2017 AVMA Report on

# VETERINARY MARKETS

AVMA Veterinary Economics

# 2017 AVMA Report on VETERINARY MARKETS

Veterinary Economics Division
American Veterinary Medical Association
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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 AMVA 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 AVMAs 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 earns 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.

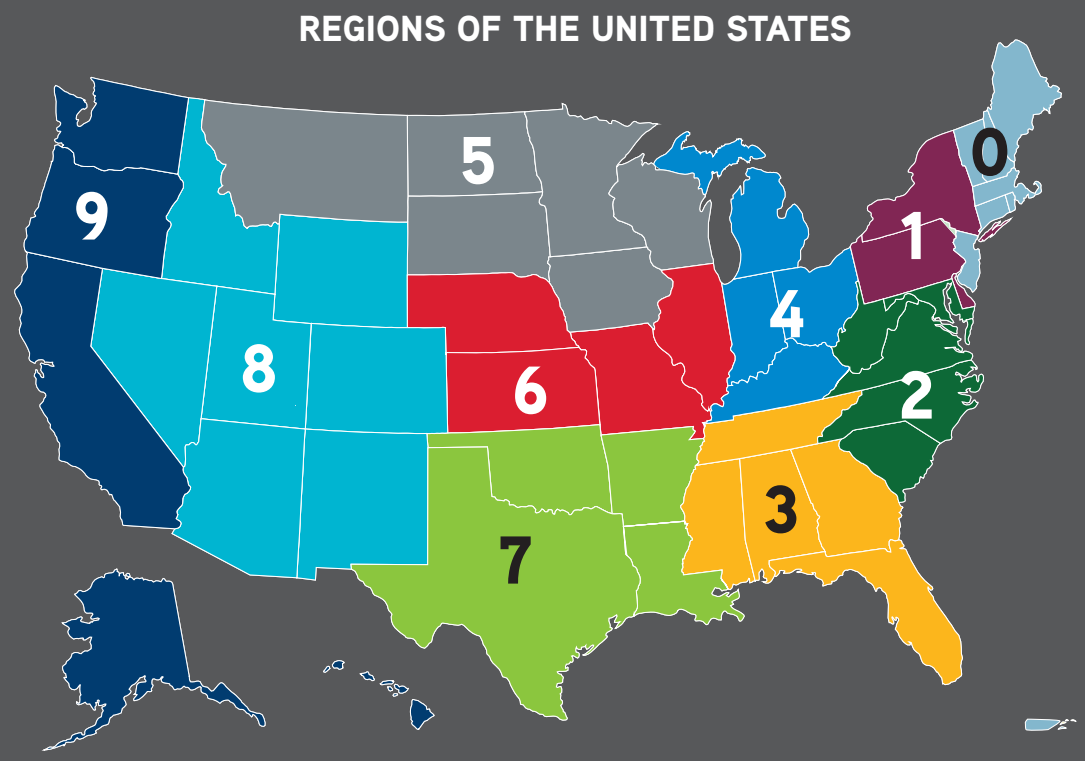



Figure 1

## 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).

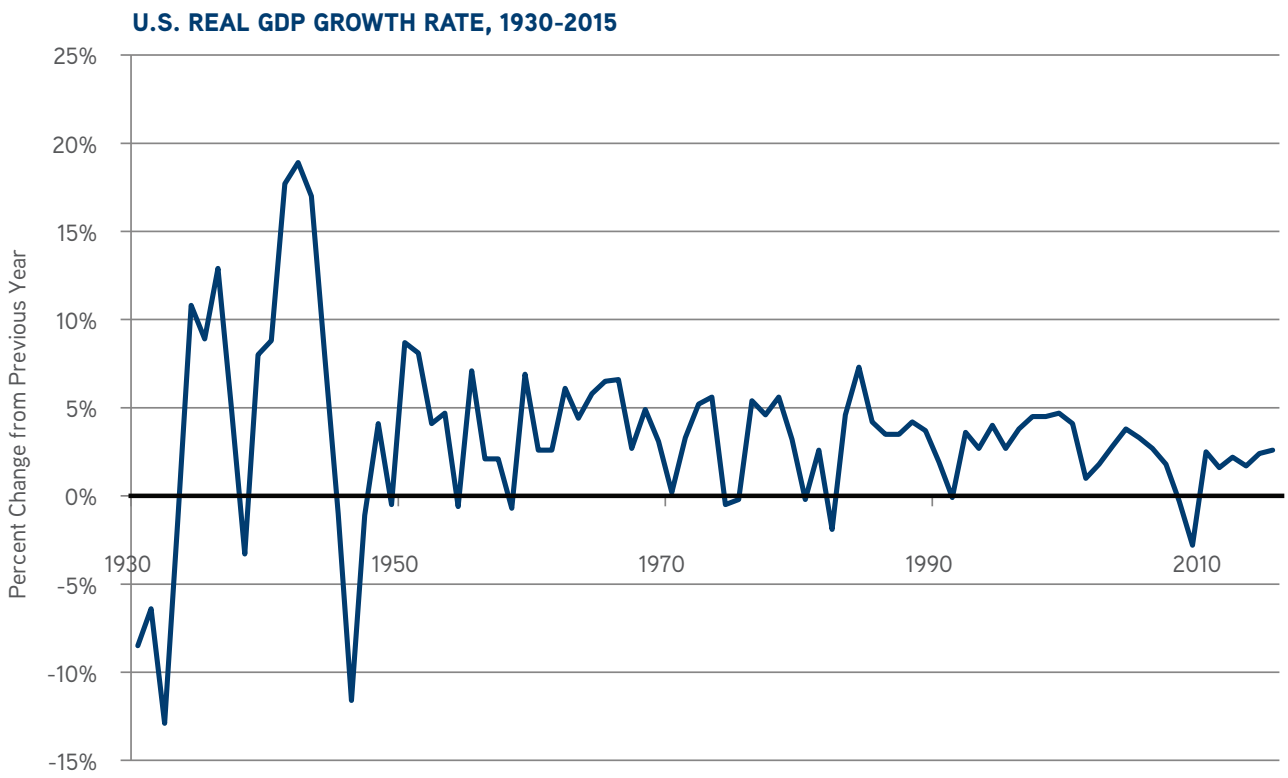

U.S. REAL GDP GROWTH RATE, 1930-2015
Percent Change from Previous Year
25%
20%
15%
10%
5%
0%
-5%
-10%
-15%
1930
1950
1970
1990
2010

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**

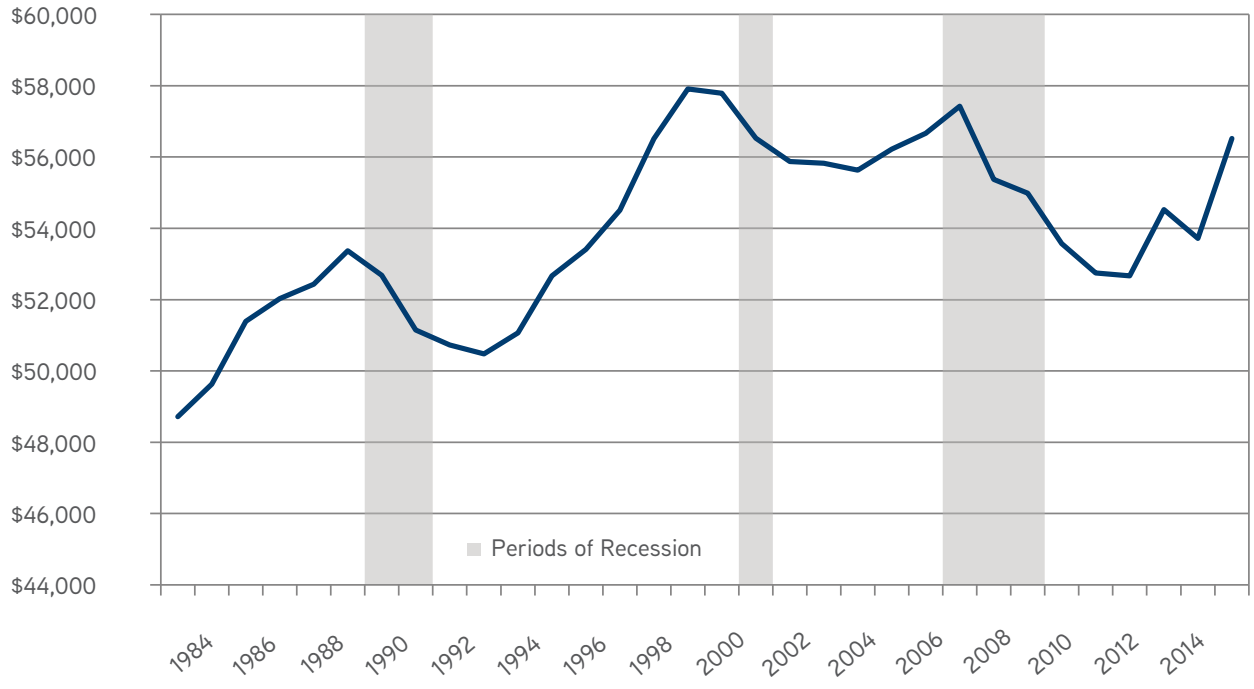



Figure 3

## 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.

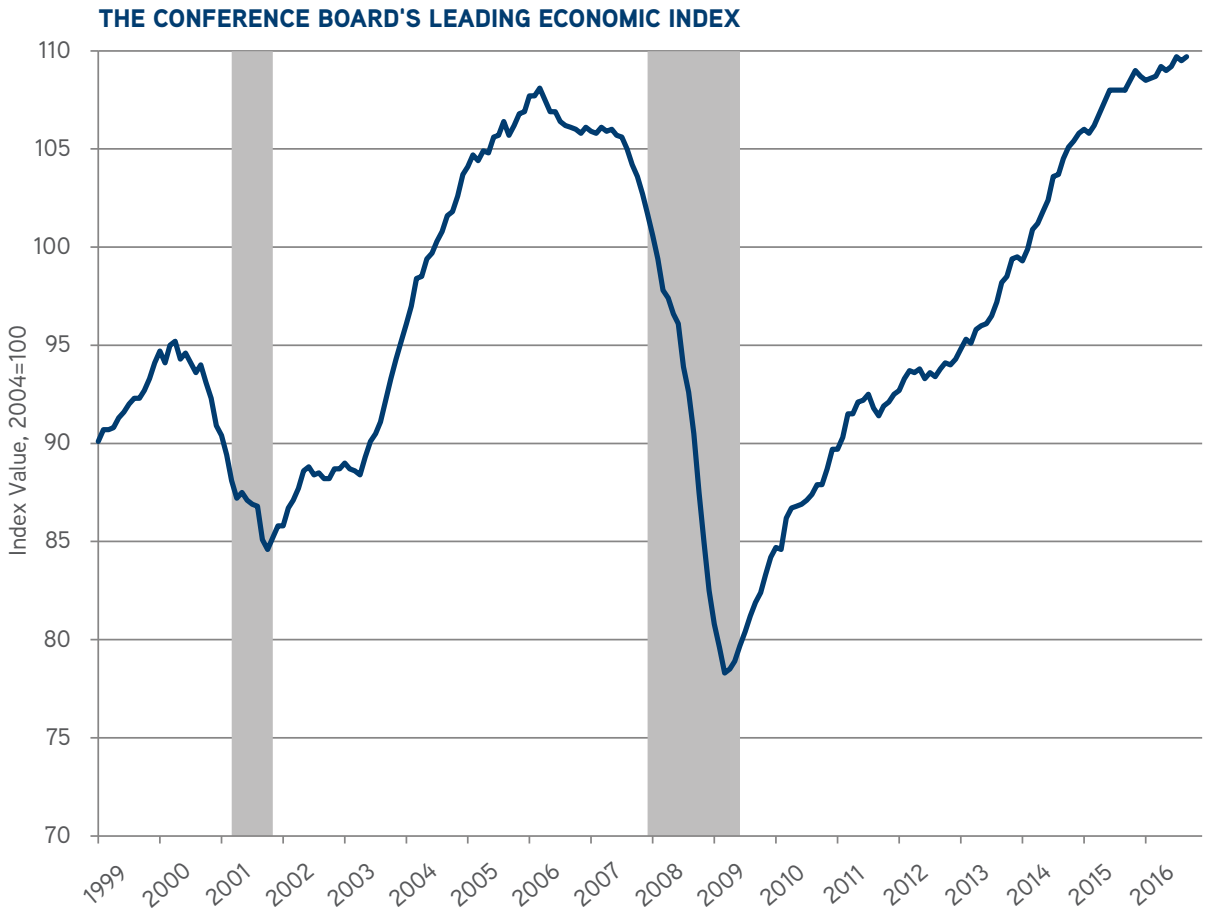



Figure 4

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.

**LEADING INDEX FOR THE UNITED STATES, PERCENT, MONTHLY, SEASONALLY ADJUSTED, 1982-2016**

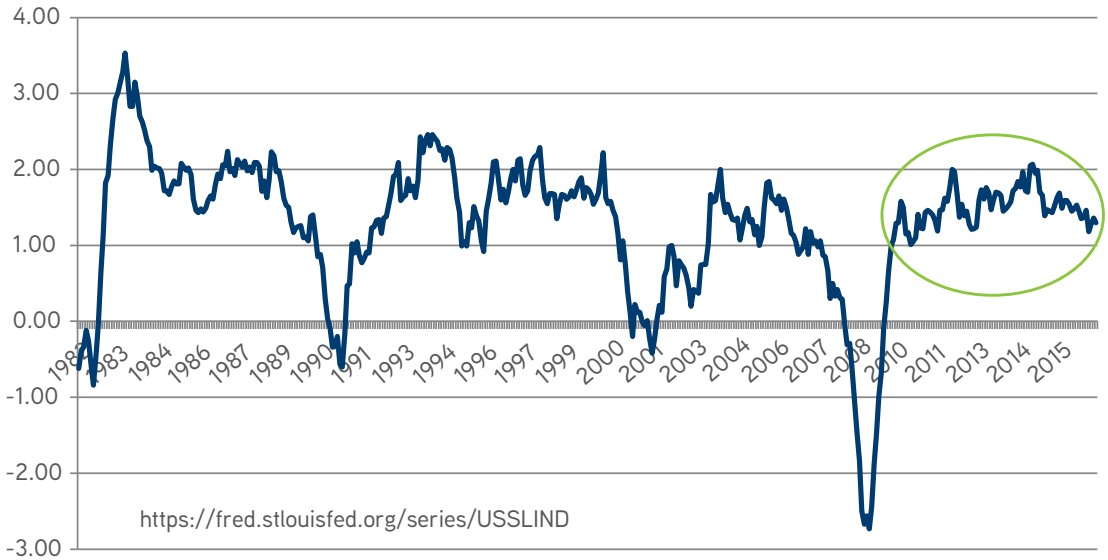



Figure 5

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.

**LEADING INDEX FOR THE UNITED STATES, PERCENT, MONTHLY, SEASONALLY ADJUSTED, 2009-2016**

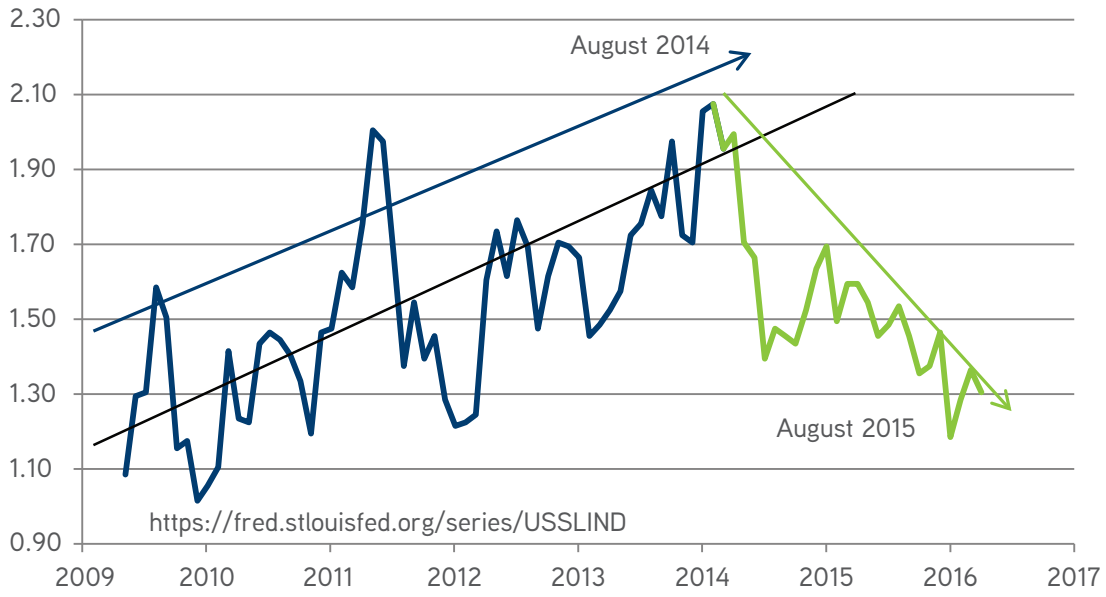



Figure 6

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.

**CONGRESSIONAL BUDGET OFFICE 10-YEAR BASELINE FORECAST OF U.S. GDP**

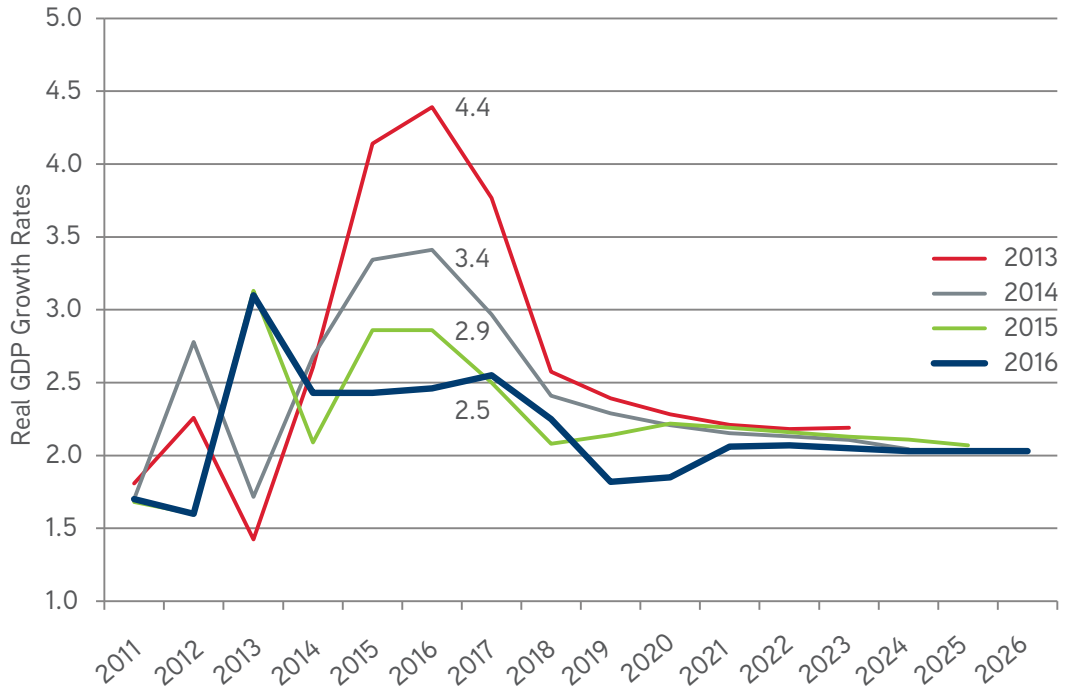



Figure 7

**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

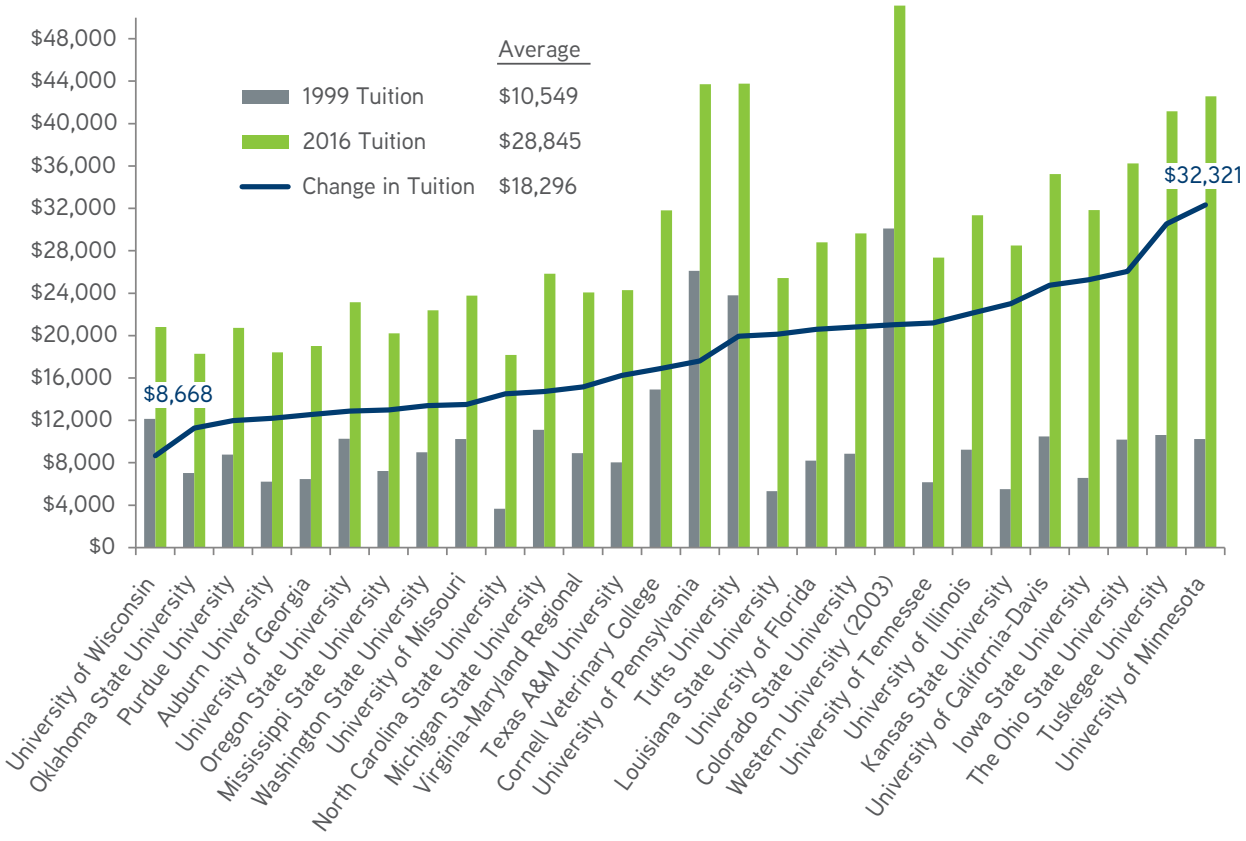



Figure 8

**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**

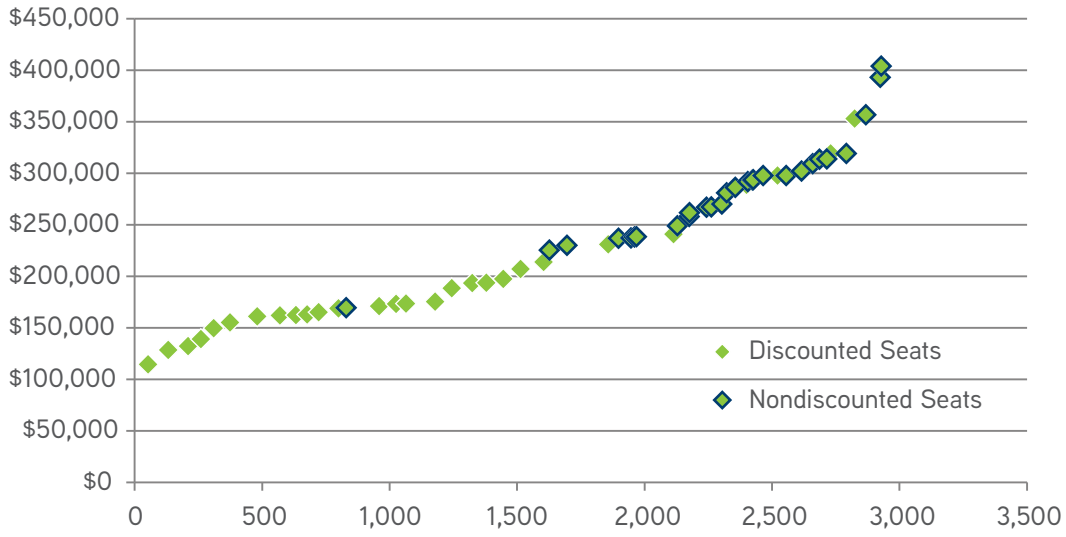
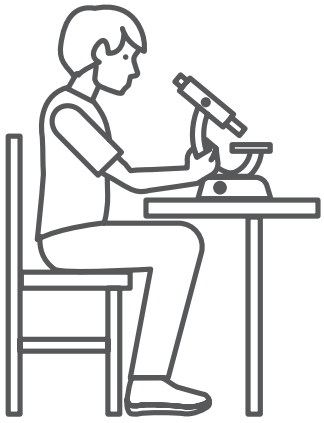



Figure 9



**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.**

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**

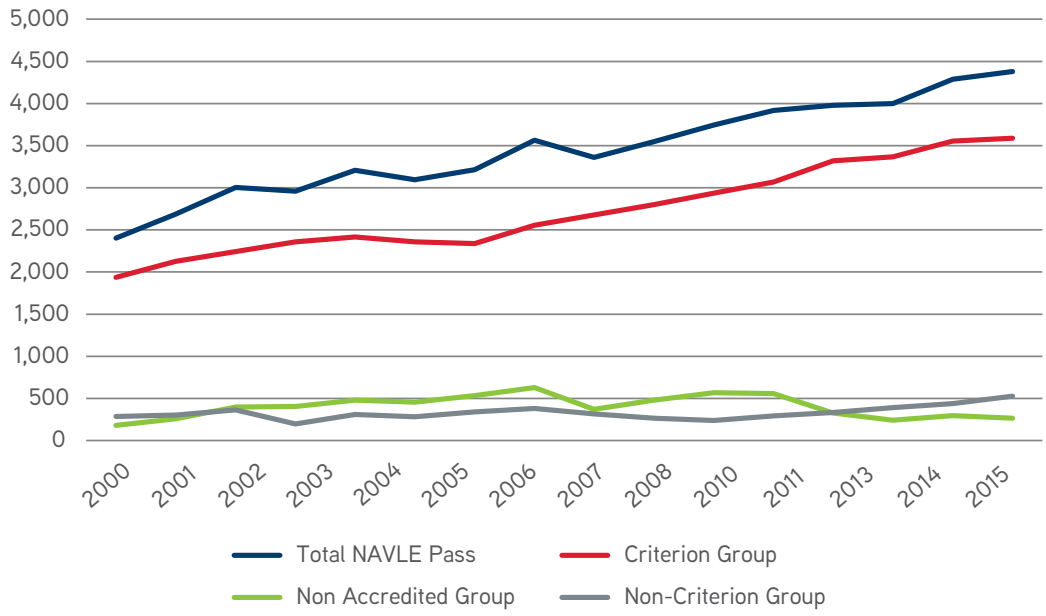



Figure 10

**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**

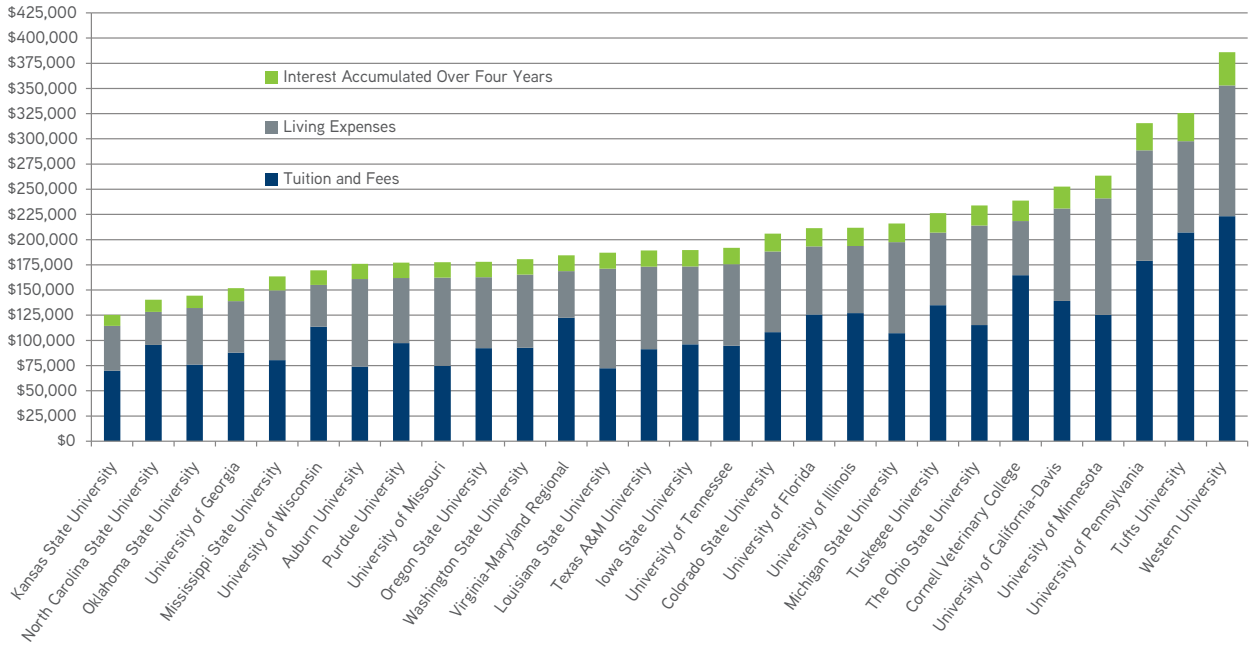



Figure 11

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.**

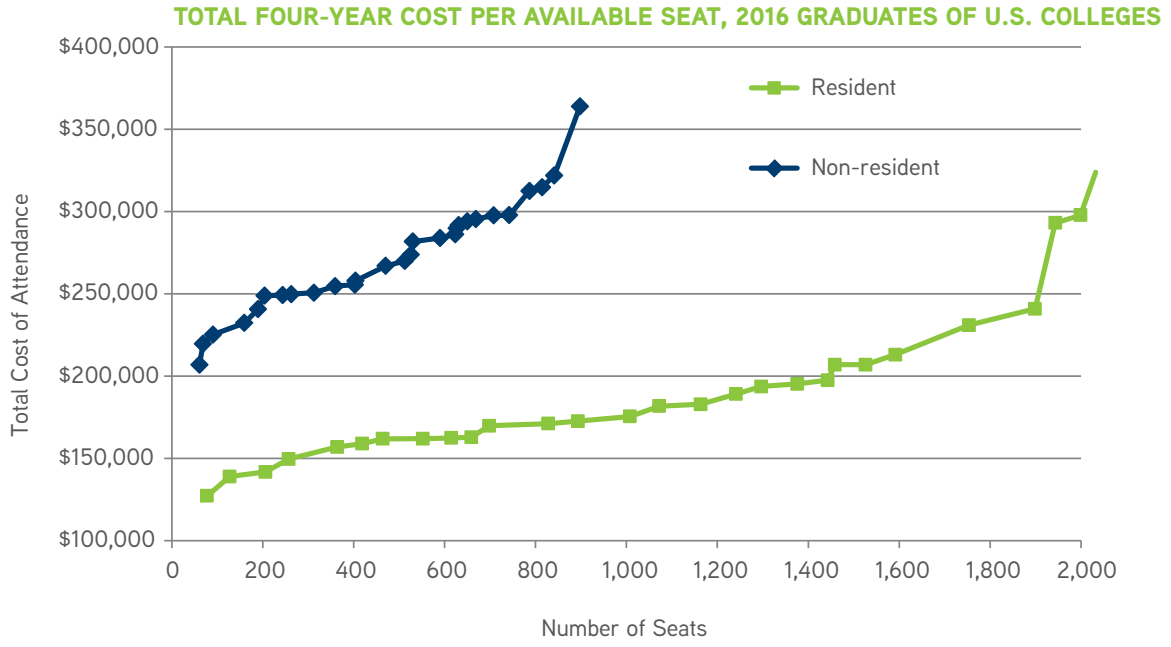



Figure 12

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.

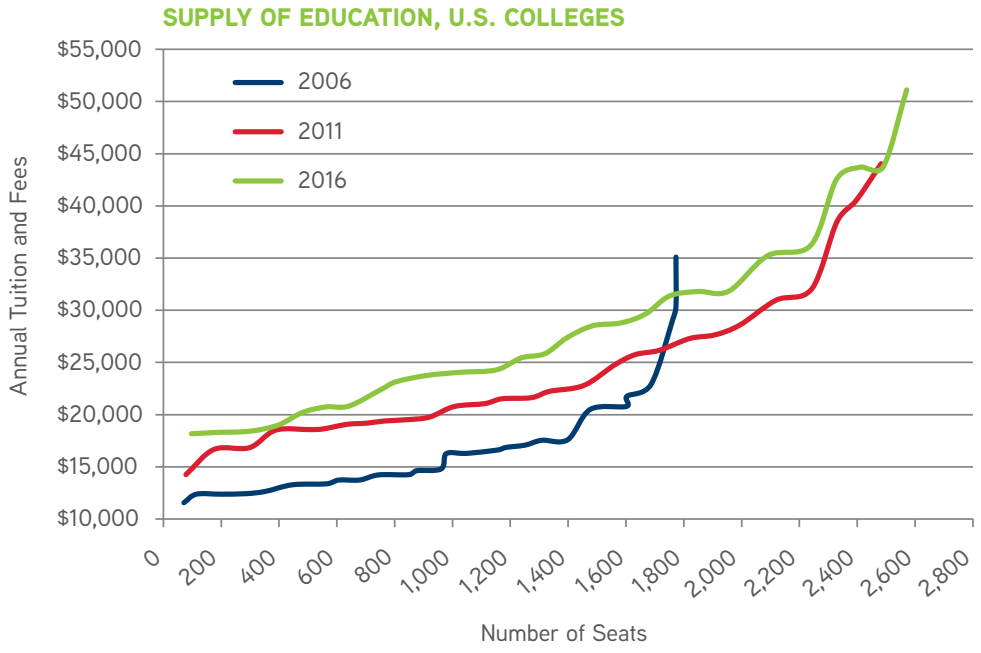



Figure 13

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.

**MEDIAN ANNUAL TUITION, U.S. COLLEGES**

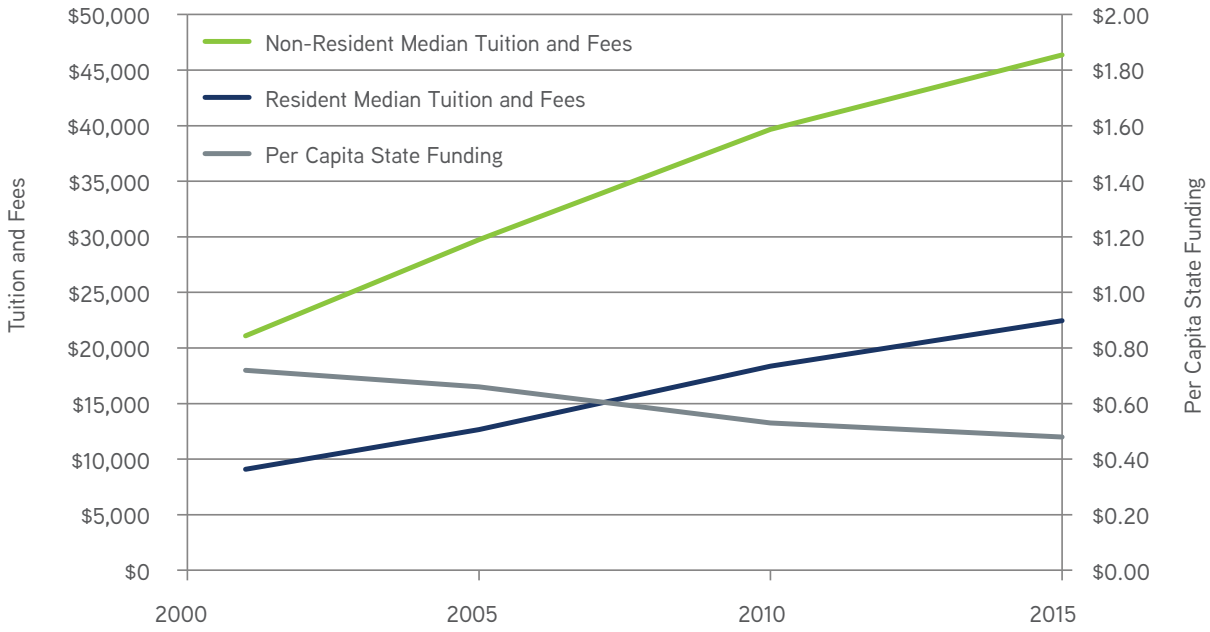



Figure 14

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.**

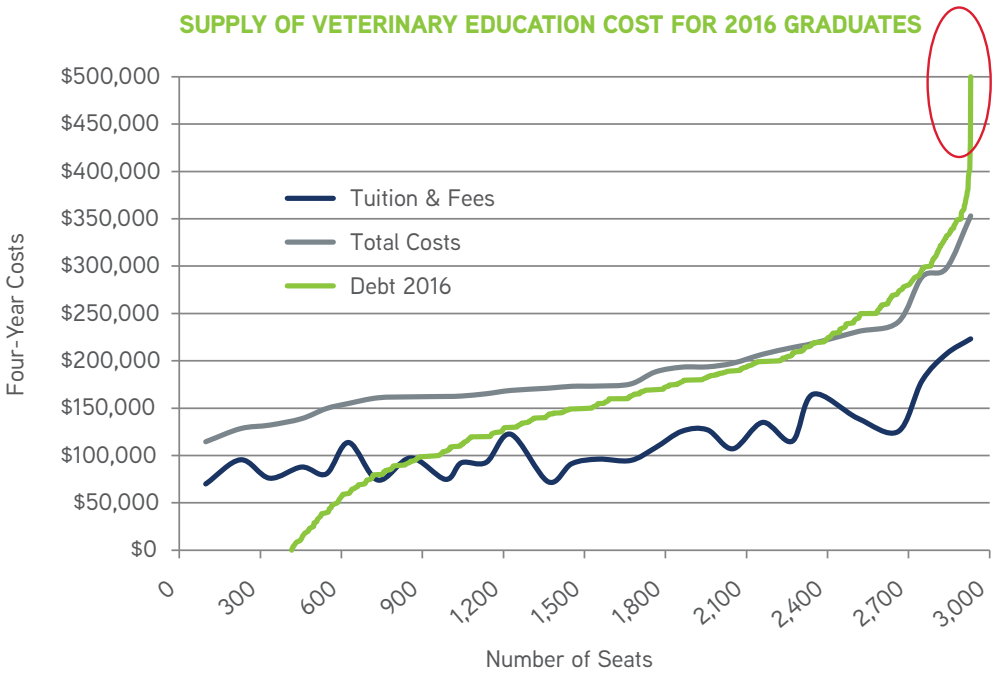



Figure 15

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.

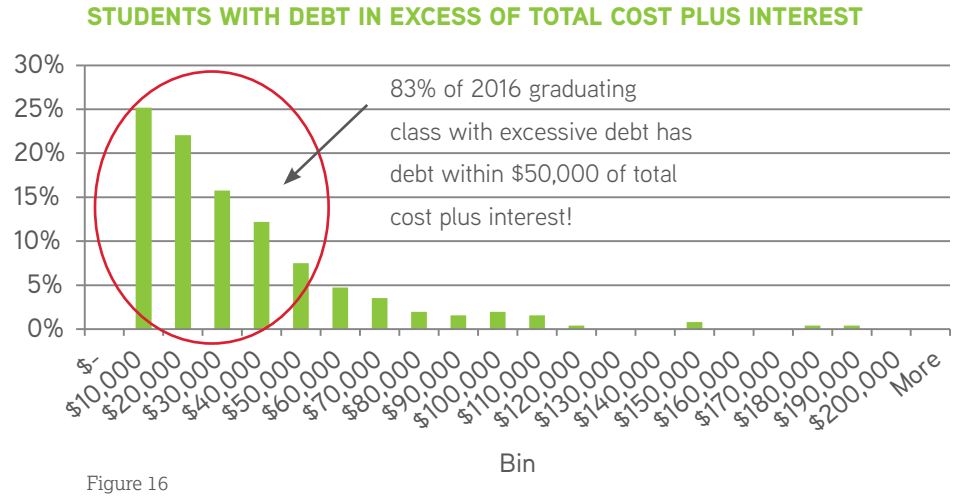



Figure 16

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.

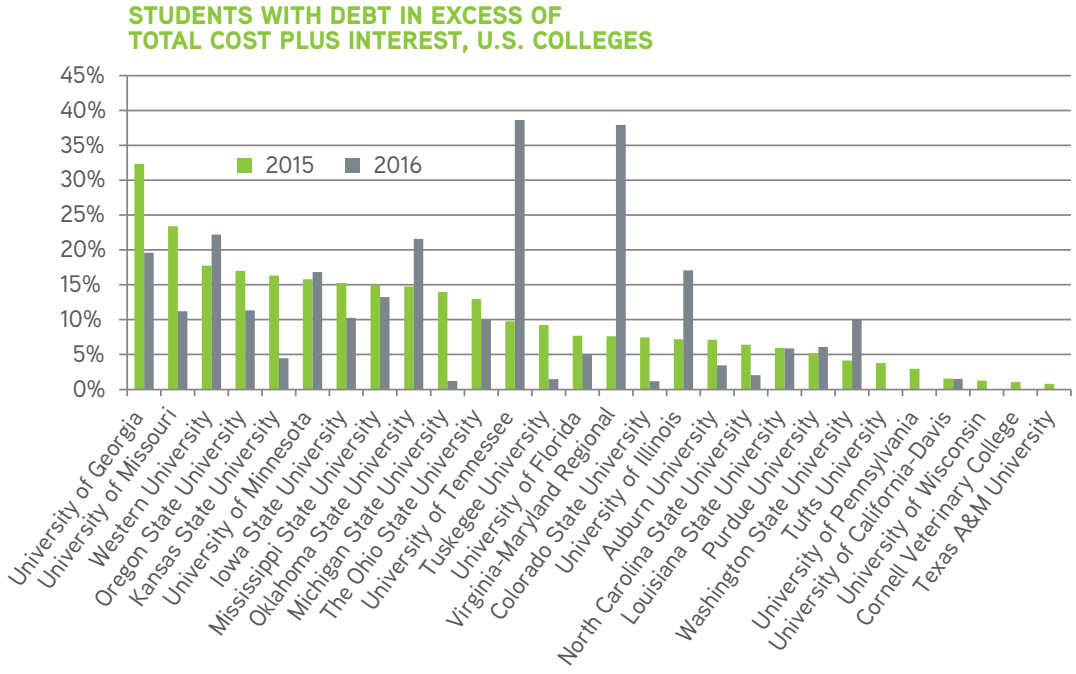



Figure 17

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 though 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.

**AAVMC VETERINARY SCHOOL APPLICANT FIGURES, 1980-2015**


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

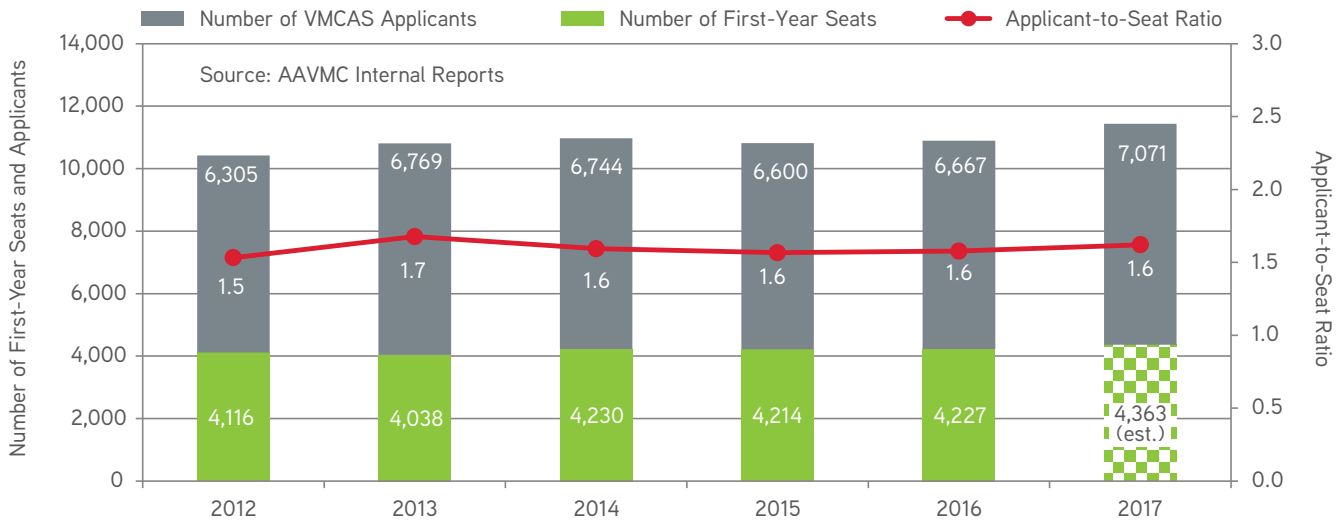



Figure 19

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).

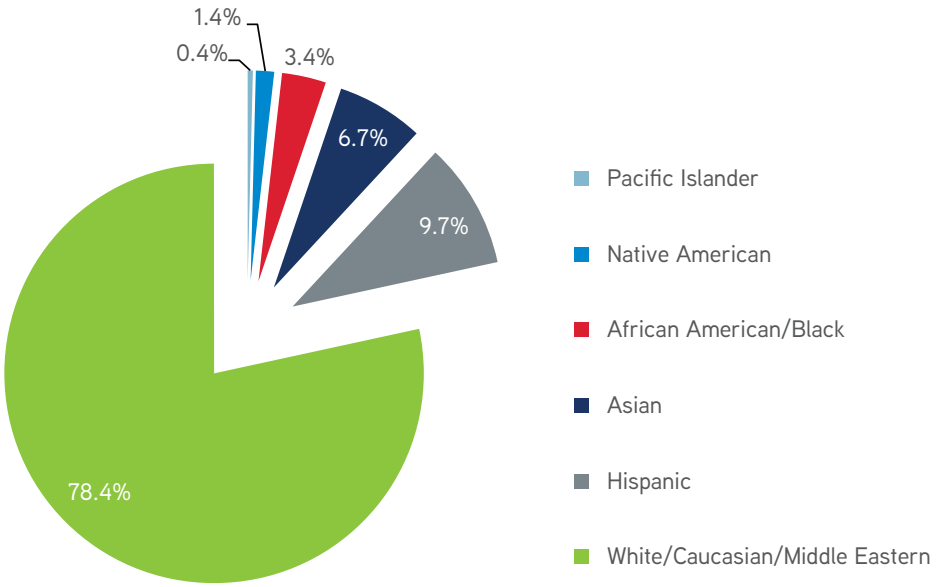
There is likely a threshold value for tuition costs that the average student is willing to pay (discussed below). Above this threshold, the number of applicants decreases, and recent analysis has shown that this threshold may be declining. Those schools whose total costs falling in the top 20th percentile 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**

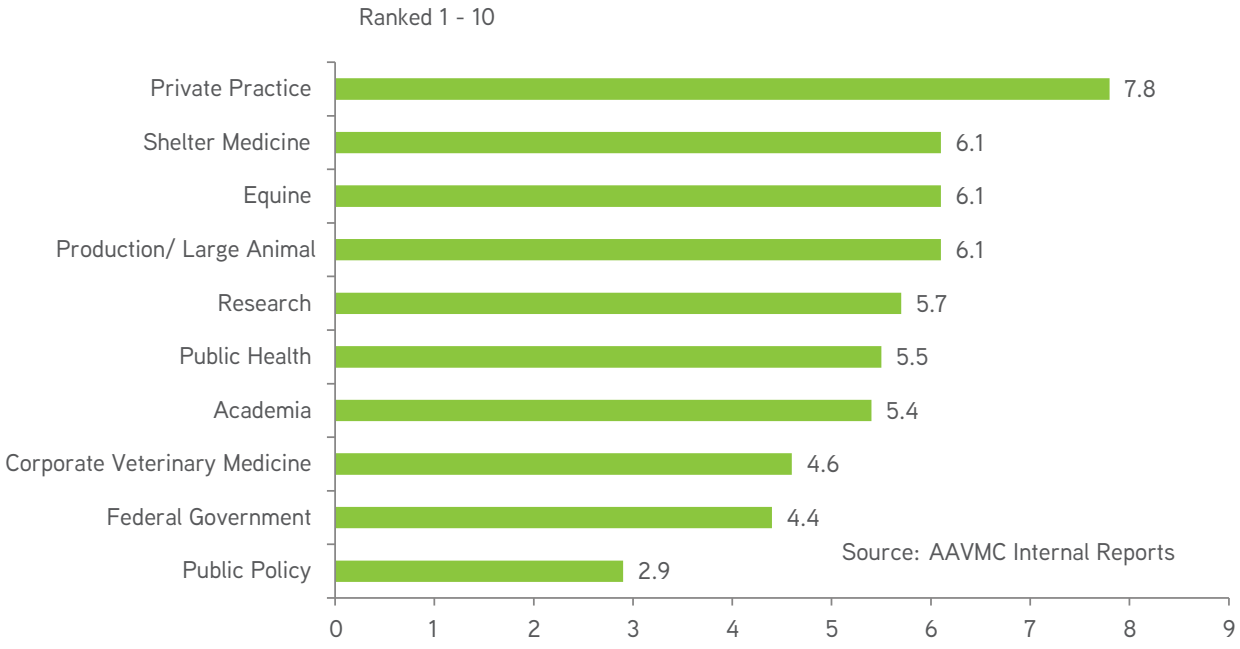



Figure 21

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

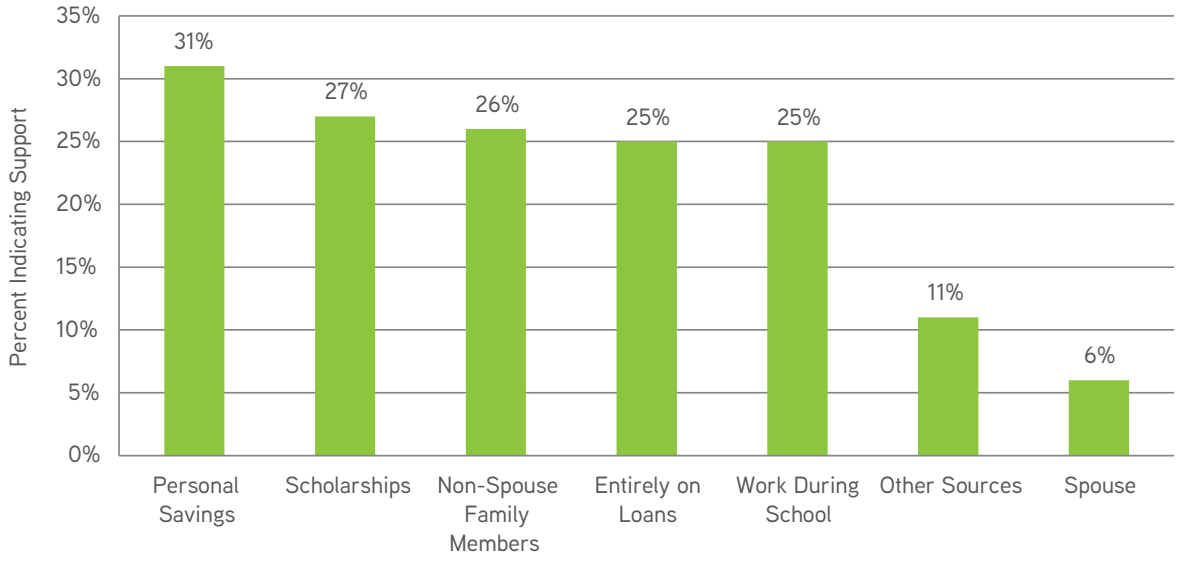



Figure 22

"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.

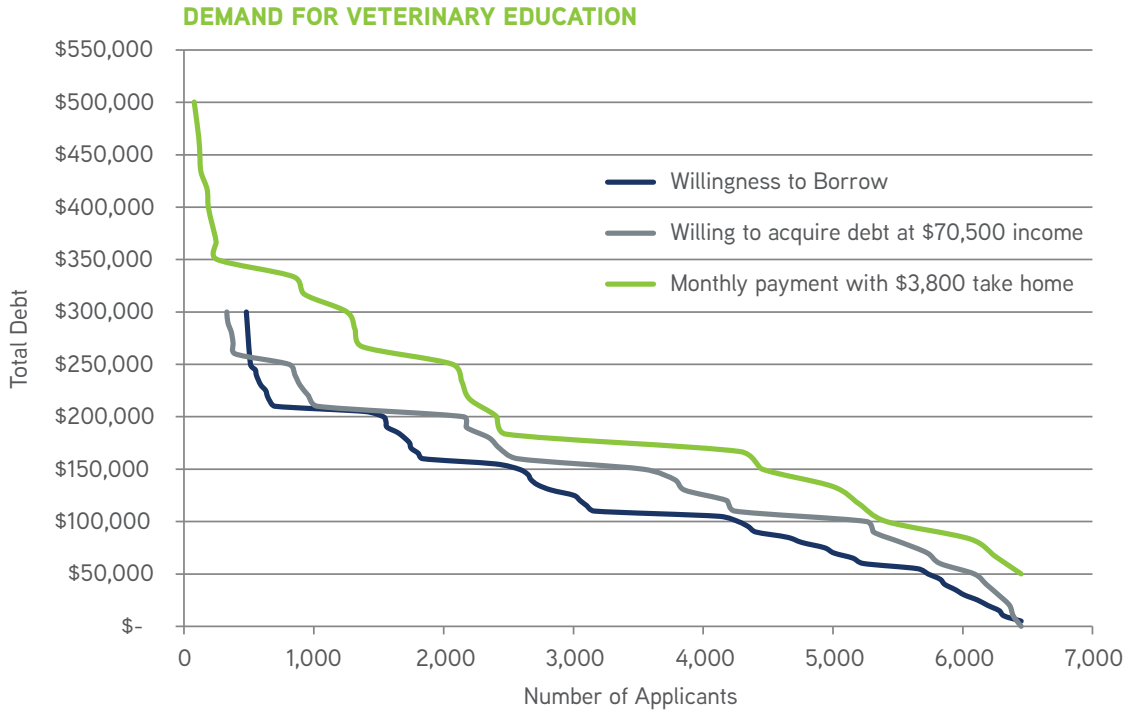



Figure 23

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**

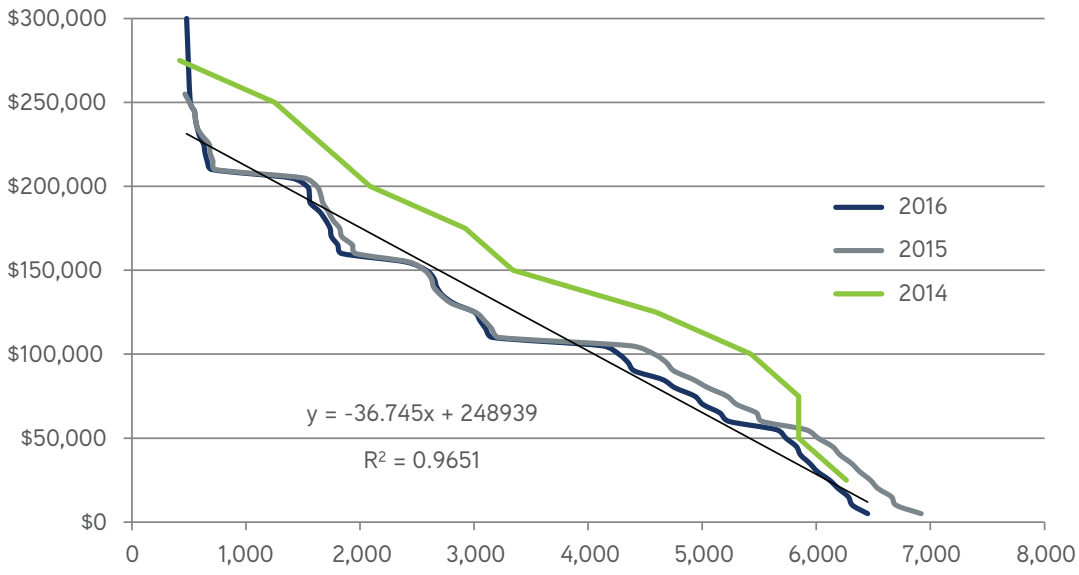



Figure 24

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.

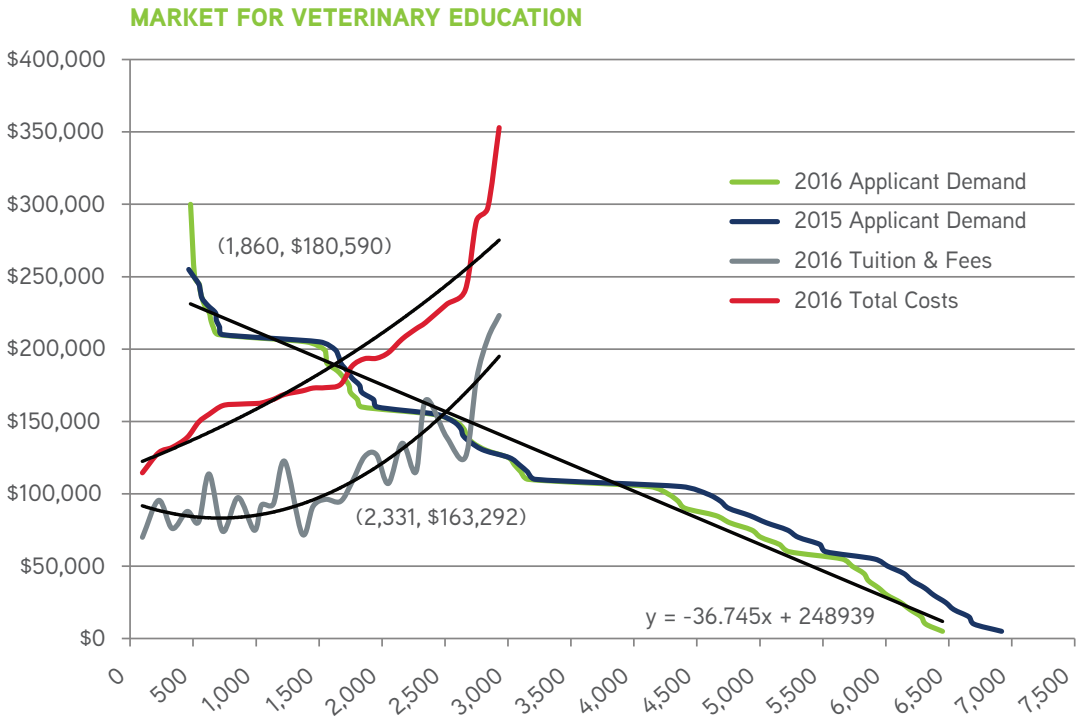



Figure 25

**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**

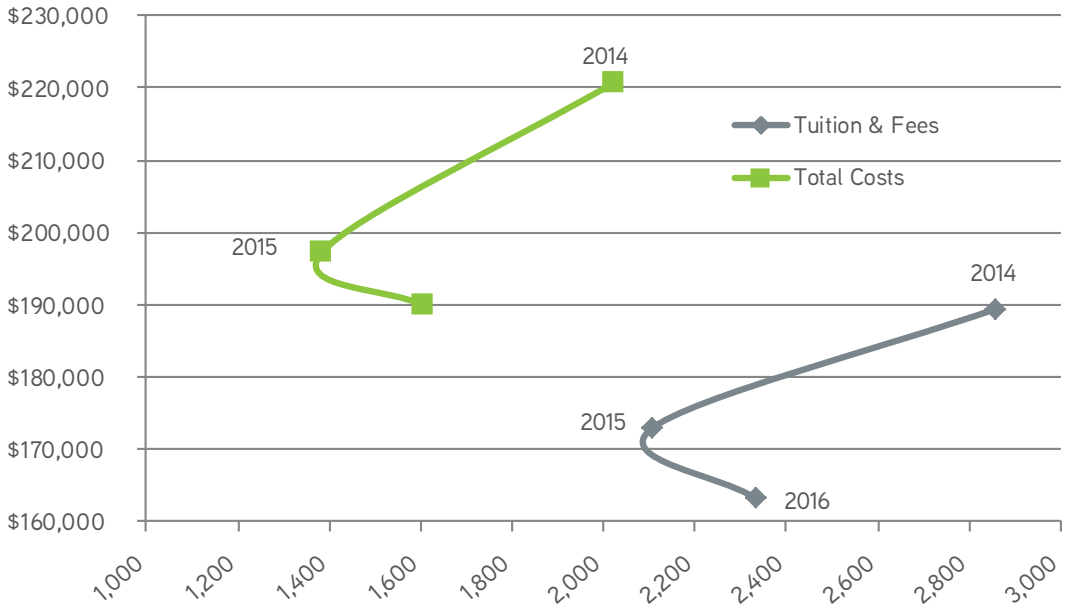



Figure 26

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

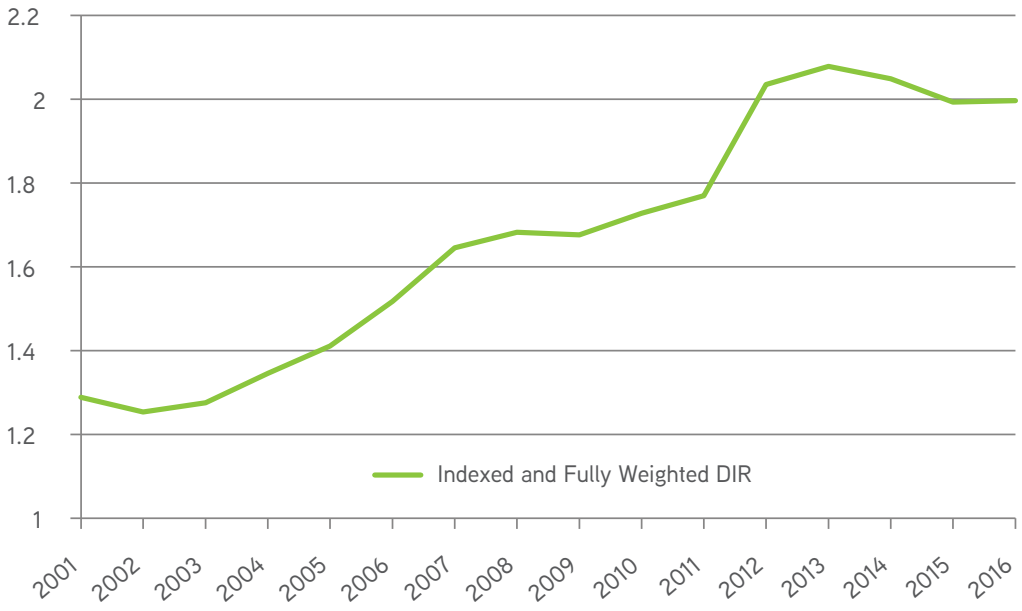



Figure 27

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

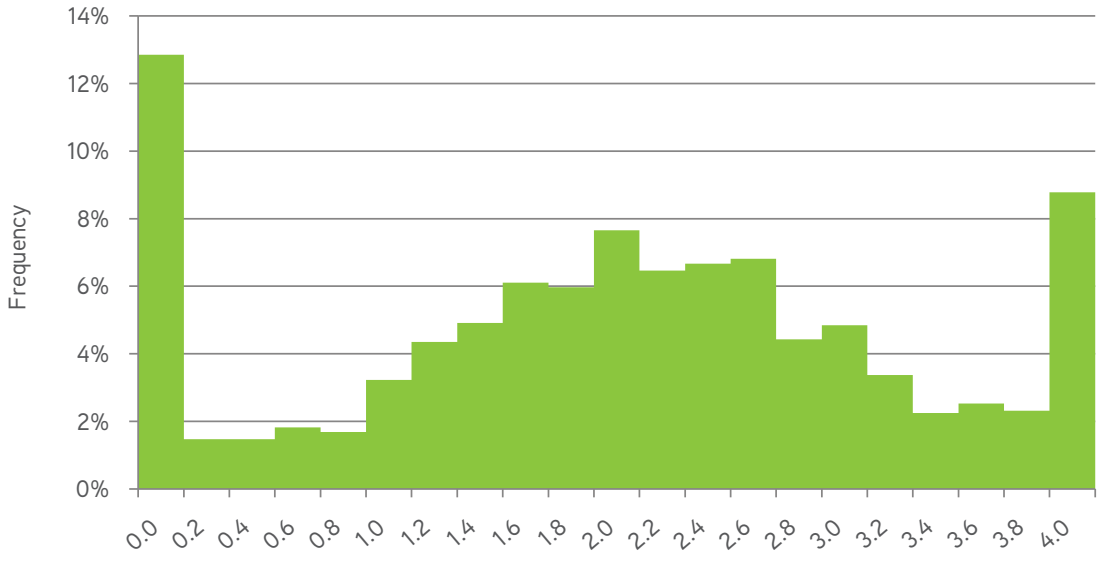



Figure 28

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**

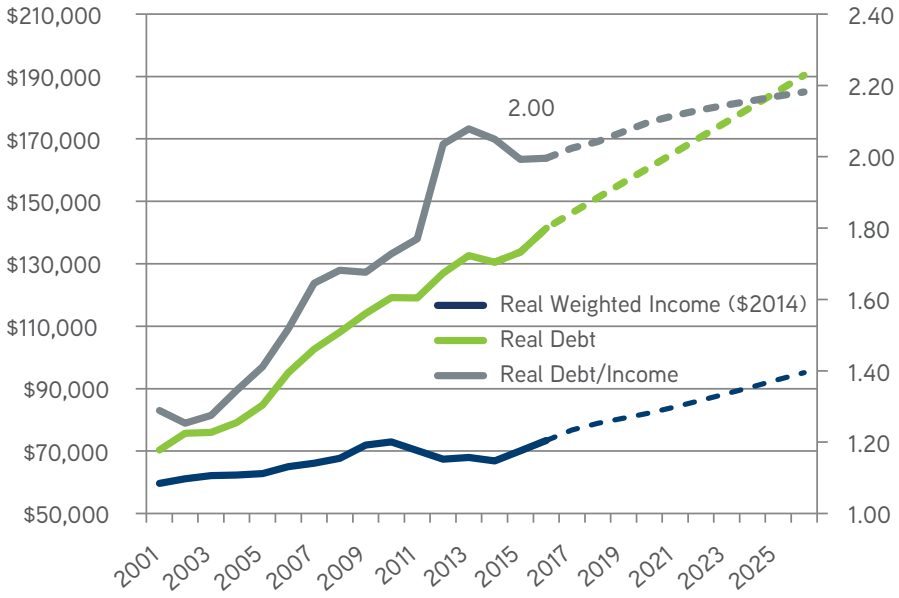



Figure 29

## 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.

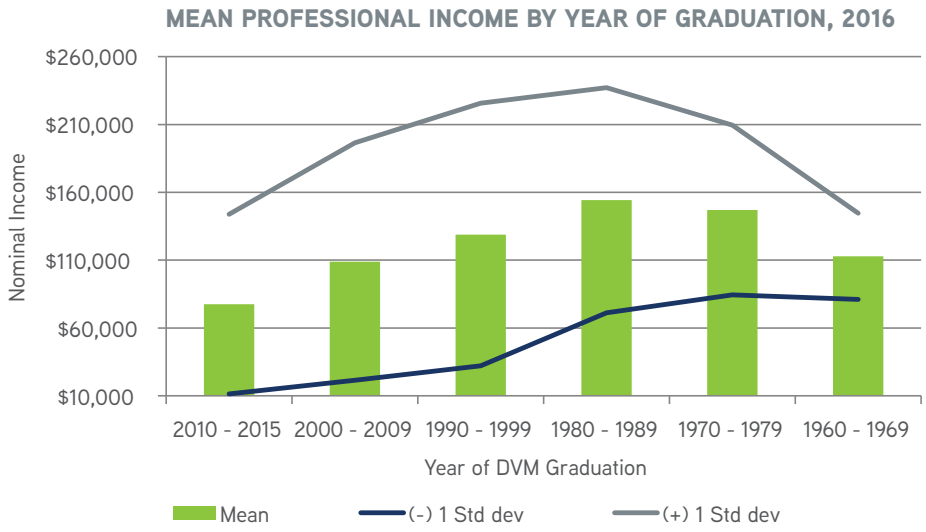



Figure 30

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.

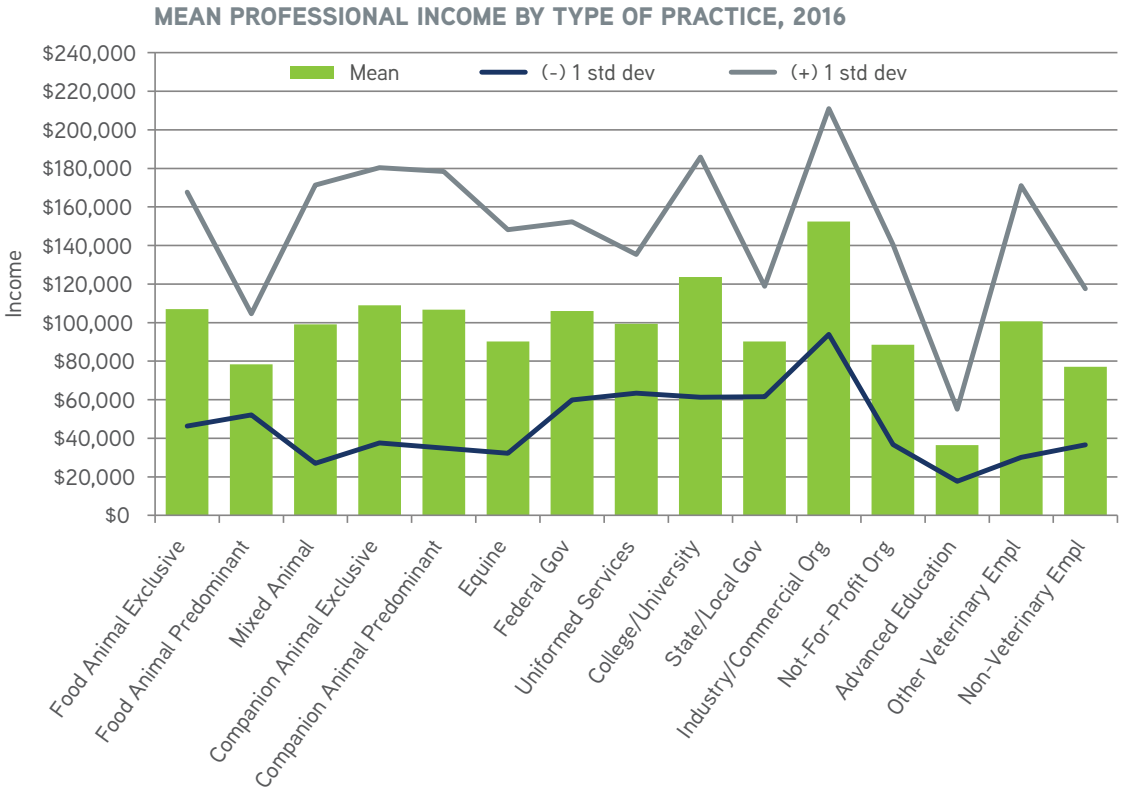



Figure 31

## 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.

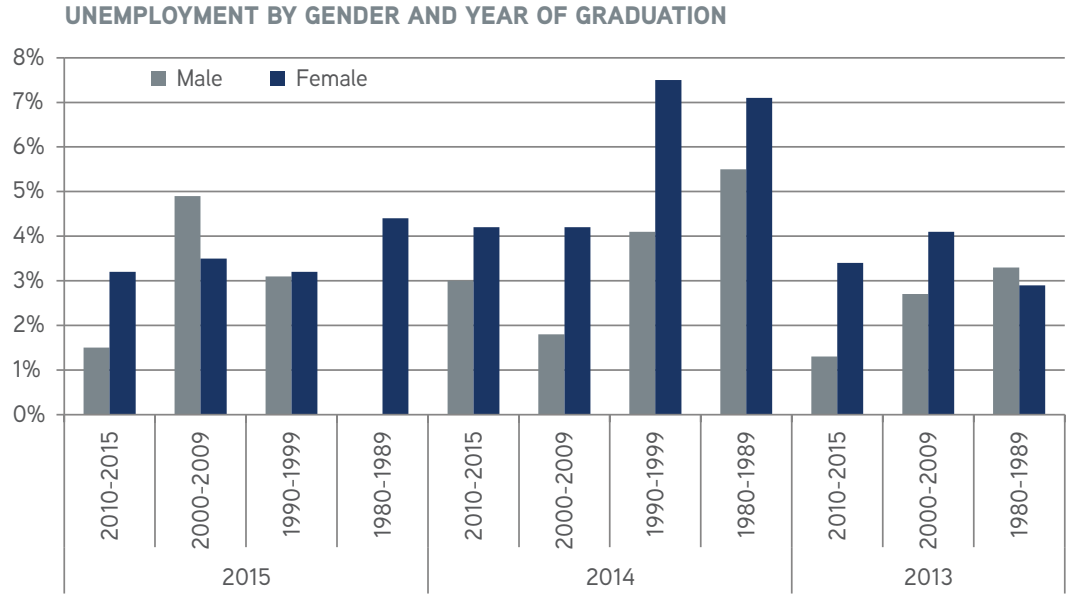


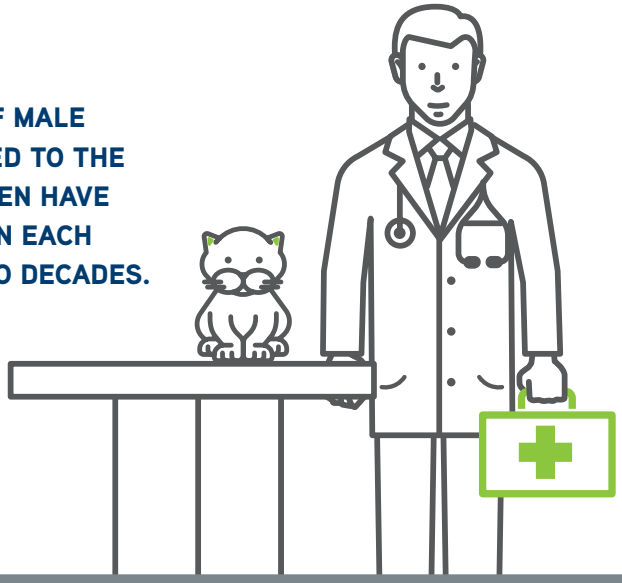

Figure 32

## 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.**



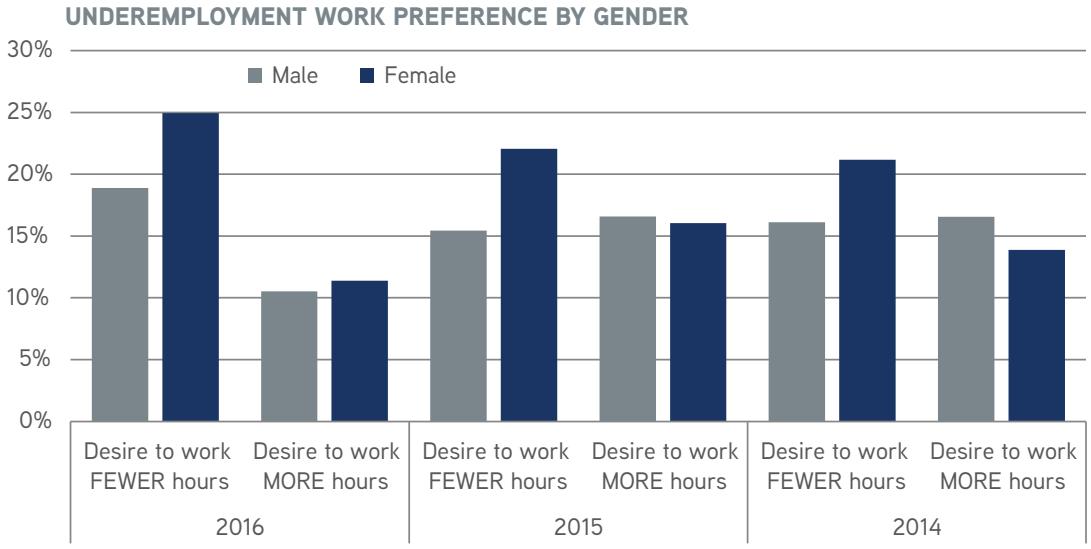



Figure 33

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.

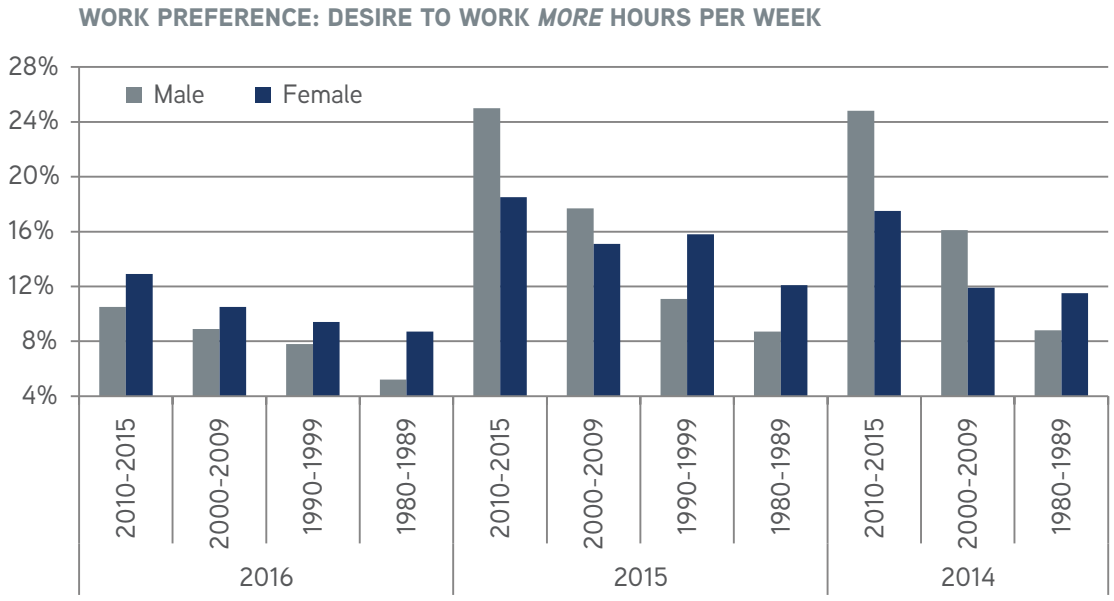



Figure 34

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**

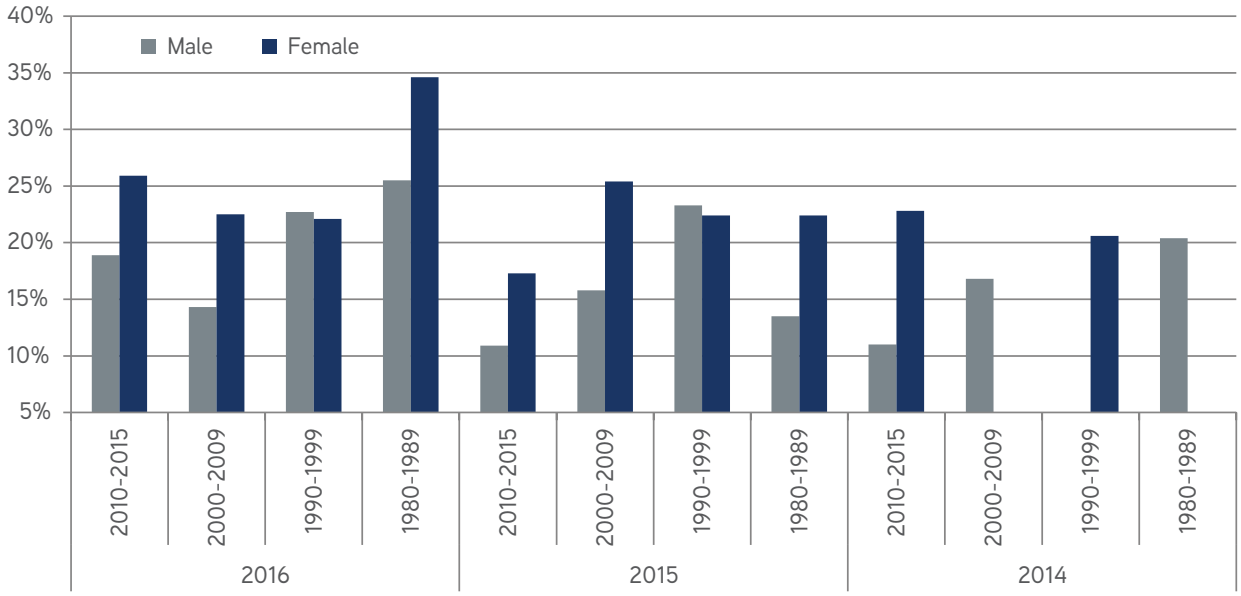



Figure 35

**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

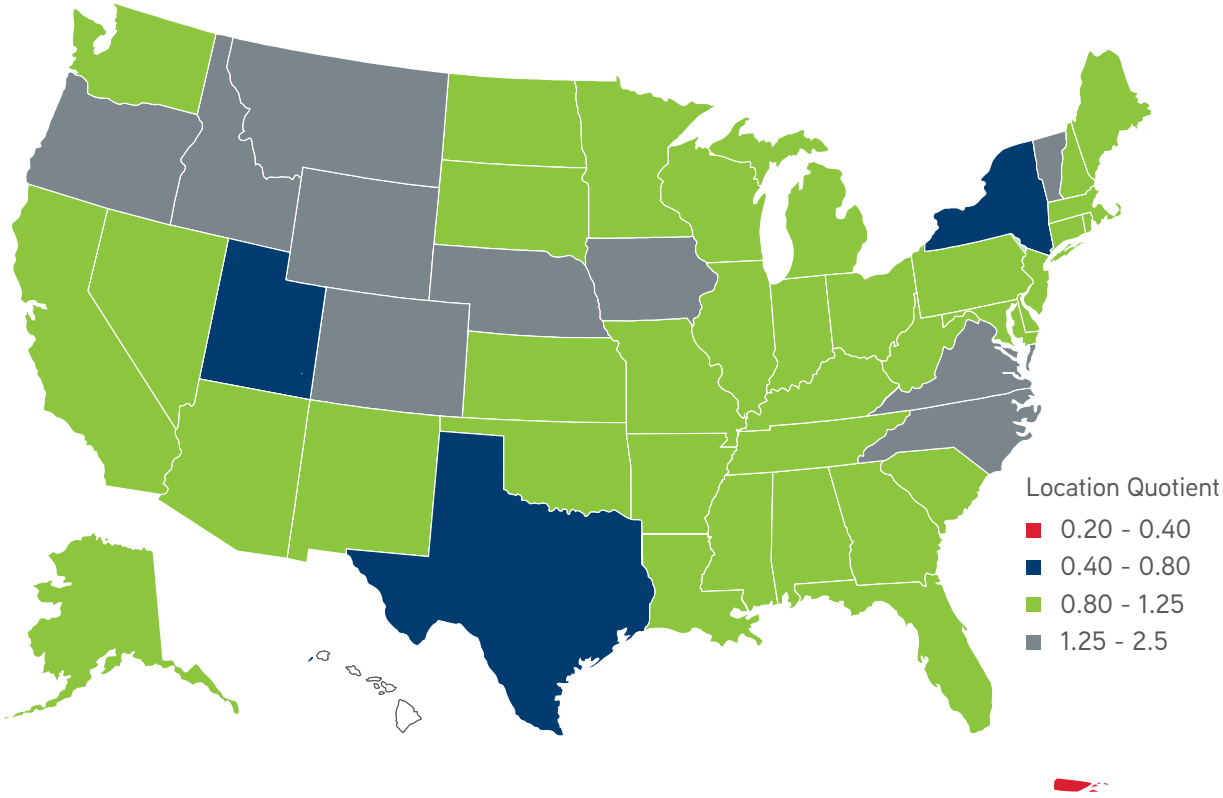



Figure 36

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**

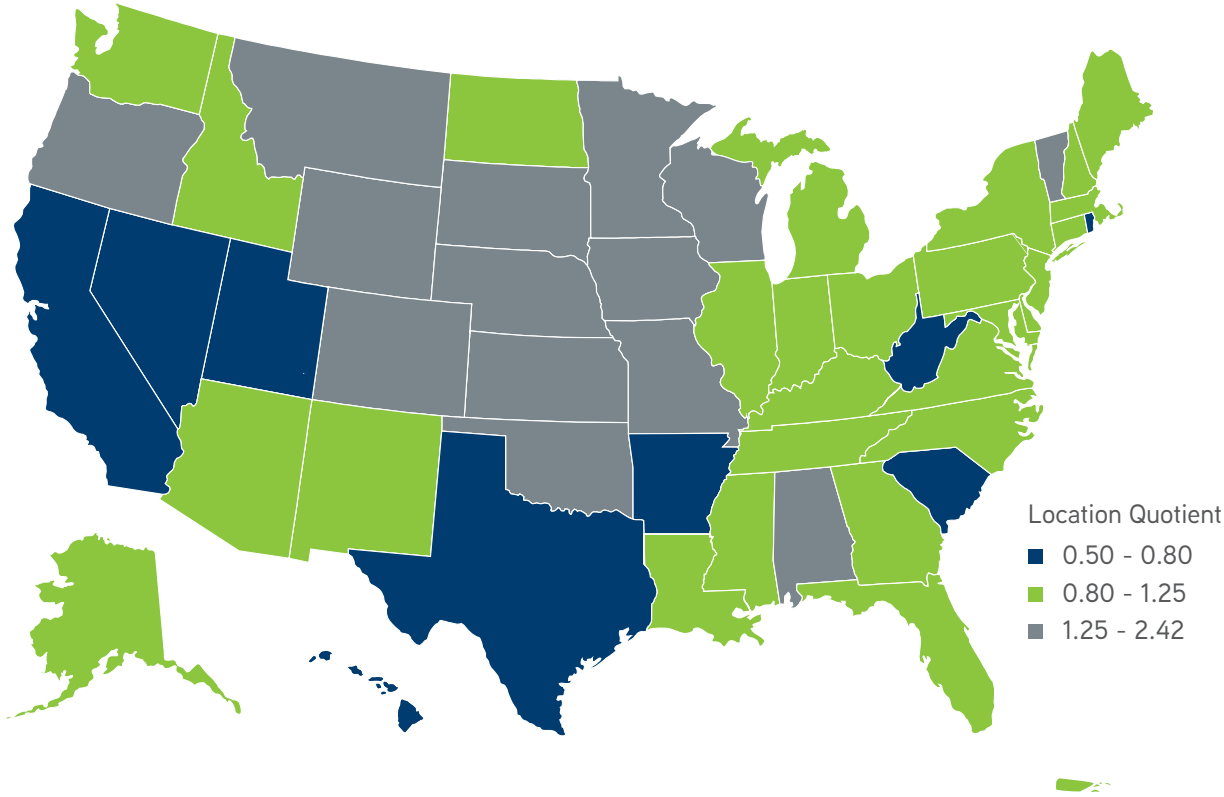



Figure 37

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.

**LOCATION QUOTIENT OF NEW VETERINARIANS BY STATE, 2016**

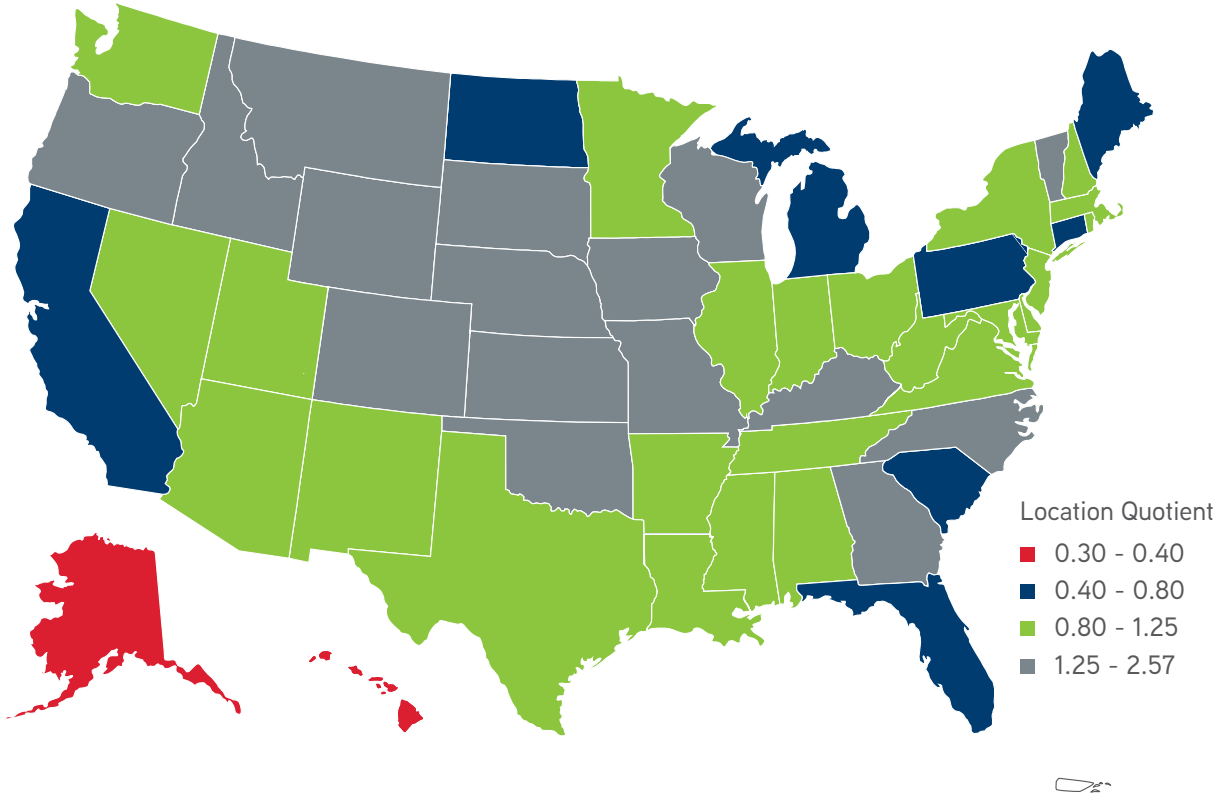



Figure 38

## 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]

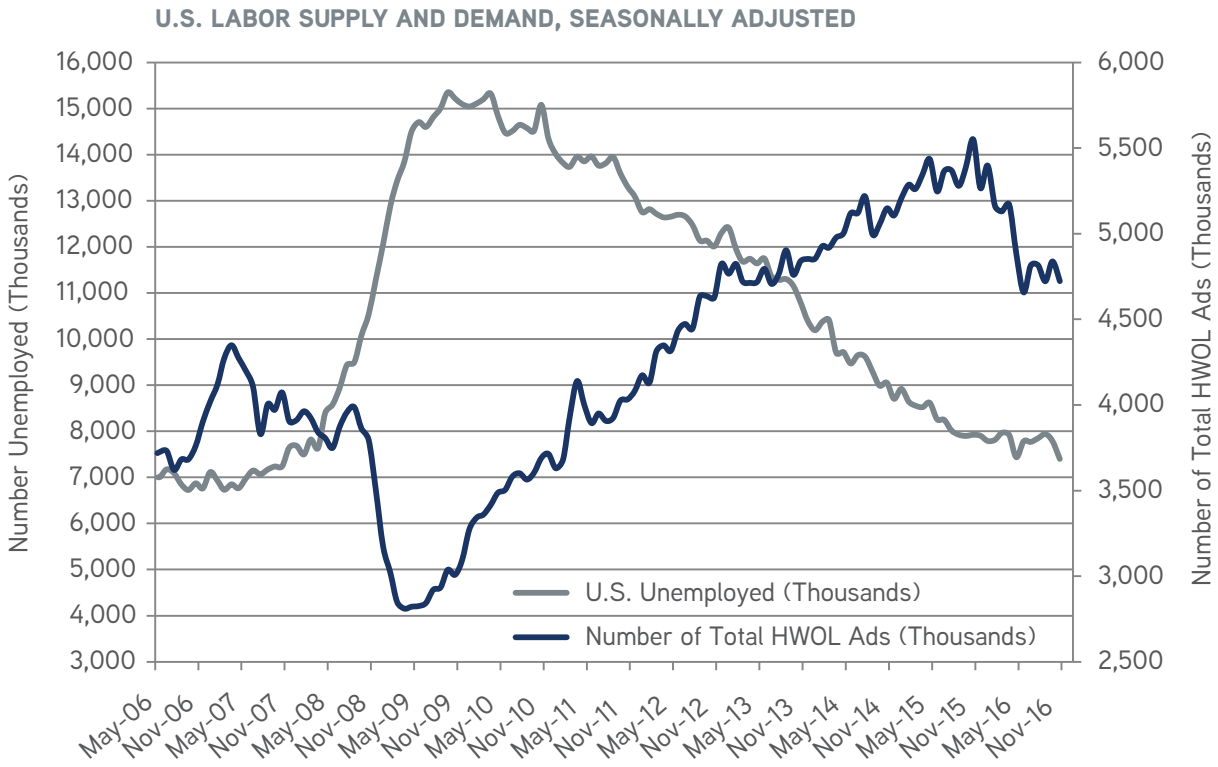
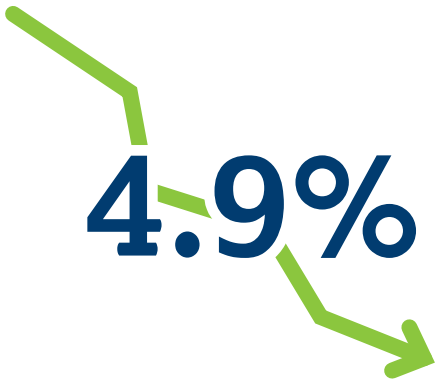



Figure 39




**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.**

[1]https://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.

**VETERINARY CAREER CENTER JOBS AND APPLICANTS**

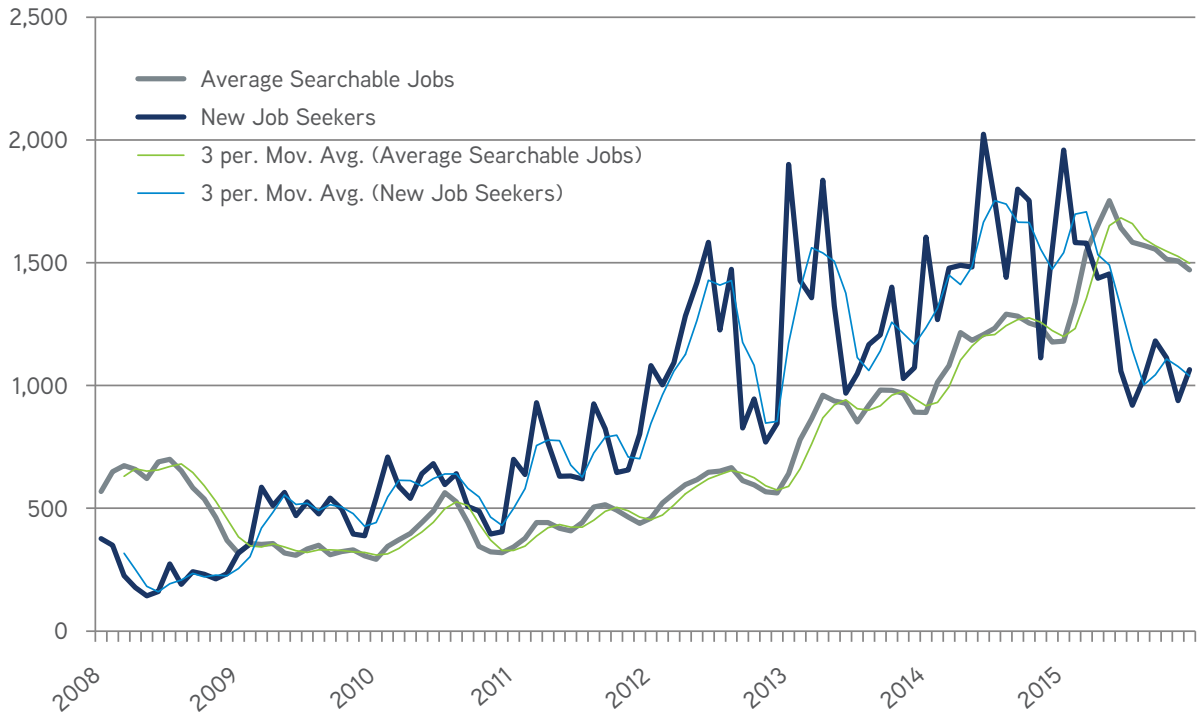



Figure 40

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**

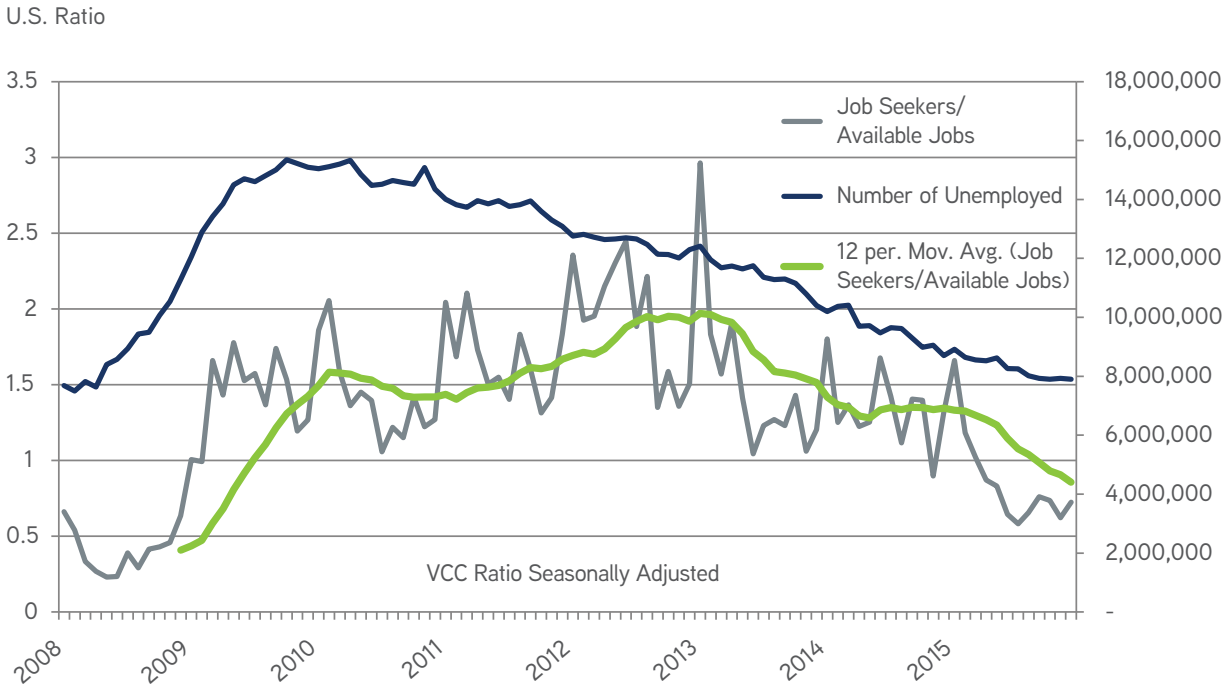


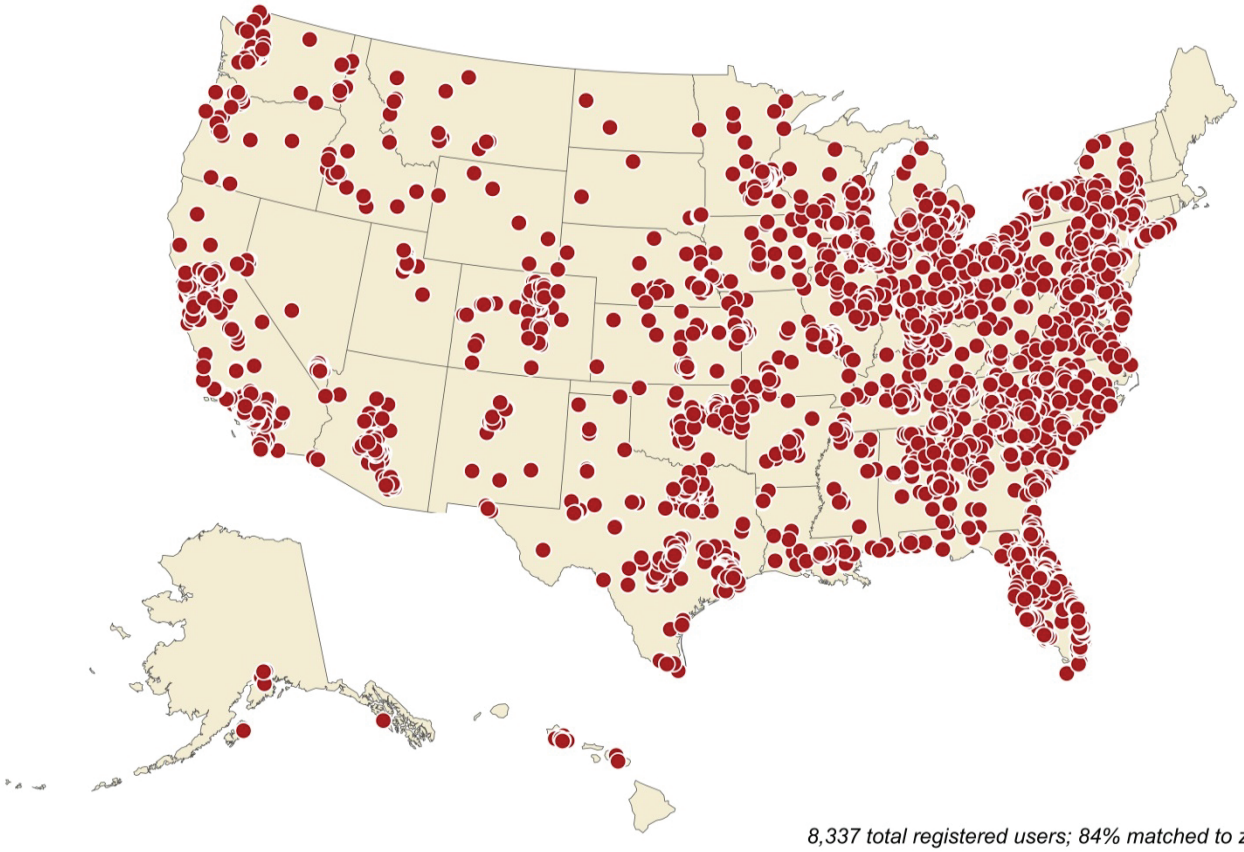

Figure 41

**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.

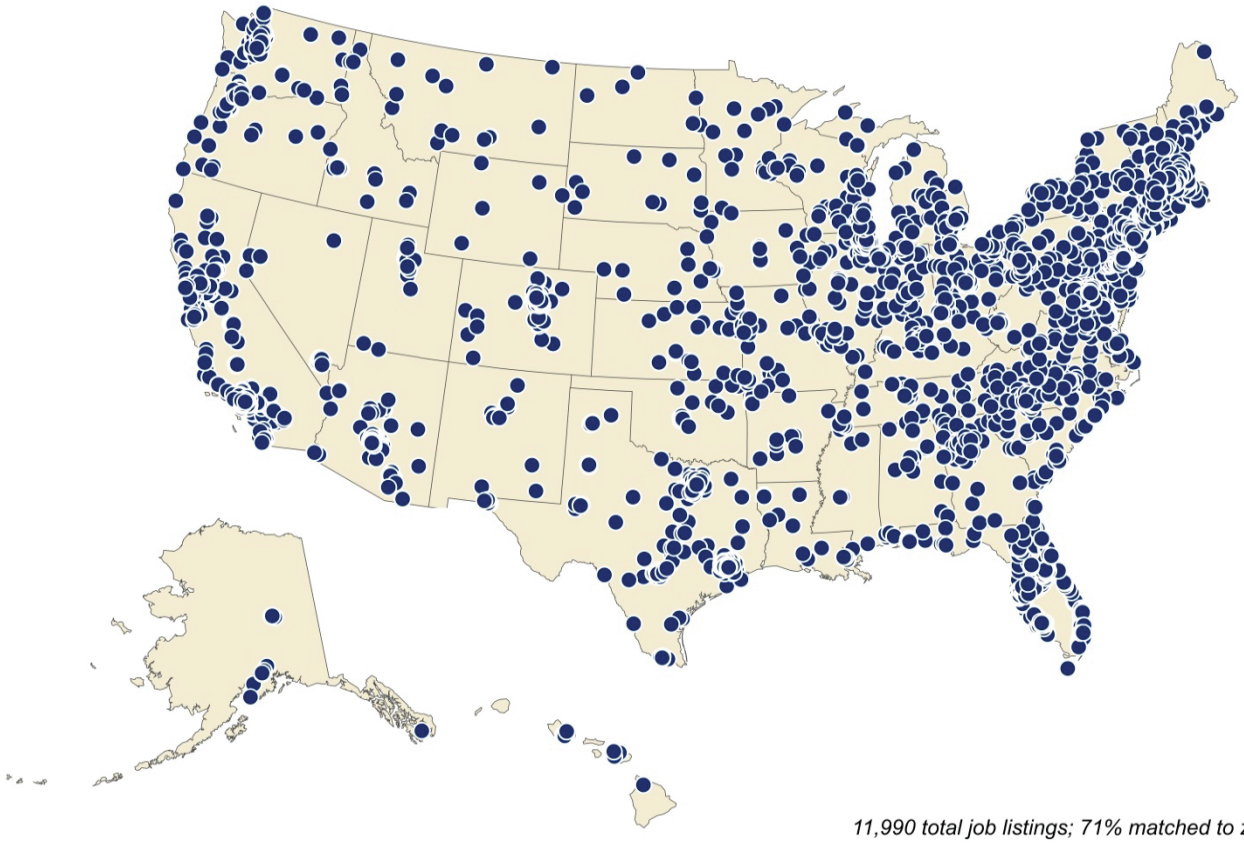
**VCC REGISTERED USERS, 2016**



*8,337 total registered users; 84% matched to zip code.*

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**

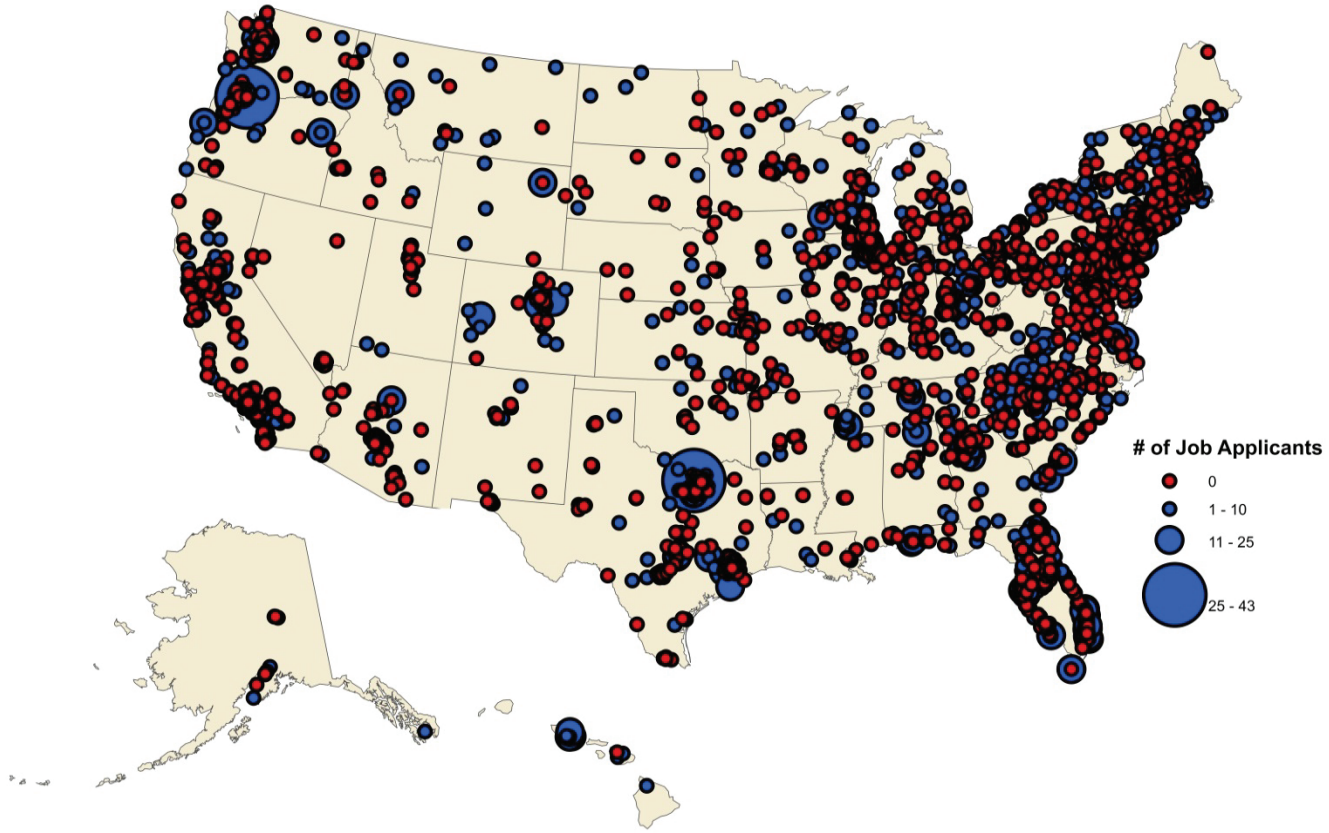



Figure 44

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.

**VCC APPLICANT-TO-AVAILABLE-JOBS RATIO, 2016**

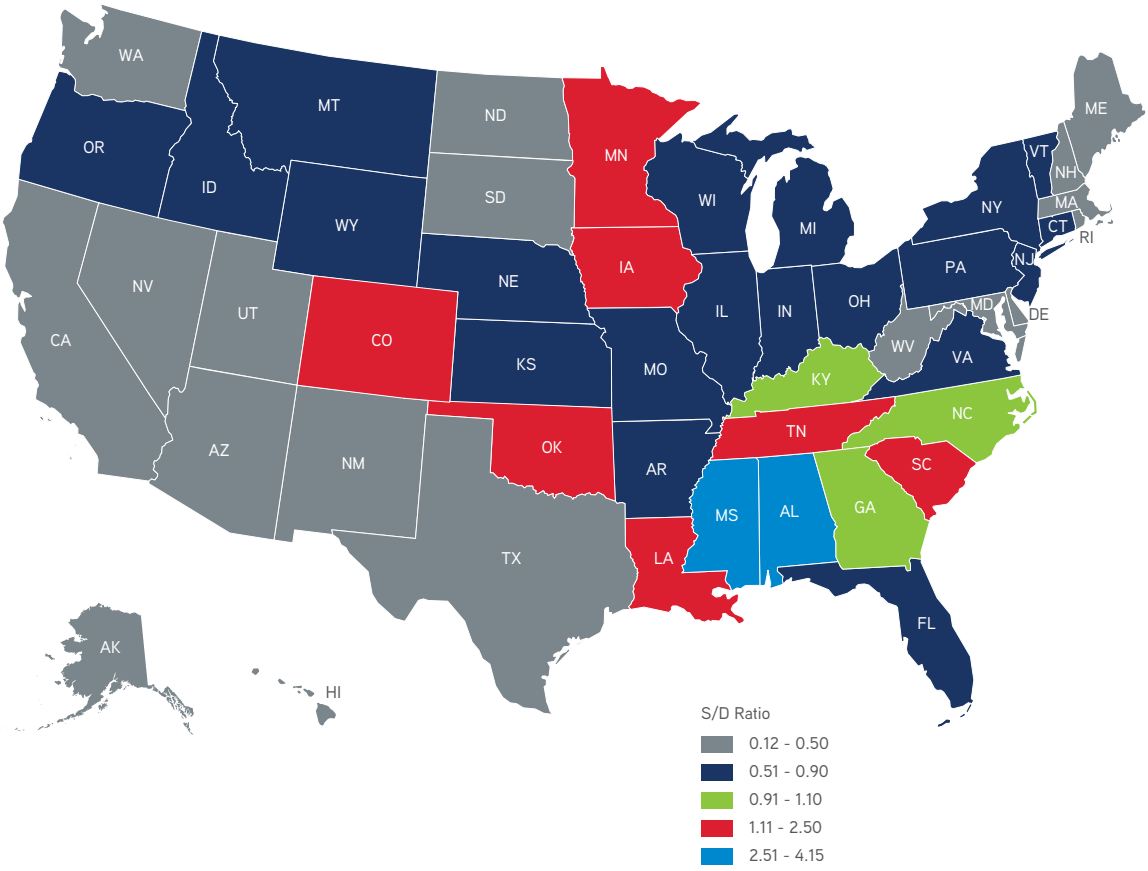



Figure 45

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 ProQoL[2] 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

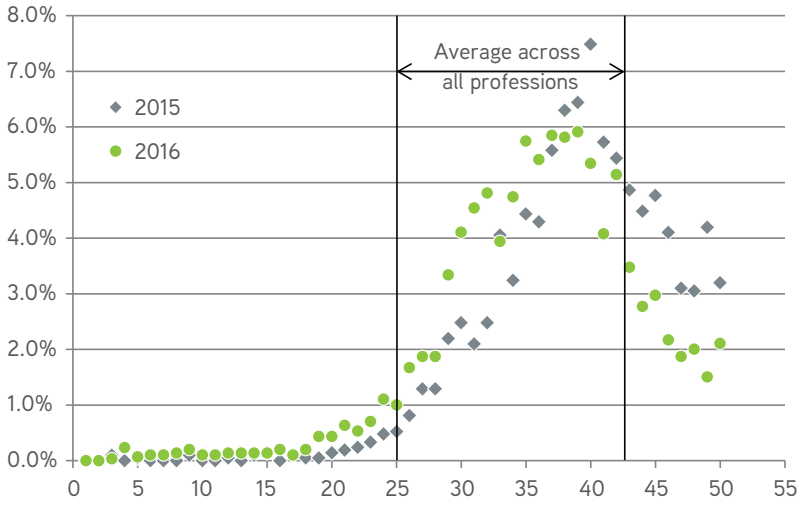



Figure 46

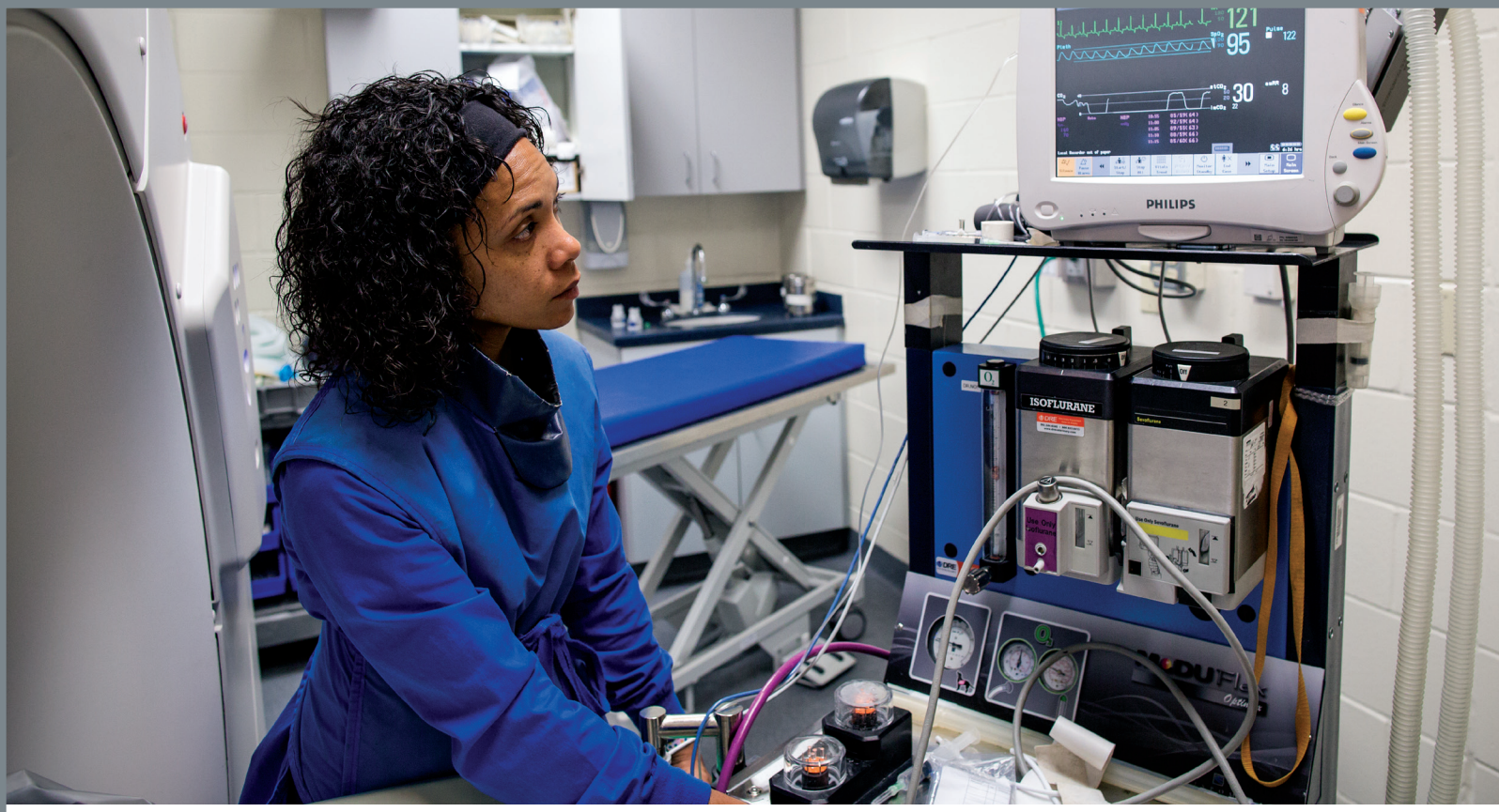
Looking at what factors are associated with low compassion satisfaction, a multiple linear regression was conducted with the variables that were felt might contribute to the variation in compassion satisfaction or compassion fatigue. The result of this analysis indicated that only two factors, satisfaction 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**

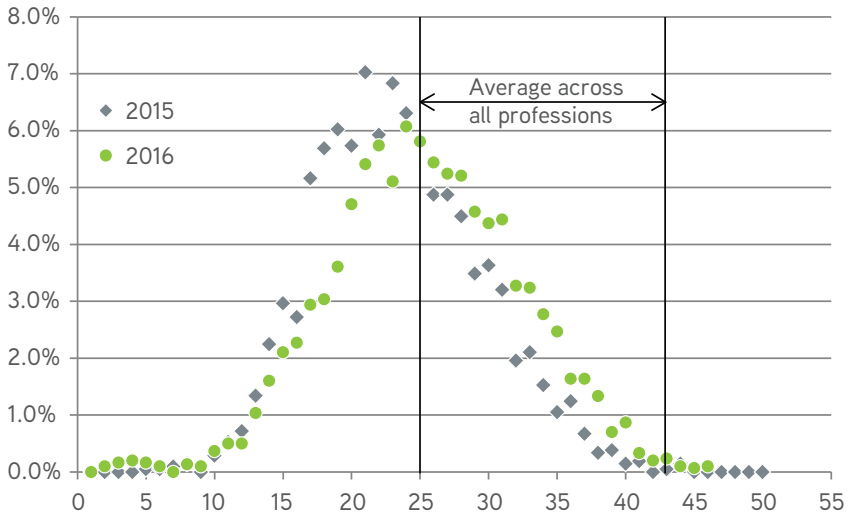



Figure 47

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

| | 2016 | | 2015 | |
|---|---|---|---|---|
| **Dependent Variable: Burnout Scale** | **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.

### SECONDARY TRAUMATIC STRESS SCORE DISTRIBUTION

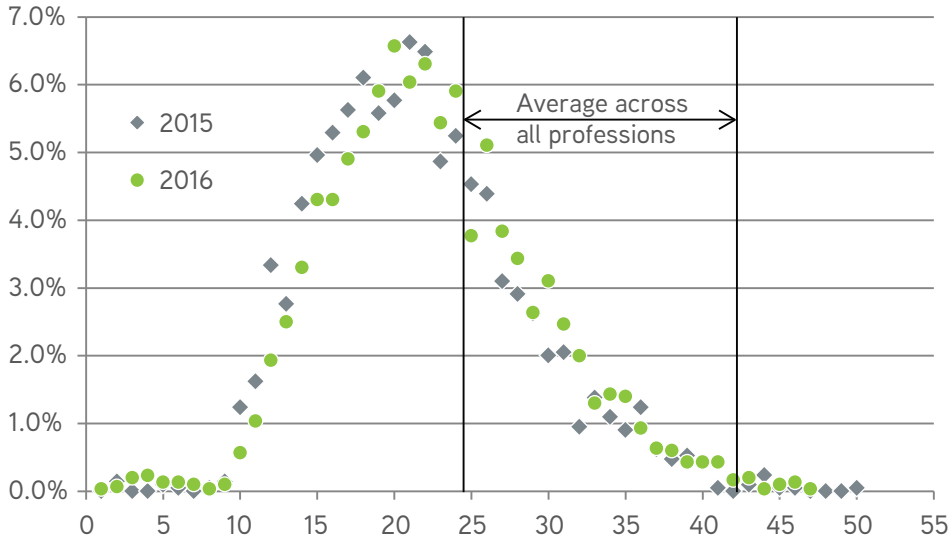



Figure 48

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 | | 2015 | |
|---|---|---|---|---|
| | Coefficient | P Value | Coefficient | P Value |
| 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.

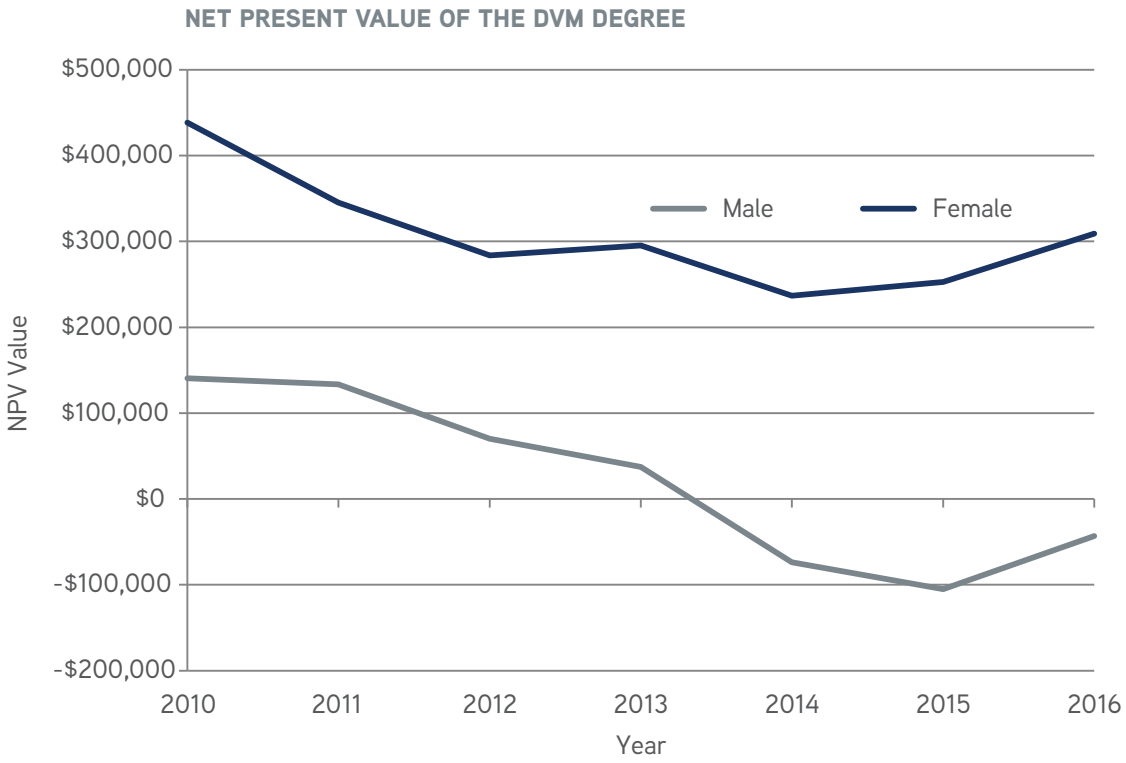



Figure 49

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.

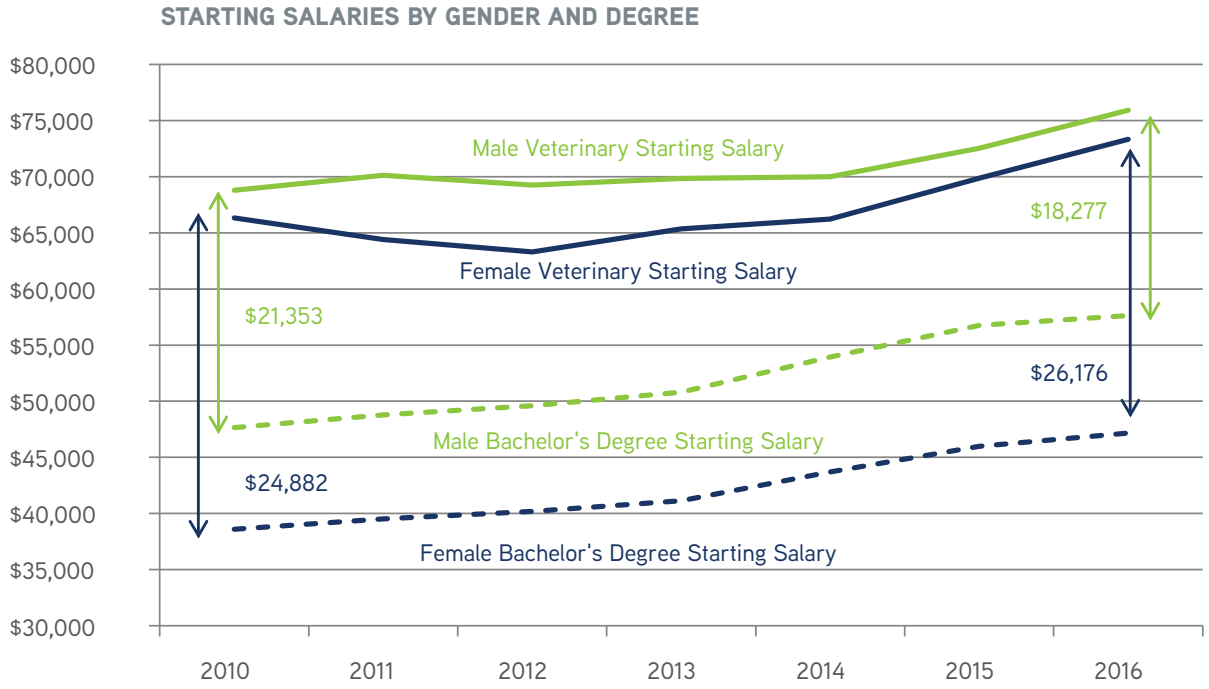



Figure 50

## 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 facilty 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**

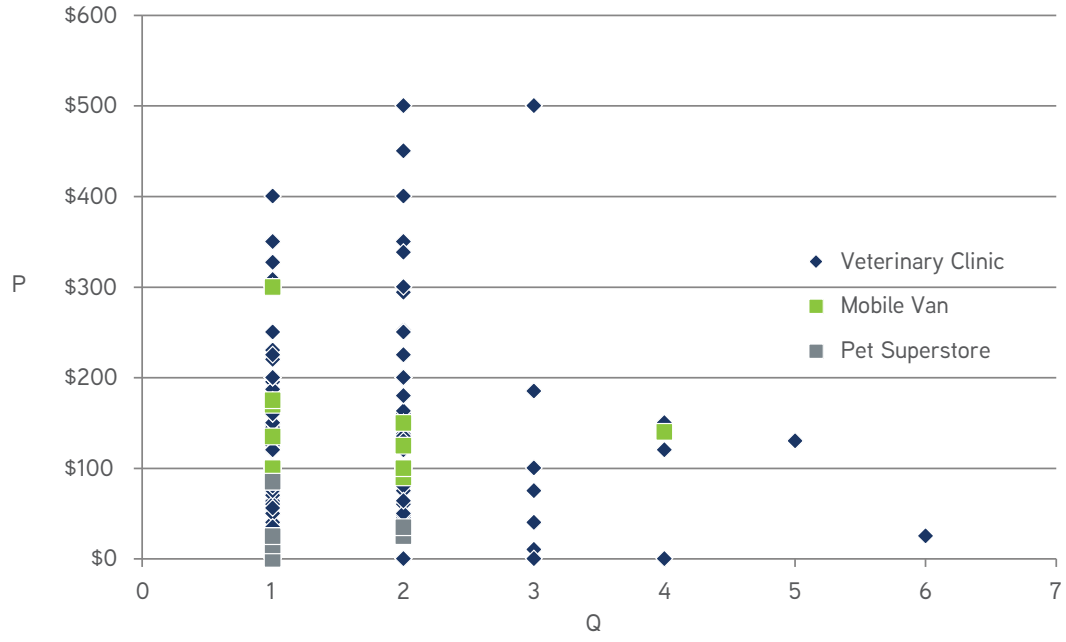



Figure 51

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.

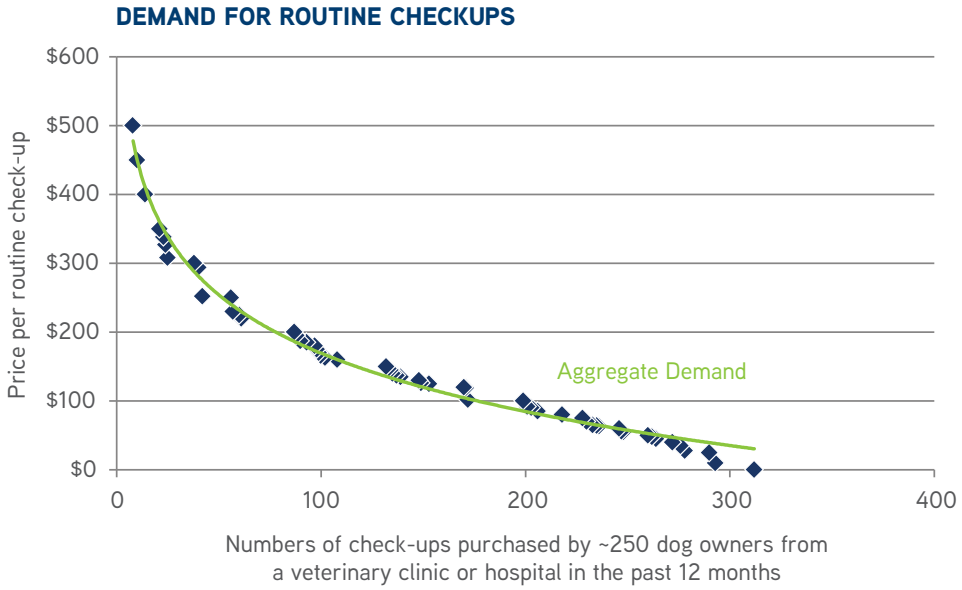



Figure 52

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.

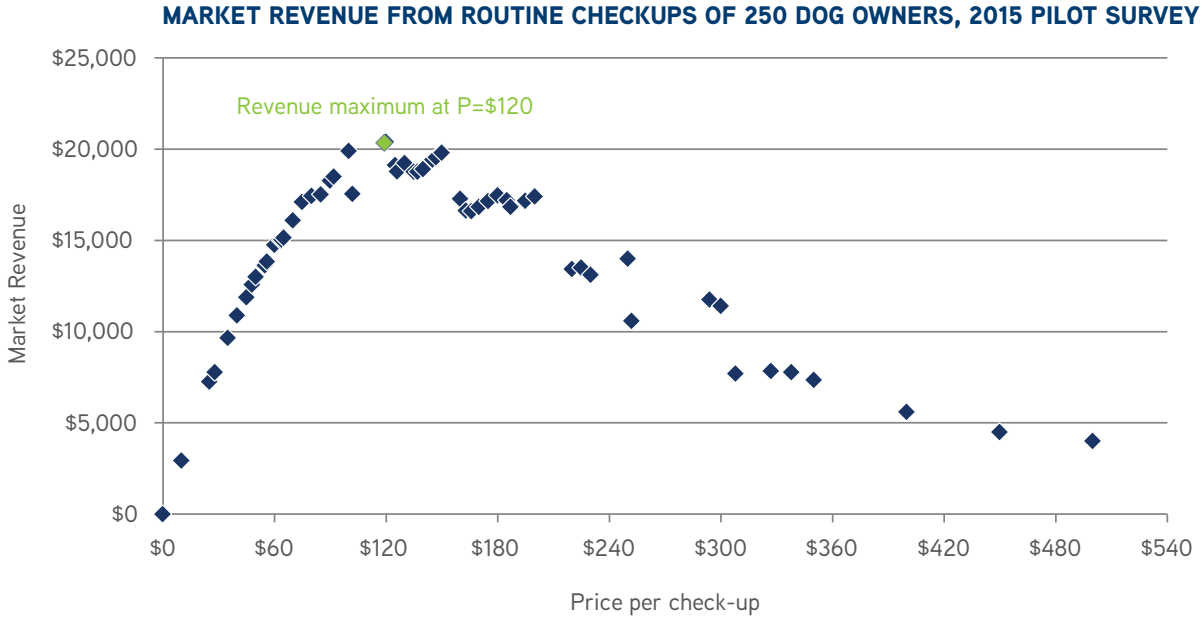



Figure 53

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

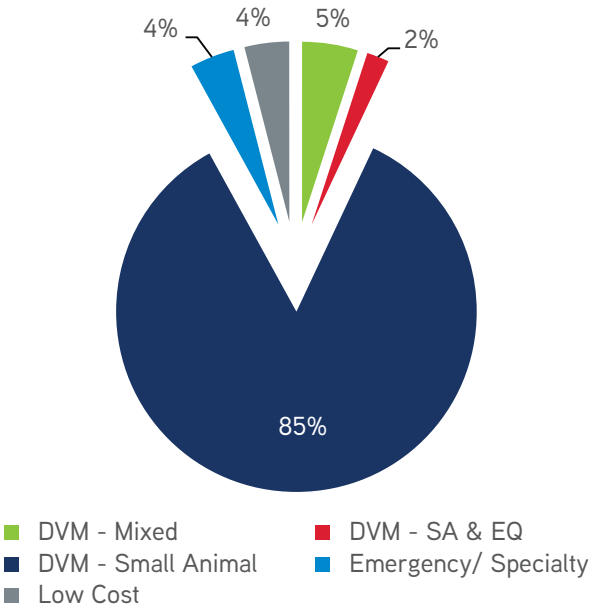
AVMA's VED and collaborators began research on the equine and bovine veterinary markets in 2016. Surveys of veterinary practitioners in these two segments of the profession were fielded and additional research is underway to measure the demand for veterinary services in these two segments and begin to 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, Animalytix 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**

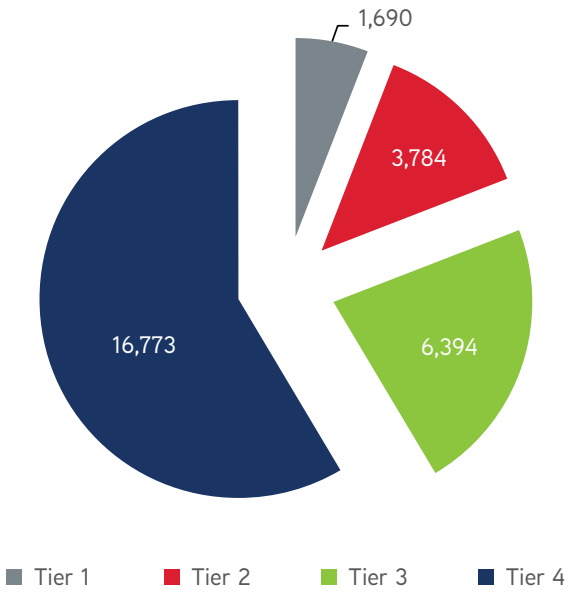



Figure 55

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. Animalytix 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

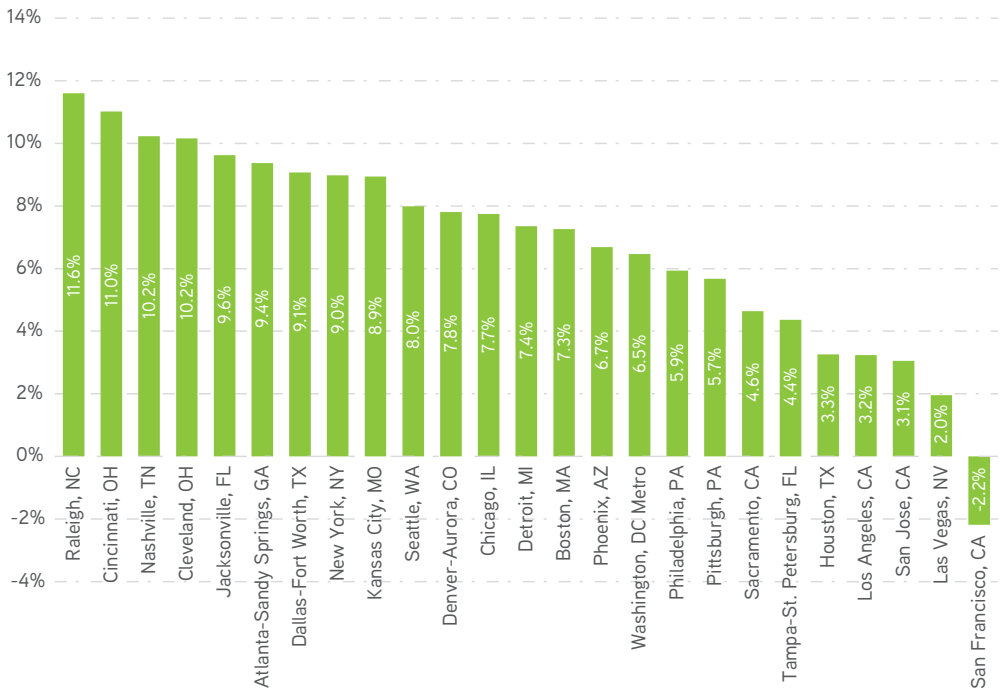



Figure 56

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

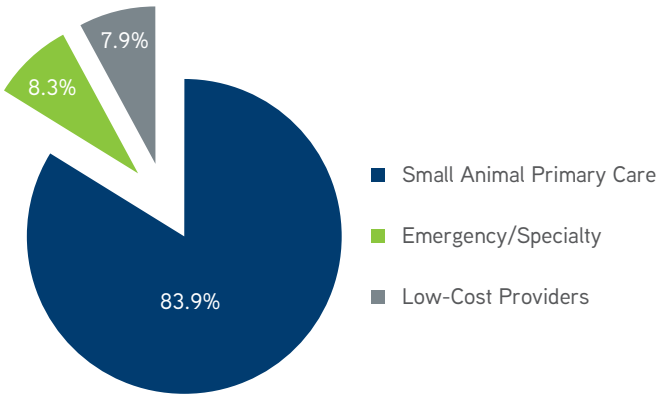
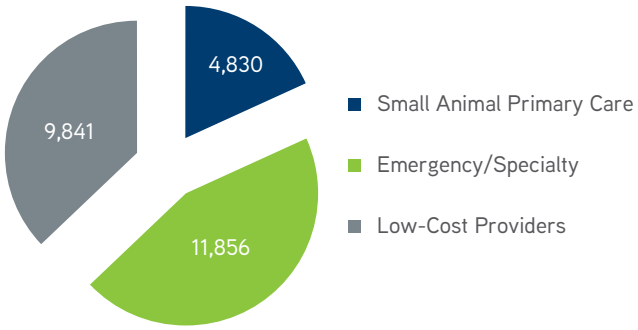



Figure 57

## 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.

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

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 University[5] 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

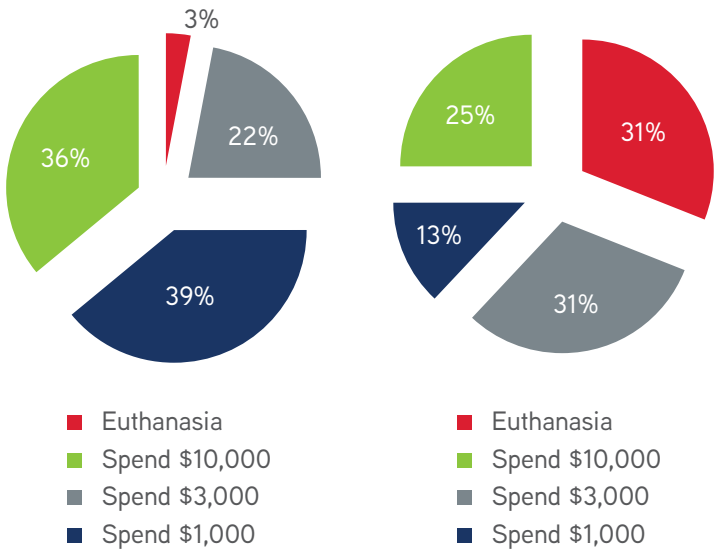



Figure 58

[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 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.

## 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 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)**

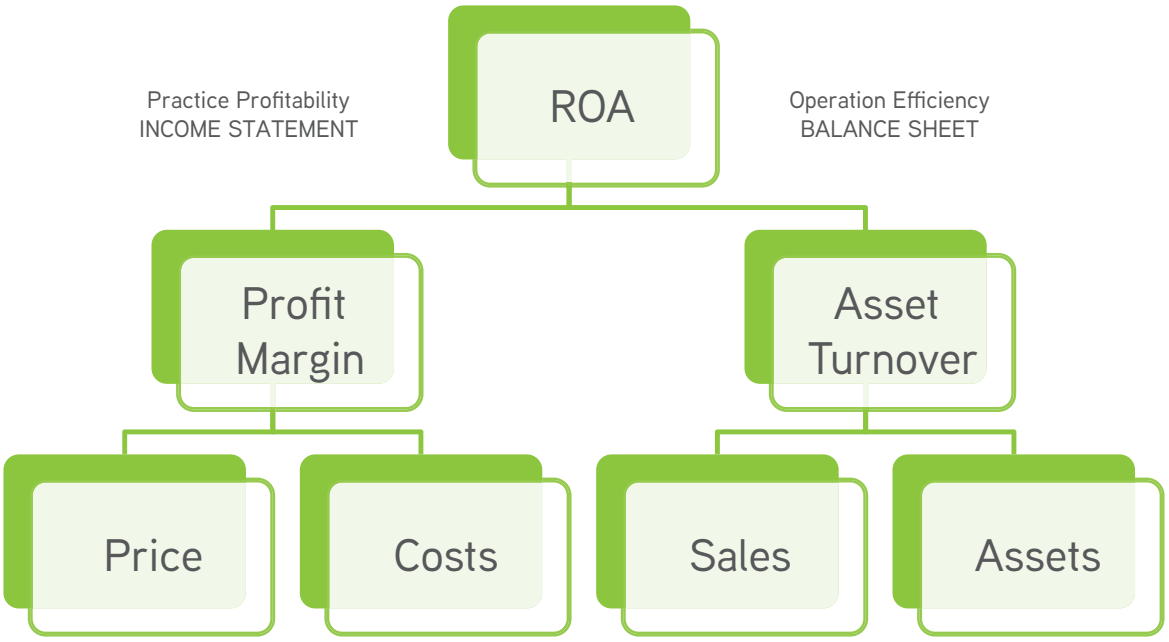



Figure 59

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 & 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.

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