



2016 AVMA Report on
**VETERINARY
MARKETS**





2016 AVMA Report on **VETERINARY MARKETS**

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Acknowledgments

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CONTENTS

5	LIST OF FIGURES	
6	SUMMARY	
10	INTRODUCTION	
14	GENERAL ECONOMIC CONDITIONS	
18	Business Cycle	
19	Leading Economic Index	
20	Macroeconomic Forecast	
23	Effect of the U.S. Economy on the Veterinary Markets	
23	Gross Domestic Product and Starting Salaries	
24	MARKET FOR VETERINARY EDUCATION	
25	Supply of Veterinary Education	
26	Supply of U.S. Accredited Domestic Schools	
31	Demand for Veterinary Education	
31	Total Applicants Over Time	
33	Willingness to Pay	
35	Equilibrium in the Veterinary Education Market	
37	Major Findings	
38	MARKET FOR VETERINARIANS	
40	New Veterinarians	
41	Supply of New Veterinarians	
42	Demand for New Veterinarians	
43	Indexed Real Weighted Mean Income (RWI)	
43	Nominal Mean Debt by Gender	
44	Debt and Income of New Graduates	
44	Real Debt-to-Income Ratio	
47	Number and Starting Salary for New Graduates	
49	Demand for New Veterinarians, 2014-2015	
52	Supply of Existing Veterinarians	
53	Geographic Distribution of Veterinarians	
54	Demand for all Veterinarians	
54	New Graduates 1, 5 and 10 Years Out	
55	2013 Graduates, Tuition and Fees, Income and Starting Salaries	
56	2009 Graduates, Tuition and Fees, Income and Starting Salaries	
56	2004 Graduates, Tuition and Fees, Income and Starting Salaries	
57	Unemployment and Underemployment	
60	Enhancing the Demand for Veterinarians	
61	Major Findings	
62	THE MARKET FOR VETERINARY SERVICES	
65	Workforce Capacity Utilization	
69	Annual Workforce Model Update	
70	Veterinary Practice Performance	
75	DISCUSSION	

LIST OF FIGURES AND TABLES

- 13 **Figure 1:** Regions of the United States
- 15 **Table 1:** Professional, Scientific, and Technical Services, NAICS 54
- 16 **Table 2:** The Make Table by Sector, 2014
- 18 **Table 3:** Length of U.S. Business Cycles
- 19 **Figure 2:** The Conference Board Leading Economic Index (LEI)
- 20 **Figure 3:** Growth of U.S. Real GDP
- 21 **Figure 4:** Real and Potential U.S. GDP in 2009 Dollars
- 22 **Figure 5:** U.S. Labor Force Participation Rate, 1945-2015
- 22 **Figure 6:** U.S. Labor Force Employment and Unemployment
- 25 **Figure 7:** Change in Tuition, 1999 to 2015
- 26 **Figure 8:** Total Four-Year Cost per Available First-Year Seat for 2015 Graduates
- 27 **Figure 9:** Number of Test-Takers Passing NAVLE
- 27 **Figure 10:** 2015 Resident, Tuition & Fees and Living Expenses
- 28 **Figure 11:** Supply of Education: Tuition & Fees and Total Costs, 2015
- 29 **Figure 12:** Supply of Education and DVM Debt, 2015
- 30 **Figure 13:** Percent of Resident Students by College with Debt-to-Cost Ratios Greater than 1.75:1
- 30 **Figure 14:** Percent of Non-Resident Students by College with Debt-to-Cost Ratios Greater than 1.5:1
- 31 **Figure 15:** AAVMC Veterinary School Applicant Figures
- 32 **Figure 16:** Forecast of Applicants and First Year Seats
- 33 **Figure 17:** VMCAS Applicants and First-Year Seats
- 33 **Figure 18:** Applicant Demand for Veterinary Education
- 34 **Figure 19:** Applicant Demand, 2015
- 34 **Figure 20:** Applicant Demand, 2014 & 2015
- 35 **Figure 21:** Supply & Demand for Veterinary Education, 2014 & 2015
- 36 **Figure 22:** 2015 Applicant Estimates of Current Average Debt Load for 2014 Graduates
- 37 **Figure 23:** Projected Applicants per First Year Seat
- 39 **Figure 24:** Veterinary Population, 2015
- 40 **Figure 25:** New Veterinary College Graduates, 2015
- 41 **Figure 26:** Supply of New Veterinarians, 2014
- 42 **Figure 27:** Nominal Mean Starting Salary by Gender
- 43 **Figure 28:** Indexed Real Mean Income of New Graduates
- 43 **Figure 29:** Nominal Mean Debt by Gender
- 44 **Figure 30:** Real Mean Debt and Income for New Graduates
- 44 **Figure 31:** Real Debt-to-Income Ratio for New Graduates
- 45 **Figure 32:** Recent Patterns in Student Debt
- 46 **Figure 33:** Internships as a Percent of Total Graduates
- 47 **Figure 34:** Internships Rise as Companion Animal Jobs Decline
- 48 **Figure 35:** Income and Quantity of New Graduates
- 48 **Figure 36:** Number and Starting Salaries of New Graduates
- 49 **Figure 37:** Debt and Income of Graduates of U.S. Veterinary Colleges
- 50 **Figure 38:** Demand for New Veterinarians by Practice Type
- 50 **Figure 39:** Market for New Veterinarians, 2015
- 51 **Figure 40:** New Veterinarian Market
- 52 **Table 4:** Distribution of U.S. Veterinarians
- 53 **Figure 41:** Location Quotient of Veterinarians by Area, May 2014
- 54 **Figure 42:** Income by Practice Type, 2015
- 55 **Figure 43:** Salaries and Costs of 2008 Graduates, by School
- 55 **Figure 44:** Salaries and Costs of 2013 Graduates, by School
- 56 **Figure 45:** Salaries and Costs of 2009 Graduates, by School
- 56 **Figure 46:** Salaries and Costs of 2004 Graduates, by School
- 57 **Figure 47:** Unemployment, by Gender and Year of Graduation
- 58 **Figure 48:** Male Work Preference
- 59 **Figure 49:** Female Work Preference
- 61 **Table 5:** Human Disease Burden
- 63 **Figure 50:** Relative Price of Veterinary Services
- 63 **Table 6:** Veterinary Services Pricing and Patronage Trends
- 64 **Table 7:** Canine Routine Check-ups in the Raleigh-Durham CSA, 2015
- 66 **Figure 51:** Excess Capacity Survey Results
- 66 **Figure 52:** Distribution of Excess Capacity by Practice Type, 2015
- 67 **Figure 53:** Excess Capacity in Private Practice by Practice Type
- 67 **Figure 54:** Excess Capacity in Private Practice by Region
- 68 **Figure 55:** Percent of Private Practices at Full Capacity by Practice Type
- 68 **Figure 56:** Percent of Private Practices at Full Capacity by Region
- 69 **Figure 57:** Excess Capacity Forecast Update
- 71 **Figure 58:** Growth of Revenue, Invoices, and Normalized EBITDA
- 71 **Figure 59:** Gross Revenue Per Veterinarian FTE
- 72 **Figure 60:** Invoices Per Veterinarian FTE
- 72 **Figure 61:** Number of Visits and EBITDA
- 73 **Figure 62:** Normalized EBITDA
- 73 **Table 8:** 2014 Expenses
- 74 **Figure 63:** Number of Days Open and EBITDA
- 74 **Figure 64:** Active Pet Species

SUMMARY

This report is a general overview of the work presented at the 2015 AVMA Economic Summit. Most important, this report will set the stage for future directions by describing where we are and where we need to go with respect to the economics of the profession and practice profitability.

While the market for veterinarians may be considered robust in the short term given the rates of unemployment and under-employment, income growth, and the job applicant-to-jobs ratio, there are longer term trends such as the increasing debt-to-income ratio, declining number of veterinary college applicants, and sensitivity of veterinary incomes to the business cycle that constrain our outlook for the profession as cautious optimism. In the face of increasing risk of a near term recession, there should be concern for the ability of the market to continue to absorb increasing numbers of veterinarians, and maintain both income growth and the general level of satisfaction of veterinarians for the profession.

At the 2014 AVMA Economic Summit, Dr. Karl Wise, a former AVMA senior executive and economist, gave his historical perspective covering nearly five decades in the profession. In summarizing the economic works pertaining to the profession over that long period, Wise noted that,

“If you read the recommendations and implications section of prior workforce study reports, one can conclude that the profession has failed to recognize the many possible options or strategies for action to address economic issues. Perhaps, as stated so simply in the movie *Cool Hand Luke*, what we have here is a failure to communicate.”

Perhaps an alternative, or more accurate, conclusion is that there has been a failure to educate. This is vital, as the difference between “communicate” and “educate” is more than just a literary synonym. The difference is as great as the difference between output and performance.

There are several possible causes for the lack of education derived from previous economic research, including the inability to convert descriptive statistics into behavioral changes, a general lack of understanding of basic economic and finance principles, and having beliefs that are unfettered by economic data.

Past economic studies and current data and analysis suggest that there is a large gap between need and demand for veterinary services, and the returns to investing in strategies to shrink this gap may well be large. This means that supply is not greater than need (oversupply), but that the quantity supplied is

greater than the quantity demanded at the current level of prices (excess capacity). The willingness of veterinarians to provide services exceeds the willingness of pet and animal owners to purchase these services at the prices being charged. There are those that would like to purchase veterinary services but cannot or are unwilling to afford them. The future of the profession will require that more veterinarians understand the economics of the profession and consider the strategies found, even applying economic theory and analytic methods in their engagement within the profession.

It is important that we identify a few key overarching problems, understand the factors that create those problems, and develop strategies to overcome them. These overarching problems can be defined with Key Performance Indicators such as the Debt-to-Income Ratio (connecting the annual performance in the market for education with the annual performance in the market for veterinarians), a measure of financial performance in veterinary practices such as a standardized EBITDA (earnings before interest, taxes, depreciation and amortization) to measure performance in the market for veterinary services, and Net Present Value of the DVM degree that provides a measure of lifetime value for veterinary professionals.

The model that defines how starting salaries vary amongst new graduates (provided in more detail in the market for veterinarians section) requires two steps. The first step uses demographic characteristics to describe variation of salaries within a year’s cohort of graduates. The second step describes the variation in mean salaries between graduation years and considers only the factors affecting overall demand: U.S. Gross Domestic Product (GDP) and the number of new graduates each year.

At current GDP, when the market is in equilibrium, the mean 2015 starting salary is \$72,229. If the market were to return to potential GDP, we estimate that the mean 2015 starting salary would be \$73,774. Consequently, GDP not only affects demand for veterinary services, 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.

GDP has a large impact on the demand for veterinary services and thus the demand for veterinarians. As GDP increases, consumer disposable incomes increase and this increases the

demand for veterinary services that, in turn, leads to higher salaries for veterinarians. Because of its importance in affecting the veterinary markets we use the Congressional Budget Office (CBO) projections of GDP in our models. The CBO does not forecast recessions and thus we rely on the Index of Leading Economic Indicators to assist in forecasting declines in GDP. These sources suggest that growth will continue to be moderate through 2016 with an increasing probability of recession through 2017.

Veterinary education is provided by U.S. accredited domestic and international schools, as well as non-U.S. accredited international schools. These schools are both non-profit and for-profit institutions. For the 30 U.S. veterinary colleges, the average tuition and fees have more than doubled, from \$10,549 in 1999 to \$27,096 in 2015. The growth in tuition over the 16-year period has ranged from \$6,905 to \$23,728, with an average increase of \$15,018, an average annual increase of 9.14 percent per year.

Mean debt acquired while in veterinary college reported by the 2015 graduates was \$141,000, with a range of \$0 (11.2 percent) to greater than \$300,000 (10 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. This "excess" debt 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.

The gap between mean debt and mean income began to widen quickly after 2005. This gap increased from roughly \$11,000 in 2001 (debt was 118 percent of income) to more than \$64,000 (debt is 192 percent of income) by 2015. The rapid and persistent expansion of this gap between debt and income for new veterinarians represents a major problem for the profession and a current focus of research efforts.

Congruent with the expansion of the gap between debt and income, the debt-to-income ratio continues to increase, rising from just under 1.2:1 in 2001 to just under 2.0:1 in 2015. Moreover, the debt-to-income ratio for women continues to be greater than for men, both because women have lower mean starting salaries compared to their male counterparts and because they have higher levels of debt.

The increasing debt-to-income ratio is consistent with an increase in the amount of a veterinarian's disposable income required to service their education debt, reducing their purchasing power and their standard of living. For those at the higher end of the debt-to-income scale, purchasing power may be squeezed to such an extent that the ability of new veterinarians to service their educational debt will be difficult and they will be forced to consider income-based repayment options.

The declining purchasing power associated with the rising debt-to-income ratio, combined with the fact that the current willingness to pay for education is estimated to be nearing a maximum level of seats at current prices, suggests that increased information designed to help applicants understand the effect of the rising ratio of education debt to income on their expected living standard may cause the demand for veterinary college seats to begin to decline.

The relationship between the number of applicants and their willingness to pay defines the demand for veterinary medical college available seats. More important than the total number of applicants is the number of applicants per available seat. 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 international U.S. accredited schools are considered, that ratio drops to 1.56:1. If the cycle in applicants follows past trends and the number of applicants drops into the range of 4,000, then the number of available seats will exceed the applicants.

The difficulty of filling seats with quality applicants may increase if new seats are added. 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 is forecast to decline 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, then the combination of new seats and declining applicants will bring the applicant-to-seat ratio to an estimated 1.04:1 by 2025. While this is likely to be a worst-case scenario, the competitive environment among veterinary schools is 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 in this case).

There is likely a threshold value for tuition costs that the average student is willing to pay; above that threshold, the number of applicants decreases, and recent analysis has shown that this threshold may be declining. Those schools with total costs 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 a conservative one.

Clearly, the number of new veterinarians and the level of disposable income of consumers of veterinary services will continue to affect the incomes of new veterinarians in the future. Two new U.S. veterinary colleges, Lincoln Memorial University in Tennessee and Midwestern University in Arizona, began to accept students in 2014 with plans to each produce about 100 new veterinarians per year starting in 2018. In addition, current existing U.S. colleges and U.S. accredited international colleges have the potential to expand seats. And there have been discussions of new veterinary schools in Florida, Texas and Arizona. As a result, the maximum number of U.S. college seats available is currently expected to increase to a maximum of roughly 3,300 by 2018 but could expand even more if new schools are built or current schools add seats. In addition, we have noted that the current economic expansion may be nearing its end. An expansion in the number of seats and an economic recession would adversely affect new veterinary incomes.

Forecasting the continued trend in the mean cost per seat and the distribution of debt among new veterinarians indicates that mean debt will continue to grow from roughly \$135,000 in 2015 to just over \$185,000 by 2025. Combined with growth in mean incomes from more than \$69,000 in 2015 to just over \$89,000 in 2025, the debt-to-income ratio is predicted to continue to stabilize around 2.0:1 through 2025. However, this scenario assumes no change in the willingness of veterinary college applicants to pay for college seats. Should the demand for seats decline, the mean cost per seat will also decline as students opt for the least expensive seats. However, if the number of seats increase (without a reduction in the cost per seat), or the economy begins a downturn, the debt-to-income ratio will likely

return to the strong growth pattern witnessed since 2005.

Unemployment was estimated at 4.5 percent in 2014 compared with 3.4 percent in 2013. There is no statistically significant difference between these two rates and both are below the U.S. national rate (6.1 percent) and the natural rate (5.6 percent).

The market for veterinary services is the largest source of demand for veterinarians and veterinary students. Just as the costs of tuition and fees (i.e., willingness of colleges to sell seats) drive the costs for veterinarians and veterinary services, the prices that pet owners are willing to pay for veterinary services drive the willingness of practices to pay veterinarians and drive veterinary students' willingness to pay for their veterinary college seats. If the three vertically related markets are efficient, then the willingness of pet owners to purchase veterinary services will be in line with what the veterinary students are willing to pay for their seat. Unfortunately for many veterinary students, this is not the case. When the debt that veterinary graduates have at graduation is large enough to cause the Net Present Value of the DVM degree to be less than zero, there is no return on the investment in the DVM education. In this situation, the new veterinarian has paid more for the degree than the value placed on that degree by pet owners.

However, this measure of economic efficiency does not consider intangible benefits that veterinary graduates may receive from their education. The addition of these intangibles may yield a positive return on investment even when the Net Present Value of the degree is negative. Nonetheless, as veterinarians continue to raise prices on veterinary services because of the increased costs of providing those services (increased costs of education, technology and intermediate products), the number of pets receiving veterinary services and the number of services each pet receives will decline, increasing the gap between the need for veterinary services and the quantity of veterinary services demanded.

The demand for veterinary services reflects the choices made by pet owners, and there is very little quantitative information on the relative importance of various factors that may impact the pet owners' purchasing decisions. In 2015, the AVMA Veterinary Economics Division and several cooperating partners began the process of identifying the factors that may be important in affecting pet owner expenditure decisions and analyzing current available data.

Overall, the Workforce Model predicts excess capacity will decline to about 6.5 percent by 2019 and remain relatively flat through the remaining forecast period, which ends in 2025. This represents an approximately 5-6 percentage point reduction compared to the original forecast made in 2013, and a 0.5 percentage point increase compared to the 2014 forecast.



INTRODUCTION

THIS REPORT IS A GENERAL OVERVIEW OF THE WORK PRESENTED AT THE 2015 AVMA ECONOMIC SUMMIT. MOST IMPORTANT, THIS REPORT WILL SET THE STAGE FOR FUTURE DIRECTIONS BY DESCRIBING WHERE WE ARE AND WHERE WE NEED TO GO WITH RESPECT TO THE ECONOMICS OF THE PROFESSION AND PRACTICE PROFITABILITY.

In 2015, the AVMA Veterinary Economics Division (VED) produced a series of reports summarizing the veterinary markets, veterinary incomes and debt, employment and practice capacity utilization. Also in 2015, the AVMA VED expanded its research efforts by developing cooperating partnerships with various universities, state and affiliated veterinary associations, and private and not-for-profit entities. Much of the work from these cooperating partners will be conveyed here and in the reports to follow.

As we are now in 2015, our second full year of economic analysis, it is important to note that much of the work performed to this point is preliminary and perhaps more appropriate if reviewed as exploratory. Because the focus of our work has been to understand what factors affect important measures such as income, costs, debt, willingness to pay, employment, underemployment and excess capacity, our methods have been to analyze the data using simple linear regression or logistical models. These models assume linearity in parameters, normally distributed error terms, and several other assumptions required to arrive at statistical estimates with the least variance, technically known as Best Linear Unbiased Estimators (BLUE).

Descriptive statistics presented, however, are not preliminary. These statistics are presented as simple descriptors of the data collected from surveys of veterinarians, and where necessary, are weighted to change the actual survey values to a value that would represent the demographics of the profession. We report means as the measure of central tendency with a measure of kurtosis and skewness because the mean is the only measure of central tendency that is useful in measuring variance and then attempting to use regression analysis to identify the factors that can be used to explain the variation in our dependent variables.

The estimated coefficients describe the quantitative relationship between the variable under consideration (dependent variables) and the factors (independent variables) hypothesized to explain the variation within the dependent variable. For instance, what factors explain the variation (difference from the mean) in veterinary incomes? These estimated coefficients may be considered preliminary until the correct functional form of the relationship between dependent and independent variables has

been determined, model specification is accurately selected, and various interaction terms and time importance has been tested. However, these preliminary estimates are of the correct magnitude and direction and thus are indicative of the general relationships between variables.

This report is a general overview of the work presented at the 2015 AVMA Economic Summit. Most important, this report will set the stage for future directions by describing where we are and where we need to go with respect to the economics of the profession and practice profitability.

At the 2014 AVMA Economic Summit, Dr. Karl Wise, former AVMA senior executive and economist, gave his historical perspective covering nearly five decades in the profession. In summarizing the economic works pertaining to the profession over that long period Wise noted that,

“If you read the recommendations and implications section of prior workforce study reports, one can conclude that the profession has failed to recognize the many possible options or strategies for action to address economic issues. Perhaps, as stated so simply in the movie *Cool Hand Luke*, what we have here is a failure to communicate.”

Perhaps an alternative or more accurate conclusion is that there has been a failure to educate. This is vital, as the difference between “communicate” and “educate” is more than just a literary synonym. The difference is as great as the difference between output and performance.

Information is communicated when it is knowingly exchanged, in written or oral form. Readers of this report will no doubt take away some data or new knowledge of the economics of the veterinary profession. But education implies that the communicated knowledge will be acted upon, that behavior has changed. Information is an output, communication is the exchange of that output, but education is the performance of that output. History would suggest that in the veterinary profession economic education has occurred only at the margin and very slowly.

There are several possible causes for the lack of education from previous economic research including the inability to convert

descriptive statistics into behavioral changes, a general lack of understanding of basic economic and finance principles, and having beliefs that are unfettered by economic data. An example of the first is the very notion of excess capacity. Generally, veterinarians seem unwilling to engage this concept and continue to argue that an oversupply of veterinarians exists. Veterinarians refer to oversupply and need, while economists refer to excess capacity and demand. Need has no price vector. That is, need is a physical attribute and not a market condition. Demand on the other hand is the relationship between the quantity demanded and price. As price is increased, need is unaffected but the quantity demanded declines. Oversupply exists when the amount of goods or services available exceed the need, while excess capacity exists when the amount of goods or services available exceeds the quantity demanded at a specific price. Persistence in the use of oversupply (synonymous with too many veterinarians) renders strategies that would seek to provide services at lower cost or increase the quantity demanded unviable for mitigating the problem. Using the term excess capacity suggests that strategies to improve the current supply-demand imbalance may be to reduce supply, lower costs, improve pricing strategies (and thus quantity demanded or enhance demand).

SUPPLY IS NOT GREATER THAN DEMAND (OVERSUPPLY) BUT THE QUANTITY SUPPLIED IS GREATER THAN THE QUANTITY DEMANDED AT THE CURRENT LEVEL OF PRICES (EXCESS CAPACITY).

Past economic studies and current data and analysis suggest that there is a large gap between need and demand for veterinary services, and the returns to investing in strategies to shrink this gap may well be large.

The willingness of veterinarians to provide services exceeds the willingness of pet/animal owners to purchase these services at the prices being charged. There are those that would like to purchase veterinary services but cannot afford them.

The future of the profession will require that more veterinarians understand the economics of the profession and consider the strategies found, even applying economic theory and analytic methods in their engagement within the profession.

Examples of beliefs unfettered by economic data are abundant. When important factors that contribute to reduced demand, increased supply or reduced profitability are reported, the guardians of that sacred cow implore indignation. No better

example can be illustrated than our suggestion last year that the profession look hard at internships because of our findings from research that included internships as a potential factor associated with variations in incomes, unemployment and competencies.

Dr. Wise, in describing a principal point for his engagement at the 2014 AVMA Economic Summit, posed the following thoughts about the creation of new vision for the profession:

"What if we could, for a time, just stop debating the problems, and stop debating how to fix them? Perhaps another approach might be more helpful if we could answer the following question: What societal role do we want the veterinary medical profession to have in the future? If we could possibly identify a set of future roles for the veterinary medical profession, then maybe we could take steps most conducive to achieving those societal roles and understanding the means by which those roles would be economically viable. Such an effort would need to be planned on a platform that would allow for serious examination of current strategies that seem promising, and most importantly, the most innovative, constructive, and perhaps the most disruptive ideas for the future."

Such an initiative as posed by Dr. Wise may indeed be a best

path towards a desired future vision and transformation. However, in reality, based on our experience with strategy management and institutional change both elsewhere and in this profession, it would be a very difficult, possibly an insurmountable, challenge for the veterinary profession to accomplish. In this case, therefore, a second best path is offered as more practicable and leading to steps for incremental change that will decidedly benefit the profession over time.

This second best path revolves around identifying a few key overarching problems, understanding the factors that create those problems and developing strategies to overcome them. These overarching problems can be defined with Key Performance Indicators such as the Debt-to-Income Ratio (connecting the annual performance in the market for education with the annual performance in the market for veterinarians), a measure of financial performance in veterinary practices such as a standardized EBITDA (earnings before interest, taxes,



depreciation and amortization) to measure performance in the market for veterinary services, and Net Present Value of the DVM degree that provides a measure of lifetime value for veterinary professionals.

The AVMA Economic Report Series provides a comprehensive source of the knowledge we have obtained by collecting and analyzing millions of pieces of data from veterinarians, veterinary employers and the consumers of veterinary services.

The 2016 Report Series will contain 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 following the presentations from the 2015 AVMA Veterinary Economic Summit. This information was supplied by analysts from entities outside of 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 AVMA Veterinary Economic Strategy Committee (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 presents these proposals to the VESC at their 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 that follow.

This report is divided into four sections.

- The first section looks at the general economy and provides information about the general economy, the current business cycle, and how veterinary markets are impacted 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 U.S., the following figure identifies where these regions are located on the map. The region number reflects the first number of all zip codes in that region.

REGIONS OF THE UNITED STATES

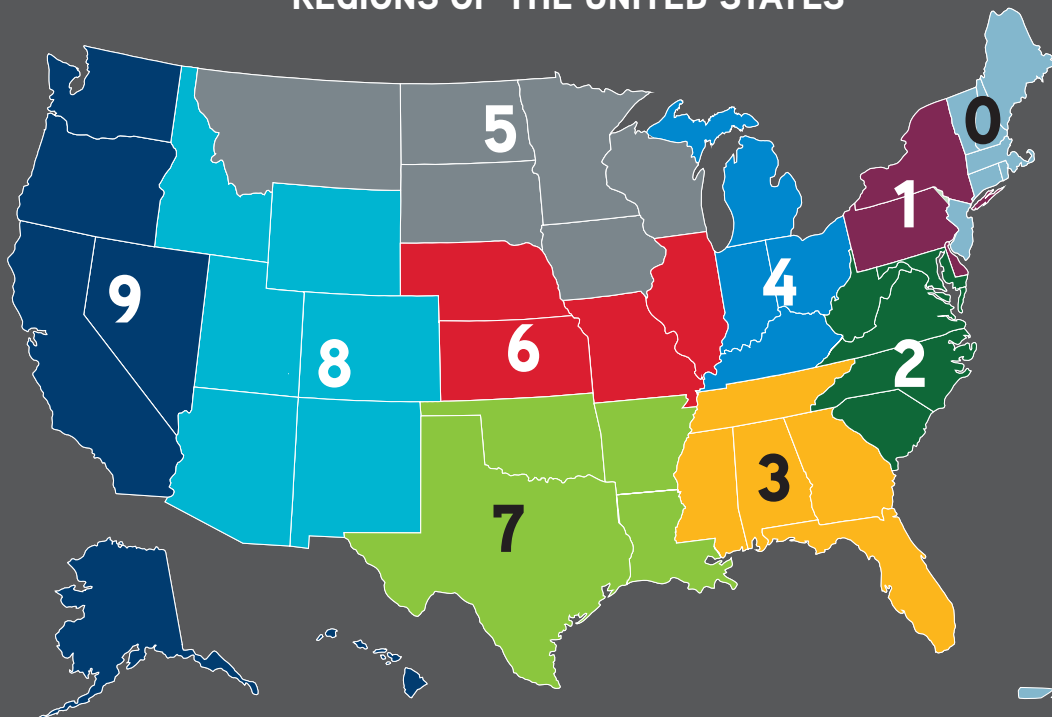


Figure 1



GENERAL ECONOMIC CONDITIONS



The performance of the U.S. economy, specifically the U.S. economy's ability to create disposable income for residents of the U.S., has a major impact on the performance of the veterinary profession. As of the third quarter of 2015, the Gross Domestic Product (GDP) for the U.S. economy stood at \$18.065 trillion.

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. Thus, 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 U.S., has a major impact on the performance of the veterinary profession. As of the third quarter of 2015, the Gross Domestic Product (GDP) for the U.S. economy stood at \$18.065 trillion. Expenditures on goods and services accounted for \$12.359 trillion, with services alone accounting for \$8.336 trillion. Government spending and investments account for equal shares of the remaining roughly \$6 trillion.

The national Input-Output (I-O) accounts divide the economy into 20 major sectors under the North American Industry Classification System (NAICS). The veterinary services sector, identified as NAICS 541940, is an industry classified within the major sector NAICS 54 – Professional, scientific and technical services. NAICS 54 comprises roughly 12.8 percent of the total output from all service sectors within the U.S. economy. Veterinary services accounts for 1.6 percent of this NAICS 54 – professional, scientific, and technical services sector.

PROFESSIONAL, SCIENTIFIC, AND TECHNICAL SERVICES, NAICS 54 (MILLIONS OF U.S. DOLLARS)

NAICS	Industry	Total Industry Output	Percent
541100	Legal services	\$288,511	18.70%
541511	Custom computer programming services	\$93,333	6.00%
541512	Computer systems design services	\$102,061	6.60%
54151A	Other computer related services, including facilities management	\$54,119	3.50%
541200	Accounting, tax preparation, bookkeeping, and payroll services	\$132,385	8.60%
541300	Architectural, engineering, and related services	\$273,730	17.70%
541400	Specialized design services	\$29,830	1.90%
541610	Management consulting services	\$145,562	9.40%
5416A0	Environmental and other technical consulting services	\$31,914	2.10%
541700	Scientific research and development services	\$162,270	10.50%
541800	Advertising, public relations, and related services	\$129,124	8.40%
5419A0	Marketing research and all other miscellaneous professional, scientific, and technical services	\$63,918	4.10%
541920	Photographic services	\$11,860	0.80%
541940	Veterinary services	\$24,527	1.60%
540000	Total Professional, Scientific and Technical Services	\$1,543,144	100%

Table 1

The statistics presented in the I-O accounts were prepared by the Industry Economic Accounts (IEAs) Directorate, Bureau of Economic Analysis (BEA), U.S. Department of Commerce. The statistics in these I-O accounts provide detailed information on the flows of the goods and services that comprise the production process of industries. These I-O accounts are presented as “Use” and “Make” tables and are described as follows:

- The Use table illustrates how each industry purchases inputs from other industries in the production of output,
- The Make table shows the total value of commodities/services that are produced by each industry.

The I-O accounts are prepared by merging information from a wide variety of sources. The primary I-O data source, the Economic Census, is conducted every 5 years by the U.S. Bureau of the Census. A detailed description of the data and methods to produce the I-O accounts is provided in the Concepts and Methods of the U.S. Input-Output Accounts available at http://www.bea.gov/papers/pdf/IOmanual_092906.pdf.

According to the I-O manual, “The Economic Census collects most of the essential data required for the tables—such as receipts, inventories, and payrolls—and the data are collected at the level of the smallest operating unit, the “establishment.” In addition, the Census Bureau’s collection procedures are designed to ensure that no individual establishment is counted more than once. Thus, by relying on the Economic Census data wherever possible, BEA is able to limit duplications that could occur when

the Economic Census is used in conjunction with other sources. Despite its comprehensiveness, the Economic Census is not a complete canvas or count of all of the economic units in the economy. The activities of the small businesses covered in the Census are measured by sampling or by administrative records rather than by direct reports from each individual business. In addition, some economic units and some industries are not included in the Economic Census. Data from other sources are needed to fill these gaps. Further, additional data are needed to carry out the various adjustments that are made in transitioning from the Census data to the I-O estimates. Much of the additional data required to prepare the I-O tables comes from other Census Bureau programs—including annual surveys that cover selected industries, such as manufacturing and services. The I-O tables also incorporate data collected and tabulated by other Federal agencies—including the U.S. Departments of Agriculture, Education, and Energy—and data from a number of private organizations.”

The Make table provides the value of total output for each sector and industry. The Make table for the 20 major sectors of the economy is provided below. The total gross output is much larger than the Gross Domestic Product (GDP) because GDP is the value of only the final goods and services produced while the Make I-O table provides the total gross value of output from each sector and thus includes the value of goods and services from other sectors used in the process of producing their own output.

THE MAKE TABLE BY SECTOR, 2014

I-O Code	Industries/Commodities Name	Total Industry Output (Millions of Dollars)
11	Agriculture, forestry, fishing, and hunting	\$490,880
21	Mining	\$640,006
22	Utilities	\$414,048
23	Construction	\$1,292,000
31G	Manufacturing	\$6,020,815
42	Wholesale trade	\$1,530,794
44RT	Retail trade	\$1,414,558
48TW	Transportation and warehousing	\$1,069,809
51	Information	\$1,475,917
FIRE	Finance, insurance, real estate, rental, and leasing	\$5,331,978
PROF	Professional and business services	\$3,655,566
6	Educational services, health care, and social assistance	\$2,333,571
7	Arts, entertainment, recreation, accommodation, and food services	\$1,251,439
81	Other services, except government	\$795,507
G	Government	\$3,254,147
	Total Commodity Output	\$30,971,033

Source: Bureau of Economic Analysis

Table 2

In 2014 the Make table from the I-O accounts indicated that the total value of the veterinary services output was \$22.460 billion. Assuming a higher-end estimate for the number of veterinary hospitals at 29,901¹ as well as a lower-end estimate of 25,000², on average, each veterinary hospital produces veterinary services worth an average of roughly \$751,145 to \$898,400. The average number of veterinary FTE's per practice is roughly 1.9 (total number of veterinarians per practice is higher) suggesting an average revenue per veterinary FTE of \$395,340 to \$472,842 and an average income per FTE of \$79,068 to \$94,568.

The Economic Census has grown from a few questions on manufacturing in the 1810 Census of Population to nearly 500 questionnaire variations that collected data from 3.7 million companies representing over 5 million business establishments in 1,056 industry classifications in the 1997 Economic Census. In addition, by using administrative records, the Census Bureau compiled data on 14 million businesses without paid employees and on 1.5 million small-business employers.

As an example, the 1997 Economic Census report on Non-employer Statistics shows roughly 10.8 million service

establishments (employer and non-employer) in the services industries. The mail-out for these industries broke down as follows: 662,000 companies received the classification form, 330,000 multi-establishment companies and 651,000 large single-establishment companies received long forms, and about 49,000 establishments (about 3.1 percent) were sampled to represent the remaining 1.55 million smaller single-establishment companies. The remaining 7 million non-employer establishments were not surveyed, but estimates were developed from administrative records.

Some service activities are redefined between service industries. For example, repairs that are performed for others by leasing-equipment-industry establishments are redefined to the repair services industry.

As explained earlier, the veterinary services industry is a small component (1.6 percent) of the Professional, scientific and technical services sector that is the largest component of the Professional and business services sector. Comparing veterinary services to all services (.203 percent) and the U.S. economy (.094 percent) the amount of total economic output is small.

¹29,901 is based on the Barnes Report that uses the number of veterinary practices in the U.S. from the 2012 Dun and Bradstreet data, as provided by LexisNexis. Because some practices have multiple locations this number is considered high.

²Adjusting for multiple practice locations AVMA VED uses this number as an approximation.

However, the veterinary services industry is more productive than average, accounting for .094 percent of total output while using only .069 percent of the labor force.

The size of an industry in relation to the U.S. economy provides a measure of the ability of that industry to manage U.S. economic events. Consider that a single firm such as Walmart has a total gross output of \$486 billion, nearly 22 times the size of the total output from the entire veterinary services industry. Changes in

Walmart policies will have a greater impact on the general economy than changes in policies of the veterinary services industry from a purely economic scale. However, the veterinary profession's effect on public health and food security (two measures not included in GDP) far outweigh its importance as an economic component of the U.S. economy.

CONSIDER THAT A SINGLE FIRM SUCH AS WALMART HAS A TOTAL GROSS OUTPUT OF \$486 BILLION, NEARLY 22 TIMES THE SIZE OF THE TOTAL OUTPUT FROM THE ENTIRE VETERINARY SERVICES INDUSTRY. CHANGES IN WALMART POLICIES WILL HAVE A GREATER IMPACT ON THE GENERAL ECONOMY THAN CHANGES IN POLICES OF THE VETERINARY SERVICES INDUSTRY FROM A PURELY ECONOMIC SCALE.



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 Gross Domestic Product (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 79 months (as of January 2016), well above the 61 month average period of expansion but still well below the expansion period of recent economic expansions.

AT THIS POINT IN THE CURRENT ECONOMIC EXPANSION, THE PROBABILITY OF CONTINUED EXPANSION WILL DECLINE WITH EACH MONTH.

LENGTH OF THE U.S. BUSINESS CYCLES

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	79
Average, 1953-2009 (10 cycles)	11	61

Source: National Bureau of Economic Research

Table 3

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 an increased 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.

LEADING ECONOMIC INDEX

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. The Conference Board is 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 Leading Economic Index (LEI) 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 15-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 to 124.6, just shy of the peak before the last recession. The continued rise through November would indicate that the economy is likely to continue to expand well into 2016 but also that the probability of a recession is beginning to increase with each passing month as the LEI reaches a new all-time level and the length of the current expansion is well past the historic average.

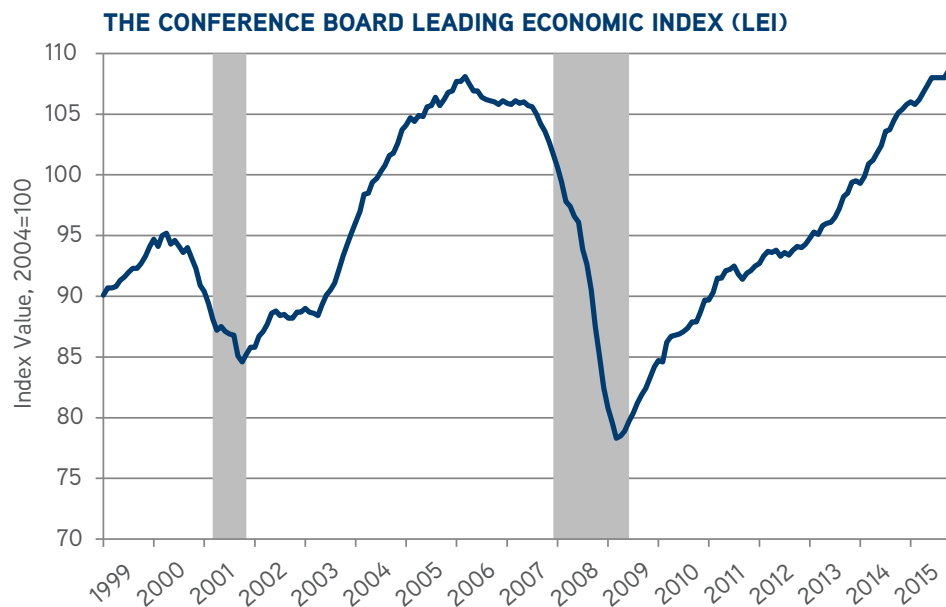


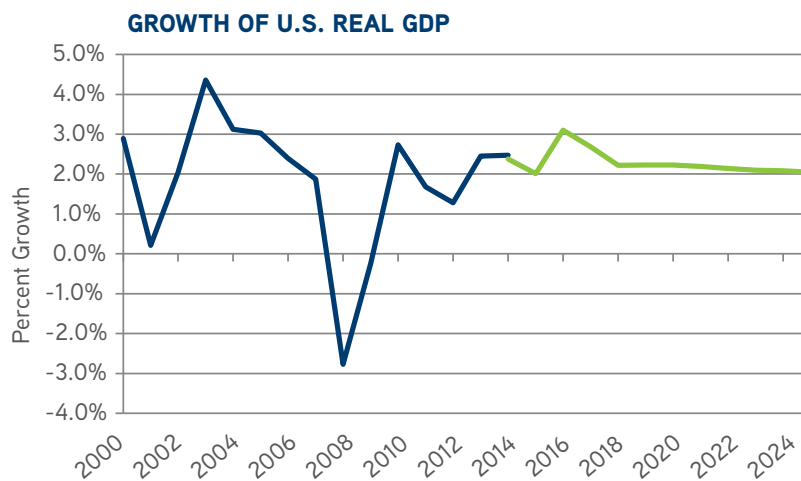
Figure 2

MACROECONOMIC FORECAST

Forecasts for the nation's economy are provided by numerous public and private sources. One forecast in particular, the Congressional Budget Office (CBO) forecast, is used to measure the economic impacts of federal legislation. The CBO is a congressional support agency that is independent of both political and business interests. As such, the CBO forecast is often cited as the most objective source and thus is frequently used in economic analysis. The AVMA Veterinary Economics Division uses the CBO forecast in estimating the projections of economic variables specific to the veterinary profession. Because personal consumption expenditures have a large impact on the demand for veterinary services, the forecast of GDP and related macroeconomic variables will have a considerable impact on the veterinary workforce projections.

Under the assumption that current laws governing federal taxes and spending will generally remain in place, the Congressional Budget Office anticipates that economic activity will continue

to expand in 2016 and 2017, and then moderate in subsequent years. As the result of a very weak first quarter in 2015, real (inflation-adjusted) gross domestic product (GDP) rose at an average annual rate of only 1.5 percent in the first half of the year. Recent data indicates that the economy sputtered in the 3rd quarter of 2015 but has returned to more vigorous growth in and through the end of 2015. The CBO expects growth to improve in 2016, to 3.1 percent, and then slow to 2 percent through the end of the 10 year forecast period. An important note about the CBO forecast is that they do not consider the business cycle within their forecast. The forecast provides longer term trends based on current policy with no indication of when the next recession may occur.



Source: Congressional Budget Office; Bureau of Economic Analysis

Figure 3

The slow rate of growth in GDP since the last recession has kept the actual GDP from returning to the long-term trend level or what is referred to as the "Potential GDP". The gap between actual and potential GDP since the last recession has created

a loss of roughly \$7.1 trillion of gross output. Two-thirds of that would have been used in the consumption of goods and services, including veterinary services.

REAL AND POTENTIAL U.S. GDP IN 2009 DOLLARS

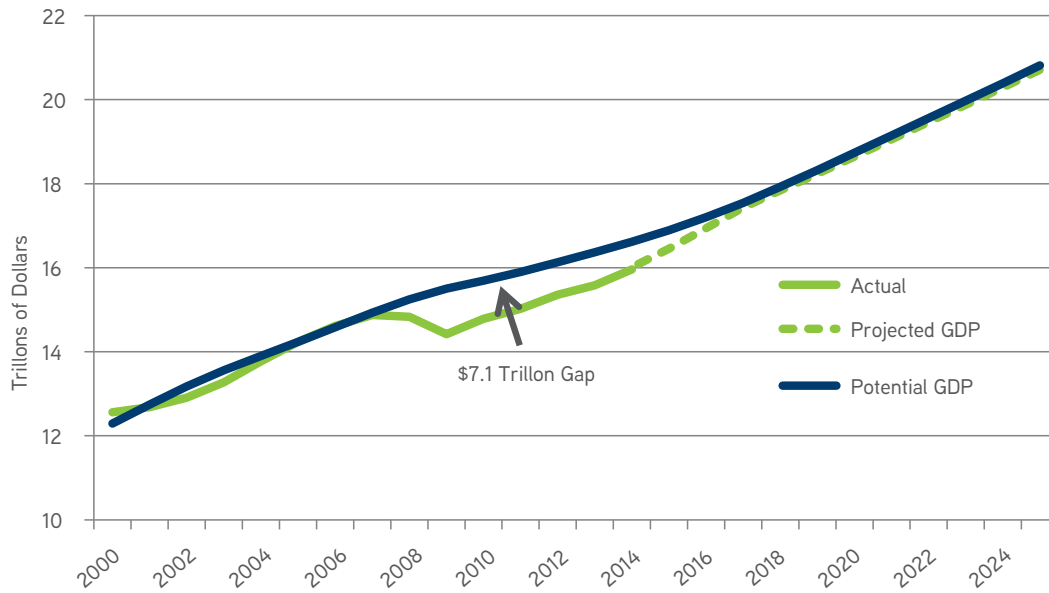


Figure 4

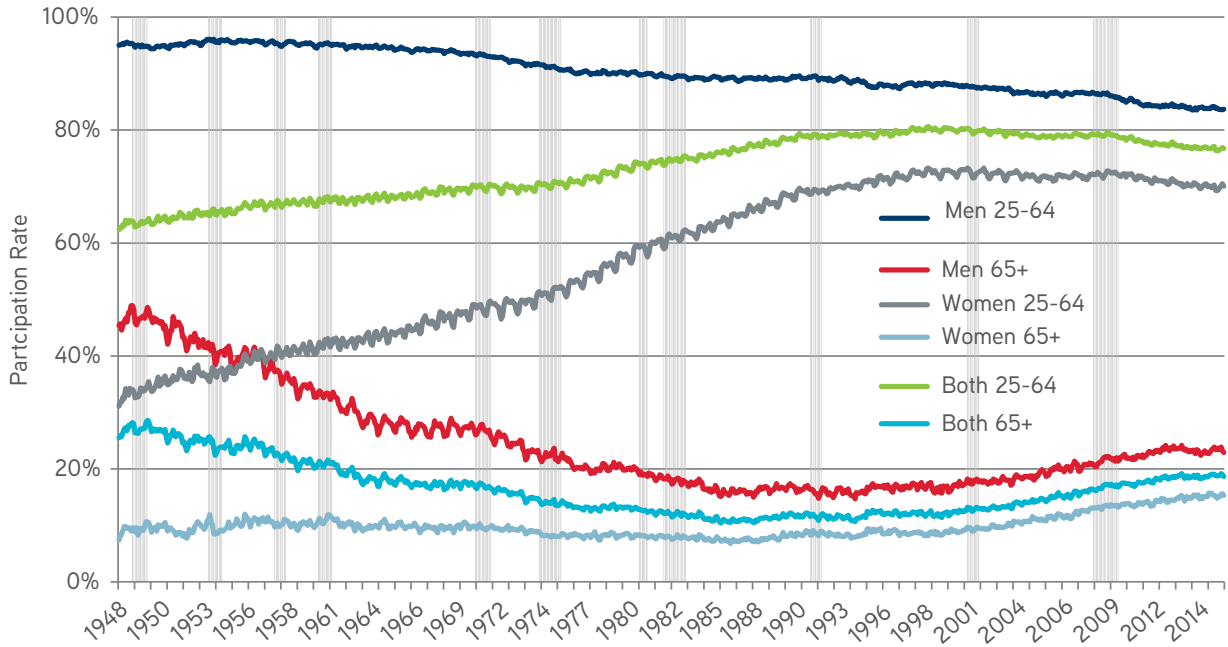
The slower growth rate in GDP and the length of time to close the gap between the actual and potential GDP may be due to the changing demographics of the workforce. While baby boomers are working longer, the millennials are joining the workforce later. These are the two largest components of the population and their changing labor force participation rate in total has led to the lowest rate of participation in 30 years at just over 60 percent.

The labor force participation rate is computed by taking the civilian labor force (people age 16 and over employed or seeking employment) and dividing it by the civilian non-institutional population (those 16 and over not in the military or committed to an institution). The longer stay of the older workers may contribute to the lower levels of participation by younger workers but the increasing number of people enrolled in higher education is also a contributor, especially since 2007. The 16-24 age group

labor participation rate fell from 66.4 percent in 1994 to 49.7 percent in 2014, and this decline has been continuous. Both the 25-34 and 35-44 age group labor participation rates also fell continuously over this period from 83.2 to 81.3 percent and 84.8 to 81.7 percent, respectively. All other age groups saw increases in the labor participation rate over the 1994-2014 period. The 65 and over age group labor participation rate grew from 12.4 percent to 21.4 percent between 1994 and 2014.

An additional dramatic change has been the labor force participation rate of women 25-64 years of age. While the labor force participation rate for men has declined steadily over the last six decades from 95.3 percent to 83.8 percent, women in this age range have increased their participation in the labor force from 33.3 percent in 1945 to a peak of 72.8 percent in 2004 and then declining to 69.9 percent in November of 2015.

U.S. LABOR FORCE PARTICIPATION RATE, 1945-2015



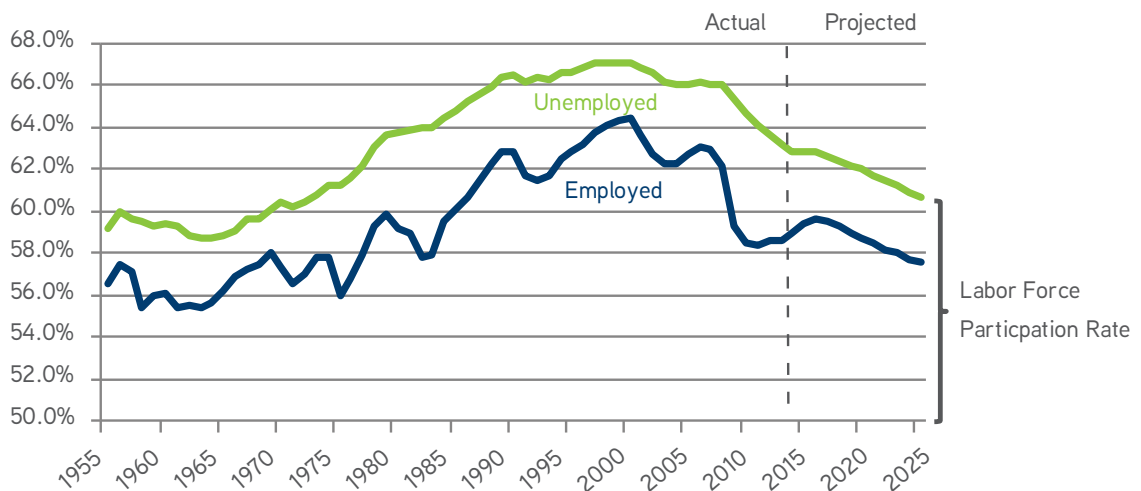
Source: Bureau of Labor Statistics

Figure 5

Spending patterns of each of these cohorts is different, and this changing demographic of income earners will affect the demand for goods and services. Unfortunately, we have little data on the veterinary service purchasing patterns of these cohorts. This will

be important information for estimating the impact of changes in GDP on the demand for veterinary services in general and, more specifically, individual types of veterinary services.

U.S. LABOR FORCE EMPLOYMENT AND UNEMPLOYMENT



Sources: Congressional Budget Office; Bureau of Economic Analysis.

Figure 6

EFFECT OF THE U.S. ECONOMY ON THE VETERINARY MARKETS

From the information presented we can conclude that:

- The economy should continue to expand into 2016, but at a moderate rate.
- Various demographic changes will continue to affect the distribution of income.
- Full recovery of actual GDP to long-term potential GDP is still several years away.

GROSS DOMESTIC PRODUCT AND STARTING SALARIES

The model of starting salaries (provided in more detail in the market for veterinarians section) 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 comprised of 15 years' worth of 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 15 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

As just noted we have very little information on purchasing patterns of the various gender and age cohorts, especially of veterinary services. But through regression analysis we can measure the relationship between GDP and veterinarian incomes.

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 those incomes.

At current GDP, when the market is in equilibrium, we estimate the mean 2015 starting salary is \$72,229. If the market were to return to potential GDP, we estimate that the mean 2015 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.





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 supply begins with the applicants who apply for the available veterinary medical college seats.

Data on applicants is obtained from the Association of American Veterinary Medical Colleges (AAVMC) Veterinary Medical College Application Service (VMCAS) 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. veterinary colleges and the 19 International, U.S. accredited colleges.

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

SUPPLY OF VETERINARY EDUCATION

Veterinary education is provided by U.S. accredited domestic and international schools, as well as non-U.S. accredited international schools. These schools are both non-profit and for profit institutions. For the 30 U.S. veterinary colleges, the average tuition and fees have more than doubled, from \$10,549 in 1999

to \$27,096 in 2015. As the graph below indicates, this increase has not been equal across all colleges. The growth in tuition over the 16 year period has ranged from \$6,905 to \$23,728 with an average increase of \$15,018, an average annual increase of 9.14 percent per year.

CHANGE IN TUITION, 1999 TO 2015

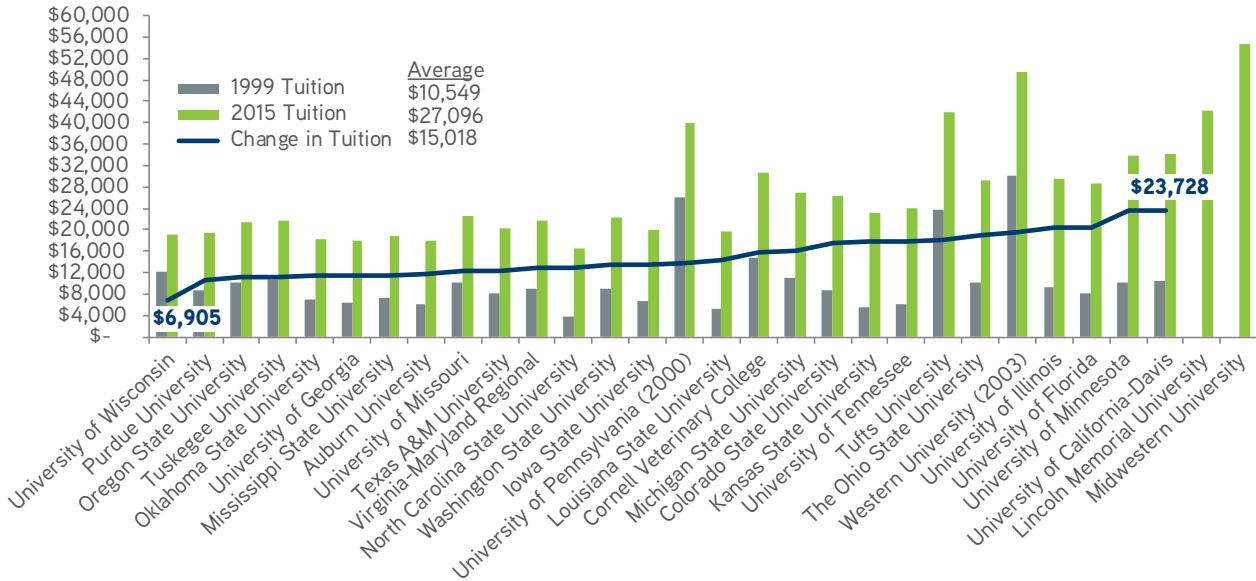


Figure 7

FOR THE 30 U.S. VETERINARY COLLEGES THE AVERAGE TUITION AND FEES HAVE MORE THAN DOUBLED, FROM \$10,549 IN 1999 TO \$27,096 IN 2015.



SUPPLY OF U.S. ACCREDITED DOMESTIC SCHOOLS

The supply curve for veterinary education is the cost of each seat provided. In the 2014-15 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 total four-year tuition and fees of the 30 U.S. schools for 1999 and 2015 are provided in the previous figure.

In 2015 there were 2,921 graduates of the 30 U.S. veterinary medical colleges. A survey of these graduates in the spring of 2015 by the American Veterinary Medical Association (AVMA) garnered 2,608 responses (a 92.7 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 (structures, equipment, faculty)? The number of seats is the quantity of output the veterinary colleges are willing to provide, and 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 the 2015 graduates. The four-year cost is an estimate and likely over-estimates the actual price that the students actually pay for each seat. 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.

TOTAL FOUR-YEAR COST PER AVAILABLE FIRST-YEAR SEAT FOR 2015 GRADUATES

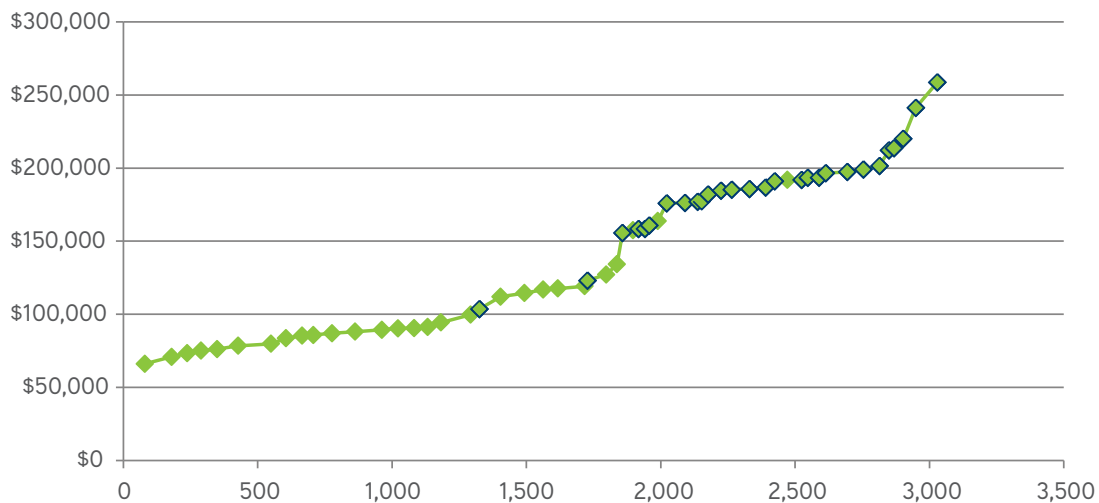


Figure 8

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, we do have an estimate of the number of total graduates from all U.S. accredited veterinary colleges and all other non-U.S. accredited veterinary colleges. The number of students passing the North American Veterinary Licensing Exam (NAVLE) provides some indication of the number of seats available for U.S. students both domestically and internationally.

In the figure below, the total number of students passing the NAVLE is compared to the number that has passed the NAVLE from U.S. accredited veterinary colleges on their first attempt (Criterion Group), the number that has passed the NAVLE from U.S. accredited veterinary colleges after more than one attempt (Non-Criterion Group), and the number of graduates from non-U.S. accredited veterinary colleges.

IN THE 2014-15 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.

NUMBER OF TEST-TAKERS PASSING NAVLE

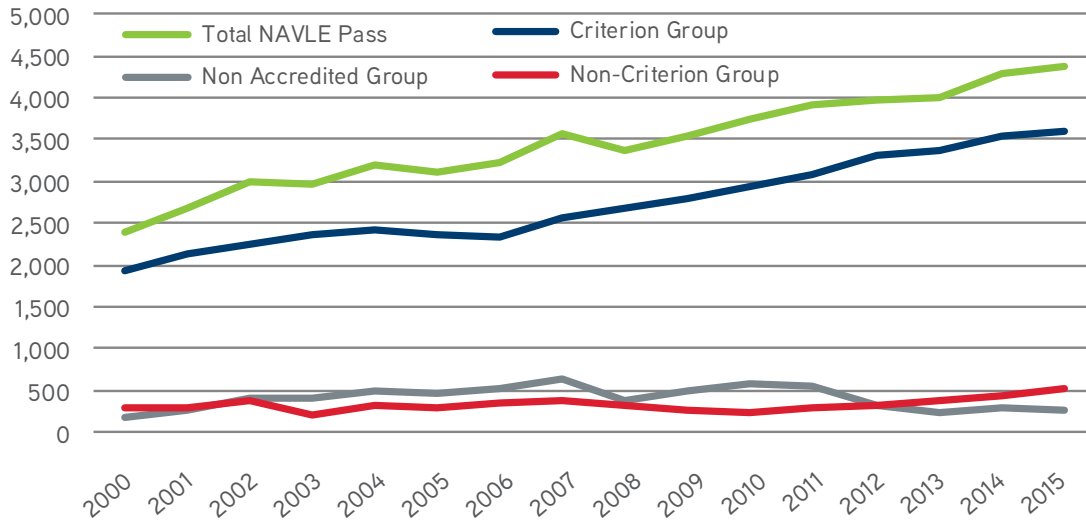


Figure 9

The direct cost of each seat for the 2015 class of graduates from the 30 U.S. colleges is the tuition and fees plus the living expenses. Using the estimates of living expenses from the

colleges, including housing, food, and transportation, provides an estimate of the expenditures that veterinary students will be required to pay to occupy a seat at a U.S. veterinary college.

2015 RESIDENT TUITION, & FEES AND LIVING EXPENSES

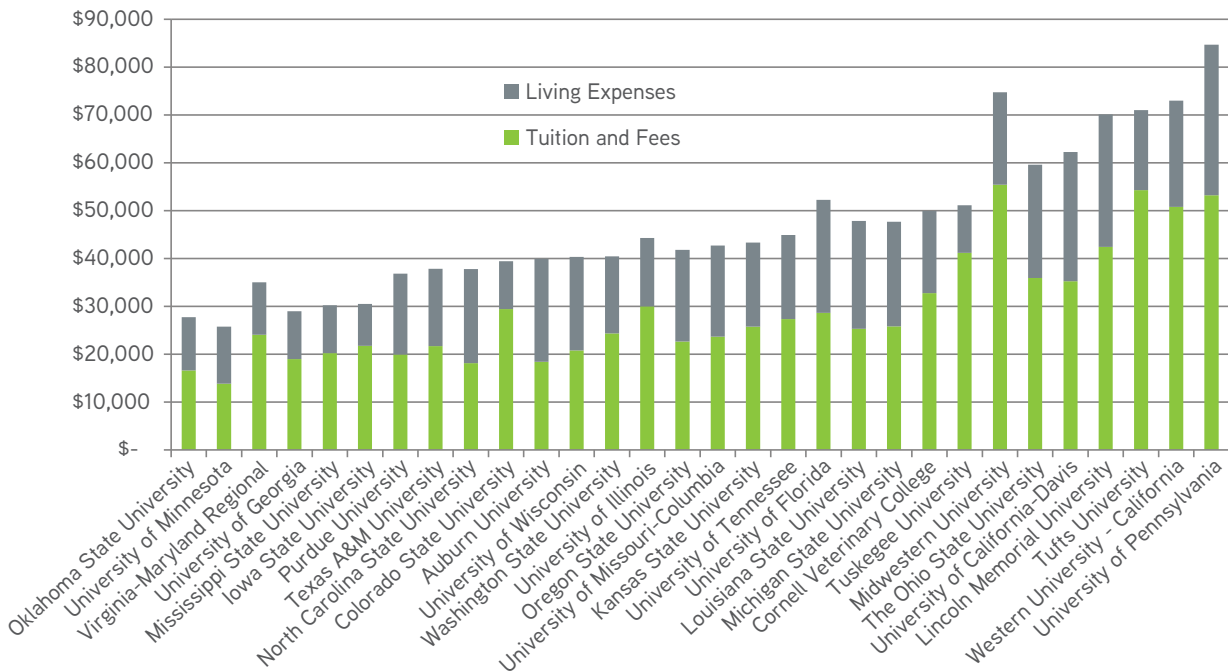


Figure 10

The mean value of living expenses for four years across all U.S. veterinary colleges was \$66,671 for the 2015 graduates, or \$16,668 per year. Some students may have more than this 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 2015 graduates (based on rates provided by each school) was \$103,327, and \$191,710 for non-discounted seats. Thus, the mean value of total costs was \$170,008 for discounted seats, and \$258,381 for non-discounted seats.

SUPPLY OF EDUCATION: TUITION AND FEES AND TOTAL COSTS, 2015

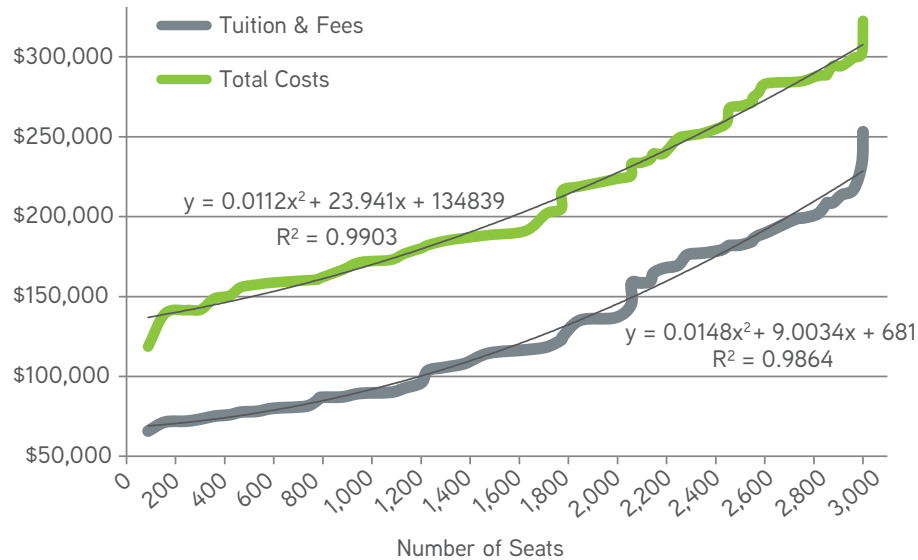
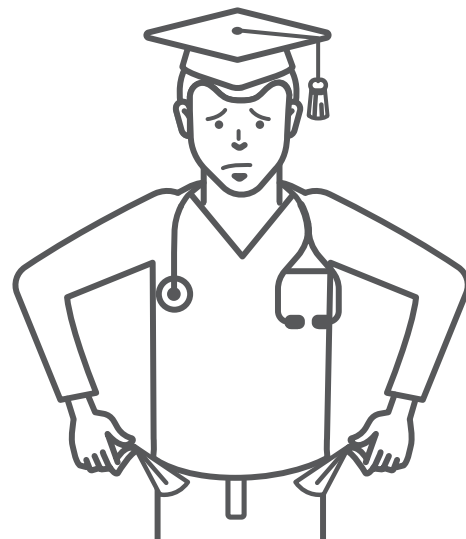


Figure 11

Mean debt acquired while in veterinary college reported by the 2015 graduates was \$141,000, with a range of \$0 (11.2 percent) to greater than \$300,000 (10 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.

MEAN DEBT ACQUIRED WHILE IN VETERINARY COLLEGE REPORTED BY THE 2015 GRADUATES WAS \$141,000, WITH A RANGE OF \$0 (11.2%) TO GREATER THAN \$300,000 (10%). 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.



SUPPLY OF EDUCATION AND DVM DEBT, 2015

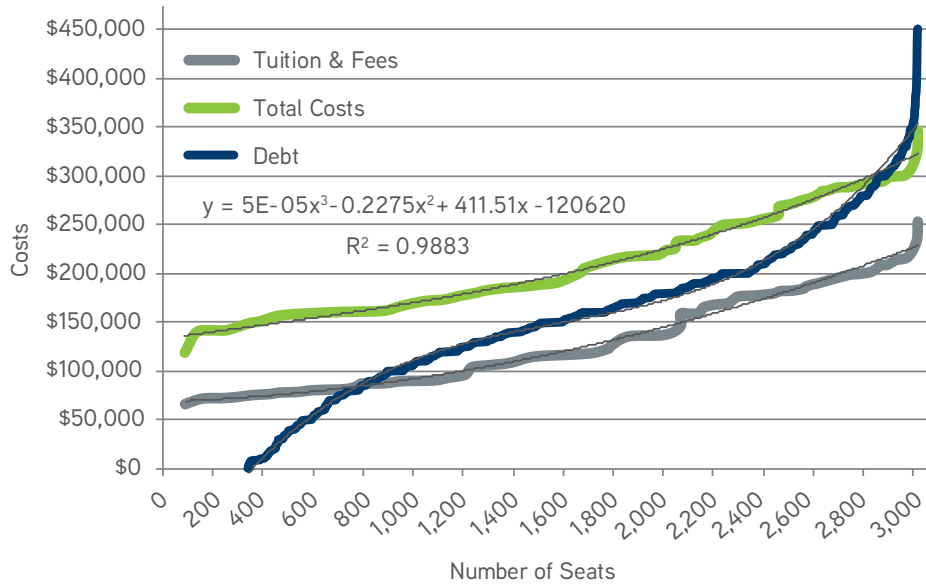


Figure 12

The debt reported by this computation gave us a ratio that we then used for the delineation between acceptable and excessive debt. That now provided us with an average living expense buffer of \$75,000 for residents and \$95,000 for nonresidents over their four-year college stay.

To provide a margin for living costs in order to identify those with “acceptable” and “excessive” levels of debt, we used the ratios of 1.5 times the non-discounted tuition rate and 1.75 times the discounted tuition rate to arrive at a maximum “acceptable” level of expenditures. Thus the mean “excess” maximum level of debt considered “acceptable” would be \$180,840 for discounted seats and \$287,565 for non-discounted seats. Again, this measure is to ascertain if there are large enough numbers of students with excessive debt such that we should increase our efforts to understand what factors are involved. The results indicate that 27.2 percent of students with discounted seats and 16.1 percent of students with non-discounted seats have excessive debt. The students with excessive debt are not uniformly distributed through the 28 colleges that graduated students in 2015. There are 15 colleges with greater than 27 percent of the students with

discounted seats and 8 colleges with greater than 16.1 percent with the students of non-discounted seats with excessive debt.

The analysis of excessive debt suggests that more research be conducted to identify what factors affect the accumulation of debt by students in the U.S. veterinary colleges. As has been noted, there may well be explanations for the existence of “excessive” debt and the non-uniformity of the debt across the colleges, including the validity of the data itself. Again, the values of tuition, fees and living expenses are estimates provided by the colleges for discounted and non-discounted seats and do not provide the actual amount paid by each student. Additionally, the value of debt is obtained from the students through their response on the senior survey and may or may not be the actual value of debt at graduation. The illustration of excessive debt is important as it indicates the need to understand to what extent better financial management by the students can reduce their debt upon graduation. A key to this research will be to obtain the actual net cost of tuition and fees, expenditure patterns and the level of debt along with the important demographic characteristics for each student.

THE ANALYSIS OF EXCESSIVE DEBT SUGGESTS THAT MORE RESEARCH BE CONDUCTED TO IDENTIFY WHAT FACTORS AFFECT THE ACCUMULATION OF DEBT BY STUDENTS IN THE U.S. VETERINARY COLLEGES.

PERCENT OF RESIDENT STUDENTS BY COLLEGE WITH DEBT-TO-COST RATIOS GREATER THAN 1.75:1

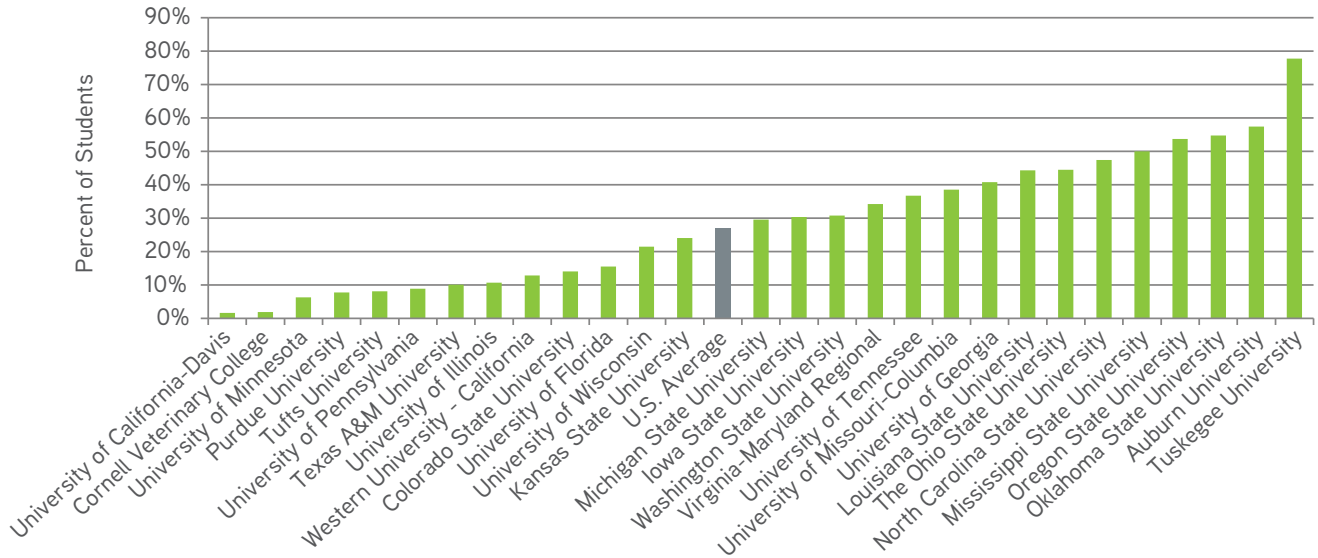


Figure 13

PERCENT OF NON-RESIDENT STUDENTS BY COLLEGE WITH DEBT-TO-COST RATIOS GREATER THAN 1.5:1

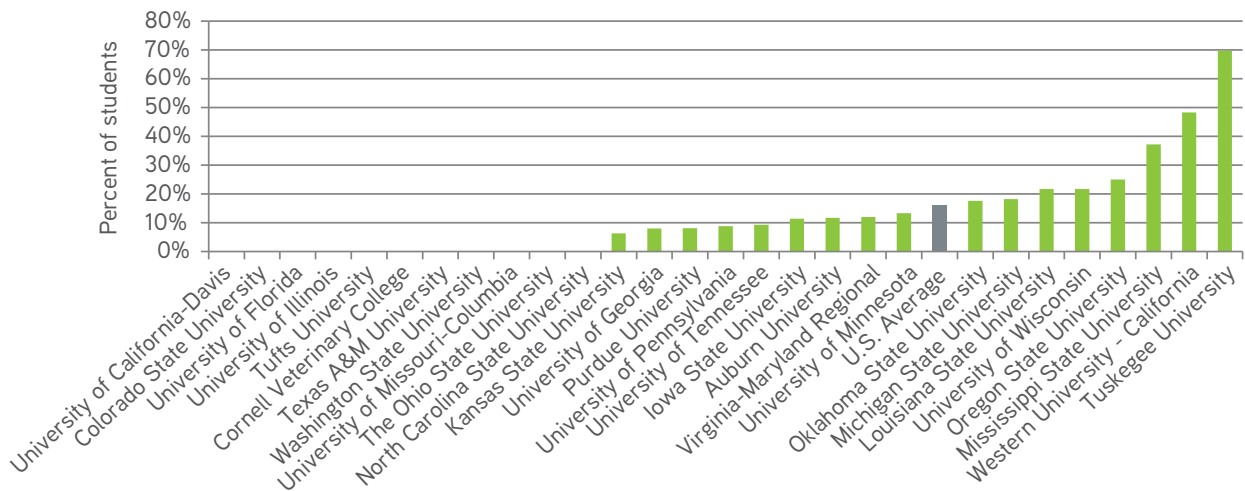


Figure 14

DEMAND FOR VETERINARY EDUCATION

The demand for veterinary education is the price applicants are willing to pay for each seat. In 2015, there were 6,600 total applicants to veterinary college who applied through the Veterinary Medical College Application System (VMCAS). An annual survey of the VMCAS applicants was initiated in 2014 with one set of questions to determine what applicants would be willing to pay to

attend veterinary college. The relationship between the number of applicants and their willingness to pay defines the demand for veterinary medical college. Understanding and measuring this relationship and how the income of veterinarians and the cost of becoming a veterinarian affect the relationship are important in estimating the future demand for veterinary education.

TOTAL APPLICANTS OVER TIME

The number of applicants 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. And, this is what has, in fact, begun to occur. What the factors are that will be the source of this cycle are unknown but will be important to predicting future market conditions.

AAVMC VETERINARY SCHOOL APPLICANT FIGURES



Figure 15

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 international U.S. accredited schools are considered, that ratio drops to 1.56:1. 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. As a result of these factors, colleges with the higher-priced seats may find it difficult to fill those seats in the near term, and the competition for quality students amongst schools may increase to such a degree that non-resident tuition and fees may be reduced or eliminated and new sources or means to reduce tuition and fees may be offered.

The difficulty of filling seats with quality applicants may increase if new seats are added. 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 is forecast to decline even with a constant number of available seats through 2025.

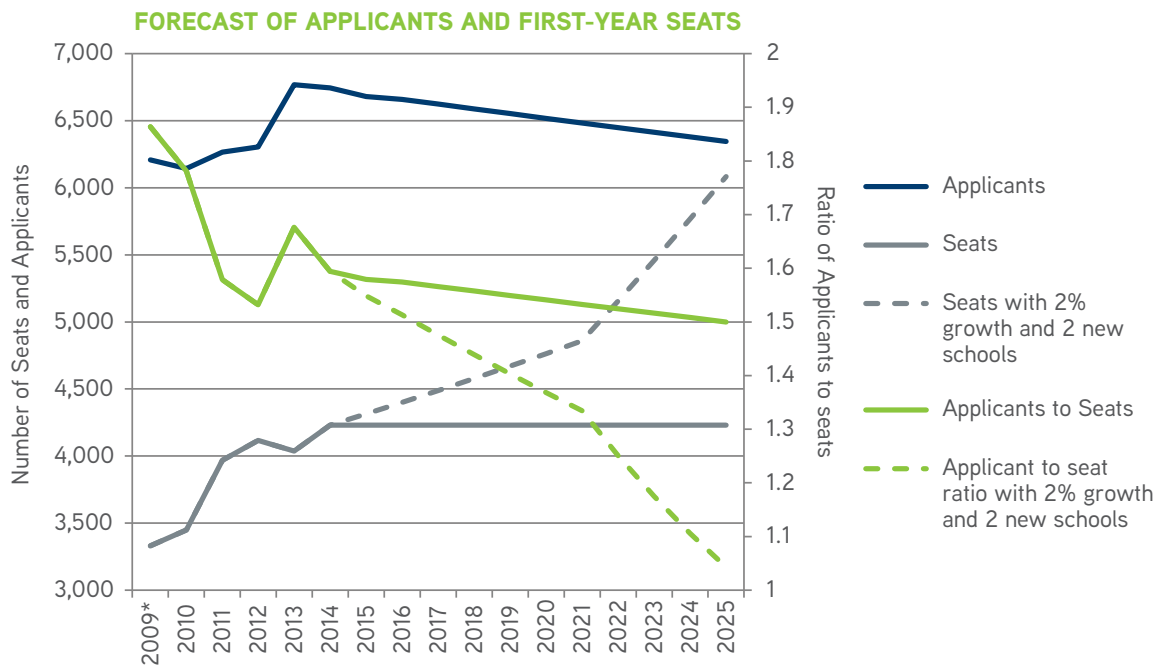


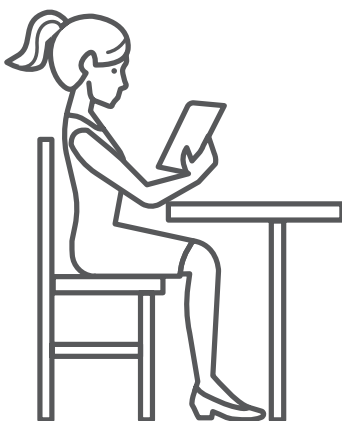
Figure 16

However, if the rate of increase in the number of seats at existing schools continues the long-term trend and two new schools are added, then the combination of new seats and declining applicants will bring the applicant-to-seat ratio to an estimated 1.04:1 by 2025. While this is likely to be a worst-case scenario, the competitive environment among veterinary schools is 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 in this case).

There is likely a threshold value for tuition costs that the average student is willing to pay (discussed below); above that threshold,

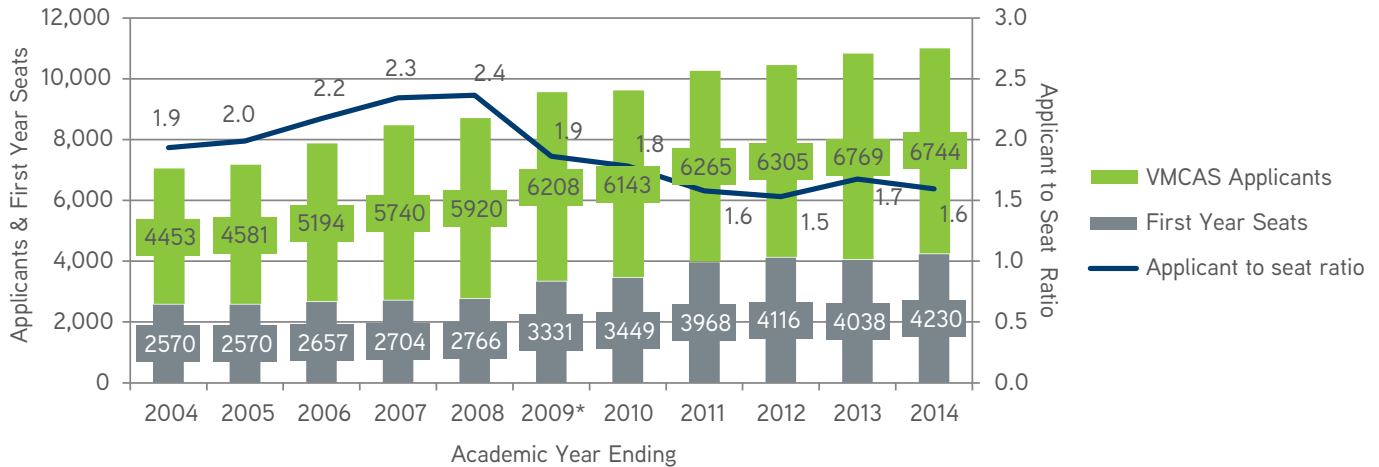
the number of applicants decreases, and recent analysis has shown that this threshold may be declining. Those schools whose total costs fall in the top 20th percentile are currently above that threshold. Thus, the addition of new seats that cost more than the threshold in this increasingly competitive 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.

The increase in the number of seats will increase the number of graduates entering the employment market for veterinarians. At this time, we do not have a model for the effect of an increased number of veterinarians on unemployment rates.



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 IN THIS CASE).

VMCAS APPLICANTS AND FIRST-YEAR SEATS



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

Figure 17

WILLINGNESS TO PAY

While the number of applicants is an indication of the number of potential students with an interest in pursuing a veterinary education, those applicants must also be willing to pay for the seat they are offered. Of course, what the applicants indicate they are willing to pay prior to receiving an acceptance letter from a specific veterinary college may differ markedly. Understanding both why this difference occurs and how it affects the long-term satisfaction with the profession and lifestyle of veterinary students will be important to discover the impact of changing the debt-to-income ratio on the demand for veterinary education. That impact will likely vary with the knowledge of that ratio and the understanding of what the ratio means for the new veterinarians' standard of living.

The chart below indicates the willingness to pay (demand) for a veterinary education based on information supplied by a sample of applicants for the 2015/16 school year. Applicants were asked three different questions related to their willingness to pay for a seat at a veterinary college.

- What is the total amount you are willing to borrow?
- What is the total amount you are willing to borrow if your income at graduation is \$65,000?
- What is the monthly payment you are willing to make if your take-home pay is \$3,600 per month?

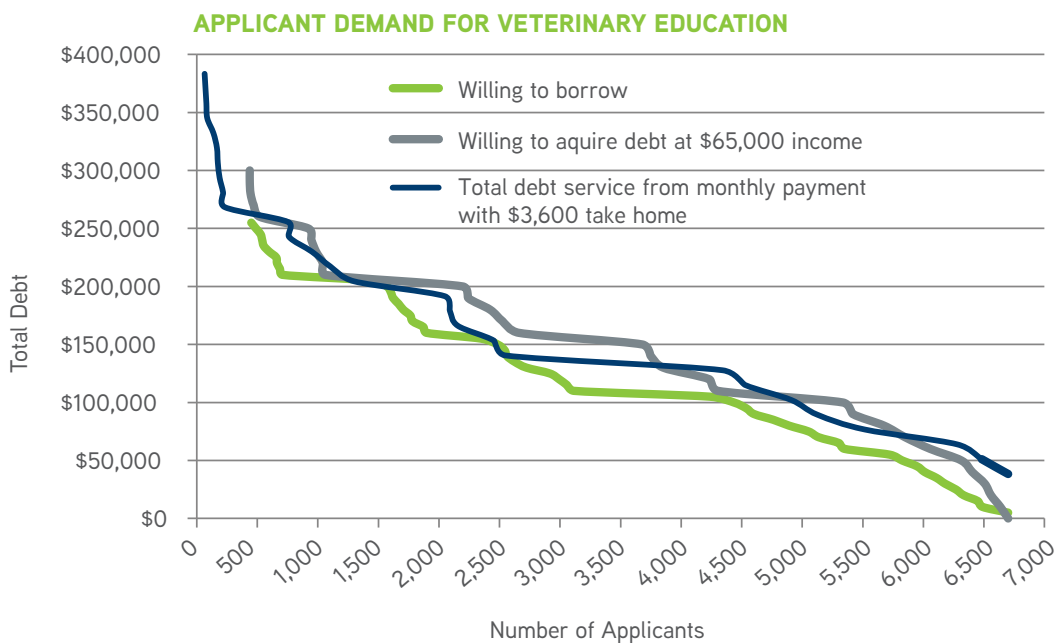


Figure 18

The responses were converted into a total amount of debt for comparison. The demand was similar in each case with few willing to acquire more than \$250,000 of debt. Using a linear function to estimate the demand indicates that no applicant

would be willing to pay more than \$244,089 and that to fill each additional seat would require a reduction of \$38.34. Thus, the last seat (to reach a total of 4,230 seats) would have to cost \$81,911 to find an applicant willing to pay to obtain the seat.

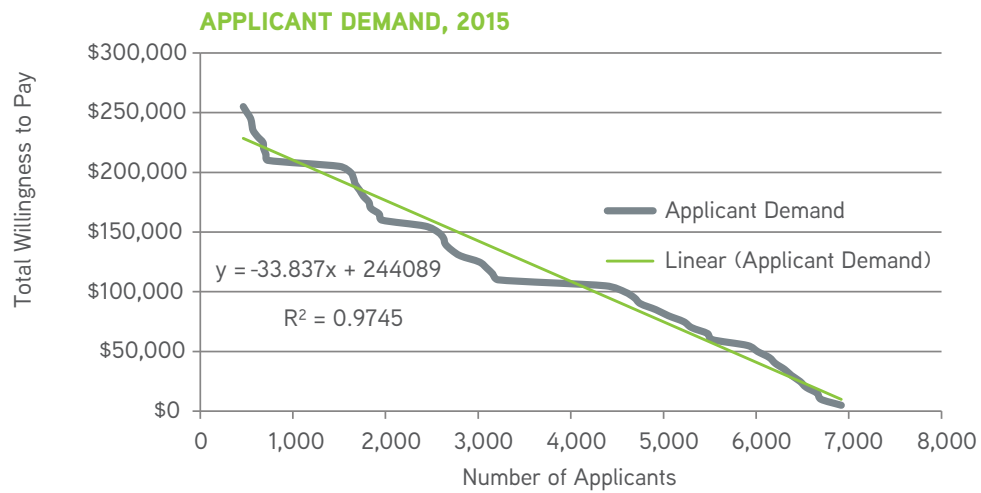


Figure 19

If the applicants could be matched with the seat such that their willingness to pay for the seat was in-line with the cost of the seat all of the seats would be filled. But this pairing is unlikely and thus some applicants will receive offers for seats that exceed their willingness to pay (at the time of application). And, not all of the applicants for veterinary college are qualified and this shifts the demand to the left meaning that the last seat would actually be required to be less expensive than what has been estimated.

For the 2014 applicant pool, the maximum willingness to pay based on the linear estimation of demand from applicant responses was \$296,037 and each additional applicant reduced the willingness to pay by \$37.28. This indicates the willingness to pay (demand) indicated by the applicants has declined by 16 percent year over year. This leftward shift in demand (reduction) will be important to track. The rate at which the number of applicants changes as demand shifts left will provide valuable information on the impacts of costs and debt on the demand for veterinary education.

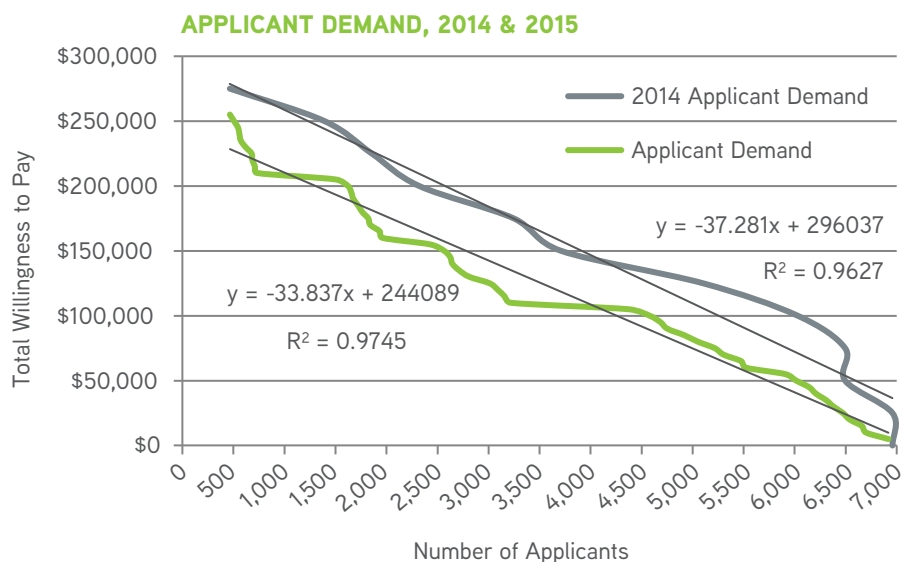


Figure 20

EQUILIBRIUM IN THE VETERINARY EDUCATION MARKET

The veterinary education market equilibrium, the intersection of the supply of and the demand for those seats, has been identified for both the supply associated with tuition and fees only, and for total costs. Both are provided because it is unclear whether the respondent answered this question based on the combined costs of living expenses and tuition and fees.

The equilibrium point occurs at that price and quantity where the willingness to pay for seats by applicants is just equal to the willingness to provide seats by the colleges.

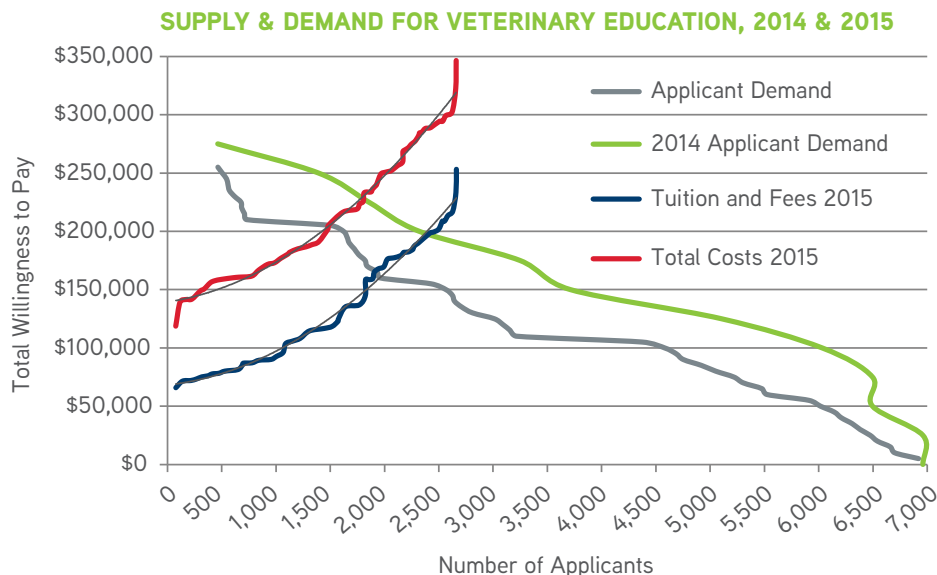


Figure 21

Two demand functions are provided in the figure above, one for the 2015 applicants willingness to pay and the other indicating the willingness to pay by 2014 applicants. The supply curves provided are from the previous figures indicating the cost per seat, the lower curve indicating only the cost of tuition and fees per seat while the upper curve providing the total cost of each seat.

The 2014 equilibrium point for willingness to pay for tuition and fees occurred at 2,859 seats and a price of \$189,428. The increase in tuition and fees would have moved the equilibrium to 2,442 seats and a price for the last seat of \$205,013 had the demand not shifted left. However, because of the contraction in willingness to pay and the increase in the cost per seat, the equilibrium is now at 2,105 seats at a price of \$172,853. This is well below the number of actual seats filled (3,028 in the 30 U.S. colleges) and the price required to fill the last seat (\$258,646).

Clearly, there is a large gap between what applicants indicate is their willingness-to-pay for their education and the actual cost of the seat they purchase. Some of this difference can be accounted for by the amount of funds they can apply to the cost of the seat from personal or other sources. The willingness to pay questions sought the applicant's willingness to acquire debt assuming they would take out loans for all of their veterinary college expenses. This is not the case, as roughly 11 percent graduate with no debt, 26 percent graduate with debt less than the cost of tuition and fees and 67 percent graduate with debt less than the total cost of the education.

The 2015 applicants were also asked what the average level of debt was for the 2014 graduating class. The results indicate considerable variability, with a mean value of \$162,050 and a standard deviation of \$69,358.

THERE IS A LARGE GAP BETWEEN WHAT APPLICANTS INDICATE IS THEIR WILLINGNESS TO PAY FOR THEIR EDUCATION AND THE ACTUAL COST OF THE SEAT THEY PURCHASE.

2015 APPLICANT ESTIMATES OF CURRENT AVERAGE DEBT LOAD FOR 2014 GRADUATES

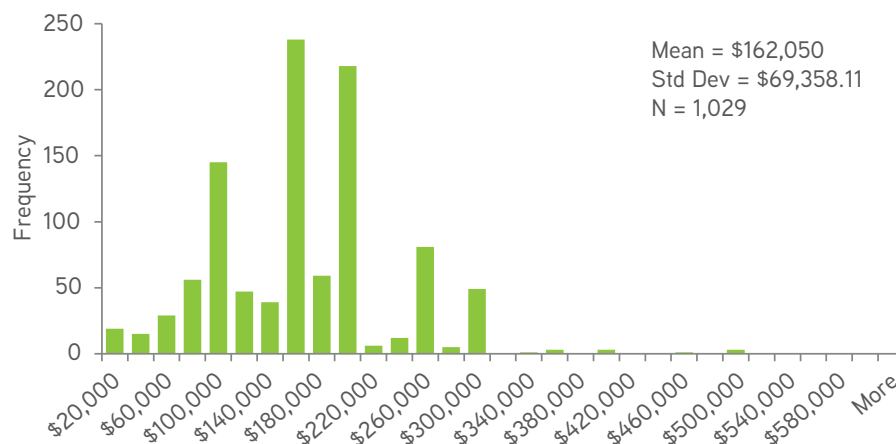


Figure 22

The year-over-year reduction in equilibrium price and quantity of seats may have occurred due to a number of different factors such as an improving understanding of the impact of debt on post-graduate standard of living or improved strategies for acquiring personal or external support. Continued examination of this relationship and more in-depth research into the factors affecting the applicant's decision to attend veterinary college will be important going forward.

At the 2015 AVMA Economic Summit, Dr. James Lloyd (Dean, University of Florida College of Veterinary Medicine) noted that the market for veterinary education is neither a market for commodities nor a perfectly competitive market. Indeed the market for veterinary education may exhibit monopolistic competition, oligopoly and monopoly characteristics. For the state supported colleges, a certain amount of monopoly power can be exerted for the discounted seats available to residents. These same schools may interact as an oligopoly competing for students within regional markets. However, combined with the 30 domestic and 19 international U.S. accredited colleges the market for veterinary education can be viewed as monopolistic competition. These various market structures imply that the conditions for a perfectly competitive market do not hold, and thus the general conditions for equilibrium cannot be used.

Dr. Lloyd also suggested the resulting demand for seats by applicants was more complicated than would be the case in a perfectly competitive market where the only distinguishing characteristic of the seat was its price. As he noted, the decision of whether to attend and what college to attend is a multifactorial decision process involving choice factors that would include personal and parental effects, cultural, educational and social context, institutional factors, and economic factors.

Having a multifactorial decision model for applicants would improve our understanding of the market for education, and perhaps more importantly, improve our forecast of the applicant-to-seat ratio. Our best guess for the trend number of applicants, seats and applicant-to-seat ratio is illustrated below based on the current trends in the market for veterinarians driving demand for seats and the trend in the cost of seats. Of course, a downturn in the economy, an increase in the number of seats or greater reluctance of potential applicants to consider veterinary medicine due to the high cost relative to income would increase the rate of decline in the applicant to seat ratio. Conversely, continued increase in new graduate incomes relative to debt may increase the attractiveness of the veterinary medical degree, increasing the number of applicants.

THE DECISION OF WHETHER TO ATTEND AND WHAT COLLEGE TO ATTEND IS A MULTIFACTORIAL DECISION PROCESS INVOLVING CHOICE FACTORS THAT WOULD INCLUDE PERSONAL AND PARENTAL EFFECTS, CULTURAL, EDUCATIONAL AND SOCIAL CONTEXT, INSTITUTIONAL FACTORS, AND ECONOMIC FACTORS.



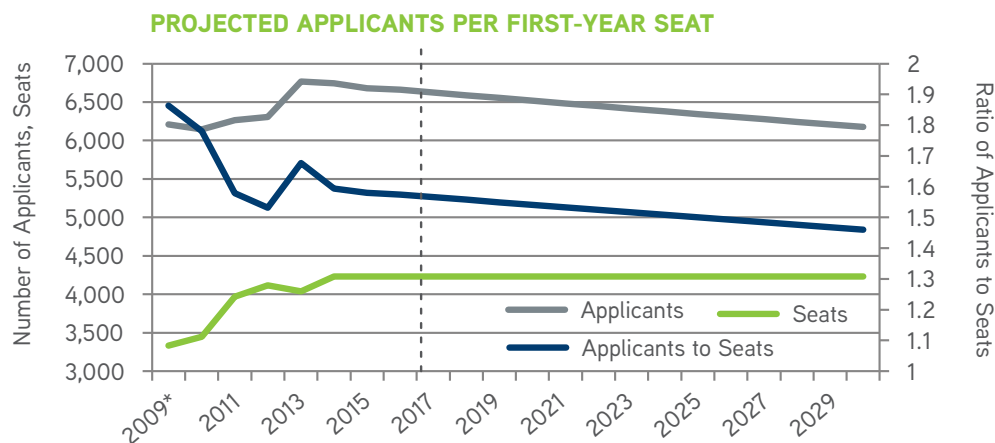


Figure 23

MAJOR FINDINGS

Key findings from the 2015 AVMA Economic Summit on the market for education included information on the applicant pool presented by AAVMC that noted the continued supply of high quality applicants in excess of the number of available seats even though the ratio of applicants to seats is only 1.6:1. These applicants are becoming more aware of the cost of a veterinary education, the debt that may have to be acquired to complete that education and the impact of that debt on their post graduate standard of living.

The current amount of scholarships received by these students in 2015 was \$29.9 million. Nevertheless, only 46.5 percent of

the veterinary students received any of this funding. The total amount of debt of the 2015 graduates from the 28 U.S.colleges exceeded \$427 million.

Continued research to define the applicant decision process and reasons for the wide variation in student debt both within schools and between schools for discounted and non-discounted seats are necessary to better understand the market dynamics and developing strategies to help students better manage the costs of education.

The current amount of scholarships received by these students in 2015 was \$29.9 million. Nevertheless, only 46.5 percent of the veterinary students received any of this funding.



MARKET FOR VETERINARIANS



As of the end of 2015, an estimated 105,067 veterinarians were actively practicing veterinary medicine in the United States. The largest share of veterinarians was employed in companion animal medicine (64.7 percent). The remaining share of veterinarians practice in university and colleges (7.6 percent), food animal medicine (4.6 percent), equine medicine (4.3 percent) and mixed animal medicine (2.9 percent).

The market for veterinarians is comprised of multiple, horizontally related markets. Veterinarians have numerous employment options upon graduation, including private practice (e.g. companion animal, food animal, mixed animals, equine), public practice (e.g. university, government, uniformed services), industry and non-profits. As of the end of 2015, an estimated 105,067 veterinarians were actively practicing veterinary medicine in the United States. The largest share of veterinarians was employed in companion animal medicine (64.7 percent). The remaining share of veterinarians practice in university and colleges (7.6 percent), food animal medicine (4.6 percent), equine medicine (4.3 percent) and mixed animal medicine (2.9 percent).

Each year a portion of the active veterinarians become inactive due to retirement, injury, illness or death; others have elected to move into a different profession. At the same time, there are new veterinarians entering the profession. In this report, the total number of veterinarians will be broken down into new and existing veterinarians as well as employees and practice owners.

VETERINARY POPULATION, 2015

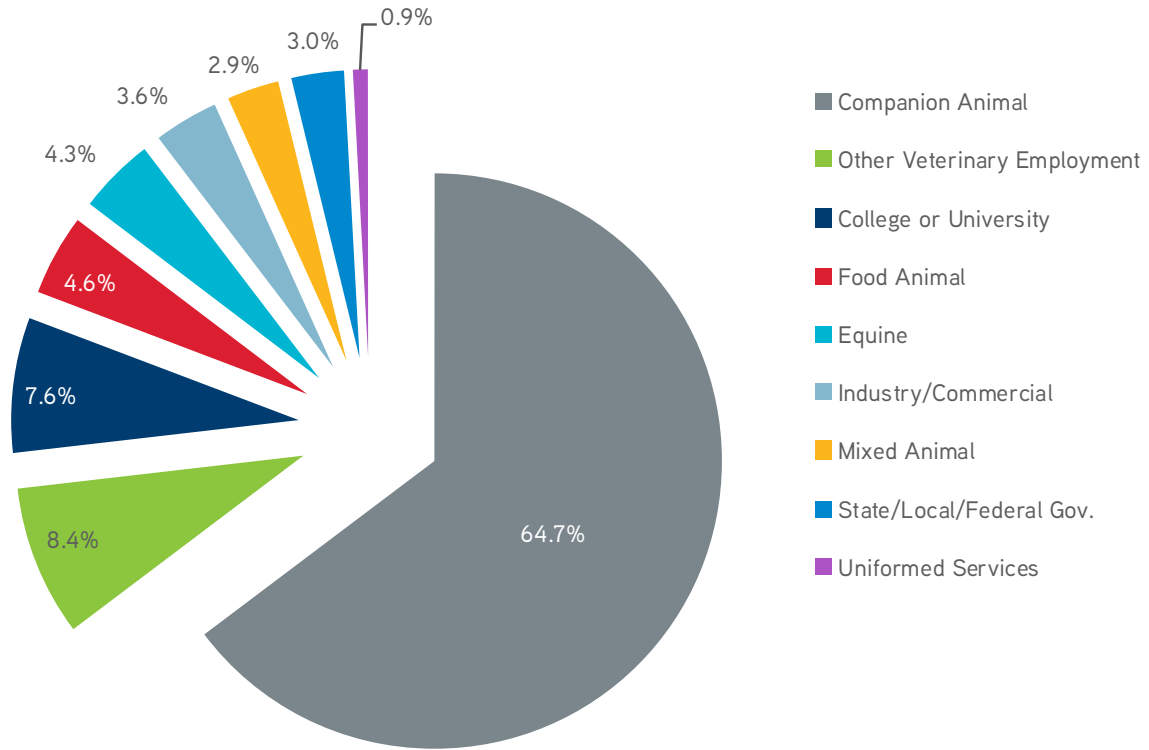


Figure 24



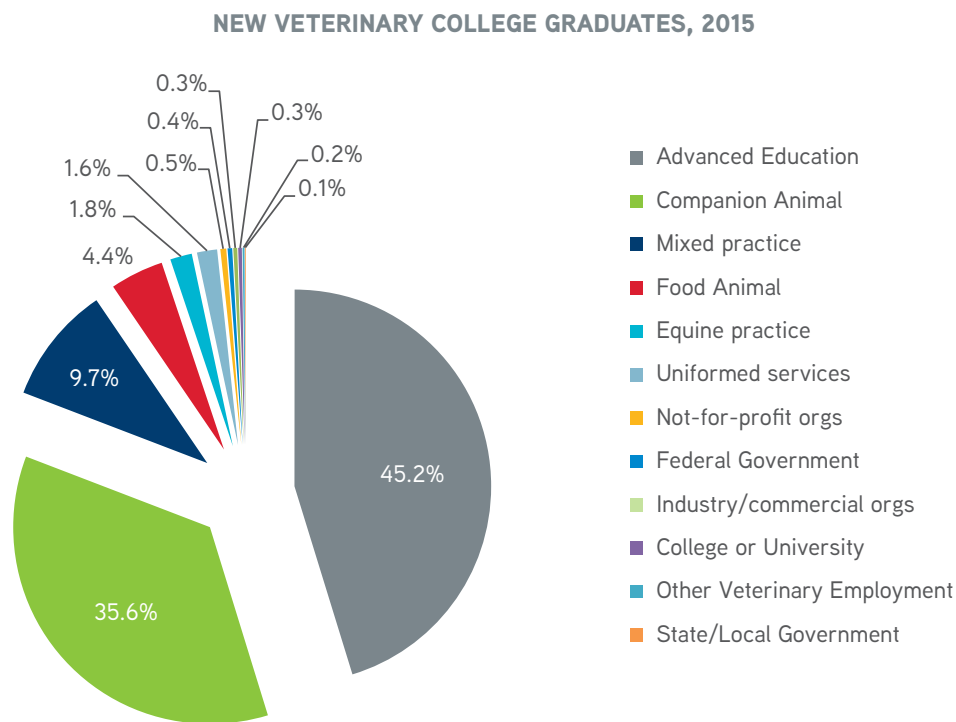
NEW VETERINARIANS

Between 2011 and 2015, 17,033 veterinarians were added to the veterinary workforce from the U.S. veterinary colleges. As seen from the results of the survey of graduating seniors, roughly half of those graduating indicated that they would be pursuing advanced degrees, residencies or internships. Of those entering employment directly after graduation, 65.0 percent were employed in companion animal practice, 17.6 percent in mixed practice, 8.0 percent in food animal practice and 3.3 percent in equine practice.

The distribution of veterinarians by practice type for recent graduates varies considerably from the distribution of existing

veterinarians by practice type and represented a 4.7 percent increase over the previous five-year period. The most noticeable difference in the distribution of existing and recent veterinarians is the large increase in the number of recent veterinarians in mixed practice versus existing veterinarians in mixed practices. The percent of recent graduates in food animal practice is larger than the percent of existing veterinarians in that practice area. And the percent entering equine medicine has declined compared to the percent of those veterinarians already engaged in equine medicine.

THE MOST NOTICEABLE DIFFERENCE IN THE DISTRIBUTION OF EXISTING AND RECENT VETERINARIANS IS THE LARGE INCREASE IN THE NUMBER OF RECENT VETERINARIANS IN MIXED PRACTICE VERSUS EXISTING VETERINARIANS IN MIXED PRACTICES.



17,033 U.S. Graduates, 2011-2015

Figure 25



SUPPLY OF NEW VETERINARIANS

The supply curve of new veterinarians represents the willingness to provide full-time equivalents (FTEs) of veterinary services at a specific price for each new veterinarian. Recent surveys of new veterinarians do not provide adequate information about the costs associated with the willingness to provide veterinary services. These costs would include annual debt repayment obligations, living costs and some return on their educational

investment. To estimate the cost per new veterinarian, a standard FTE and a median income plus the annual debt obligation are used to determine the supply function. However, because of the wide variation in debt obligation, the last veterinarian in the supply curve would require a considerably higher income to be fully compensated for total educational costs and a normal return on that investment.

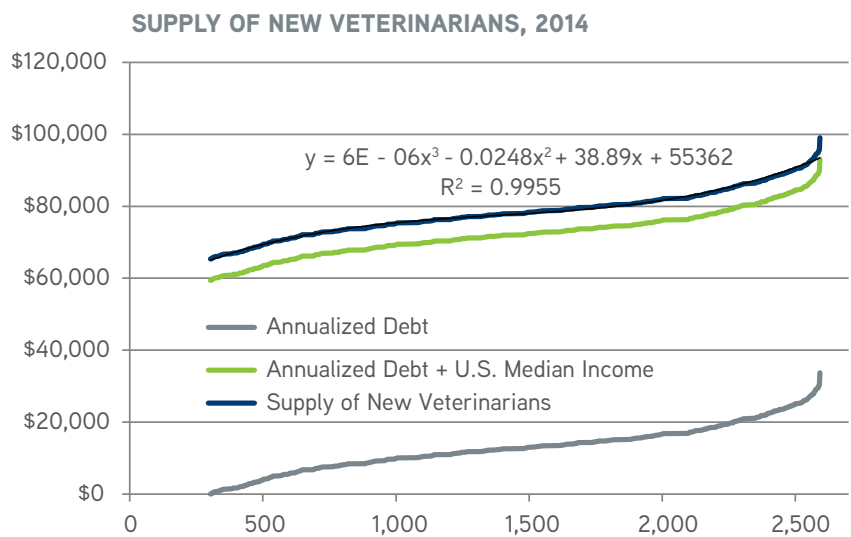


Figure 26

DEMAND FOR NEW VETERINARIANS

To determine the demand for new veterinarians, we use the data provided by the AVMA Senior Survey. That survey is administered annually to graduating veterinary students and solicits information on their demographics, employment status, starting salaries, student debt and several other variables including board certifications and postgraduate plans. Because gender mix, regional location and type of practice changes over time, and because these changes are statistically significant in affecting income, the annual reported compensation for new veterinarians is adjusted for these changing factors and inflation. After adjusting for these factors an Indexed Real Weighted Mean Income (RWI) is created. The RWI enables the annual variations in income to be measured for the impacts of the changing number of new veterinarians and the changing economic conditions (GDP/capita) on current compensation for new veterinarians.

Controlling for these factors is important in the determination of demand as demand is the relationship between price and quantity. Factors other than quantity must be held constant to get a true measure of the effect of a change in demand on the change in price. The increase or decrease in demand (ie. the change in all the price-quantity points) occurs as the result of changes in consumer incomes. Increasing consumer income will increase the demand for veterinary services leading to an

increase in the price of veterinary services. The increase in the price of veterinary services will increase the price (i.e. incomes) of veterinarians, all other things being equal.

The RWI is a standard economic practice of creating a Laspeyres index. The most widely known use of this index is to develop our country's Consumer Price Index (CPI). In estimating the CPI, the value of a fixed basket of consumer goods is held constant over time. The ratio of the value of the market basket in a specific year to a base year value indicates the percentage change in the price of the basket of goods. In the same way, the RWI uses a constant cohort of veterinarians with the same percentages of gender, practice type and regional location.

For instance, the graph below illustrates the difference between male and female nominal mean starting salaries at graduation. For the entire 2001-2015 period, the mean starting salaries for males have exceeded those for females. Note from the figure below that the gap in mean salary between men and women has varied year to year. In addition, because the percent of women joining the profession continues to grow each year, a continuation of the male-female gap in income will result in a decline in mean income for all new veterinarians, all other things being equal. The RWI holds the percentage of men and women constant through time so that the impact, year-to-year of variations in gender will not affect the price, quantity relationship.

THE RWI ENABLES THE ANNUAL VARIATIONS IN INCOME TO BE MEASURED FOR THE IMPACTS OF THE CHANGING NUMBER OF NEW VETERINARIANS AND THE CHANGING ECONOMIC CONDITIONS (GDP/CAPITA) ON CURRENT COMPENSATION FOR NEW VETERINARIANS.

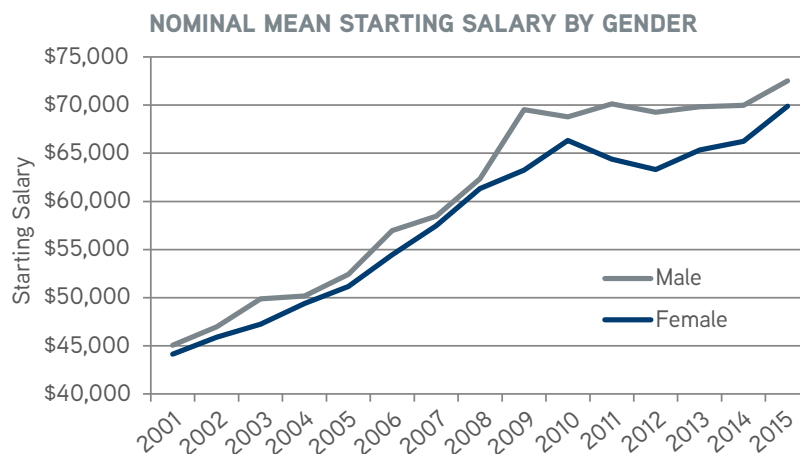


Figure 27

INDEXED REAL WEIGHTED MEAN INCOME (RWI)

A comparison of the nominal mean income and the RWI (in 2014 dollars) is illustrated in the chart below. Nominal mean income showed good growth until 2008, was relatively flat until 2014, and reached a new high in 2015. The RWI followed a somewhat

similar pattern but continued on into 2015 to be well below the peak real income set in 2010. The RWI indicates that new graduate incomes have not returned to previous purchasing power levels and continue to be well off the longer term trend.

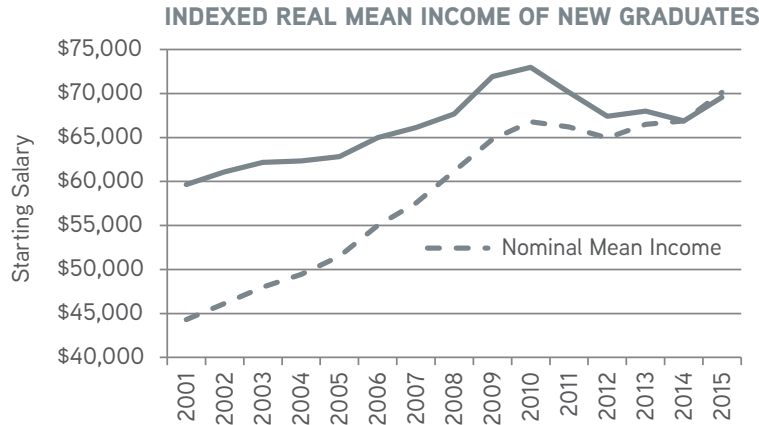


Figure 28

NOMINAL MEAN DEBT BY GENDER

In addition to the gender gap in starting salary, the data shows a gender gap exists in student debt. Female graduates have more debt than males, as illustrated in the chart below. This gap reached nearly \$10,000 in 2013 but closed considerably in 2014 before widening again in 2015. Average debt for all new veterinarians is now roughly \$140,000. Because the majority of new veterinarians finance this debt over 25 years at the

government rate (6.8 percent in 2014), we use the amortized cost of servicing that debt as part of the cost of supplying new veterinarians. And, just as with the creation of the RWI for starting salaries of new veterinarians, an indexed real mean debt is determined to control for changes in debt that result from changes in gender and other factors that are found to be statistically significant in affecting debt.

IN ADDITION TO THE GENDER GAP IN STARTING SALARY, THE DATA SHOW A GENDER GAP EXISTS IN STUDENT DEBT. FEMALE GRADUATES HAVE MORE DEBT THAN MALES.

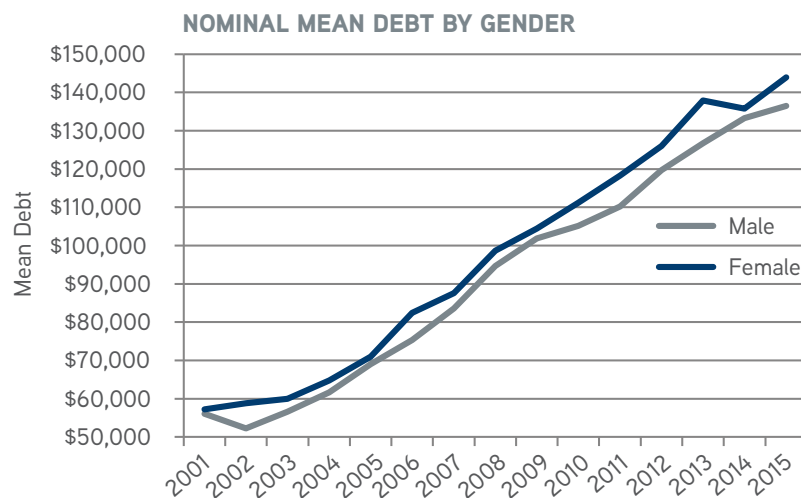


Figure 29

DEBT AND INCOME OF NEW GRADUATES

The gap between debt and income began to widen quickly after 2005. This gap increased from roughly \$11,000 in 2001 (debt was 118 percent of income) to more than \$64,000 (debt is 192 percent

of income) by 2015. The rapid and persistent expansion of this debt and income gap for new veterinarians represents a major problem for the profession and a current focus of research efforts.

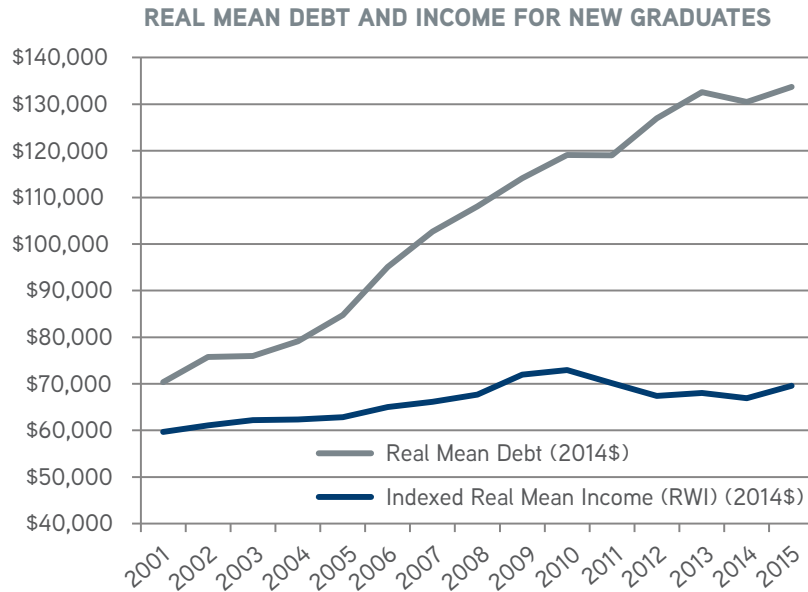


Figure 30

REAL DEBT-TO-INCOME RATIO

Congruent with the expansion of the gap between debt and income, the debt to income ratio continues to increase, rising from just under 1.2:1 in 2001 to just under 2.0:1 in 2015.

Moreover, the debt-to-income ratio for women continues to be greater than for men, both because women earn less than their male counterparts and because they have higher levels of debt.

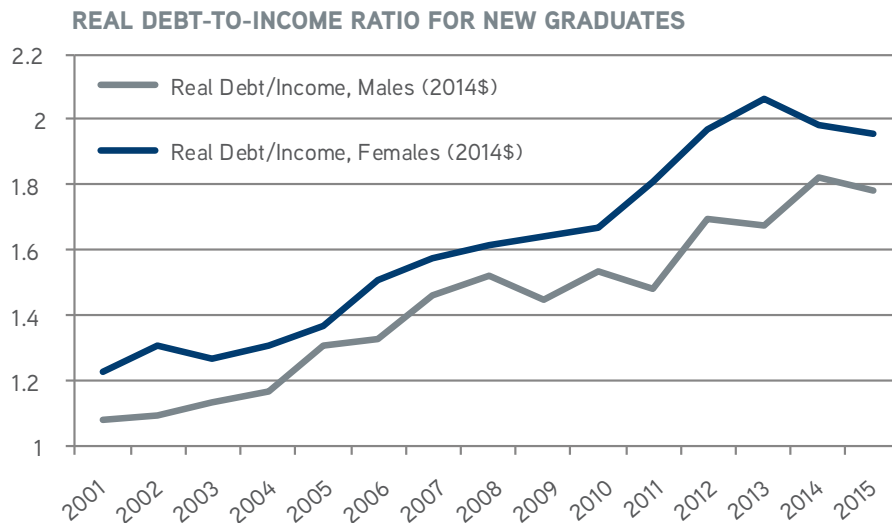


Figure 31

THE INCREASING DEBT TO INCOME RATIO IS CONSISTENT WITH INCREASES IN THE AMOUNT OF A VETERINARIAN'S DISPOSABLE INCOME REQUIRED TO SERVICE THEIR EDUCATION DEBT, REDUCING THEIR PURCHASING POWER AND THEIR STANDARD OF LIVING.

The increasing debt-to-income ratio is consistent with increases in the amount of a veterinarian's disposable income required to service their education debt, reducing their purchasing power and their standard of living. For those at the higher end of the debt to income scale, purchasing power may be squeezed to such an extent that the ability of new veterinarians to service their educational debt will be difficult and they will be forced to consider income-based repayment options. The income-based options allow for loan payments based on income that are smaller than simple amortized loan repayment options and provide forgiveness of the loan balance at the end of the repayment period. However, the forgiven loan balance is treated as ordinary income by the Internal Revenue Service and will be taxed, requiring a very large tax payment at the end of the repayment period.

The declining purchasing power associated with the rising debt-to-income ratio, combined with the fact that the current willingness to pay for education is estimated to be nearing a maximum level of seats at current prices, suggests that increased information designed to help applicants understand the effect of the rising ratio of education debt to income on their expected

living standard may cause the demand for seats to begin to decline.

The findings of a study of veterinary debt and income by Williams et al. provided a unique perspective by analyzing the factors that separate those veterinary students without debt from those with debt, and then analyzing the factors associated with the level of debt for those with debt.

These authors began by noting the trend in the debt-to-income ratio for all graduates, rather than the debt-to-income ratio for those with full-time employment as indicated above. This brings another important factor: post-graduate internships and residencies, into the debt-to-income ratio. The figure below shows the rapid increase in the debt to income ratio that began in 2006, along with the constant decline in salaries over the same period. The decline in salaries is a result of the increasing number of internships especially over the period from 2006 to 2012. The nearly \$40,000 difference between the average salary for interns and the average salary for full-time employment causes the average income for all graduating veterinarians to decline over time.

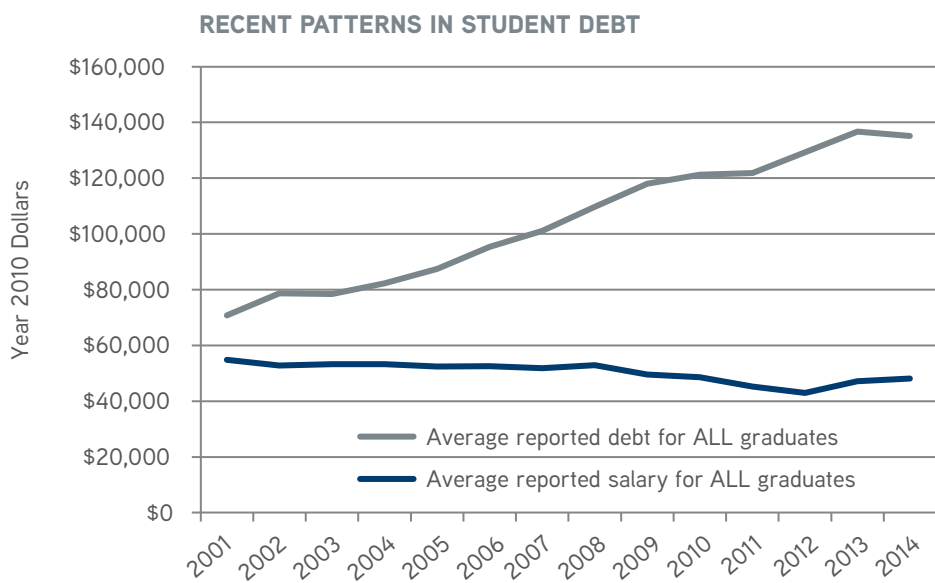


Figure 32

The trade-off between internships and full-time employment that occurred between 2006 and 2012 is illustrated in the figures below. The first figure illustrates the percentage of the survey respondents that had no employment prior to graduation, the percentage taking internships, and the percentage going into companion animal practice. From 2006 to 2012, the number of graduates without employment prior to graduation rose

rapidly from less than 10 percent to more than 35 percent of total respondents. Companion animal practice employment fell from 35 percent to less than 15 percent, while internships rose by roughly 10 percent of respondents. The actual number of internships rose by 70 percent over this period, from 412 graduates with internships prior to graduation to 696 graduates with internships.

INTERNSHIPS AS A PERCENT OF TOTAL GRADUATES

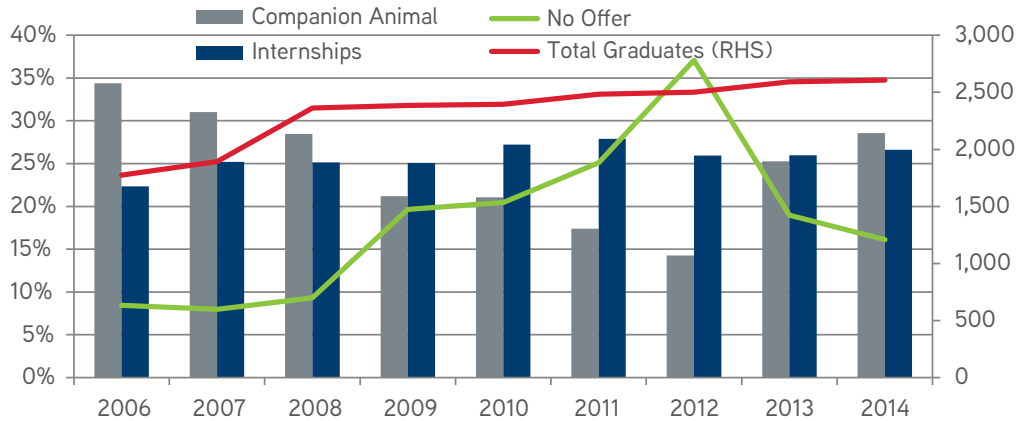


Figure 33

INTERNSHIPS GREW DURING THE RECESSION BUT DID NOT DECLINE WITH THE ECONOMIC RECOVERY WHILE FULL TIME EMPLOYMENT DECLINED DURING THE RECESSION AND INCREASED DURING THE RECOVERY.

Considering only those graduates who secured employment prior to graduation provides a clearer picture of the trade-off between full-time companion animal practice and internships. Note that the percent of total veterinary graduates who elect either full-time employment in companion animal medicine or an internship remains fairly constant at 75 percent - 80 percent and that as full-time employment in companion animal medicine fell it was offset by similar increases in internships. The reason for this change over such a short period is unclear, but suggesting that it is associated with graduate's perception of competence or their confidence would be difficult for such a short-term occurrence. In addition, the substitution of internships for full-time employment occurred during the recession and quickly reversed once the economy began to regain strength after 2012. However, as noted in the figure above, those unemployed at graduation declined sharply after 2012 and the actual number of those securing internships prior to graduation remained unchanged between 2011 and 2014. Internships grew during the recession but did not decline with the economic recovery while full time employment declined during the recession and increased during the recovery.

Why this substitution occurred is unclear, but the effect of internships on the average income of graduates is certain. As a result of the large adverse impact of internships on average income (and the debt to income ratio) our inability to explain the role of internships in the profession (e.g. economic adjustment or educational needs), and the need for a measure to indicate the financial health of the veterinarian as she enters the profession, we did not include internships in our debt-to-income ratio.

The debt-to-income ratio is a Key Performance Indicator (KPI) of the financial health of the veterinary graduate. As such, the indicator needs to describe the financial health of a typical veterinary graduate and prior to 2006 and after 2012 this was a full-time employee (not additional education). The current trend is a reduction in the percentage of graduates electing further education (internship or residency). If the internship is a requirement for entry into the profession or is used as an economic adjustment (pay lower salaries in times of economic stress), then the inclusion of those who pursue further education into the debt-to-income ratio KPI may need to be considered.

INTERNSHIPS RISE AS COMPANION ANIMAL JOBS DECLINE

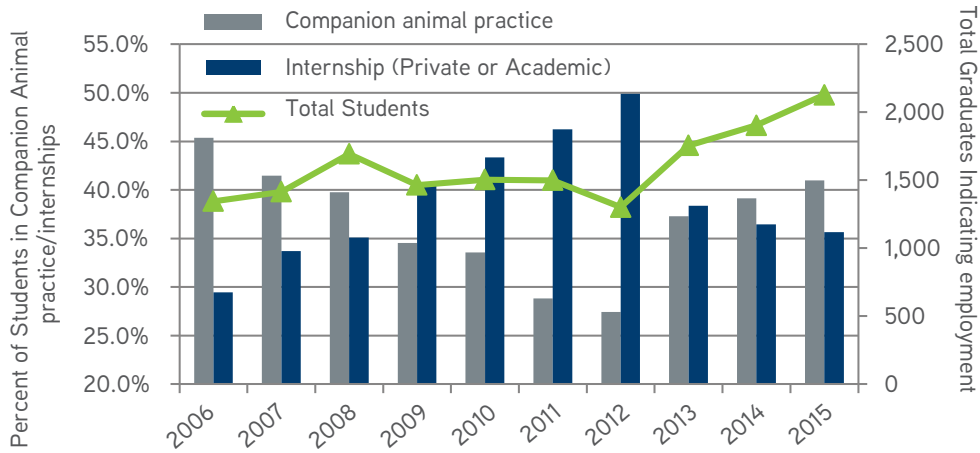


Figure 34

The Williams et al study also considered how much debt veterinary students could accumulate in school using Return on Investment (ROI) calculations. Assuming a premium of \$25,000 for the DVM degree over the bachelor degree, a 30-year career, and a three percent discount rate, a veterinary student could accumulate \$310,000 in debt before the ROI became negative.

If economic gains from education are the only factor in the decision to obtain a DVM degree, then as the expected level of debt of a student approached \$310,000 the number of applicants would decline. However, if there are non-monetary gains that are important to the potential veterinary student, then the \$310,000 level becomes only a warning light that beyond this debt level those non-monetary benefits are being realized and only after reaching this number will the number of applicants decline.

NUMBER AND STARTING SALARY FOR NEW GRADUATES

As noted previously, both the quantity of new veterinarians and the income of veterinary service consumers affect the price (i.e. income) of new veterinarians. The figure below illustrates this relationship. From 2001 to 2008, the number of new veterinarians entering the workforce was fairly constant each year while the economy continued to expand providing increases in consumer disposable income. From 2008 to 2012, the number of new veterinarians entering the workforce with full-time employment declined as did their income. The declining

income was a result of the sharp downturn in GDP. After 2012 the economy began to improve considerably and more new veterinarians entered the workforce with full-time employment immediately after graduation and their incomes also improved. Between 2014 and 2015 new veterinarians with full-time employment immediately after graduation, reached a new record high at 1,296 (from a low of 578 in 2012) and mean income increased by nearly \$3,000 (4.5 percent).



BETWEEN 2014 AND 2015 NEW VETERINARIANS WITH FULL-TIME EMPLOYMENT IMMEDIATELY AFTER GRADUATION REACHED A NEW RECORD HIGH AT 1,296 (FROM A LOW OF 578 IN 2012) AND MEAN INCOME INCREASED BY NEARLY \$3,000 (4.5 PERCENT).

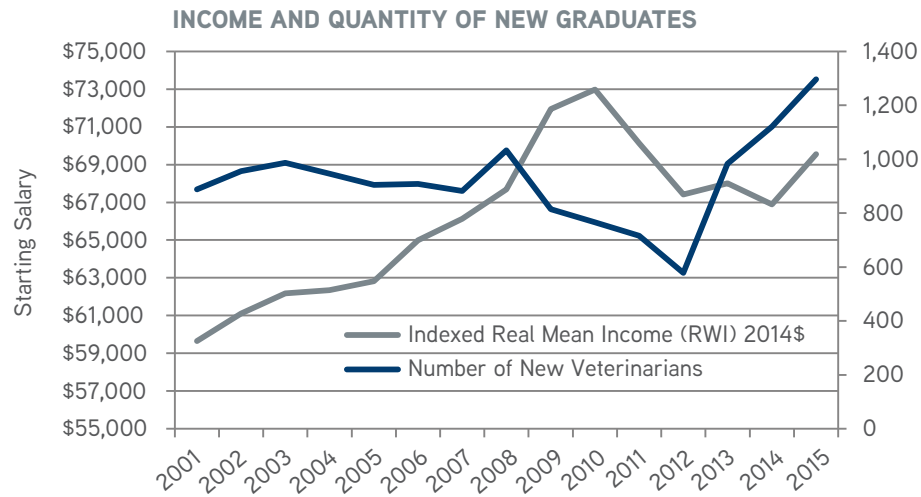


Figure 35

Clearly, the number of new veterinarians and the level of disposable income of consumers of veterinary services will continue to affect the incomes of new veterinarians in the future. Two new U.S. veterinary colleges, Lincoln-Memorial in Tennessee and Midwestern in Arizona, began to accept students in 2014 with plans to produce 100 new veterinarians each per year starting in 2018. In addition, current existing U.S. colleges and U.S. accredited international colleges have a potential to expand seats. And, there have been discussions of new veterinary schools in Florida, Texas and Arizona. As a result, the maximum number of U.S. college seats available is currently expected to increase to a maximum of roughly 3,300 by 2018 but could expand even more if new schools are built or current schools add seats. In

addition, we have noted that the current economic expansion may be nearing its end. An expansion in the number of seats and an economic recession would adversely affect new veterinary incomes.

Because we rely on the CBO forecast to determine the GDP growth and we can make no assumptions about the plans for veterinary colleges to expand seats, our forecast calls for GDP growth through 2025 and no growth in seats after the two new schools come online in 2018. The improvement in general economic activity will lead to improvement in per capita income, increasing the demand for veterinarians and thus providing growth in new veterinarians' incomes.

THIS GROWTH IN INCOME WILL ACCELERATE AS THE ANNUAL NUMBER OF NEW VETERINARIANS STABILIZES AFTER 2018. CONTINUED GROWTH IN GDP AND THE STABILIZATION OF COLLEGE SEATS WILL HELP NEW VETERINARIAN INCOMES RETURN TO TREND BY 2021.

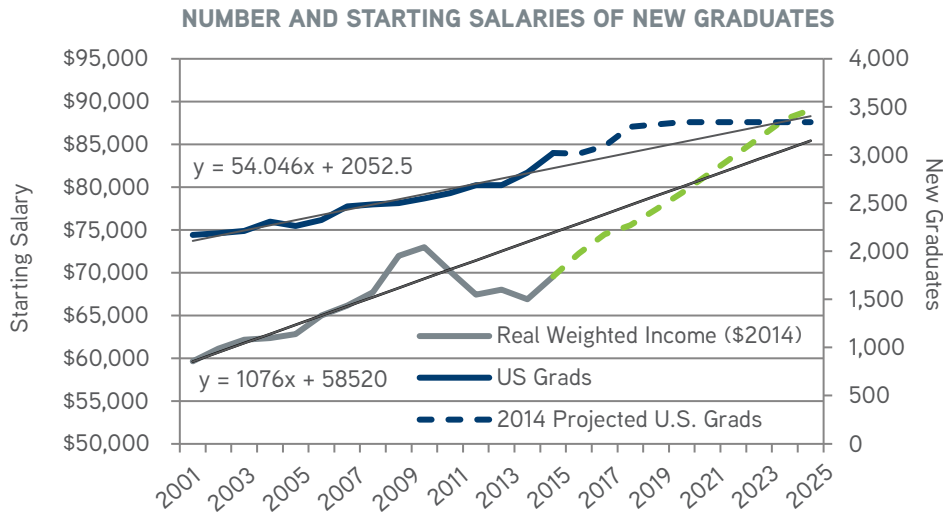


Figure 36

Forecasting the continued trend in the mean cost per seat and the distribution of debt among new veterinarians indicates that mean debt will continue to grow from roughly \$135,000 in 2015 to just over \$185,000 by 2025. Combined with growth in mean incomes from more than \$69,000 in 2015 to just over \$89,000 in 2025, the debt-to-income ratio is predicted to continue to stabilize around 2.0:1 through 2025. However, this scenario

assumes no change in the willingness of veterinary college applicants to pay for college seats. Should the demand for seats decline, the mean cost per seat will also decline as students opt for the least expensive seats. However, if the number of seats increase (without a reduction in the cost per seat), or the economy begins a downturn, the debt-to-income ratio will likely return to the strong growth pattern witnessed since 2005.

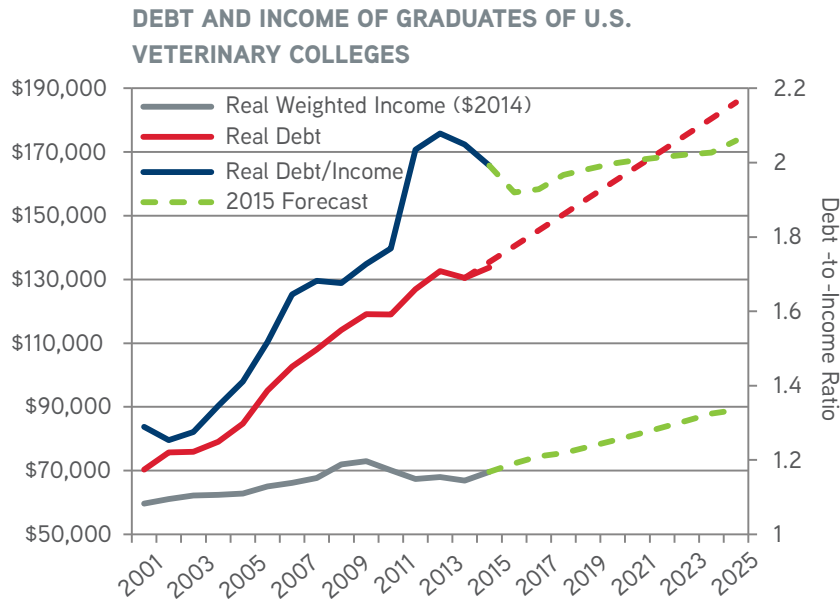


Figure 37

DEMAND FOR NEW VETERINARIANS, 2014-2015

In 2015-16, 4,381 veterinarians passed the North American Veterinary Licensing Exam (NAVLE) and became eligible to enter the U.S. veterinary workforce. In our survey of seniors at U.S. veterinary colleges (3,209), 2,663 of these seniors responded to the survey, with 1,302 (48.9 percent) indicating that they had accepted a position in either public or private practice (only 1,296 reported their starting salary), 763 (28.7 percent) indicating they had accepted an internship, and 49 (1.8 percent) a residency. In addition, 32 (1.2 percent) had extended their education, while 317 (11.9 percent) had not made a choice or received an offer at the time of the survey. The remainder represents those who did not respond to the question (7.5 percent).

The demand for new veterinarians can be estimated for each of the horizontally related markets. The estimated demand curve for six practice types is presented below. These individual

demand curves can then be horizontally summed to produce the aggregate demand curve for new veterinarians. The individual demand curves provide the price-quantity (i.e. income-number of new employed veterinarians) relationships in each market.

Price elasticity of demand is the percentage change in price (i.e. compensation) required to trigger a 1 percent change in the quantity and indicates how employers will respond financially to a higher quantity of new veterinarians. They will be willing to take on more veterinarians, but only for a reduced level of compensation. Price elasticity of demand differs significantly among the different practice types.

The price elasticity of demand is most elastic (i.e. a larger change in quantity for a 1 percent change in price) for companion animal practitioners and least elastic for veterinarians in industry.

FOR COMPANION ANIMAL PRACTITIONERS, A SMALL REDUCTION IN INCOME WILL INDUCE A LARGER DEMAND FOR NEW VETERINARIANS. IN CONTRAST, A VERY LARGE REDUCTION IN INCOME WOULD BE NEEDED TO INDUCE INDUSTRY EMPLOYERS TO INCREASE THE DEMAND FOR NEW VETERINARIANS.

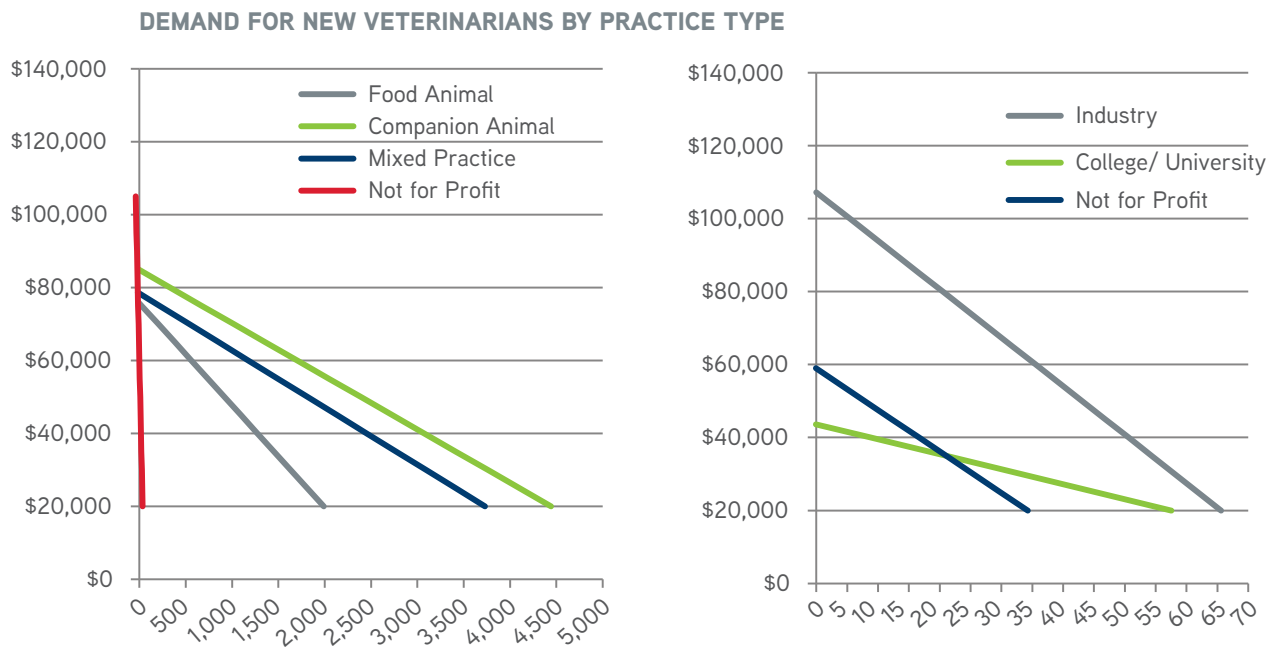


Figure 38

The equilibrium in the market for new veterinarians can be determined by equating the demand for new veterinarians with the supply of new veterinarians. The equilibrium income and number of veterinarians would occur if there were perfect

information in the market for new veterinarians, and new employees selected employment only when their perceived value was offered by the employer.

THE EQUILIBRIUM NUMBER OF NEW VETERINARIANS IS ESTIMATED TO BE 667 AT A STARTING SALARY OF \$72,229, CONSIDERABLY DIFFERENT FROM THE CURRENT MARKET CONDITION OF 1,296 NEW VETERINARIANS AT A MEAN STARTING SALARY OF \$70,117.00.

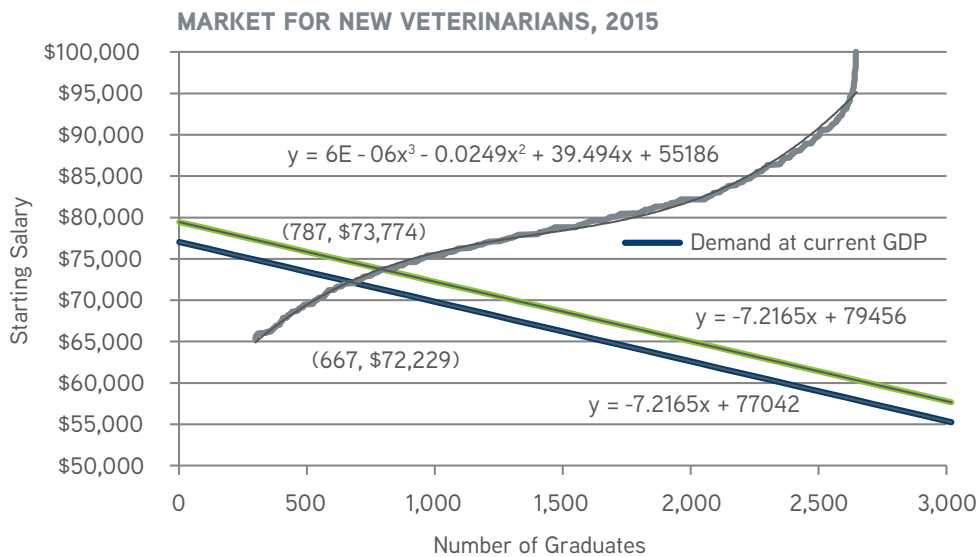


Figure 39

With a recovery of real GDP per capita to trend levels, the equilibrium in the market for new veterinarians would be 787 employed new veterinarians at a starting salary of \$73,774.

From the data and analysis, we can construct a picture of the market for new veterinarians as indicated below. In 2015, there were 1,296 respondents to the survey that indicated they had a position in hand with a mean average starting salary of \$70,117. This starting salary represents the average salary that employers were willing to pay and that new veterinarians were willing to accept for employment prior to graduation. However, based on debt-servicing obligations and living costs, the last veterinarian supplied to the market might have required \$77,608 in starting salary to be adequately compensated, representing a gap of \$7,491. This level of mean starting salary would have reduced the debt-to-income ratio from the current 2.0:1 to 1.82:1.

The supply curve for new veterinarians illustrated in the graphic below indicates what each of the veterinarians may require in compensation to service their debt, have a standard of living equal to a median income earner, and receive a 10 percent premium for their professional degree. Of course each individual graduate may have different expectations for fair compensation.

And, the equilibrium determination also assumes, perhaps unrealistically, that those willing to sell their services for less (have lower debt) are of equal quality as those wishing to receive higher levels of compensation. Regardless of the caveats associated with the equilibrium estimate, those caveats likely hold constant year to year and offer only a portion of the rationale for the difference between what actually occurred in 2015 and the computed equilibrium. In 2014 the equilibrium was 771 new veterinarians with a salary of \$72,536. The actual 2014 values were 1,121 and \$66,897.

A similar difference occurred in 2015, with an equilibrium number of new veterinarians of 667 and a starting salary of \$72,229. The actual values of 1,296 new veterinarians and \$70,117 starting salary indicate that more new veterinarians are willing to work for less pay than would be suggested by our equilibrium estimates. While the gap between the estimated equilibrium income and the actual income has closed year over year, the gap between the estimated equilibrium and actual number of new graduates obtaining full time jobs prior to graduation continues to expand.

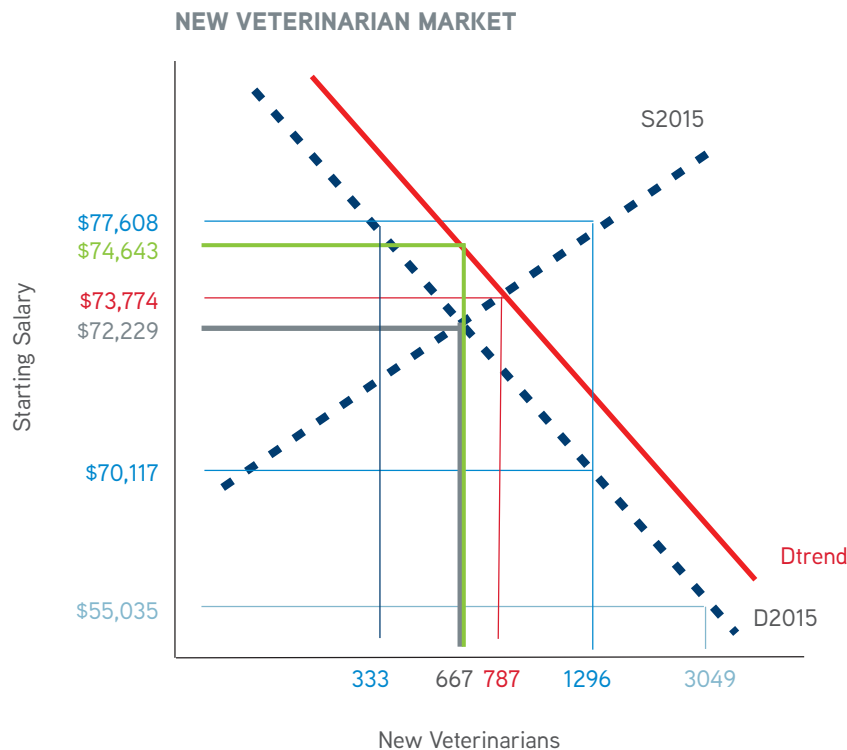


Figure 40

WHILE THE GAP BETWEEN THE ESTIMATED EQUILIBRIUM INCOME AND THE ACTUAL INCOME HAS CLOSED YEAR OVER YEAR, THE GAP BETWEEN THE ESTIMATED EQUILIBRIUM AND ACTUAL NUMBER OF NEW GRADUATES OBTAINING FULL TIME JOBS PRIOR TO GRADUATION CONTINUES TO EXPAND.

SUPPLY OF EXISTING VETERINARIANS

Data informing the supply of existing veterinarians stems partly from the Employment Survey. The Employment Survey solicited information on the employment status (including underemployment and overemployment) of persons graduating in 1989, 1999, 2004, 2009, and 2013. That is, individuals who, in 2014 were 1, 5, 10, 15, and 25 years out from college.

Additionally, AVMA maintains a database of all U.S. graduates from U.S. accredited veterinary colleges and uses that data to determine the number, type and locations (demographics of the profession) of veterinarians.

DISTRIBUTION OF U.S. VETERINARIANS

Current Veterinary Employment	U.S. Population
Companion animal practice	66.50%
Other Veterinary Employment	7.00%
College or University (Faculty or staff only)	6.30%
Food animal practice (predominant)	6.00%
Equine practice	4.40%
Mixed practice (at least 25% companion and 25% food or equine)	3.90%
Industry/commercial organizations	3.10%
Government (State/ Federal/ Uniformed Service)	2.80%
Total	100.00%

Dispersion of Veterinarians	U.S. Population
Region 0	2.21%
Region 1	9.93%
Region 2	11.63%
Region 3	13.94%
Region 4	10.53%
Region 5	8.22%
Region 6	9.33%
Region 7	11.63%
Region 8	8.73%
Region 9	13.44%
Region 10	0.40%
Total	100.00%

Table 4

However, AVMA has no data of the cost that veterinarians incur to provide veterinary services. AVMA has developed a Personal Financial Planning tool to assist veterinarians in developing

personal financial budgets. This information may be useful in the future to develop the cost curves and supply functions for veterinarians.

GEOGRAPHIC DISTRIBUTION OF VETERINARIANS

Veterinarians are not distributed uniformly throughout the country. Part of this is a result of the size of local markets but another part stems from where veterinarians have chosen to live. The Bureau of Labor Statistics produces a location quotient for various professions in the United States.

This location quotient provides a ratio of the number of veterinarians per thousand employees in a given location to the number of veterinarians per thousand employees in the United States.

If the value of the location quotient is less than one, the concentration of veterinarians in a specific area is less than the U.S. average.

VETERINARIANS ARE NOT DISTRIBUTED UNIFORMLY THROUGHOUT THE COUNTRY. PART OF THIS IS A RESULT OF THE SIZE OF LOCAL MARKETS BUT ANOTHER PART STEMS FROM WHERE VETERINARIANS HAVE CHOSEN TO LIVE.

LOCATION QUOTIENT OF VETERINARIANS, BY AREA, MAY 2014

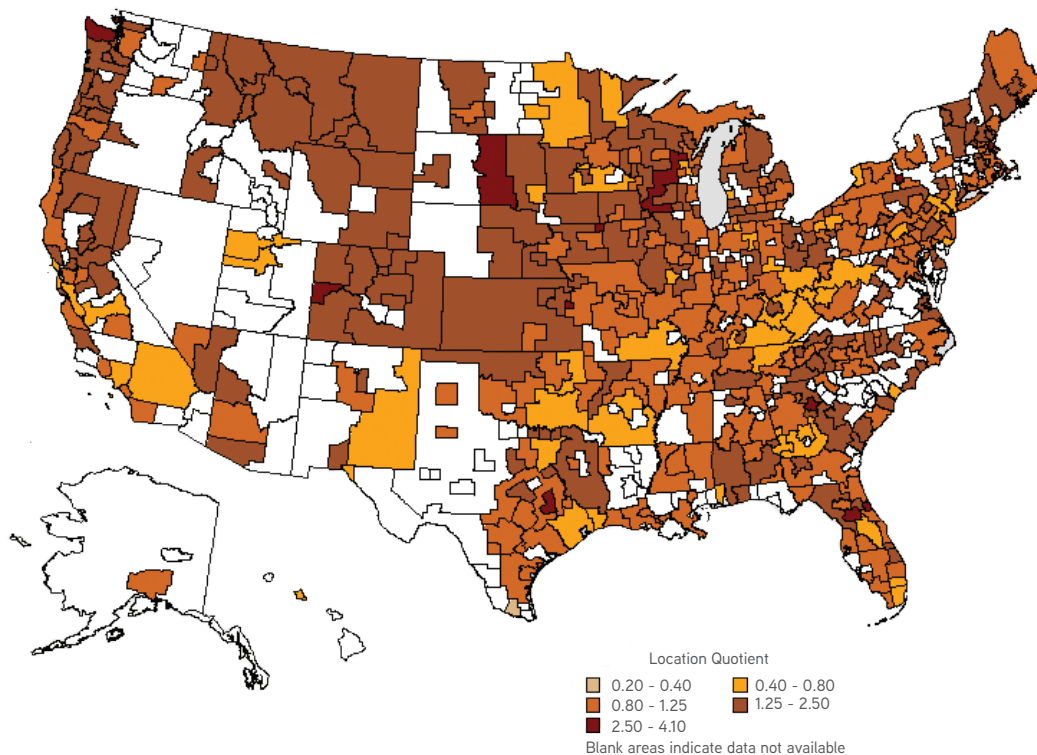


Image courtesy of <http://www.bls.gov/oes/current/ml291131.png>

Figure 41

If we assumed that the number of pets per household did not change geographically then the location quotient provides an indicator of the maldistribution of veterinarians. The location quotient identifies communities with less than half the U.S. average concentration of veterinarians per thousand employees to more than 2.5 times the U.S. average concentration. This suggests variation in the supply and demand balance geographically, defining maldistribution.

Neill and Holcomb provided results of their research on the concentration of veterinarians and the effect of this concentration

on veterinary incomes. They computed the veterinary “density” as the actual number of veterinarians in the county versus the predicted number of veterinarians based on demographic characteristics of the population by county. They found that for every 10 percent increase in the density, veterinarian incomes fell by 1.2 percent. Given that the difference in the BLS location quotient is 10-fold between least dense and most dense counties, this finding suggests that maldistribution may be a major factor in determining the variation in veterinarian incomes.

DEMAND FOR ALL VETERINARIANS

The 2014 Employment Survey allows us to compare compensation by practice type, location, gender, age and other demographic factors. The income by practice type indicates that for specific practice types such as industry, the level of compensation is significantly higher than the average income for

all other practice types. This suggests that veterinarians willing to work in industry are scarce compared to those willing to work in other types of practice in relation to the number of jobs available. If the relative scarcity were equal across the various practice types, the mean income for each group would be similar.

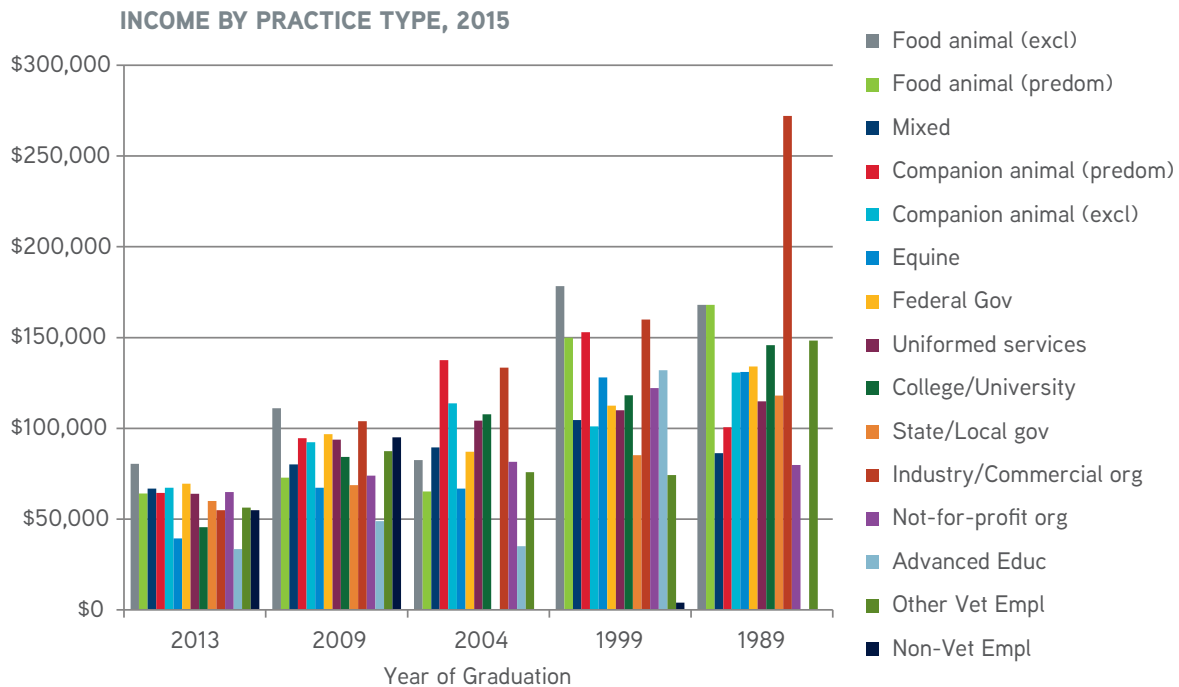


Figure 42

Does a higher priced education provide higher levels of compensation? Using the Employment Survey to compare starting salaries, current salaries and the tuition and fees for the 28 U.S. veterinary colleges there is no statistical evidence to indicate any relationship between education costs for the DVM professional degree and starting or current salaries. There is no statistical difference in either the starting or current salaries for

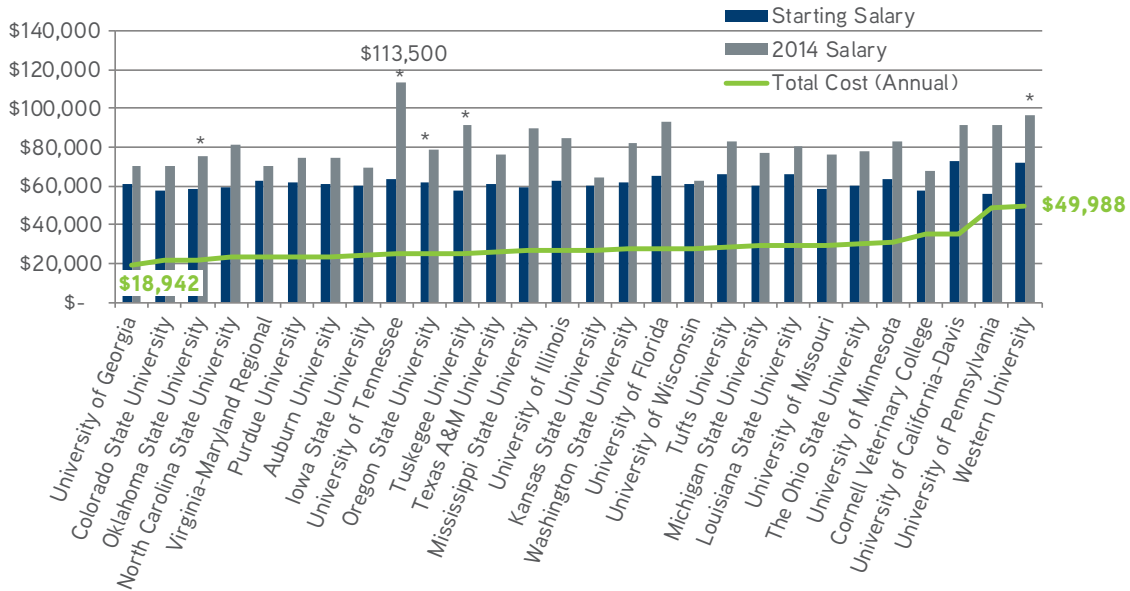
graduates from the 28 U.S. veterinary colleges. However, starting salaries are significantly affected by region as a result of differing costs of living. As a result, there are some colleges whose students received significantly higher starting salaries based on employment location, and others with significantly lower starting salaries than the mean starting salary for all graduates.

NEW GRADUATES 1, 5 AND 10 YEARS OUT

As we mentioned earlier in this report, one caveat of the Senior Survey is that it does not present a thorough picture of the post graduate plans of new veterinarians. Many new veterinarians secure employment opportunities and are presented with invitations to pursue continuing education after they fill out the senior survey. Consequently, many of them report having no employment or continuing education opportunities on the survey but find some soon after completing the survey.

To bridge this gap, a similar set of questions is asked on our employment survey, sent to all veterinarians who have graduated 1, 5, 10, 15, and 25 years ago from 2014. The following charts illustrates the tuition and fees and income of veterinarians graduating in 2004, 2009 and 2013 by school.

SALARIES AND COSTS OF 2008 GRADUATES, BY SCHOOL



*Less than 1 responses on 2014 salaries

Figure 43

2013 GRADUATES, TUITION AND FEES, INCOME AND STARTING SALARIES

For 2013 graduates of veterinary colleges, annual tuition and fees, residents only, ranged from \$17,637 per year to \$49,200 per year. Unweighted, nominal, mean starting salaries ranged from

\$59,000 to \$76,000, and 2015 salaries ranged from \$46,000 to \$78,000. However, there were no significant differences, between colleges, in starting salaries or present salaries.

SALARIES AND COSTS OF 2013 GRADUATES, BY SCHOOL

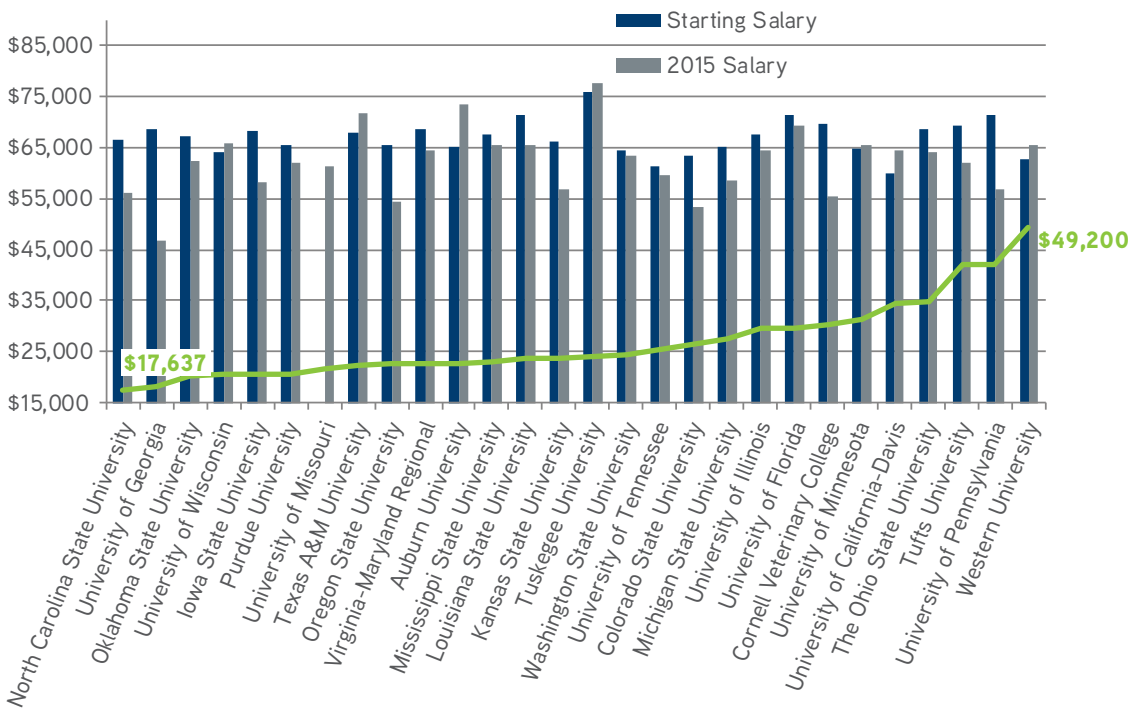


Figure 44

2009 GRADUATES, TUITION AND FEES, INCOME AND STARTING SALARIES

Just four years prior, 2009 graduates of veterinary colleges incurred tuition and fees costs ranging from \$12,896 to \$38,945. The nominal, mean, unweighted starting salaries ranged from \$51,500 to \$83,000 and their mean 2015 salaries ranged from

\$67,000 to \$109,000. There was also no significant difference in starting salaries nor 2015 salaries between colleges among 2009 graduates.

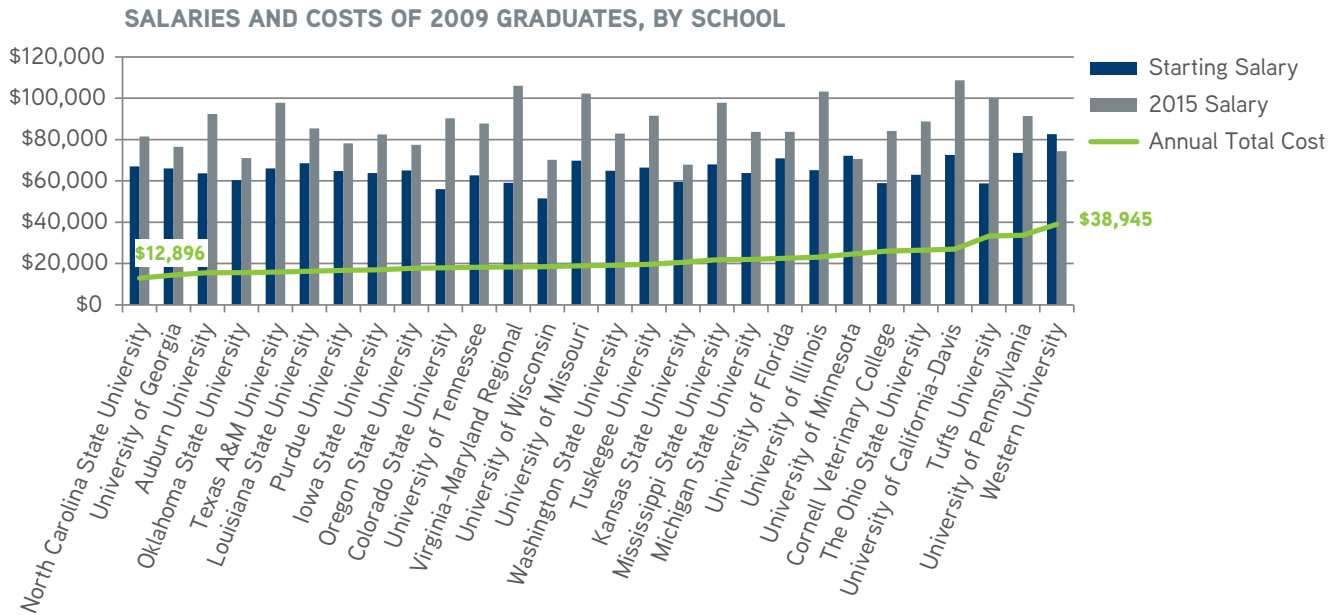


Figure 45

2004 GRADUATES, TUITION AND FEES, INCOME AND STARTING SALARIES

Annual tuition and fees for 2004 graduates of veterinary colleges ranged from \$6,568 to \$28,356. Mean, nominal, unweighted starting salaries for this class ranged from \$44,000 to \$54,000,

and 2015 salaries ranged from \$50,000 to \$218,000. Here too, there was no significant difference in starting or current salaries between colleges.

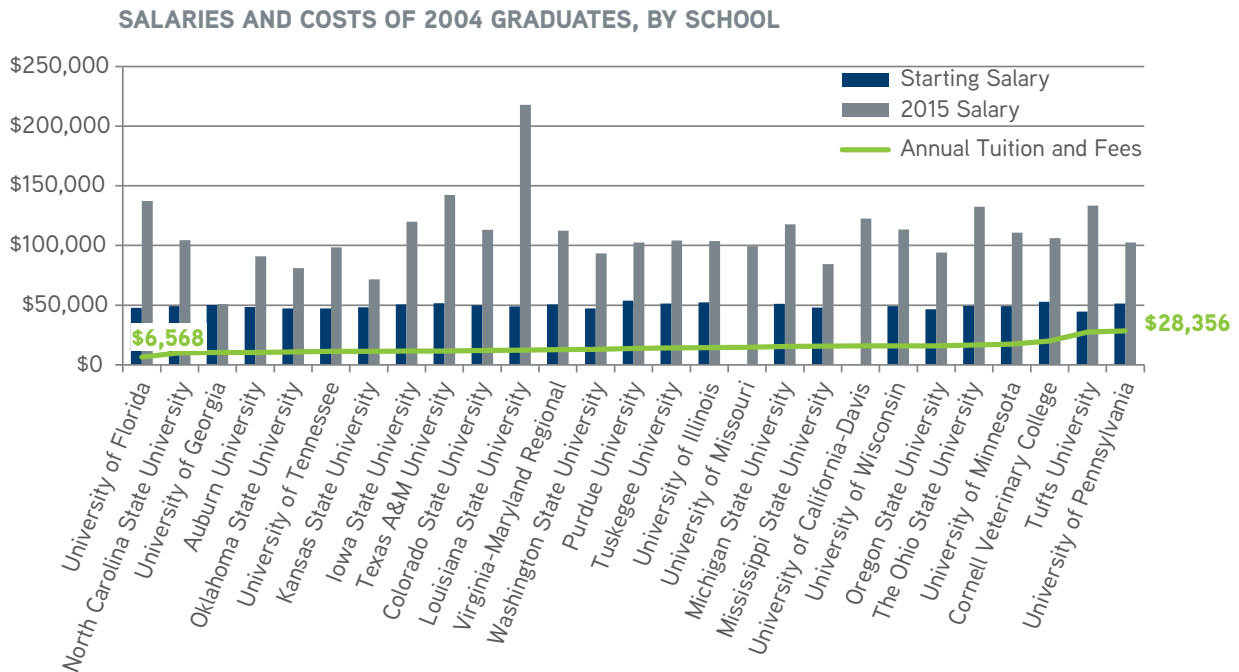


Figure 46

UNEMPLOYMENT AND UNDEREMPLOYMENT

Unemployment is the term used to describe persons without a job who are willing and able to work. For instance, persons unable or unwilling to work would not be counted in the unemployment rate as they are not without employment for lack of effort. Underemployed on the other hand is the term used to describe persons who are working less hours than desired or utilizing less than their optimal potential. To determine the unemployment and underemployment levels within the veterinary profession, we designed a questionnaire, the Employment Survey, and began our inquiry into the profession.

The main objective of the Employment Survey was to determine the amount of unemployment and underemployment in the profession. Unemployment was estimated at 4.5 percent in 2014 compared with 3.4 percent in 2013. There is no statistically

significant difference between these two rates and both are below the U.S. national rate (6.1 percent) and the natural rate (5.6 percent). Under normal circumstances, some percentage of the population is bound to be unemployed at some point in time. People may relocate, change jobs, graduate and start searching for jobs and adapt to several life scenarios and these events create temporary unemployment. The changes in life experiences create what is known as the “natural rate of unemployment”. Part of the difference in the unemployment rates between 2013 and 2014, is the result of the additional year of graduation used in the 2015 survey. The 2015 survey contained respondents 15 years post-graduation, while the 2014 survey did not. The two older groups, 15 and 25 years post-graduation, had higher rates of unemployment, particularly for women.

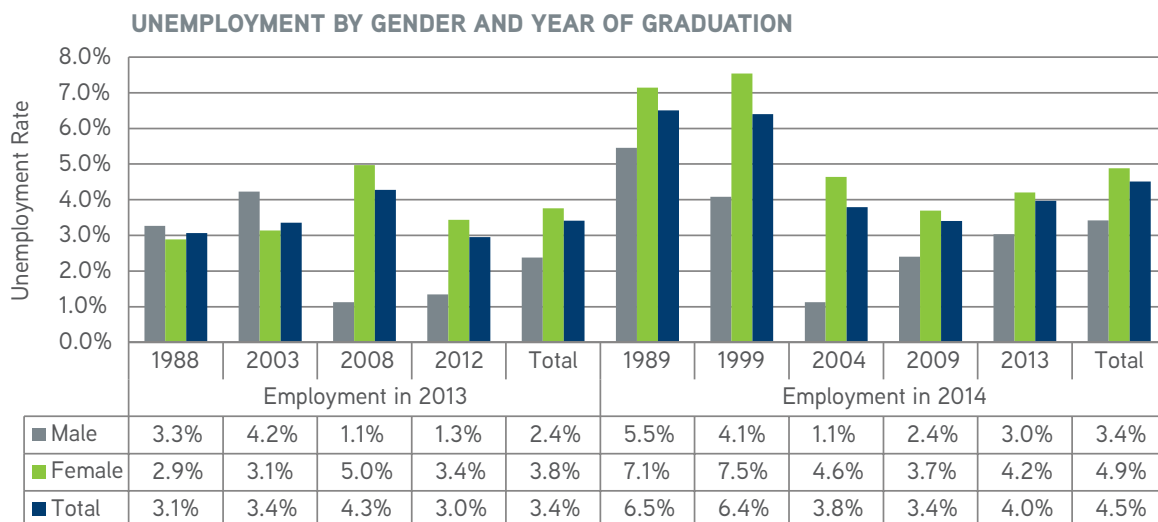
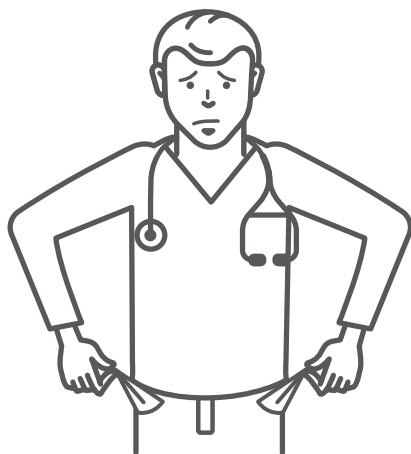


Figure 47

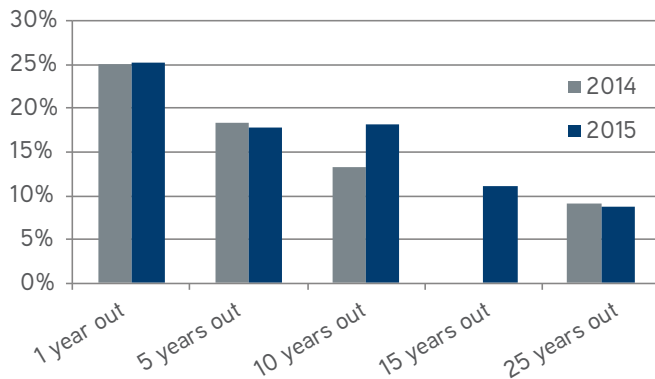


UNEMPLOYMENT WAS ESTIMATED AT 4.5 PERCENT IN 2014 COMPARED WITH 3.4 PERCENT IN 2013. THERE IS NO STATISTICALLY SIGNIFICANT DIFFERENCE BETWEEN THESE TWO RATES AND BOTH ARE BELOW THE U.S. NATIONAL RATE (6.1 PERCENT) AND THE NATURAL RATE (5.6 PERCENT).

The rate of underemployment in the U.S. economy is very close to the unemployment rate currently, with both just above five percent. For veterinarians however, the overall level of underemployment is actually negative. Veterinarians were asked whether they wished to reduce the number of hours they work (with an associated decline in income) or increase their hours (with an associated increase in income).

For males, the underemployment pattern is unchanged from 2014. As men begin their veterinary career there are more that wish to work more hours for greater compensation than there are those who wish to work less for less compensation. However, as the men begin to age (by 10-15 years post graduate) there are more that wish to work less for less compensation than wish to work more for more compensation.

MALE WORK PREFERENCE: DESIRE TO WORK ADDITIONAL HOURS PER WEEK



MALE WORK PREFERENCE: DESIRE TO WORK FEWER HOURS PER WEEK

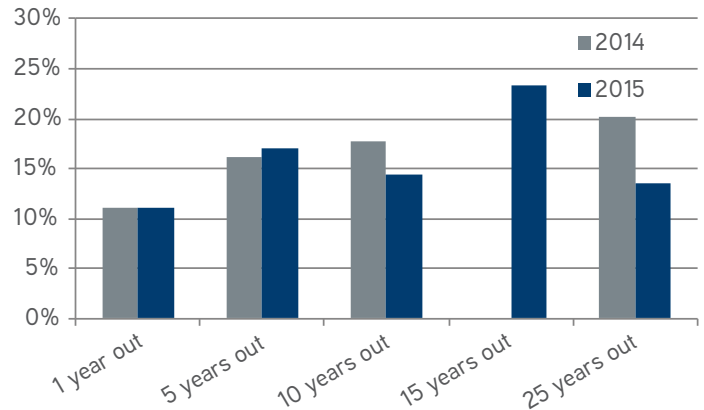
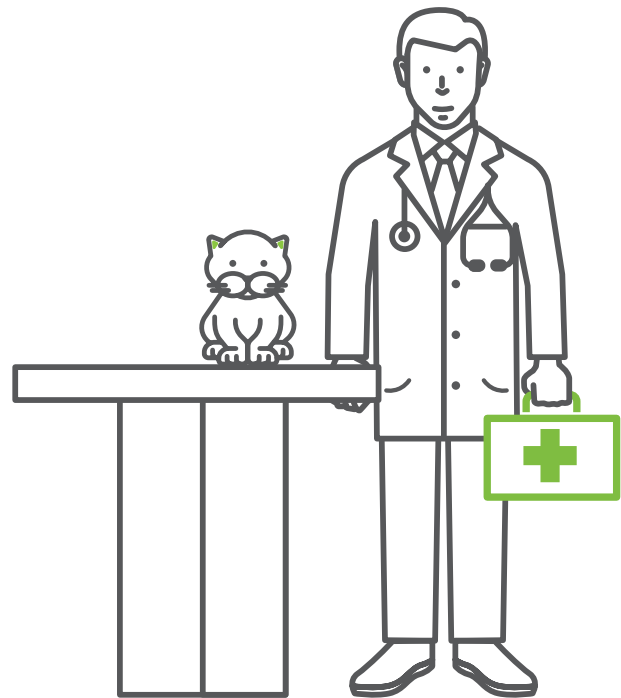


Figure 48

AS MEN BEGIN THEIR VETERINARY CAREER THERE ARE MORE THAT WISH TO WORK MORE HOURS FOR GREATER COMPENSATION THAN THERE ARE THOSE WHO WISH TO WORK LESS FOR LESS COMPENSATION.



For females in the profession the pattern of underemployment is different. At all age groups there are more women willing to work

fewer hours for less compensation than there that wish to work more hours for more compensation.

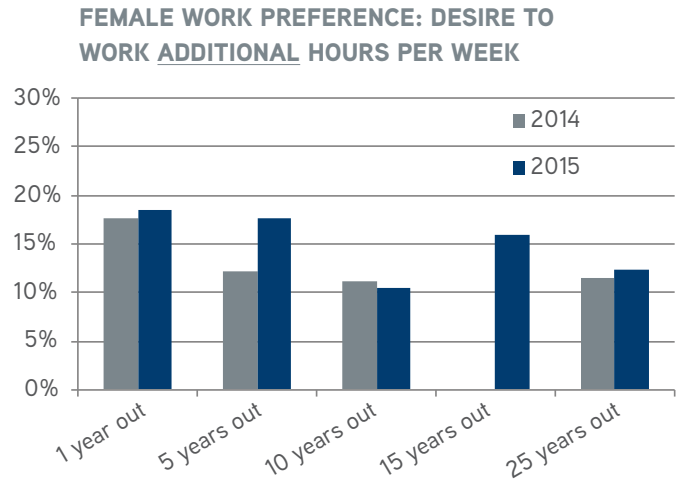
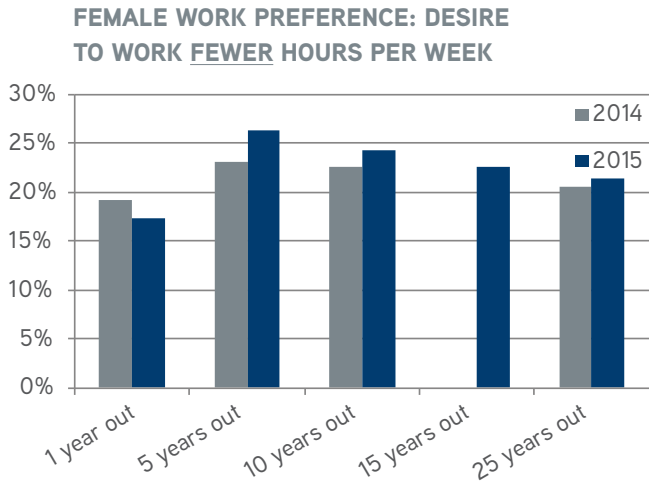
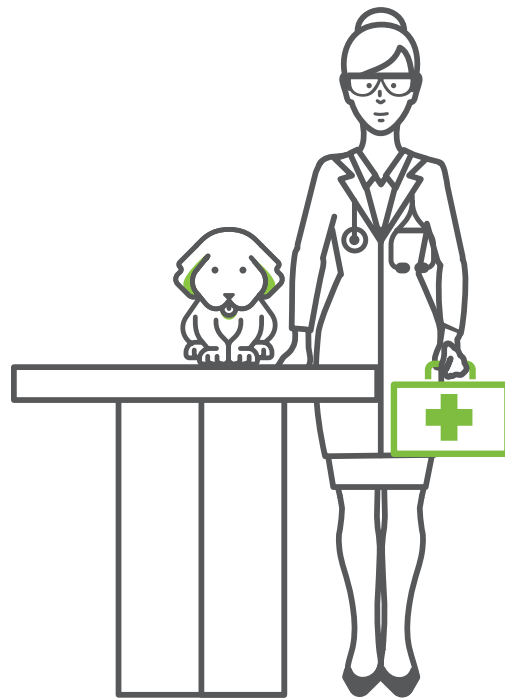


Figure 49

FOR FEMALES IN THE PROFESSION THE PATTERN OF UNDEREMPLOYMENT IS DIFFERENT. AT ALL AGE GROUPS THERE ARE MORE WOMEN WILLING TO WORK FEWER HOURS FOR LESS COMPENSATION THAN THERE ARE THAT WISH TO WORK MORE HOURS FOR MORE COMPENSATION.



The sum of all the hours that men and women wish to work less for less compensation and the hours that they wish to work more for more compensation produces a value for underemployment of -68,520.3 hours. Using a 40-hour work week this would equate to needing an additional 1,713 veterinarians to bring the entire workforce into alignment with their desire for hours per week. Thus, if optimum capacity of a veterinary practice is defined by the hours that veterinary practitioners are willing to work, then there is no excess over optimum capacity. The indication that some veterinarians are working beyond their optimum number of hours suggests that there is a maximum beyond that optimum.

This maximum capacity to provide veterinary services is one part of the measure of excess capacity. The maximum ability to provide veterinary services represents the total capacity while the amount of services (total hours worked) provides a measure of capacity utilized. The difference between that maximum capacity and the actual capacity utilized is excess

ENHANCING THE DEMAND FOR VETERINARIANS

In the early 2000s, numerous authors noted the “need” for veterinarians in the public health areas to develop practitioners equipped with the cross-disciplinary knowledge and skills capable of addressing the cycle of poverty and disease in low income societies and the link between animal and human health. While veterinary colleges were quick to respond to this need by developing the educational capacity to train the cadre of professionals sought, the willingness to pay for this talent never materialized. No analysis can be found that provided Congress with a measure of the value of this talent in terms of the potential return on investment. However, many recent zoonotic outbreaks help to provide a measure of the cost of not having this talent in place to monitor and prevent such outbreaks. The recent effect on pork prices from the Porcine Epidemic Diarrhea virus, egg prices from the Avian Influenza virus and the catastrophic effect on human health and gross domestic product of several West African countries from the Ebola epidemic offer case studies.

The potential for improving the demand for veterinarians by providing clear economic evidence of the value of an “ounce of prevention” in relation to the “pound of cure” led the AVMA Veterinary Economics Strategy Committee to support the efforts of the Paul G. Allen School for Global Animal Health at Washington State University to begin to quantify the costs of zoonotic disease outbreaks and the benefits (foregone costs) of having sufficient veterinarians engaged in the monitoring and management of these diseases to limit their economic consequences.

capacity. Our measure of underemployment indicates that the profession is between the optimum capacity utilization and the maximum capacity utilization and suggests that the current level of excess capacity may be insufficient at meeting the needs of veterinarians.

However, we have no measure of unemployment or underemployment in the profession for an extended time period and thus are unable to determine the direction of either. More importantly we have insufficient information at this point to determine what factors influence unemployment or underemployment. While multiple regression analysis can be performed on the variation in underemployment and unemployment, with the limited time periods any estimated relationships can only be viewed as associations between variables and not as cause and effect. Some of these associations will be described in more detail in the Report on the Market for Veterinarians.

Dr. Tom Marsh of the Paul G. Allen School provided the conceptual framework for estimating the benefits and costs of zoonotic disease management and also provided first estimates of the benefits and costs of the recent Avian Influenza (AI) outbreak. He noted that the Human Disease Burden estimated by the World Health Organization ranked infectious diseases as the number one cause. Also, he noted that animal influenza in general is at the top of the list of infectious diseases.

In summarizing his findings, Dr. Marsh indicated that current estimates (August, 2015) were that expenditures will exceed \$1 billion dollars for the AI events, when all costs are accounted for (with no significant human health costs). This estimate provides a strong signal for careful consideration of more investment into biosecurity, training, and preparation to prevent and respond to these disease outbreaks. He explained that understanding the economic impacts of zoonotic diseases will improve prediction for future events and marginal changes for policy scenarios, and will enhance efficient resource allocation for planning purposes. This suggests that an economic case could be made for more investment into research and outreach on animal diseases. However, actually making that case will require measuring the economic benefits and costs of greater involvement of veterinary professionals in zoonotic disease prevention and management.

HUMAN DISEASE BURDEN

Rank	Broad Cause
1	Infection diseases (incl. respiratory infections)
2	Cardiovascular diseases
3	Injuries
4	Neonatal conditions
5	Cancers
6	Mental and behavioral disorders
7	Respiratory diseases
8	Neurological and sense organ conditions
9	Musculoskeletal diseases
10	Endocrine, blood, immune disorders, diabetes mellitus

Table 5

MAJOR FINDINGS

Dr. Matt Salois from Elanco provided an industry perspective of an economist working in the animal health industry utilizing the information presented on the market for veterinarians. He noted that three key findings stood out.

1. There is a skewed distribution of new veterinarians, with 80 percent in advanced education or companion animal 2011-2015 (65 percent of total veterinarian population).
2. New graduate debt is rising faster than income, with greater disparity in women than men and higher debt-to-income ratios.
3. Experience affects earnings differentially, with food animal (exclusive) and industry having the highest ROI on additional years of experience.

He noted that, most importantly, the available information indicates that the U.S. veterinary profession is experiencing excess capacity not an oversupply of veterinarians, and that this was an important distinction because it suggests three options for market improvement; 1. reduce supply, 2. lower price (growth), 3. increase demand. But, he explained that, to be useful, this information must be leveraged by the industry and translated into actionable items.

To be useful to the profession the information must go beyond the descriptive to being prescriptive, to address the “Now what?” That is, what actions logically follow from the analysis, both for the AVMA and for the veterinary practice?

More specifically, he noted that reducing supply or lowering price are not successful strategies in the long-run because reducing supply often leads to reducing relevance. However, demand creation is a sustainable business strategy and thus research should target how veterinarians can become invaluable to pet owners and how they can increase the scope of veterinary visits.

Based on the data presented at the Summit, he suggested that industry may wish to see research directed at specific potential opportunities for innovation and value creation such as the discovery of new value-added products and services that would drive pet outcomes, convenience, and revenue. New research on innovative practice management and operations strategies such as those designed for inventory control, and staff utilization, would also be beneficial as would, more efficient use of technology. And, because veterinarians are highly regarded and trusted by the general public more emphasis should be placed on determining how to better leverage the relationship with pet owners.

While the market for veterinarians may be considered robust currently, given the rates of unemployment and under-employment, income growth, and job-applicant-to-jobs ratios, there are considerable trends such as the increasing debt-to-income ratio, declining number of veterinary college applicants, and sensitivity of veterinary incomes to the business cycle that pose challenges. In the face of increasing risk of a near-term recession, there should be concern for the ability of the market to continue to absorb increasing numbers of veterinarians.

MORE SPECIFICALLY, DR. SALOIS NOTED THAT REDUCING SUPPLY OR LOWERING PRICE ARE NOT SUCCESSFUL STRATEGIES IN THE LONG-RUN BECAUSE REDUCING SUPPLY OFTEN LEADS TO REDUCING RELEVANCE. HOWEVER, DEMAND CREATION IS A SUSTAINABLE BUSINESS STRATEGY AND THUS RESEARCH SHOULD TARGET HOW VETERINARIANS CAN BECOME INVALUABLE TO PET OWNERS AND HOW THEY CAN INCREASE THE SCOPE OF VETERINARY VISITS.



MARKET FOR VETERINARY SERVICES



Just as the costs of tuition and fees (i.e. willingness of colleges to sell seats) drives the costs for veterinarians and veterinary services, the prices that pet owners are willing to pay for veterinary services drives the willingness of practices to pay veterinarians and veterinary students' willingness to pay for their veterinary college seat.

The market for veterinary services is the largest source of demand for veterinarians and veterinary students. Just as the costs of tuition and fees (i.e. willingness of colleges to sell seats) drives the costs for veterinarians and veterinary services, the prices that pet owners are willing to pay for veterinary services drives the willingness of practices to pay veterinarians and drives veterinary students' willingness to pay for their veterinary college seat. If the three vertically related markets are efficient, then the willingness of pet owners to purchase veterinary services will be in line with what the veterinary students are willing to pay for their seat. Unfortunately, for many veterinary students this is not the case. When the debt that veterinary graduates have at graduation is large enough to cause the Net Present Value of the DVM degree to be less than zero, there is no return on the investment in the DVM education. In this situation, the new veterinarian has paid more for the degree than the value placed on that degree by pet owners.

However, this measure of economic efficiency does not consider intangible benefits that veterinary graduates may receive from their education. The addition of these intangibles may yield a positive return on investment even when the Net Present Value of the degree is negative. None the less, as veterinarians continue to raise prices on veterinary services because of the increased costs of providing those services (increased costs of education, technology and intermediate products) the number of pets receiving veterinary services and the number of services

each pet receives will decline, increasing the gap between the need for veterinary services and the quantity of veterinary services demanded.

The demand for veterinary services reflects the choices made by pet owners, and there is very little quantitative information on the relative importance of various factors that may impact the pet owners' purchasing decisions. In 2015, the AVMA VED and

several cooperating partners began the process of identifying the factors that may be important in affecting pet owner expenditure decisions and analyzing current available data.

Using the pricing trends for veterinary services from the KPMG study and the BEA the price for veterinary services relative to other consumer prices declined from 1972 to 1996 before turning sharply and rising at roughly five percent per year through 2014.

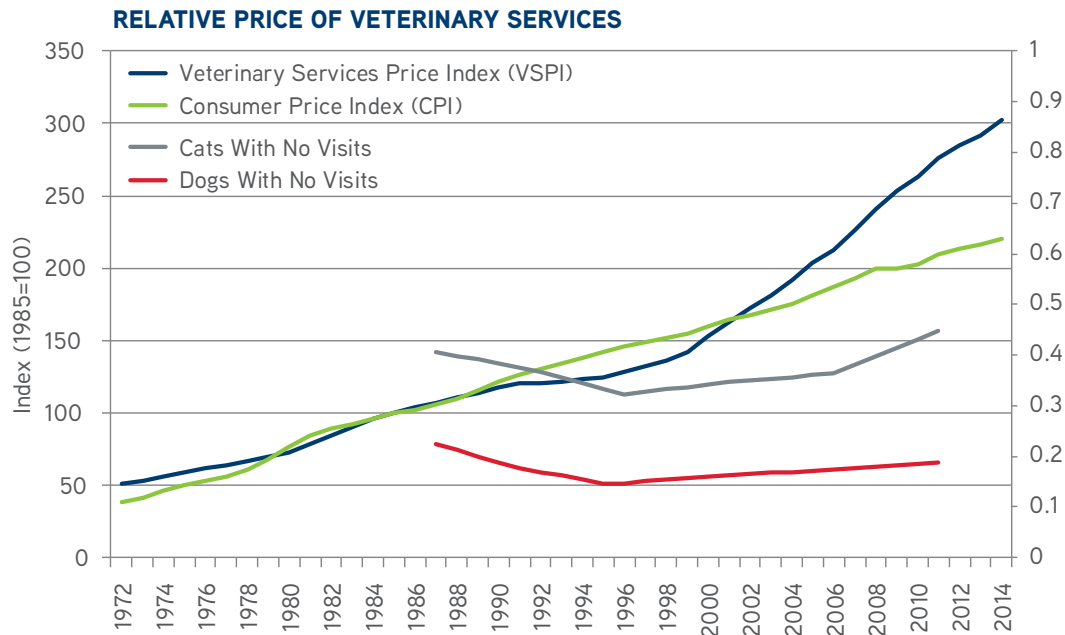


Figure 50

As relative prices for veterinary services rose, expenditures for veterinary services per pet declined and the number of pets not visiting the veterinarian increased.

Analysis of 2012 Pet Ownership and Demographics Survey data by the National Center for Food and Agricultural Policy (NCFAP) for the AVMA identified how demand for veterinarian-supplied wellness visits (exam plus vaccinations) depends on price, opinions, household income, and other factors. Nationwide, about 81% of dog owners visited a veterinarian in the prior year. About 84% of that 81% (about 68% of all dog owners) made a

wellness visit. Why so few? Pricing is important. Where prices were 5% lower, the share was 5% higher, at 73%. Beliefs and opinions are important. Only 14% of those who said that "routine checkups are not important for their dog's long and healthy life" brought their dog to a veterinarian for an exam plus vaccinations. But a big reason why the share looks so low is that the survey asked only about visits to a veterinary clinic.

A new survey of dog owners in the eight county area around Raleigh, North Carolina asked about all the places people might take their pets for care. Fully 92% of the respondents

VETERINARY SERVICES PRICING AND PATRONAGE TRENDS

	1996-7	2001	2006	2011
Veterinary Services Price Index ^a	100	125.7	163.0	211.0
Consumer Price Index ^a	100	109.5	125.1	139.9
Number of Pet Dogs in USA (thousands) ^b	52,922	61,572	72,114	69,926
Real veterinary service expenditure/dog ^c	\$129	\$142	\$123	\$108

DATA: ^a Bureau of Labor Statistics; ^b Pet Demographic Survey Sourcebook Table 2-16, page 72; ^c Expenditure per dog, PDS Table 2-16p.72, divided by the Veterinary Services Price Index

Table 6

took their dog somewhere for a routine check-up during the prior year. Most went to a veterinary clinic or hospital. Their survey responses were validated by cross-checking with their

veterinarians. A few took their dogs to veterinarians in mobile van services, pet-focused retail stores or shops, shelters and publicly-sponsored free clinics.

CANINE ROUTINE CHECK-UPS IN THE RALEIGH-DURHAM CSA, 2015

veterinary clinic or hospital	80%
shelter or Humane Society	1%
publicly-sponsored clinic	1%
pet shop	1%
pet-focused retail store	4%
mobile facility or van	6%
no routine check-up past 12 mos.	8%

Table 7

This new research suggests that there may be significantly more compliance with veterinary recommendations than previously measured, and more patronage of veterinarians – in other types of establishments – than previously measured.

While the work of NCFAP is preliminary, several findings support previous results from other studies. These include;

- Many dog and cat owners don't visit veterinarians because they cannot afford the higher prices and/or there are more convenient alternatives that exist.
- Those pet owners that do not patronize veterinary clinics and hospitals are more price-sensitive, own cats, have lower opinions of vet care, lower incomes, and live in mobile homes.
- Those that do not visit veterinary clinics and hospitals patronize DVMs in retail outlets, mobile vans, public clinics, and shelters.

While the NCFAP research suggests that rising prices and falling incomes of consumers has reduced the demand for veterinary services, Nationwide Pet Insurance presented information from more than 6 million distinct veterinary office visits (claims for paid amount) and over 14 million treatments that were reported to them over the last 6 years (2009-2014). This information suggested that expenditures on a constant basket of wellness and medical veterinary services actually fell by 1 percent. During this same period (2009-2014) the indexed price for veterinary services reported by the Bureau of Economic Analysis showed an increase of 15 percent compared to the consumer price index, which increased by 8 percent over the same period.

The Nationwide Pet Insurance data also provided a price index for expenditures on wellness and medical treatment separately for canines and felines. For canines, the wellness treatments price index increased by 10 percent over the period, while the price index for medical treatments decreased by 5 percent. For

felines, the price index for wellness treatments increased by 10 percent and declined by 10 percent for medical treatments.

The BEA price index represents the prices that veterinarians have listed for their services, while the Nationwide data indicates the prices actually paid for those services. Further, the price indices for Nationwide are for wellness treatment and medical treatment “bundles”, rather than single products or services. These treatments may contain a set of products and services that may change over time. The insured pet owner may also change where they purchase products used in treatments and this could affect the price. While these are all possible explanations for the difference between the BEA and Nationwide price indexes no analysis has yet been completed to determine why these differences exist.

Two observations were clear from this analysis. First, the difference between the movement of the “price” indexes between the BEA and Nationwide are substantial and require further review. Second, if the Nationwide results do represent the trend across the profession the pricing strategy of raising prices on wellness treatments while lowering prices on medical treatments may well be the reverse of the strategy needed to maximize profits. Because wellness treatments are likely to be more price elastic than medical treatments (i.e. more sensitive to price increases), the demand for wellness treatments may be more sensitive to price increases than medical treatments and thus raising wellness treatment prices will have a greater reduction in the number of treatments demanded by pet owners.

However, research into price trends and the impacts of changing prices on the demand for veterinary services is still in an exploratory stage. Thus, veterinary practitioners should not be directed to take specific actions at this time, but may be encouraged to consider and attempt to measure the impacts of price changes to specific products and services in their own

practice on the quantity of that product or service demanded.

AVMA VED will continue to work with other researchers and veterinary entities to collect and analyze prices of veterinary services and the impacts of these prices as well as the incomes of pet owners on the demand for veterinary services. However, data on the price and costs of specific veterinary services remains difficult to gather. Part of the problem is that veterinary practices find it difficult to provide or are reluctant to share, for the purposes of research and statistical tabulation, client procedure-based data (i.e. actual prices charged, not book prices) even when it is anonymized.

The second major problem in collecting data on veterinary services is that private practice veterinary clinics lack a unified chart of accounts to normalize names and descriptions of products and services. This lack of a chart of accounts makes the endeavor of data collection a mess. In human medicine and dentistry, most payments come from insurance companies, and these insurance companies stipulate exactly how much they will pay for a given procedure. This, among other catalysts, is why there is so much uniformity in the market for human medicine. The veterinary services market has had no such centralized catalyst, with the

WORKFORCE CAPACITY UTILIZATION

A Key Performance Indicator (KPI) for the veterinary services sector is excess capacity. Excess capacity is the ability to provide services in excess of the quantity demanded at a specific price. Thus, there are three components to excess capacity: demand, supply and price. Changing any one of these factors will change the level of excess capacity. The need for veterinary services continues to outpace the ability to supply those services at prices that adequately compensate veterinarians for the time and effort


result being that charts of accounts have all kinds of names and prices, and few resources exist to inform practice managers of what others are charging for similar services.

In the September 5, 2014, Animal Health News & Notes, Brakke Consulting noted, "It is imperative that the animal health industry along with associated partners such as veterinarians, pet retailers, producers and branded food companies be diligent in providing easily assessable information that is accurate and reliable on the internet. This developing technology needs to be harnessed and managed for the benefit of all parties involved related to animal health. This may take some management time and investment, but in the long run it will be worth it."

The AVMA Veterinary Economic Division concurs with this assessment. Electronic collection of data required to estimate supply and demand curves for the veterinary services market is certainly possible at this time and will be critically important if a workforce modeling system that links the three vertically related veterinary markets and the consumption of veterinary services is to be developed. This tool will provide vital information to veterinary college applicants as well as those about to graduate.

invested. There is little disagreement that there are companion, food animal, equine and various non-animal related veterinary services that are needed but not provided, such as the number of animals without appropriate vaccinations or the monitoring and prevention of zoonotic diseases.

As a veterinary KPI, excess capacity should be measured annually using a consistent, analytical process so that the value can be compared across the years as a measure of the



Because wellness treatments are likely to be more price elastic than medical treatments (i.e. more sensitive to price increases), the demand for wellness treatments may be more sensitive to price increases than medical treatments and thus raising wellness treatment prices will have a greater reduction in the number of treatments demanded by pet owners.

economic health of the profession. However, excess capacity, as currently measure, is a physical measure and does not provide ample information about the financial health of the profession. A decline in excess capacity may be a positive indicator unless it is

achieved through a reduction in the profitability of the profession. Excess capacity is measured using the annual AVMA Capacity Survey, and future values are forecasted using the AVMA Workforce Model.

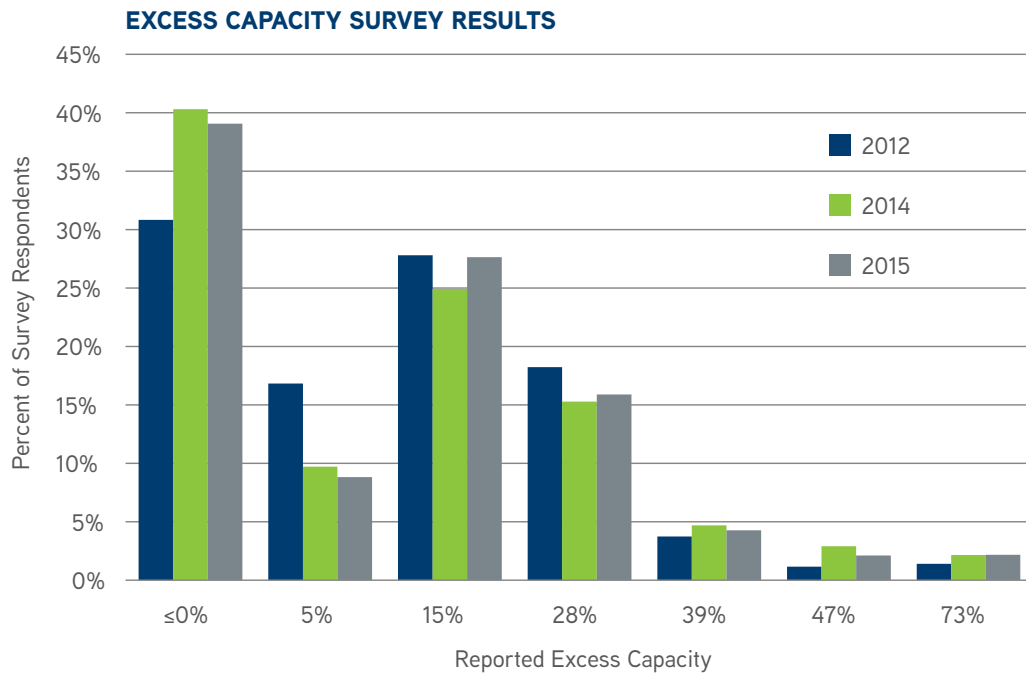


Figure 51

The way that veterinary practices answer the question about excess capacity is changing. A larger percent of practices in 2014 and 2015 answered that they were at full capacity. On the flip side, the percent of practices that reported very low levels

of excess capacity was much higher in 2012 than the two later years. On the other hand, the number of practices saying that they had an extremely high level of excess capacity increased slightly in 2014 and stayed high in 2015.

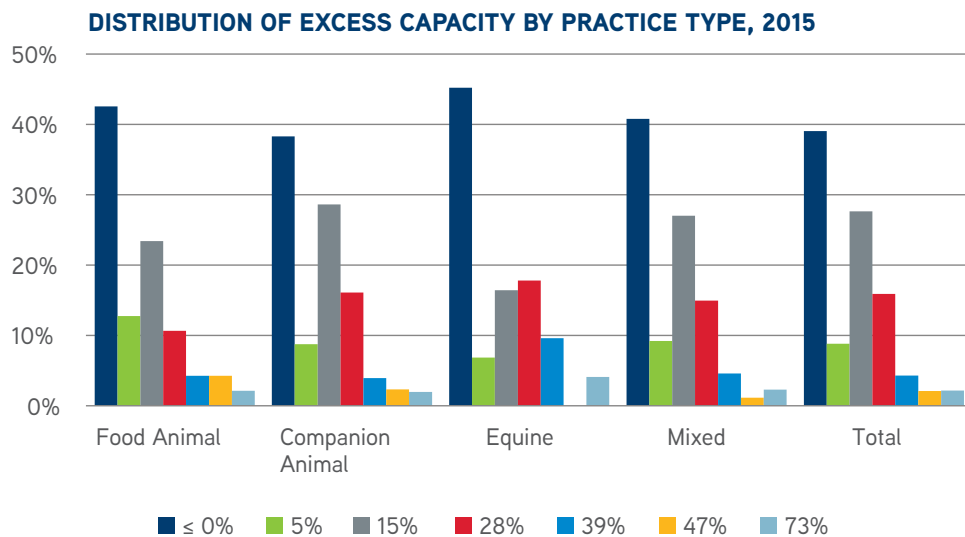


Figure 52

The distribution of excess capacity by practice type in the 2015 AVMA Capacity Survey was remarkably uniform. All four primary practice types (food animal, companion animal, equine, and mixed animal) reported that they had no or negative excess capacity as

their most frequent response to the questionnaire, and 15 percent as the second most common response, except for Equine which closely lost out to the 27.5 percent category.

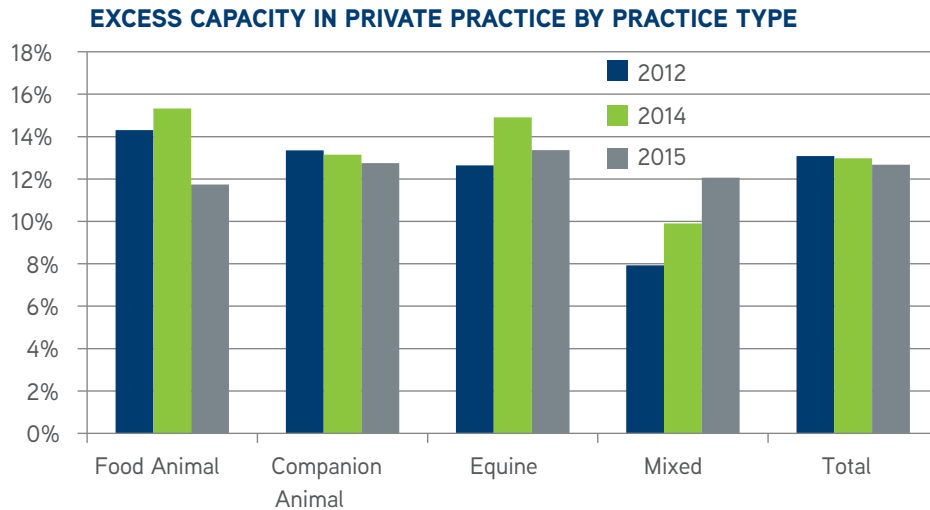


Figure 53

The above chart puts these indicators together and compares across the three survey years. Food animal and equine practices saw a peak in excess capacity in 2014, and have been on the decline in 2015. Mixed animal practices have had a consistent increase in excess capacity across the three years. This is exactly inverse to what the companion animal sector and overall

industry have been experiencing. It's worth noting that for private practices overall, the difference from 2012 to 2014 and the difference from 2014 to 2015 are not statistically significant, though the difference from 2012 to 2015 is statistically significant.

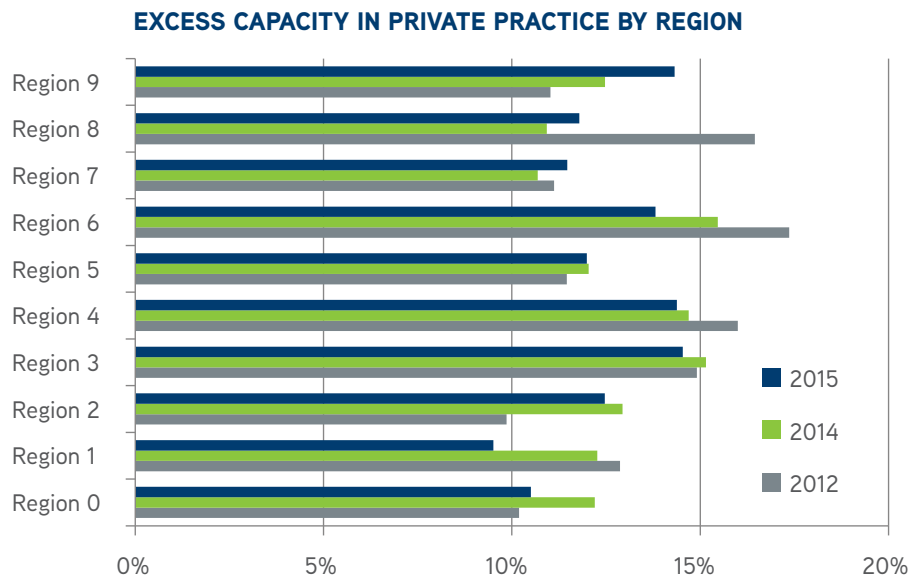


Figure 54

When the data are tabulated by year and region, no clear pattern emerges. Some regions like 6 (Illinois, Missouri, Kansas and Nebraska) and 4 (Indiana, Ohio, Michigan and Kentucky) show a consistent pattern of decline in excess capacity, while regions

such as 9 (California, Oregon, Washington, Alaska and Hawaii) show a clear increase in excess capacity. Most regions were mixed, with no clear pattern over time.

PERCENT OF PRIVATE PRACTICES AT FULL CAPACITY BY PRACTICE TYPE

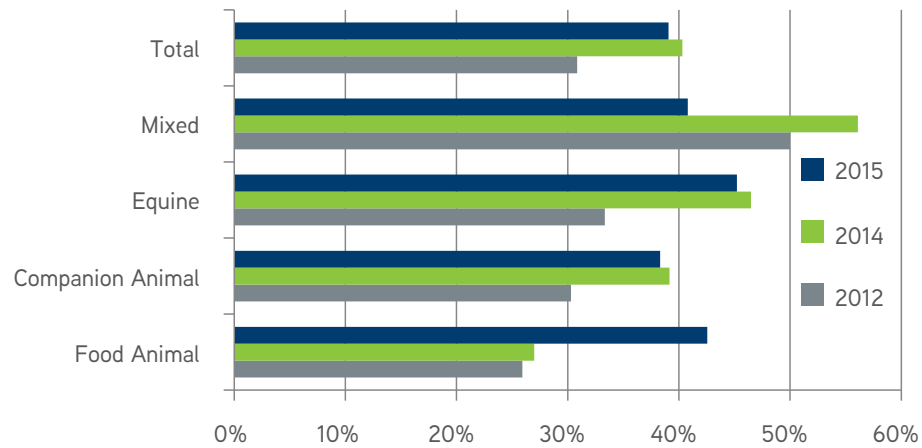


Figure 55

As stated before, the overall level of excess capacity is one of the profession's key performance indicators, but one of the major components driving this number is the percent of practices working at full capacity (or higher). Again, few clear time-related patterns emerge, with the exception of food animal practices.

This subset saw a marked increase in practices working at full capacity, quite probably due to the drought in the West and other factors that have increased the price of beef, and thus the value of cows and other food animals.

PERCENT OF PRIVATE PRACTICES AT FULL CAPACITY BY REGION

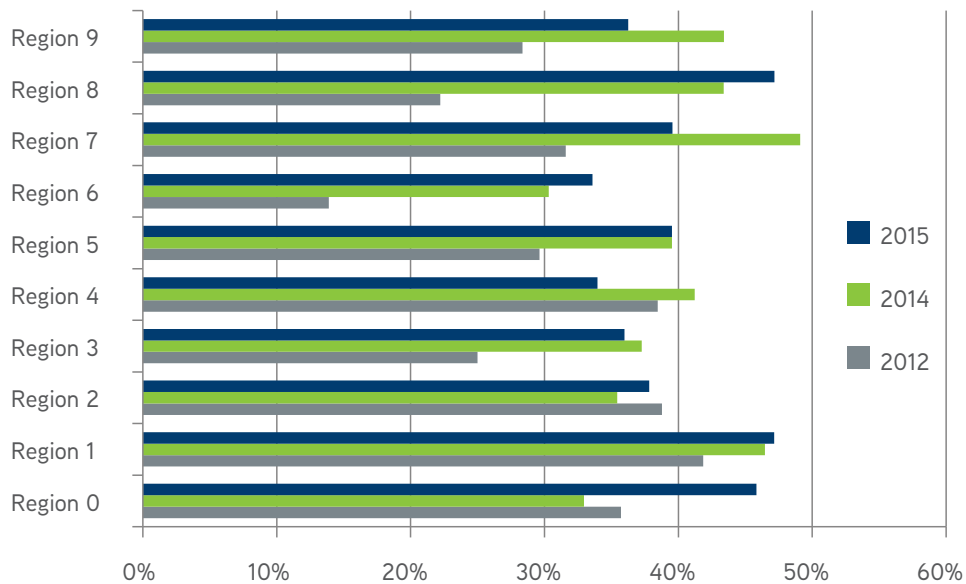


Figure 56

Lastly, looking at the data by region, there does not appear to be a clear pattern. First, the regions are large and the distribution of respondents within regions could account for much of the difference. Second, the stage of growth for responding practices could also influence the results. Some practices may have hired new staff that created more excess capacity as demand for their services became too much to handle with the size of staff they

had. Still others may have had considerable excess capacity and now are returning to more optimal levels. Finally, we have illustrated how a difference in interpretation of the survey question could affect results. Going forward, having a measure of total capacity available and the amount of unused capacity in each region may provide a clearer picture.

ANNUAL WORKFORCE MODEL UPDATE

The AVMA Workforce Model combines information from multiple sources to predict what excess capacity will be in future years. The first piece of information is the current level of excess capacity, which is detailed in the previous text and graphs. The decrease in excess capacity between the 2014 and 2015 Capacity Surveys did reduce the forecast for excess capacity, but other

factors worked in the opposite direction to increase the forecast for excess capacity from 2014 to 2015. Much of the increase results from the change in the CBO's forecast of GDP. As noted earlier, the CBO forecast of GDP has been to increase more slowly than previously estimated, which will reduce the demand for services from food animal veterinarians.

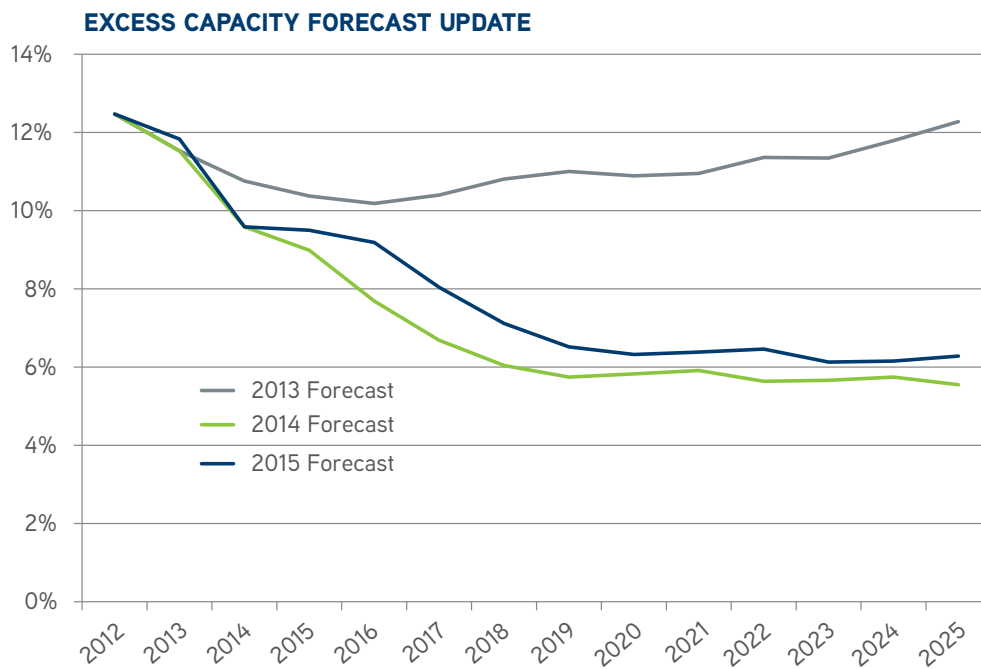


Figure 57

THE OVERALL LEVEL OF EXCESS CAPACITY IS ONE OF THE PROFESSION'S KEY PERFORMANCE INDICATORS, BUT ONE OF THE MAJOR COMPONENTS DRIVING THIS NUMBER IS THE PERCENT OF PRACTICES WORKING AT FULL CAPACITY (OR HIGHER).



The increase in the forecast from 2014 to 2015 is the result of two changes in the model. The first is that growth in U.S. GDP will not be as robust, resulting in slower growth in the demand for food animal protein. This lowers the future demand for food animal veterinarians. Secondly, and as explained in the 2015 AVMA Report on the Market for Veterinary Services, the question about the measurement of current excess capacity has shifted to how we believe the survey respondent is interpreting the question, rather than how an analyst would interpret the question. These two factors ultimately led to an increase in the forecast for excess capacity compared to previous years.

Overall, the Workforce Model predicts excess capacity will decline to about 6.5 percent by 2019 and remain relatively flat through the remaining forecast period, which ends in 2025. This represents an approximately 5-6 percentage point reduction compared to the original forecast made in 2013, and a 0.5 percentage point increase compared to the 2014 forecast.

The reduction from 2014 to 2019 was attributed to three primary causes. First, macroeconomic conditions in the economy have been steadily improving. This economic growth has led to increased demand. In particular, this demand increase coupled with a drought in the West has increased the price of livestock.

VETERINARY PRACTICE PERFORMANCE

The final session of the 2015 AVMA Veterinary Economic Summit was presented by Terry O'Neil a partner at the accounting firm of Katz, Sapper and Miller (KSM) where the Veterinary Management Groups (www.veterinarystudygroups.com) have their practice financial information collected through a secure web portal. The information is analyzed by KSM, who maintains member's data anonymously and confidentially. The information presented was collected from 422 members and provides a 1.5 percent sample of veterinary practices throughout the U.S. The Veterinary Management Group practices use a standard chart of accounts to aggregate their data from specific services and products into categories so that all practices can be compared. This is an important part of the data collection process, one that will be required for the profession to collect sufficient data to provide meaningful financial guidelines that are segmented by region, type of practice, size of gross sales, operating hours, number of exam rooms or physical size of the practice and other cohorts.

A large amount of information was presented that provides comparisons of the financial performance of various services and products across different segments of practices. Certainly this is a robust data base that provides an indication of the knowledge

Using U.S. Department of Agriculture projections, the number of livestock will increase significantly from current levels, leading to a greater demand for food animal veterinarians. Second, the improving macroeconomic picture has also increased the forecast for government spending, meaning more public positions for veterinarians will be opened. Third, with the rising costs of education and the decline in veterinary school applicants, the market for education is nearly in equilibrium. This decreases the forecast for new graduates from 2 percent growth per year to no growth after 2018. This forecast regarding the number of graduates is a key component of the decreasing excess capacity estimate. These three changes in assumptions account for approximately half of the decline in forecast excess capacity. The other half of the decline in excess capacity is due to the newest estimate of current excess capacity, which is about 2 percentage points lower than in 2012.

The 2013 AVMA Workforce Study included several assumptions where data were not available. As these assumptions are replaced with data, the baseline value of excess capacity computed for 2013 may change. In this case, each year that new data are used, its impact on the baseline estimate of excess capacity will be provided.

available to the profession through a well-defined data collection and analysis strategy. We provide a summary of this information but encourage practice owners and practice managers to identify the processes that can be used to participate in this or similar data collection and analysis processes.

The VMGs in aggregate have shown growth in normalized EBITDA (Earnings before interest, taxes, depreciation and amortization – a measure of profitability) from 2011 through the second quarter of 2015.

Normalized EBITDA is calculated by:

1. Normalizing owner's compensation at 20% of owner production,
2. Limiting owners management compensation to the lesser of the amount paid or 3% of hospital revenue, and
3. Calculating rent at 6% of hospital gross revenue.

This increased profitability has been fueled by increased growth in revenue in spite of the lack of sustained growth in invoices. Just as important however, is the effect of managing costs and internal operations efficiency to gain profitability.

OVERALL, THE WORKFORCE MODEL PREDICTS EXCESS CAPACITY WILL DECLINE TO ABOUT 6.5 PERCENT BY 2019 AND REMAIN RELATIVELY FLAT THROUGH THE REMAINING FORECAST PERIOD, WHICH ENDS IN 2025.

GROWTH OF REVENUE, INVOICES, AND NORMALIZED EBITDA

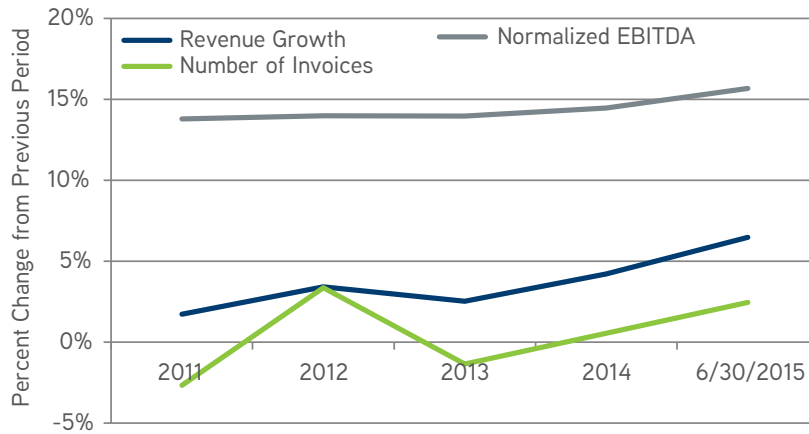


Figure 58

The gross revenue for the VMG practices, both the mean value for all practices (including the top 20 percent) and the mean value for the top 20 percent showed gross revenues per DVM Full Time Equivalent (FTE) of roughly \$600 thousand and \$700 thousand, respectively, over the time period 2010 through the second quarter of 2015. The year over year growth in practice gross revenue coupled with the lack of sustained growth in gross

revenue per DVM FTE suggests that increasing DVM FTEs did not produce corresponding revenue equal to the average gross revenue per DVM FTE that existed prior to the addition of DVM FTEs. The additional DVM FTEs may have occurred through either expanding hours of service by the practice or hiring of new employees.

GROSS REVENUE PER VETERINARIAN FTE

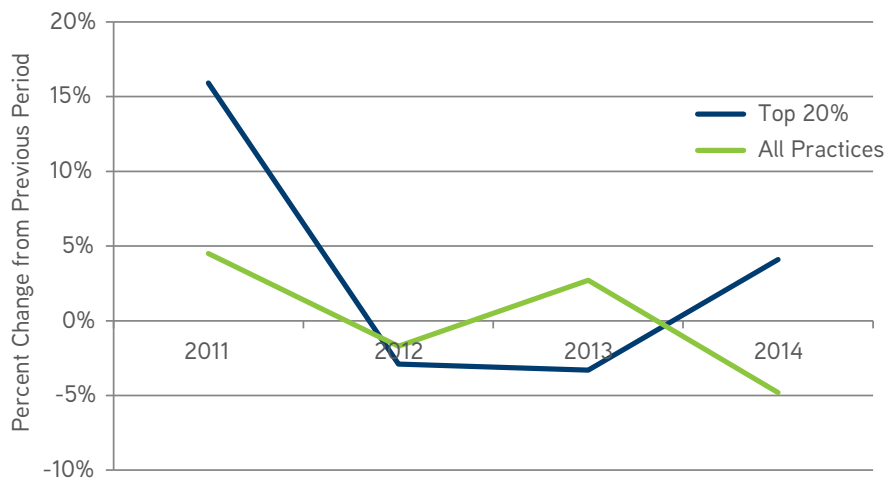


Figure 59

The number of invoices per DVM FTE also varied considerably between the top 20 percent of practices and all other practices combined. The top practices managed to maintain 4,600 invoices per DVM FTE while all practices averaged roughly 4,200

invoices per DVM FTE. Over the entire time period, the difference between the top 20 percent practices and all practices combined fell from more than 400 invoices per DVM FTE to roughly 200 invoices per DVM FTE.

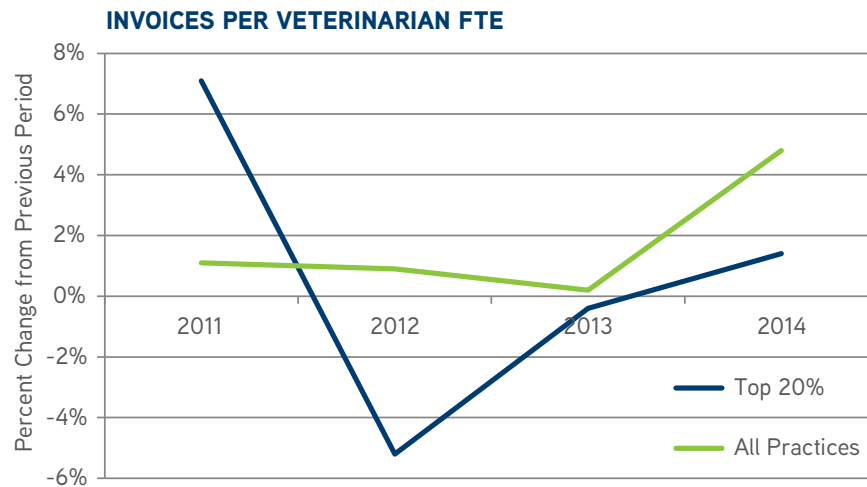


Figure 60

Interestingly, the practices at the higher end of profitability (EBITDA greater than 20 percent), had a relatively lower number of visits per pet (3.0) and total amount spent per pet (\$447). Again, while they have a slightly larger number of invoices and

fewer invoices per pet, they have a higher level of profitability. This suggests again that these top practices are doing a better job controlling expenses and managing internal operation efficiency.

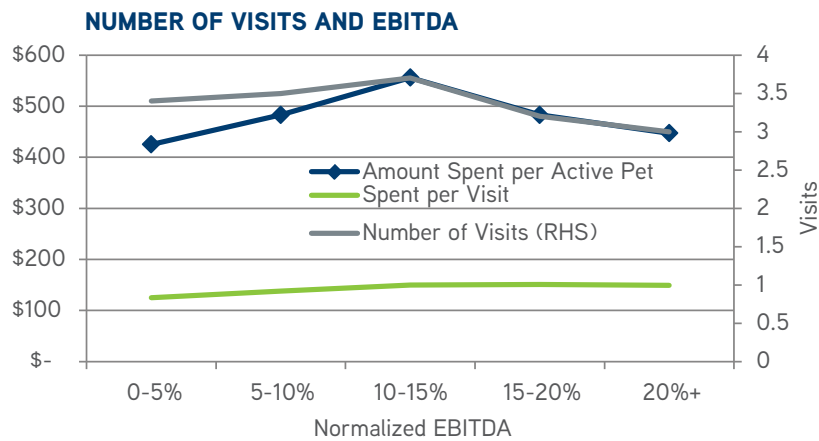


Figure 61

Profitability (EBITDA) was substantially different between the top 20 percent of practices (roughly 25 percent) and all other practices (roughly 15 percent). The top practices may have

achieved maximum efficiency while the other practices are continuing to improve.

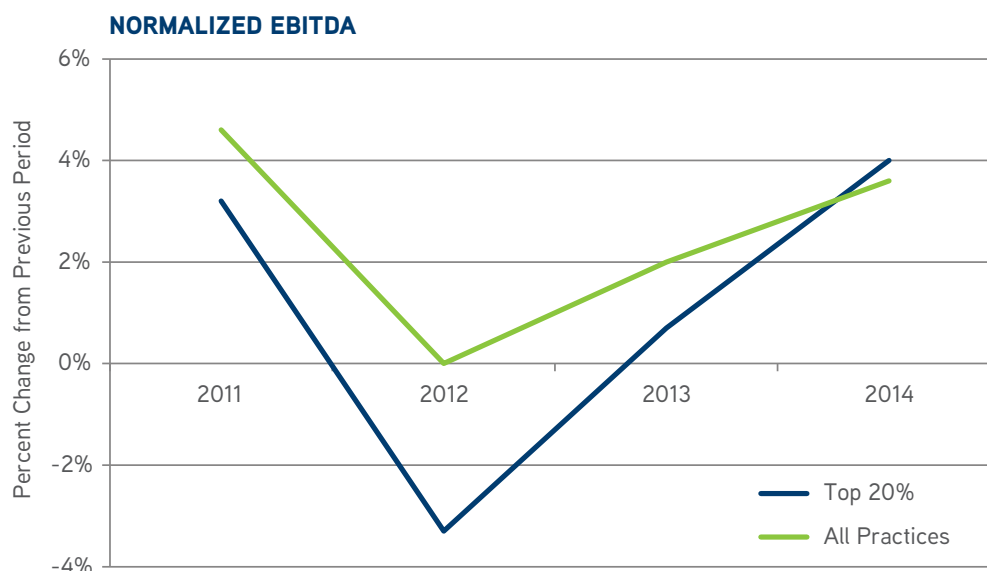


Figure 62

Using the difference in the efficiency of the practices as an explanation for the large differences in profitability may be validated by analyzing the percent of revenue accounted for by various inputs. For instance, direct costs as a percent of total revenue in the top 20 percent of practices was 8.5 percent less than for all practices. The costs of the major categories of inputs were lower across the board for the top 20 percent of practices

when compared to all other practices. For a practice with \$1 million in gross revenue, a 1 percent actual difference in the cost as a percent of total revenue would be equivalent to \$10,000 in gross profit. Thus, the sum of the difference in the three cost categories identified below (10 percent) would be \$100,000 difference in gross profit (10 percent).

2014 EXPENSES

	Top 20%	All Practices	Difference	Actual
Direct Costs	20%	22%	<8.5%	-2%
Labor & Benefits	40%	46%	<12.9%	-6%
Other Expenses	15%	18%	<12.5%	-22%
EBITDA	25%	14%	<70.1%	-10%

Table 8

Larger practices have more employees and also appear to be open more days of the week than smaller practices. But little information is given on how the hours per day changed (either in total hours open or in FTEs per day) as the practices moved from a five-day work week to a seven-day work week. In competitive markets the move by businesses to more hours per day or more days per week has proved to be a cost-increasing practice

(profit-reducing practice). As one practice seeks to gain market share by increasing hours or days, competitors are forced to follow suit and no new revenues are captured while costs have increased. The appropriate scheduling of DVM and staff FTEs for a seven-day work week that maximizes client visits or invoices per hour of service may improve operational efficiency and increase profitability.

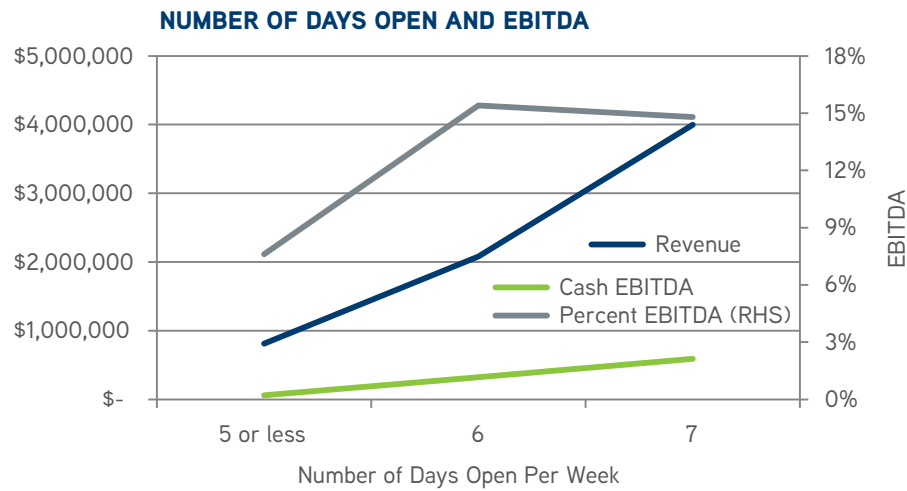
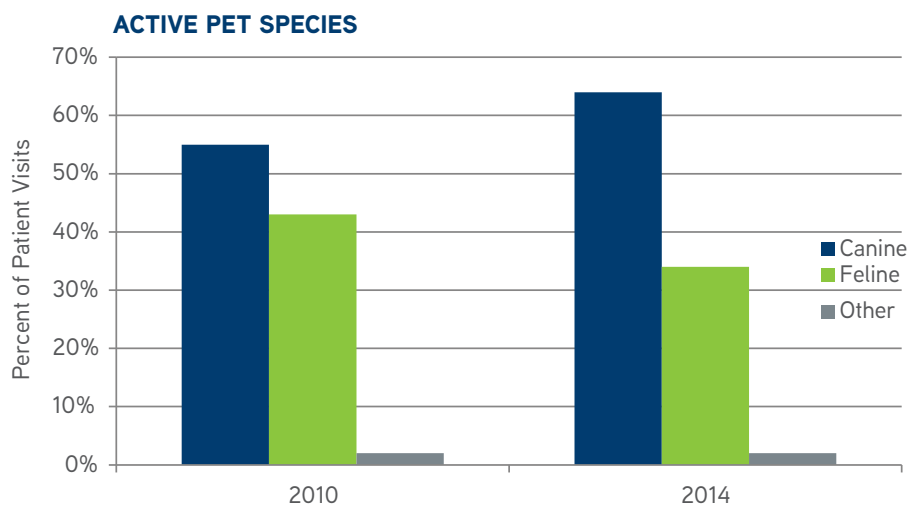


Figure 63

While the data presented by KSM for the VMG practices certainly demonstrated the potential gains in returns that can be acquired through more efficient operations and economies of size, the data were also in synch with the information provided by both the industry speakers from Henry Schein Animal Health and Elanco. The number of pets on the practices' books is nearly twice those that have been seen in the last 24 months, and the amount of wellness visits, dental exams, and other wellness related products and services (compliance) offers plenty of opportunity

to expand revenue. The key message is that among the practices analyzed by KSM there is considerable room for improvement through increased revenues and improved operational efficiency. Clearly, there are services that may be needed that are not being provided, and thus there is potential demand that remains untapped even in the most profitable practices.



Pets are considered active if they have visited the practice in the last 24 months.

Figure 64

DISCUSSION

From the 16 presentations at the 2015 AVMA Veterinary Economic Summit one of the most important messages was that much has been accomplished in understanding the economics of the profession, but much work remains. The profession is highly dependent on the health of the general economy and the extent to which this healthy economy increases the disposable incomes for Americans across all income levels. An increase in Gross Domestic Product (GDP) has a positive impact on disposable income which in turn increases the quantity demanded for all veterinary services at the current price levels (shifts demand). This shift, leading to an increase in the quantity demanded, may be reduced if the prices of veterinary services rise faster than inflation. Because the economy is likely to continue to expand (although at only a modest pace) over the next 8 to 18 months, practice owners should be seeing increased demand in their practices. This was certainly the case for the Veterinary Management Group (VMG) practices. However, just as in the case of the VMG practices, whether this shift in demand leads to an increase in profit will depend on the operational

the likelihood that aspiring veterinary applicants will come into contact with them increases. The interaction of new veterinarians under financial stress with potential applicants will improve the financial acumen of the potential applicants, i.e., understanding how debt will affect their lives, and lead to different career decisions than was the case in prior years.

Continued growth in the cost of education will be difficult to stem as state governments cut education spending as they continue to struggle with declining revenues. In addition, health care costs and unfunded legislative mandates are unlikely to abate and thus schools will have to raise tuition, or increase the number of seats, or both, to maintain current programs. Increasing the number of seats will slow the growth in income for graduates as more graduates enter the market and thus the rate of growth in debt will increase while the rate of growth in income declines. While the general economy continues to grow, this growth may offset the lost income due to increasing number of graduates. However, the financial pressure on schools will increase during the next recession and the declining economy

THE PROFESSION IS HIGHLY DEPENDENT ON THE HEALTH OF THE GENERAL ECONOMY AND THE EXTENT TO WHICH THIS HEALTHY ECONOMY INCREASES THE DISPOSABLE INCOMES FOR AMERICANS ACROSS ALL INCOME LEVELS.

efficiency of the practice. Those practices that did not see increased profitability over the last few years may want to evaluate how demographics have changed in their market area. Obviously, there are areas of the country where population and or economic activity has declined since the last recession, and practices in these areas may still be struggling to reach pre-recession revenues.

Market for Education

The demand for seats at the veterinary colleges is declining and may continue to decline for an extended period. In 2015, the graduates of the 28 U.S. colleges entered the market for veterinarians with nearly \$430 million in debt (roughly \$142,000 per graduate on average) and U.S. students attending U.S. accredited international schools added another \$300 million in estimated debt. Until this year, the growth in this debt has exceeded the growth in starting salaries, reducing the graduates' standard of living and increasing their financial stress. The increased stress reduces satisfaction with their lifestyle and may bring them to question their profession. As more of these graduates with high debt enter the market for veterinarians,

will adversely impact salaries. The picture going forward is increasing competitiveness in the supply of seats as declining applicant numbers produce a declining applicant to seat ratio (even with no increase in the number of seats).

Students currently receive \$29.9 million in institutional aid, but only 46.5 percent of the students receive any aid. Several schools have sought to improve the amount of institutional aid and their success will have an impact on the average debt of graduates. Clearly, even under the best conditions, the performance of the market for education is unsustainable. Moreover, changes must occur in not just the market for education, but also in the markets for veterinarians and the veterinary services market for this performance to improve.

We have developed the debt:income (D:I) ratio as a Key Performance Indicator (KPI) for the veterinary education market. This KPI ties the costs of seats (Debt) to the demand for veterinary services (Income). The current D:I ratio stands at just under 2:1 and this ratio places a heavy burden on graduates. A more sustainable D:I ratio may be closer to 1.4:1. Strategies to reduce the D:I ratio to this level are urgently needed. More



Veterinarians report generally good to very good health and have relatively low burn out. Their current employment satisfaction is also generally high although it does range from very unsatisfied to very satisfied.

importantly, these strategies must consist of strategies born by the federal and state governments (general public), students, veterinary colleges, and veterinary employers. The high D:I ratio is a major problem for the entire profession and every member of the profession will have to absorb some part of the pain associated with moving this ratio to 1.4:1.

Market for Veterinarians

The market for veterinarians has been robust over the last two years in response to the increased demand for veterinary services at practices across the country. The number of graduates indicating they had a full time position prior to graduation reached an all-time high in 2015 at 1,302 (1,296 reported their starting salary), a 10 percent increase over the prior year. In addition, the average salary for these graduates was up by nearly \$3000, a 4.5 percent increase over the prior year. In addition, data from the AVMA's Veterinary Career Center (VCC) indicated that the applicants to jobs ratio has declined from 9:1 in 2010 to less than 2:1 in 2015.

Unemployment and underemployment remain very low for the profession, with unemployment (4.1 percent) still below the natural rate of unemployment (5.2 percent) and a negative underemployment. The sum of the hours of veterinarians who wish to work less hours for less compensation exceeds the sum of the hours of veterinarians who wish to work more hours for more compensation. The average hours worked was approximately 47 for males, and 41 for females. Thus, as the veterinary workforce continues to shift to larger percentages of females, more veterinarians will be required to produce the same amount of services.

Maldistribution is a problem in the veterinary profession. The concentration of veterinarians (veterinarians per 1,000 employees) varies from half the national average in some counties to more than two-and-a-half times the national average in other counties⁶. As concentration in a specific market increases, incomes of veterinarians decline. Where veterinary numbers are concentrated and the local economy has struggled to recover, veterinary practices may yet find a continuing battle to improve financial performance. On the other hand, where veterinary practices are in markets that are shown to have strong local economic activity and concentration is low, the market for veterinarians is likely to be very tight and practices may feel overwhelmed by the growing demand for their services. Because of this maldistribution many veterinarians have a different view than what we provide through the analysis and trends in means.

Finally, veterinarians report generally good to very good health and have relatively low burn out. Their current employment satisfaction is also generally high, although it does range from very unsatisfied to very satisfied. Most interesting is the pattern

where there is nearly an absence of high-income veterinarians who are unsatisfied but a very large group of low-income veterinarians who are satisfied to very satisfied. Again, the general pattern is that higher incomes are associated with higher levels of satisfaction.

Market for Veterinary Services

The least studied market in the profession, this market contains pet owners and other animal owners who demand veterinary services. We have seen that the demand for veterinary services is income elastic - as disposable income increases, more veterinary services are purchased. We have also found that pet owners with low opinions of veterinary care, and those who don't consider their pets to be family members, are less likely to purchase veterinary services. These two characteristics, considered tastes and preferences, may not be the only characteristics that create a barrier to demand. Pet owners are also sensitive to prices but we have not yet been able to prove definitively whether the demand for specific veterinary services, or even wellness services versus medical treatments, are sensitive such that increasing prices will actually reduce total revenue. And interestingly, some data suggest that veterinarians have raised prices at a rate greater than the rate of general inflation while the Nationwide analysis of their claims data suggest that prices for wellness services has increased by 8 percent while prices for medical services has decreased by 2 percent over the last 5 years.

A key question remaining is whether the demand for veterinary services can be expanded through pricing strategies that raise only price-inelastic services and do so at no more than the rate of inflation for price elastic services. Some recent research suggested that practices have more preventive care (wellness services) revenue opportunities than their current practice total gross revenue. And there are several analyses that have suggested that roughly half of the patients on the doctors' books have not been to the practice in the last year. This information suggests that there is untapped demand. Whether this demand has not been met due to prices of services, tastes and preferences, or incomes of pet owners, needs to be determined.

Unresolved Research Questions

Many research findings are topics of hot debate. For some of these topics, we have presented analysis based upon the available data, and the analysis is limited due to incomplete data. Other findings represent association between variables rather than cause and effect. Some of the topics presented at the summit that were debated during the year as well as at the summit include:

SHIFTING AWAY FROM THE VETERINARY MARKETS, THE AVMA WILL BEGIN TO DEVOTE RESOURCES TO THE STUDY OF VETERINARY PRACTICES. WE WILL EVALUATE THE FINANCES OF PRACTICE FROM AN ECONOMIC PERSPECTIVE USING ECONOMETRICS TO DETERMINE WHAT FACTORS HAVE THE BIGGEST IMPACT ON PROFITABILITY BY VARIOUS TYPES OF SEGMENTATION.

- The Net Present Value of the DVM degree and how to interpret the trade-off of income and debt
- The value of internships
- The existence of student debt beyond the actual costs associated with attending a specific veterinary college and associated living expenses.
- The correct methods for determining the Debt-to-Income ratio
- Low unemployment and a robust market for veterinarians
- Negative underemployment
- A general wellness problem in the veterinary profession

We will continue to collect and analyze the data we receive from applicants to veterinary colleges, veterinary students, veterinarians, practice owners and other veterinary employers and the consumers of veterinary services. As we unearth findings that fly in the face of “common belief” we will work to collect the information necessary to determine the factors that are involved and their relationships.

New Approaches

After three years of collecting, analyzing and building the analytic results into conceptual models of the veterinary markets we have learned a great deal, identified key characteristics on which to focus and have become more aware of the forces that guide resources from undergraduate classrooms to veterinary places of employment to interact with the general public. We have also become aware of how many surveys and data collection processes are carried out in the veterinary profession. We have often noted that this profession is both over-surveyed and under-informed. As a result of these findings AVMA economics staff submitted the following three proposals at the 2015 Summit.

1. Develop a profession-wide data analytics process. A data analytics process refers to the processes of collecting, analyzing, reporting, managing and disseminating the data and analytic results. In developing this process the profession would benefit from a census set of survey information on applicants, veterinary

students, veterinarians, veterinary employers and consumers of veterinary services. Each of these surveys would be conducted once per year and collect the data needed for the profession and made available to researchers.

2. Develop a council of economic and financial advisors that would provide the oversight to the data analytics process and determine the validity of the analytic methods and results of research from the data analytics process. This council would be drawn from the broadest representation of the entire animal health industry and those with the economic and financial expertise necessary to help guide the effort.

3. Develop a cadre of economic and financial expertise to study the veterinary profession including those residing in industry, academia, non-profits and small businesses. One such group should focus on consumer demand for veterinary services and another on practice profitability. These two areas are the least well studied quantitatively and may well provide the best answers to improving the performance in veterinary markets.

At the AVMA Veterinary Economics Division, our direction for the next year is clear. We are going to continue to develop models of the veterinary markets to better understand what guides resources. This starts by understanding why applicants choose to be veterinarians and what factors have the strongest impact on their choice. From the other side of the markets we need to better understand the choices made by pet and animal owners.

Shifting away from the veterinary markets, the AVMA will begin to devote resources to the study of veterinary practices. We will evaluate the finances of practice from an economic perspective using econometrics to determine what factors have the biggest impact on profitability by various types of segmentation.

And finally, we will begin to develop a policy modeling system to systematically evaluate legislative initiatives, policies and programs that might impact the veterinary profession to better inform our government relations team about the cost and benefits of these proposals to the profession and practices.



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- **Operations** will include all areas that pertain to the internal operations of the practice including staffing, staff assignments, team building, and goal implementation.
- **Strategies** will focus on various approaches for improving the financial performance of the practice that impact client relationships and improve the internal functioning of the practice.
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The AVMA Report on the Market for Veterinarians:

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

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



2016 AVMA & AAVMC Report on

THE MARKET FOR VETERINARY EDUCATION



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2016 AVMA & AAVMC Report on

THE MARKET FOR VETERINARY EDUCATION

Veterinary Economics Division
American Veterinary Medical Association
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CONTENTS

5	LIST OF FIGURES AND TABLES
6	SUMMARY
8	INTRODUCTION
10	MARKET FOR EDUCATION KPI
12	The Applicant Pool for Veterinary Colleges
13	Demand for Veterinary College Seats
14	Applicant-to-Seat Ratio
15	Veterinary Colleges Supply of Seats
17	The Applicants' Estimate of the DVM Debt
19	The 2015 Graduating Class
20	DESCRIPTIVE STATISTICS FOR GRADUATES
24	NEW VETERINARIAN INCOMES
29	Factors Affecting Incomes for New Veterinarians
32	NEW VETERINARIAN DEBT
40	Factors Affecting Debt for New Veterinarians
42	NEW VETERINARIAN DEBT-TO-INCOME RATIO
45	Factors Significant in Explaining the Debt-to-Income Ratio
48	DEBT AND INCOME OF THE 2015 GRADUATING CLASS
54	Cost of Living Census
58	Regional Exchanges and State-to-State Arrangements
60	IMPROVING THE DEBT TO INCOME RATIO
61	Historical Perspective
65	Setting a New Target
71	Strategies to Reach the Goal
72	The General Public Strategies
72	Veterinary College Applicant and Student Strategies
72	Veterinary College Strategies
73	Public and Private Practice Strategies
74	DISCUSSION

LIST OF FIGURES AND TABLES

- 12 **Figure 1:** AAVMC Veterinary School Applicant Figures
- 13 **Figure 2:** Applicant Demand, 2014, 2015 & 2016
- 14 **Figure 3:** VMCAS Applicants and First Year Seats
- 15 **Table 1:** Historical Analysis of the Applicant Pool
- 15 **Figure 4:** U.S. Veterinary Graduates, All Sources
- 16 **Figure 5:** Supply of Education: Tuition & Fees and Total Cost, 2015
- 16 **Figure 6:** Supply and Demand for Veterinary Education, 2014 & 2015
- 17 **Figure 7:** Supply of Education and DVM Debt, 2015
- 17 **Figure 8:** Applicants' Estimate Versus Actual Debt Load of Graduates
- 19 **Table 2:** 2015 Response Rate of Senior Survey by School
- 21 **Figure 9:** DVM Graduates Receiving Offers for Jobs or Advanced Education
- 21 **Figure 10:** Distribution of New Veterinarians
- 22 **Figure 11:** Distribution of New Veterinarians: Private Practice
- 22 **Figure 12:** Distribution of New Veterinarians: Public Practice
- 23 **Figure 13:** Distribution of New Veterinarians: Private, Public and Internships
- 23 **Figure 14:** Species Focus of Internship
- 23 **Figure 15:** Distribution of New Veterinarians in Advanced Education
- 25 **Figure 16:** Mean Starting Salaries of New Veterinarians
- 25 **Figure 17:** Distribution of Starting Salaries for New Veterinarians
- 26 **Figure 18:** Mean Starting Salaries: Private Practice
- 26 **Figure 19:** Mean Starting Salaries: Public Practice
- 27 **Figure 20:** Mean Starting Salaries: Advanced Education
- 27 **Figure 21:** Indexed Real Income & Nominal Income of New Veterinarians
- 30 **Table 3:** Factors Affecting Incomes for New Veterinarians
- 33 **Figure 22:** Debt of New Graduates: Mean of All Debt Versus Mean of Non Zero Debt
- 33 **Figure 23:** Difference in Mean Debt: All Graduates Versus Only Graduates with Non-Zero Debt
- 34 **Figure 24:** DVM Debt by Post-Graduate Plans
- 34 **Table 4:** The Distribution of Students with over \$320,000 in DVM Debt by College
- 35 **Figure 25:** Mean DVM Debt: Private Practice
- 35 **Figure 26:** Mean DVM Debt: Public Practice
- 36 **Figure 27:** Mean Starting Salaries & Debt of New Veterinarians
- 36 **Figure 28:** Mean Debt by Gender
- 37 **Figure 29:** U.S. Veterinary Colleges: Tuition & Fees
- 37 **Figure 30:** Resident and Non-Resident Debt
- 38 **Figure 31:** Debt: All Students Versus Only Students with Non-Zero Debt
- 38 **Figure 32:** New Veterinarians with No DVM Debt
- 39 **Figure 33:** Real Indexed DVM Debt & Unweighted Debt
- 41 **Table 5:** Factors Affecting Debt of New Veterinarians
- 44 **Figure 34:** Debt-to-Income Measures
- 44 **Figure 35:** Debt-to-Income by Post-Graduate Plans
- 46 **Table 6:** Factors Affecting the Debt-to-Income Ratio
- 49 **Figure 36:** Distribution of 2015 Student Debt
- 49 **Figure 37:** Distribution of 2015 Starting Salary
- 50 **Figure 38:** Salaries of 2013 Grads 1 Year Out
- 50 **Figure 39:** Distribution of Debt-to-Income Ratio, 2015
- 51 **Figure 40:** Distribution of Debt and Income, 2015
- 51 **Figure 41:** Distribution of Debt and Income, 2013 Grads 1 Year Out
- 53 **Figure 42:** 2015 Mean Reported Debt by School
- 53 **Figure 43:** Mean DVM Debt Over Tuition by College, 2015
- 54 **Table 7:** Third Quarter 2015 Cost of Living Census
- 55 **Figure 44:** Mean DVM Debt Over Tuition by College and Cost of Living, 2015
- 56 **Table 8:** Distribution of Grads by College, Debt and Income
- 61 **Figure 45:** Net Tuition as a Percent of Public Higher Education Total Educational Revenue
- 62 **Table 9:** Distribution of Faculty at Universities
- 62 **Table 10:** Distribution of Faculty at Public Institutions
- 63 **Table 11:** Distribution of Faculty and Total Students
- 63 **Table 12:** Revenues and State Support
- 64 **Figure 46:** Number of Seats in U.S. Veterinary Colleges
- 65 **Table 13:** Debt-to-Income Ratio
- 66 **Table 14:** Total Cost-to-Income Ratio
- 67 **Table 15:** Total Cost Plus Interest-to-Income Ratio
- 68 **Table 16:** Total Cost Plus Interest/Income
- 69 **Table 17:** Debt Below and Above Total Cost Plus Interest, Full Time Only
- 70 **Table 18:** Debt Below and Above Total Cost Plus Interest

SUMMARY

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

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

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

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

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

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

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

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

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

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

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

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

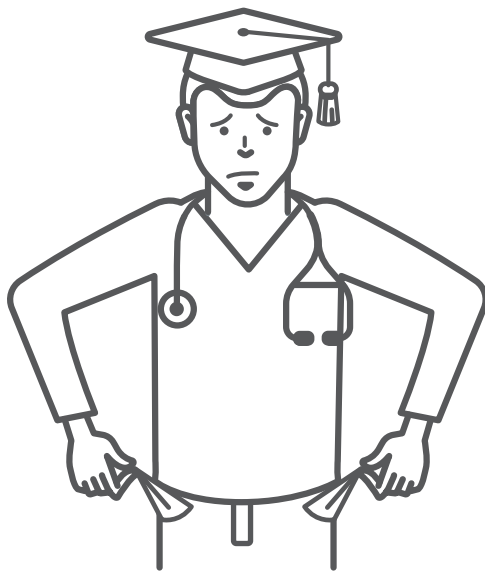
the ability to provide veterinary services is sufficient to meet the needs of the public and consumers, the profession is failing to provide these services at prices that allow consumers to obtain the level of veterinary services that are needed and provide the public health protection demanded by the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

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

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

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

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



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

INTRODUCTION

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

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

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

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

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

This analytical process of controlling the characteristics of a good or bundle of goods to measure the market impact is a common practice in economics and is best known as the Consumer Price Index. This index holds steady the quantity of a specific number of goods (basket of goods) year to year to measure the change in price as an indicator of inflation. Holding constant the demographic characteristics of new veterinarians, (i.e., a constant percentage of a certain gender, practice type and distribution by region) allows for the examination of how the changing number of graduates affects the income they receive.

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

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

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

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

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

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

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

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

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



MARKET FOR EDUCATION KPI



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

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

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

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

There are several scenarios that must be considered when calculating the DIR. The DIR that the AVMA produces is derived from analyzing AVMA’s Senior Survey. The Senior Survey is distributed to the graduating seniors of the AVMA accredited U.S. colleges each spring. The survey asks seniors to report their post-graduate plans, educational debt, starting salaries and other basic demographic information. A major caveat, particularly among reported debt figures, is that students report their best estimate of the information

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

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

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

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

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

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

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



THE APPLICANT POOL FOR VETERINARY COLLEGES

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

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

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

COLLEGES SUPPLY OF SEATS

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

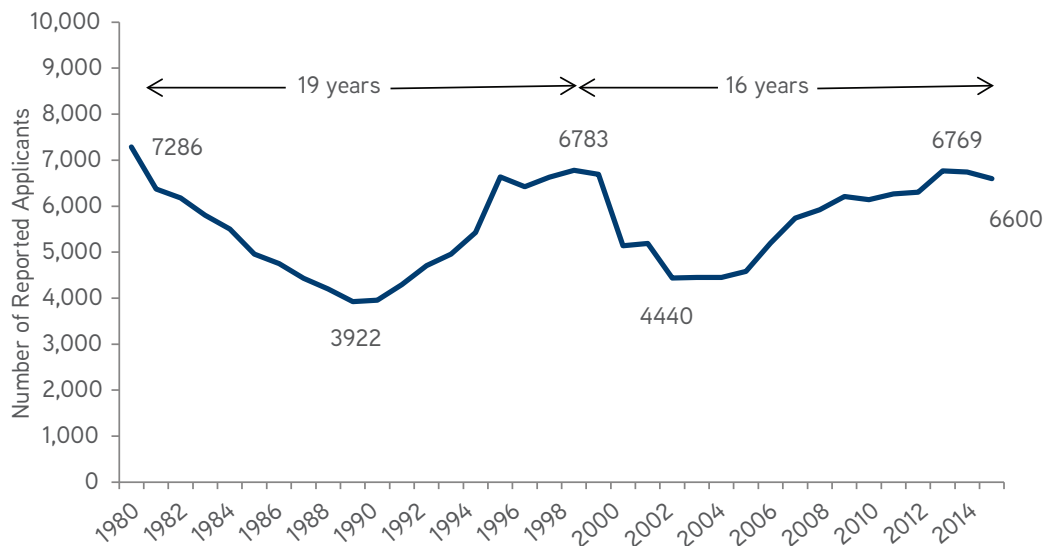
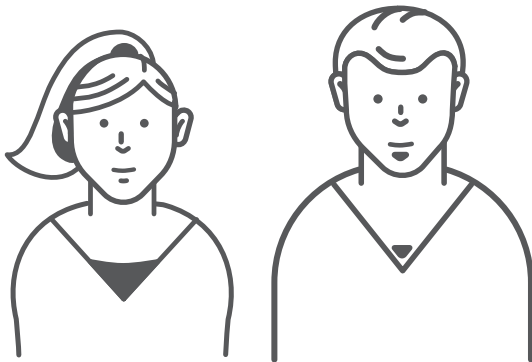


Figure 1

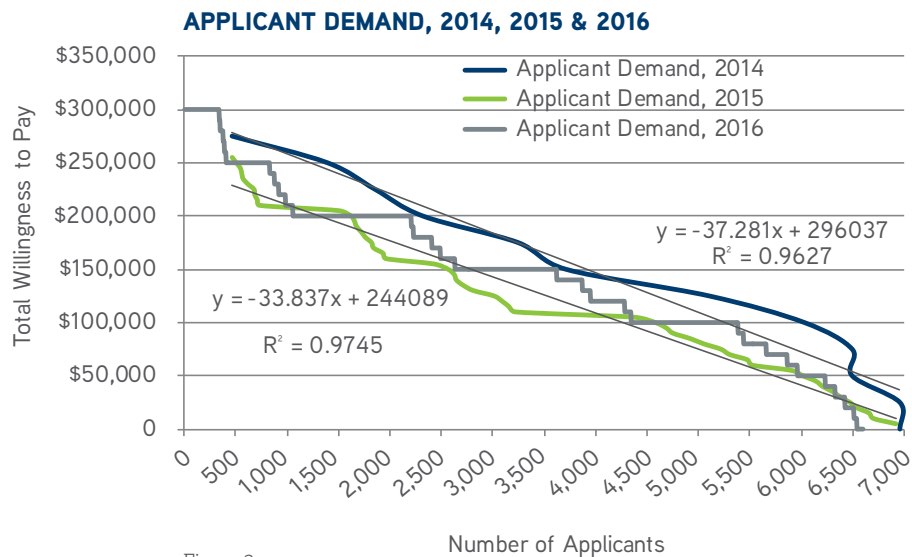


IF THE PREVIOUS PATTERN IN APPLICANT NUMBERS PERSISTS, THEN WE COULD EXPECT THE NUMBER OF APPLICANTS TO CONTINUE TO FALL AT LEAST OVER THE NEXT DECADE.

DEMAND FOR VETERINARY COLLEGE SEATS

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

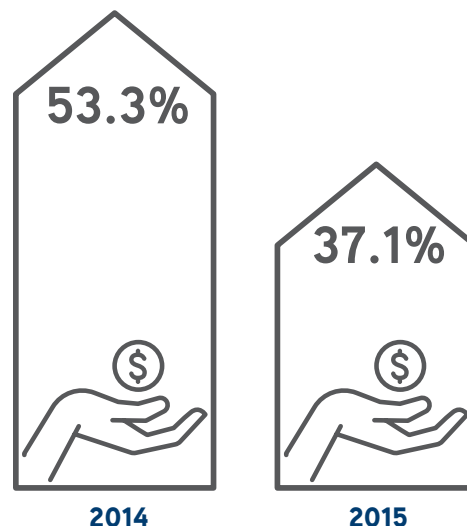
Between the period 2014 and 2015, the demand curve in the market for veterinary education shifted to the left. The implication of this shift is that at the same price fewer market participants (applicants) are demanding a veterinary education. More specifically, in 2014, 53.3 percent of applicants were willing to pay up to \$150,000 for a veterinary education, while in 2015, only 37.1 percent of the applicants were willing to pay up to \$150,000 for a veterinary education. At this rate the colleges would either have to reduce tuition to fill seats or have a shrunken pool of applicants from which to select first year veterinary students.



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

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

IN 2014, 53.3 PERCENT OF APPLICANTS WERE WILLING TO PAY UP TO \$150,000 FOR A VETERINARY EDUCATION, WHILE IN 2015, ONLY 37.1 PERCENT OF THE APPLICANTS WERE WILLING TO PAY UP TO \$150,000 FOR A VETERINARY EDUCATION.

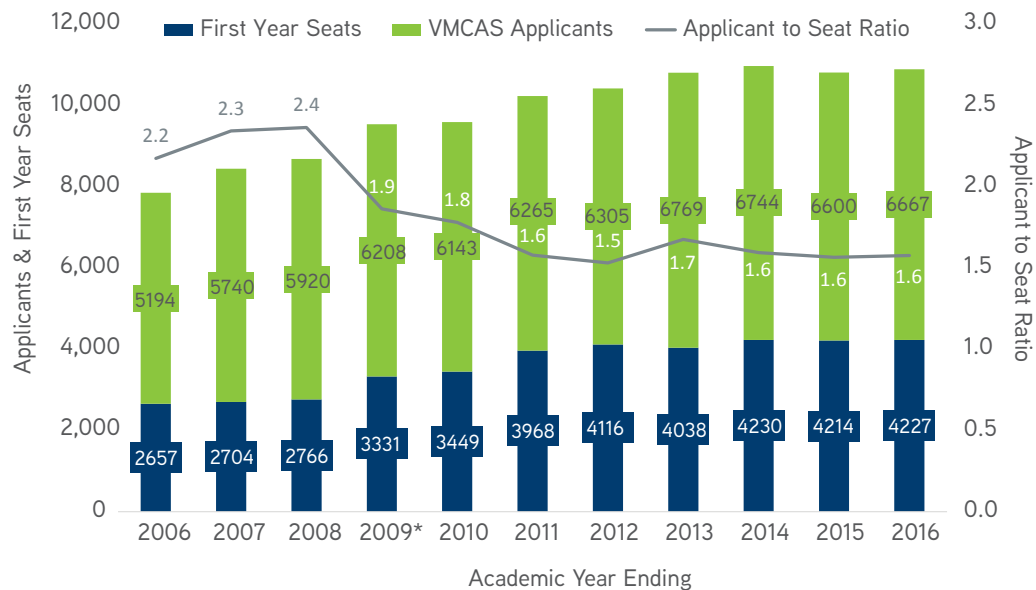


APPLICANT-TO-SEAT RATIO

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

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

VMCAS APPLICANTS AND FIRST YEAR SEATS, U.S. AND INTERNATIONAL INSTITUTIONS, AAVMC INTERNAL REPORTS, 2006-2016



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

Figure 3

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

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

IT IS IMPORTANT TO NOTE, HOWEVER, THAT THE DIP IN THE APPLICANT-TO-SEAT RATIO IN 2009 WAS PRIMARILY A RESULT OF ADDING THE U.S. AVMA ACCREDITED FOREIGN SCHOOLS AND NOT REFLECTIVE OF ANY MAJOR DIFFERENCE IN THE NUMBER OF AVMA APPLICANTS OR U.S. VETERINARY COLLEGE SEATS.

HISTORICAL ANALYSIS OF THE APPLICANT POOL

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

Table 1

VETERINARY COLLEGES SUPPLY OF SEATS

The number of seats available to U.S. students includes those seats available at the 30 AVMA accredited veterinary colleges in the US, 3 AVMA-accredited Caribbean Colleges, 16 AVMA accredited veterinary colleges in other countries, and numerous other veterinary colleges across the globe. The AVMA has members that graduated from more than 225 veterinary colleges. However, VMCAS tracks only U.S. citizens who apply for seats at AVMA accredited veterinary colleges. The seats currently occupied include the 2016 through 2019 graduating

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

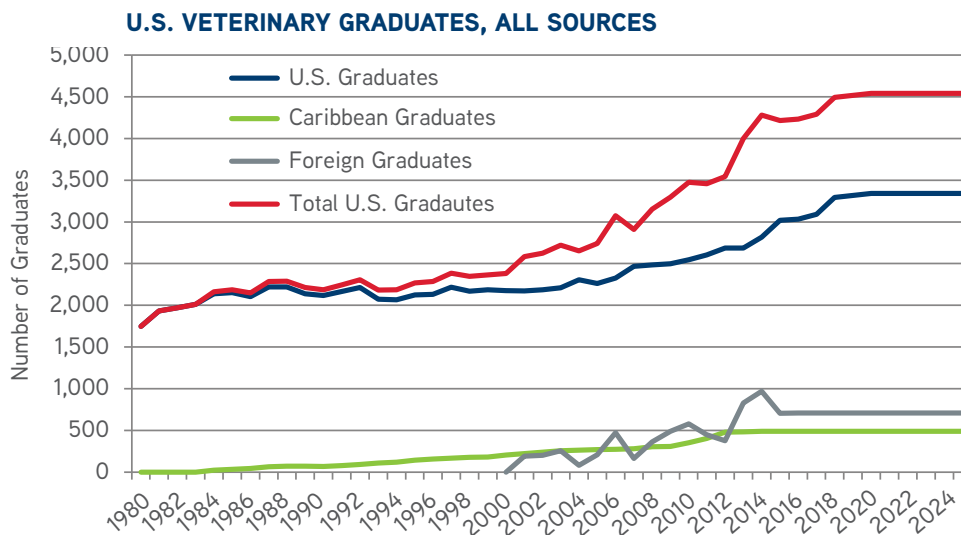


Figure 4

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

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

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

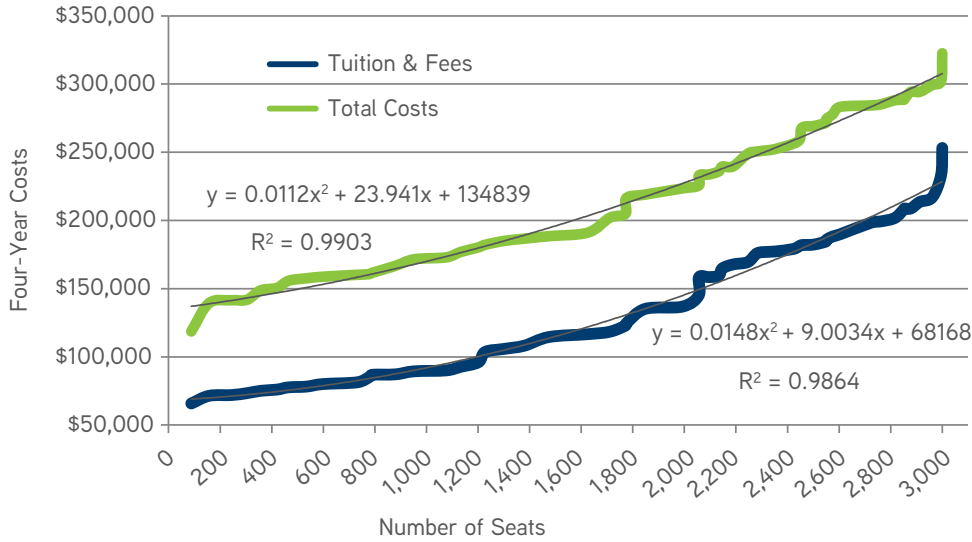


Figure 5

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

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

SUPPLY AND DEMAND FOR VETERINARY EDUCATION, 2014 & 2015

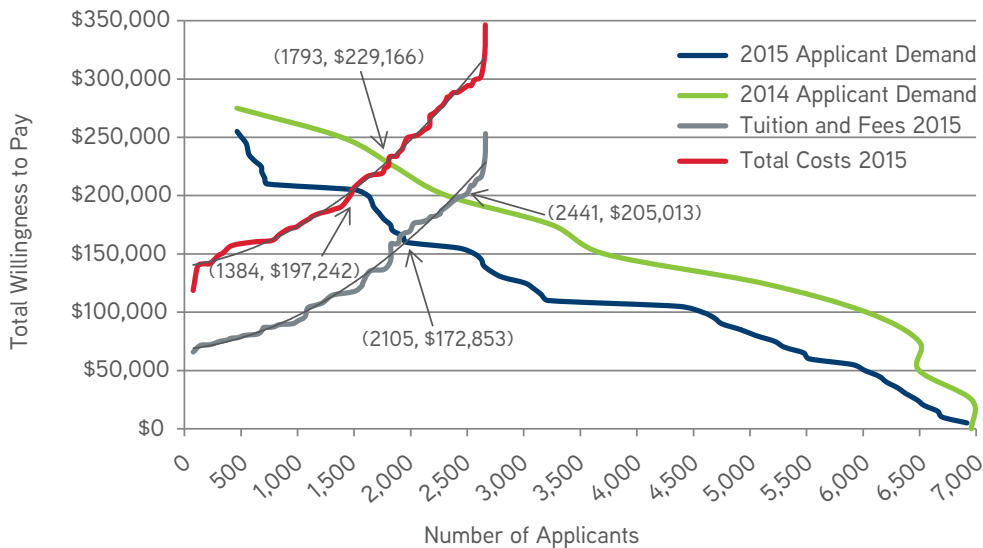


Figure 6

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

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

SUPPLY OF EDUCATION AND DVM DEBT, 2015

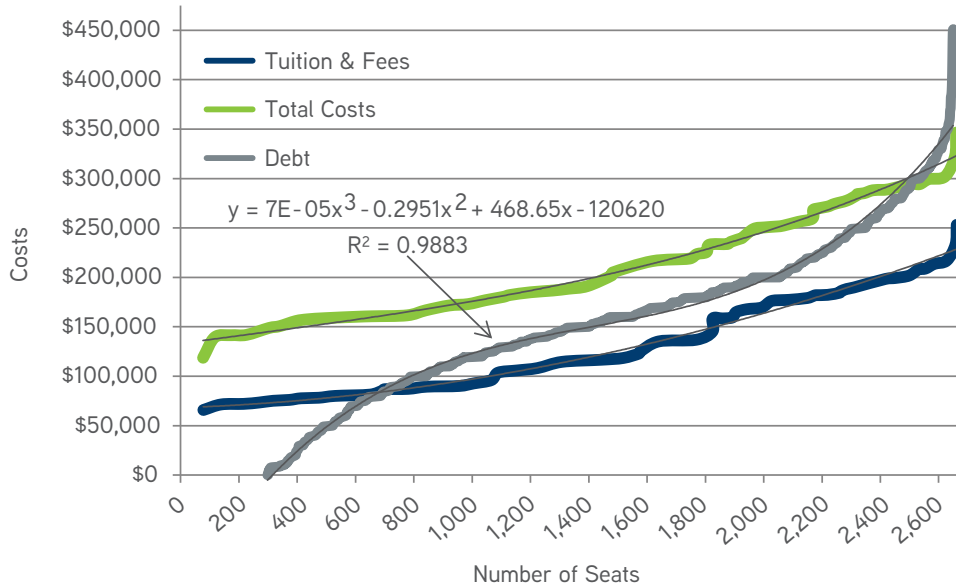


Figure 7

THE APPLICANTS' ESTIMATE OF THE DVM DEBT

The 2015 applicants were asked to estimate what they thought the debt load of the 2014 graduates debt load was. The following chart depicts their responses. As a comparison, the actual 2014 reported debt load of the graduates is provided in the same chart.

The applicants had a relatively accurate idea of the debt load of new veterinarians. This debt load, based on the starting salaries for new veterinarians is high, but not high enough to have deterred applicants from pursuing veterinary college.

APPLICANTS' ESTIMATES VERSUS ACTUAL DEBT LOAD OF GRADUATES

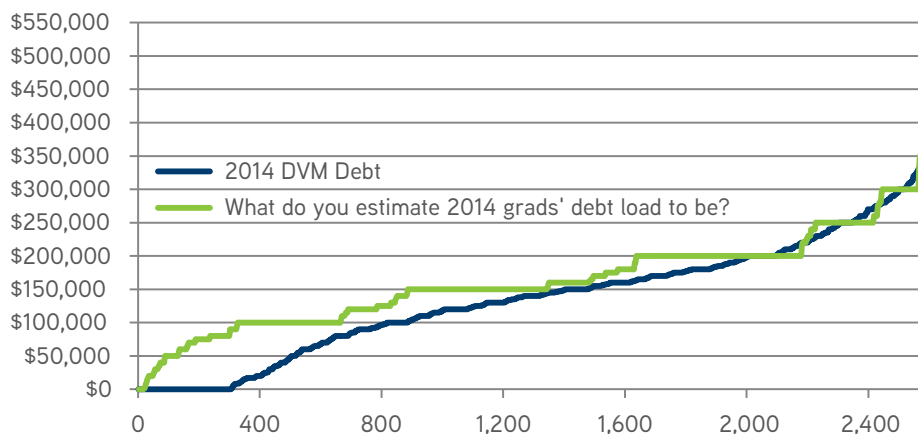


Figure 8

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

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



THE 2015 GRADUATING CLASS

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

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

2015 RESPONSE RATE OF SENIOR SURVEY BY SCHOOL

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

Table 2

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

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



DESCRIPTIVE STATISTICS FOR GRADUATES



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

A major component of the Senior Survey is the post-graduate plans of the graduating veterinary students. Students were asked to report their plans after graduating, whether they planned to pursue an internship, residency, continuing education or full-time employment. They were also asked to report the location of their post-graduate employment or education. The following figure illustrates the percentage of new veterinarians finding employment or gaining acceptance into an educational program upon graduation. Although there are students who reported finding no employment at the time the survey was distributed, there is evidence to suggest that many of those new veterinarians found employment within a year of graduating. Because the 2015 Senior Survey was our first effort to collect the data from foreign AVMA accredited veterinary colleges, we hope to improve the response rates for this group of colleges going forward.

DVM GRADUATES RECEIVING OFFERS FOR JOBS OR ADVANCED EDUCATION

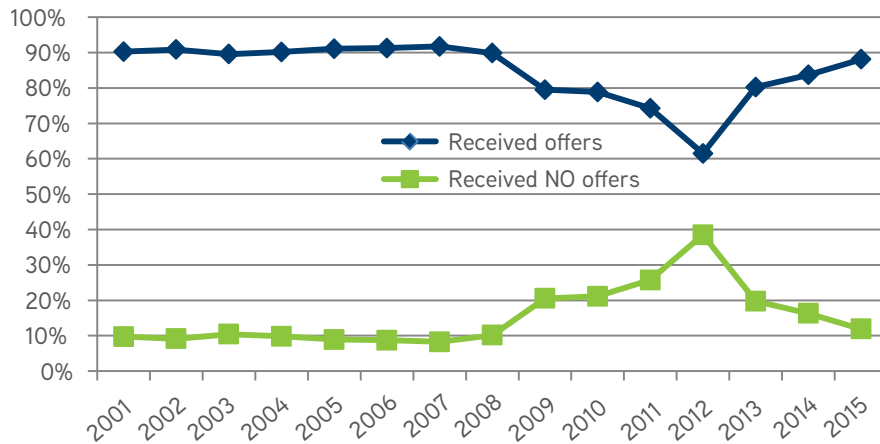


Figure 9

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

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

DISTRIBUTION OF NEW VETERINARIANS

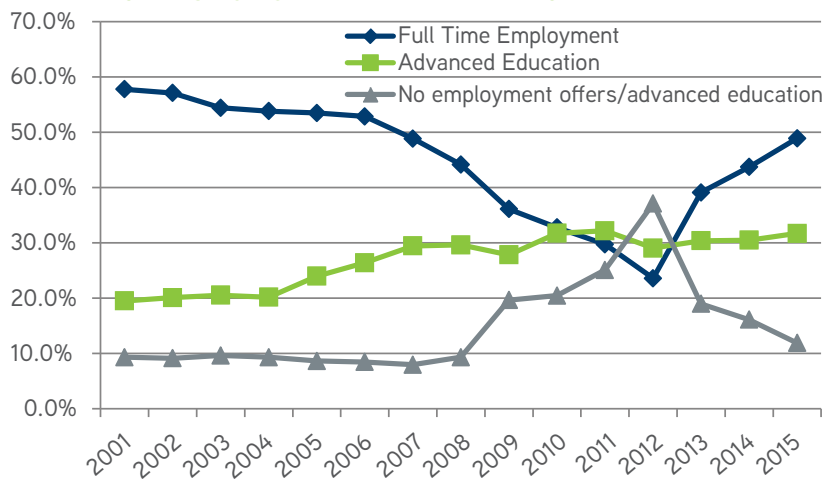


Figure 10

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

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

DISTRIBUTION OF NEW VETERINARIANS: PRIVATE PRACTICE

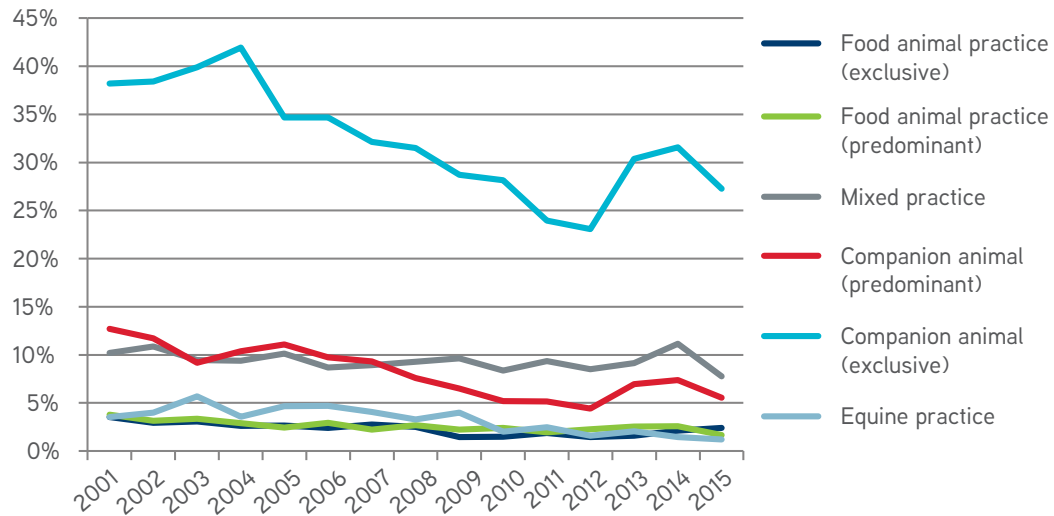


Figure 11

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

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

DISTRIBUTION OF NEW VETERINARIANS: PUBLIC PRACTICE

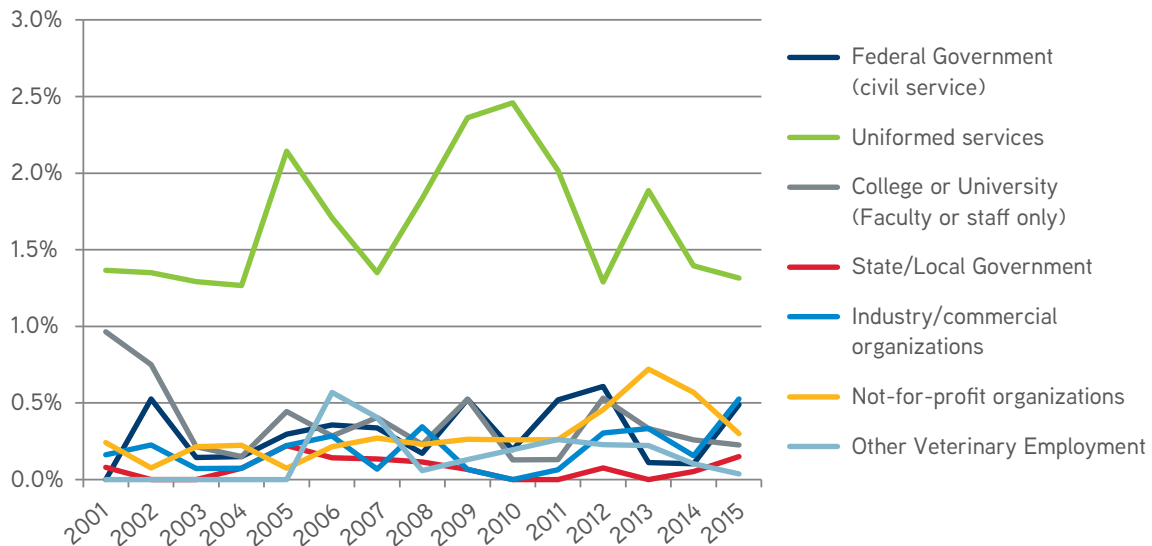


Figure 12

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

Over the last six years, 75 percent of new veterinarians pursuing internships reported being in a companion animal species-

focused internship. There has generally been no change in the species focus of internships accepted by new veterinarians.

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

DISTRIBUTION OF NEW VETERINARIANS: PRIVATE, PUBLIC AND INTERNSHIPS

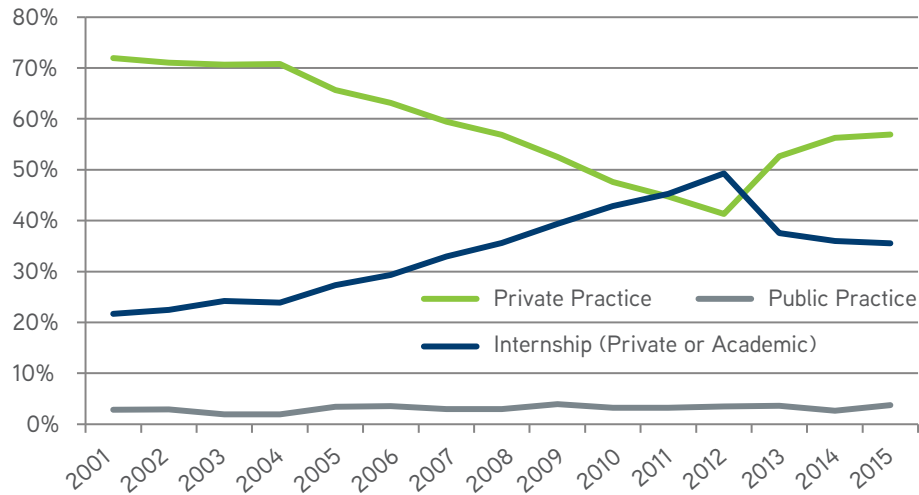


Figure 13

SPECIES FOCUS OF INTERNSHIP

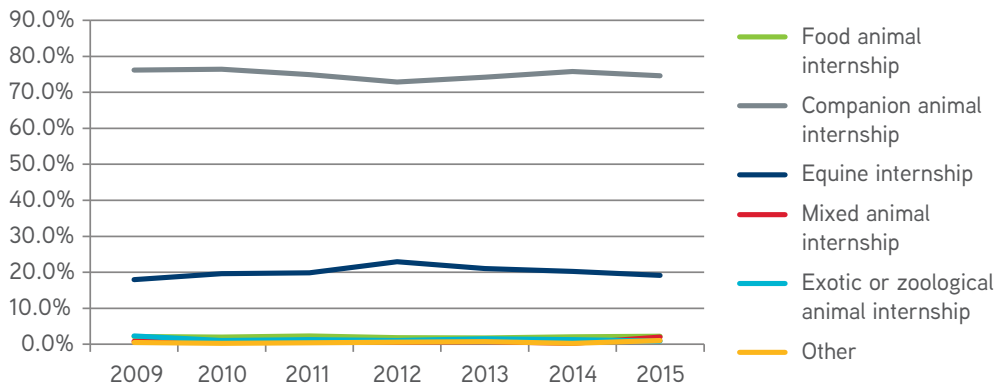


Figure 14

DISTRIBUTION OF NEW VETERINARIANS IN ADVANCED EDUCATION

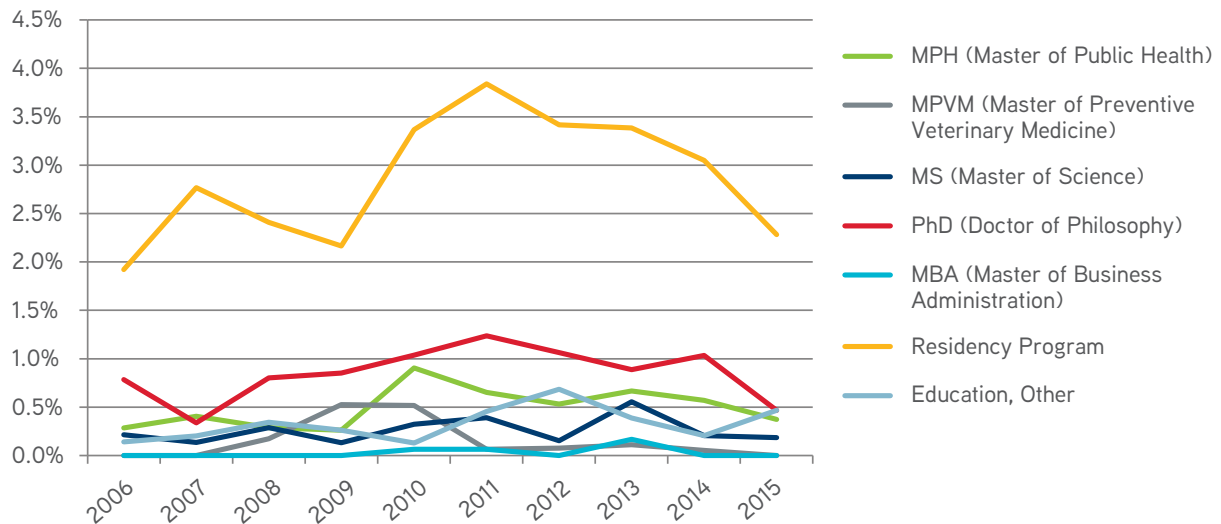


Figure 15



NEW VETERINARIAN INCOMES



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

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

Veterinarians in full-time positions in private practice have consistently been the highest compensated group among the class since 2010, with veterinarians in public practice following closely behind. The lowest compensated group within the class was those pursuing internships, with mean annual earnings of \$28,312 and an average annual increase of \$510 per year (between 2006 and 2015).

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

MEAN STARTING SALARIES OF NEW VETERINARIANS

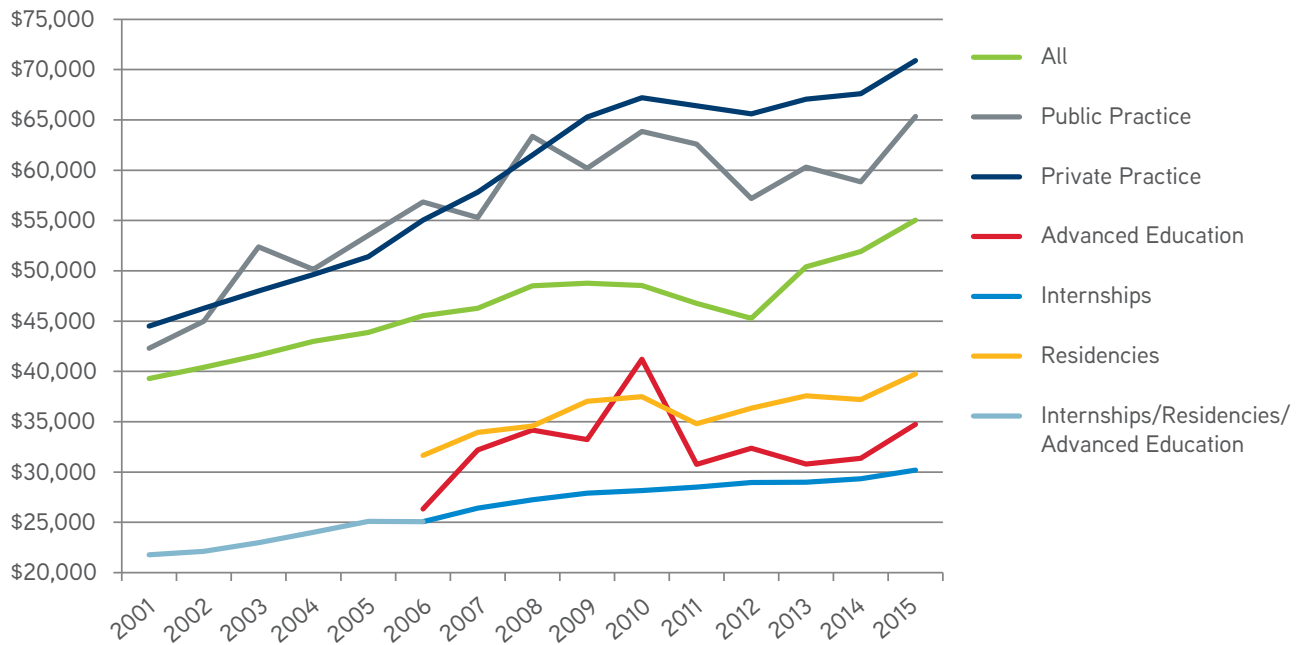


Figure 16

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

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

DISTRIBUTION OF STARTING SALARIES FOR NEW VETERINARIANS

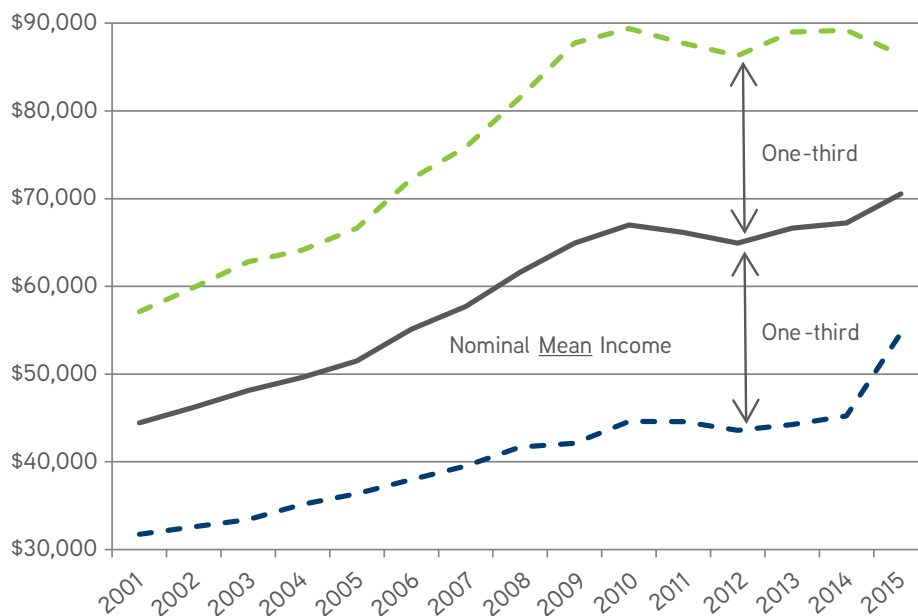


Figure 17

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

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

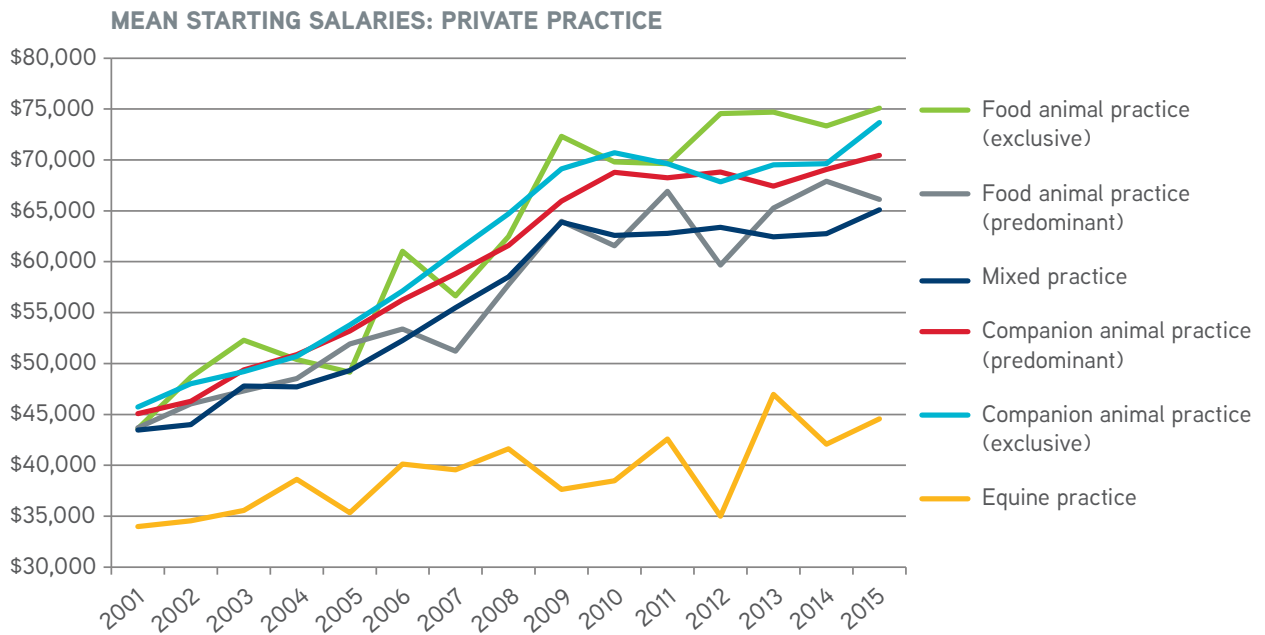


Figure 18

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

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

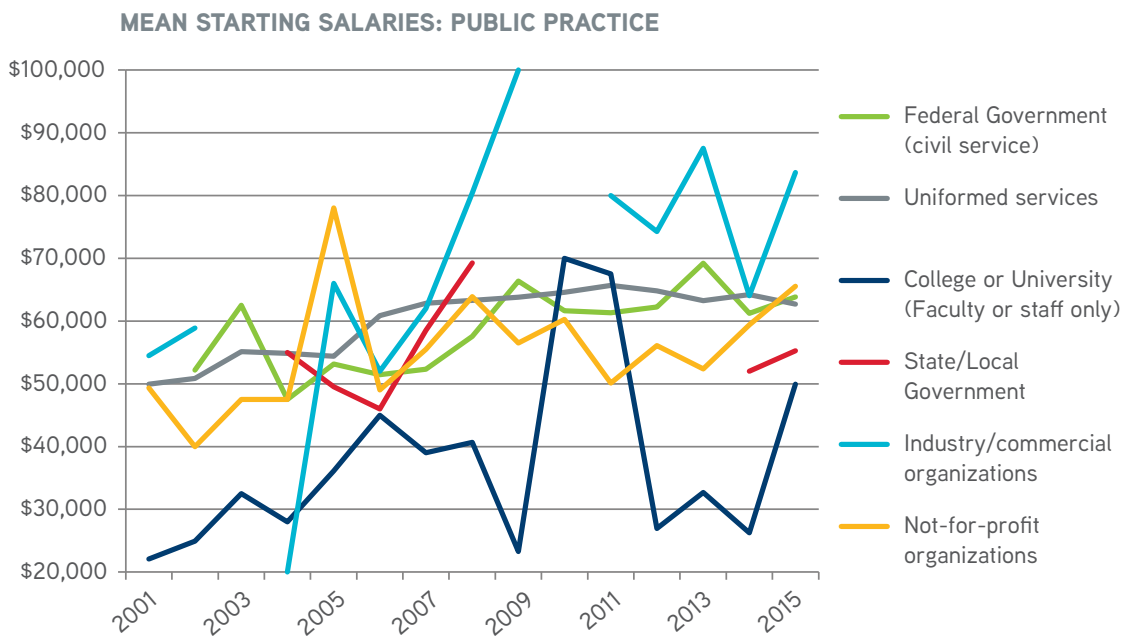


Figure 19

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

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

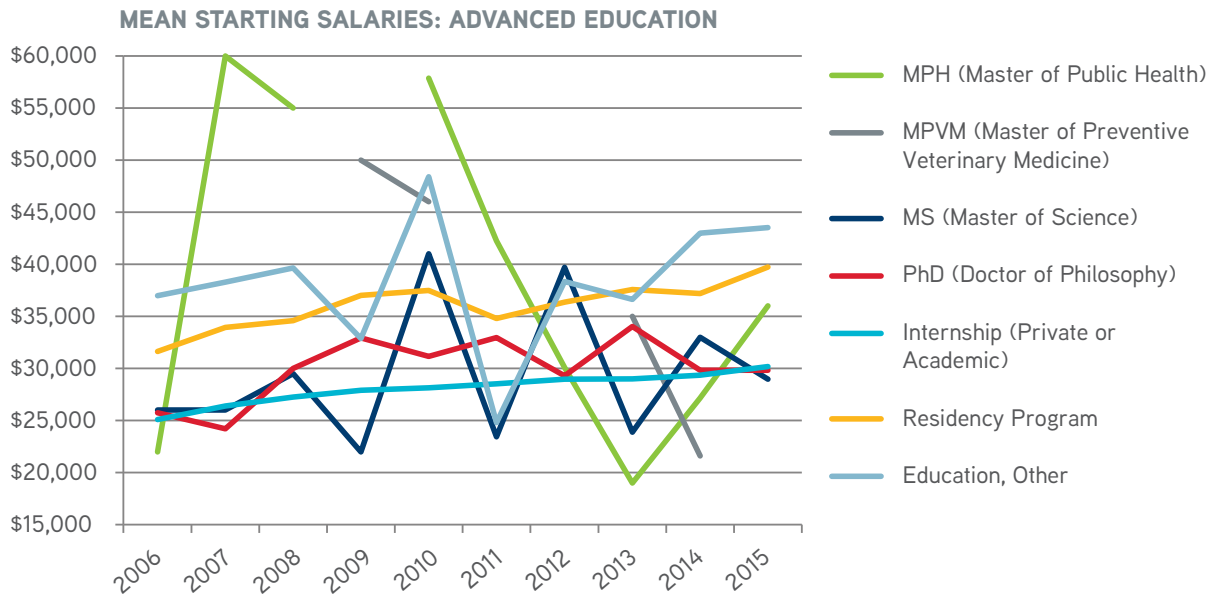


Figure 20

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

The value of starting salaries, known as the indexed Real Weighted mean Income (RWI), measures the change in salary of a constant cohort of veterinarians holding variables such as gender, practice type and location constant and controlling for inflation. The RWI produces a starting salary “index”, a mean starting salary that represents the inflation-adjusted mean starting salary for a constant gender distribution, practice type distribution, and locational distribution for the new graduates that received full-time employment prior to graduation.

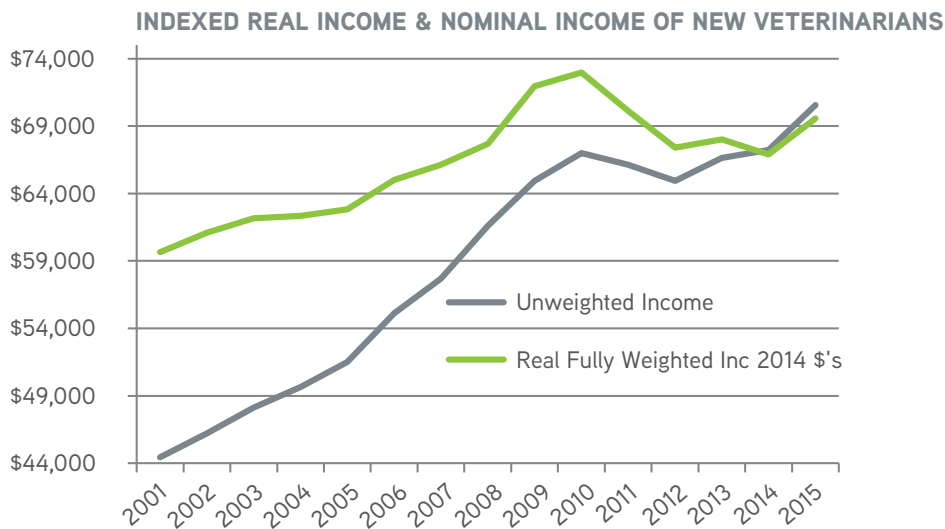


Figure 21



FACTORS AFFECTING INCOMES FOR NEW VETERINARIANS

There are numerous factors that explain the variation in income. The following table describes the effect of various factors on starting salaries obtained through the analysis of these starting salaries with a multiple linear regression in which the dependent variable is the starting salary of new veterinarians. The data used in this analysis comprised 15 years of responses from over 92 percent of all graduates of the 28 U.S. veterinary colleges. We analyzed the impact on salaries of graduating college, DVM debt, age, gender, location, anticipated work hours per week and post-graduate plans, including options to pursue internships, residencies, advanced education and board certification.

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

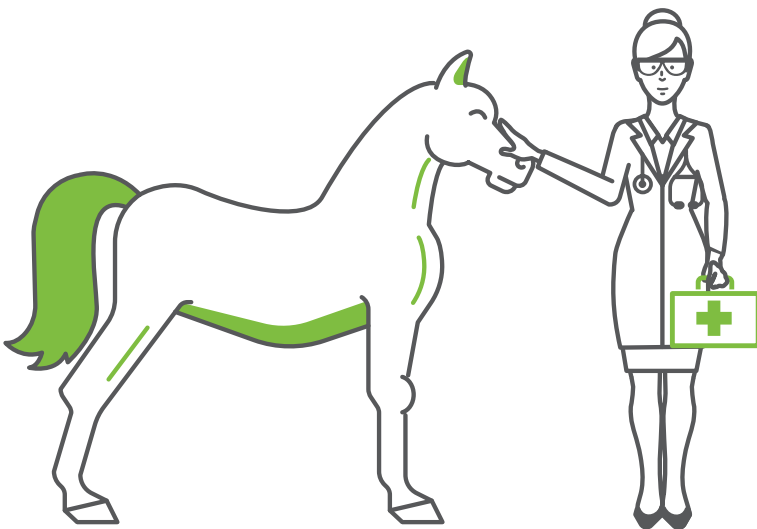
The final column labelled “sig” represents the significant variables. These values, also known as the p-values, are such that for a “sig” less than 0.05, the coefficient of “B” is statistically, significantly different from “0.” For instance, for Region 4 the p value is 0.927; this means it is not statistically,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

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

The unstandardized coefficient for the variable “year” is \$1,669.64 and indicates that the mean starting salary for new veterinarians increases by \$1,670 every year. However, this is the trend increase and does not consider a change in the number of new veterinarians or a change in the general economic conditions (e.g., GDP).

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

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



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

FACTORS AFFECTING INCOMES FOR NEW VETERINARIANS

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

Table 3

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

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

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

Table 3 Cont'd.

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





NEW VETERINARIAN DEBT



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

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

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

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

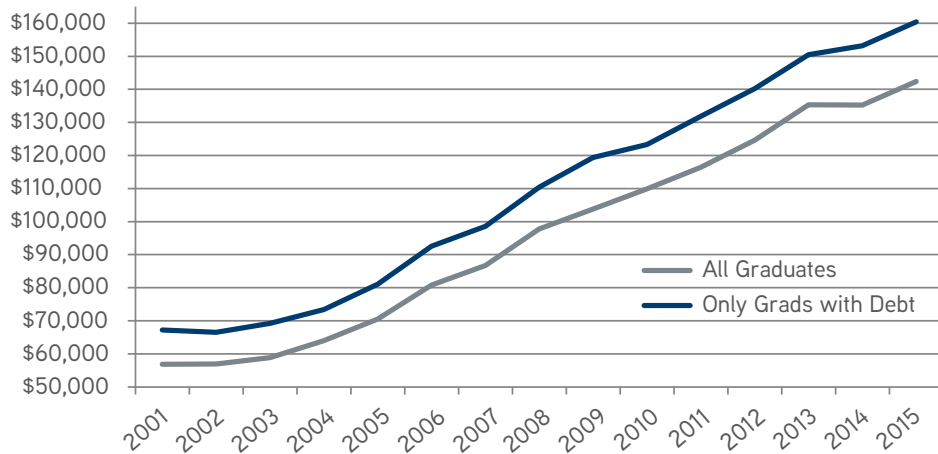


Figure 22

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

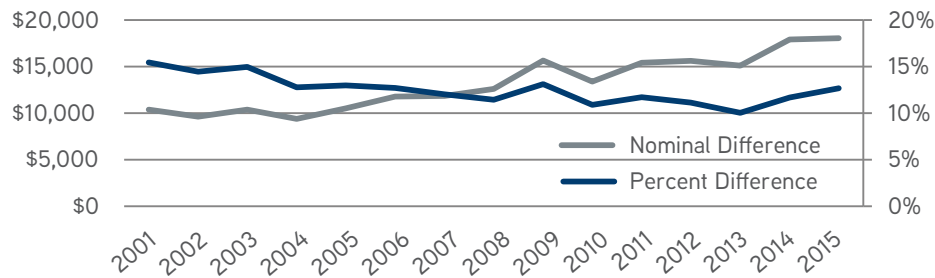


Figure 23

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

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

DVM DEBT BY POST-GRADUATE PLANS

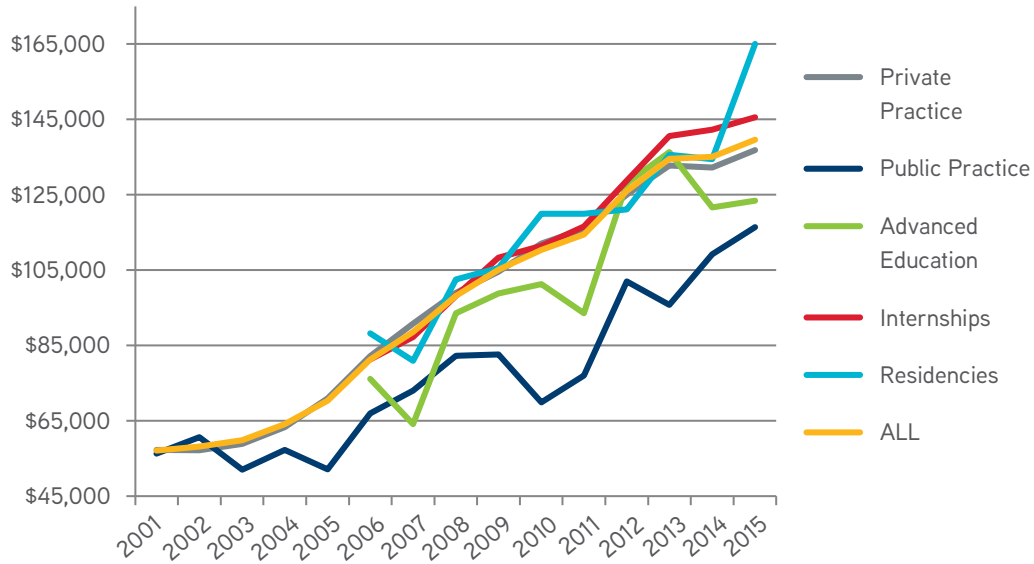


Figure 24

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

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

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

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

Table 4

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

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

MEAN DVM DEBT: PRIVATE PRACTICE

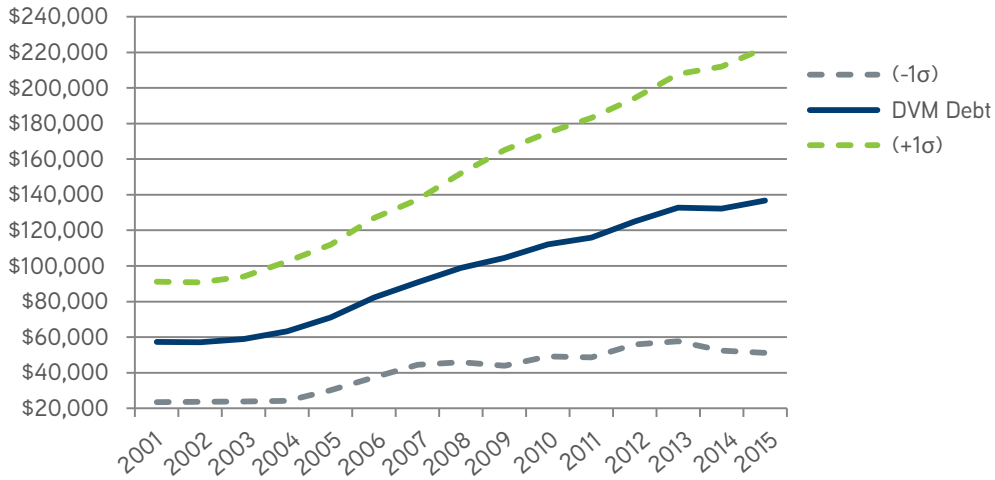


Figure 25

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

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

MEAN DVM DEBT: PUBLIC PRACTICE

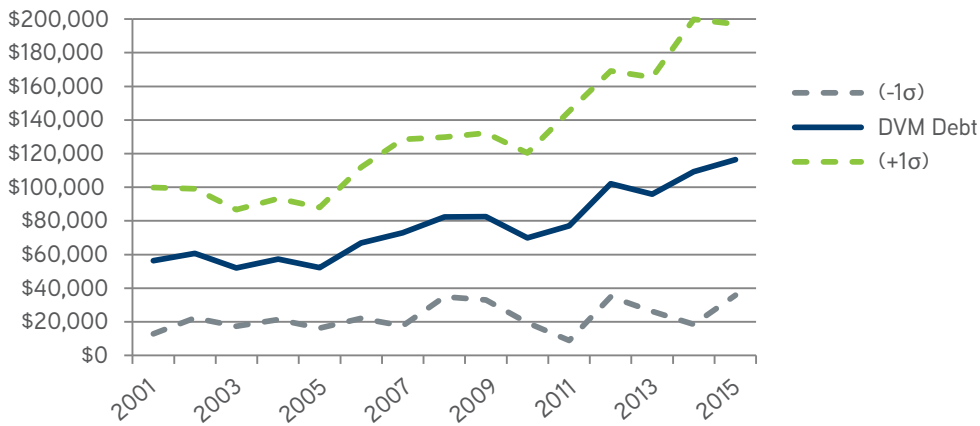


Figure 26

For each sector, whether public practice, private practice, advanced education, internships or residencies, the growth rate of DVM debt has outpaced the growth rate of the starting salaries of new veterinarians. Although the growth rates of debt and starting salaries prior to 2005 were comparable, the rate of growth in debt began to accelerate in 2006 and continued to grow much faster than incomes almost continually through 2015.

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

MEAN STARTING SALARIES & DEBT OF NEW VETERINARIANS

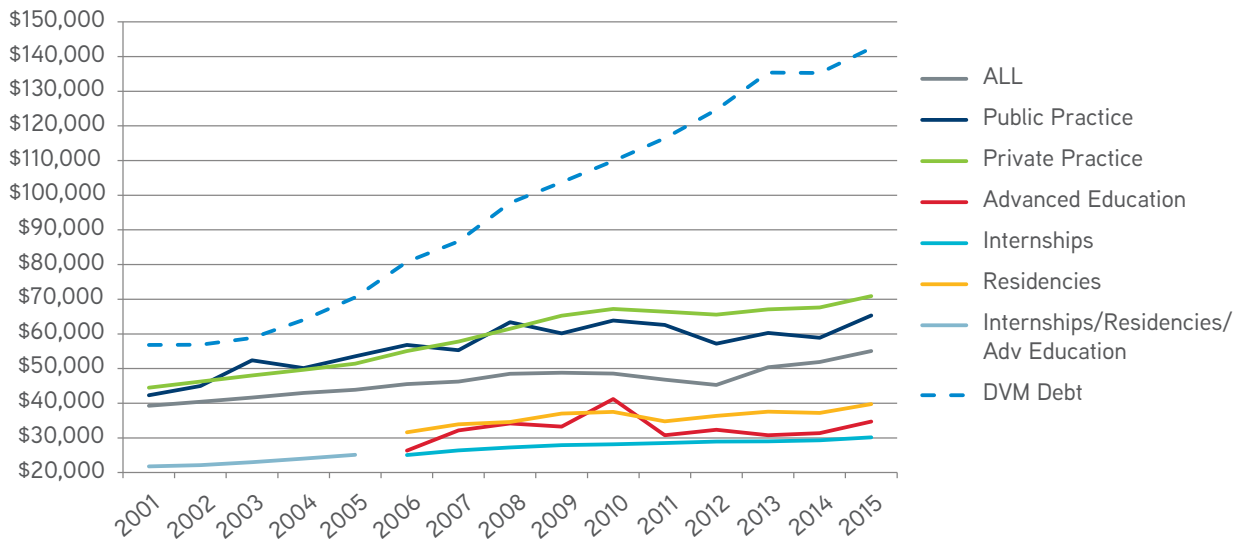


Figure 27

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

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

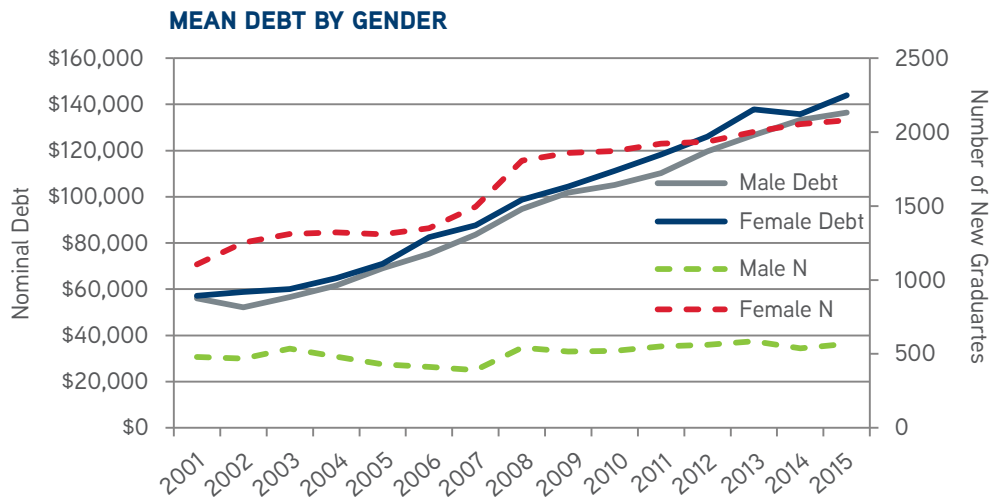


Figure 28

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

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

U.S. VETERINARY COLLEGES: TUITION & FEES

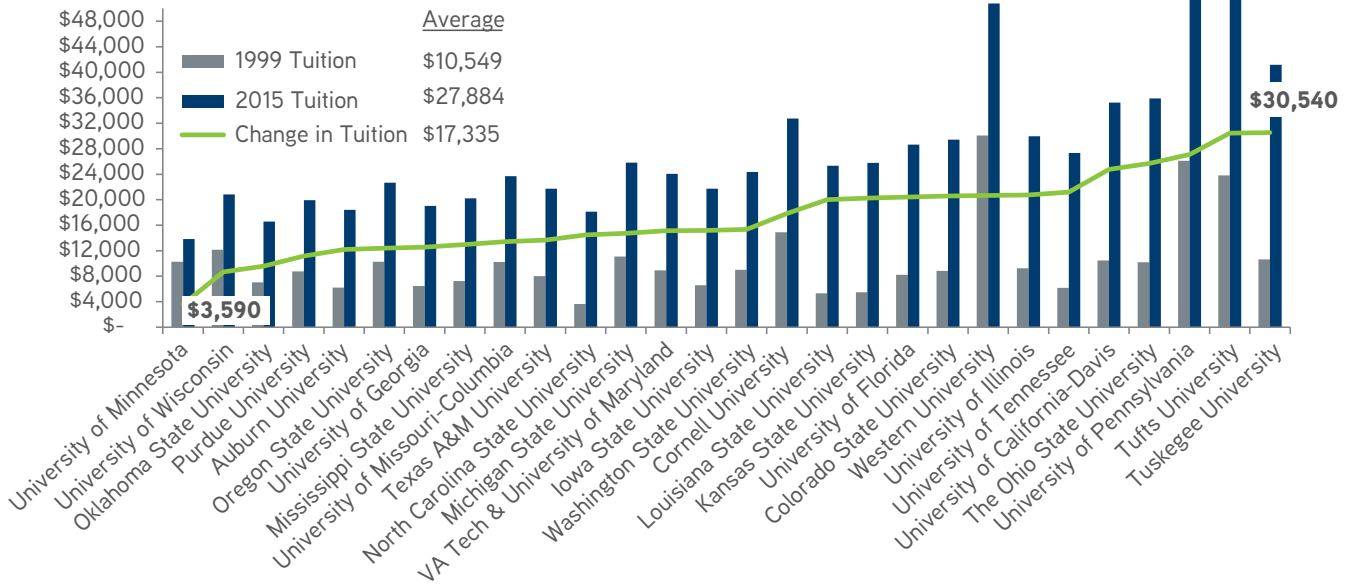


Figure 29

One significant factor contributing to the variation in the debt level of new veterinarians is their residency status, i.e., resident is in state, non-resident is out of state. Residents are those that attend veterinary college in the state where they reside while non-residents are those that attend veterinary colleges outside of the state of their primary residence. However, some students may be able to attain residency status after their first year in veterinary college. More appropriately, we refer to discounted and non-discounted seats. Discounted seats refer to those

students who pay less than the full cost of attendance either because they are residents of the state where the veterinary college is located or because their state has a contract with the veterinary college to pay the out-of-state (non-residency) tuition and fees. Over the last 10 years, the mean debt of graduating veterinary students reporting resident status was over \$30,000 less than the mean debt of graduating veterinary students reporting non-resident status.

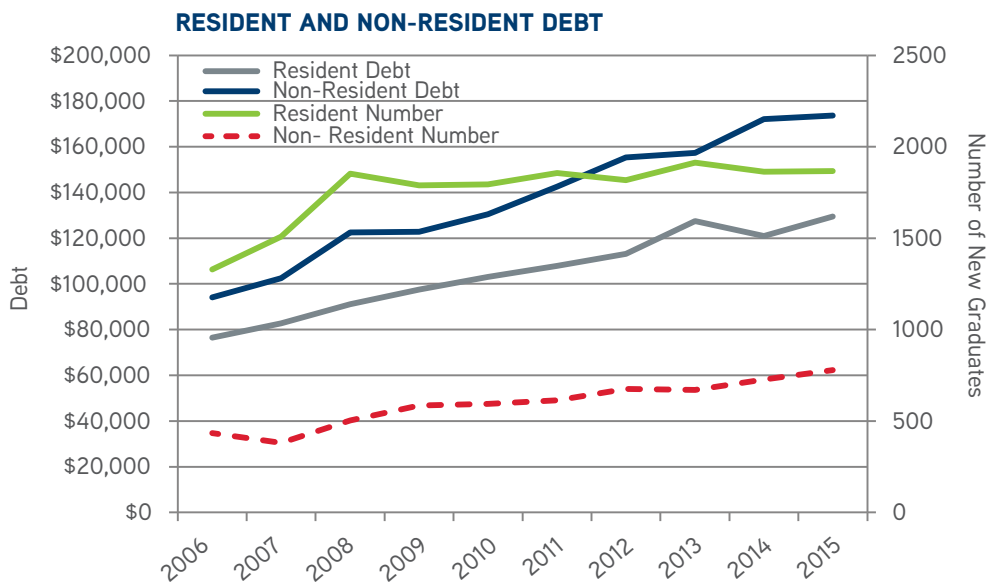


Figure 30

The following chart illustrates the number of new veterinarians graduating with debt and those graduating with no debt. Although the number of students with no debt has remained relatively constant, with an increasing class size, the proportion has been

shrinking. In 2001, 15.4 percent reported graduating with no debt, and this proportion has been on a steady decline, with 11.2 percent reporting graduating with no debt in 2015.

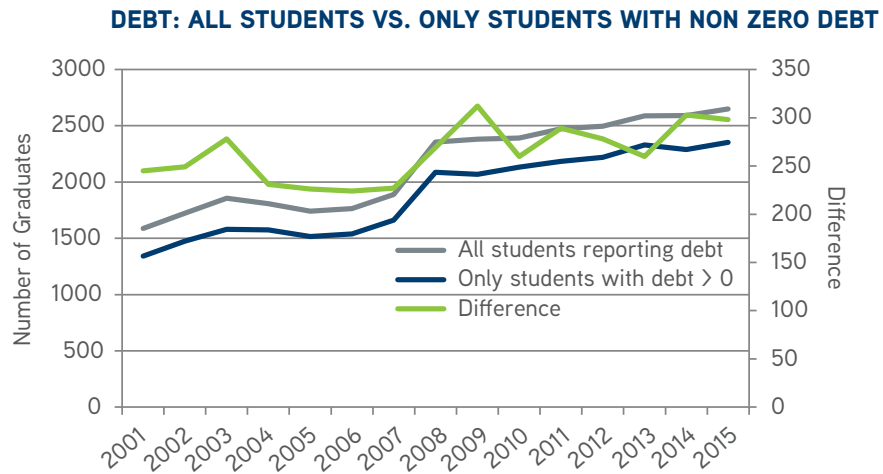


Figure 31

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

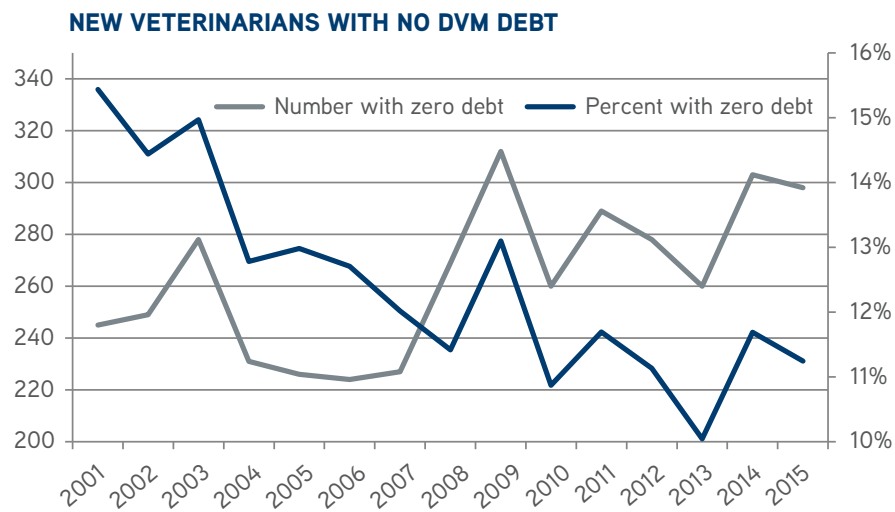


Figure 32

Similar to the methods used to determine the index of real weighted mean income (RWI), we determine an index of Real Weighted mean DVM Debt (RWD) by measuring the annual change in the debt load of a constant cohort of graduates and adjusting for inflation. In 2014 dollars, the RWD nearly doubled from just over

\$75,000 in 2001 to approximately \$142,000 in 2015. To determine this measure, we held constant the following: ratios of gender, the percentage of students in residency status, and the distribution of graduates across schools based on cost of tuition.

REAL INDEXED DVM DEBT & UNWEIGHTED DEBT

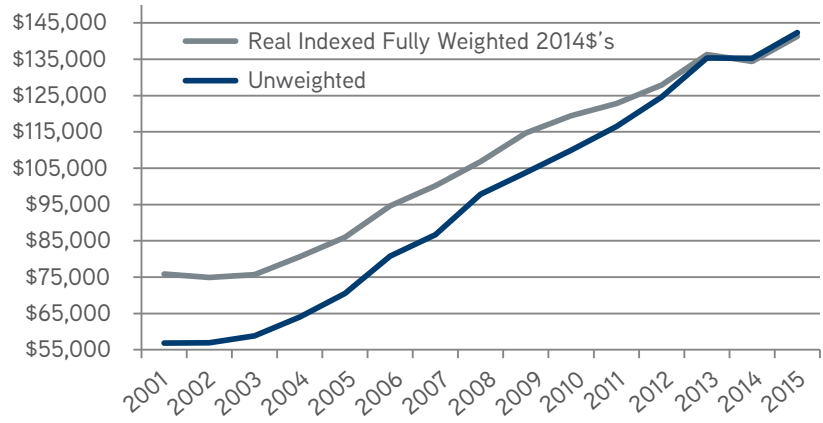


Figure 33



FACTORS AFFECTING DEBT FOR NEW VETERINARIANS

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

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

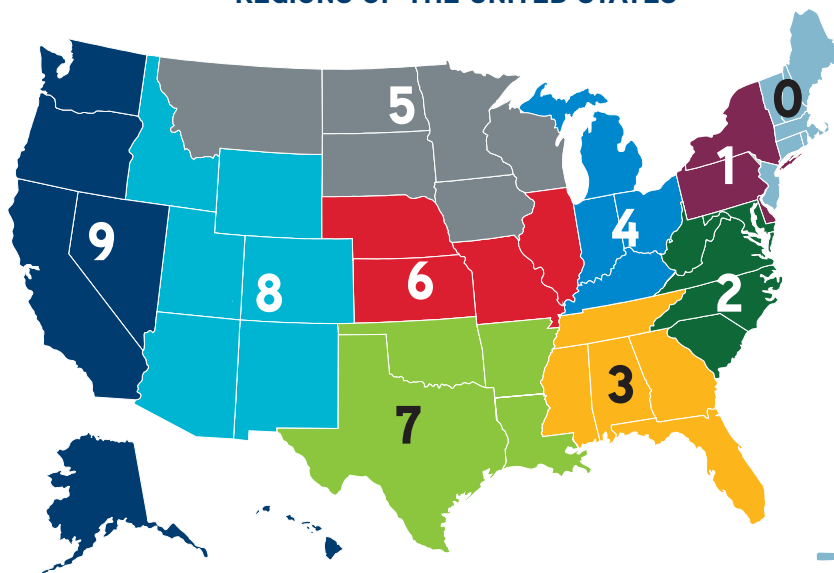
According to our regression model, new veterinarians graduating from schools in Region 6 had \$8,604 more debt than new veterinarians graduating from schools in Region 3, and new veterinarians graduating from schools with “pricey tuition” had \$66,793 more debt than those graduating from schools with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

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

As in the regression explaining the variation in income, the non-standardized coefficients in this regression explaining the variation in debt represent the dollar value attached to the variable in question, whereas the standardized coefficients represent the relative value of each coefficient. For example, the standardized coefficient of 0.221 for “pricey tuition” indicates that the debt incurred from graduating from a school who has pricey tuition carries almost 10 times more weight than the debt incurred from going to a school in Region 0, coefficient 0.025.

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

REGIONS OF THE UNITED STATES



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

FACTORS AFFECTING DEBT OF NEW VETERINARIANS

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

Table 5





NEW VETERINARIAN DEBT-TO-INCOME RATIO



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

The debt-to-income ratio (DIR) is an important measure of the economic performance of the market for veterinary education. The debt-to-income ratio ties together the market for education and the market for veterinarians. By definition, the debt-to-income ratio measures the percentage of debt that is covered by annual income. Although some economists suggest that a debt-to-income ratio of 1:1 may be the limit that should be considered to guarantee personal financial sustainability, this best applies to non-professional undergraduate degrees. Because the increases in income associated with experience are much greater for those with professional degrees, especially graduate professional degrees, the level of debt to income that can be serviced without posing serious financial stress is likely closer to 1.4:1. During the period 2001 through 2015, the mean change in the debt-to-income ratio is 30.9 percent per annum.



In the following chart we illustrate several measures for the DIR. The first (highest DIR) represents the mean of the individual debt-to-income ratios. The middle line represents the mean of the individual debt-to-income ratios adjusted to maintain a constant cohort of veterinarians over time. The last (bottom line) provides the simple ratio of the mean of all reported incomes and all reported debt. In all cases, only the incomes of those graduates with full-time employment are included and all

reported debt values are included. In other words, the sample of observations of debt is larger than the sample of income from graduates with full-time employment and thus this measure is inaccurate. The first two measures are based on graduates who have both incomes from full-time employment and reported debt. The AVMA DIR that is used as a KPI is the fully weighted, individual DIR or the Real Weighted mean Index.

DEBT-TO-INCOME MEASURES

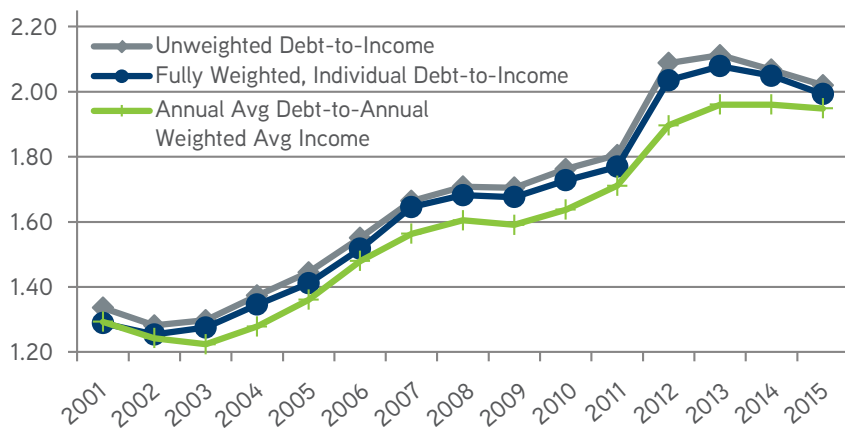


Figure 34

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

New veterinarians pursuing public practice have had, on average, the lowest debt-to-income ratio for most of the period 2001 through 2015. In 2015 they reported a debt-to-income ratio of 1.85:1. On the other hand, new veterinarians pursuing internships had the highest debt-to-income ratio for most of the same period, with a mean debt-to-income ratio of 4.89:1 in 2015, more than double that of those pursuing employment in public practice. The debt-to-income ratio of those pursuing full-time employment in private practice was relatively low compared to other sectors, with a ratio of 2.02:1 in 2015.

DEBT-TO-INCOME BY POST-GRADUATE PLANS

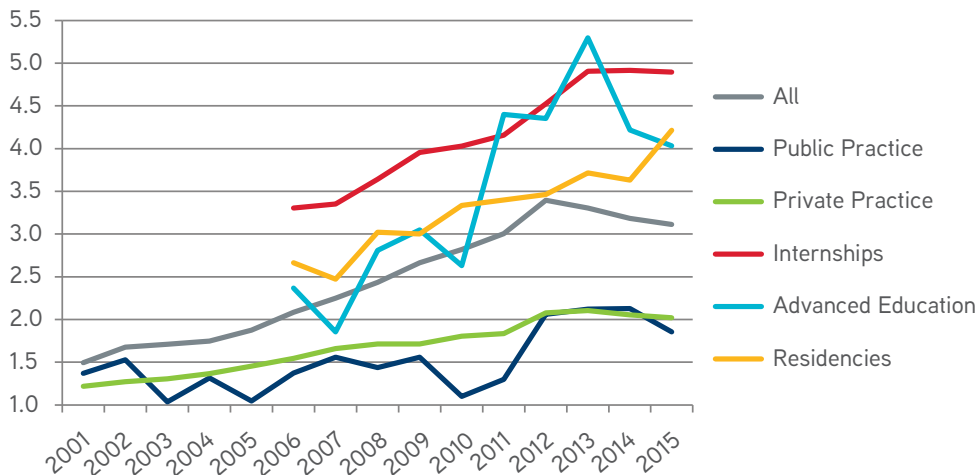


Figure 35

FACTORS SIGNIFICANT IN EXPLAINING THE DEBT-TO-INCOME RATIO

The analyses of the factors that contribute to the difference between the individual level of income and the mean income, and for individual debt and mean debt, for graduates from 2001 to 2015 have been illustrated previously. This analysis illustrates the factors that explain the differences between the DIR for each individual and the mean DIR for the sample of all graduates between 2001 and 2015 that reported income and debt. A regression of debt-to-income as a function of year, age, gender, whether the respondent had children, sought employment, received any offers, number of hours and weeks expecting to work, additional degrees held, location of anticipated place of employment, practice type, Gross Domestic Product (GDP) lagged one year, and veterinary college was performed. Results are provided in the table below.

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

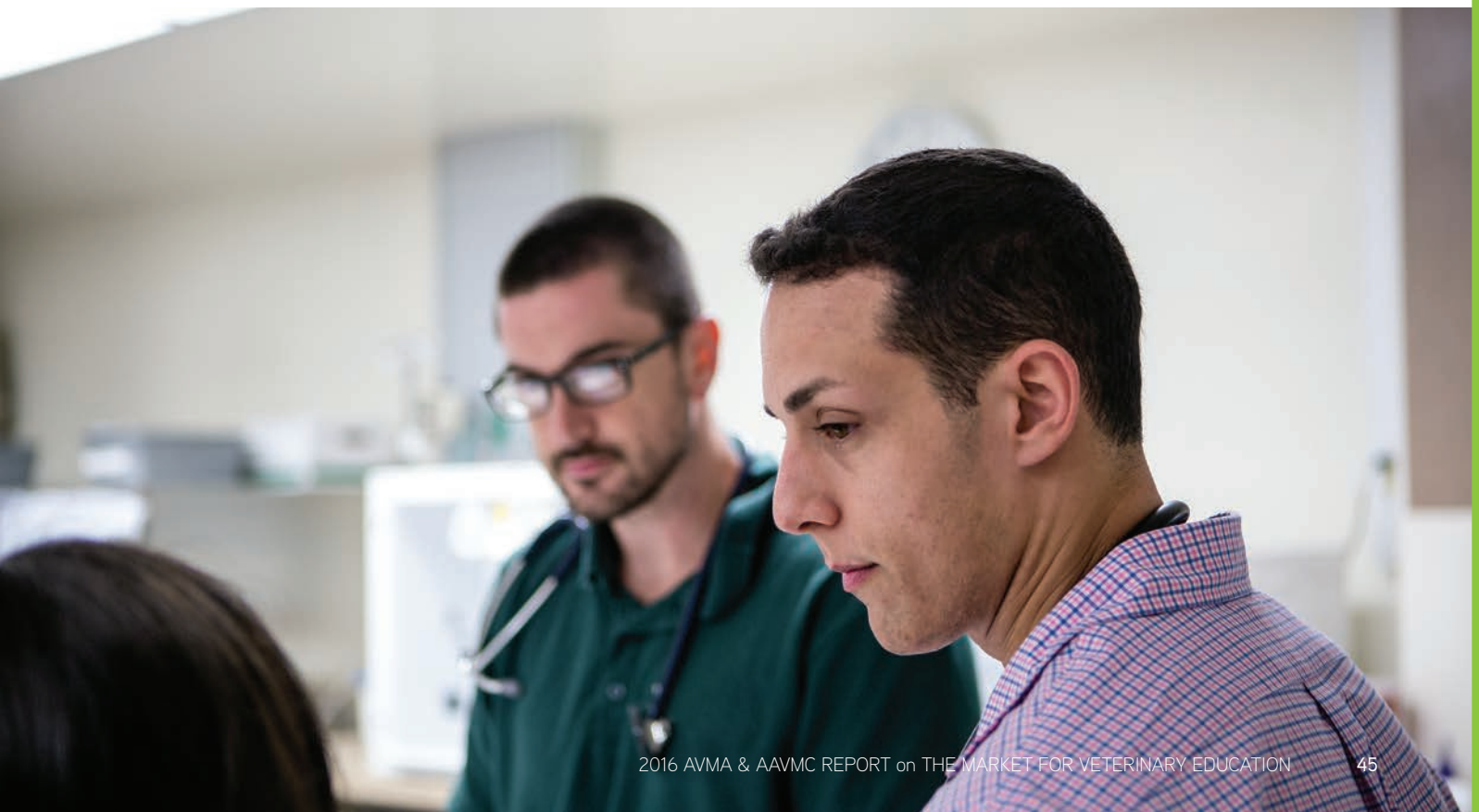
The following factors were statistically significant in explaining the variation in the debt-to-income ratio of survey respondents, at a 5 percent level of significance: year of graduation, age, gender, whether or not respondent has children, hours they expect to work, practice type (food animal, equine, government services and university employee) and the college of graduation. The group with the most significant variables was the college of

graduation. Out of 28 universities, 24 were significantly different from Texas A & M in explaining the variation in the debt-to-income ratio as a result of the school. Veterinary colleges at the University of Georgia, Purdue University and North Carolina State University had debt-to-income ratios that were not statistically different from Texas A & M.

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

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

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



FACTORS AFFECTING THE DEBT-TO-INCOME RATIO

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

Table 6

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

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

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

Table 6 cont'd.



DEBT AND INCOME OF THE 2015 GRADUATING CLASS



The majority of graduates have debt-to-income ratios at the beginning of their career that far exceed the 1.4:1 DIR that establishes an upper bound for “acceptable” levels of financial stress.

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

DISTRIBUTION OF 2015 STUDENT DEBT

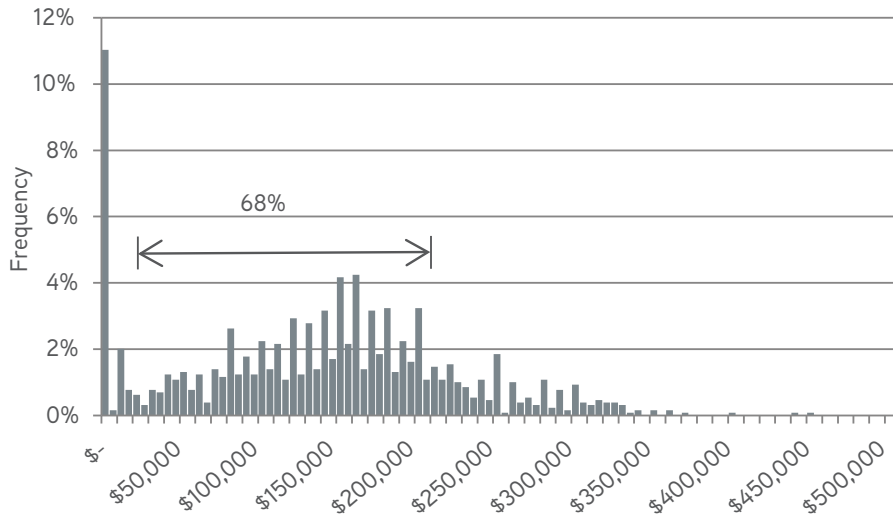


Figure 36

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

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

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

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

DISTRIBUTION OF 2015 STARTING SALARY



Figure 37

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

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

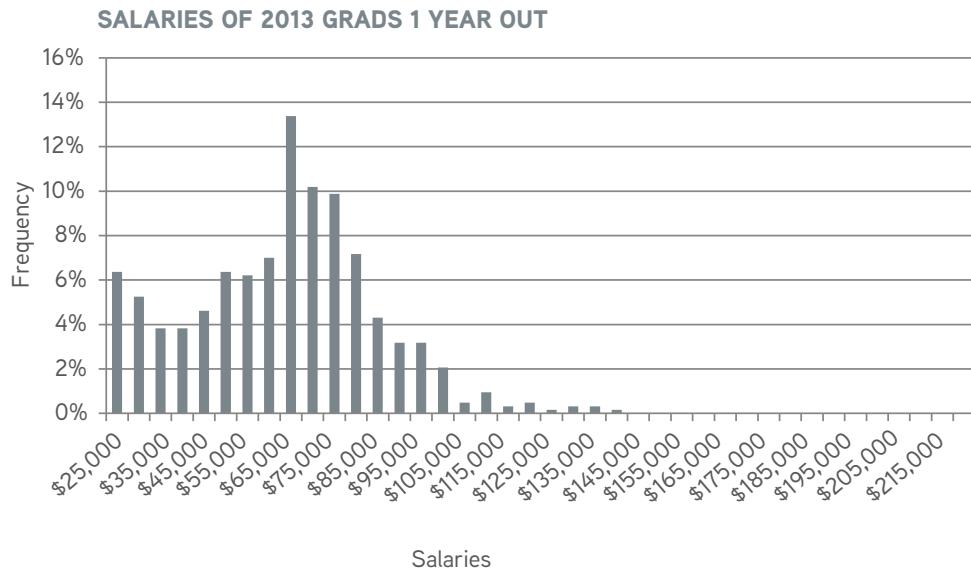


Figure 38

Using the individual reported debt and income, the distribution of the debt-to-income ratio is computed for all of those graduates who provided a value for debt and had indicated a starting salary for full-time employment prior to graduation. The distribution includes a large number of observations at both ends of what might otherwise be a normally distributed sample of graduates.

More research is needed to understand what factors contribute to the large number of observations at both ends of the distribution. Most important in the illustration is that the majority of graduates have debt-to-income ratios at the beginning of their career that far exceed the 1.4:1 DIR that establishes an upper bound for "acceptable" levels of financial stress.

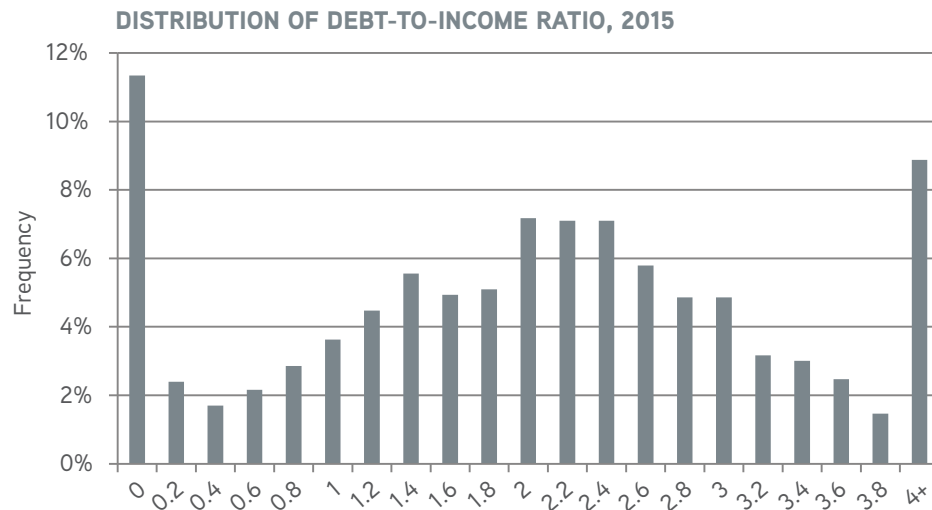


Figure 39

The following chart illustrates, in general, that debt levels are about double that of income levels. In addition, the distribution of incomes of new veterinarians finding full-time employment is

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

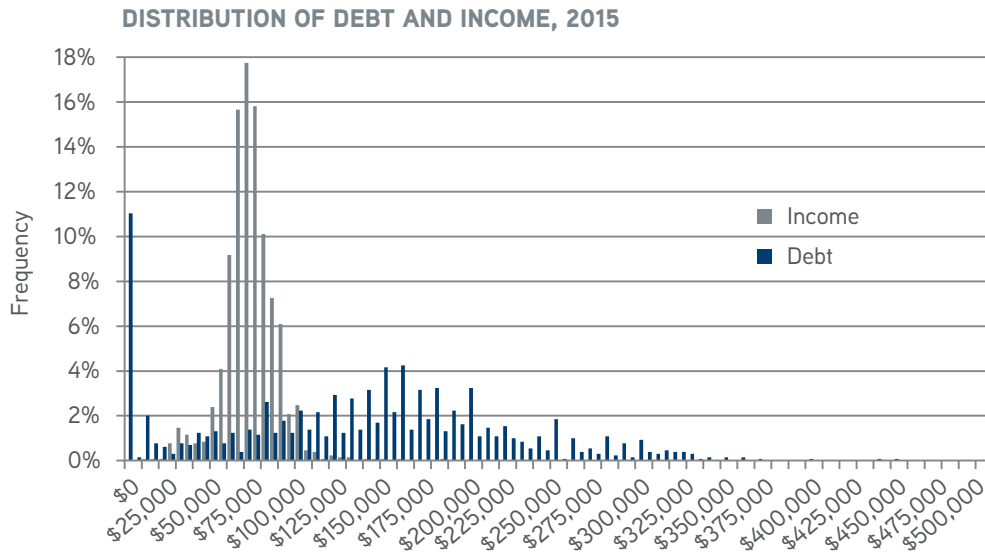


Figure 40

Since the income and debt data from the 2015 class only represents a proportion of the class, the following table is a sample of the population surveyed one year after graduation.

Evidently, the debt and income numbers of the population one year post graduation closely mirrors the first years from the Senior Survey indicating the validity of our Senior Survey results.

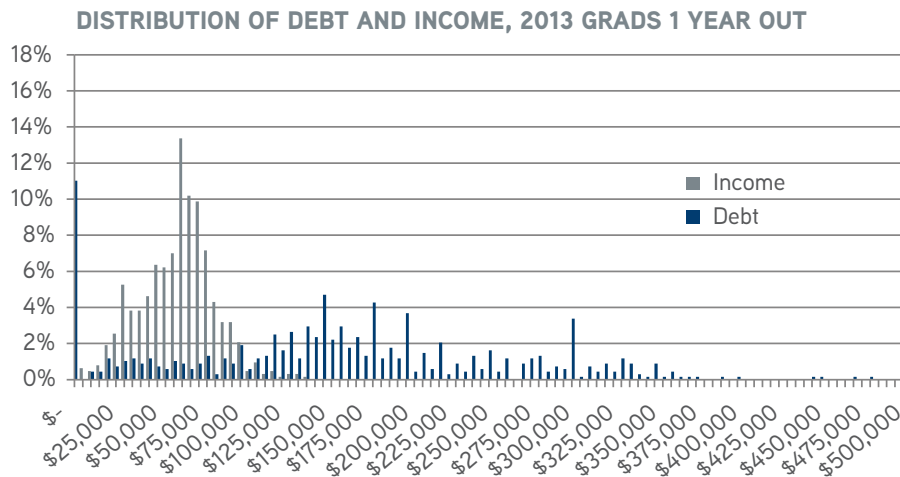


Figure 41



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

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

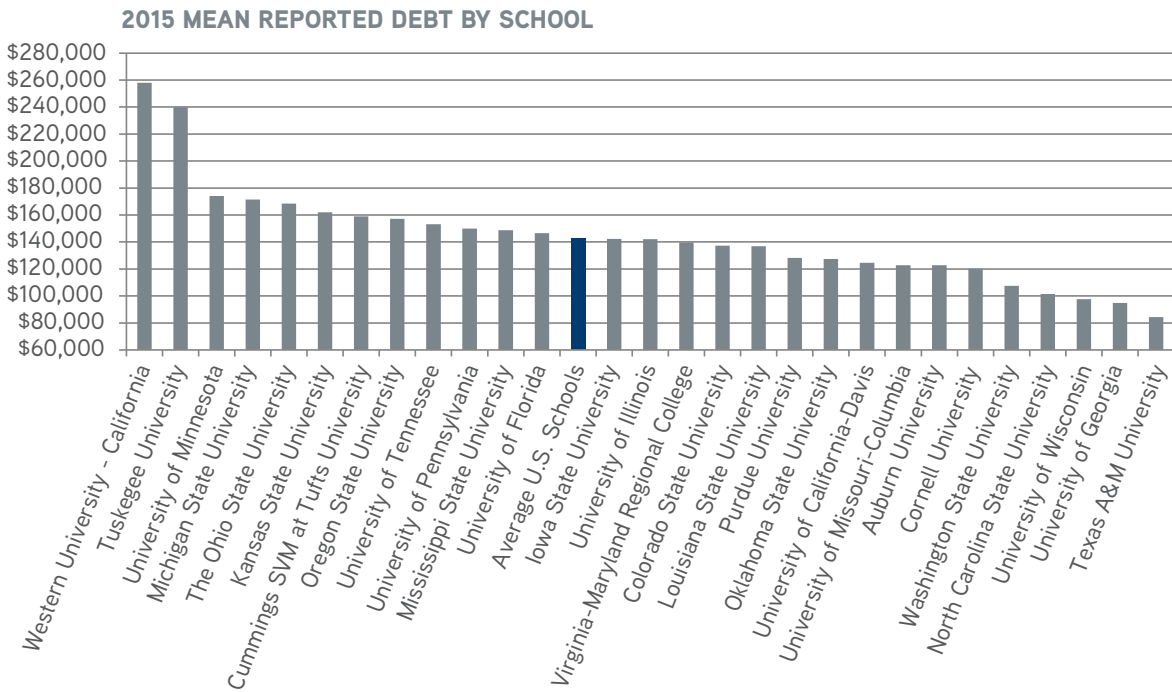


Figure 42

Using the reported residency status of graduates, four years of tuition is subtracted from the reported debt and a mean value of this difference is computed. For example, if the reported tuition for four years was \$80,000 and the DVM debt reported for

four years was \$170,000, then the DVM debt over tuition in this instance would be \$90,000 (\$170,000-\$80,000). Interestingly, several of the more expensive schools have a mean debt for graduates that is below the four-year tuition costs.

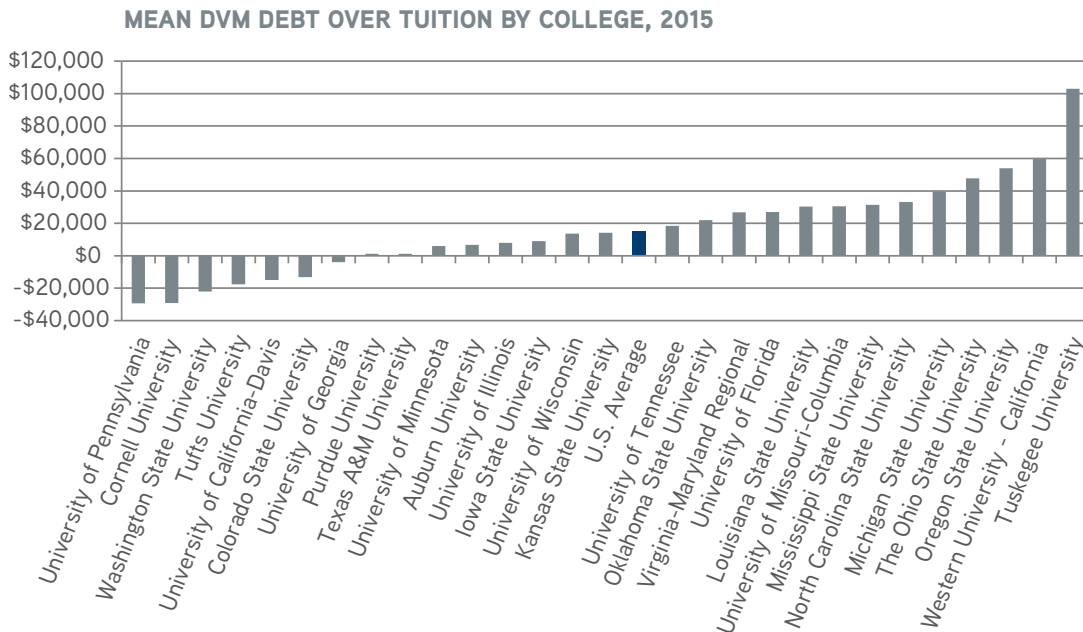


Figure 43

While mean debt over tuition (i.e., mean debt in dollar value greater than tuition) may be considered as an indication of how much veterinary students may have potentially spent on living expenses, we know that living costs vary by location within the United States. Data on the relative costs of living by state were obtained from the Missouri Economic Research and Information Center, https://www.missourieconomy.org/indicators/cost_of_living/. These values represent those relative costs of living in various locations for the third quarter of 2015.

An illustration of the four-year cost of living by school using the U.S. average of \$50,000 as a baseline is provided in the figure below. As an example, for this illustration we assume a student budgets \$12,500 per year for four years, as a baseline (national

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

COST OF LIVING CENSUS

THIRD QUARTER 2015 COST OF LIVING

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

Table 7

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

Table 7 cont'd.

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

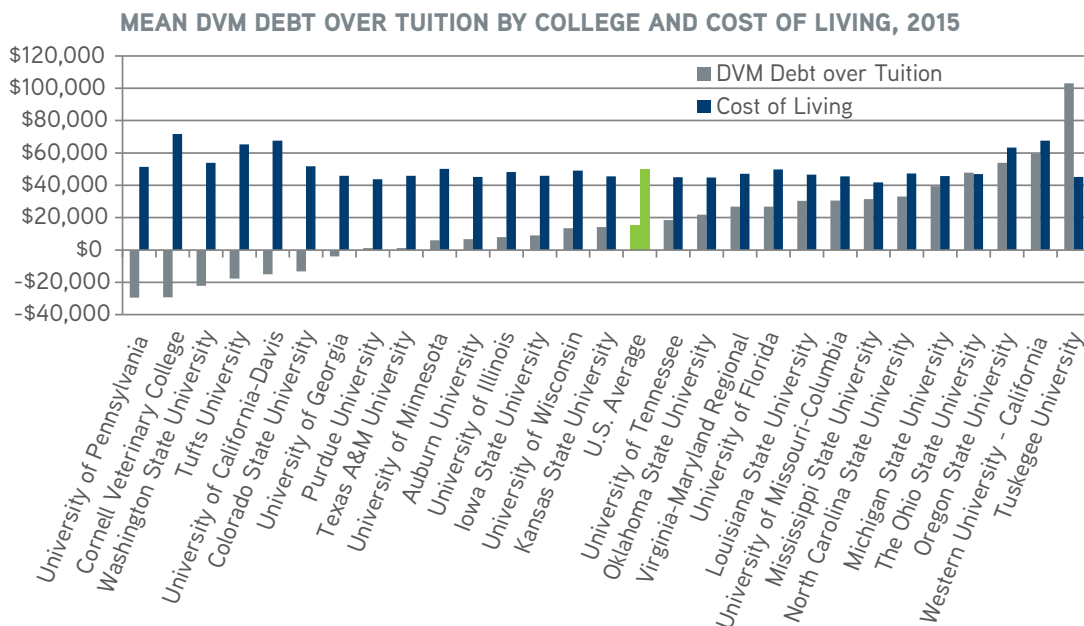


Figure 44

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

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

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

DISTRIBUTION OF GRADS BY COLLEGE, DEBT & INCOME

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

Table 8

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

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

REGIONAL EXCHANGES AND STATE-TO-STATE ARRANGEMENTS

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

provides a "support fee" to the enrolling institution to reduce the student's tuition (students enrolled in a public program typically pay the resident rate) and give them preferential admission as a non-resident.

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

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

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

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

In the late 1940s and 1950s, several regional compacts were formed in order to share publically funded higher education resources. The Southern Regional Education Board (SREB; www.sreb.org) was created in 1948 by Southern governors and legislators, and the Western Interstate Commission for Higher Education (WICHE; www.wiche.edu) was established in 1953 by Western governors. More than 65 years later, both compacts continue to operate regional contract exchanges that significantly reduce the cost of professional healthcare education for students who reside in a state without a public veterinary program (as well as other healthcare fields). Two additional regional compacts serve the Midwest and the Northeast: the Midwest Higher Education Compact (MHEC; www.mhec.org), and the New England Board of Higher Education (NEBHE; www.nebhe.org), but neither operate a similar program for DVM education.

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

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

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



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



IMPROVING THE DEBT-TO-INCOME RATIO



The increase in the number of seats, especially during the last economic recession, forced the supply of new veterinarians to increase faster than the increase in the demand for the services from these graduates.

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

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

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

services of these graduates. More importantly, there has been very little connection between the market for education and the market for graduates.

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

HISTORICAL PERSPECTIVE

A considerable body of research has indicated that the rise in tuition, as a percent of public higher education revenue, over the last two decades stems from declining public support for all public education. Other factors contributing to increased costs per student include the cost of administration, increasing pension and health care costs, and the increasing state and federal regulations that require reporting for compliance.

The growth in tuition occurred during and just after the recessions of 2001 and 2008, as state and federal legislators cut taxes to stimulate the economy and reduced public support of colleges both in response to declining budgets and shifting

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

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

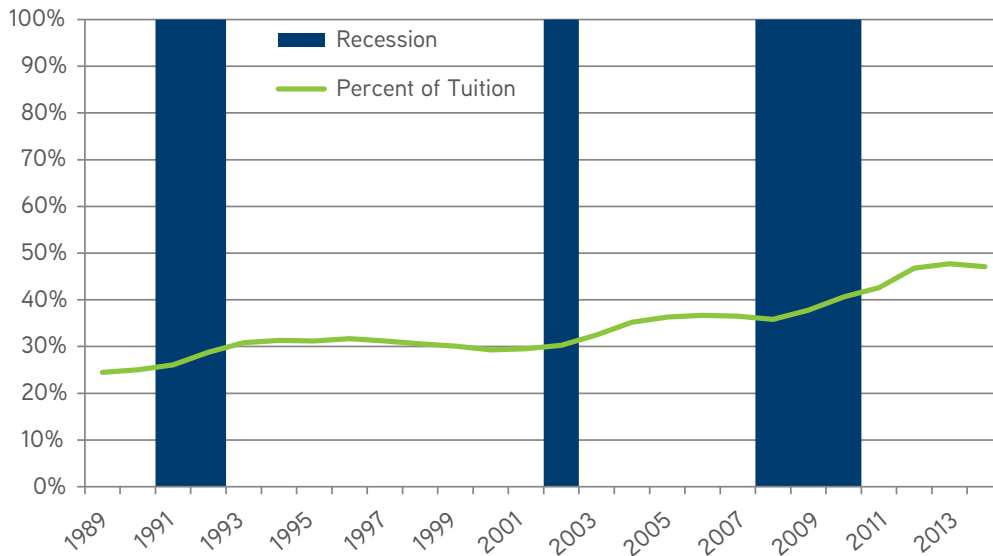


Figure 45

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

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

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

DISTRIBUTION OF FACULTY AT UNIVERSITIES

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

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

Table 9

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

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

DISTRIBUTION OF FACULTY AT PUBLIC INSTITUTIONS

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

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

Table 10

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

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

DISTRIBUTION OF FACULTY AND TOTAL STUDENTS

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

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

Table 11

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

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

REVENUES AND STATE SUPPORT

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

Table 12



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

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

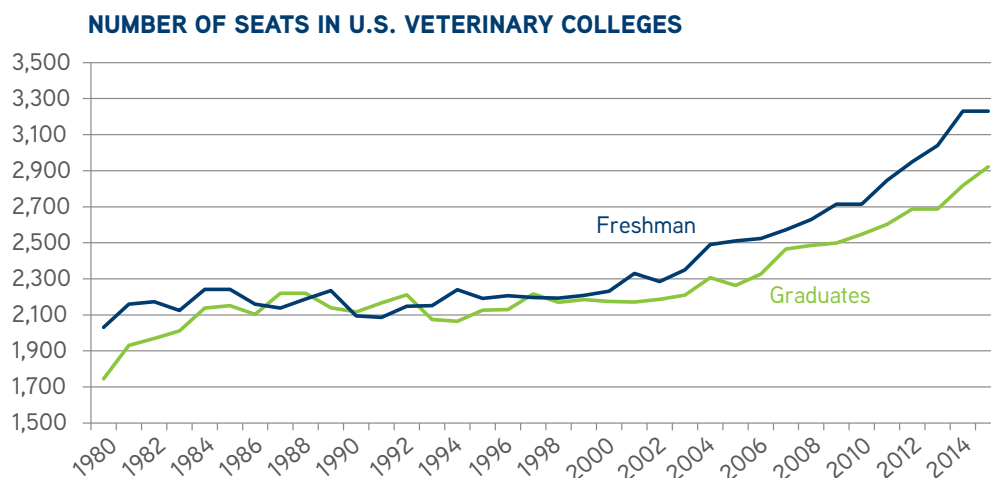


Figure 46

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

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

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

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

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

SETTING A NEW TARGET

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

The values for debt and income are reported by students prior to graduation, and, for 2015, out of 3,018 graduates, 2,661 reported a value (including zero) for debt, but only 1,292 reported both a debt and income from full-time employment. Using these data we compute the debt to income ratio (DIR) for each school. Assuming there is no difference in income of the graduates of each school, the higher the DIR the greater the cost of tuition and fees.

DEBT-TO-INCOME RATIO

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

Table 13

By comparison, we can use the tuition and fees and the living costs estimated by each school to calculate a mean total cost (tuition plus living expenses) to income ratio for each school.

These two tables can then be used to compare the debt-to-income and cost-to-income for each school.

TOTAL COST-TO-INCOME RATIO

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

Table 14

There is no method, using only the survey responses, to determine the accuracy of the reported debt values, whether the values include interest charges, when debts were incurred, or the value of interest charges that would have accumulated (what year or semester the costs were incurred). The interest charges can be estimated, assuming that the total costs were distributed over the total number of semesters and a 7.0 percent interest

rate was charged. The total interest payments that would have accumulated with full payment of tuition and living expenses are computed for the veterinary college education provided at each college for discounted and non-discounted seats. The following table provides the ratio of total cost to income assuming the interest charges are included as part of the costs.

TOTAL COST PLUS INTEREST-TO-INCOME RATIO

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

Table 15

The tables above can be combined to provide an indication of how well students have been able to keep debt below costs. That is, have they had some method of ensuring that they keep a lid on expenses such that the amount of debt that they accumulate while in veterinary college is less than the total cost of attending?

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

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TOTAL COST PLUS INTEREST/INCOME

	Mean	N	Std. Deviation
Western University - California	5.3535	32	2.55128
University of Pennsylvania	5.2532	20	2.23173
Tuskegee University	4.5955	16	1.52941
Colorado State University	4.3807	42	1.74448
Tufts University	4.2198	36	1.78967
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University of California-Davis	3.0931	27	.82864
Oregon State University	3.0707	26	.88911
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Oklahoma State University	2.7664	48	.86606
University of Missouri-Columbia	2.6496	64	.41448
Texas A&M University	2.6329	67	.67630
North Carolina State University	2.4384	31	.66294

Table 16

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

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

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

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

Table 17

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

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

DEBT BELOW AND ABOVE TOTAL COST PLUS INTEREST

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

Table 18

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

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

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

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

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

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

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

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

3. REDUCE EDUCATION OUTLAYS OF STUDENTS BY 10 PERCENT.

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

4. INCREASE STARTING SALARIES BY 10 PERCENT.

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

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

STRATEGIES TO REACH THE GOAL

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

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

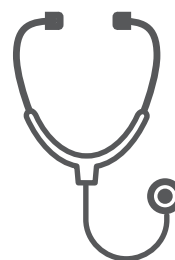
This should not be considered either as a complete list or a list of definitive solutions. These are suggested strategies that should be evaluated based on their ability to achieve a desired level of DIR reduction against the overarching mission of providing a well-defined future role of veterinarians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

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

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

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

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



THE GENERAL PUBLIC STRATEGIES

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

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

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

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

VETERINARY COLLEGE APPLICANT AND STUDENT STRATEGIES

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

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

2. Increase the awareness of the cost of veterinary education

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

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

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

VETERINARY COLLEGE STRATEGIES

1. Institutionalize a connection between the education and veterinary markets

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

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

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

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

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

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

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

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

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

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

6. Economies of size and/or specialization of schools

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

7. Veterinary graduate readiness/confidence improvement

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

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

PUBLIC AND PRIVATE PRACTICE STRATEGIES

1. Increased financial literacy of veterinary practice owners

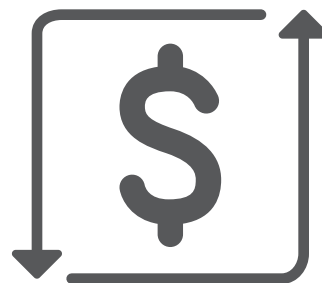
While the veterinary colleges may be tasked with ensuring economic viability of their graduates, practice owners must be tasked with ensuring they have the ability to reward the success of the colleges' programs. If graduates are not rewarded for their contribution to the value of a practice, veterinary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

2. Enhance the demand for Veterinarians

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

3. Increase the value of graduates

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



DISCUSSION

OUR EFFORTS HERE ARE TO GO BEYOND A YEAR TO YEAR COMPARISON OF MEAN INCOME TOWARD THE USE OF AN INDEX THAT MEASURES THE IMPACT OF THE ECONOMY ON A CONSTANT COHORT OF VETERINARIANS.

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

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

As applicants matriculate veterinary college, they eventually graduate and become new veterinarians. The main source of data for new veterinarians is AVMA's Senior Survey, which is distributed to graduating seniors just a few weeks before graduation. This survey solicits information on veterinary students' career plans, starting salary, debt and other specific demographics. However, the survey data has limitations. There is no information on expenditure patterns of the students, the actual costs of their education and any interest payments on the loans they have acquired. While each veterinary college provides the exact cost of tuition and fees for residents and non-residents and an estimate of living expenses, we have no information on the role of scholarships or other forms of external support to provide for an exact estimate of costs per student or the amount paid per student. In developing strategies to reduce the DIR, this information will be important.

The Senior Survey has been distributed by the AVMA for decades, and although we have made attempts to expand the respondent pool to AVMA accredited institutions outside the U.S., our data are primarily comprised of responses from the 28 U.S.-located veterinary colleges. This is a caveat in this research piece, since a proportion of U.S. students attend AVMA accredited foreign colleges and return to the U.S. to find jobs and repay student loans. Intuitively, these students tend to have significantly larger debt loads and consequently higher

debt-to-income ratios. We will continue to work with AAVMC to collect data on the graduates from the AVMA accredited foreign veterinary colleges.

This report, which combines the 2015 Report on Debt and Income and the Market for Veterinary Education, is in large part a replacement for AVMA's Facts and Figures feature report previously published in JAVMA. Our efforts here are to go beyond a year to year comparison of mean income toward the use of an index that measures the impact of the economy on a constant cohort of veterinarians. We also will provide annually an update on the model of new graduates' starting salaries, debt, and debt-to-income level. These models will help us and veterinary applicants and students predict their starting salary and debt at graduation and assist them in developing personal strategies for managing their post-graduate finances to maximize their standard of living.

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

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



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Main focus areas:

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

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Space is limited.

THE AVMA 2016 ECONOMIC REPORTS INCLUDE:

The AVMA Report on Veterinary Markets:

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

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

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

The AVMA Report on the Market for Veterinarians:

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

The AVMA Report on the Market for Veterinary Services:

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