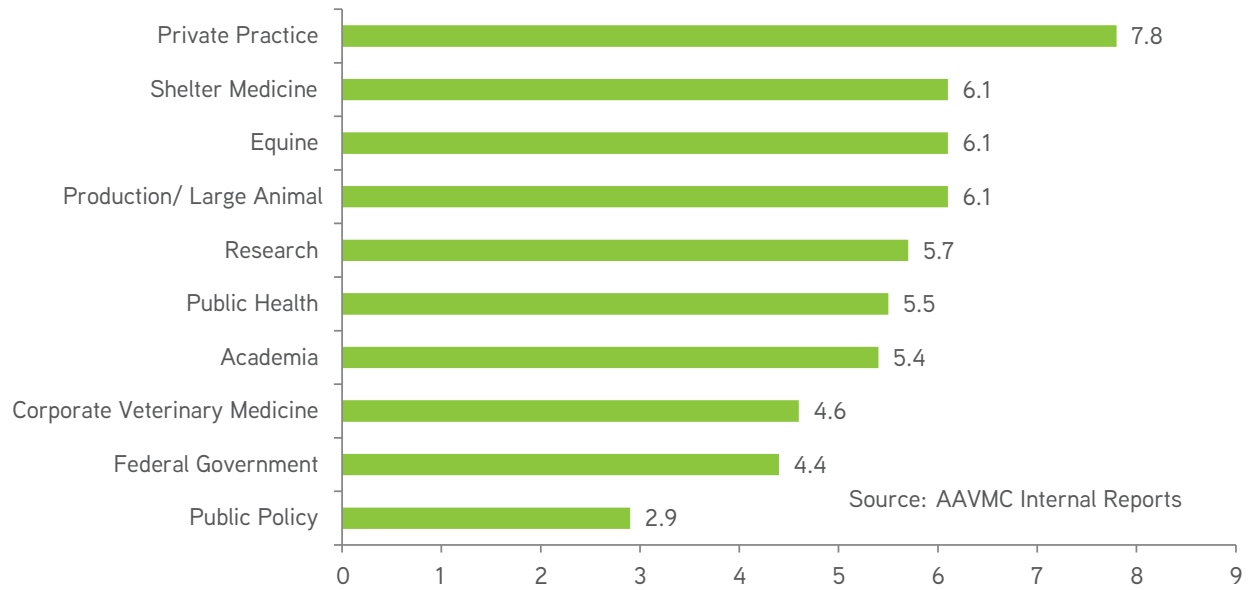


Figure 21



As one might expect, three-quarters of the veterinary school applicants have pets; 44 percent have more than one pet. Of the pet owners, 63 percent estimate that they spend more than \$100 per month on their pet(s), and 75 percent of the pet owners plan to bring their pets to veterinary college. However, only one in three have budgeted for pet expenditures.

An area that is currently of great concern in the veterinary profession is financial literacy of the incoming veterinary

students. First, only 25 percent of the applicants indicated that they would rely entirely on student loans for the veterinary education. The other 75 percent noted they would receive some support from family, scholarships, personal savings, work or some other source. Roughly 60 percent of the applicants noted that their pre-veterinary advisor provided no information about educational debt, and 55 percent noted they had not spoken to a financial aid professional.

SOURCES OF FINANCIAL SUPPORT FOR CLASS OF 2020 VETERINARY SCHOOL APPLICANTS

Source: AAVMC Internal Reports

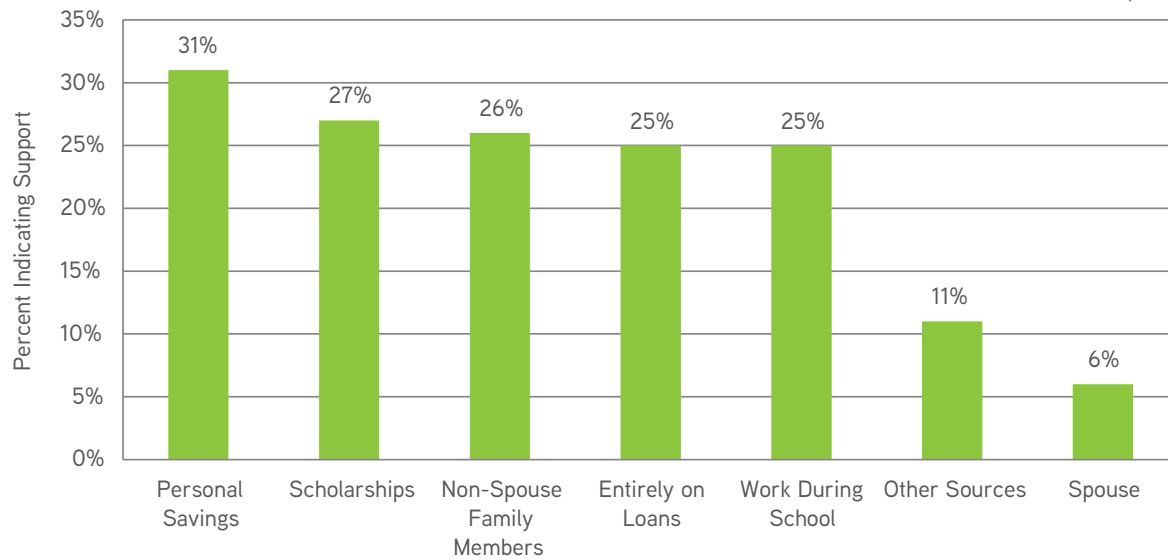


Figure 22

“Check All That Apply.” Percentages do not add to 100%.



Willingness to Pay for Veterinary Education

The market for veterinary education is driven by the demand for seats from the pool of applicants. The amount that each applicant is willing to pay for a veterinary college seat will yield the demand schedule (curve) for veterinary education. Applicants were asked three different questions to ascertain their willingness to pay for a seat:

- 1) How much are you willing to borrow to cover the cost of attendance of veterinary school?
- 2) If you knew that your starting salary after graduating from vet school would be \$70,500 per year, how much *total debt* would you be willing to accept to cover all your expenses (including tuition and cost of living) in order to acquire a DVM?
- 3) The average starting salary for a new veterinarian is \$71,000. With this annual salary, after taxes, assume your monthly take

home pay is \$3,800. How much would you be willing to pay back on your student loan per month?

Using the information provided in items 2 and 3, the amount that each applicant is willing to pay for a seat was computed and compared to their direct response as to their willingness to borrow. The estimates from each of the three questions are very similar. The close similarity between the demand schedules for items 1 and 2 may suggest that the applicants have a good idea of the mean salary of veterinary graduates and have simply determined an approximately monthly value of the total debt that they are willing to incur. When provided with a take-home salary, however, the level of debt that they are willing to service on this income exceeds by \$50,000 the amount of debt they were willing to incur.

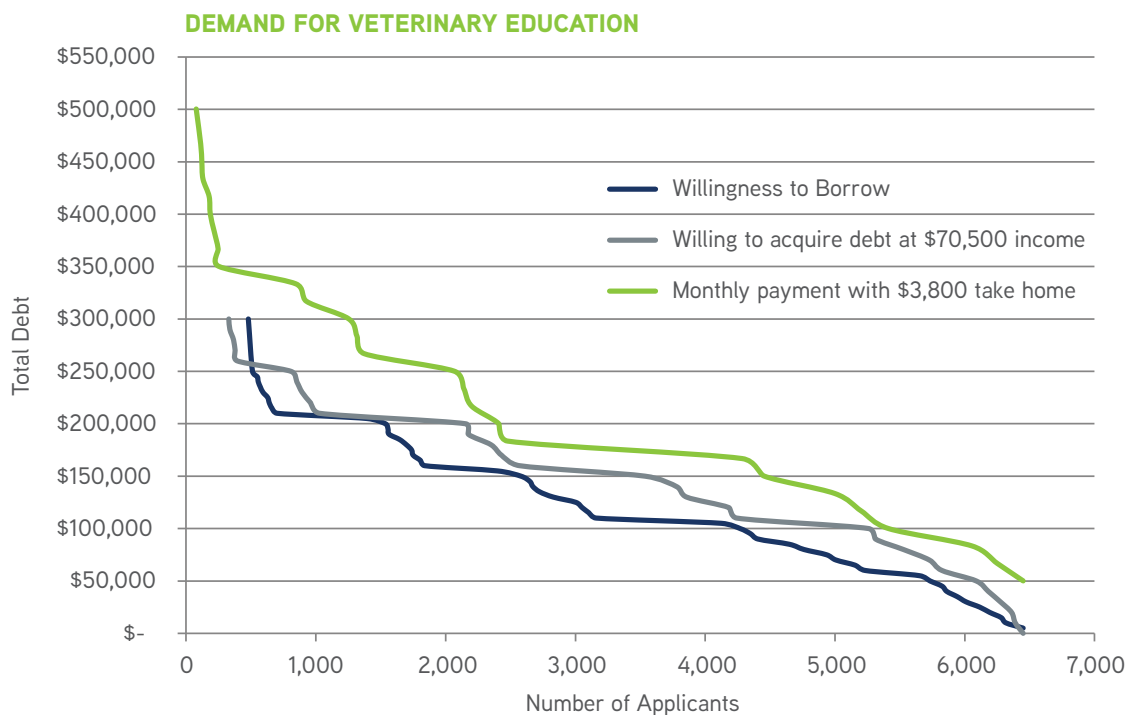


Figure 23

Comparing the willing-to-pay schedule from the last three years there has been very little change. The maximum remains around \$250,000 and for every additional seat demanded

the willingness to pay declines by roughly \$37. Thus to fill 1,000 seats would require that the last seat cost no more than \$213,000 (\$250,000 less \$37,000).



APPLICANT DEMAND FOR VETERINARY EDUCATION

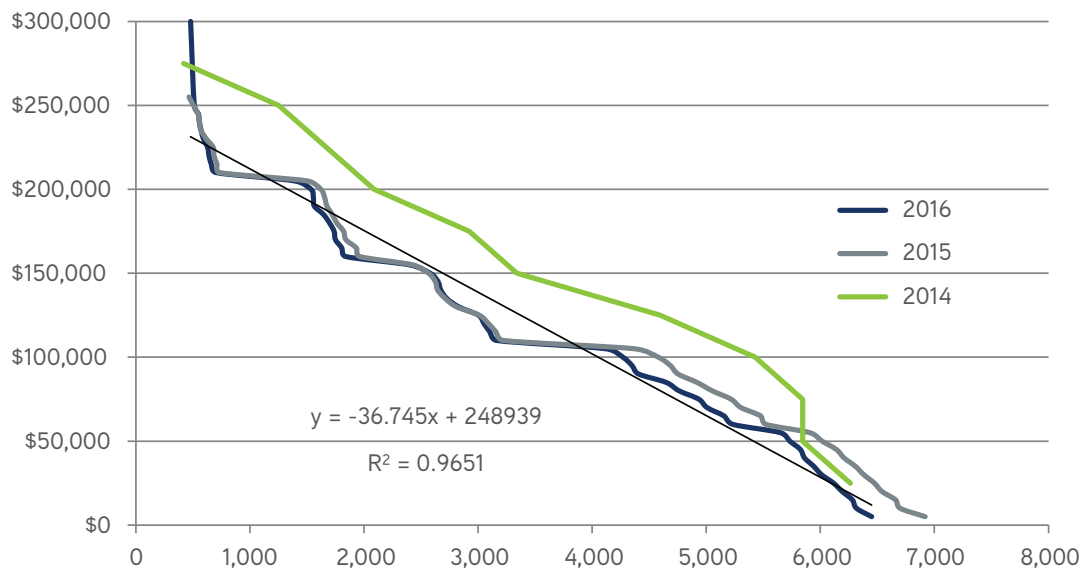


Figure 24

There are, however, several caveats with this analysis. First, the question asked of the applicants sought how much they were willing to *borrow* rather than how much they would be willing to *pay*, inclusive of any outside financial support; And second, whether the willingness to pay represents the amount they are hoping to pay at the college of their choice, or the maximum they are willing to pay to attend whatever veterinary

college they can get into, remains unknown. Finally, does the willingness to pay represent what they are willing to pay for tuition and fees only, or does it include living expenses or interest payments? These are important questions that will be used to refine the current questions to better understand the real willingness of applicants to pay to attend veterinary college.

Market for Education Equilibrium

The colleges of veterinary medicine have set the prices per seat and the applicants have indicated their willingness to pay for a seat. In a perfectly competitive market there would be no difference in the quality of education obtainable from each seat and the only feature that would differ is the price of the seat. In this perfectly competitive market, those seeking a seat would purchase a seat only if they would obtain the seat at a price at or below what they are willing to pay for that seat. And, the colleges would provide the seat only if they could receive a price at or above the price for which they are willing to sell the seat.

In this perfectly competitive market analysis, the number of seats that would be purchased by the applicants can be determined by equating the willingness to sell of the colleges with the willingness to buy of the applicants. Using the willingness to borrow obtained from the applicants and the cost per seat provided by the colleges, the total number of seats that the applicants are willing to buy in 2016 was estimated at 2,331 seats with an average price of \$163,292. This estimate assumes that the applicants' willingness to pay was for only tuition and fees. If the willingness to pay was for the total costs (tuition and fees, living expenses and interest) of the seat, then the total number of seats that would be purchased was estimated at 1,606 with an average total cost of \$189,912.

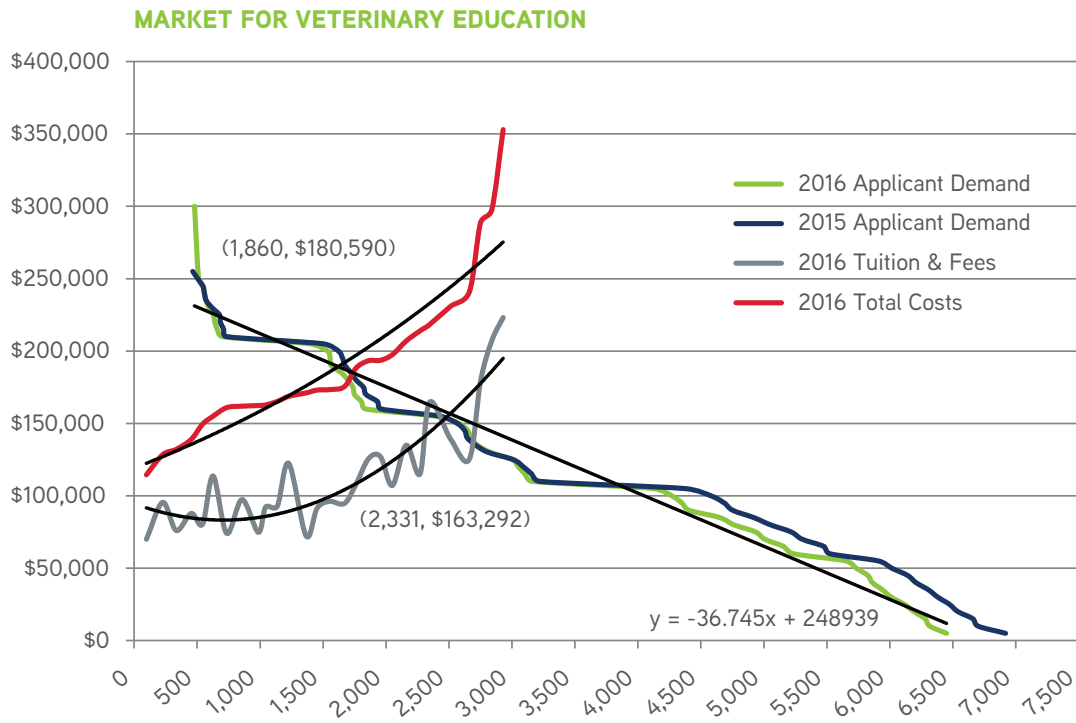


Figure 25

USING THE WILLINGNESS TO BORROW OBTAINED FROM THE APPLICANTS AND THE COST PER SEAT PROVIDED BY THE COLLEGES, THE TOTAL NUMBER OF SEATS THAT THE APPLICANTS ARE WILLING TO BUY IN 2016 WAS ESTIMATED AT 2,331 SEATS WITH AN AVERAGE PRICE OF \$163,292.

Of course the market for veterinary education is not perfectly competitive. The quality of education provided at each college is not equal as each college has numerous variations in course selection, areas of concentration, and educational processes to name a few. In addition to tuition costs, in-state students may have a preference for their in-state college, have lower living expenses being closer to home, or may be reluctant to move out of state to a different socioeconomic climate. Regardless of the reasons, applicants generally prefer their home colleges.

Applicants may also have indicated their willingness to pay based only on their first choice of schools and thus they provided a willingness to pay that may only express what they hope to pay and not how much they would be willing to pay to obtain a seat from the school where they might be accepted. Clearly, in the United States alone, more than 3,200 seats were filled and the last seats would have cost in excess of \$220,000.

**MARKET FOR VETERINARY EDUCATION,
ANNUAL CHANGE IN EQUILIBRIUM POINT**

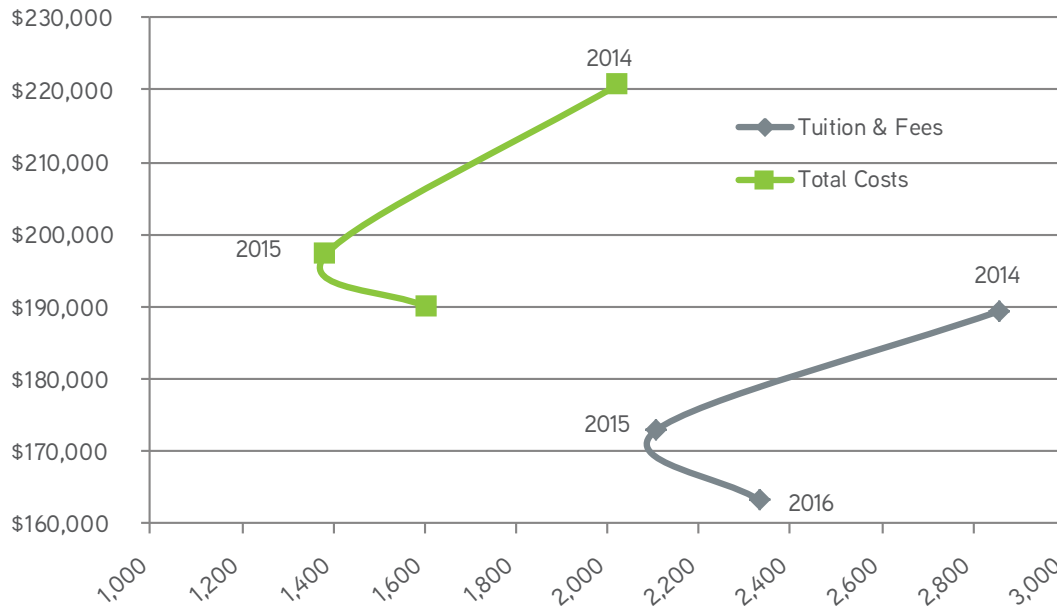


Figure 26

In addition, not all the applicants are selected; less than half are offered a seat in a U.S. college, and the willingness of these new students to pay cannot be separated from the total pool of applicants. With all of these caveats, one might ask, “What is the

point of determining this equilibrium in the market for veterinary education?” The key is to observe how the equilibrium is moving year to year.



MARKET KEY PERFORMANCE INDICATOR

The discussion of the applicant's willingness to pay and the veterinary colleges' willingness to sell is summarized by the apparent equilibrium price and quantity of seats. This equilibrium price and quantity compared to the actual price and quantity of seats provides a perspective on the market for veterinary education at a specific point in time. The changes to each of these measures over time provides an overview of how the market is changing and the direction the market is headed. But these measures only provide a view of how well the market is functioning internally, not how well the market is performing within the veterinary markets.

The output of the market for veterinary education is new veterinarians. The performance of this market is the efficiency with which resources are used to produce veterinarians who are valued by society at or above the cost of producing them. More specifically, is the value of output from a veterinary college equal or above the cost of producing the veterinarian? To determine this value would require the actual cost of producing each veterinarian and the value of output that each veterinarian provided over their life of service. But this measure would include more than value provided by the college. Each veterinarian could obtain additional training and experience that would improve their value of output. Thus we need a measure at graduation of the value of the veterinarian against the cost of producing that veterinarian.

The ratio of debt to starting salary (income) provides such a measure. The debt-to-income ratio has several shortcomings as an exact measure of the social value of the veterinarian versus

the costs of producing that veterinarian. Consider the following measures for the 2016 graduating class from the 28 U.S. veterinary colleges:

- mean total cost (tuition and fees, living expenses, interest) of a veterinary college seat was \$206,952;
- mean debt of a graduating veterinarian was \$141,421;
- mean income of graduates obtaining full-time employment prior to graduation was \$73,380;
- a DIR of 2.00

The debt does not provide an accurate measure of the cost of producing the veterinarian. Clearly, because the mean debt is less than the mean cost, there are outside funding sources that have been used to pay the educational expenses. Further, the mean cost of a veterinary education just provided does not cover the total costs of providing a veterinary education as the tuition and fees cover only a part of the total actual costs. The majority of the U.S. veterinary college seats are discounted seats. For 25 of the 30 U.S. veterinary colleges, states provide some portion of the costs of the education.

A KPI is an indicator of relative performance, not necessarily an exact measure of performance. The DIR is a KPI that can be used to indicate whether the market is becoming more or less efficient. Over the period 2001 to 2016 the average annual increase in the DIR has been 0.06, but has fallen by 0.027 per year since 2013. An increasing DIR indicates that the cost of producing a veterinarian is growing faster than society's value of the veterinarian.



INDEXED AND FULLY WEIGHTED DEBT-TO-INCOME RATIO



Figure 27

While the weighted indexed DIR provides an indicator for the mean new veterinarian, providing an illustration of the variation of the DIR within the class of nearly 3,000 graduates may be as important. While the mean may change little from year to year, the distribution of DIR for each class may change and indicate a growing problem. The movement to a less kurtotic distribution or to a greater skewness (to the left) would indicate a larger share of graduates with a very high DIR. Currently there are roughly 56 percent of graduates with a DIR at 2:1 or greater, and 65 percent

above the veterinary profession's DIR target of 1.4:1.

Any debt must be serviced from available disposable income and as such will reduce future expenditures of the person with debt. The greater the debt, the greater the adverse effect on lifestyle, as the amount of disposable income that must be used to service the debt cannot be used for purchases that may improve lifestyle. The 1.4:1 target DIR for the veterinary profession was determined from the cost of servicing the debt being no more than 10 percent of disposable income at five years after graduation.

DISTRIBUTION OF DIR, 2016 GRADUATES

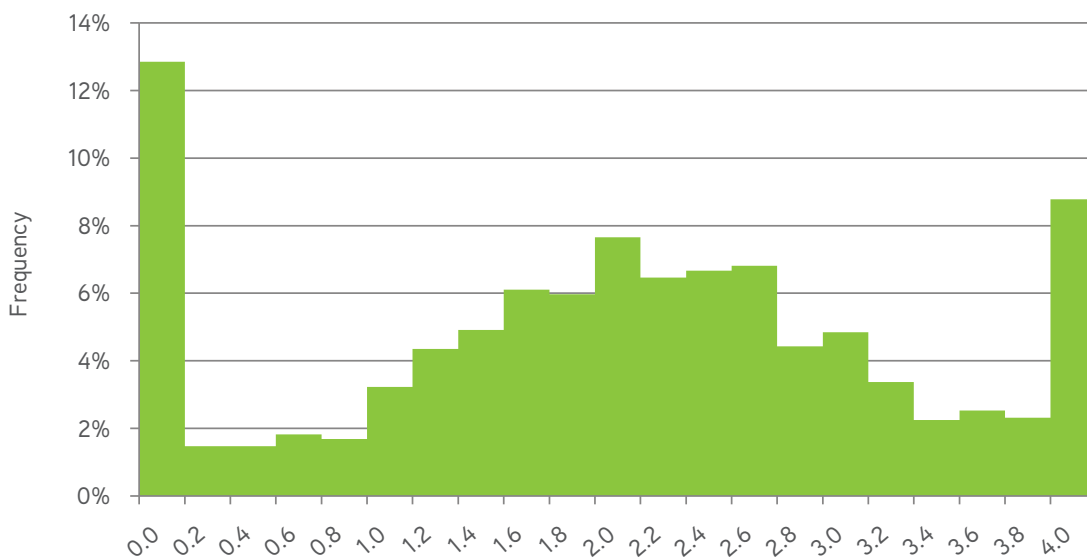


Figure 28

A forecast of the DIR indicates that the efficiency of the market for veterinary education will continue to decline through 2026. The DIR is expected to reach 2.18 by 2026. This forecast assumes no changes in the provision of veterinary education, no new seats

added, no change in the number of applicants and no change in society's perceived value of the veterinarian, and growth in the general economic activity as predicted by the CBO.

DEBT AND INCOME OF GRADUATES, U.S. COLLEGES

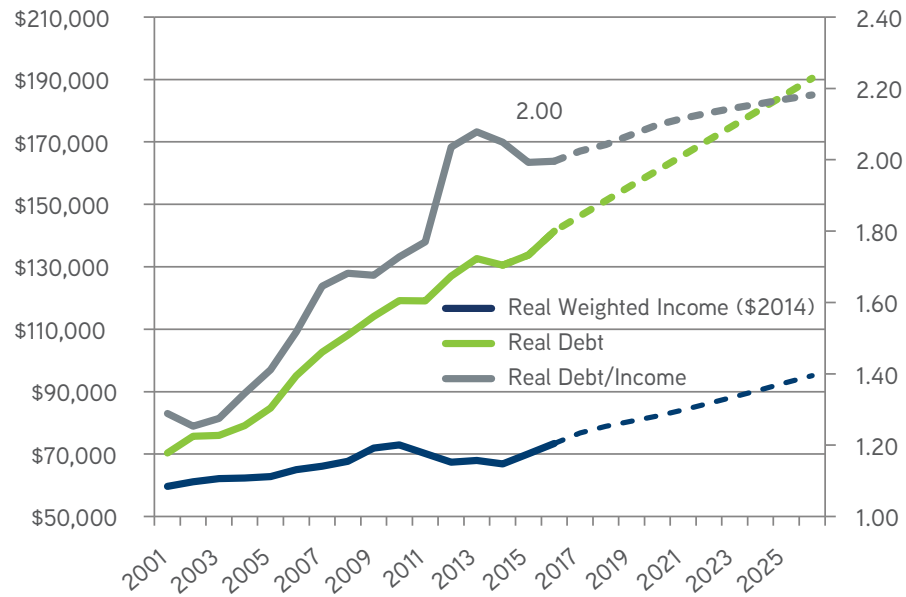


Figure 29

SUMMARY

The number of qualified applicants for veterinary college continues to exceed the number of available seats. And the graduates of the veterinary colleges currently face a rising demand and thus face rising starting salaries in the near term. The costs of a veterinary education continue to rise, however, mostly in relation to the decline in public support. As a result, new graduates will continue to face a higher debt-to-income level.

These near-term projections are based on the continued growth of the U.S. economy. As we approach the apex of the economic cycle, the increasing probability of an economic downturn increases – and, when seen, will both exacerbate the student debt as state funding declines further, and slow the growth in starting salaries. The combined impact will increase the rate of growth in the DIR.





THE MARKET FOR VETERINARIANS



The market for veterinarians is not one single homogenous market.

The market for veterinarians is the market within the vertically related veterinary markets where society's demand for veterinary services interacts with supply of veterinarians to determine the number and value of veterinarians. But the market for veterinarians is not one single homogenous market but rather a number of horizontally related markets based on geographical location, community size, and type of practice.

This report will provide national data and analysis and the more detailed analysis of the location, community and practice type specific markets will be provided in the 2017 Report on *The Market for Veterinarians*.

VETERINARY INCOMES

Incomes of veterinarians increase as they gain experience through the first three decades of their career and then begin to decline as they reduce the hours they devote to the practice

of veterinary medicine. The variation in incomes also increases with age through the first three decades and then declines through the remainder of their career.

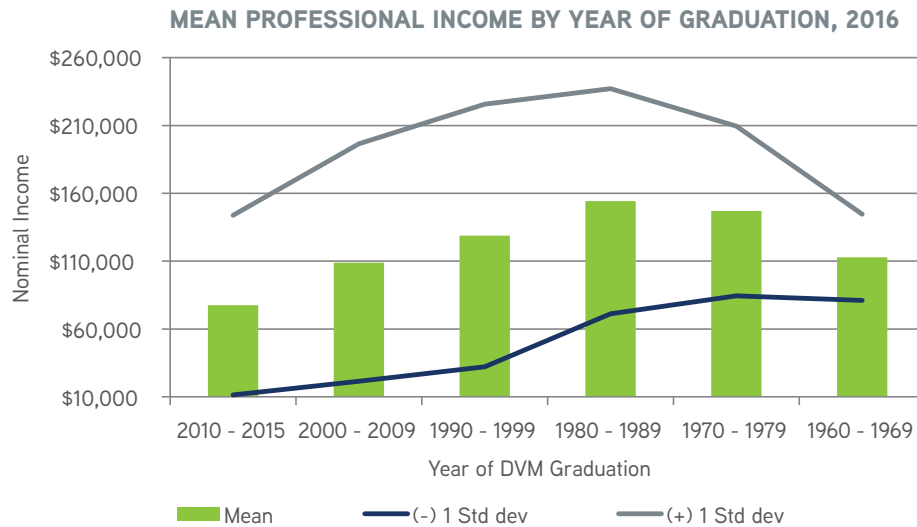


Figure 30

Mean income and the variation in income also differ by practice type. Veterinarians employed in industry and academia have the highest mean incomes while those in predominately food animal practice and non-veterinary employment having the lowest

mean incomes. However, the variations in incomes are affected by location and size of community, as are living costs. Thus, mean incomes alone may not be useful as a measure of the standard of living derived from a career in veterinary medicine.

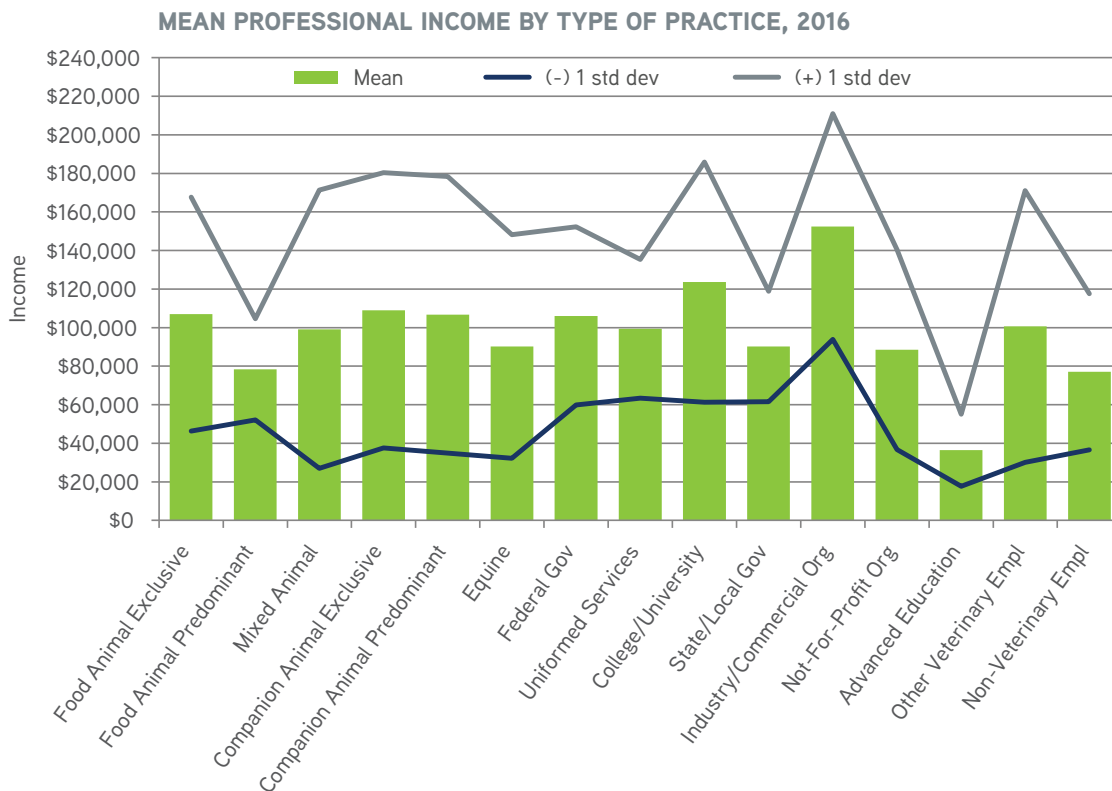


Figure 31

VETERINARIAN UNEMPLOYMENT

Unemployment in veterinary medicine has remained low for the last three years (2013-2015), with the mean unemployment rate near 4 percent. Some unemployment is associated with employment mobility. There is often a period of time where unemployment occurs between jobs. Over the last 12 months

nearly 8,000 veterinarians sought employment, roughly 8 percent of the veterinary workforce. Thus, job mobility may account for a large portion of the unemployment and this is known as the natural rate of unemployment nationally, thought to be around 4.5 percent.

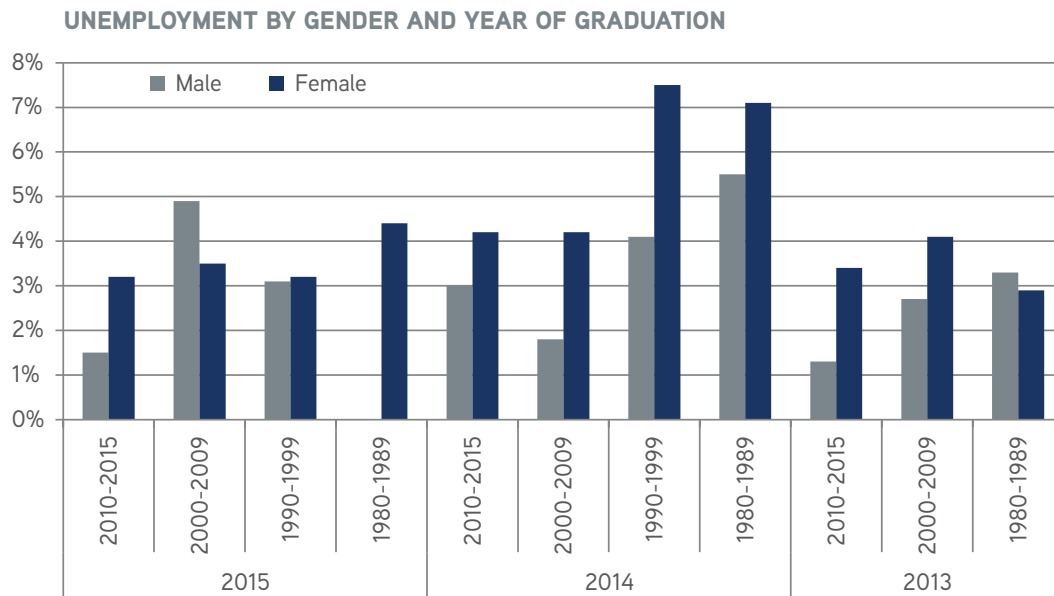


Figure 32

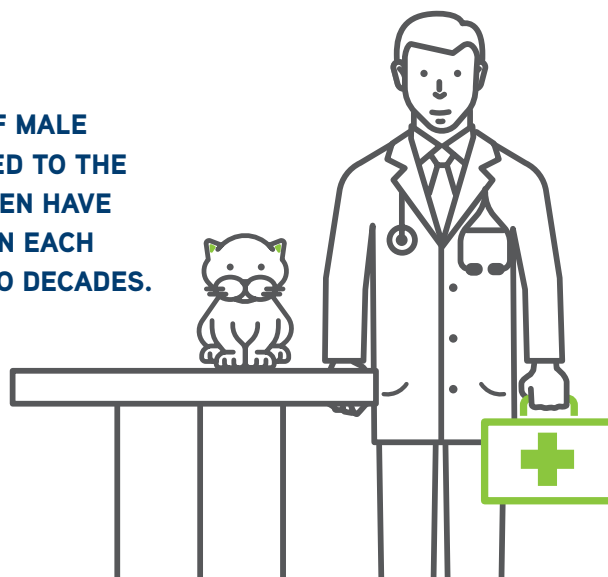
VETERINARIAN UNDEREMPLOYMENT

The veterinary profession continues to experience negative underemployment, the total number of hours that all veterinarians wish to work less for less compensation exceeds the total number of hours that all veterinarians wish to work more for more compensation. And the amount of negative underemployment has increased over the last three years (2013-2015).

For men, underemployment existed in both 2013 and 2014

but became negative in 2015. The age distribution of male veterinarians is skewed to the older ages as fewer men have entered the profession each year over the last two decades. And, generally, among younger veterinarians there are more who wish to work more hours for greater compensation than those who wish to work fewer hours for less compensation, and these preferences shift as veterinarians age.

THE AGE DISTRIBUTION OF MALE VETERINARIANS IS SKEWED TO THE OLDER AGES AS FEWER MEN HAVE ENTERED THE PROFESSION EACH YEAR OVER THE LAST TWO DECADES.



UNDEREMPLOYMENT WORK PREFERENCE BY GENDER

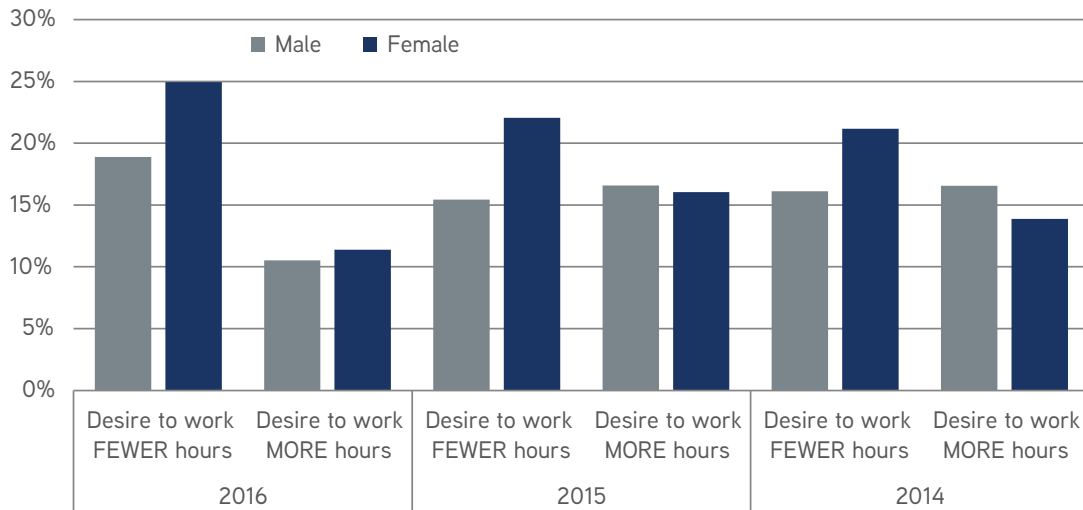


Figure 33

The shifting preferences that occur with age for the hours worked per week can be seen in the percent of veterinarians, by graduation year, who wish to work more hours for greater compensation. In all three years, the percent of those wishing to increase their hourly work week increases as the year of

graduation becomes more recent. The significant decline in the percent of veterinarians desiring a longer hourly work week in 2015 compared to the two prior years is an indicator of the growth in demand for veterinary services.

WORK PREFERENCE: DESIRE TO WORK MORE HOURS PER WEEK

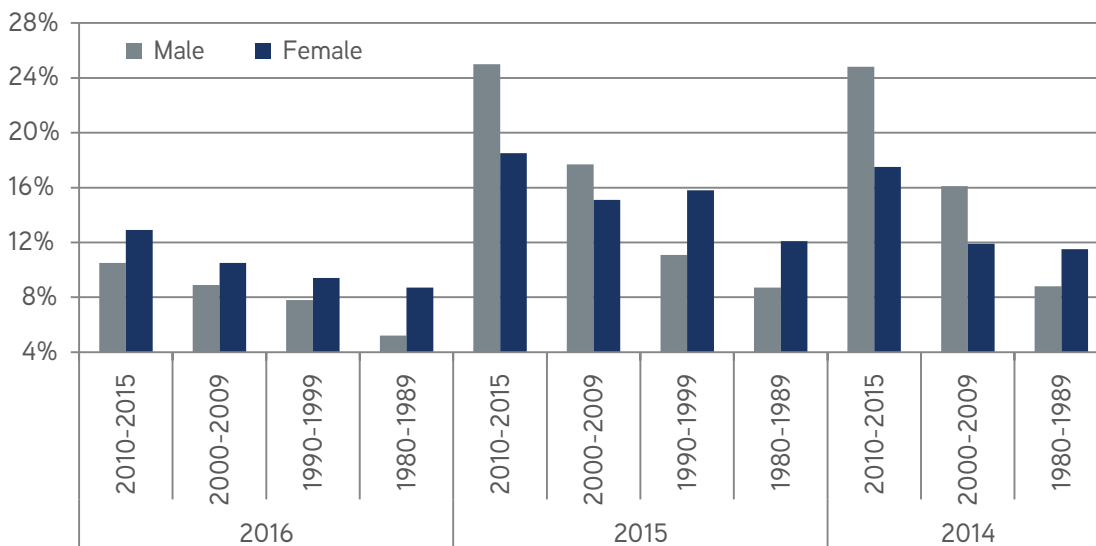


Figure 34

Another indicator of the growing demand for veterinary services is the increase in the percent of veterinarians who wish to work fewer hours. While there is generally a higher percentage of female veterinarians wishing to work fewer hours per week – and the percent has increased over the last three years – the trend is similar for men. The amount of total

negative underemployment has increased from 66,200 hours in 2013 to 73,320 in 2014 and 135,640 in 2015. In 2015, 3,391 veterinarians would be required to be added to the workforce to facilitate the desire of all veterinarians to reach their optimal hourly work week.

WORK PREFERENCE: DESIRE TO WORK FEWER HOURS PER WEEK

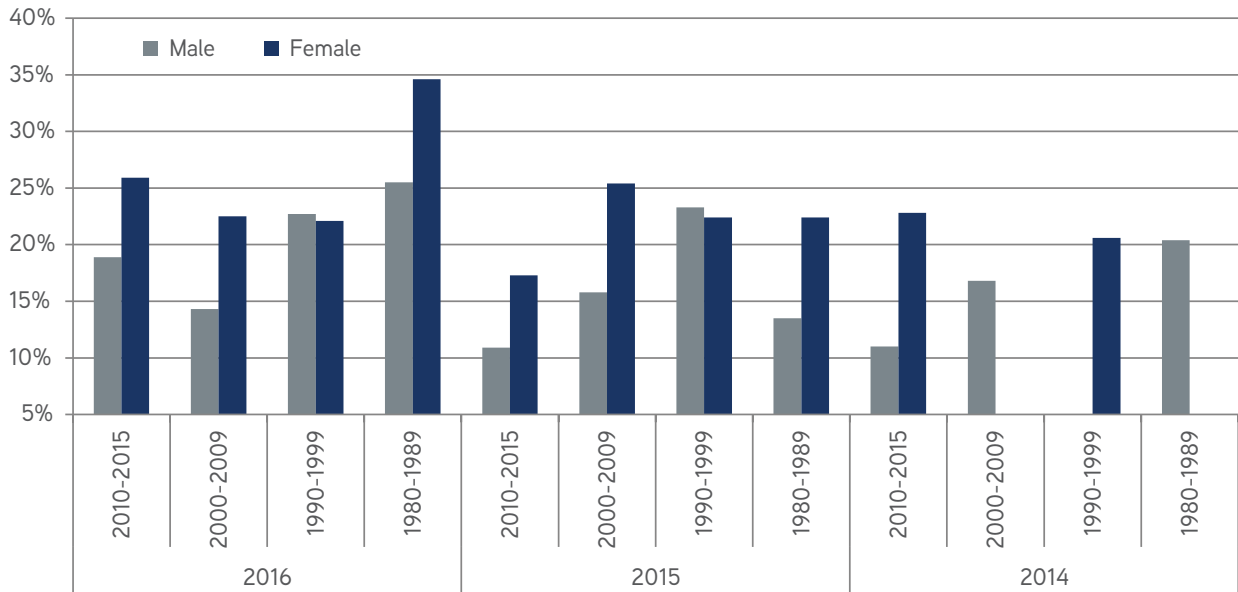


Figure 35

LOCATIONS WHERE THE CONCENTRATION OF VETERINARIANS (NUMBER OF VETERINARIANS PER 100,000 PEOPLE) EXCEEDS THE NATIONAL AVERAGE MAY HAVE HIGHER LEVELS OF UNEMPLOYMENT, UNDEREMPLOYMENT AND LOWER INCOMES THAN IN SIMILAR LOCATIONS WHERE THE CONCENTRATION OF VETERINARIANS IS LESS THAN THE NATIONAL AVERAGE.



RELATIVE CONCENTRATION OF VETERINARIANS

Veterinarians wishing to work more hours is an indication that some practices are not operating at optimal capacity while practices with veterinarians wishing to work fewer hours may be an indication of practices that are working beyond optimum capacity and closer to full capacity. This difference in the amount of hours that veterinarians wish to change may also be a result of the maldistribution of veterinarians.

Locations where the concentration of veterinarians (number of veterinarians per 100,000 people) exceeds the national average may have higher levels of unemployment, underemployment and lower incomes than in similar locations where the concentration of veterinarians is less than the national average. However, because the demand for veterinary services is affected by many demographic factors, simply looking at the concentration of veterinarians will not provide a complete explanation for the differences in unemployment, underemployment and incomes

between locations. For instance there is a higher demand for veterinary services among higher-income animal owners and thus high-income locations should be expected to have a concentration of veterinarians that exceeds the national average.

The Bureau of Labor Statistics (BLS) created the location quotient from data collected by the Quarterly Census of Employment and Wages (QCEW) program to allow for a comparison of relative employment levels in the United States, states, counties, and metropolitan statistical areas. A labor quotient of 1 would indicate that the number of veterinarians in the location per 100,000 employees is equal to the number of veterinarians per 100,000 employees for the United States. Thus, an LQ in excess of 1 indicates that veterinarians in that location comprise a higher percent of total employment than for the United States.

LOCATION QUOTIENT OF VETERINARIANS BY STATE, 2015

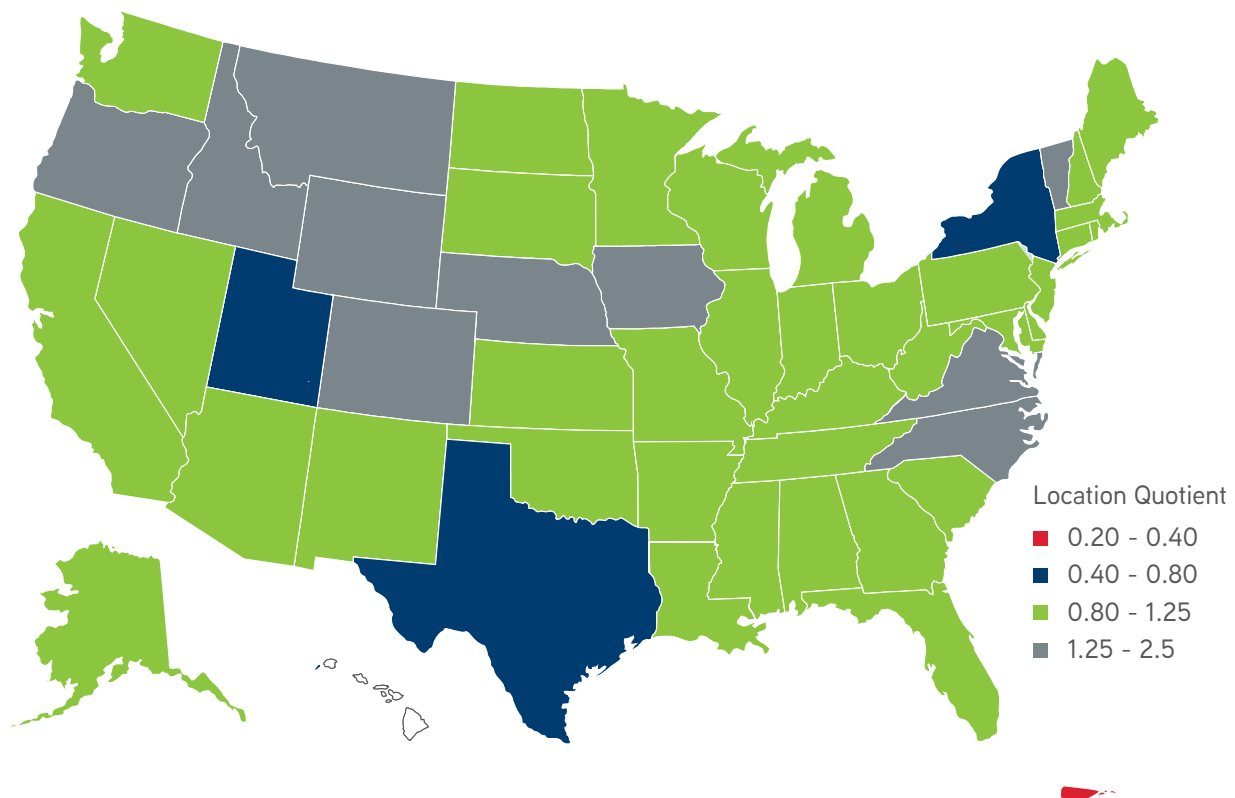


Figure 36

While the BLS uses data from a census of employment and wages, the AVMA has a database of veterinarians, both employers (e.g., practice owners) and employees that can be used to compute a labor quotient. While the state-level labor quotients produced by the BLS and the AVMA data are similar, there are differences. Part of this difference may be due to a locational bias in the AVMA's data of veterinarians, as roughly a quarter of the veterinarians in the database have not reported a current location. Because there is no means for determining the extent to which these veterinarians with an unknown current location are similar in geographic location to the other veterinarians, it is possible that part of the difference between the two maps is due to a locational bias.

However, the AVMA data contain the location of veterinary practice employers (practice owners) that may not all be included in the BLS data on employment. The BLS survey estimates the total number of veterinarians employed at 78,300, far short of the roughly 105,000 veterinarians estimated from the AVMA database. The BLS data does not include employers in the employee data and, with roughly 27,000 veterinary practices in the United States and included in the AVMA data – and many of these practices being single-veterinarian practices – some differences between the AVMA and BLS location quotient may be expected.

LOCATION QUOTIENT OF AVMA VETERINARIANS BY STATE, 2016

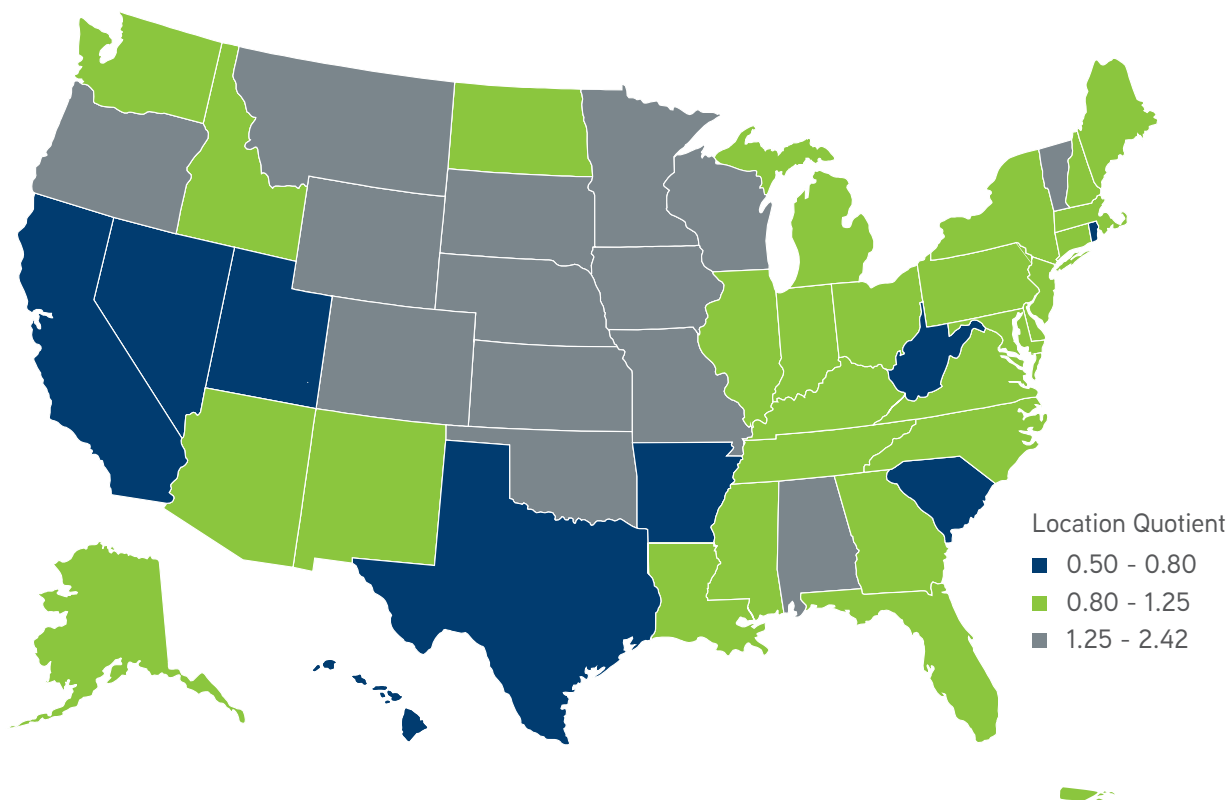


Figure 37

The location quotient for new veterinarians can also be examined by using the responses from the AVMA senior survey. With more than 90 percent of new graduates indicating where

their first employment opportunity is located, the relative concentration of new veterinarians is similar to the existing patterns.

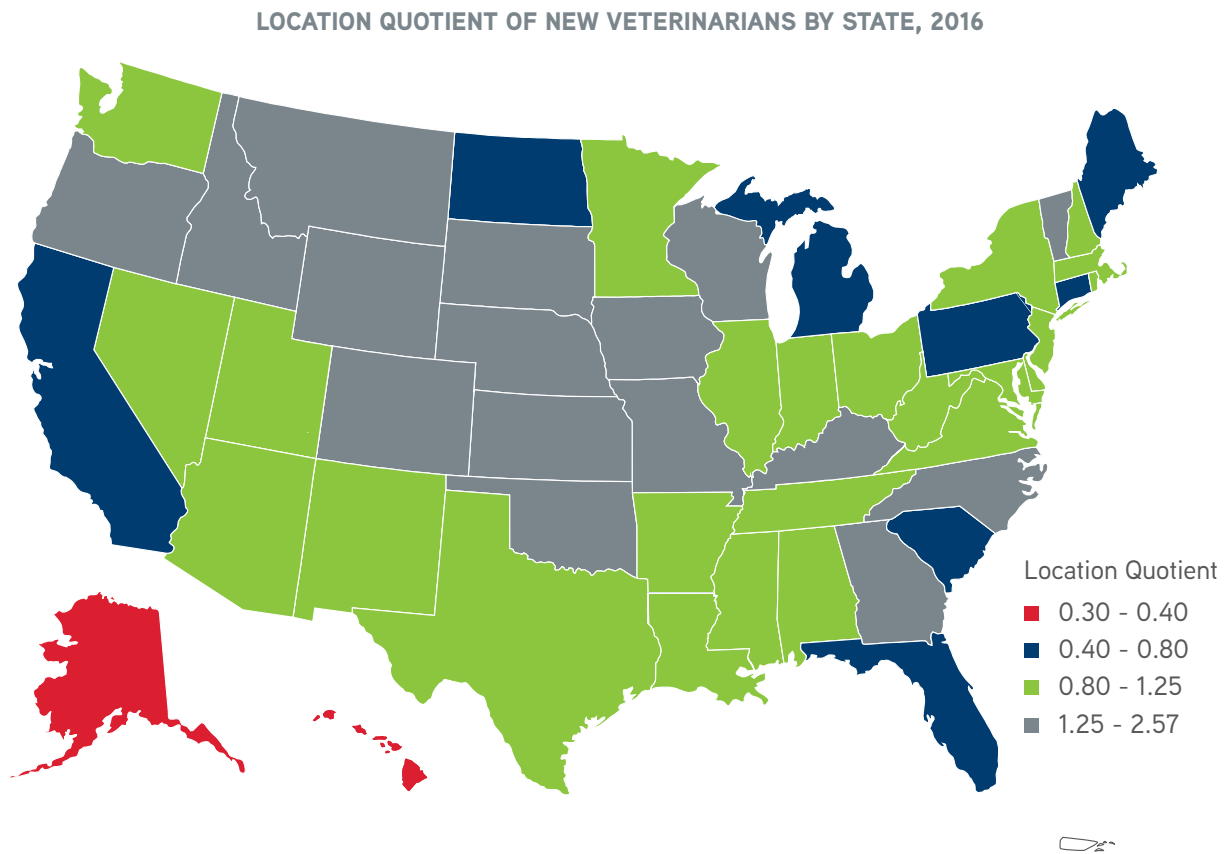


Figure 38

VETERINARIAN EMPLOYMENT OPPORTUNITIES

As the general economy has improved since the recession ended in June 2009, the number of unemployed has declined and the number of jobs available has increased. As of August, 2016 there were just over 7 million people actively seeking employment and just under 5 million jobs available, as estimated by the Conference Board's Help Wanted On-Line (HWOL) Survey. "The HWOL program is targeted to cover the full

universe of all online advertised vacancies which are posted directly on Internet job boards. The HWOL program uses data collected from over 16,000 online job-board sources including corporate job boards. Each year new job-board sources are added as they emerge while some existing sources may be dropped if it is determined that they primarily spider their ads from other job boards."¹

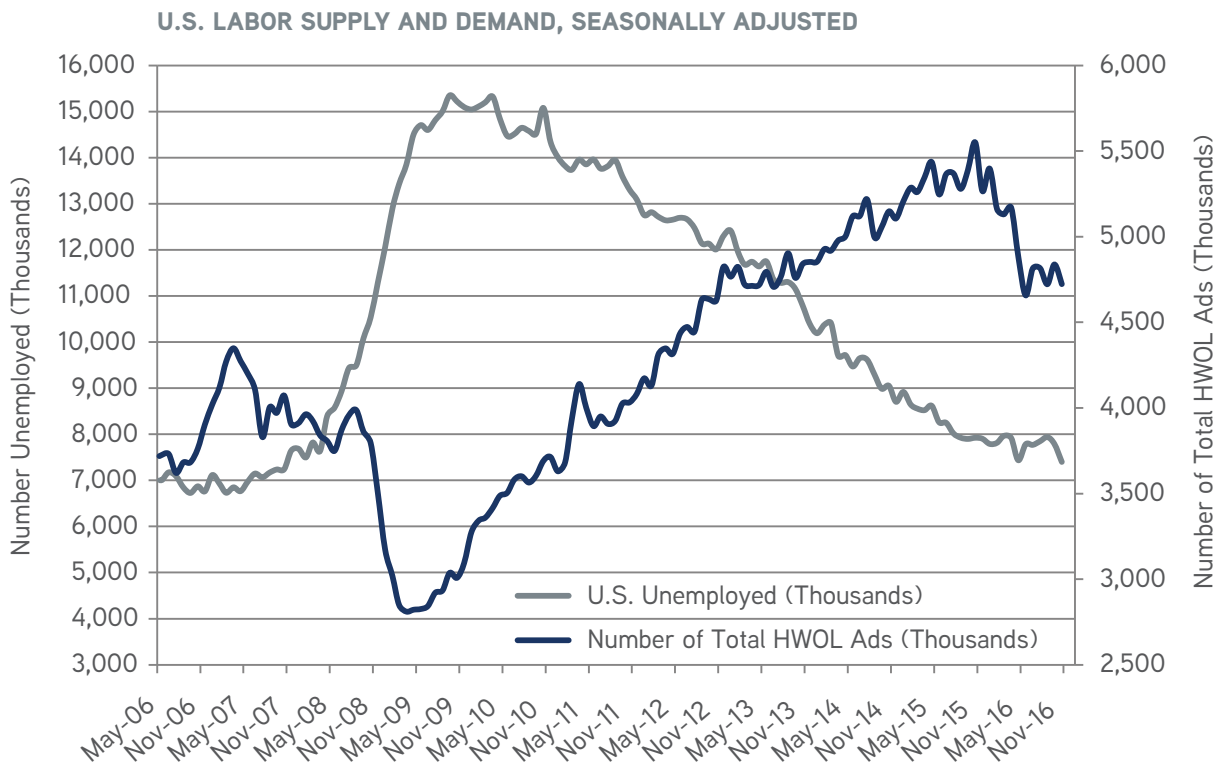
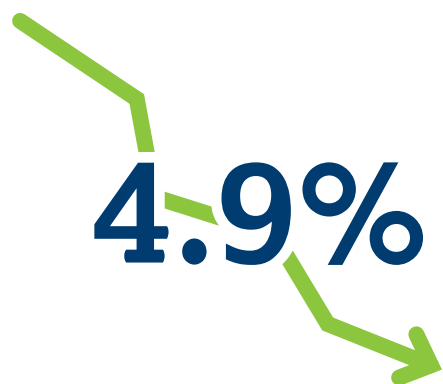


Figure 39



IN LATE 2015 THE NUMBER OF HWOL ADVERTISEMENTS FOR JOBS BEGAN TO FALL AND THE NUMBER OF UNEMPLOYED REACHED A BOTTOM AND BEGAN TO INCREASE. WITH THE U.S. UNEMPLOYMENT RATE NOW AT 4.9 PERCENT THE ECONOMY MAY HAVE REACHED FULL EMPLOYMENT.

¹https://www.conference-board.org/pdf_free/press/HWOLTechNotesMar3020167.pdf



In late 2015 the number of HWOL advertisements for jobs began to fall and the number of unemployed reached a bottom and began to increase. With the U.S. unemployment rate now at 4.9 percent the economy may have reached full employment.

A similar trend can be seen in the AVMA's Veterinary Career Center (VCC) data. The VCC provides a national database of available jobs and those actively seeking employment specific to veterinary medicine. However, the number of VCC registrants seeking employment may not be unemployed

but rather are employed job seekers wishing to change their location or type of employment.

Just prior to the last recession the number of registered job seekers was less than the number of posted employment opportunities. This changed during the recession and the number of registered applicants exceeded the number of available jobs until the end of 2015 when again the number of available jobs exceeded the number of applicants.

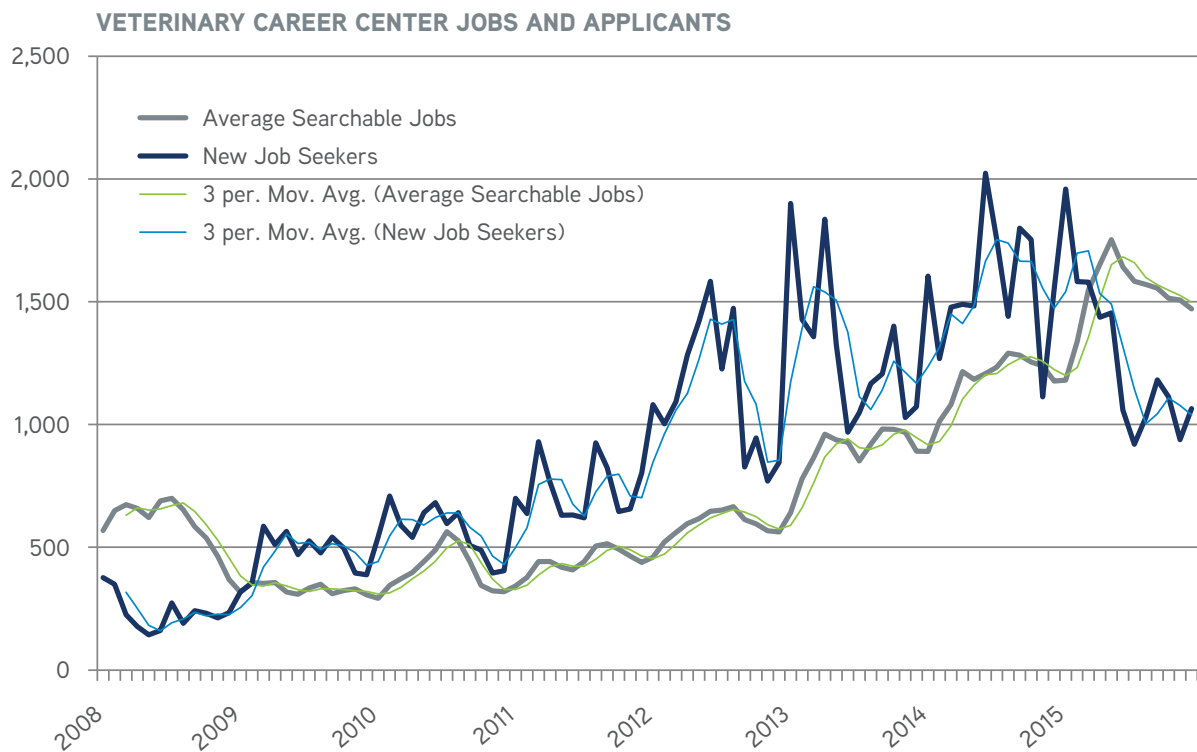


Figure 40

The VCC had 11,990 employment opportunities posted during the first nine months of 2016 with 87 percent of those for DVMs,

but during the same period only 7,820 registered applicants with only 44 percent of those identifying as DVMs.

VCC DESCRIPTIVE STATISTICS OF JOBS, 2016

Education Level	Frequency	Percent
2-Year Degree	378	3.2%
4-Year Degree	151	1.3%
DVM or Equivalent	10,420	86.9%
Doctorate	214	1.8%
High School	524	4.4%
Masters	22	0.2%
Some College	281	2.3%
Total	11,990	100%

Table 2

VCC DESCRIPTIVE STATISTICS OF USERS, 2016

Experience Level of Registered User					
Registered User	< 1	1 to 7	7+	Any Level	Total
Veterinarian	888 (35%)	1,529 (51%)	891 (49%)	114 (26%/3%)	3,422 (44%)
Veterinary Student	677 (26%)	121 (4%)	17 (1%)	73 (17%)	888 (11%)
Veterinary Technician	253 (10%)	620 (21%)	410 (22%)	40 (9%)	1,323 (17%)
Not Listed	729 (29%)	725 (24%)	518 (28%)	215 (48%)	2,187 (28%)
Total	2,547 (100%)	2,995 (100%)	1,836 (100%)	442 (100%)	7,820 (100%)

Table 3



Computing the ratio of job applicants to available jobs we can compare the trends in the market for veterinary labor with the national labor market. This comparison provides several observations. First, when compared to the national labor market, the market for veterinarians was slower to react to the recession, has a smaller variation in the supply/demand ratio and is considerably more volatile month to month. The U.S. supply/demand ratio peaked at the end of the recession and had

declined throughout the economic expansion while the supply/demand ratio for veterinarians did not peak until nearly four years after the end of the recession; and while the national ratio fell below the pre-recession low more than two years ago, the ratio for the veterinary labor market has not yet reached the pre-recession level. This could suggest a continued tightening in the market for veterinarians.

VCC RATIO OF JOB APPLICANTS TO AVAILABLE JOBS

U.S. Ratio

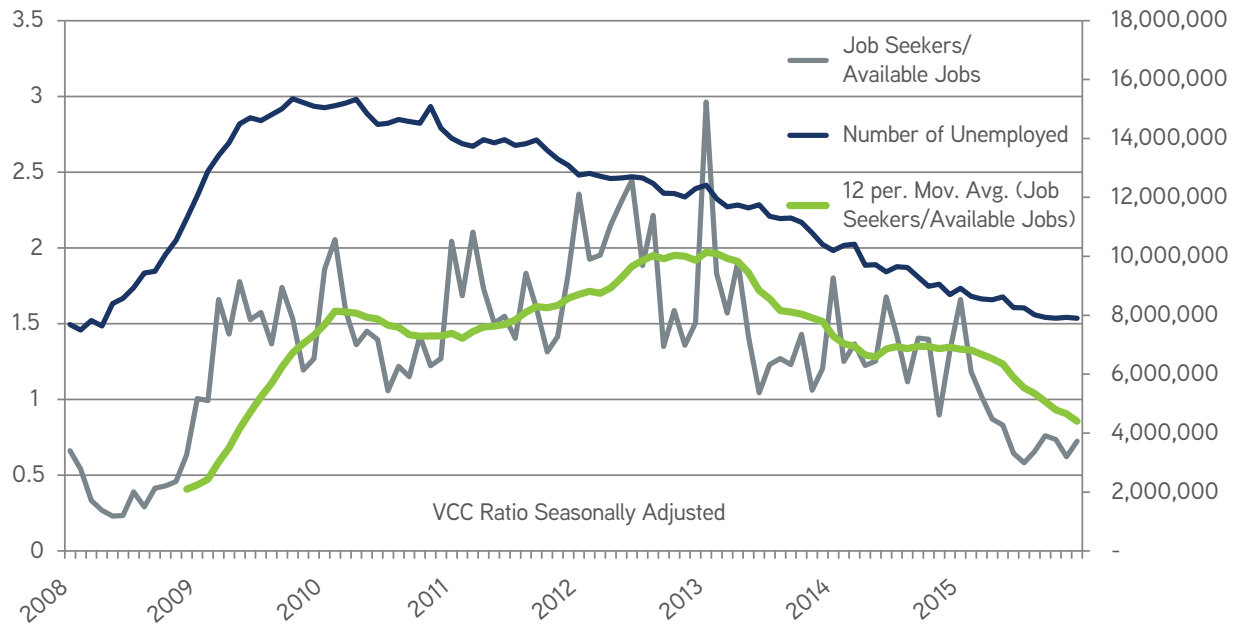


Figure 41

WHEN COMPARED TO THE NATIONAL LABOR MARKET, THE MARKET FOR VETERINARIANS WAS SLOWER TO REACT TO THE RECESSION, HAS A SMALLER VARIATION IN THE SUPPLY/DEMAND RATIO AND IS CONSIDERABLY MORE VOLATILE MONTH TO MONTH.

Geographic Location of Veterinary Jobs and Applicants

The registered job applicants have been mapped by zip code for those (84 percent) who indicated a zip code. And, the available jobs have also been mapped by zip code when available (71

percent). There is some commonality in both the location of the employment opportunities, the location of the applicants and density of the population.

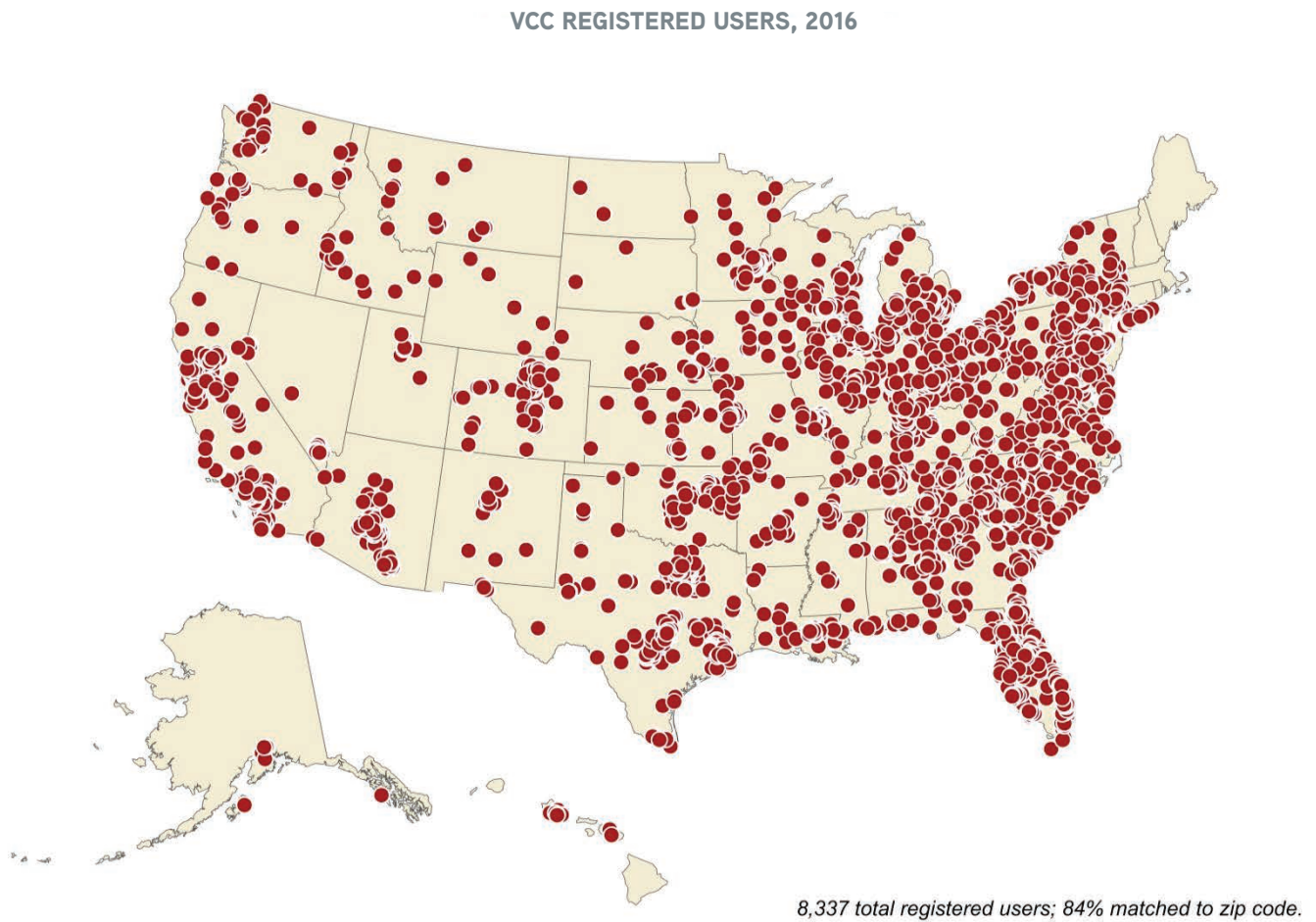
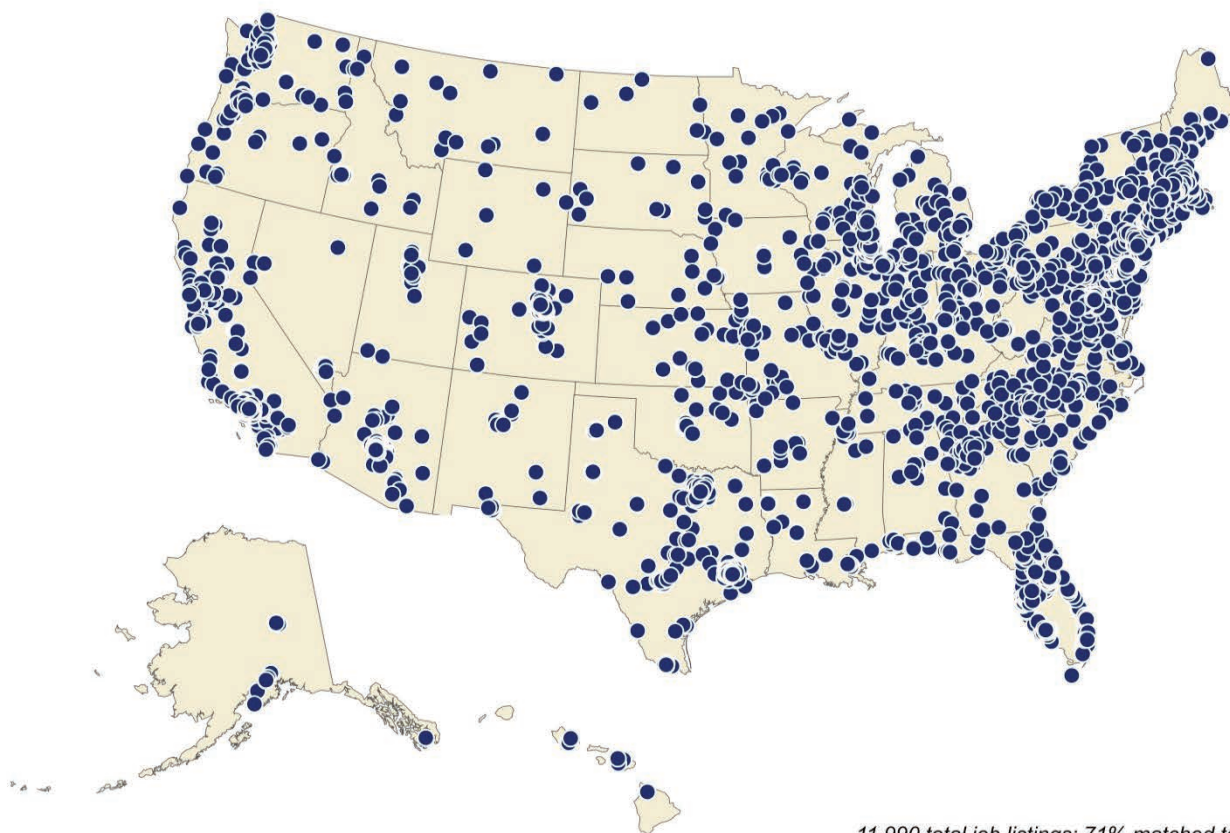


Figure 42

VCC DVM JOB LISTINGS, 2016



11,990 total job listings; 71% matched to zip code.

Figure 43

However, the number of job applicants per job varied widely with many employment opportunities finding no applicants through the VCC. While some of these employment opportunities may have been filled through other means, the trend in applicants to jobs over the extended period from 2008 would suggest that some of these employment opportunities simply did not find any

applicants. And as noted previously, the sharp rise in starting salaries, low unemployment rate, and negative underemployment would support the conclusion that the tight market has created a short-term shortage of veterinarians for specific locations and employment opportunities.

VCC JOB APPLICANT QUANTITY PER DVM JOB LISTINGS, 2016

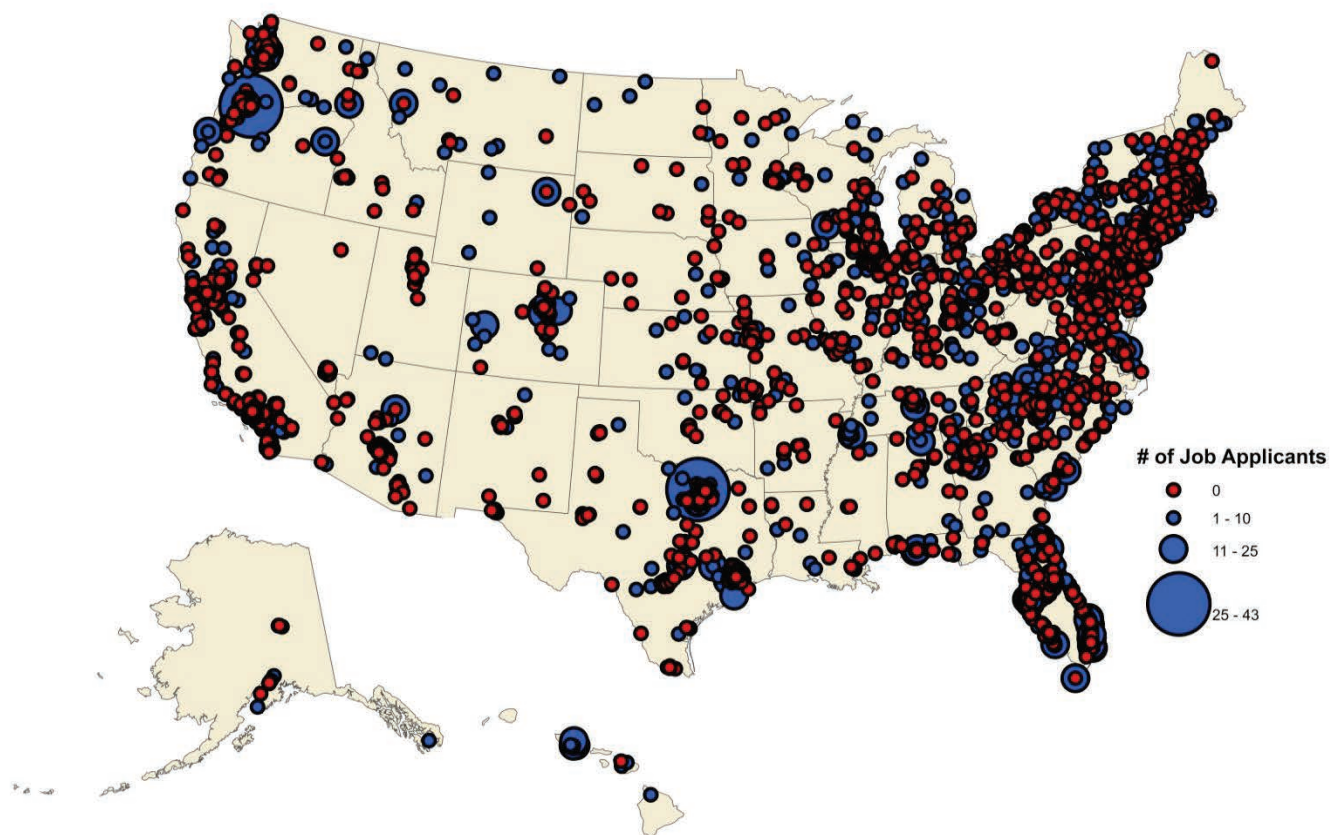


Figure 44

Based on the comparison of the national labor market and the veterinary labor market and the measures of unemployment, underemployment and starting salaries, the year ahead can certainly expect to see continued difficulty in filling veterinary employment opportunities and increasing pressure to raise compensation to attract applicants. However, this tightening of the veterinary job market will vary by location.

The applicant-to-jobs ratio for veterinarians varies from roughly 0.3:1 (roughly three jobs for every applicant) to over 4:1 (four applicants for every job). This extreme geographical disparity in the applicant-to-jobs ratio suggests that maldistribution is playing a major role in the determination of compensation level, unemployment and underemployment.

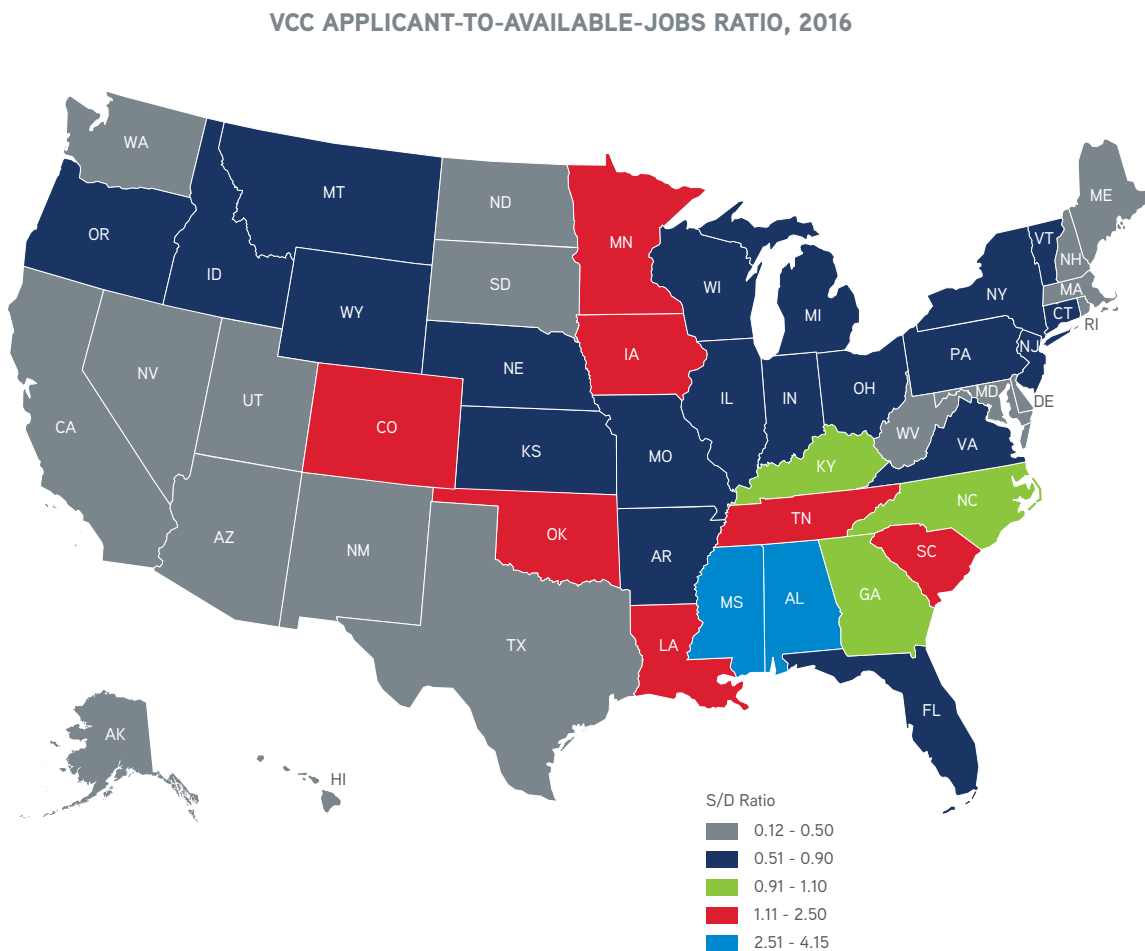


Figure 45

At least a portion of this maldistribution is a function of the desire of veterinarians to return to their home to establish a career. The greatest proportion of new veterinarians are from the suburbs (roughly 60 percent) and a slightly higher percentage of graduates (62 percent) find employment in the suburbs. But only 66 percent of those that grew up in suburban settings returned to the suburbs; another 20 percent of these found employment in rural areas and 14 percent found employment in urban settings.

Of the 3,148 recently graduated veterinarians that grew up in urban settings, however, only 53 percent return to urban areas while 32 percent find employment in the suburbs and another 15 percent begin their careers in rural areas. These trends are interesting, as national trends show a desire among new graduates (millennials) to move to urban settings. Whether the new veterinarians are moving to where the jobs are located or moving to the areas they wish to live and then seeking employment is an important question.

NEW VETERINARIAN COMMUNITY TYPE

	Grew Up	Found Employment			
		Rural	Suburban	Urban	Total
2013-2016	Rural	757	320	140	1,217
	Suburban	1,164	3,804	842	5,810
	Urban	480	994	1,674	3,148
	Total	2,401	5,118	2,656	10,175
	Grew Up	Found Employment			
		Rural	Suburban	Urban	Total
2016	Rural	204	71	38	313
	Suburban	316	982	210	1,508
	Urban	133	258	398	789
	Total	653	1,311	646	2,610

Table 4

VETERINARIAN WELLNESS

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

Starting in 2015, the Professional Quality of Life (ProQoL) tool was included in the annual survey of veterinarians (employment survey in 2015, census of veterinarians in 2016) to begin to understand the factors that may contribute to compassion satisfaction and fatigue.

The ProQoL² tool is a measure of compassion satisfaction and compassion fatigue associated with helping others who have experienced suffering. *Compassion satisfaction* is about the pleasure you derive from your work. For example, you may feel like it is a pleasure to help others through what you do at work. You may feel positively about your colleagues or your ability to contribute to the work setting or even the greater good of society through your work with people who need care. *Compassion fatigue* encompasses negative feelings derived

from work through scoring of burnout (exhaustion, frustration, anger, depression) and secondary traumatic stress (work-related trauma).

Responses to the ProQoL questions are scored based on the responses of thousands of individuals across a number of occupations. The scores have been established to describe low, normal and high compassion satisfaction and fatigue as well as burnout and secondary trauma. The results from the AVMA surveys indicated that the mean ProQoL scores for compassion fatigue, burnout and secondary trauma were in the lower normal range, while compassion satisfaction was in the higher normal range. But these mean scores fail to illustrate the number of respondents who were in the high range for burnout and secondary trauma. The results of the ProQoL scores are plotted against the percent of respondents with each specific score. The distribution of compassion satisfaction scores follows a normal distribution that is skewed left. Less than a score of 22 is considered a low score for compassion satisfaction.

² B. Hudnall Stamm, 2009. Professional Quality of Life: Compassion Satisfaction and Fatigue Version 5 (ProQoL). /www.isu.edu/~bhstamm or www.proqol.org

COMPASSION SATISFACTION SCORE DISTRIBUTION

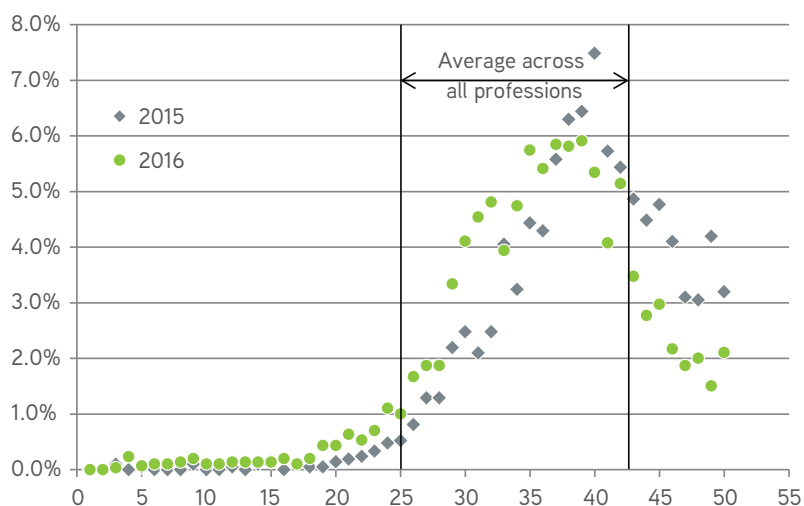


Figure 46

Looking at what factors are associated with low compassion satisfaction, a multiple linear regression was conducted with the variables that were felt might contribute to the variation in compassion satisfaction or compassion fatigue. The result of this analysis indicated that only two factors, satisfaction with current employment and how well the veterinarian felt they were prepared for their career, were statistically significant in both

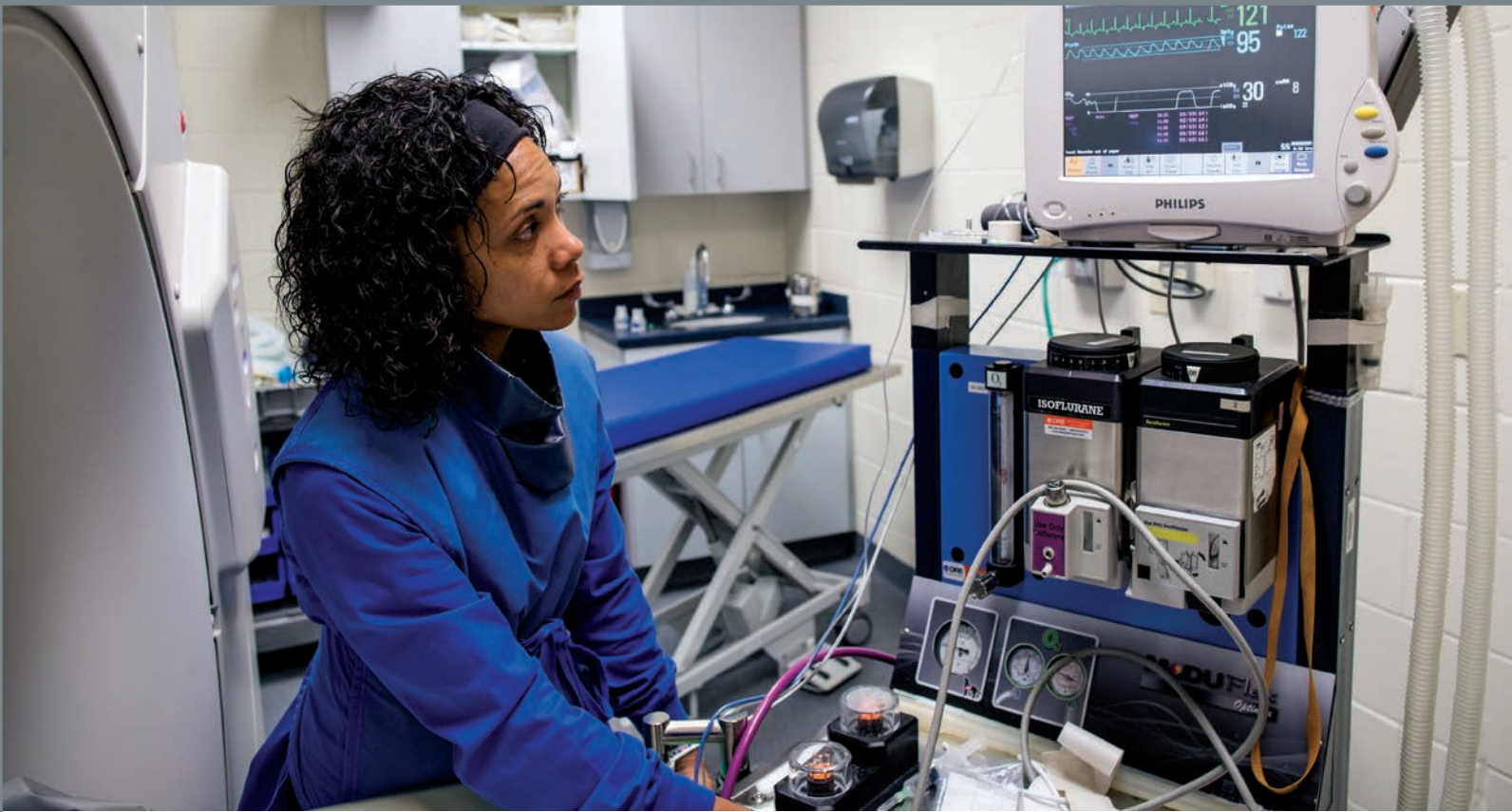
2015 and 2016. Both of these factors were positively associated with compassion satisfaction.

In 2016, industry employment, lower income and hourly compensation were found to be statistically significant in a negative association with compassion satisfaction, while being employed in academia, living in a smaller community, and increased age were positively associated with compassion satisfaction.

FACTORS CORRELATED WITH COMPASSION SATISFACTION SCORE

	2016		2015	
	Coefficient	P Value	Coefficient	P Value
(Constant)	16.001	0.000	18.851	0.000
Satisfaction with current employment	3.016	0.000	2.753	0.000
How well your education has prepared you to be a veterinarian	1.758	0.000	1.682	0.000
Professor (Assistant, Associate, or Full)	4.488	0.025		
Industry/commercial organizations	-4.441	0.038		
Advanced Education			-1.763	0.018
Size of community in which practice is located: 2,500 to 49,999 residents	0.655	0.035		
Compensation mode: Hourly	-1.162	0.026		
Personal Income	-9.37E-07	0.048		
Gender: Female=1/ Male=0			1.021	0.001
Age	0.054	0.000		
Hours Worked per week			0.035	0.002
Ethnicity - Asian			1.999	0.012
Marital Status: Single			-0.932	0.003
Marital Status: Divorced			1.363	0.038

Table 5



The two sources of compassion fatigue, burnout and secondary traumatic stress, were also measured. A score above 35 on the burnout or secondary trauma stress scale may suggest a need to seek help to deal with the factors that are causing either

burnout, secondary trauma stress or both. The burnout scores from both the 2015 and 2016 surveys were normally distributed with the mean at the low end of the normal range. However, 7.2 percent of 2016 respondents had scores in excess of 35.

BURNOUT SCORE DISTRIBUTION

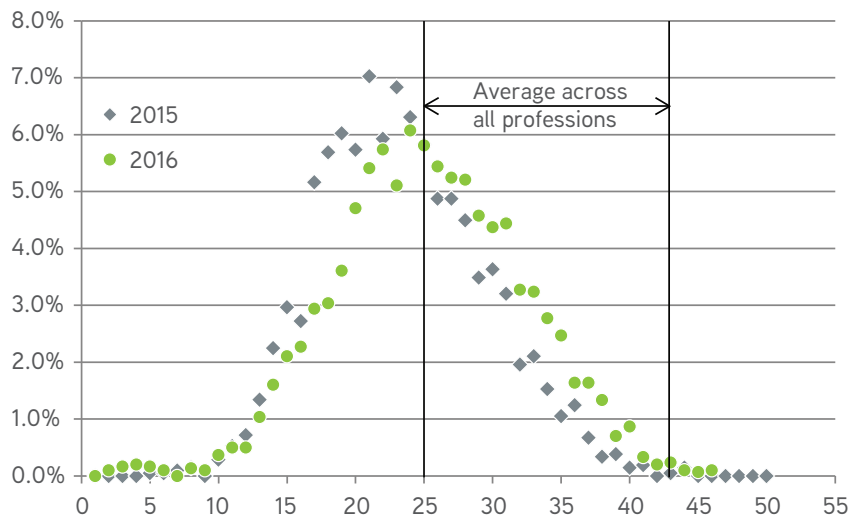


Figure 47

Using the same approach to examine the factors associated with burnout that was used with compassion satisfaction, three factors were found to be statistically significant in both 2015 and 2016. The less satisfied with current employment and the less prepared the respondent felt their education had prepared

them for a career in veterinary medicine, the greater the burnout score. The more hours worked per week the greater the burnout score. Again, there were several other factors that were statistically significant in their association with higher levels of burnout.

FACTORS CORRELATED WITH BURNOUT SCORE

Dependent Variable: Burnout Scale	2016		2015	
	Coefficient	P Value	Coefficient	P Value
Constant	37.044	0.000	36.151	0.000
Satisfaction with current employment	-2.707	0.000	-2.594	0.000
Food animal practice (predominant)			-3.891	0.000
Food animal practice (exclusive)			-3.329	0.000
Equine practice			-1.657	0.008
Not-for-profit organizations	-4.629	0.024		
Hours Worked per week	0.08	0.000	0.054	0.000
How well your education has prepared you to be a veterinarian	-1.055	0.000	-1.188	0.000
Gender: Female=1/Male=0	1.04	0.002		
Educational Debt	4.28E-06	0.032		
Ethnicity - Black/African American	-3.385	0.038		
Ethnicity - Hispanic/Latino			-2.79	0.001
Ethnicity - Asian			-1.894	0.009
Marital Status: Single			1.02	0.000
Age	-0.051	0.001		
Graduation Year			-0.382	0.038

Table 6

Secondary traumatic stress scores had a similar distribution to that of the burnout scores. However, the mean is to the left

(lower) than for burnout and the percent of respondents with a score above 35 (4.1 percent) is lower than for burnout.

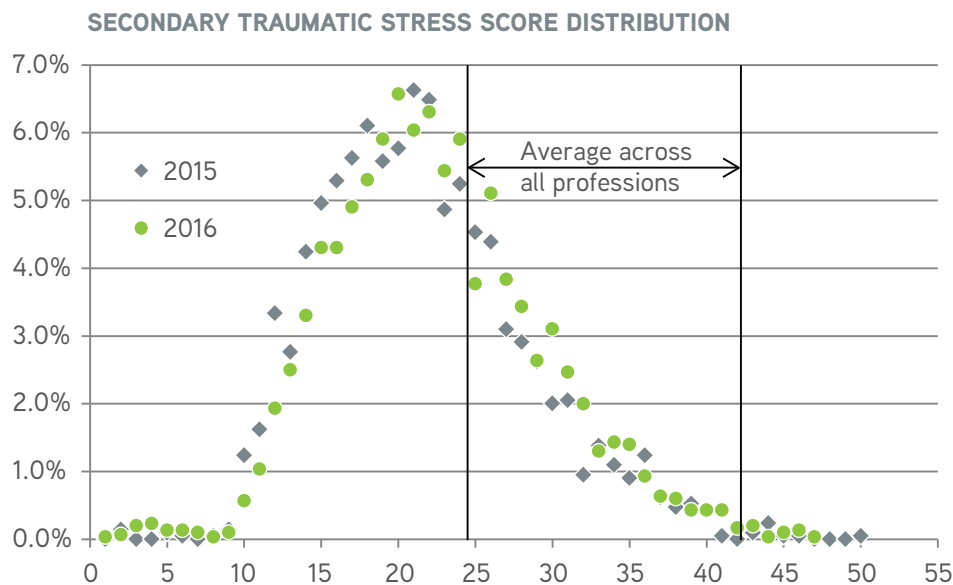


Figure 48

Again, using the same approach to examine the factors associated with secondary traumatic stress that was used with compassion satisfaction and burnout, four factors were found to be statistically significant in both 2015 and 2016. The less satisfied with current employment and the less prepared the respondent felt their education had prepared them for a career

in veterinary medicine the greater the secondary traumatic stress score. Females, and the more hours worked per week were associated with greater levels of secondary traumatic stress. As with both compassion satisfaction and burnout, there were several other factors that were statistically significant in their association with higher levels of burnout.

FACTORS CORRELATED WITH SECONDARY TRAUMATIC STRESS SCORE

	2016	P Value	2015	P Value
	Coefficient		Coefficient	
Constant	26.383	0	23.237	0
Graduation Year	-0.749	0		
Satisfaction with current employment	-1.349	0	-1.31	0
Hours Worked per week	0.075	0	0.072	0
Gender: Female=1/ Male=0	1.461	0	1.883	0
How well your education has prepared you to be a veterinarian	-0.581	0.009	-0.695	0.001
Food animal practice (predominant)			-3.251	0.014
Food animal practice (exclusive)			-2.732	0.017
Companion animal practice (exclusive)			1.724	0
Companion animal practice (predominant)			1.278	0.015
State/Local government			-3.817	0.015
Uniformed services	12.997	0.032		
Researcher	12.11	0.005		
Ethnicity - Black/African American			-3.427	0.032
Age			-0.037	0.033

Table 7



THE NPV HIT A LOW IN 2014 FOR WOMEN AND 2015 FOR MEN. THE DIFFERENCE IN THE NPV FOR MEN AND WOMEN IS DUE TO THE HIGHER DEBT AND LOWER INCOMES OF WOMEN AT GRADUATION AND THE HIGHER OPPORTUNITY COSTS OF PURSUING A VETERINARY EDUCATION FOR MEN AS COMPARED TO WOMEN.



VETERINARY MARKET KEY PERFORMANCE INDICATOR

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

The output of the market for veterinarians is the capacity to provide veterinary services. The performance of this market is the efficiency with which veterinary resources are used to produce veterinary services that are valued by society at or above the cost of producing them, and, one of the main costs is veterinary compensation. An efficient market would enable veterinarians to receive a normal economic return on the cost of becoming a veterinarian. A normal economic return is a percent return on the investment for comparable investments. This can be thought of as the return on investment of alternative investments. A simple comparison is a comparison to the long-term return on investment in the U.S. stock market, 7 percent annually. Net

Present Value (NPV) of the veterinary degree can be used as an indication of the return on investment to the DVM degree.

The NPV is calculated by estimating the income received from the veterinary career less the compensation that may have been received without the DVM degree and the costs of obtaining the DVM degree. Consider the following measures for the 2016 graduating class from the 28 U.S. veterinary colleges:

- Mean total debt (debt plus the servicing costs) of a 2016 graduating veterinarian is \$283,251 using a 25-year repayment plan;
- Mean lifetime income of 2016 graduates was estimated at \$52.million;
- NPV for men is estimated at -\$43,038
- NPV for women estimated at \$308,892

The NPV hit a low in 2014 for women and 2015 for men. The difference in the NPV for men and women is due to the higher debt and lower incomes of women at graduation and the higher opportunity costs of pursuing a veterinary education for men as compared to women.

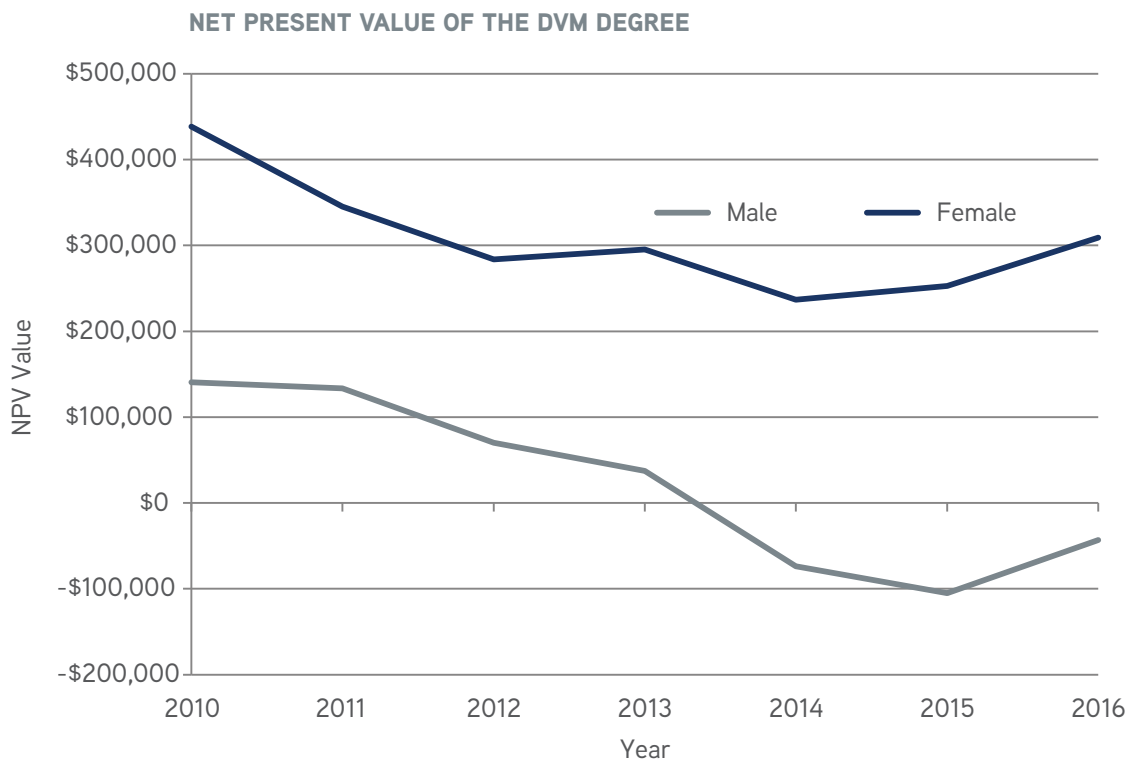


Figure 49

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

The difference in the NPV of the DVM for women and men is mostly a result of the higher opportunity costs for men compared to women. With only a B.S., women earn only 72 percent of what men earn over their career, but earn more than 92 percent of what men earn at the beginning of their career as

a veterinarian. And the difference between the starting salary of a DVM and B.S. has increased for women but declined for men over the last six years.

The drop in the difference of DVM and B.S. degrees for men from \$21,353 to \$18,277 indicates that the opportunity cost of men to gain a DVM is increasing, making the economic decision to obtain a DVM more difficult. On the one hand, for women, the opportunity cost of obtaining the DVM is declining as the difference between the DVM and B.S. starting salary has increased from \$24,882 to \$26,176.³

These differences in opportunity costs may contribute to the growing concentration of women in the veterinary profession. For men, the negative NPV yields no return on the DVM, while for women the positive NPV indicates a positive return on investment.

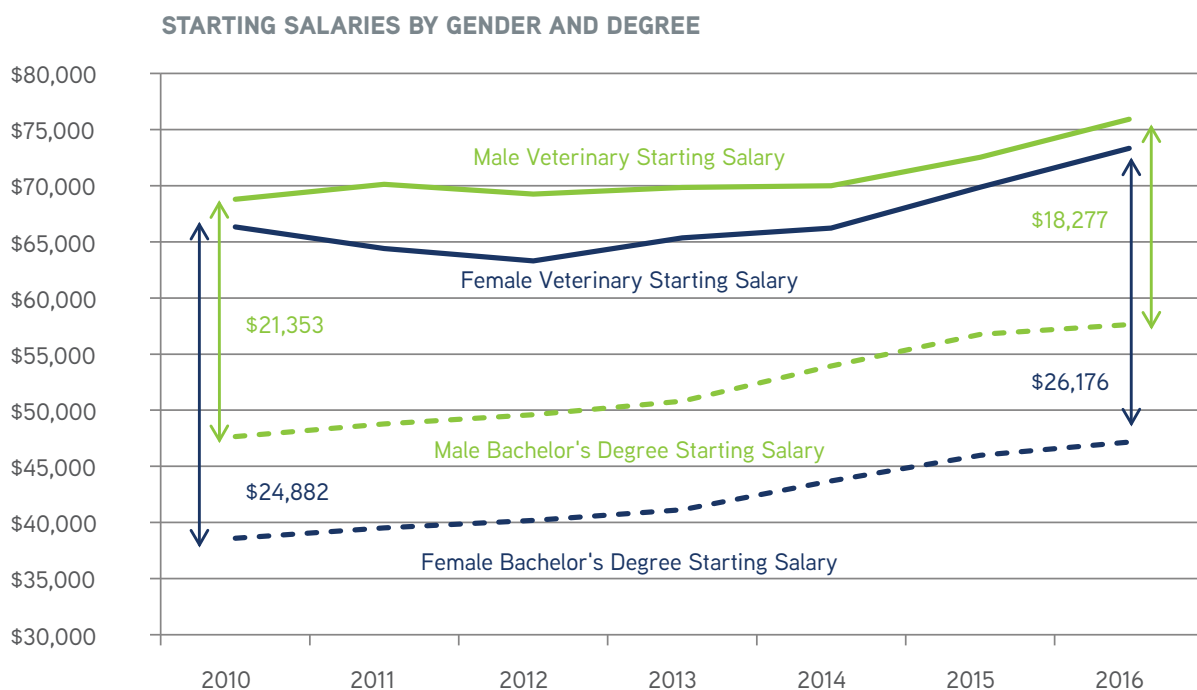


Figure 50

SUMMARY

The market for veterinarians continues to be robust with rising incomes, low unemployment and negative underemployment. The variation in relative concentration of veterinarians, particularly in specific suburban areas creates considerable variation in how veterinarians may perceive the market. Even though the national market currently appears very robust, some local markets may seem much less robust.

The rising median household incomes coupled with the lag between the national economic performance and the markets for veterinarians, the national market for veterinarians should continue to be robust through the next two years. And, improved mobility of veterinarians to correct the current maldistribution would improve the local markets for veterinarians as well as the market for veterinary services.

³ Salary Trends Through Salary Survey: A Historical Perspective on Starting Salaries for New College Graduates
 Salary Trends Through Salary Survey: A Historical Perspective on Starting Salaries for New College Graduates, (2017). Naceweb.org. Retrieved 5 January 2017, from <https://www.naceweb.org/job-market/compensation/salary-trends-through-salary-survey-a-historical-perspective-on-starting-salaries-for-new-college-graduates/#appendix>





THE MARKET FOR VETERINARY SERVICES



While the majority of veterinarians are employed in the provision of services to companion animals, even these markets differ by geography and the types of services offered or of focus.

Like the market for veterinarians, the market for veterinary services is not a single national homogenous market, but rather a number of different markets that are horizontally related. They are related through the common input, veterinarians, but produce many different types of services that can be separated into public and private services.

Within the market for private veterinary services are shelter services, specialty services, general practices in food animals, equine, companion animals (sometimes feline-specific) and various combinations of these. Within public service are state and federal government public health and research services, lab animal services, teaching, research and extension positions are veterinary colleges and non-profit services in veterinary associations, accrediting and licensing bodies.

While the majority of veterinarians are employed in the provision of services to companion animals, even these markets differ by geography and the types of services offered or of focus. As such, describing the market for veterinary services in a general connotation is difficult at best. But some relationships hold across all markets, such as the growth in the demand for veterinary services that occurs as median household incomes increase, the number of animals increase or the disease and medical problems of animals increase.

DEMAND FOR PRIVATE PRACTICE VETERINARY SERVICES

Owners of pets, working animals, livestock, aquatic species, and wildlife all require the services of private veterinary practitioners. For private practitioners, the demand for their veterinary services increases as the number of animals increases, animal owners awareness of the veterinary medical services the animals require increases, and animal owners' willingness to purchase these medical services increases. Each of these factors that affect the demand for veterinary services is, in turn, affected by various factors. And, unfortunately, there has been very little research to determine these relationships.

The number of pets is estimated every five years by the AVMA Pet Demographic Survey (PDS). The first PDS was conducted in 1982, and the most recent PDS was fielded in 2012. The purpose of the PDS is "to serve the veterinary medical profession and all other individuals who need to make decisions about the health care and product marketing demands associated with the companion animal industry and ... to update and expand our knowledge about the companion animal population in the United States regarding demographic characteristics and use of veterinary medical services."

The specific objectives of the PDS are "to determine:

1. Populations of dogs, cats, birds, horses and other pets owned by U.S. households;
2. Household demographic characteristics associated with pet ownership; and
3. Frequency of times that pets were seen by a veterinarian and annual veterinary medical expenditures."⁴

Since the 1992 PDS, the national survey received roughly 50,000 responses (47,000-60,000) and provided a national estimate of the number of pets of all types, frequency of visits to the veterinarian and the expenditure on veterinary services or products and market size. Unfortunately, this information does not provide the data required to measure demand. The annual expenditure provided by a household is a single number of the

total amount paid to veterinarians in the surveyed year, while demand is a set of quantities purchased or not purchased at each price by pet owners. And total market size is the number of customers (per year) as well as the pet owners who did not patronize a veterinarian during the year surveyed.

At the end of 2015, in cooperation with the AVMA VED, the National Center for Food and Agricultural Policy, an independent consulting group specializing in demand analysis, conducted a metropolitan market demand study to devise an accurate, low-cost household survey of single multi-county market areas for measuring the demand for veterinary services. This pilot study sought to determine a process for integrating smaller, metropolitan market specific areas with the five-year PDS. These metropolitan market surveys would help to understand the difference in the relationship between the demands for veterinary services that may occur as a result of differing market demographics. A second objective is to provide a method for computing the annual changes to the national estimates of numbers of pets, number of veterinary visits by each pet, and the effect of price and income on the demand for specific veterinary services-and from whom the veterinary services were purchased.

One of the unique findings in the 2015 pilot study was the question on routine check-ups in the past 12 months. The 2012 PDS noted that roughly 20 percent of dog owners had not visited a veterinarian in the last 12 months. However, when provided more choices of where the canine pet may have received a routine check-up in the past 12 months, 80 percent of respondent canine owners noted they had obtained a routine check-up in the last 12 months, in line with the PDS estimate. However, another 13 percent indicated that they had received a routine check-up at a veterinary hospital or clinic alternative. This calls into question the oft-quoted percent of pets not receiving annual care. However, this research occurred in a small local market and thus may not extrapolate to the larger United States.



⁴ J. Karl Wise, Center for Information Management, AVMA, 1992

ROUTINE CHECKUP FREQUENCY AND PROVIDER

PDS versus Pilot Survey Q9		2012 PDS	Random Sample	Veterinary Clients
Exam, vaccinations obtained from vet in previous year?		81%		
Routine check-up (somewhere) in past 12 months?			92%	97%
	Not this year	19%	8%	3%
	Not from a veterinarian			
Pilot Q10a-h				
Where did you take Dog for routine check-ups (exam, vaccinations, etc)?				
	veterinary clinic or hospital		80%	82%
	shelter or Humane Society		1%	
	city- or county-sponsored public clinic		1%	
	pet shop		1%	
	pet-focused retail store		4%	
	mobile facility or van		6%	11%
	OTHER: vet who does house calls			4%

Table 8

The price paid for the routine check-up was also provided by the respondents along with the number of visits per year by type of provider. The visits, along with the price per visit, are shown in

the figure below and illustrate the prevalence of one or two visits per dog and the range of prices paid per dog visit.

NUMBER OF CHECKUP VISITS PER YEAR PER DOG (Q) AND TOTAL PAID PER VISIT (P), 2015 PILOT SURVEY

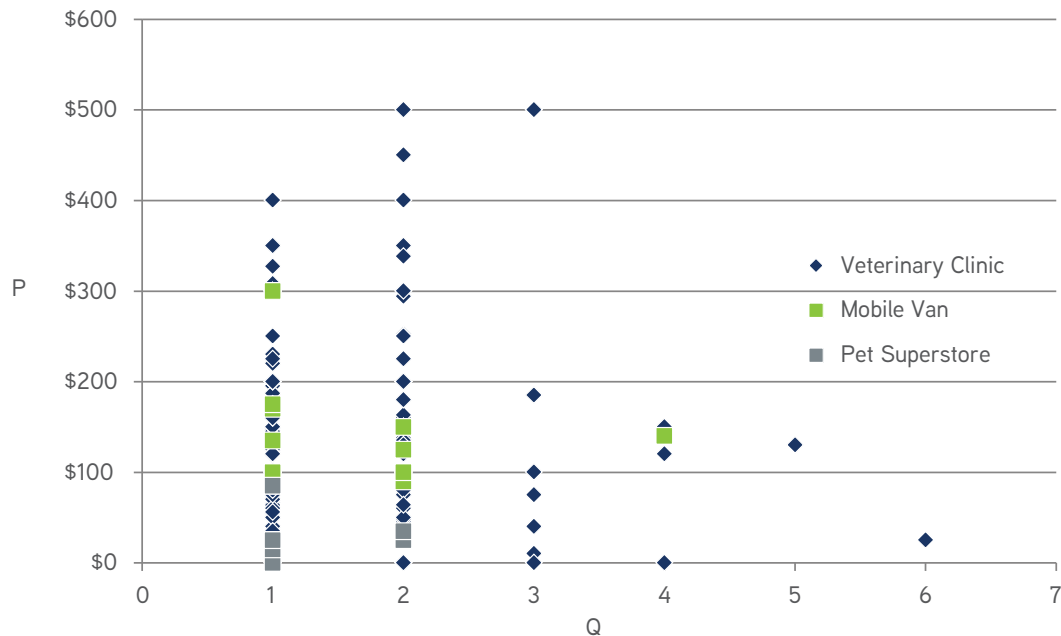


Figure 51

The quantity and price can be organized in an accumulative distribution to produce a demand schedule, indicating how many dog visits for routine check-ups could be provided at different prices. Roughly 100 routine check-up visits would be purchased at a price of \$200 per visit and 200 routine check-ups would be

purchased at \$100 per visit. In this specific market the demand for routine check-ups is inelastic (a large increase in price has little impact on quantity demanded) from \$500 to \$200 but becomes elastic (a change in price has a larger impact on the quantity demanded) after the price reaches below \$200.

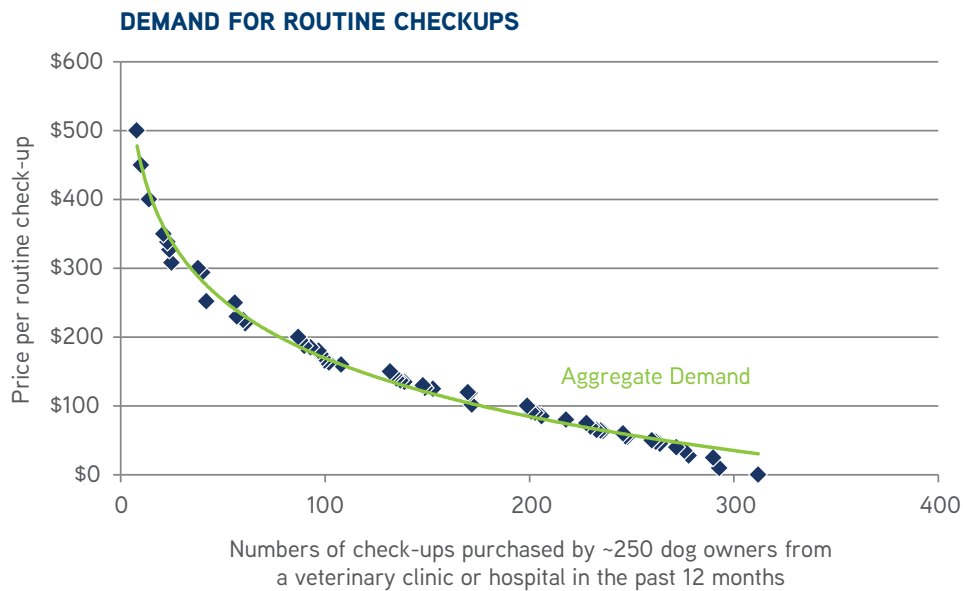


Figure 52

Plotting the amount of revenue (price of each routine check-up times the number of check-ups) that can be earned at each price illustrates the optimum price with which to maximize revenue. At \$120 per routine check-up, the total revenue is

maximized (not necessarily profit). An important question is whether the revenue maximizing price is the same around the country or if it is unique to every market.

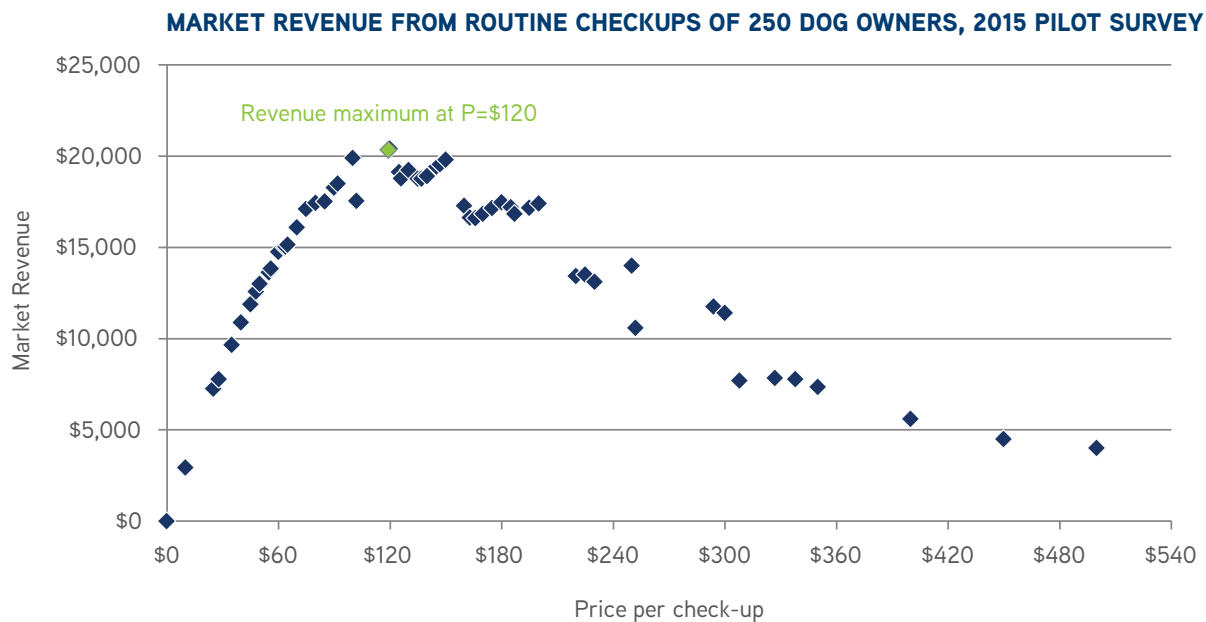


Figure 53

Determining the revenue maximizing price for various services and the factors that create any variation in this price between locations will provide important information to veterinary practices on or about the impacts of price on the demand for veterinary services.

In November of 2016 the first Metro Market Demand (MMD) surveys were conducted in Los Angeles and Boston and the national PDS will be fielded in the first quarter of 2017. The findings from the analysis of this survey data will be presented at the 2017 AVMA Economic Summit.

DEMAND FOR EQUINE AND BOVINE VETERINARY SERVICES

AVMA's VED and collaborators began research on the equine and bovine veterinary markets in 2016. Surveys of veterinary practitioners in these two segments of the profession were

fielded and additional research is underway to measure the demand for veterinary services in these two segments and begin to understand the effect of various factors on demand.

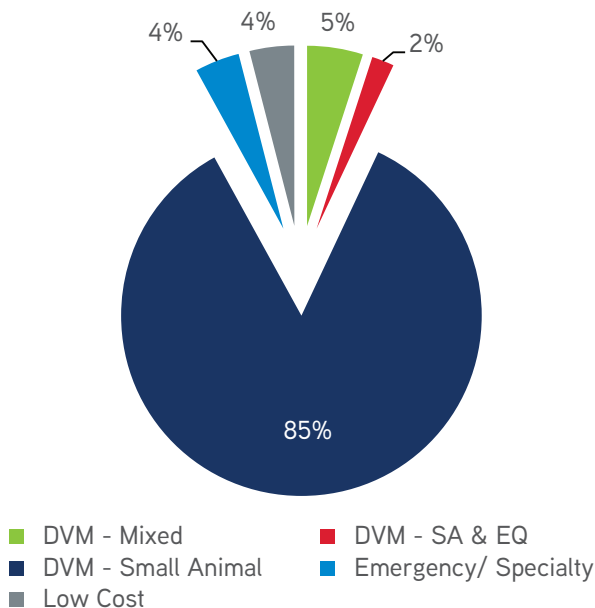
VETERINARY PRODUCTS DEMAND AS A LEADING ECONOMIC INDICATOR

Roughly, 30 percent of the revenue in veterinary practices is derived from the sales of pharmaceutical products. When combined with vaccines, surgical supplies and other routine consumables in the exam room and surgical suite, the combined annual expenditures for these items represent approximately 25 percent of total operating expense for the typical companion animal practice. At the 2016 AVMA Economic Summit, Dr. Travis Meredith of Animalytix, Salisbury, Md., presented a new perspective on the use of these data as a leading indicator of the financial health of the veterinary marketplace. A public clearinghouse for industry sales and aggregated market share information, Animalytix has a comprehensive database of nearly \$60 billion in animal health product sales of vaccines, pharmaceuticals, nutraceuticals and veterinary supplies from more than 500 manufacturers. This database has been

developed from a partnership with animal health distribution companies and selected manufacturers to provide weekly or monthly sales reporting on more than 8,500 brands.

Historically, these data have been used by distributors to assist in the settlement of rebates and free goods programs, manage supply chain issues and conduct forecasting. In 2016, however, Animalytix launched a series of initiatives focused on the needs of the veterinary practice owner and/or business manager and providing insight into market changes across numerous geographic areas. Analysis of the data, utilizing key "sentinel" indicators, provides a view of macro and regional trends in treatment rates, perspective on changes in treated patient populations over time, as well as identifies opportunities and challenges for the profession.

ANIMALYTIX VETERINARY CONSUMPTION INDEX



What's In The Basket

- Needles
- Sutures
- Syringes
- White Goods
- Fluids
- Human Labeled Pharmaceuticals (Generics)
- Euthanasia Products
- Others

What's Not in the Basket

- Canine Vaccines
- Feline Vaccines
- Flea & Tick Products
- Heartworm Preventative Products
- Other pharmaceuticals influenced by regional or seasonal epidemiology.

Figure 54

One valuable application of this information is the ability to assess the distribution of veterinary services based on product consumption. To achieve an objective metric across the population, Animatech developed a Veterinary Consumption Index (VCI) utilizing a constant “market basket” of commonly used exam room and surgical suite consumables as a core

indicator of commercial practice volume. Changes in the aggregate consumption rates for the VCI basket can then be used to assess growth across discrete geographic regions or among practice types (e.g., traditional small animal practice, emergency/specialty practices or low-cost providers such as spay/neuter and shelter operations).

THE ROLE OF ENTITY SIZE AND THE IMPACT ON MARKET DISPARITY

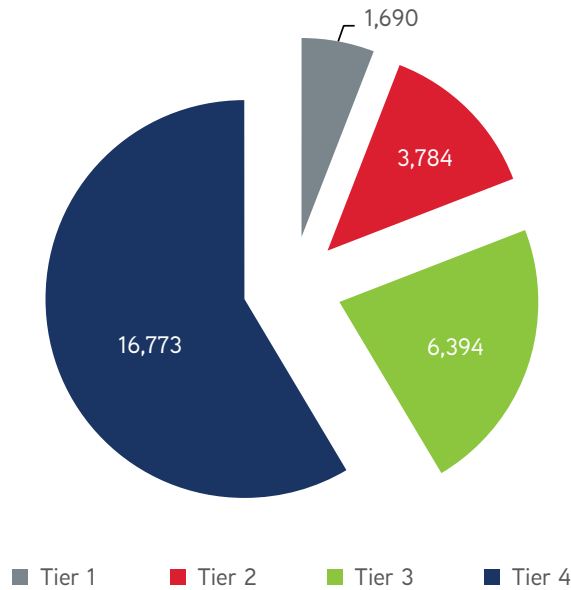


Figure 55

In addition to changes across geographic markets or practice types, the VCI can also be used to evaluate the concentration (size and quantity) of veterinary practices in the market. Animatech has identified more than 28,000 unique locations serviced by a veterinarian which consume the bulk of vaccines, pharmaceuticals and supplies used in treatment of small animals. Purchasing volumes show that approximately 1,700 or 5.9 percent of the total number of locations consume 25 percent

of all VCI product purchases (Tier 1). The second quartile (Tier 2) consists of 3,400+ practices or approximately 13.2 percent of total locations. Together, Tier 1 and 2 practices account for less than 20 percent of the total number of practices but 50 percent of all VCI product consumption. In contrast, the bottom quartile (Tier 4) reflects 60 percent of the total number of practices but collectively purchases only 25 percent of the total exam room and surgical suite consumables.

ROUGHLY, 30 PERCENT OF THE REVENUE IN VETERINARY PRACTICES IS DERIVED FROM THE SALES OF PHARMACEUTICAL PRODUCTS. WHEN COMBINED WITH VACCINES, SURGICAL SUPPLIES AND OTHER ROUTINE CONSUMABLES IN THE EXAM ROOM AND SURGICAL SUITE, THE COMBINED ANNUAL EXPENDITURES FOR THESE ITEMS REPRESENT APPROXIMATELY 25 PERCENT OF TOTAL OPERATING EXPENSE FOR THE TYPICAL COMPANION ANIMAL PRACTICE.

VCI DYNAMICS VARY BETWEEN MAJOR MARKETS

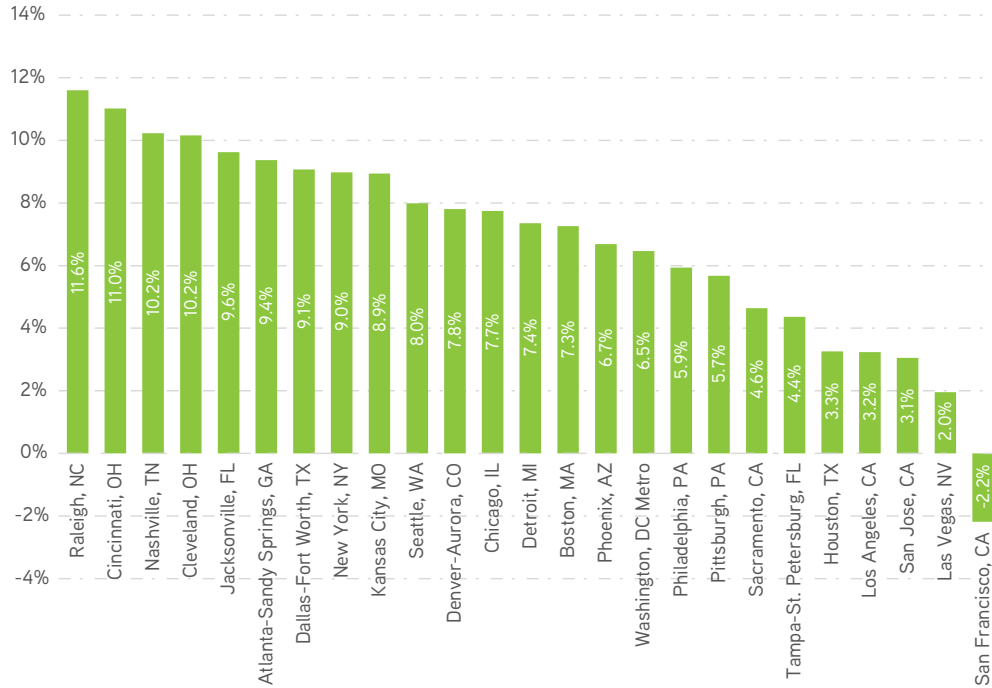


Figure 56

While the concentration perspective is valuable in understanding how entity size influences the overall market, the VCI can also be used to identify variations in performance between geographic markets. Measuring the percent change in the volume of sales for specific metropolitan markets provides an indication of the

change in demand for veterinary services. This is an important measure and can help guide the MMD surveys to determine in which metro markets growth is or is not occurring and the underlying demographic or demand factors driving different results across these markets.

INHALANT ANESTHETIC CONSUMPTION AS A LEADING INDICATOR FOR SURGERY SUITE ACTIVITY

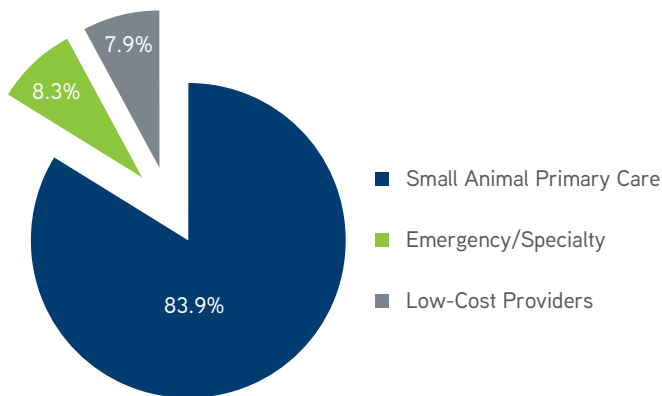
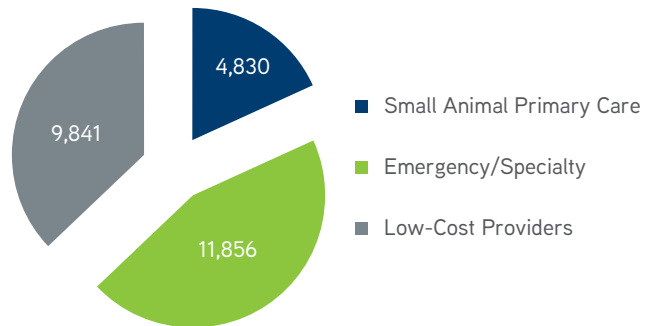


Figure 57

PER LOCATION INHALANT CONSUMPTION DYNAMICS, 2013-2016



The analysis of the product consumption market can also be used to evaluate changes in specific practice profit centers. For example, inhalant anesthetics can provide a useful indicator for surgical and dental activity. Inhalants are used specifically for advanced procedures requiring patient anesthesia, are consumed in unit increments and are utilized on an as-needed basis throughout the year. Use by practice type indicates where surgeries and dentals are being most performed and how that market share is changing over time. By examining the consumption patterns of inhalants across practice types, low-cost providers can be seen to be utilizing twice as much inhalant, and emergency/specialty practices 2.5 times as much inhalant as small animal primary care practices.

Analysis of these data over time will be useful in assessing whether the traditional small animal primary care practices continue to lose surgical volume to alternative providers or reverse recent trends and grow their relative share of surgical caseload.

The analysis of product consumption information provides valuable insight into the veterinary services market, geographically, by profit center and even for potentially monitoring the adoption of clinical standards over time. Coupled with the MMD surveys and the PDS, the profession can begin to build a more comprehensive picture of the market for veterinary services and better evaluate the factors driving change in the veterinary profession.

PET HEALTH INSURANCE AND VETERINARY EXPENDITURES

A persistent question in the veterinary profession is whether pet health insurance increases the demand for veterinary services. Unfortunately, again there is no published literature that addresses this question. There have been studies that have noted an association between higher levels of pet owner expenditures and pet health insurance.

comparing the same pet owner's decisions with and without pet insurance.

An analysis of the impacts on pet expenditures resulting from the purchase of pet health insurance would best be done by capturing pet owner's pet health care decisions both with and without insurance. But it is impossible to have anyone own, and not own, pet insurance at the same time. Two alternatives exist: Collect a large enough set of observations of pet health care decisions by owners with and without pet health insurance. The data would compare similar pet types, ages and health as well as pet owners' socio-economic characteristics, to get close to

A second analytic option is to ask owners to respond to hypothetical questions about pet health decisions with and without pet insurance. For instance, asking how much a pet owner would be willing to spend for emergency surgery rather than euthanizing the pet. An initial field test of this question by AVMA VED collaborators at Mississippi State University⁵ found that the choice of euthanasia (at a cost of \$100) was reduced from 31 percent to 3 percent through the election of the emergency surgery and thus not only were current expenditures increased but future expenditures would also increase through the increase in lifespan of the pet.

These research results are preliminary. Complete results should be available by the 2017 AVMA Economic Summit.

CLIENT SPENDING WITH INSURANCE AND WITHOUT INSURANCE

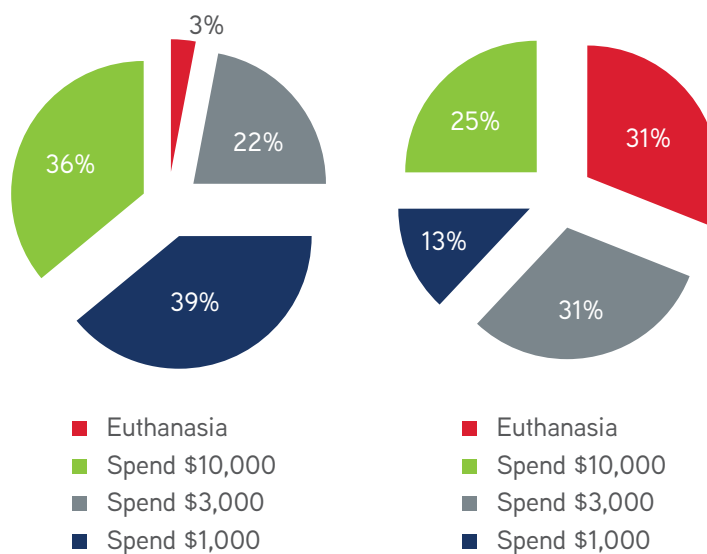


Figure 58

⁵ Williams, Angelica, Keith Coble and Brian Williams.

PUBLIC HEALTH VETERINARY SERVICES

The public practice of veterinary medicine includes public health services such as monitoring and managing food safety and zoonotic diseases. A growing body of literature suggests that animal diseases are burdens to households, regions, countries, and society in general. The world population has doubled since 1960 and continues to grow, with nearly 1 billion people added every 13 years. Food security and malnutrition remain persistent world problems.

Sixty percent of all infectious diseases are zoonotic (Taylor et al. 2001) and 15 of the 35 leading communicable causes of death are zoonotic in nature. The zoonotic diseases adversely affect human health both through the adverse consequences on livestock and the direct consequences on human health. The primary commodities feeding into the global production of food are both crops and livestock. Four livestock and livestock products are ranked by value among the top 10 commodities produced in the world (FAO). Animal diseases reduce both the quality and quantity of these four livestock products, reducing the availability of protein for the human diet.

Because the monitoring and managing of zoonotic diseases is a public veterinary service, the decisions about the number of veterinarians required is a decision for state and federal governments. To ensure that there is an adequate quantity of these public veterinary services provided, governments need the best information on the trade-offs between the costs of prevention and the costs of treatment. More specifically, what

are the avoided costs of zoonotic disease outbreaks versus the expenditures required to ensure that avoidance? And, this estimate of benefits (cost avoidance) to costs of adequate monitoring and management should be made for all potential zoonotic disease outbreaks rather than for each individual potential outbreak as many of the potential zoonotic diseases have similar geographical origins.

The AVMA VED is cooperating on research with the Paul G. Allen School for Global Animal Health and the School of Economic Sciences at Washington State University. This research is intended to develop a process for measuring the costs of zoonotic diseases and determining a level of monitoring and management that would maximize the benefit/cost ratio, and in so doing, calculate the optimal quantity of veterinary services (number of veterinarians) that should be purchased by state and federal governments.

To begin the development of a standard process for measuring benefits and costs, the research began by analyzing the recent avian influenza outbreak. For this specific zoonotic outbreak no documented human health event or costs to individuals occurred. However, approximately \$879 million was spent on the outbreak and subsequent planning activities (Johnson et al 2016), \$200 million was spent on indemnity payments, and \$610 million on response activities on premises. In addition to these costs, poultry producers lost more than \$1 billion and consumers paid higher prices for poultry products.

SUMMARY

The demand for veterinary services is the driving determinant for the number and compensation of veterinarians. Demand, the relationship between price of products and services and the quantity of those services, includes both consumers who have purchased pet health products and services from a veterinarian and people with animals that need care but who have not purchased the necessary goods and services.

Research to measure the impacts of prices and household incomes on veterinary goods and services continues along with looking at factors (e.g., pet health insurance, demographic characteristics) that explain the variation in these demand

determinants. Additionally, research continues on understanding the role of various private practice strategies (or absence of them) on veterinary medical care purchasing decisions. Animals not receiving any veterinary care, as well as those receiving only a subset of the health care required to ensure a healthy animal, continue to be a very large share of the potential animal health care market. This gap between the current demand for veterinary medical services and the need for these services may exceed the profession's current capacity to provide services.



VETERINARY PRACTICES



The most profitable practices appear to be those that have best controlled their costs and maintained the lowest cost of acquiring new clients.

Terry O'Neil, of Katz, Sapper and Miller, an accounting firm that provides analytics for the Veterinary Study Groups, provided an overview of the financial performance of the more than 400 veterinary practices that provide practice financial data to KSM. Following the trend we saw in the robust market for veterinarians, veterinary practices' revenue growth and earnings before interest, taxes, depreciation and amortization – or EBITDA – has continued to show strong growth since 2013.

The most profitable practices appear to be those that have best controlled their costs and maintained the lowest cost of acquiring new clients. The most profitable practices have the lowest labor costs (total compensation) as a percent of total revenue, below 40 percent. These most profitable practices also have client acquisition costs below \$25 per new client.

While the number of invoices per DVM full-time equivalent has increased, the average client transaction remained in the \$150 range. Growth in revenue may have been a result of higher prices, an expanded bucket of services, or most likely both.

The KSM data and KPIs are one of the few sets that are available to provide a picture of the changing financial health of veterinary practice year to year. However, because of the great diversity in veterinary

practices both from the demographics of the communities they serve and the profit centers on which each practice focuses, these 411 practices are insufficient to provide national financial guidelines that may be applicable to any practice. Developing these industry standard KPIs for the various sized markets and the product and service focus of each practice is important to help guide the practices in strategies to improve financial performance.

In 2016, the AVMA VED began a major thrust into achieving the goal of improving the financial performance of veterinary practices. The AVMA Core practice management Continuing Education (Core CE) program, developed with Banfield, Henry Schein Animal Health, and KSM, was introduced at the AVMA annual convention in San Antonio, Texas. The Economic Advisory Research Council (EARC) was initiated with a Practice Finance Research Group to focus on developing methods and

PRACTICE MANAGEMENT CONTINUING EDUCATION

The AVMA Core CE program was developed to begin the process of organizing the practice management CE. The Core CE program focuses on the basic components of practice finance, operations, strategies and marketing/economics, providing specific action items and measures of success for these actions. In the strategies area, for example, specific experiential activities are used in the course to guide participants in the implementation of forward booking and strategies to improve compliance with practice standards.

The Core CE concept is to organize the available CE resources to deliver the information that will provide the building blocks for practice financial performance, and which will have the greatest impact on the financial performance of the practice, as well as assist practitioners in the implementation and use of these resources. For instance, a basic requirement in a practice is to be able to develop an income statement and use that income statement to construct a budget. Without the full implementation of these two financial practices, no other financial strategies are actionable.

The focus of the operations component is on the roles of the various practice employees: practice manager, veterinary

processes to collect and analyze practice financial data to provide standards for key financial performance indicators.

During the 2016 AVMA Economic Summit, Dr. Karen Felsted noted that, although a vast array of practice management resources is available, most veterinary practices are under-performing. There are potentially several reasons for the apparent failure of veterinary practices to utilize the available practice management resources to attain higher levels of financial performance. First, the resources are informative but neither organized nor, in many cases, actionable. Second, there are simply too many resources and veterinarians are paralyzed by initiative fatigue. And finally, there has been a focus in the profession on revenue and profitability rather than demand and return on investment.

technician, receptionist, veterinarian and veterinary owner. The expected performance of each is defined in the practice's budget. And in the economics/marketing component a compensation negotiation tool is provided that ties budget, operations and strategies together to determine what level of compensation can be expected for specific levels of employee performance.

At the AVMA Convention 2016 57 veterinary practices (practice owner and manager pairs) participated in the level-one Core CE program and are now attempting to implement 16 specific action items. VetPartners consultants are following up with each practice to evaluate the success of practices in implementing each action item. The AVMA VED will report on the success of this program at the 2017 AVMA Economic Summit.

At the AVMA Convention 2017 the level-one Core CE will be offered along with a new level-two Core CE. The AVMA VED will continue to monitor and evaluate the effectiveness of organizing the practice management continuing education resources and presenting them to a practice team. The Core CE program will continue to be refined based on its ability to improve the financial performance of the participating practices.

ECONOMIC ADVISORY RESEARCH COUNCIL

The purpose of the EARC is to provide leadership to the veterinary profession in all areas of economics. The Council will focus efforts on enhancing the demand for veterinary services, specifically, improving the access of all animals to appropriate levels of high-quality care. Currently all components of the data analytics within the profession are independent, many efforts are redundant, and there remains many gaps in data and information pertaining to important market relationships throughout the veterinary profession. The EARC will provide a forum for discussing the data and analytic needs of the profession and the sharing of data, analysis, concepts and ideas.

The EARC is a profession-wide organization established to govern data analytics for the veterinary profession. The EARC will take the broadest view of the veterinary markets and private practices to guide the collection, analysis and reporting of veterinary economic and financial data. Identifying the most important profession-wide objectives, measuring performance in achieving these objectives, determining what data need to be collected, identifying appropriate methods for the collection and management of data as part of this data analytics process, and ensuring that this information is put into the hands of those who can make it actionable, will be the fundamental activities of this council.

Over the last year, representatives from throughout the profession have discussed the need to focus research efforts, reduce overlap (particularly in data collection) and oversee information provided to the profession. Based on these and other issues, there has been widespread agreement on both the need for this council and for stakeholders' willingness to participate. The first meeting occurred at the AVMA Convention 2016.

The oversight provided by the EARC will reduce the need of our members to determine what information appearing in numerous publications is accurate and actionable. The EARC will also provide for a more efficient use of resources (no overlapping research) so that better progress can be made in areas of greatest concern.

The EARC began with three specific groups that are aligned with the three veterinary markets. Representatives from each of these groups may have a seat on the EARC, as may members of the AVMA Veterinary Economic Strategy Committee. The VESC provides a cohort of veterinary and industry professionals who have had considerable experience with data analytics in the veterinary profession as applied to veterinary economics. And, the VESC is responsible for assisting the AVMA Veterinary Economics Division in setting research priorities for the AVMA, the only professional association of veterinarians with an economics division.

The three groups organized in 2016 are the Pet Demographic Research Group and the Pet Insurance Research Group, both of which pertain to the market for veterinary services, and the Practice Finance Research Group.

The principle purpose of the EARC and each of the research groups within the EARC is to develop the objectives for the group, define the measure by which the objectives will be measured and the data analytics process needed to ensure that these objectives are achieved. Specific KPIs should be developed to measure each objective. The data analytics process including survey design and data collection, data management and processing, analysis, summary and reporting should have a well-defined schedule of annual activities.

Each group is currently establishing meeting times and member roles and outlining requirements for membership. The leadership of each of the groups will be from a member of the AVMA's VESC. The chair of the EARC will be the chair of the AVMA VESC.

The purpose of the PFRG is to improve the profitability of veterinary practices and increase the lifelong value of the DVM degree. There are certainly many practice management strategies that can be deployed to improve the quantity of pets visiting veterinary hospitals, and the quality of care pets receive through the purchase of veterinary products and services that will enhance the quality of life for the pet. However, the financial data from veterinary practices required to develop financial KPIs

for practices with different profit center focuses, demographic characteristics of their business areas, and size of practice is not currently available in a form that is useable. While the profession has long discussed the need for standardized definitions and measure, uniform standards have not yet been widely adopted and thus there are insufficient quantities of practices with comparable information to enable data collection and analysis to determine the best strategies to improve performance.

The PFRG established three lines of work, creating a single standard chart of accounts for all veterinary practices, standard diagnostic codes, a defined set of KPIs for veterinary practices and a financial literacy program to provide financial education to all veterinarians and veterinary practice employees on the topics practitioners in the field deem important, in the format they wish to receive it and at the time they need it. The progress of the

PFRG towards accomplishing these goals will be reported at each meeting of the EARC and at the 2017 AVMA Economic Summit.

The focus on KPIs will follow the Dupont method of financial analysis. Currently the focus of the profession is on practice profitability, and the profession must begin to think about financial performance rather than practice profitability. The most important key financial performance indicator is return on assets (ROA). ROA is a financial performance indicator that includes both profitability – an indicator of the effectiveness of pricing and cost control strategies, and asset turnover – an indicator of how efficiently assets are used to generate sales. It is imperative that these two indicators of performance are measured, not only for every practice, but for each profit center within a practice, so that practices can be compared based on their markets to determine relative financial performance.

DUPONT ANALYSIS (ORIGINAL)

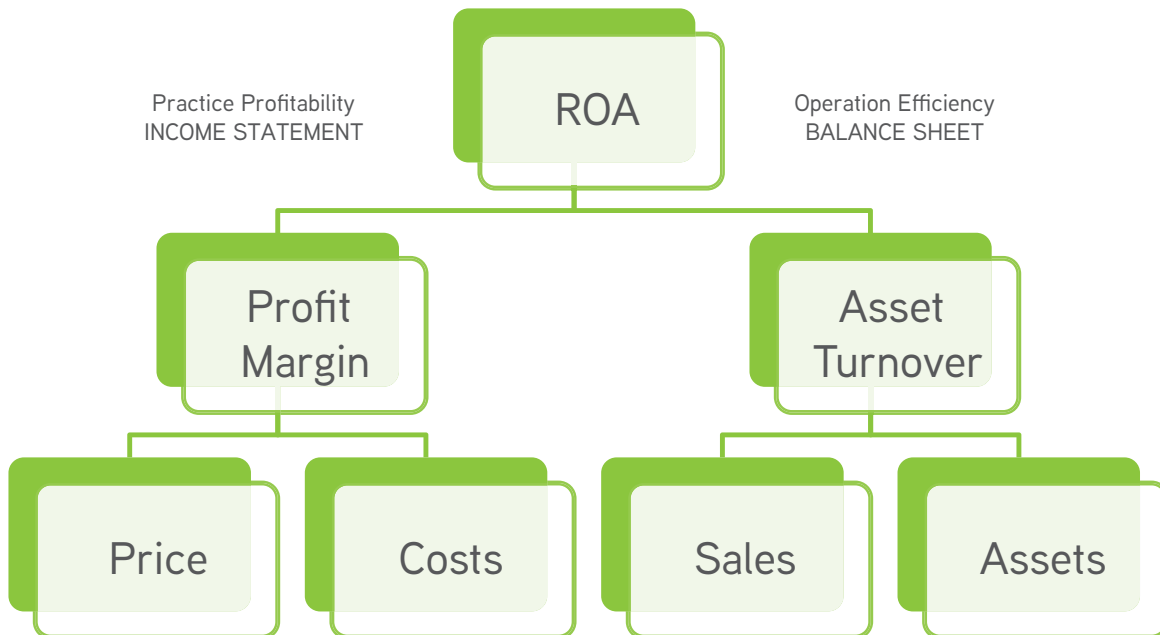


Figure 59

Using the KPIs for financial performance, ROA, profitability and asset turnover provides a more comprehensive review of the financial performance of a business. This is because it allows for a comparison across different business models: those that are able to set prices independently because they are in a less competitive market, and those that must set prices to remain competitive and then rely on the number of patients to generate returns.

The table below compares the financial performance of six major corporations. Ford has the best total revenue, but Microsoft has the best gross income and profit margin. Both of these companies produce a product but Microsoft's product

has less competition than Ford's. Both Ford and Microsoft, however, require a large set of assets to generate revenue, and Ford does a better job using available assets to generate sales with an asset turnover index (ATI) of \$0.67 of sales for every dollar of assets. Colgate, though, has a very good profit margin (17.39 percent) and also does the best job of the three companies in using its available assets to generate sales (\$1.34 of sales for every dollar of assets) and thus has the greatest ROA at 23.32 percent. Clearly, in the decision as to which corporation would be the best investment (or which company you would prefer to purchase), Colgate with the very high ROA would be your choice.

FINANCIAL SUMMARIES FOR SELECTED MAJOR CORPORATIONS, 2015 (BILLIONS OF DOLLARS)

	Ford Motor	Henry Schein	Zoetis	Merck	Colgate	Microsoft
Total Revenue	\$149.60	\$10.63	\$4.77	\$39.50	\$16.03	\$85.30
Gross Income	\$7.65	\$0.73	\$0.75	\$6.93	\$2.79	\$20.18
Profit Margin	5.11%	6.90%	15.74%	17.54%	17.39%	23.66%
Total Assets	\$224.93	\$6.50	\$7.91	\$101.78	\$11.96	\$193.69
ATI	0.67	1.64	0.60	0.39	1.34	0.44
ROA	3.40%	11.29%	9.48%	6.81%	23.32%	10.42%

Table 9

SUMMARY

Nationally, the market for veterinary services continues to rebound from the last recession and many practices are beginning to reach or surpass the optimum capacity of the practice and are hiring more veterinarians. This improvement should continue through 2017. However, little is actually known about the overall performance of the more than 27,000 veterinary practices. Working with these practices to collect, analyze and report on financial KPIs should be a priority for the profession along with better understanding animal health care decisions of animal owners.

Evidence exists to suggest that the amount of veterinary services currently being provided falls short of the services that would be needed to provide all animals with the

appropriate level of health care. The new AVMA metro market demand and pet demographic surveys; research on pet health insurance and on benefits and costs of managing zoonotic diseases; and the analysis of practice financial performance are directed toward understanding the factors that have created the gap between veterinary services delivered and services needed. Providing veterinarians with the strategies that could improve the demand for veterinary services and close the demand-need gap will require understanding these factors. And, closing this demand-need gap will lead to an increase in veterinary compensation, increasing the NPV of a veterinary degree and reducing the DIR for new graduates.

DISCUSSION

The body of knowledge in the economics of the veterinary profession is growing quickly, much faster than the use of this knowledge to improve the efficiency of the veterinary markets and the financial performance of veterinary practices. As a result, the AVMA is developing a comprehensive outreach program to assist veterinarians in understanding how to use this economic knowledge in their practice of veterinary medicine.

The “Fix the Debt” initiative is an important new initiative for the veterinary profession and is not the sole responsibility of the veterinary education community. The cost of education and the debt that new graduates carry with them into their professional careers will have a long term-effect on the performance of the veterinary markets. The reduction in public support for public education has persisted for nearly three decades and requires a response not only from those who determine the allocations of public funds to education, but also a response from the veterinary profession in developing new educational paradigms that can provide the same quality of graduates at a lower cost. Lowering the cost of education or reducing the rate of increase in the education costs to below the rate of inflation will help in the provision of veterinary services at prices that increase at less than the rate of inflation, closing the demand-need gap in veterinary services in both public and private practice.

But while it is clear that the cost of education and the debt of new graduates must be reduced, it is also clear that veterinarians must do more to increase the demand for their services and close the demand-need gap. Veterinarians cannot do this alone but will require both the information discussed in this report and assistance in turning this information into strategies that they can implement. The profession has been long on information but short on offering the assistance required to transform this knowledge into changes in actions to improve

market efficiency and increase practice financial performance. The goal of the EARC is to develop a profession-wide data analytics process.

Data analytics is the process that collects and analyzes the data required to effectively improve the KPIs of the profession. The process is thus driven by the KPIs and so the first effort of the EARC will be to establish the KPIs for the profession.

A second major goal of the EARC will be to more efficiently use the profession’s limited resources to facilitate effective research efforts. Rather than having numerous surveys by various entities collect the same information, the data analytics process should establish a data collection process for the entire profession. This reduces the number of times a veterinary professional must answer the same question, and more efficiently uses available resources to enable more research with the current level of resources.

As the economics of the profession continue to improve as a result of the expanding economy, it will be important to stay the course and not assume that the economic problems have been solved and that there is no longer a need for this research. Complacency has been a consistent problem for the profession and this has led to the absence of time series data – data necessary to understand economic problems and provide efficient solutions.

The AVMA’s VED has laid out an aggressive program and schedule for research and is developing a strategy for effective outreach. Success of this initiative will depend on the contributions from and the cooperation of the profession and the entities involved in providing products and services to the profession.



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THE AVMA 2017 ECONOMIC REPORTS INCLUDE:

The AVMA Report on Veterinary Markets:

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

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

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

The AVMA Report on the Market for Veterinarians:

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

The AVMA Report on the Market for Veterinary Services:

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



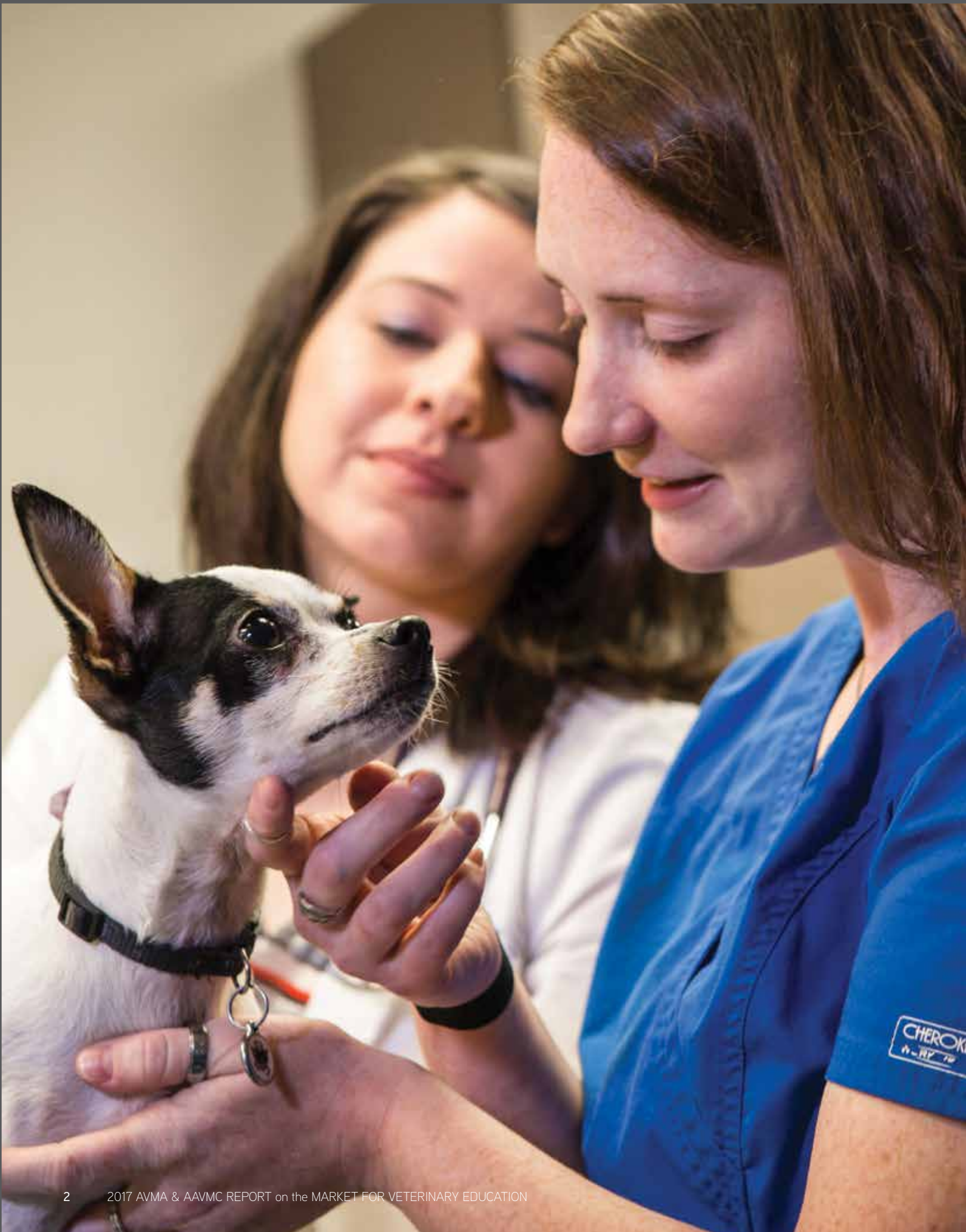
2017 AVMA & AAVMC Report on

THE MARKET FOR VETERINARY EDUCATION



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2017 AVMA & AAVMC Report on **THE MARKET FOR VETERINARY EDUCATION**

Veterinary Economics Division
American Veterinary Medical Association
May 2017

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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 veterinary 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 veterinary 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.

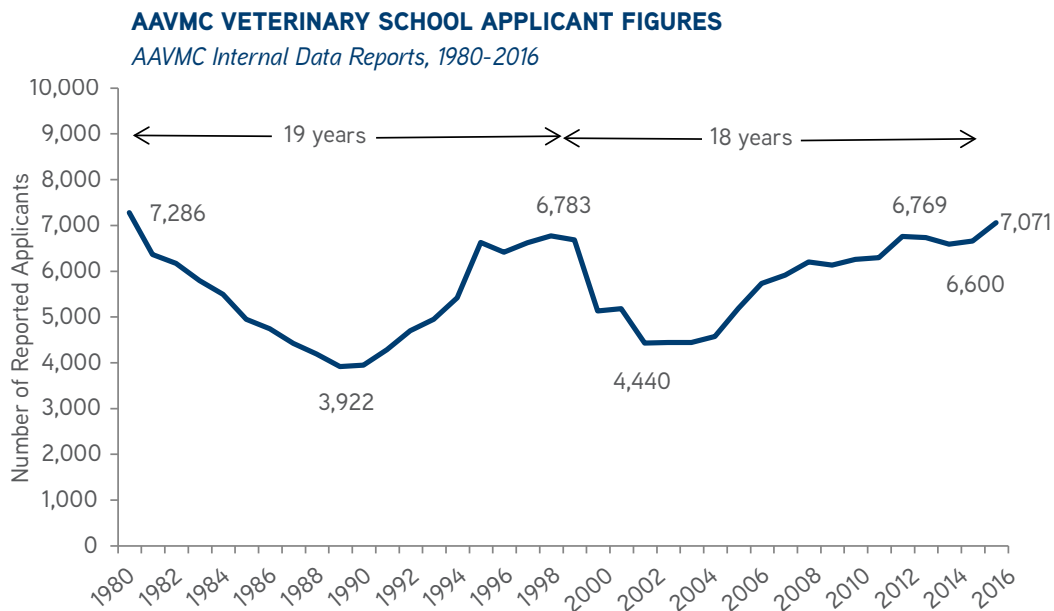


Figure 1

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

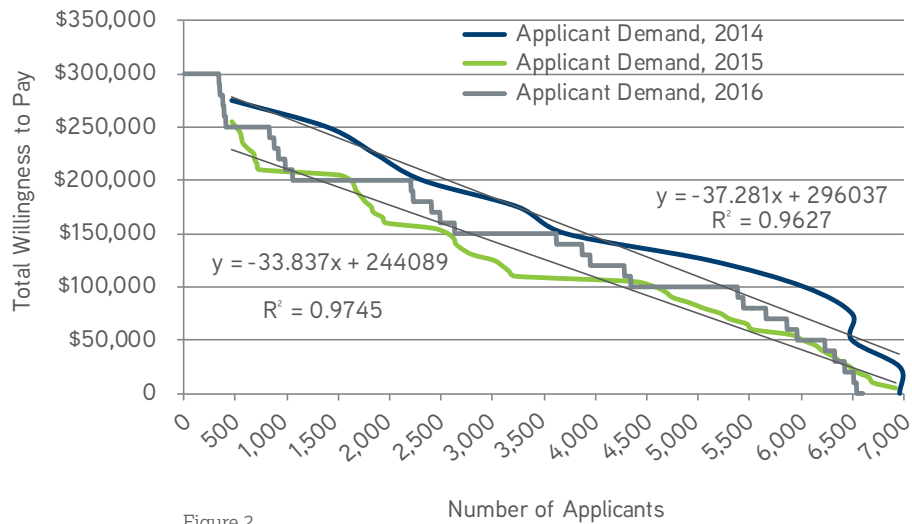


Figure 2

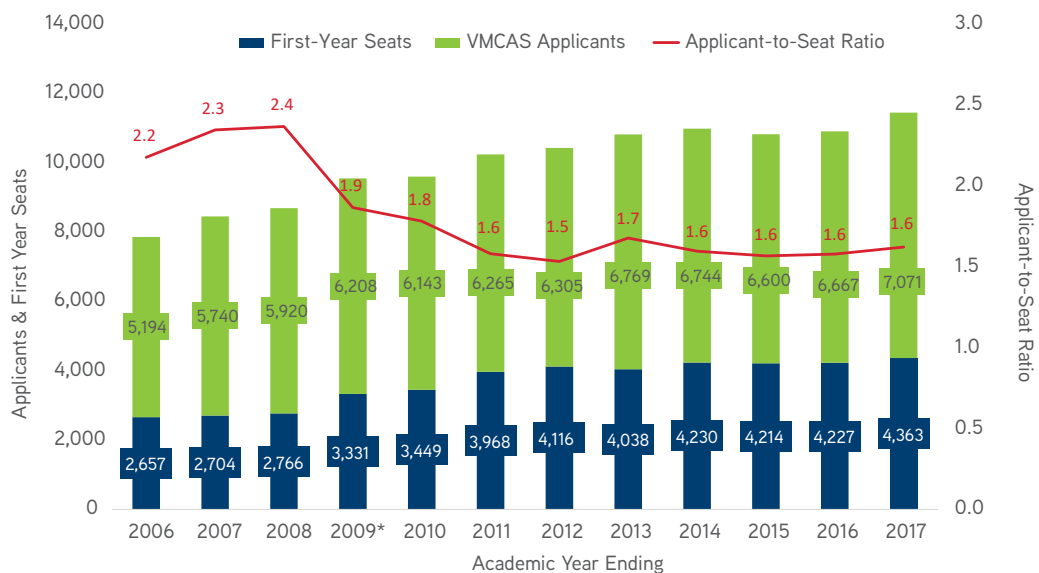
APPLICANT-TO-SEAT RATIO

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

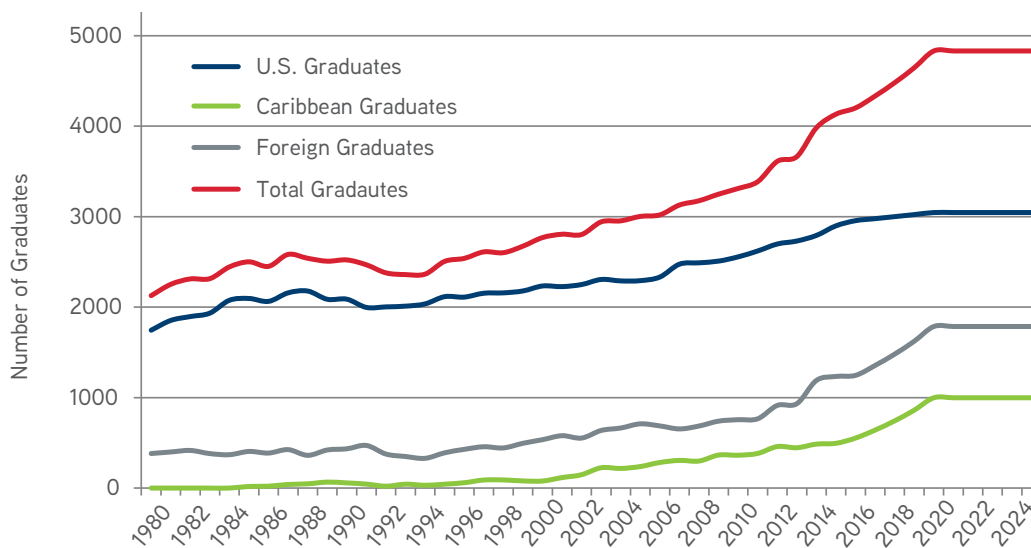


Figure 4

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 students 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.

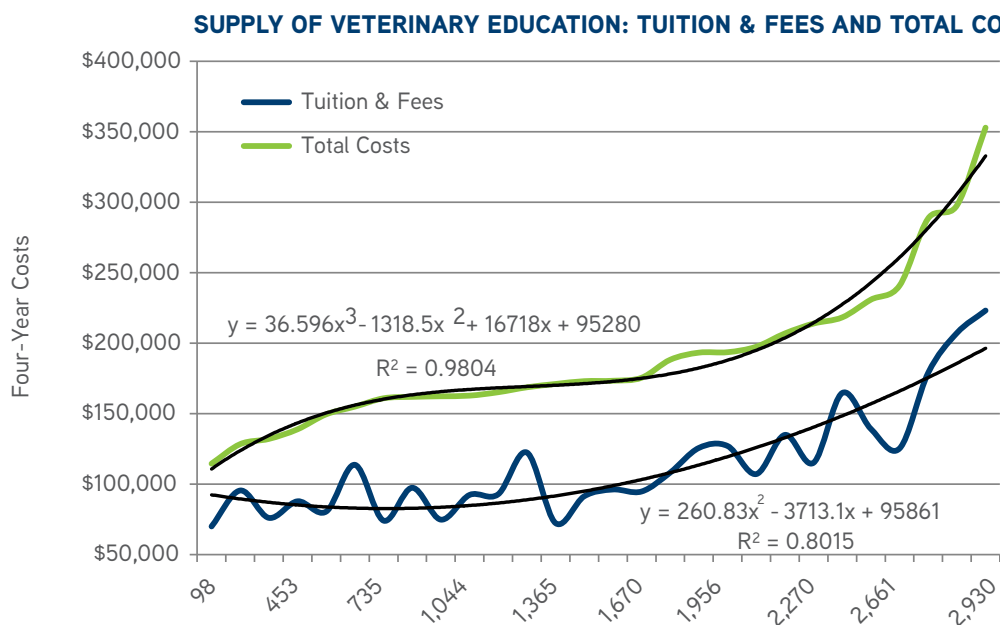


Figure 5

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

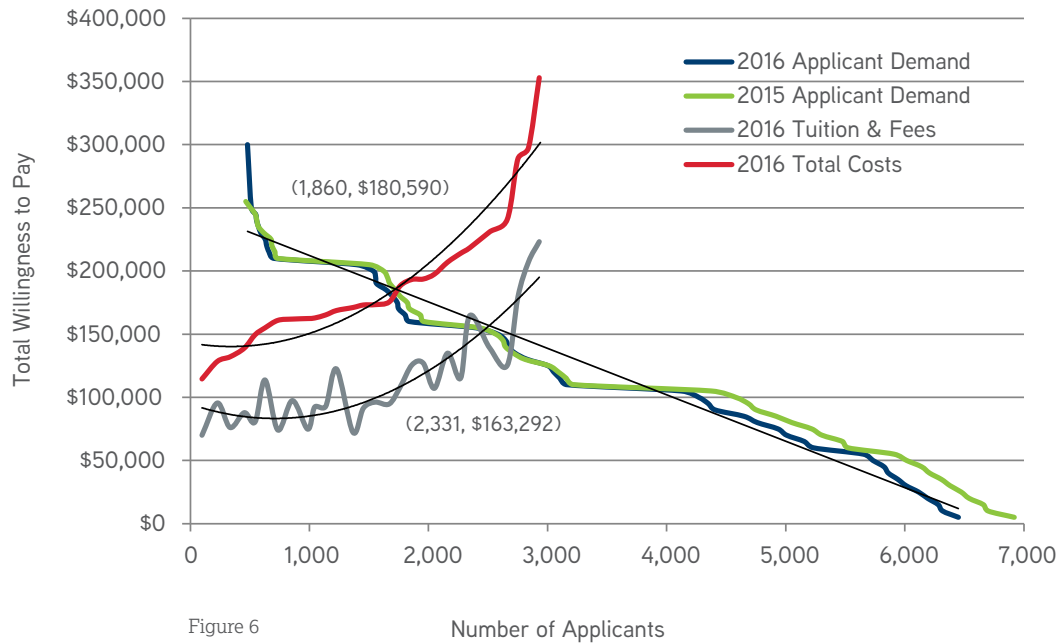


Figure 6 Number of Applicants

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

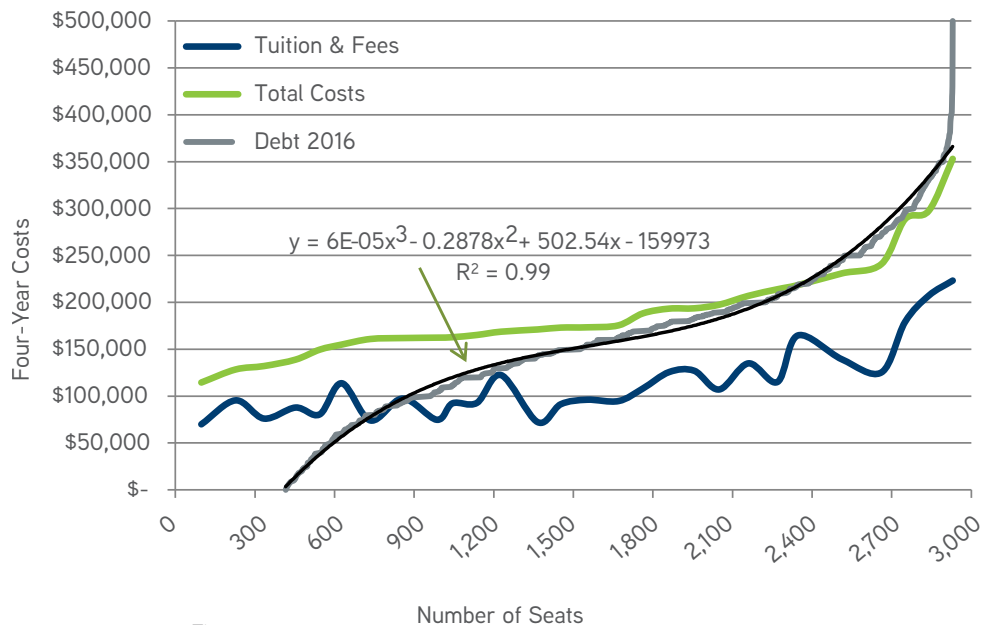


Figure 7

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.

APPLICANTS' ESTIMATES VS. ACTUAL DEBT LOAD OF GRADUATES

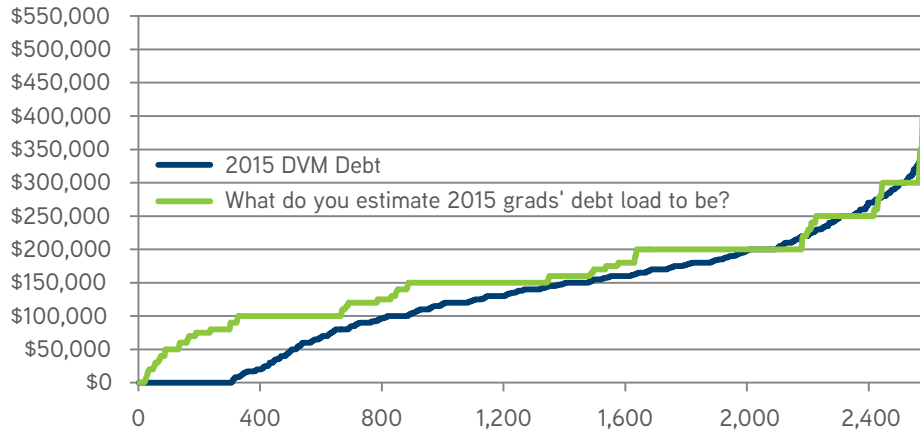


Figure 8



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.

DVM GRADUATES RECEIVING OFFERS FROM JOBS OR ADVANCED EDUCATION

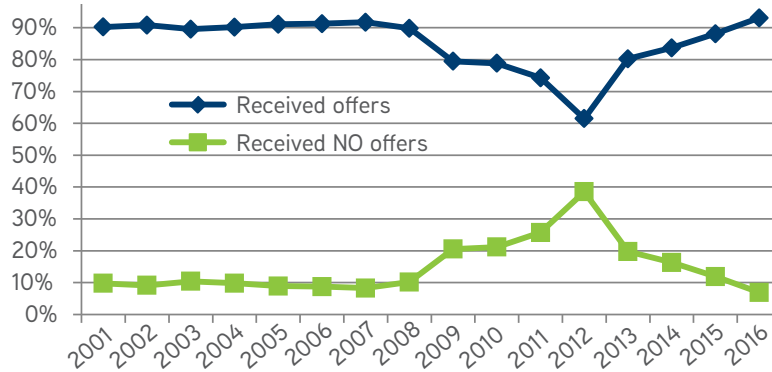


Figure 9

The percentage of graduating veterinary students finding full-time employment or getting offers to pursue post-graduate education in the 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.

DISTRIBUTION OF NEW VETERINARIANS

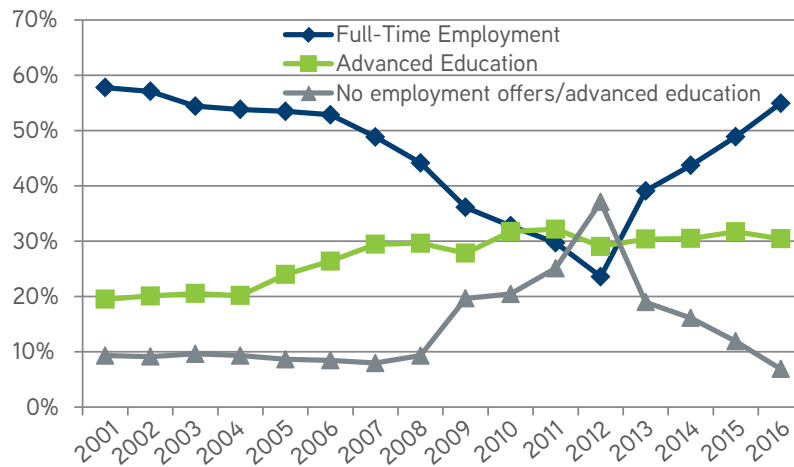


Figure 10

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

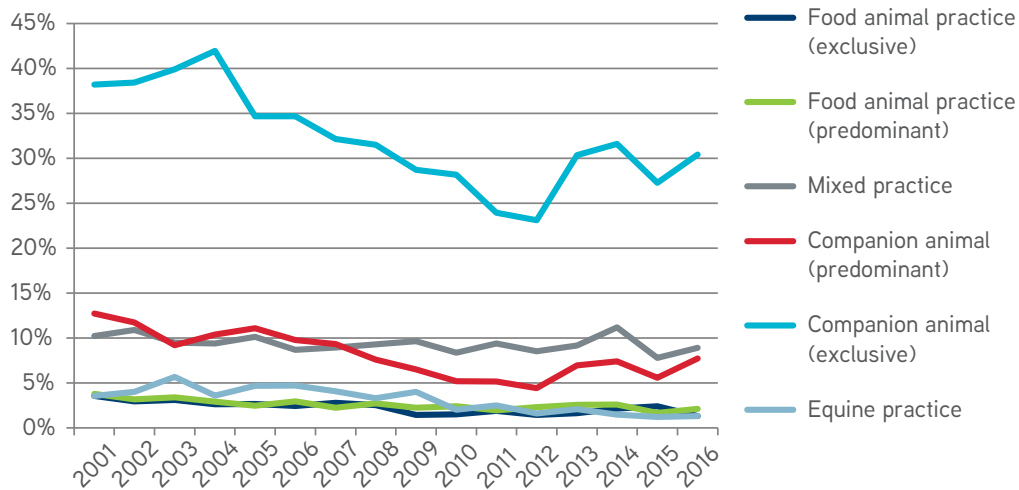


Figure 11

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

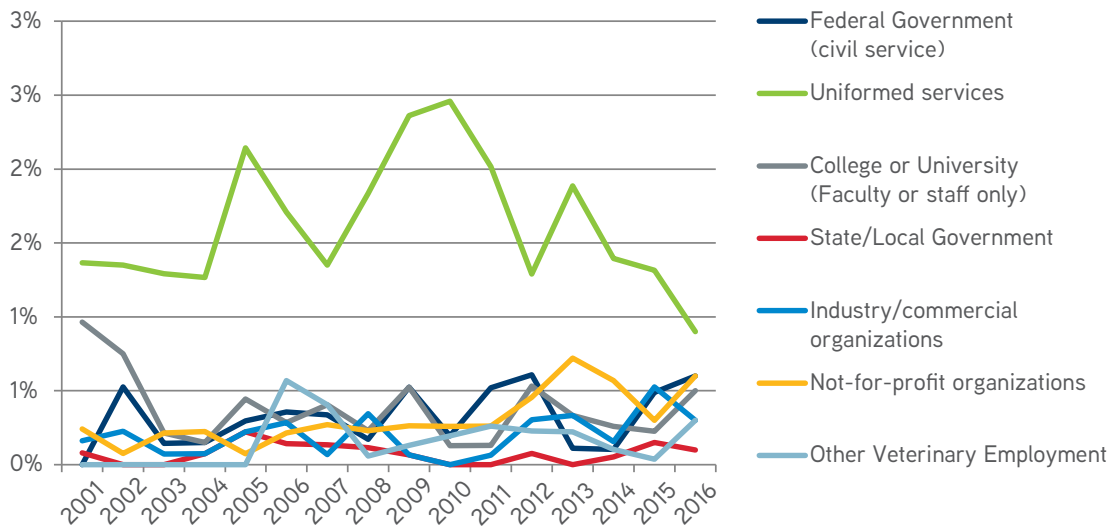


Figure 12

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**

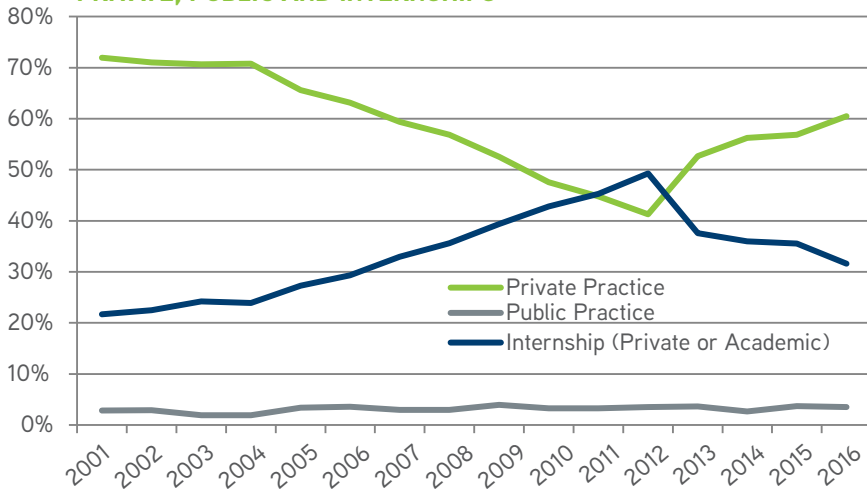


Figure 13

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.

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.

SPECIES FOCUS OF INTERNSHIP

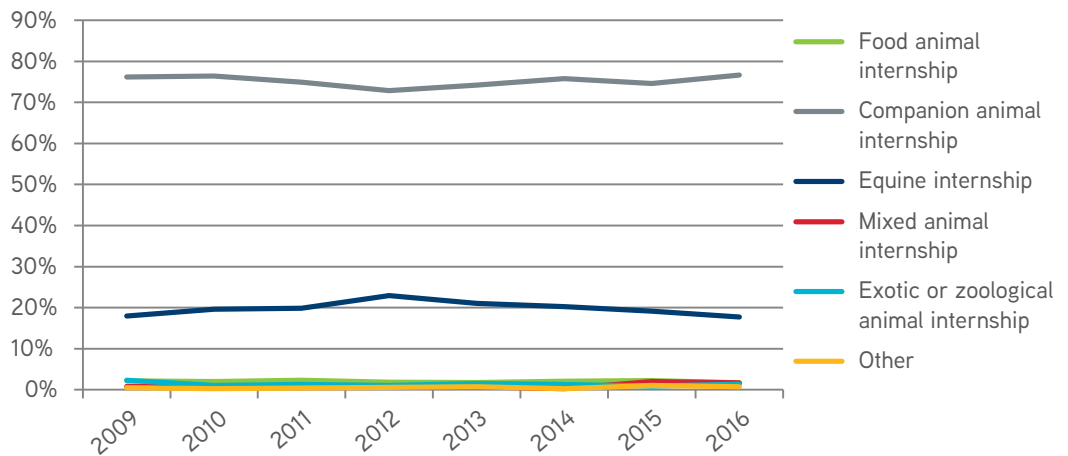


Figure 14

DISTRIBUTION OF NEW VETERINARIANS: ADVANCED EDUCATION

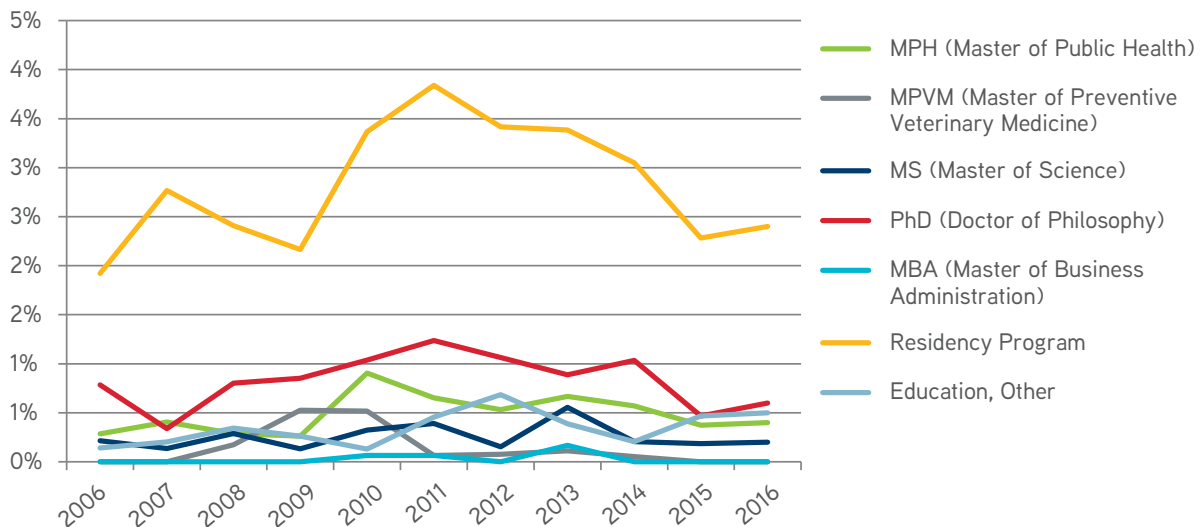


Figure 15



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.

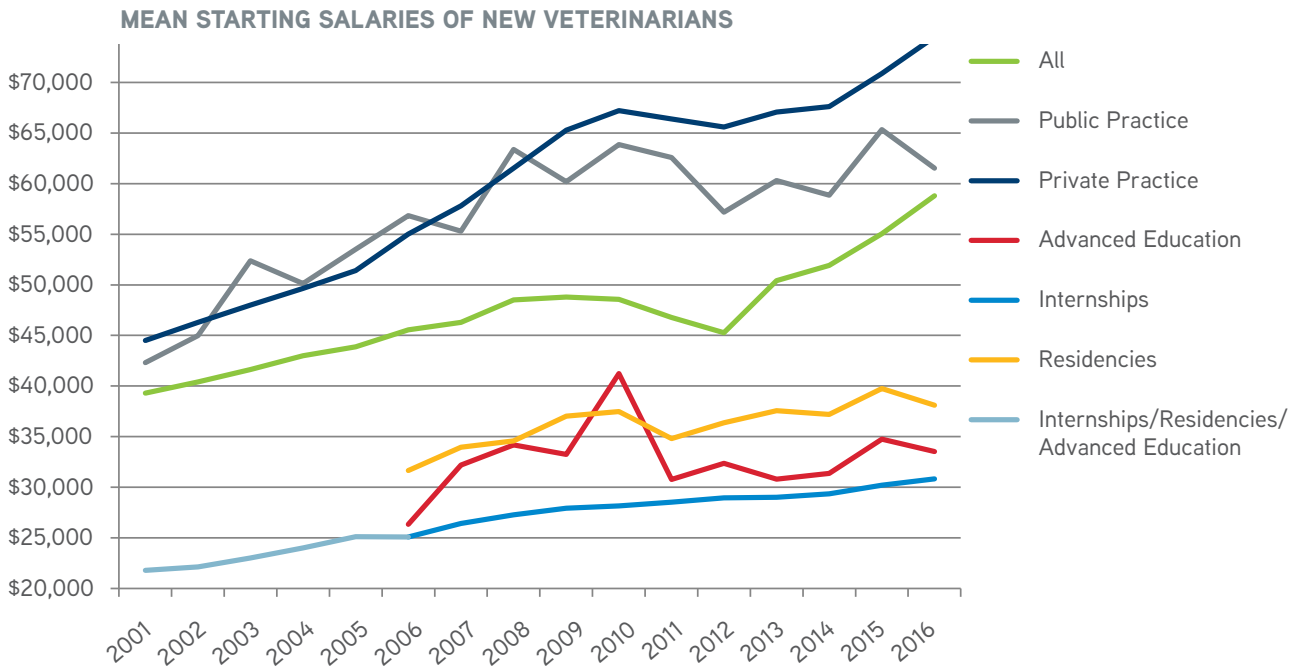


Figure 16

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.

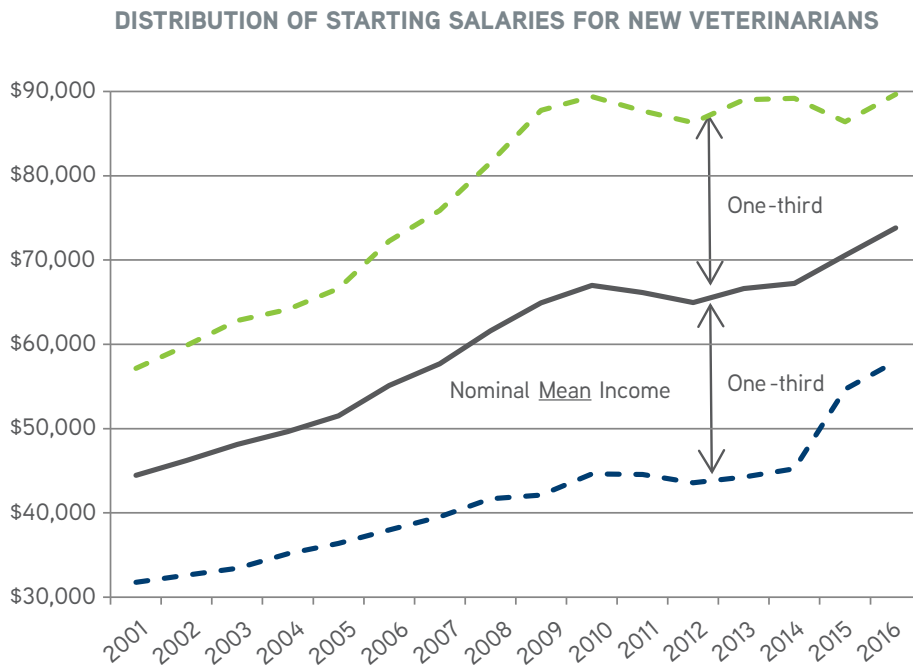


Figure 17

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

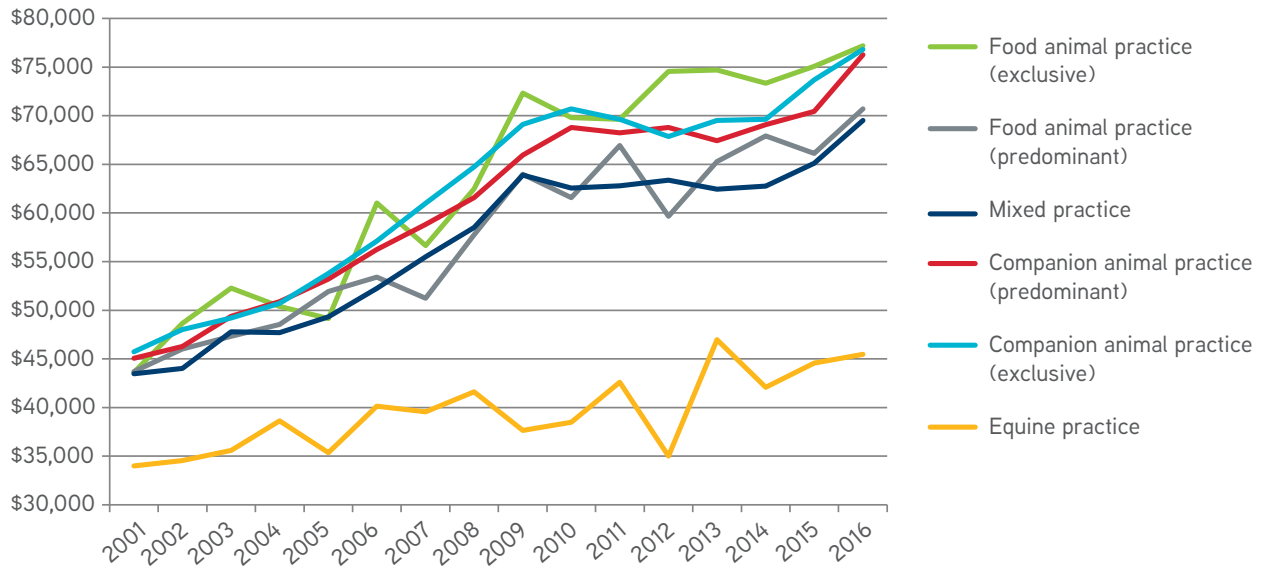


Figure 18

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

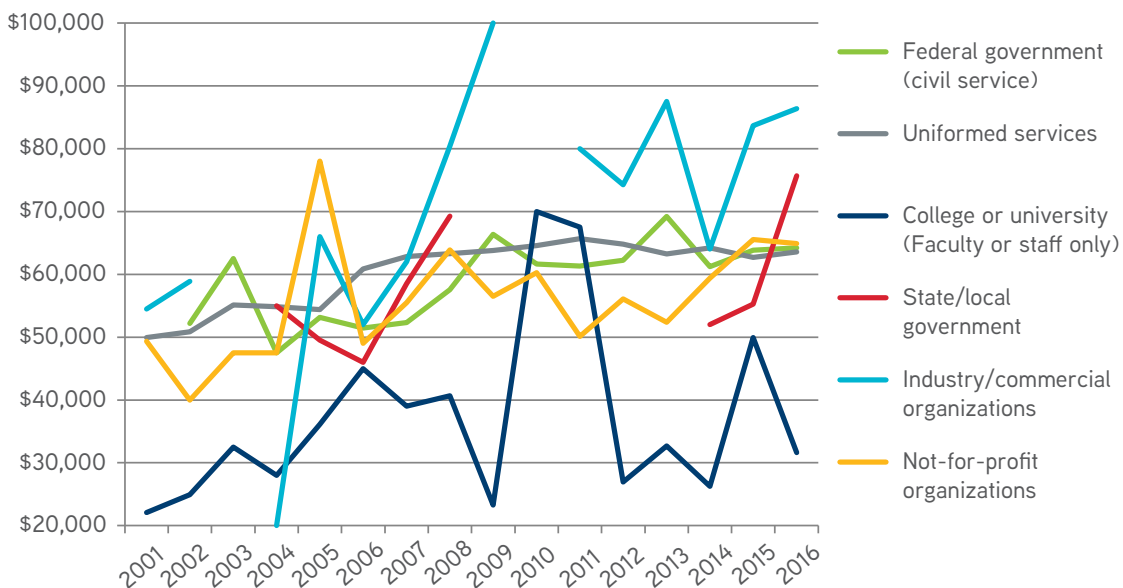


Figure 19

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.

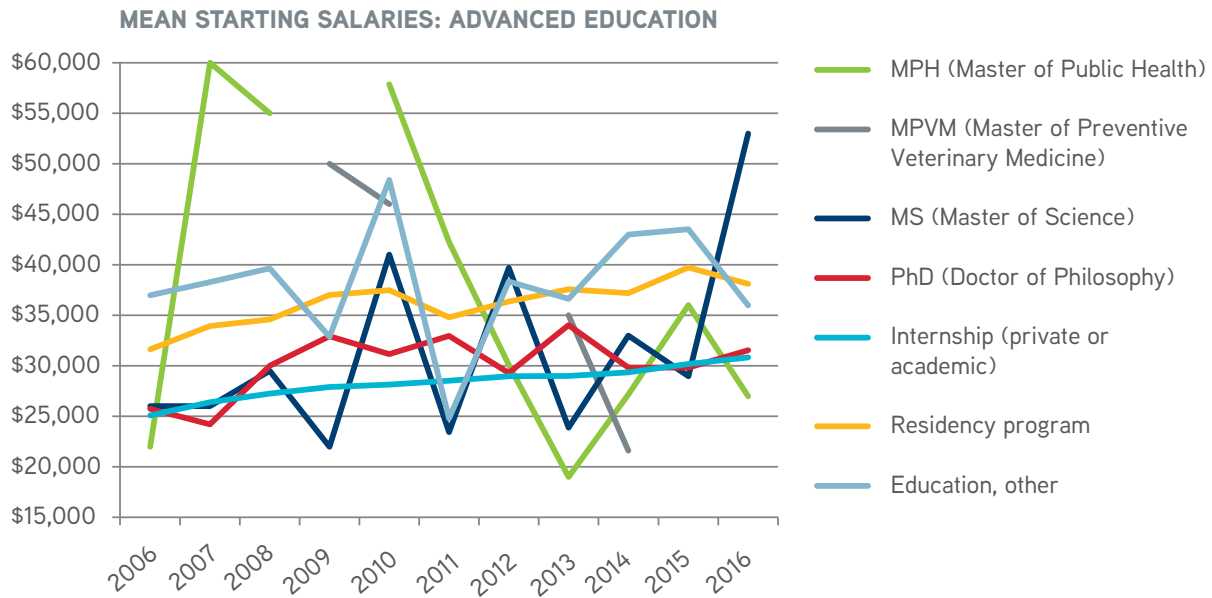


Figure 20

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.

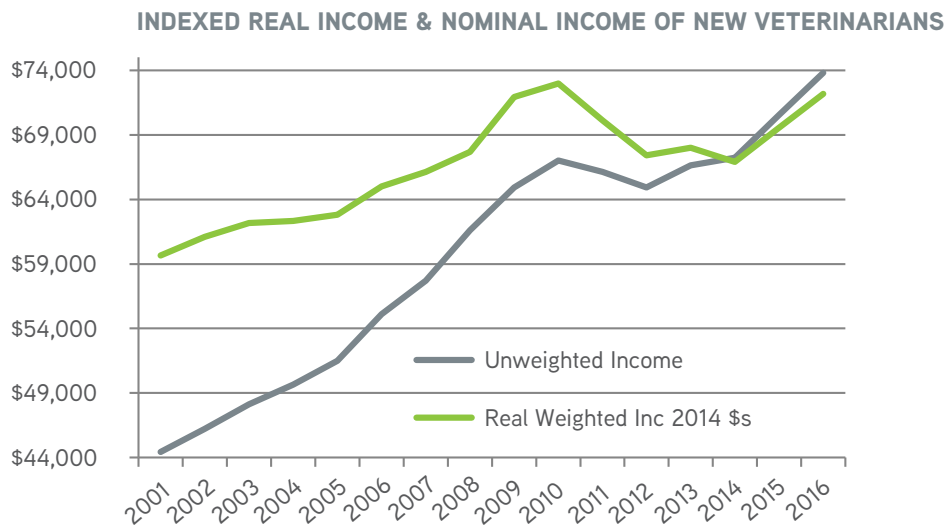


Figure 21

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	439.57	301.491	.005	1.458	.145	
		Masters Degree	-688.86	890.579	-.003	-.773	.439	
		Doctorate Degree	483.80	1366.533	.001	.354	.723	
		Other Professional Degree (MD, JD, Etc)	-1,674.10	1040.275	-.006	-1.609	.108	
		Other Degree						
	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 Program		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.

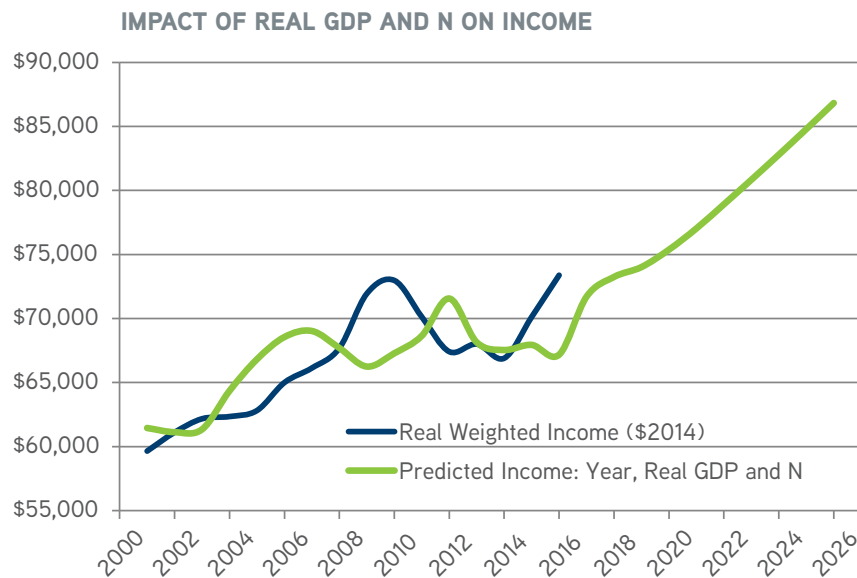


Figure 22





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.

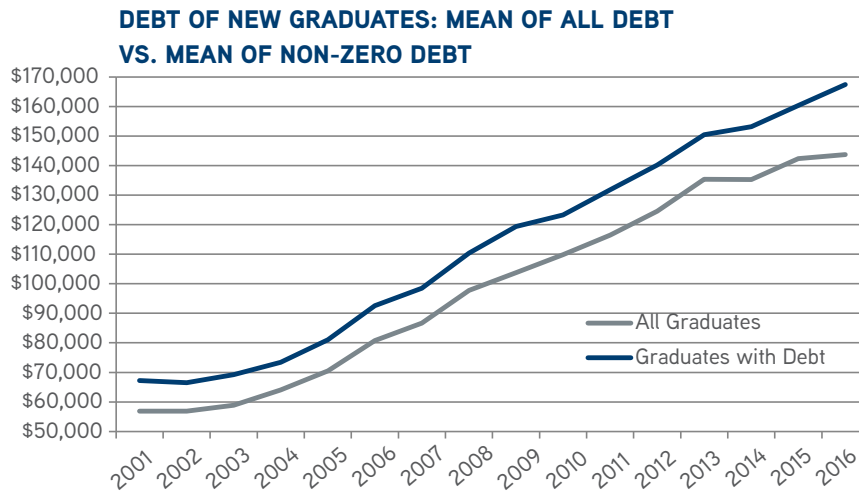


Figure 23

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.

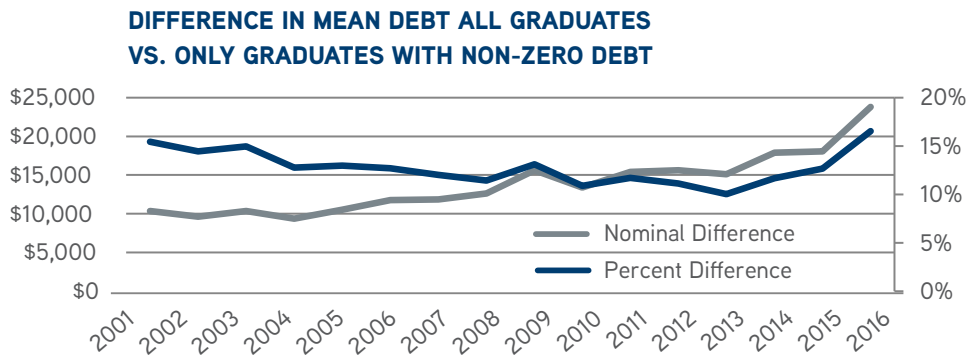


Figure 24

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

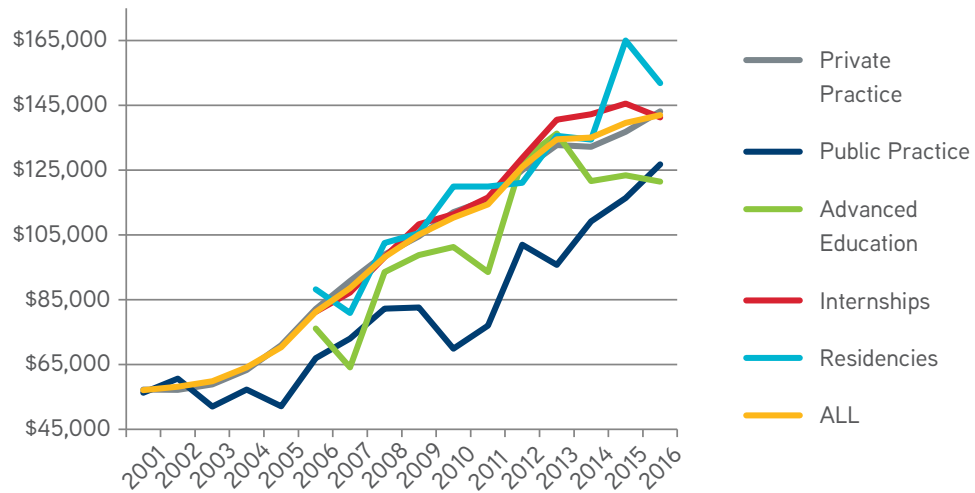


Figure 25

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

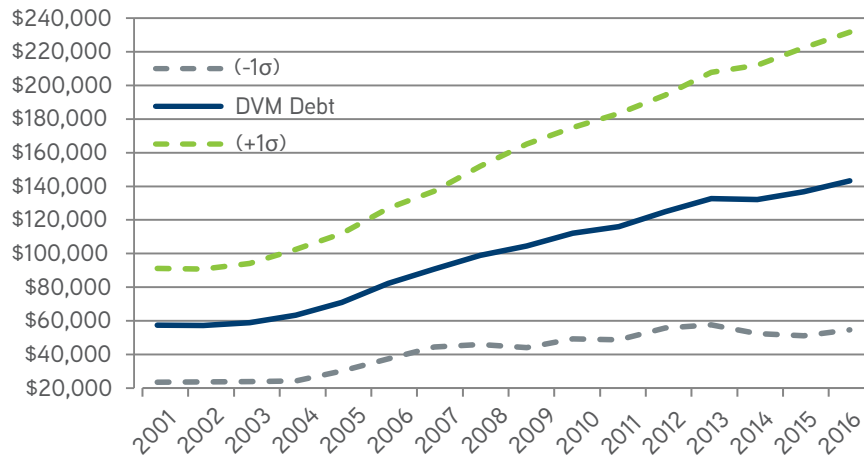


Figure 26

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

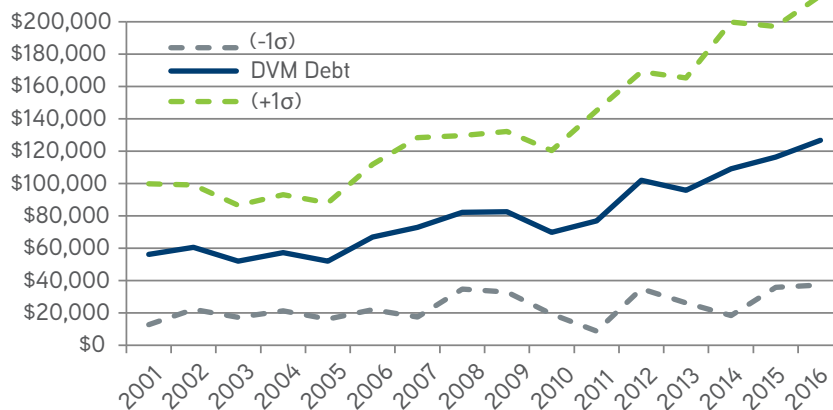


Figure 27

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.

MEAN STARTING SALARIES AND DEBT OF NEW VETERINARIANS

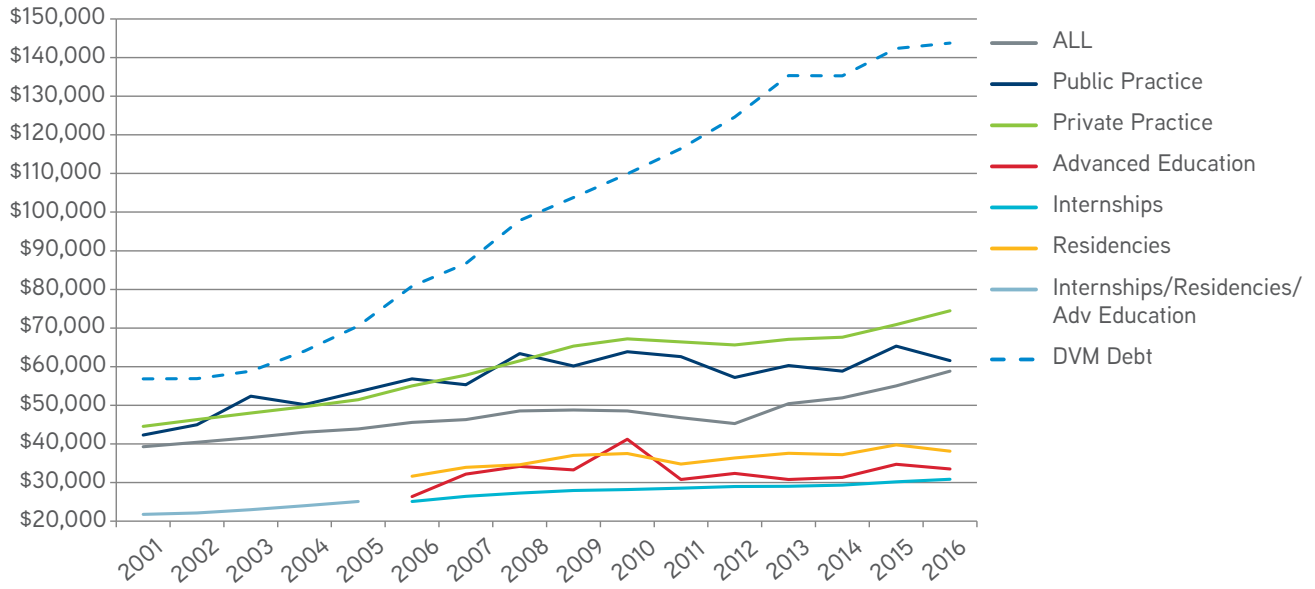


Figure 28

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.

MEAN DEBT BY GENDER

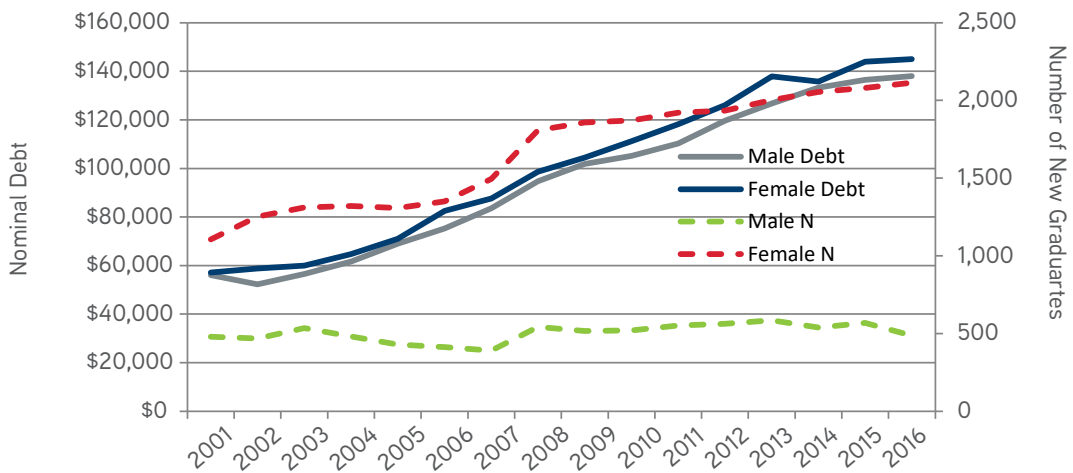


Figure 29

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

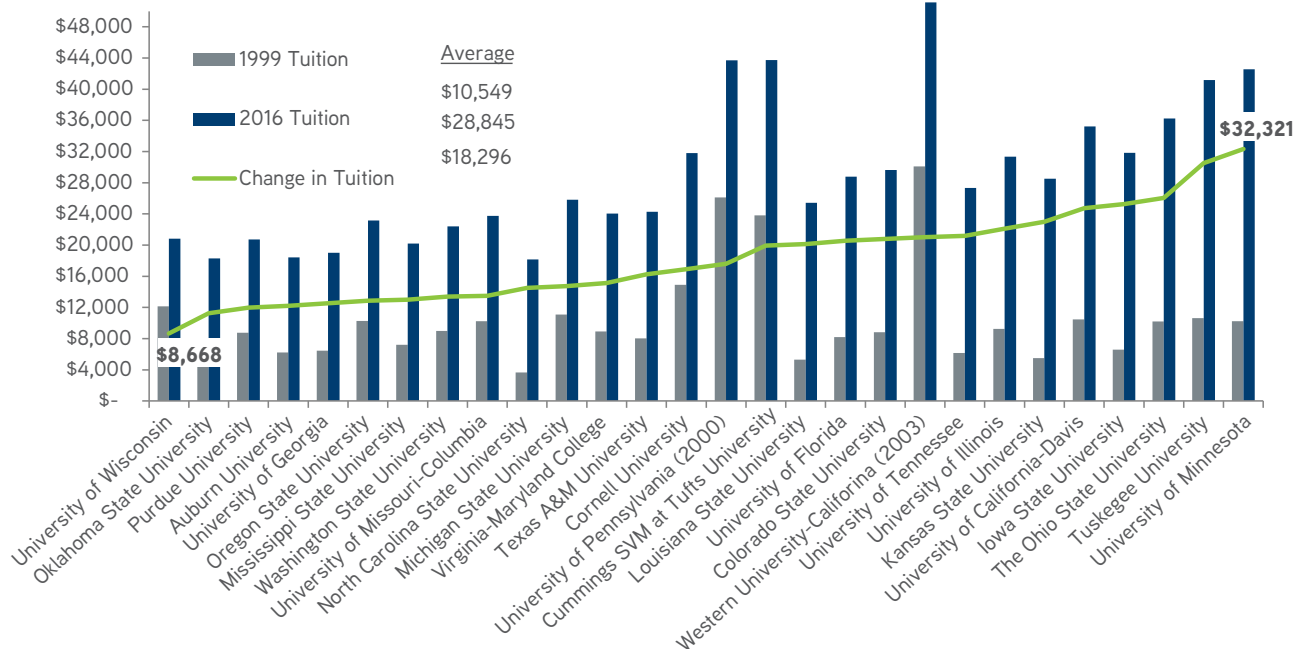


Figure 30

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

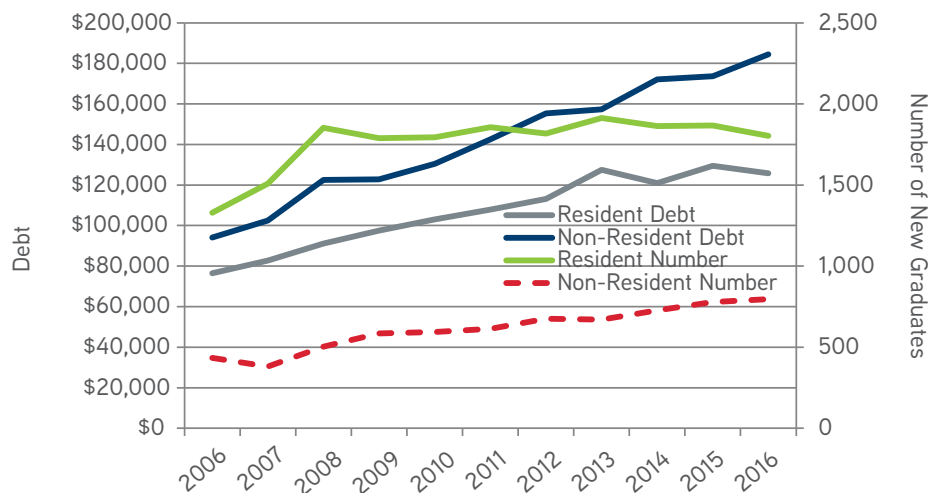


Figure 31

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.

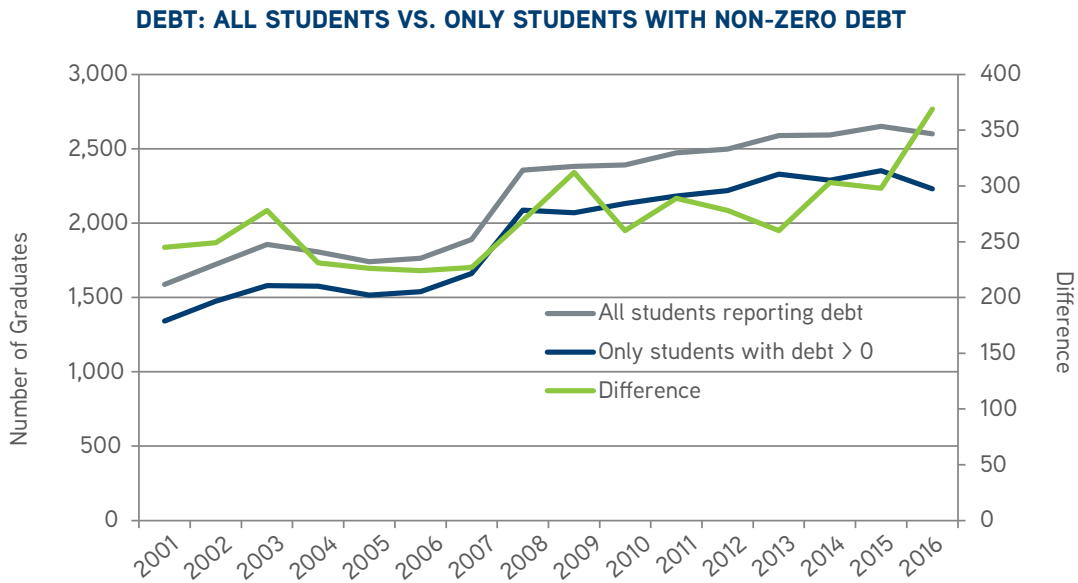


Figure 32

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

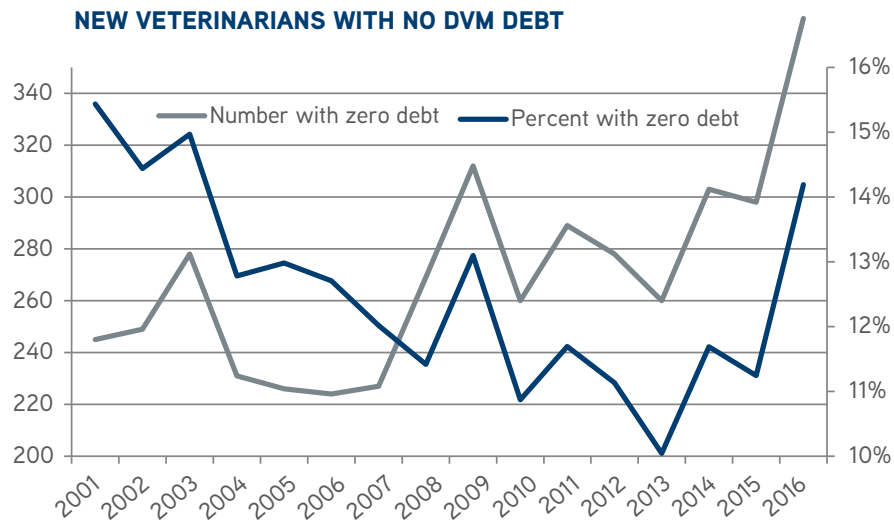


Figure 33

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

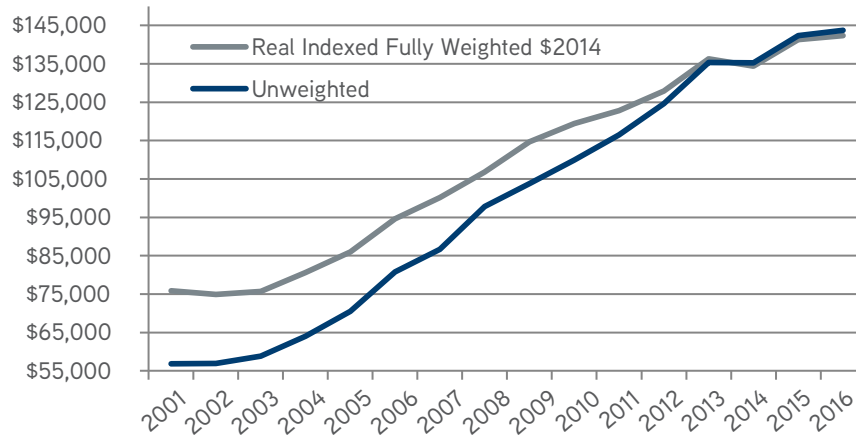


Figure 34

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.

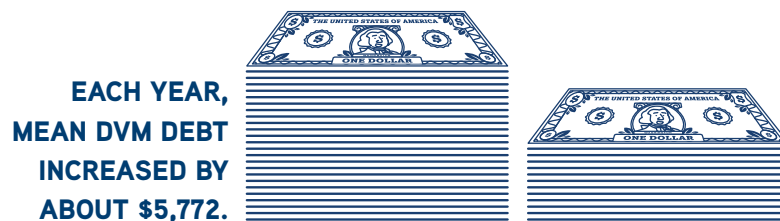
As in the regression explaining the variation in income, the non-standardized coefficients in this regression explaining the variation in debt represents the dollar value attached to the variable in question whereas the standardized coefficients represents the relative value of each coefficient. For 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.

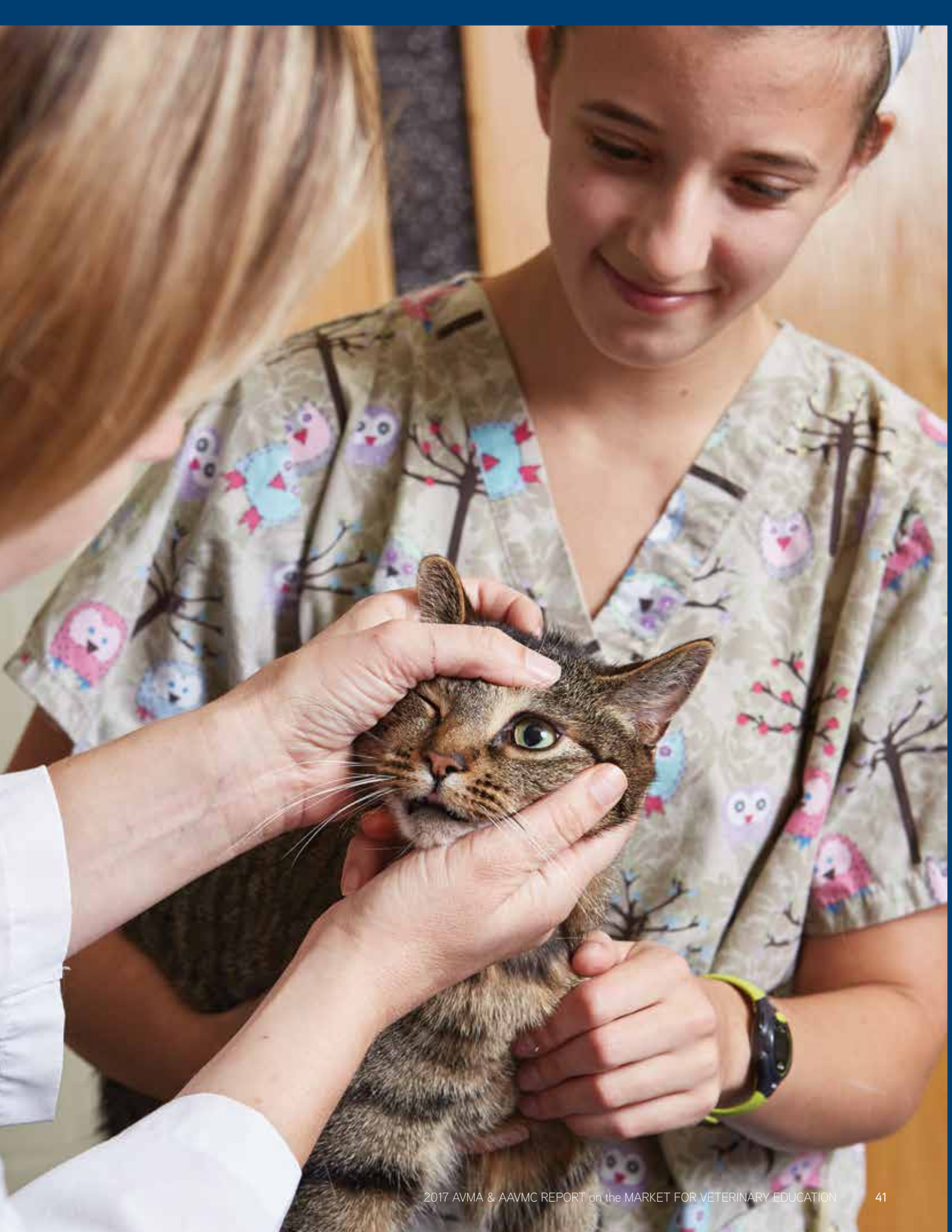
Of importance is the unstandardized coefficient for year of the survey that indicates the mean value of costs has increased by nearly \$5,800 per year. An additional finding of importance is that while the model explaining the variation in income was able to explain 71 percent of the variation with the 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







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

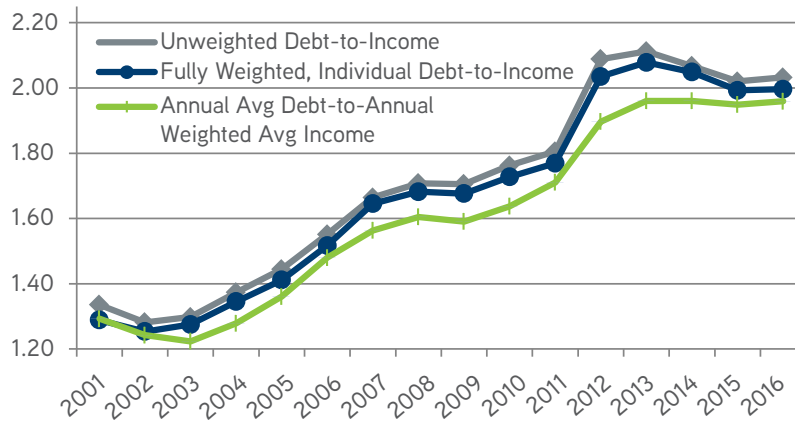


Figure 35

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

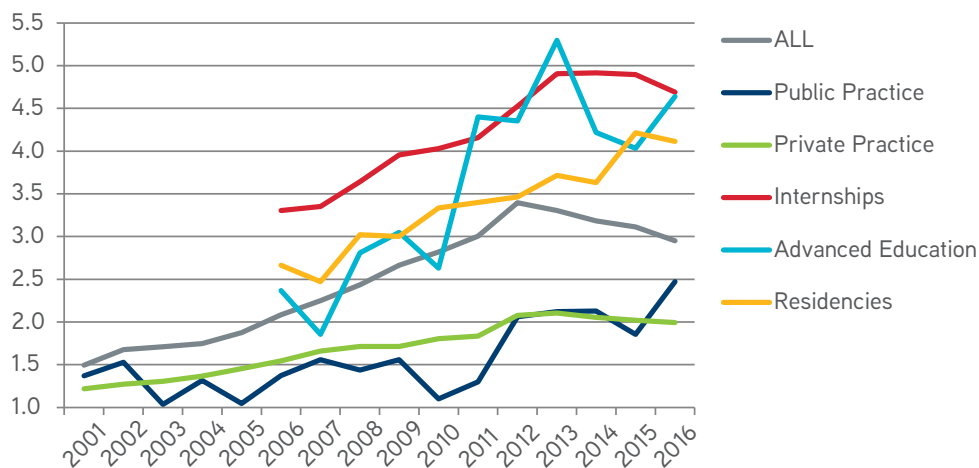


Figure 36

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		Sig.
		B	Std. Error	Beta	t	
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
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.

DISTRIBUTION OF DEBT, 2016

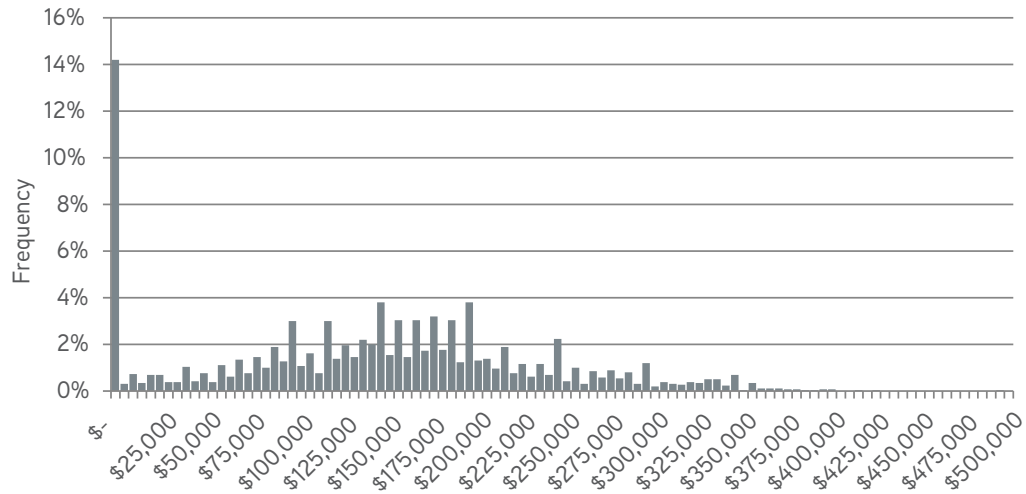


Figure 37

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.

DISTRIBUTION OF STARTING SALARY, 2016



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.

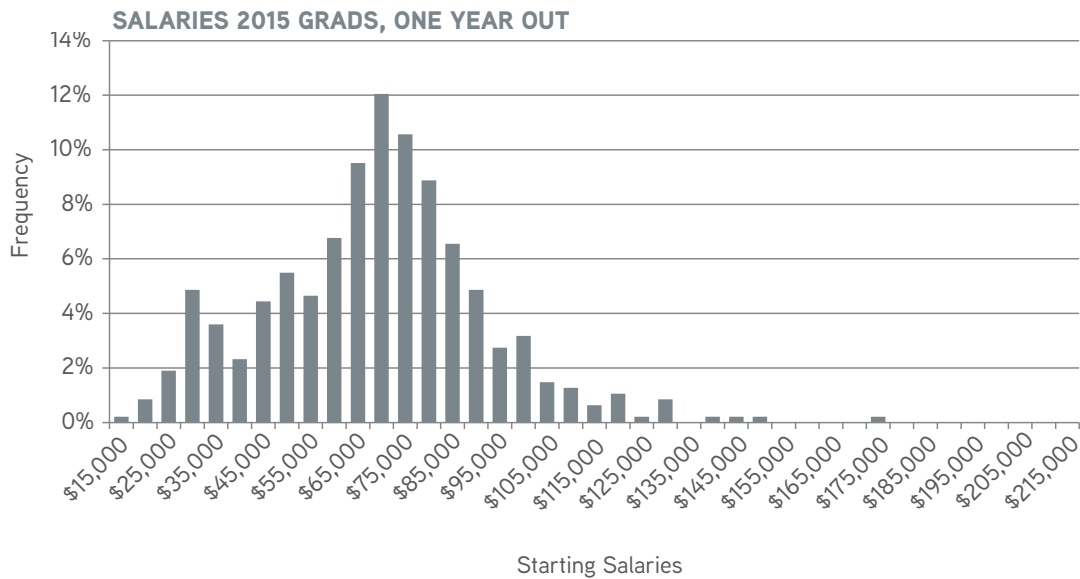


Figure 39

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.

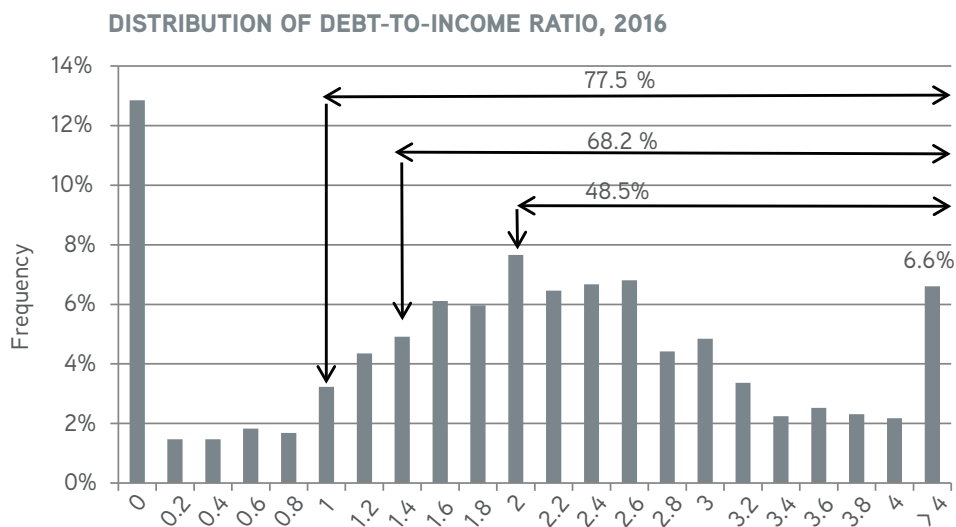


Figure 40

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.

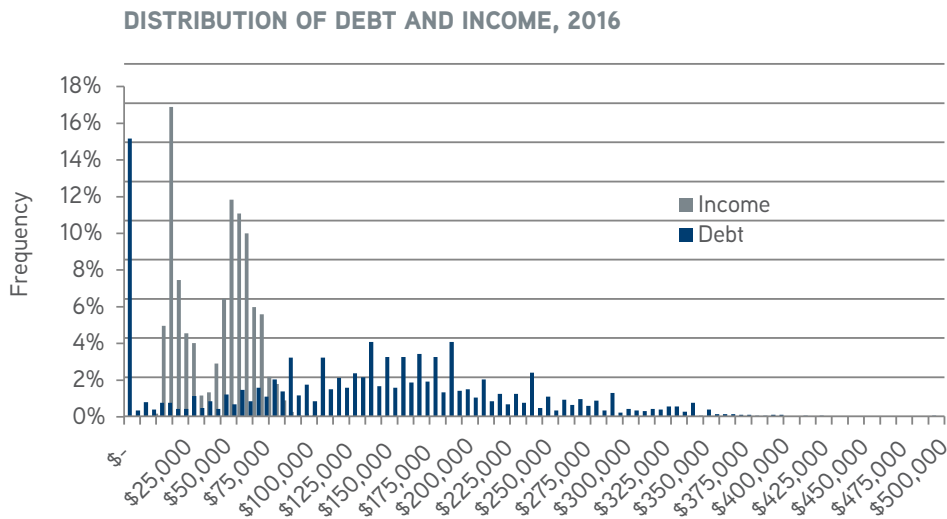


Figure 41

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.

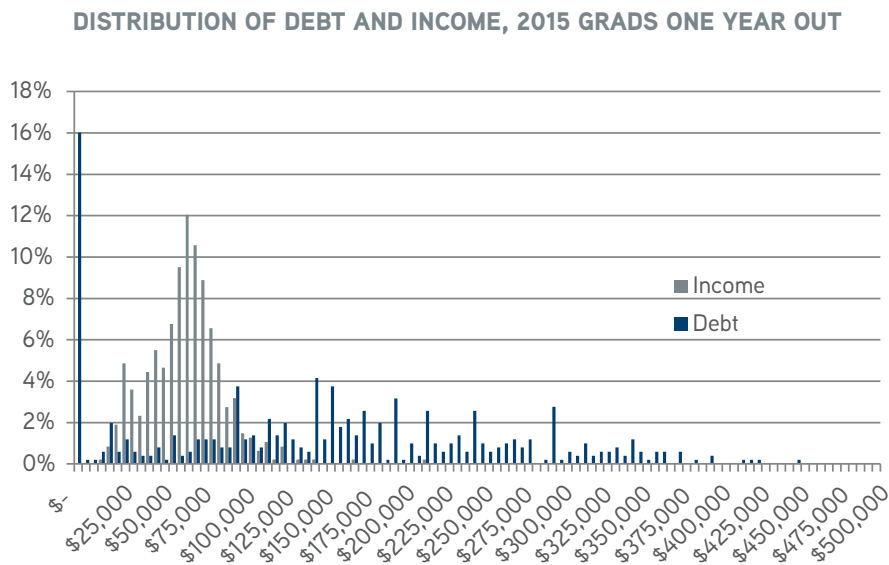


Figure 42

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.

2016 MEAN REPORTED DEBT BY SCHOOL

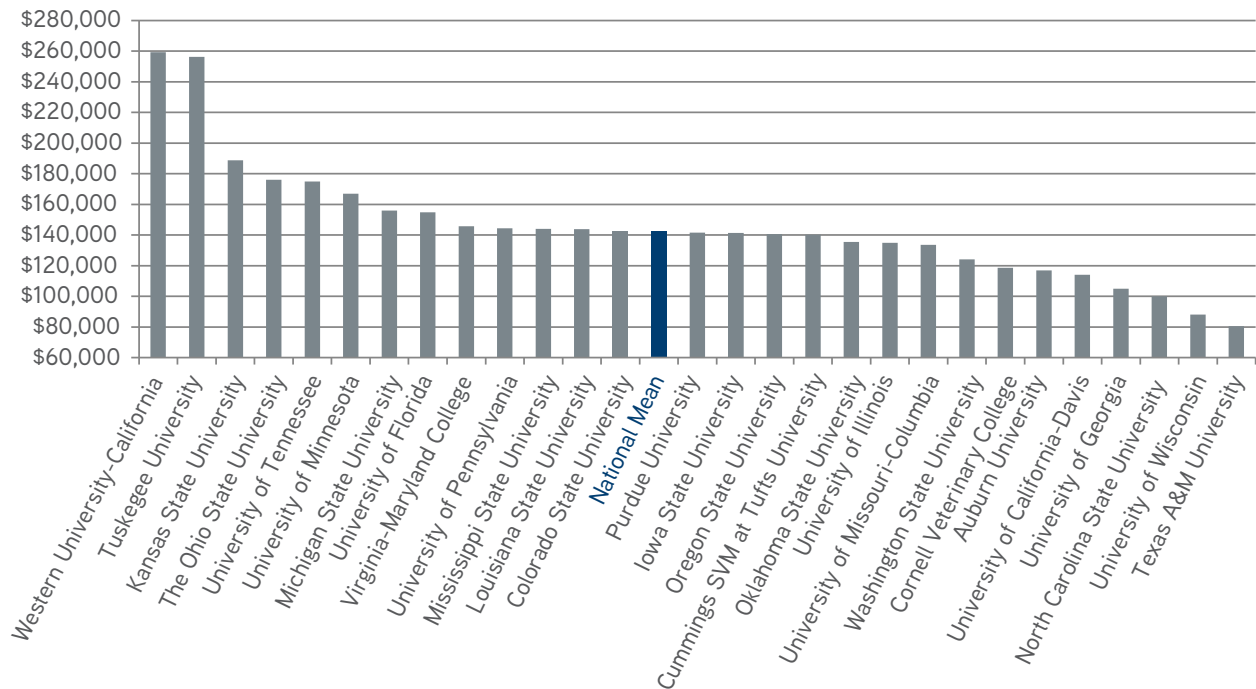


Figure 43

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.

MEAN DVM DEBT OVER DISCOUNT TUITION BY COLLEGE, 2016

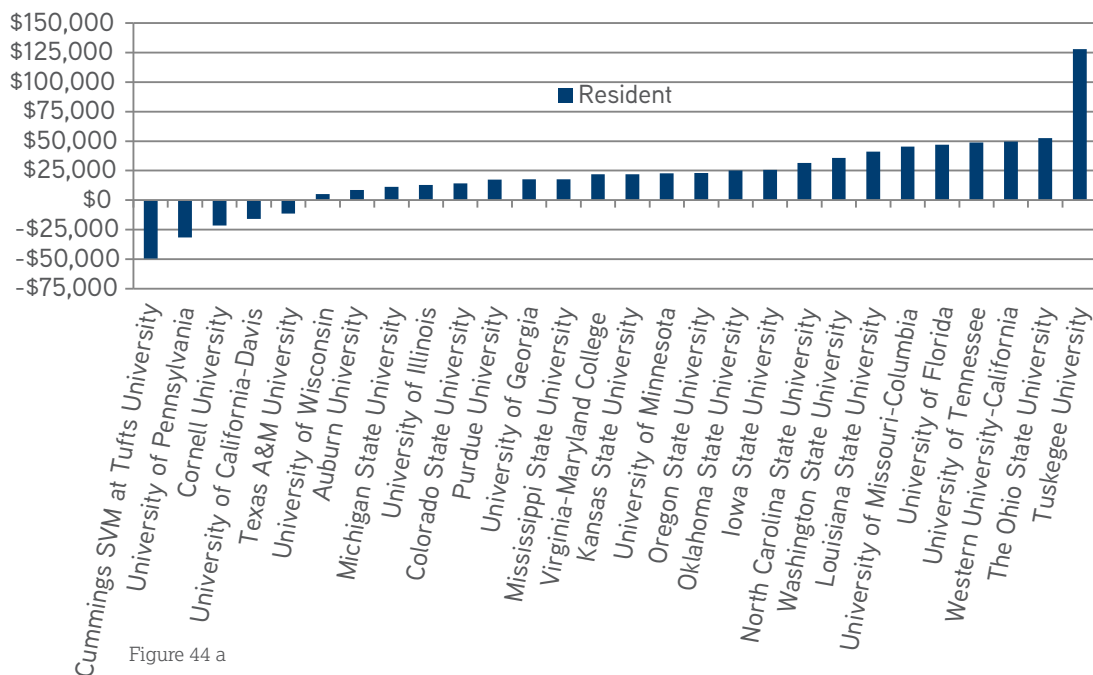


Figure 44 a

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.

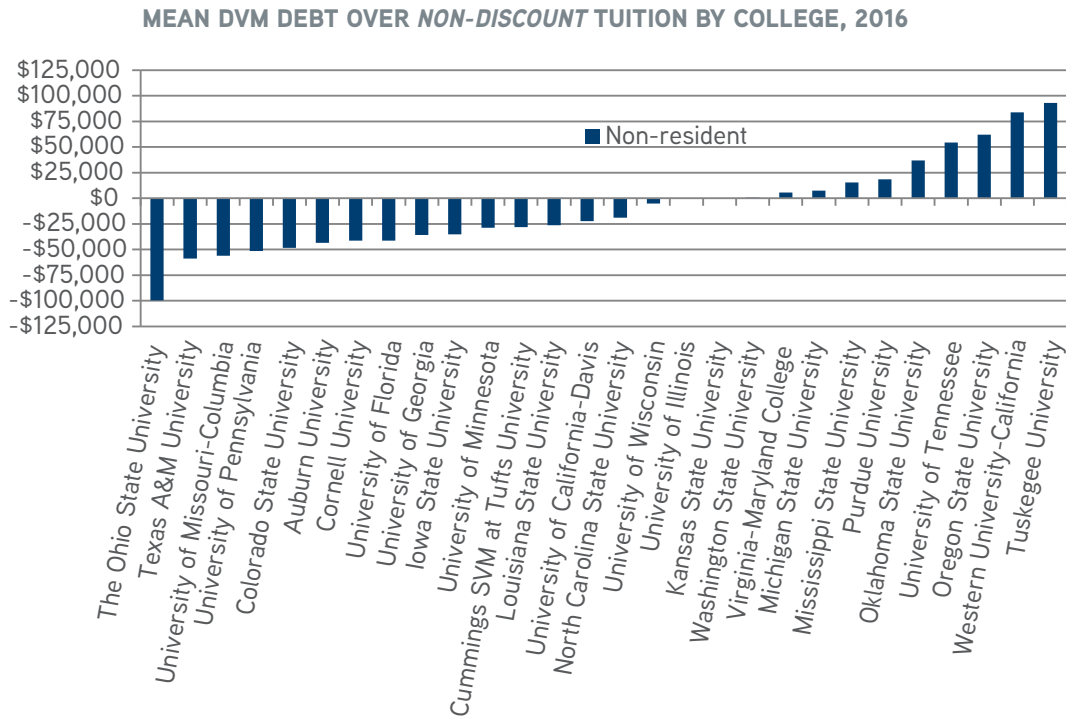


Figure 44 b

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

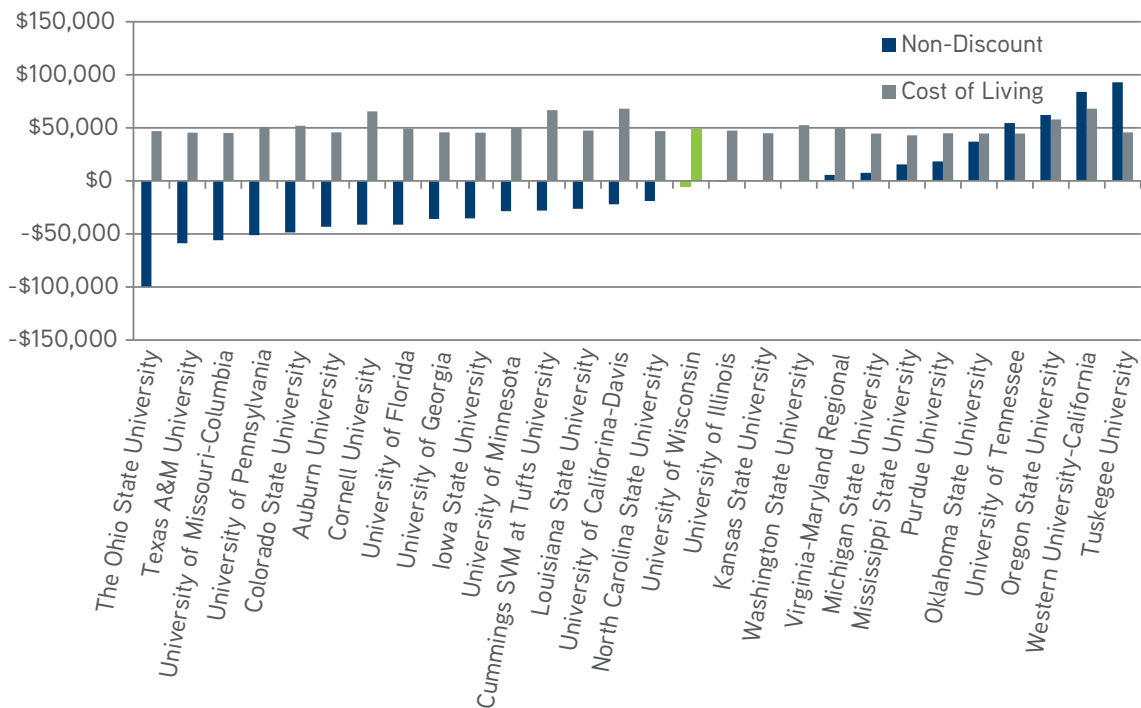


Figure 45a

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

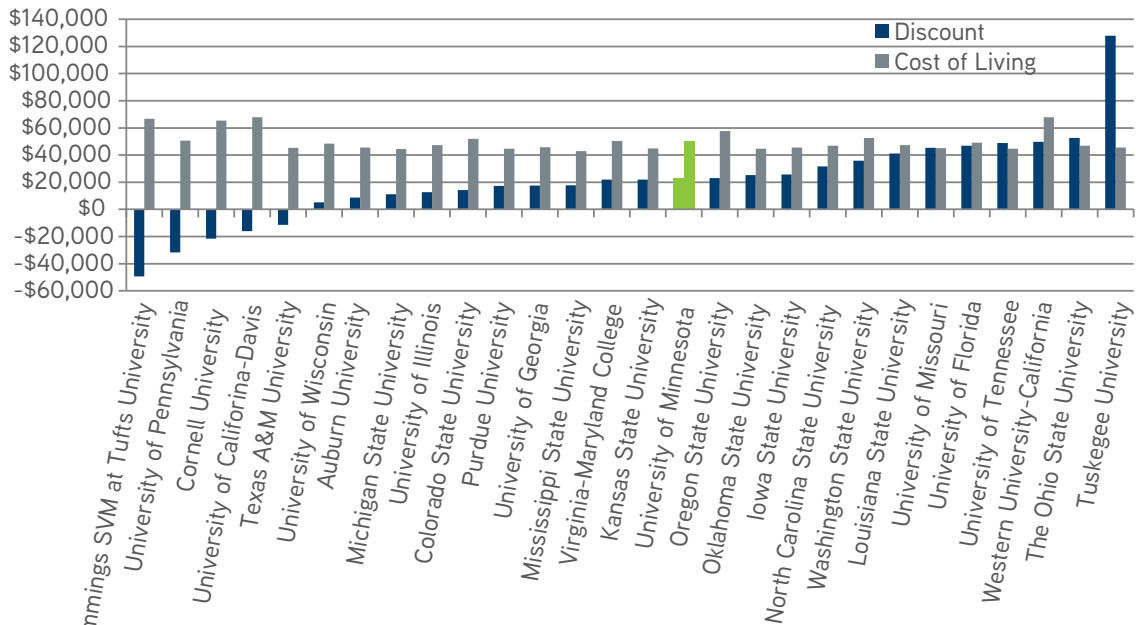


Figure 45b

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

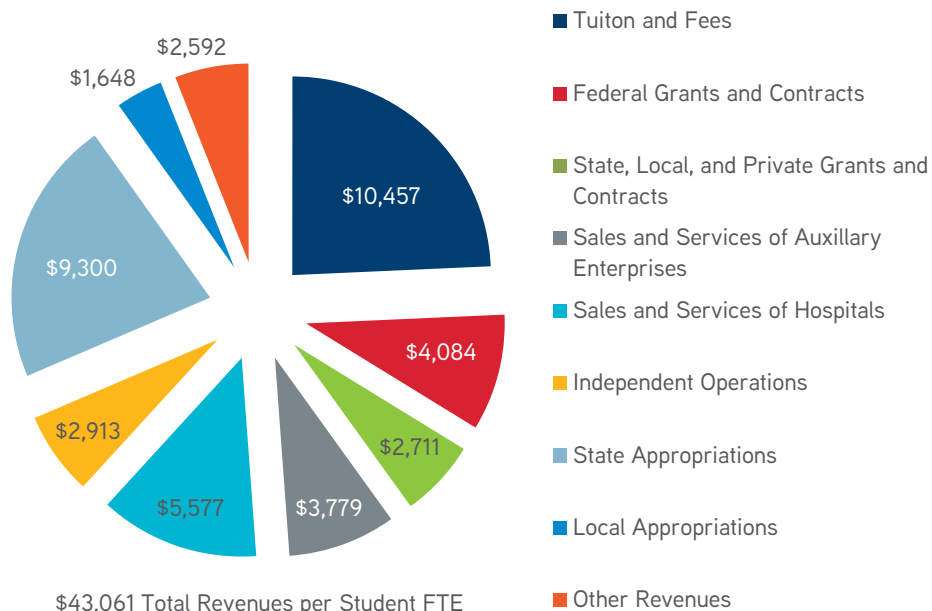


Figure 46

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

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.

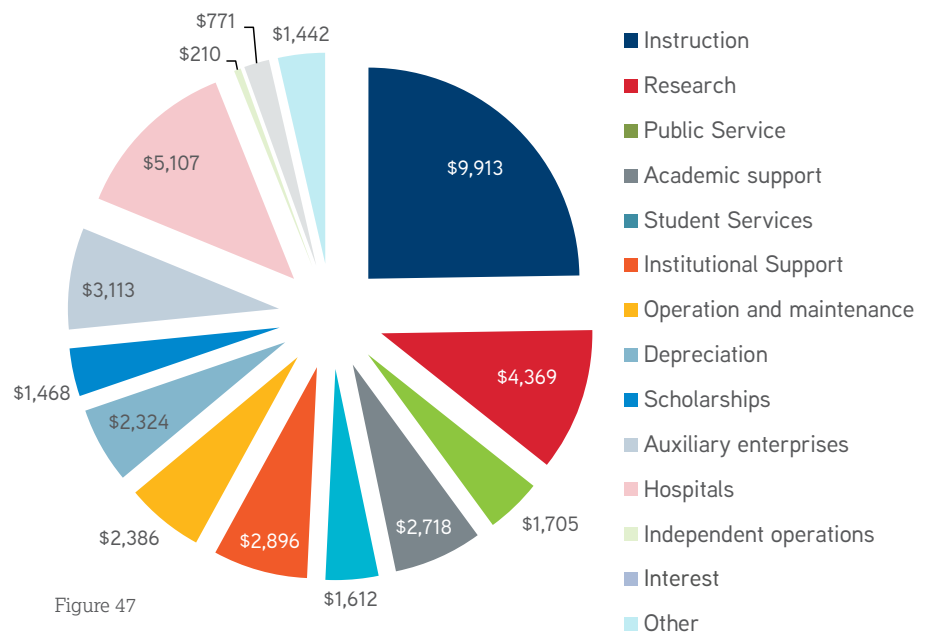


Figure 47

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

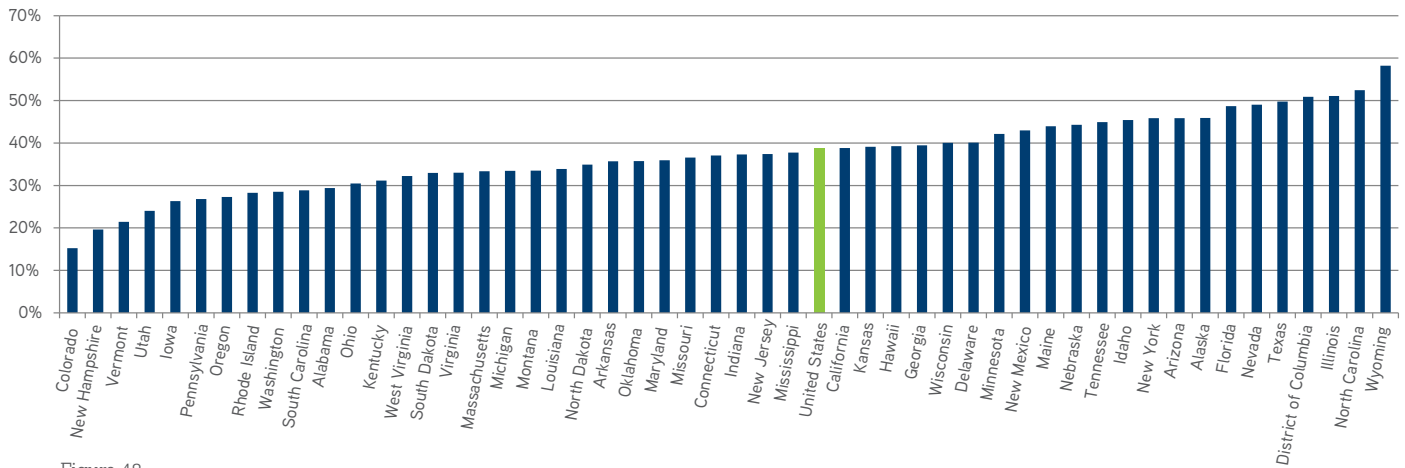


Figure 48

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

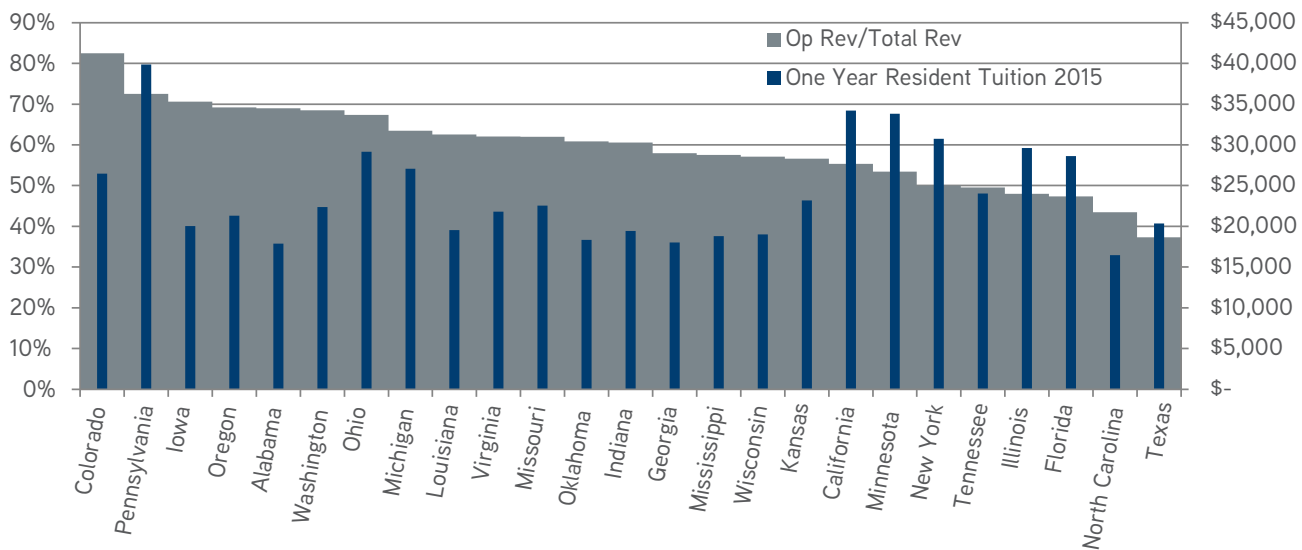
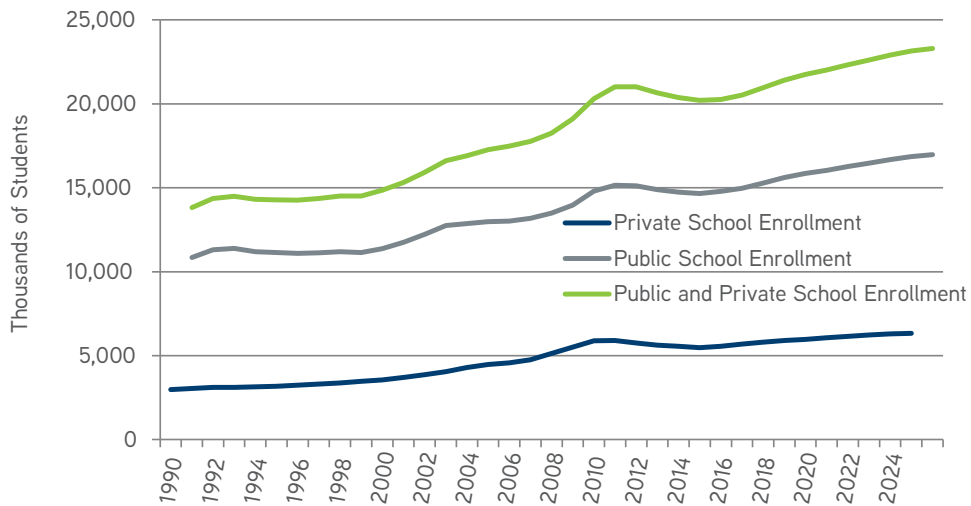


Figure 49

ENROLLMENT IN DEGREE-GRANTING POST-SECONDARY INSTITUTIONS



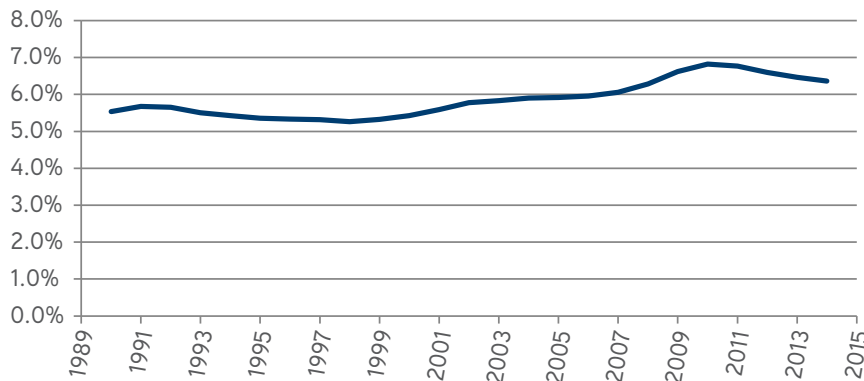
Reference: National Center for Educational Statistics

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

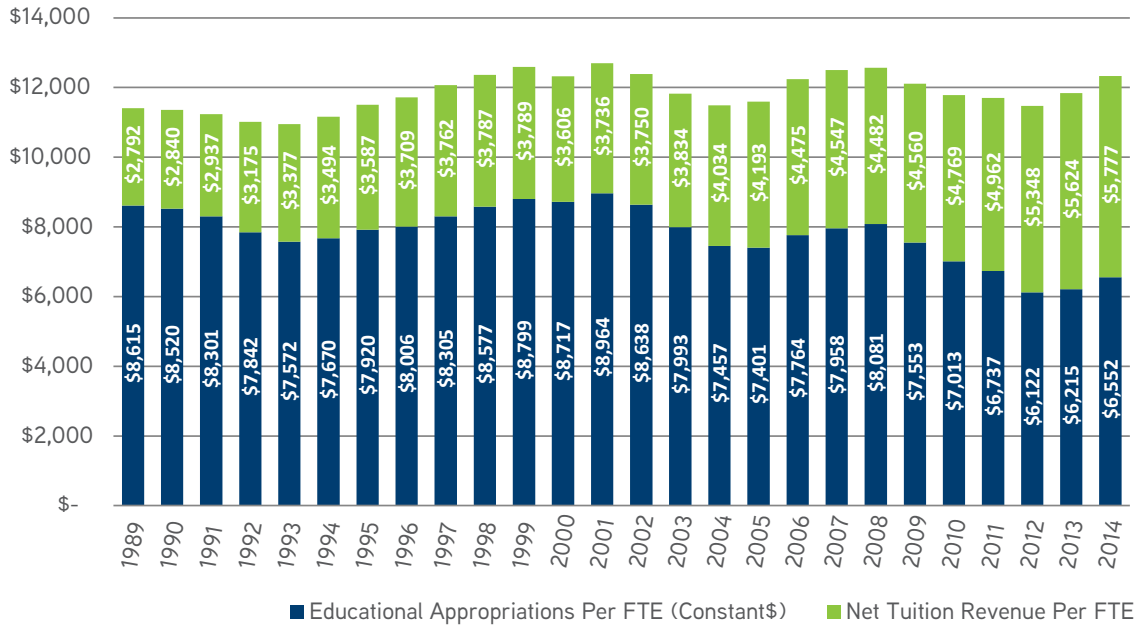


Figure 52

Also, during the last three decades the graduation rate has increased across bachelors, masters and doctoral 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

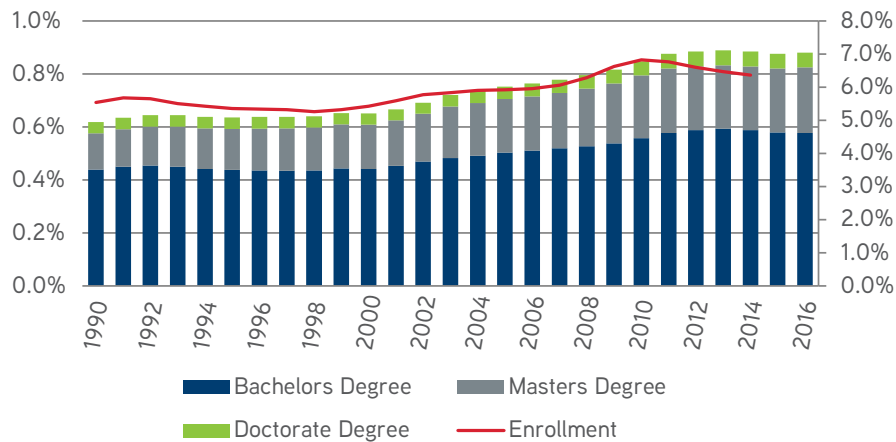


Figure 53

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.

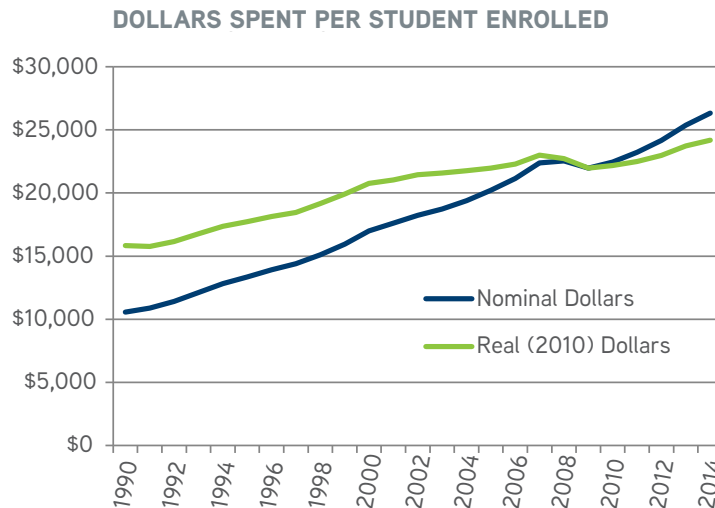


Figure 54

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.

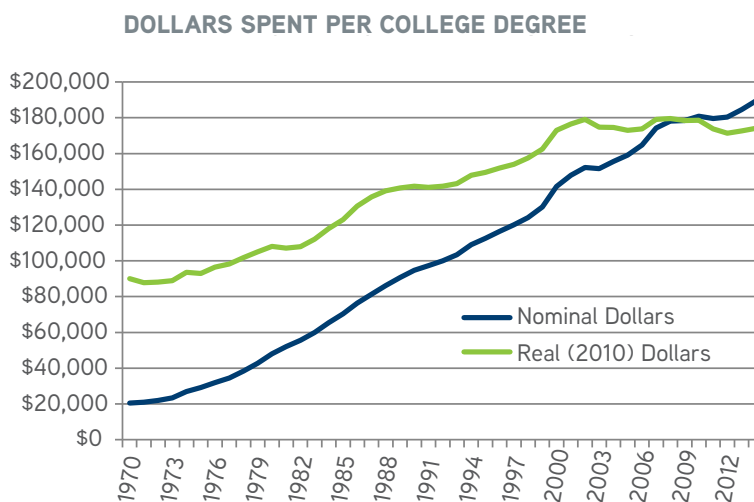


Figure 55

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

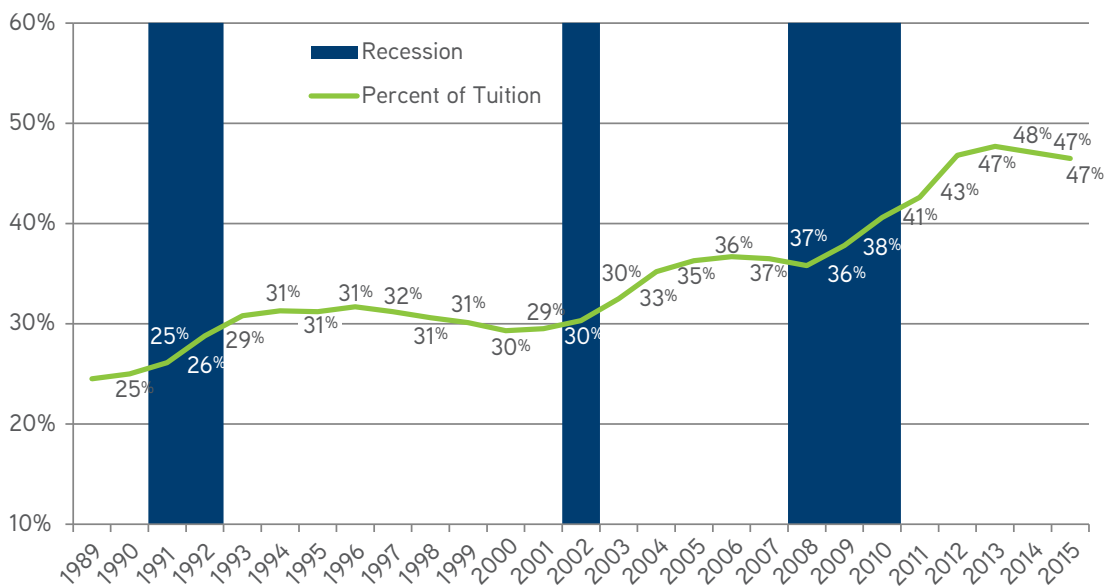


Figure 56

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

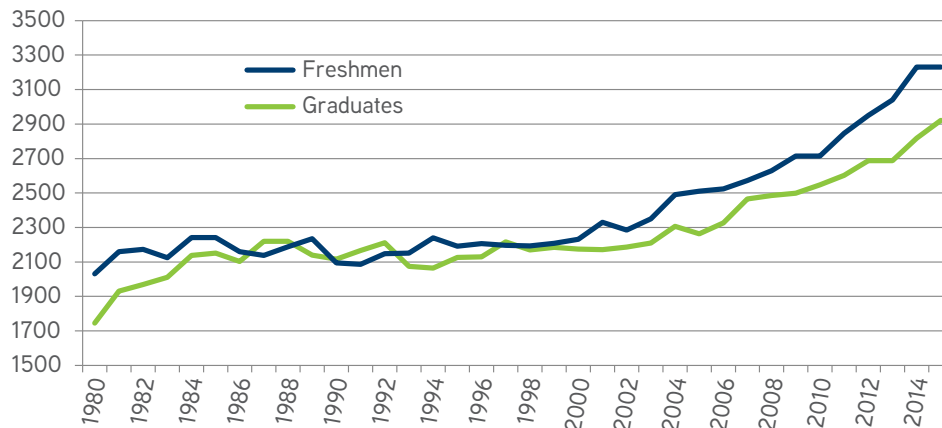


Figure 57

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-

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

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

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 States 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 Management 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 AAMVC to collect data on the graduates from the AVMA-accredited foreign veterinary colleges.

This report, which is a follow up to the *2016 AVMA & AAMVC 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.



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