2016 AVMA Report on

VETERINARY MARKETS

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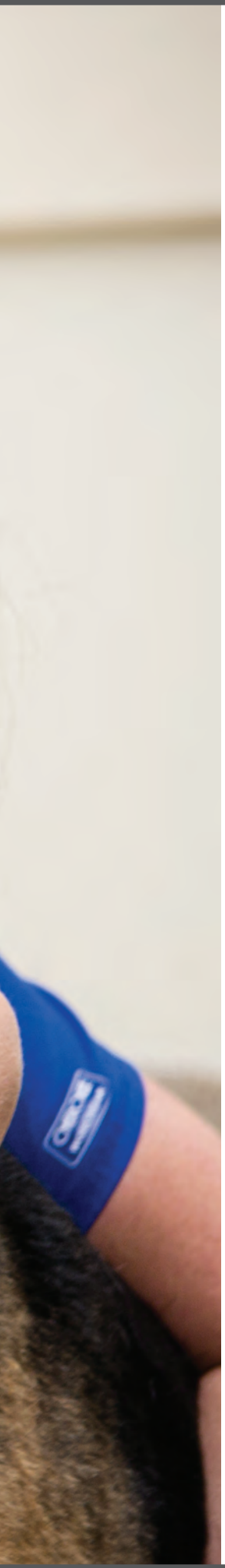

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VETERINARY MARKETS

Veterinary Economics Division
American Veterinary Medical Association
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Acknowledgments

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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

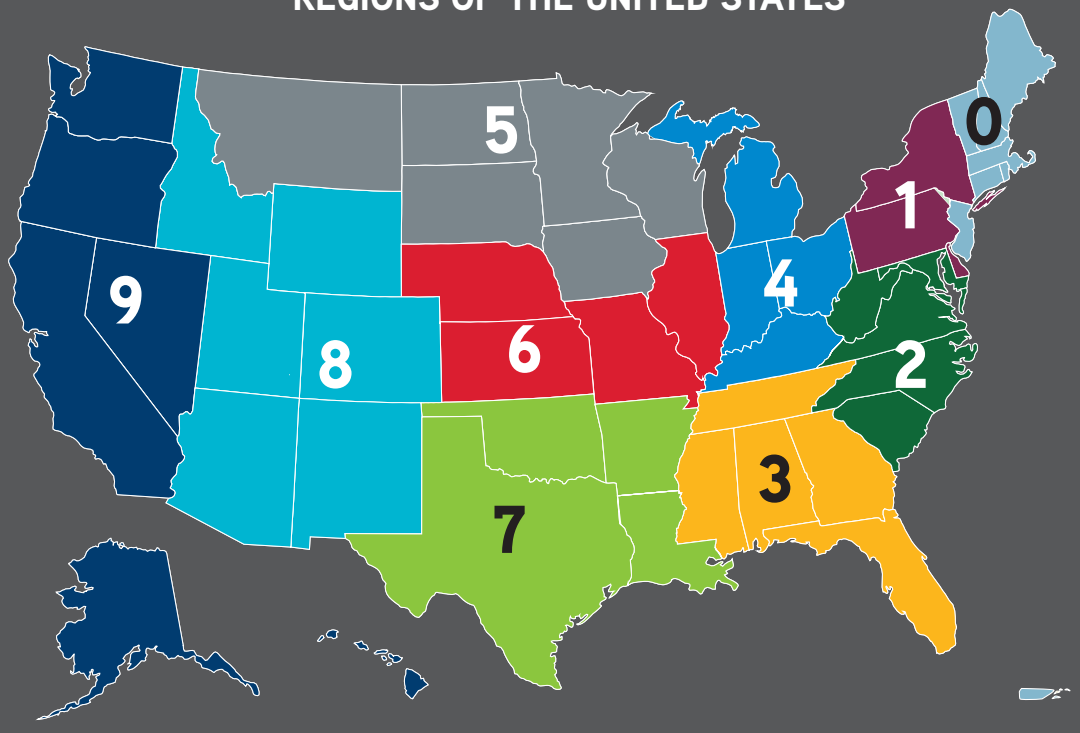


Figure 1

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 29,901[1] as well as a lower-end estimate of 25,000[2], 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.

[1]29,901 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.

[2]Adjusting 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 polices 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.

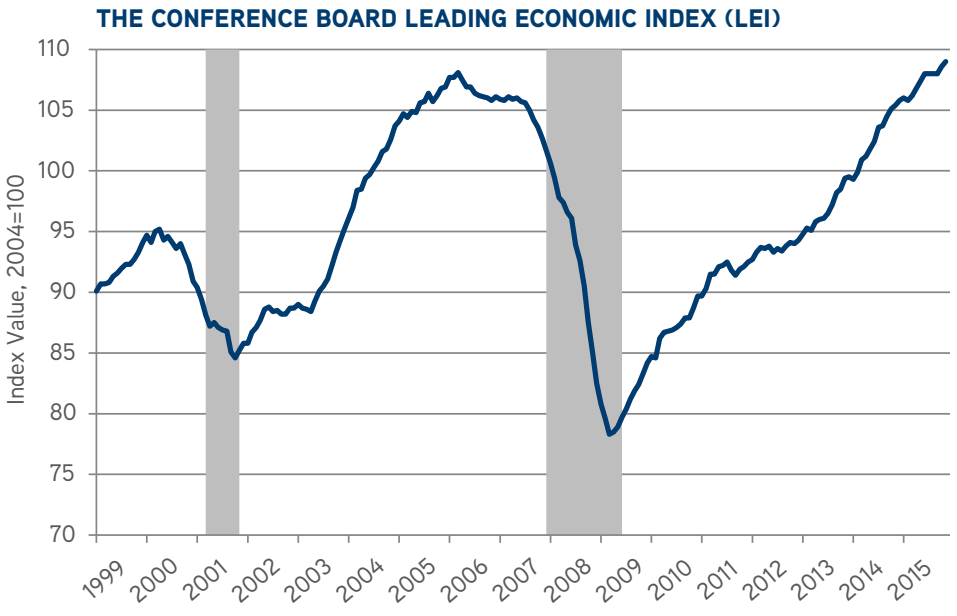
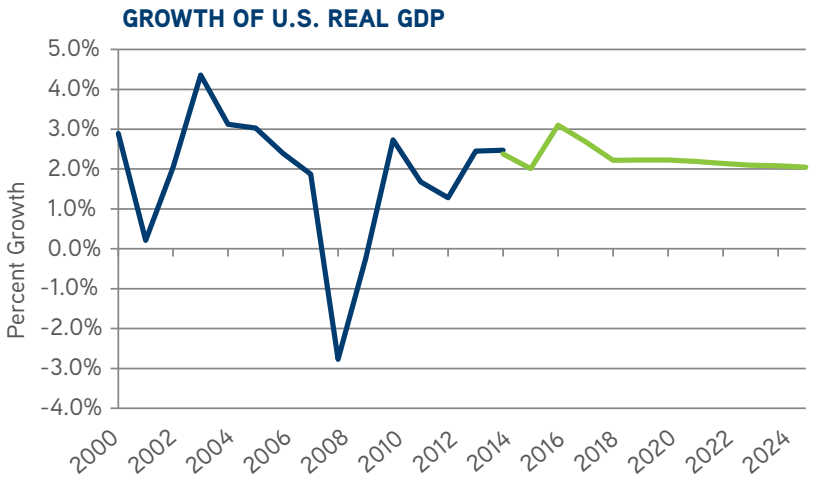


Figure 2

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.

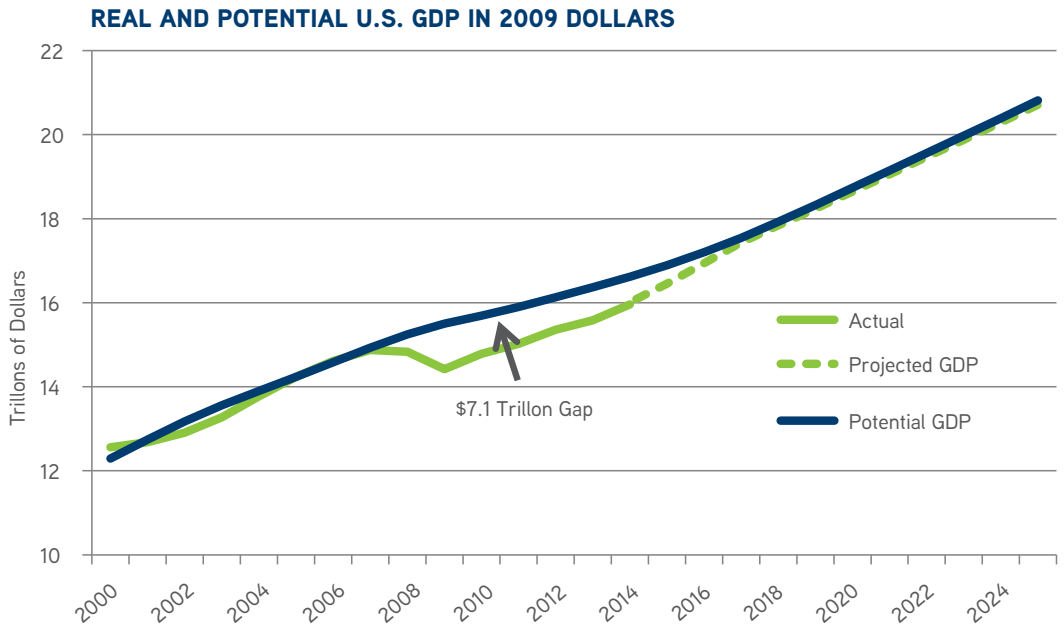
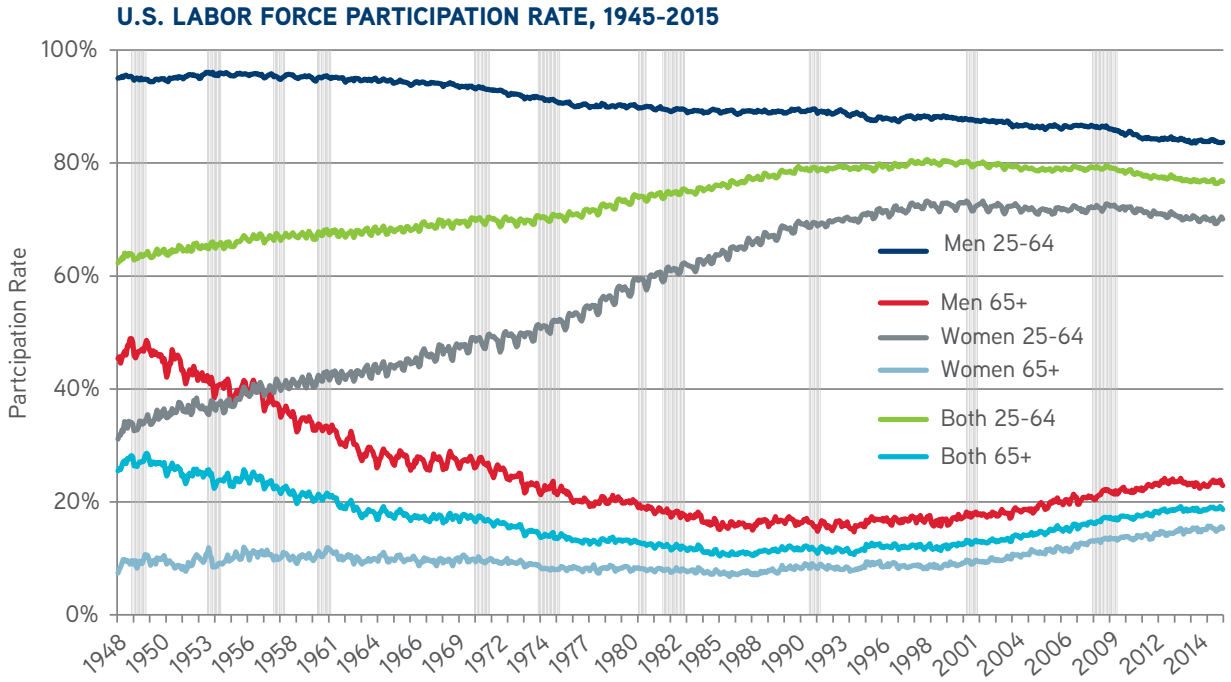


Figure 4

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.

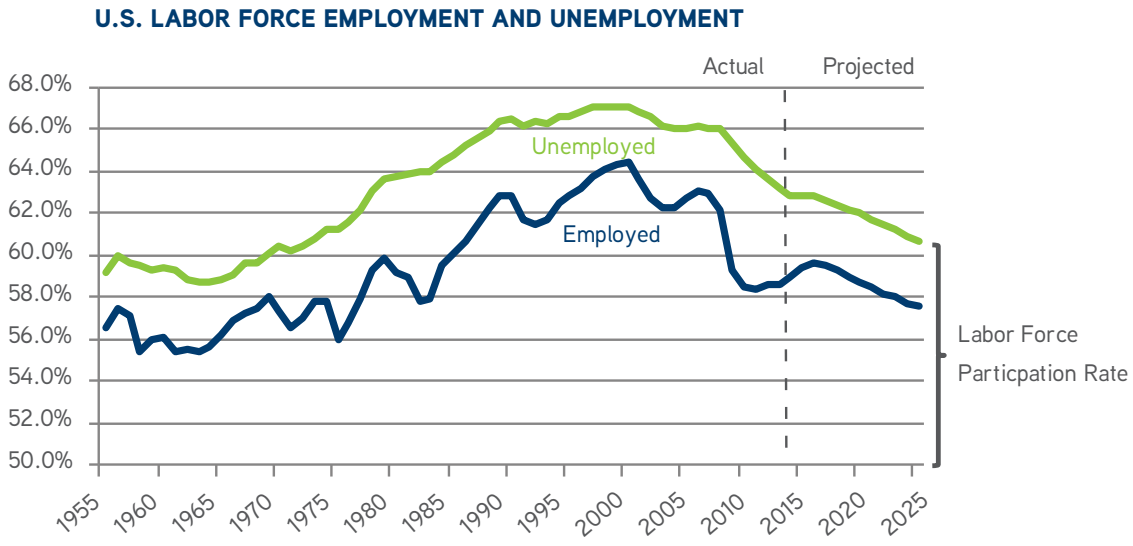
An additional dramatic change has been the labor force participation rate of women 25-64 years of age. While the labor force participation rate for men has declined steadily over the last six decades from 95.3 percent to 83.8 percent, women in this age range have increased their participation in the 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.



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.



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.

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.

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 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

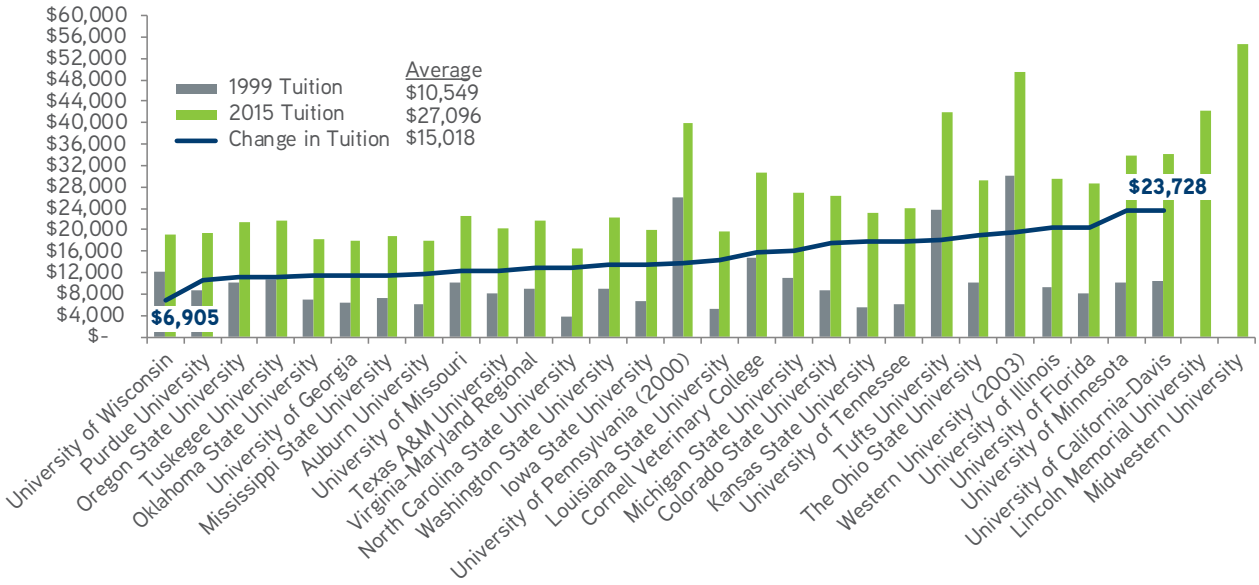
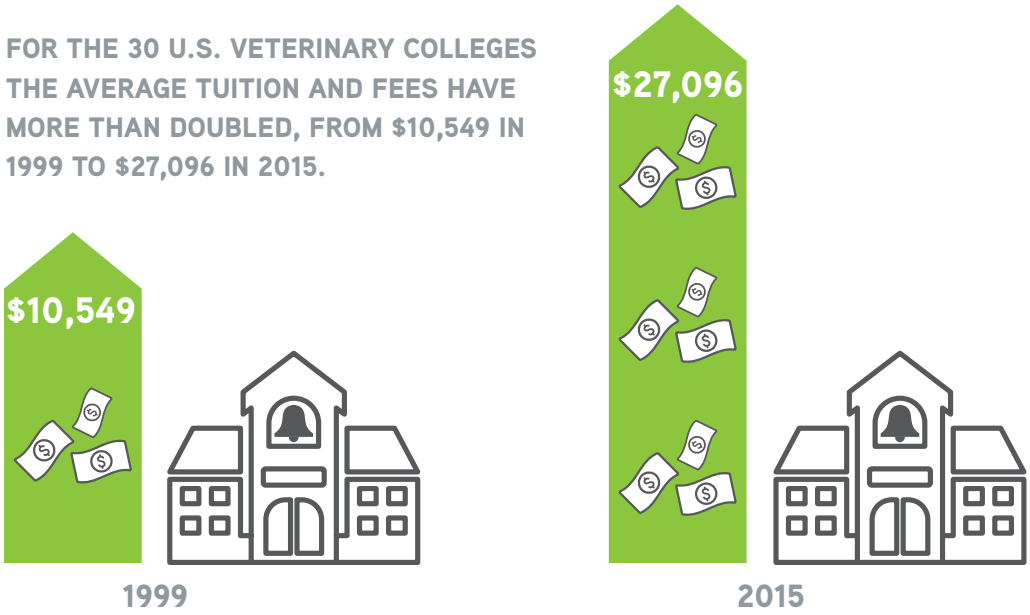


Figure 7

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

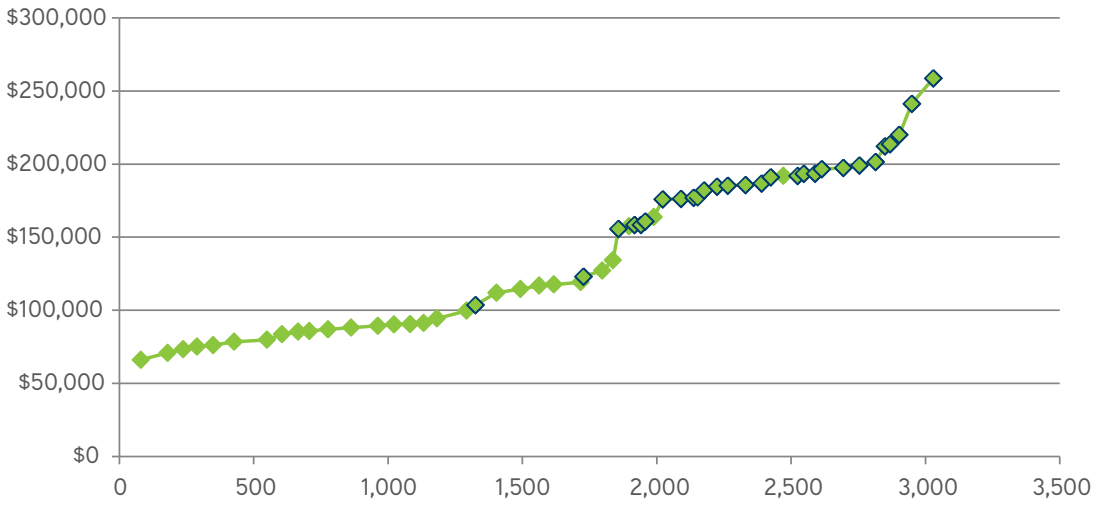


Figure 8

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.

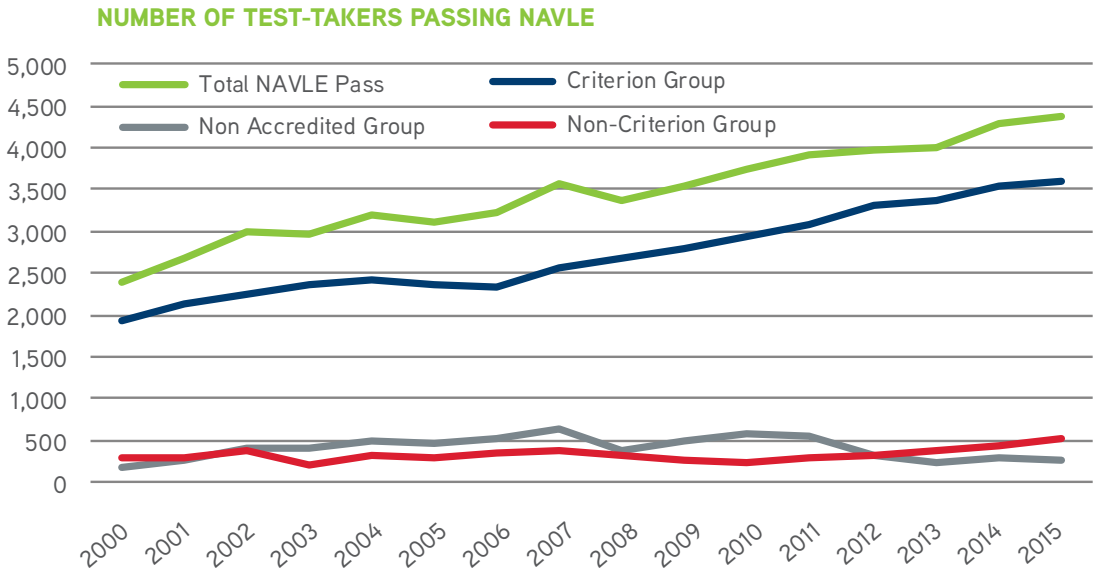


Figure 9

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.

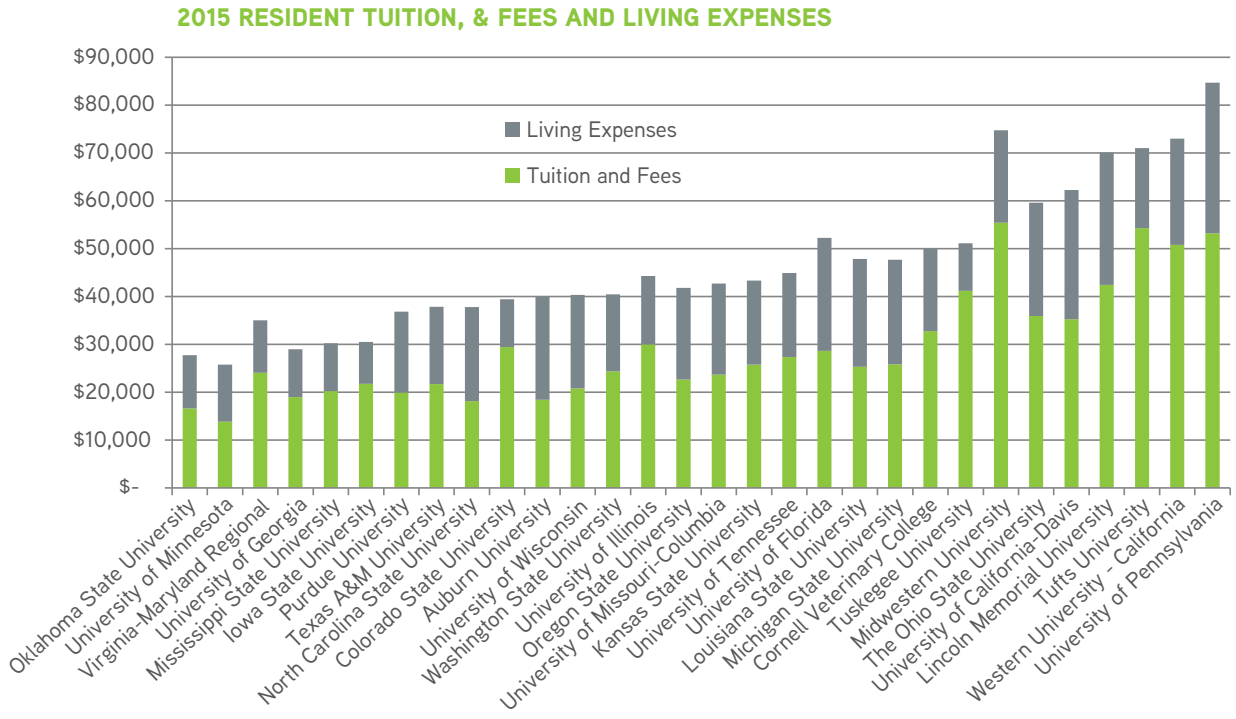


Figure 10

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

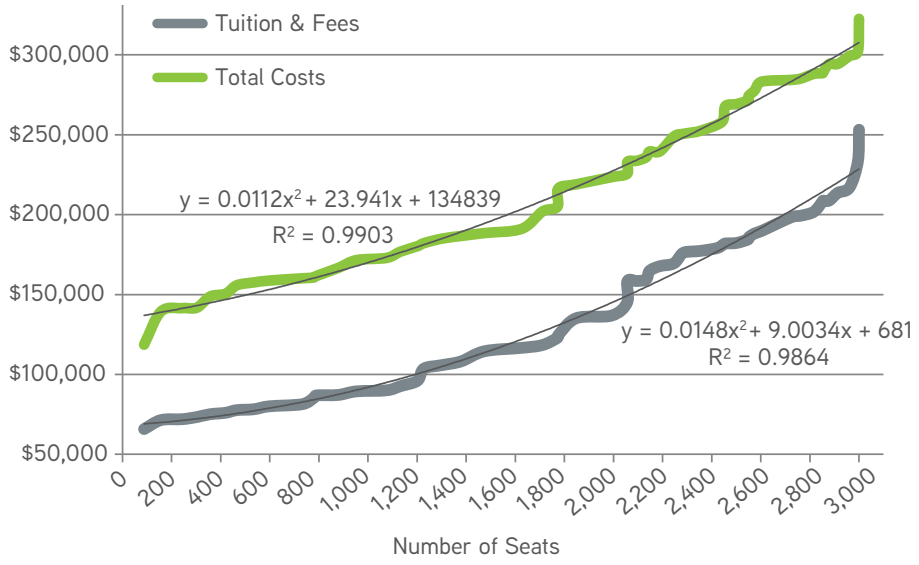
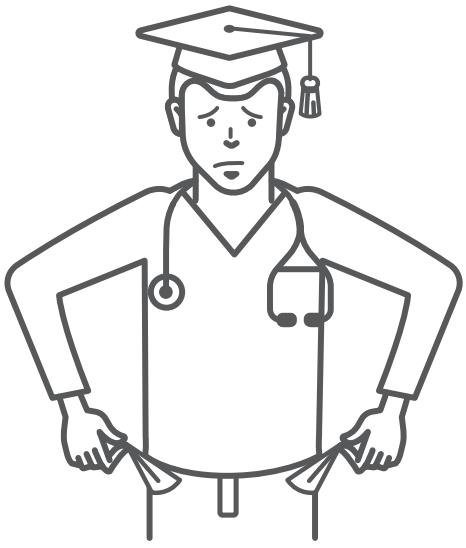


Figure 11

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

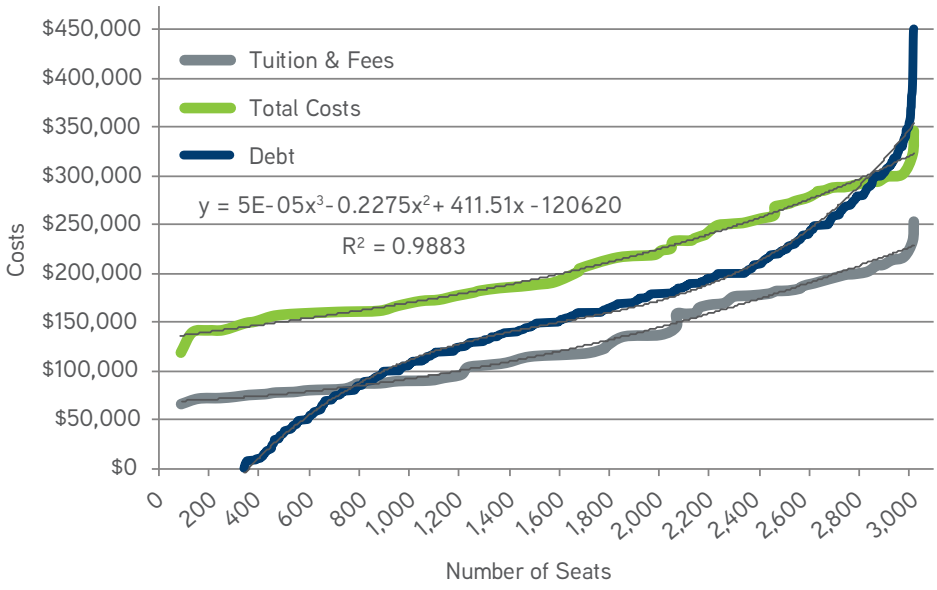


Figure 12

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

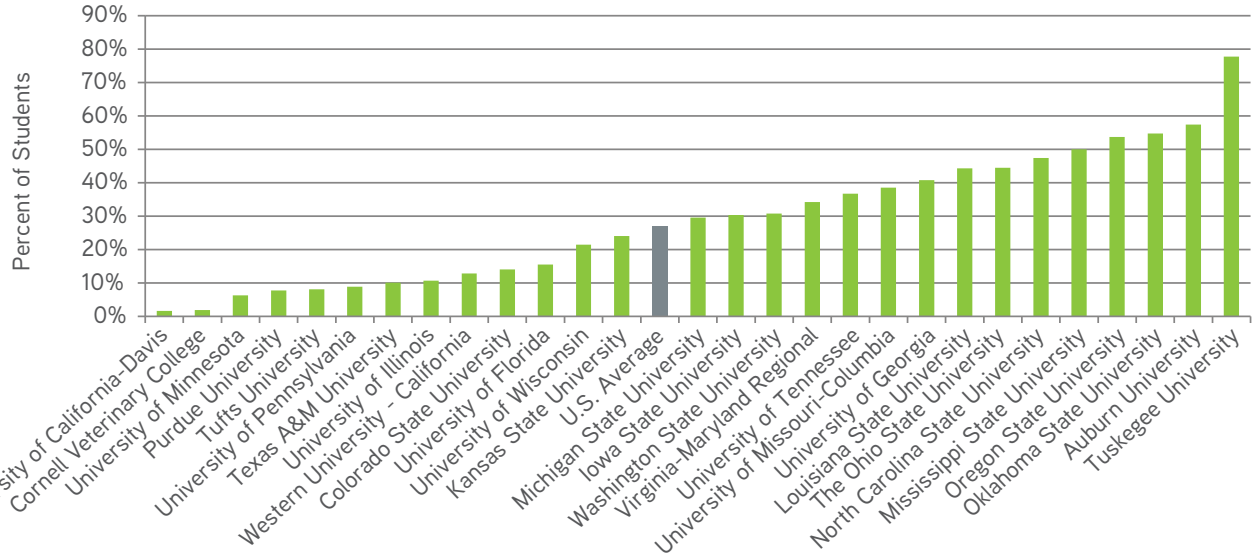


Figure 13

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

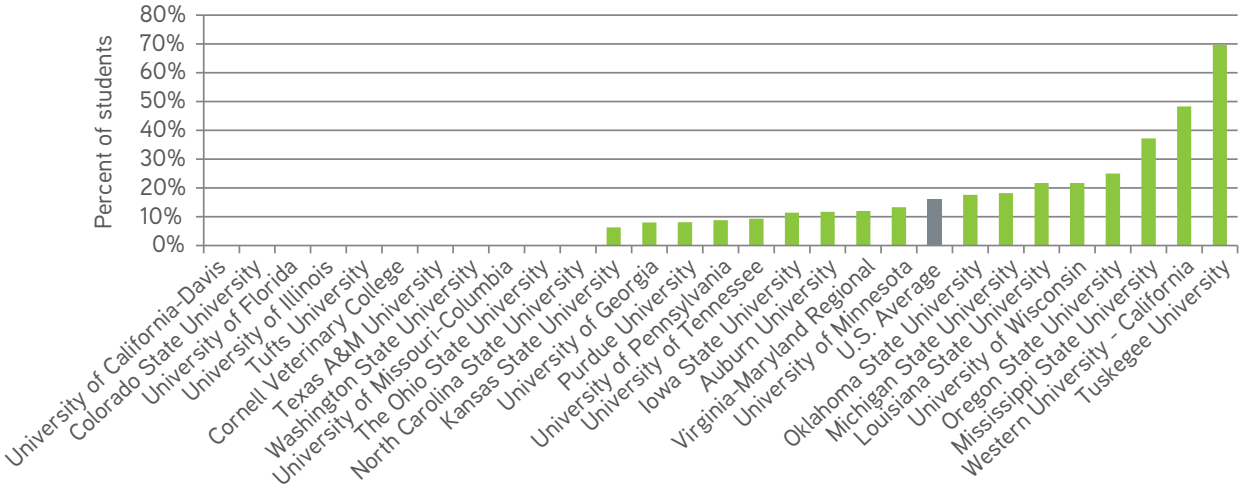


Figure 14

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 though the Veterinary Medical College Application System (VMCAS). An annual survey of the VMCAS applicants was initiated in 2014 with one set of questions to determine what applicants would be willing to pay to attend veterinary college. The relationship between the number of applicants and their willingness to pay defines the demand for veterinary medical college. Understanding and measuring this relationship and how the income of veterinarians and the cost of becoming a veterinarian affect the relationship are important in estimating the future demand for veterinary education.

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.

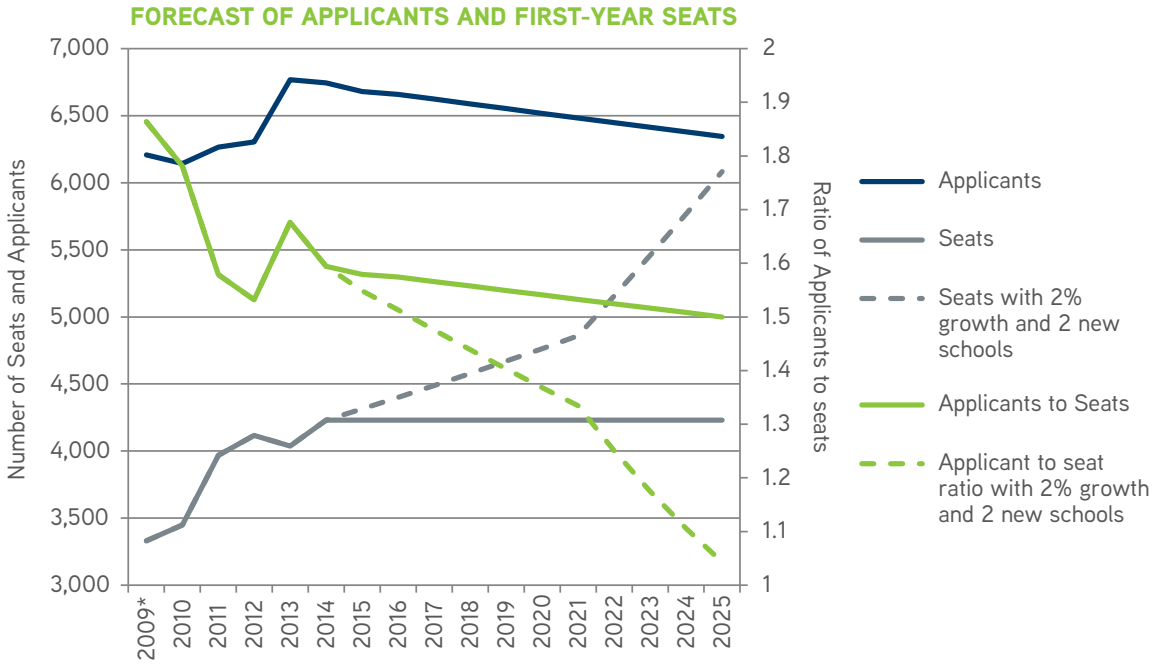


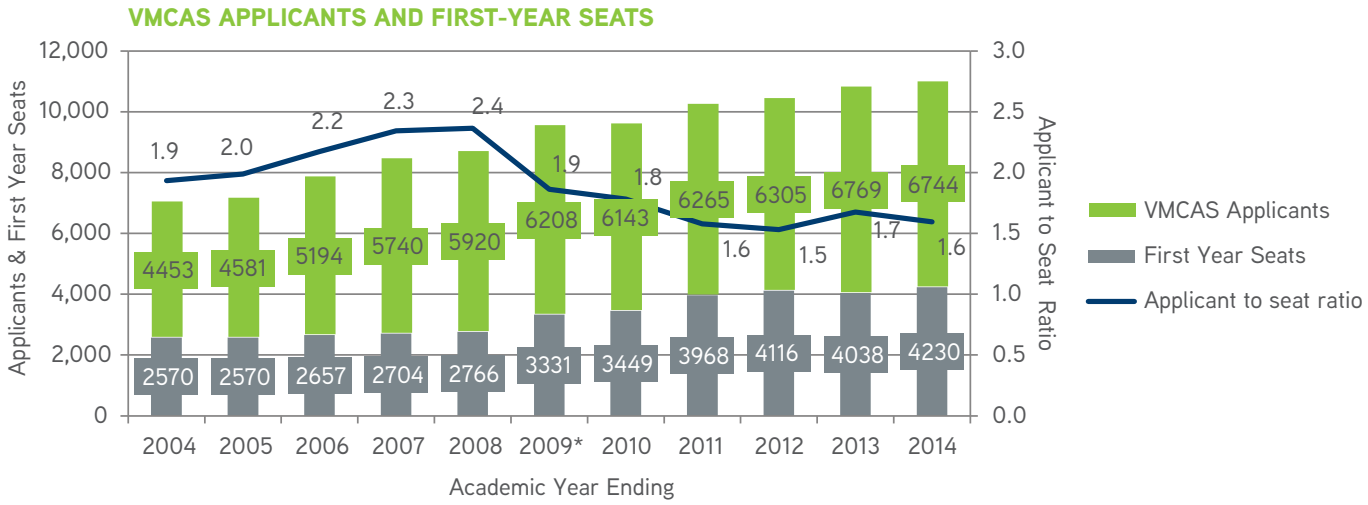
Figure 16

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).



**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?

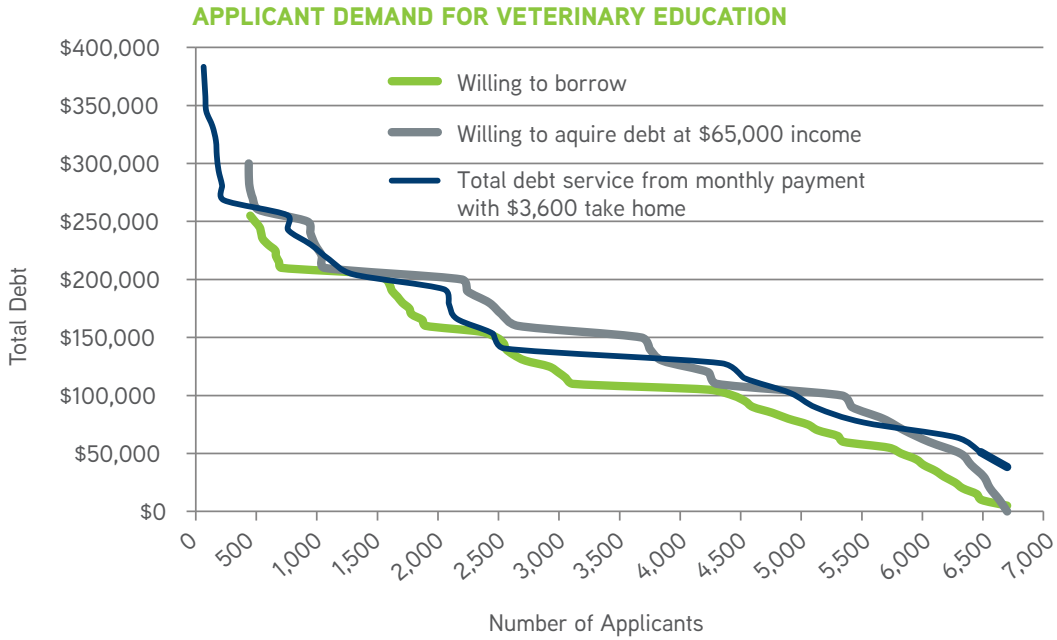


Figure 18

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.

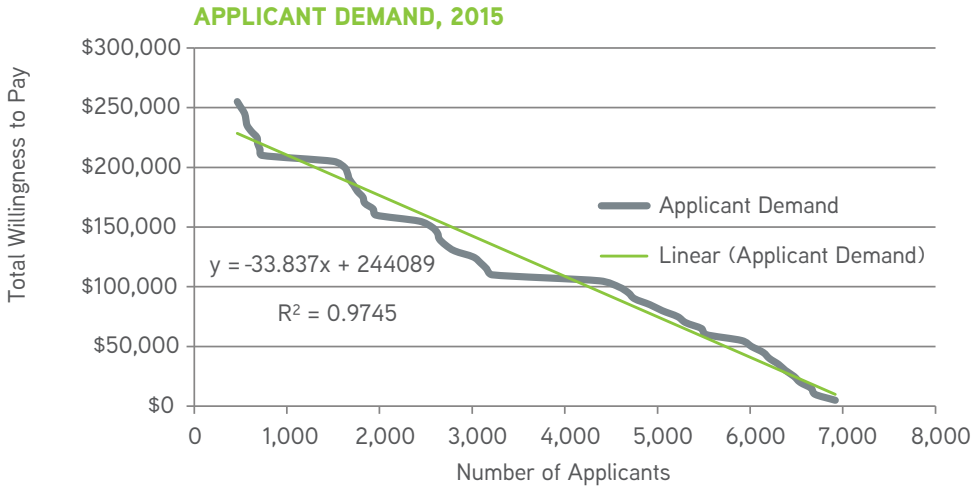


Figure 19

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.

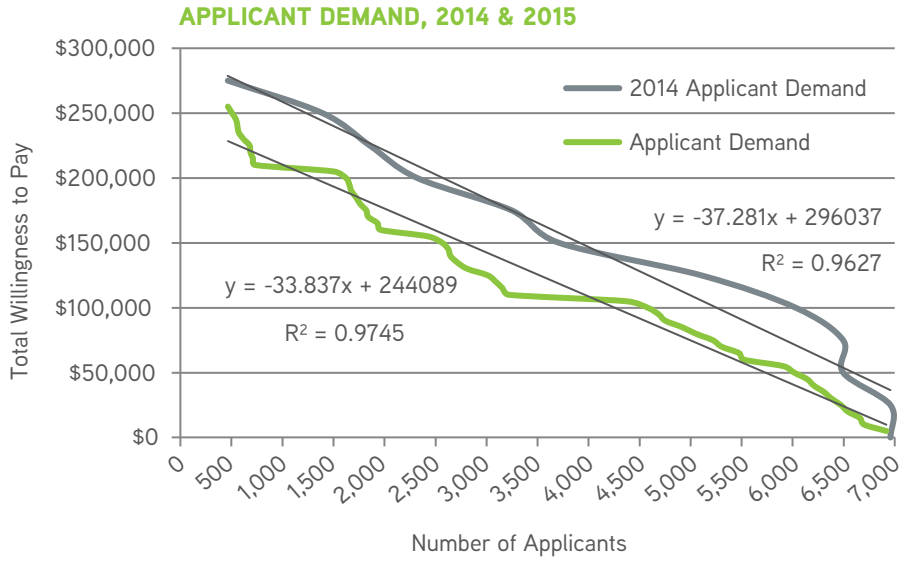


Figure 20

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.

SUPPLY & DEMAND FOR VETERINARY EDUCATION, 2014 & 2015

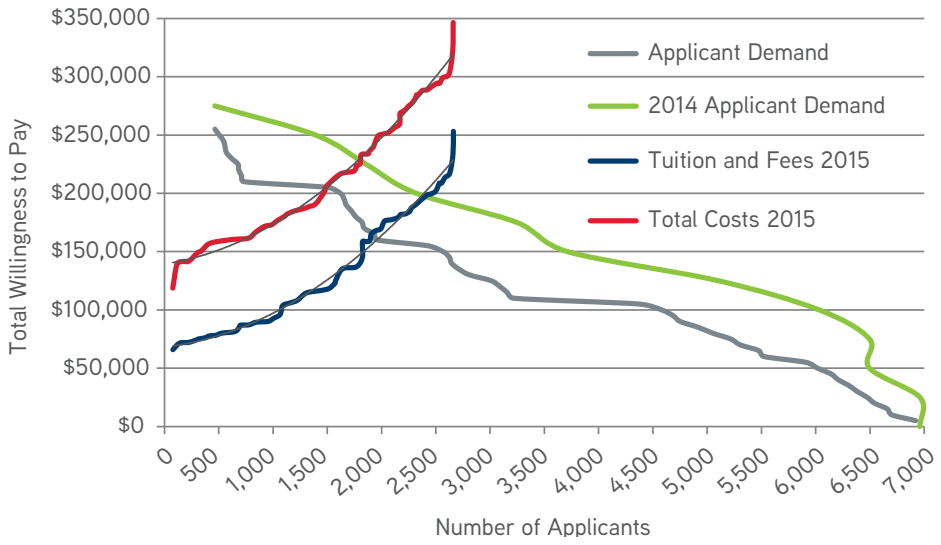


Figure 21

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

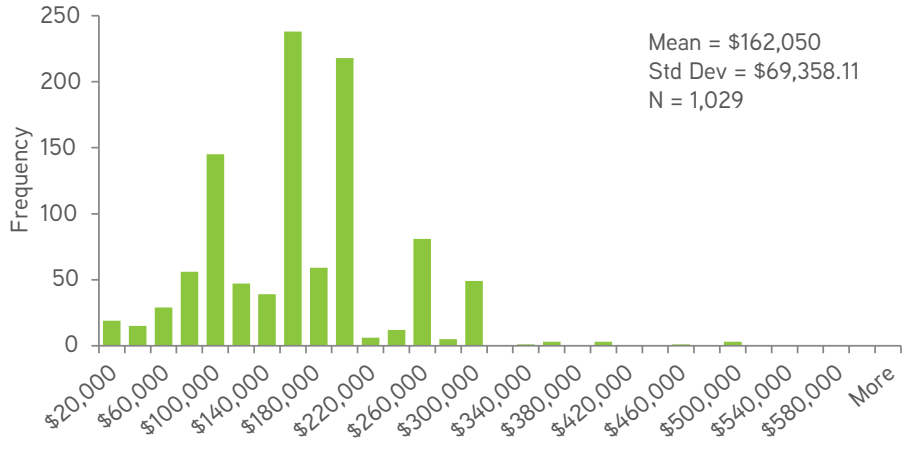


Figure 22

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.

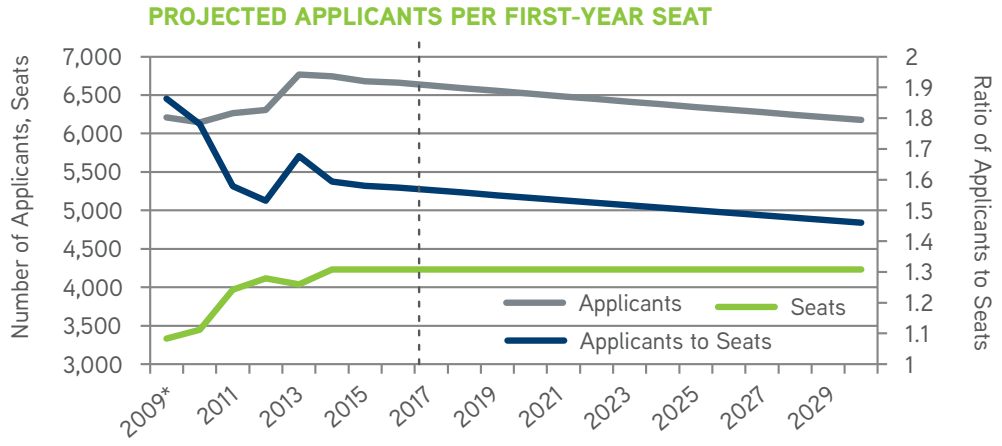


Figure 23

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

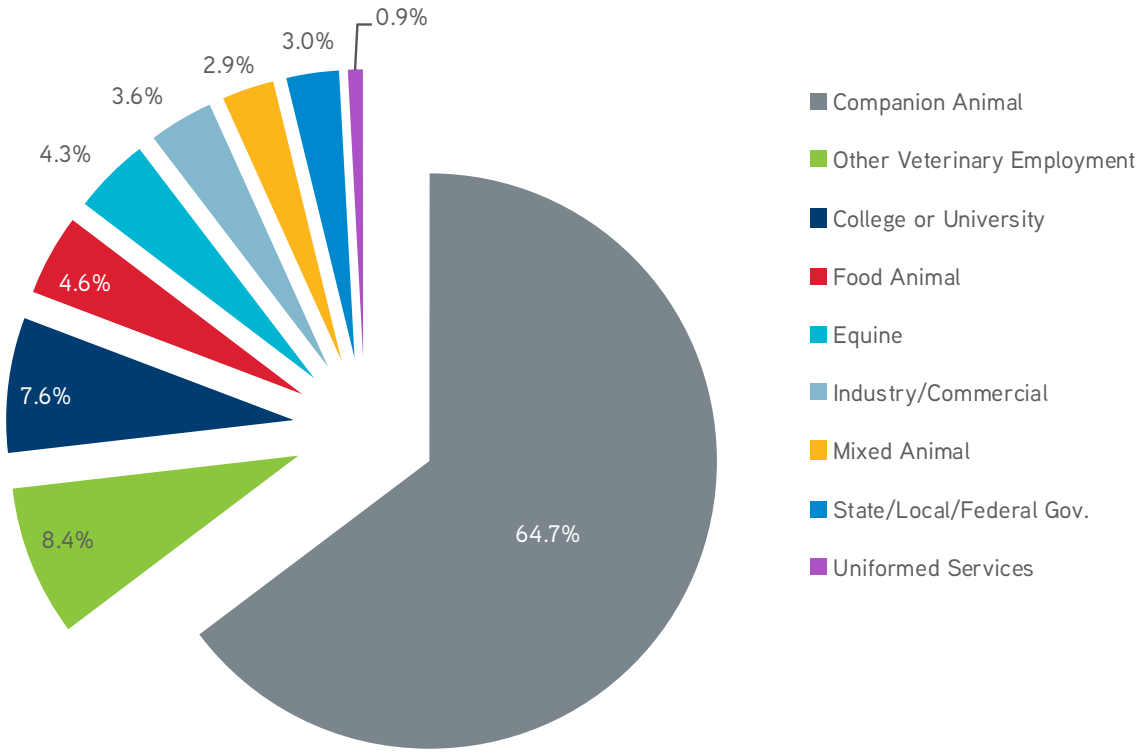


Figure 24

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.

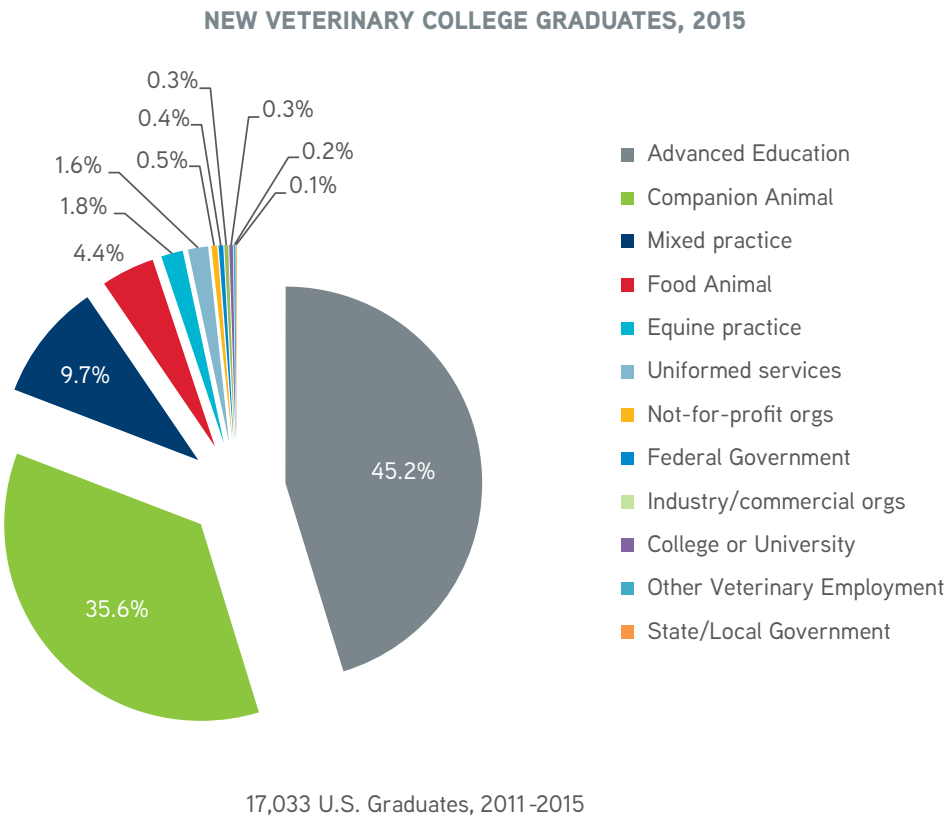


Figure 25

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.

SUPPLY OF NEW VETERINARIANS, 2014

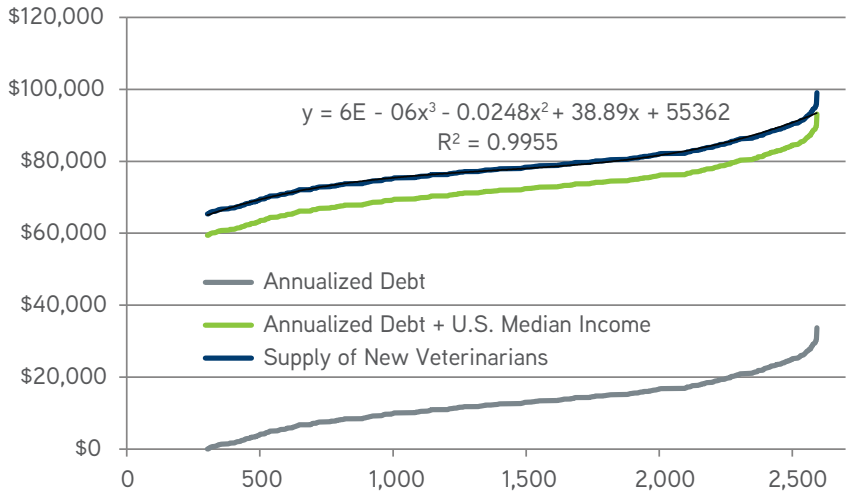


Figure 26

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.

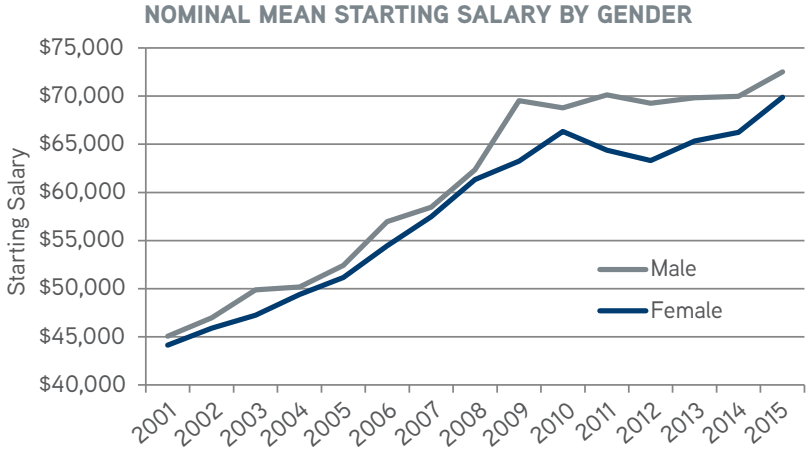


Figure 27

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.

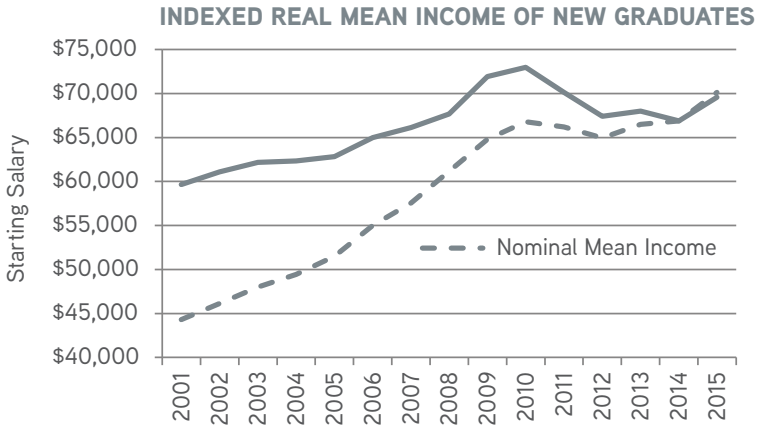


Figure 28

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.

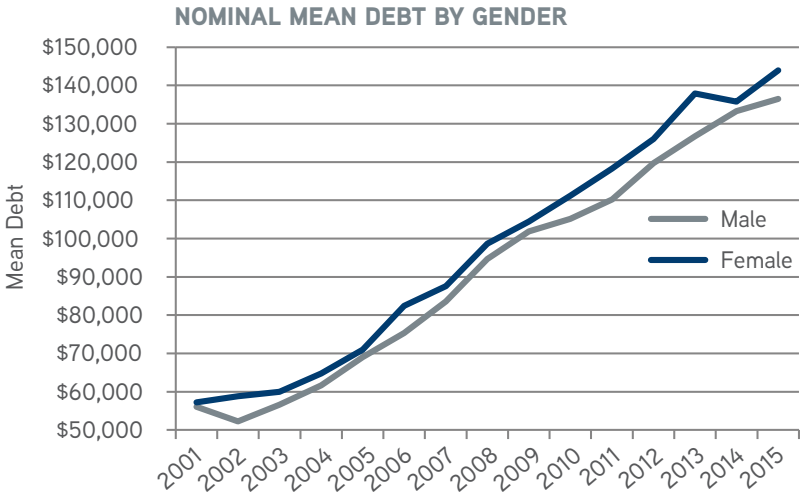


Figure 29

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.

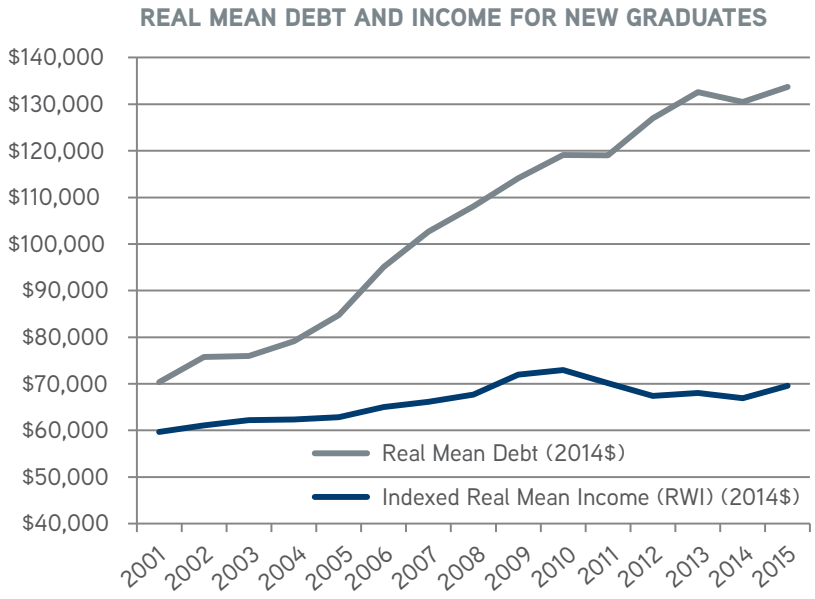


Figure 30

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.

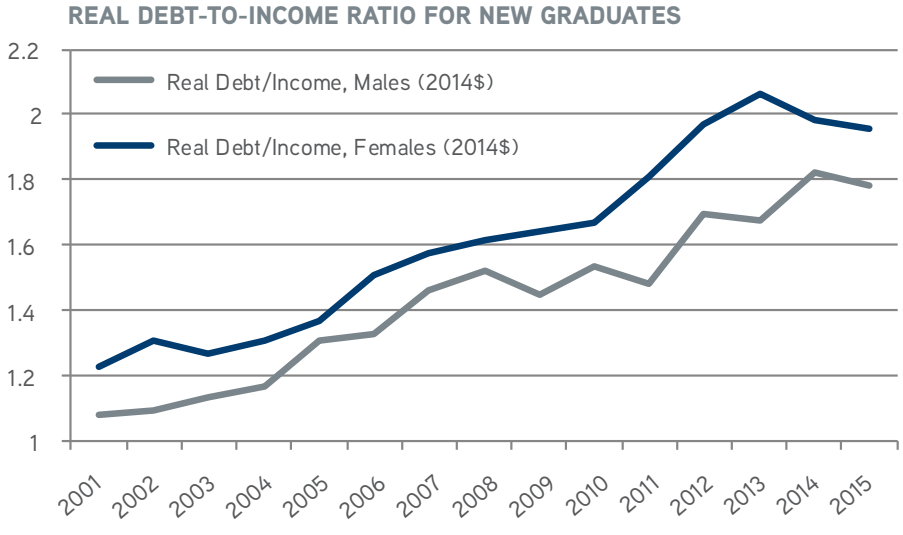


Figure 31

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.

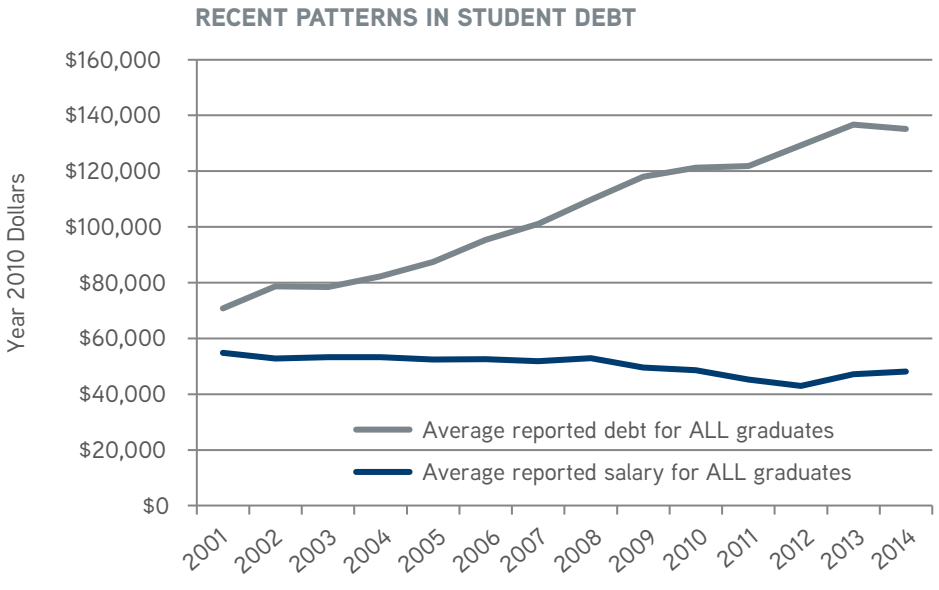


Figure 32

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.

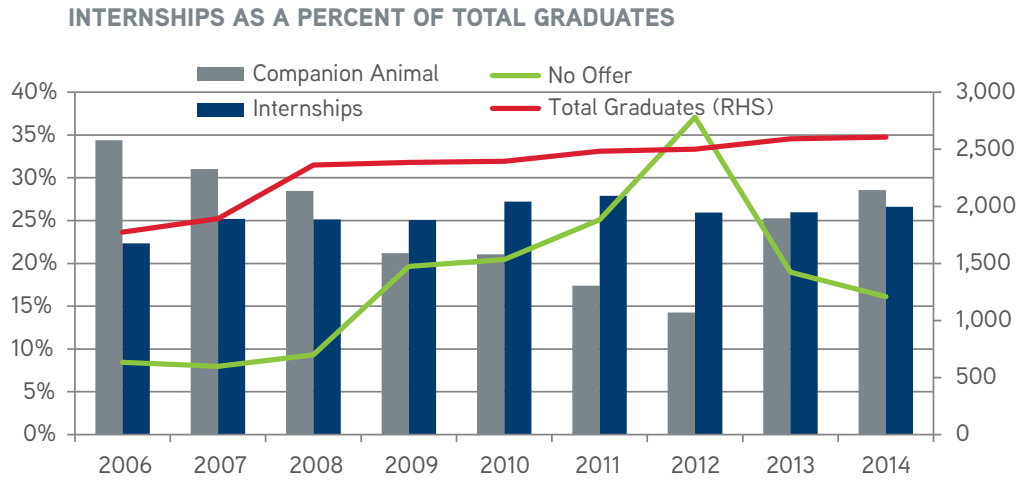


Figure 33

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.

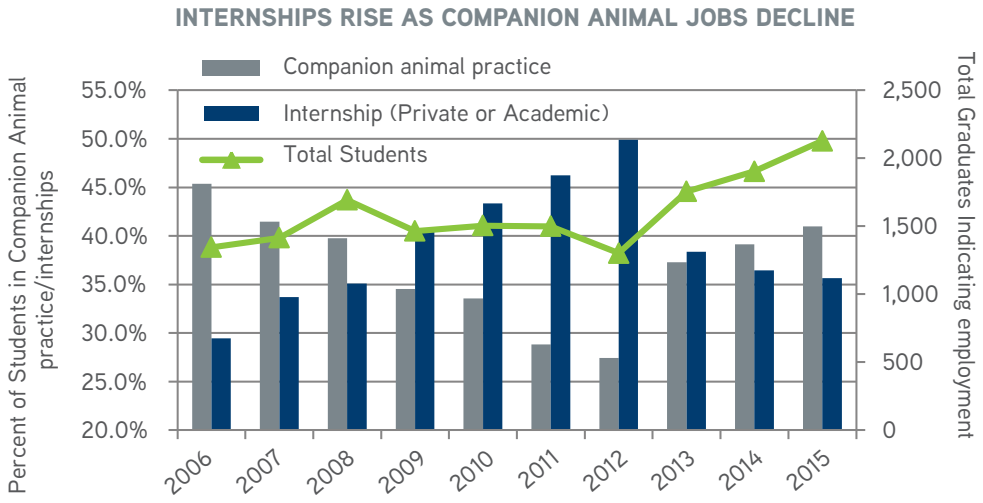


Figure 34

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).

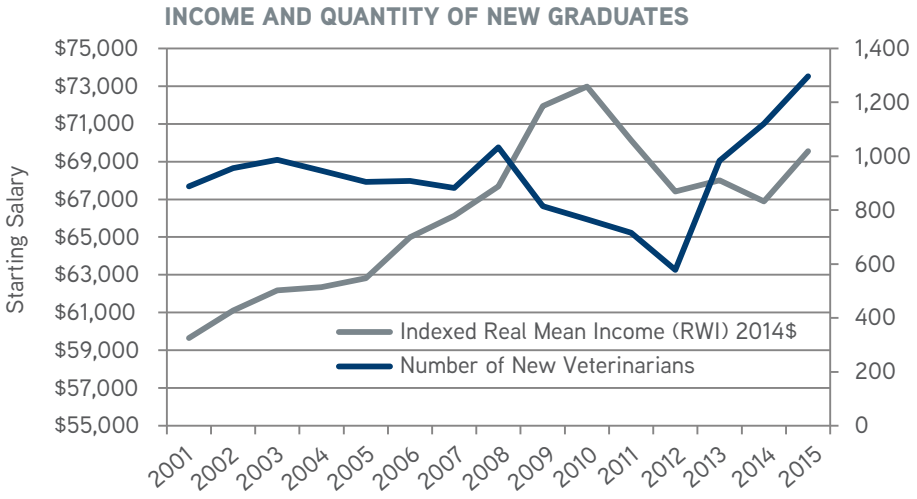


Figure 35

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.

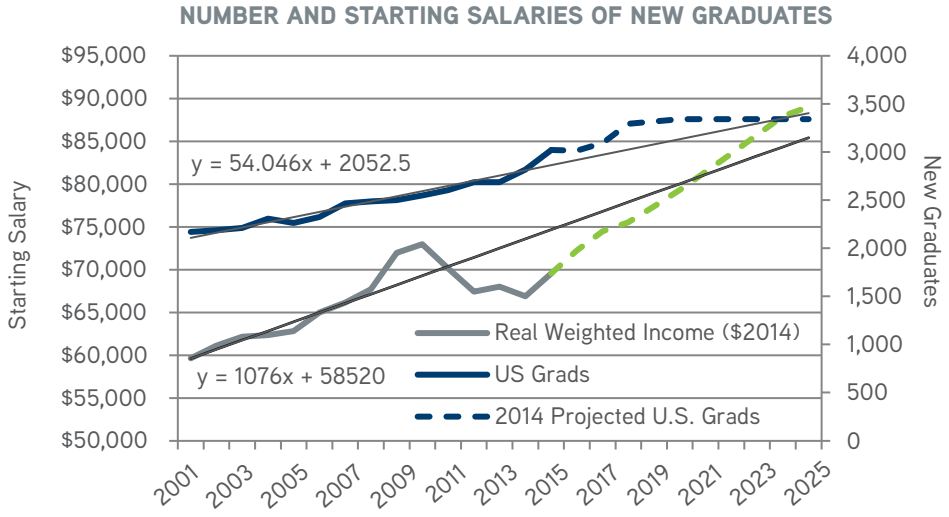


Figure 36

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.

DEBT AND INCOME OF GRADUATES OF U.S. VETERINARY COLLEGES

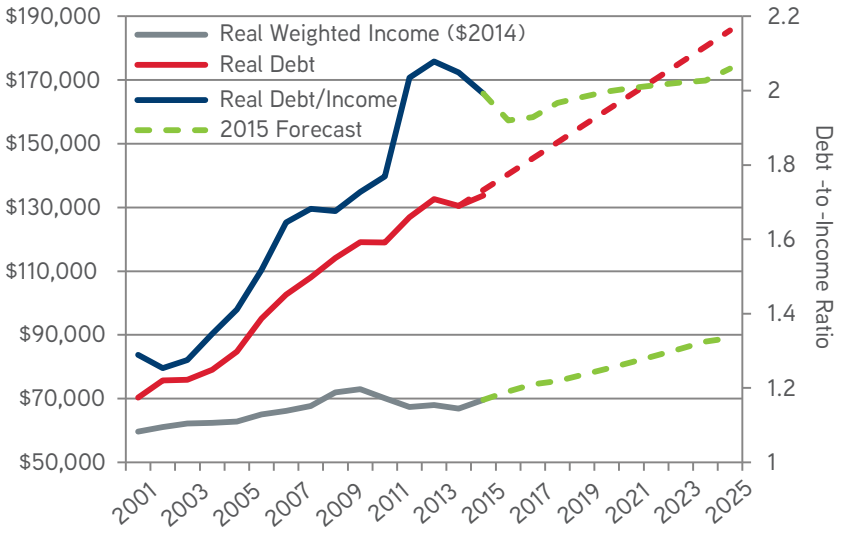


Figure 37

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.

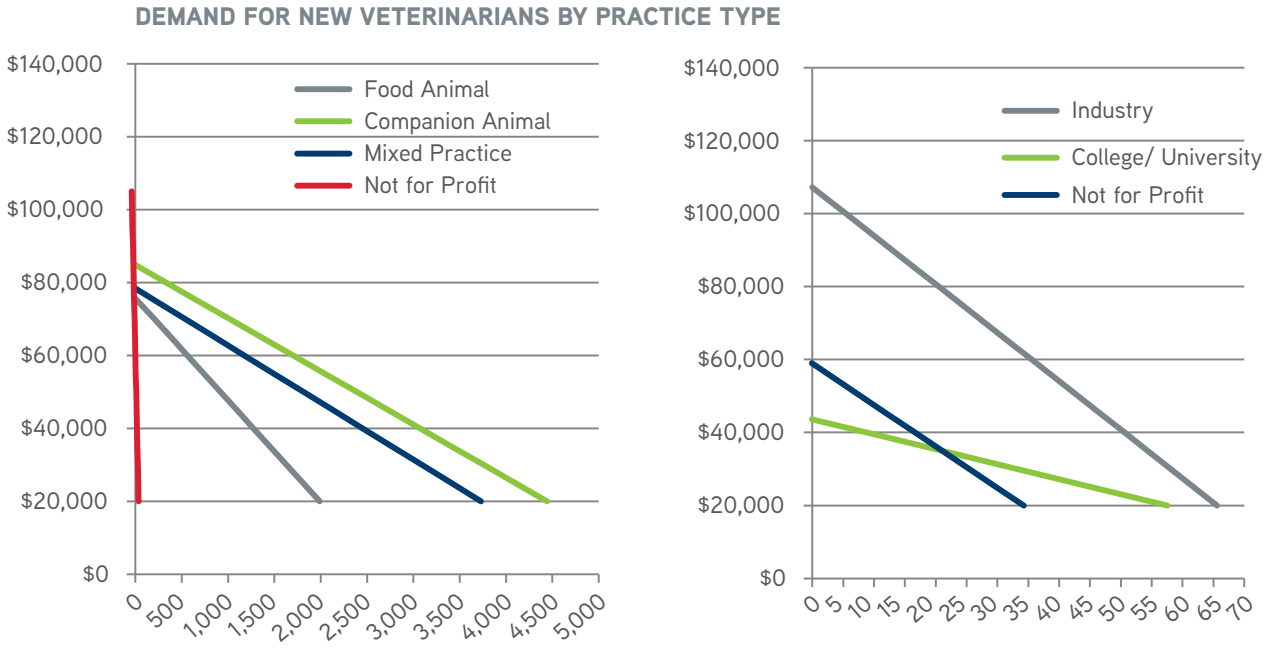


Figure 38

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.

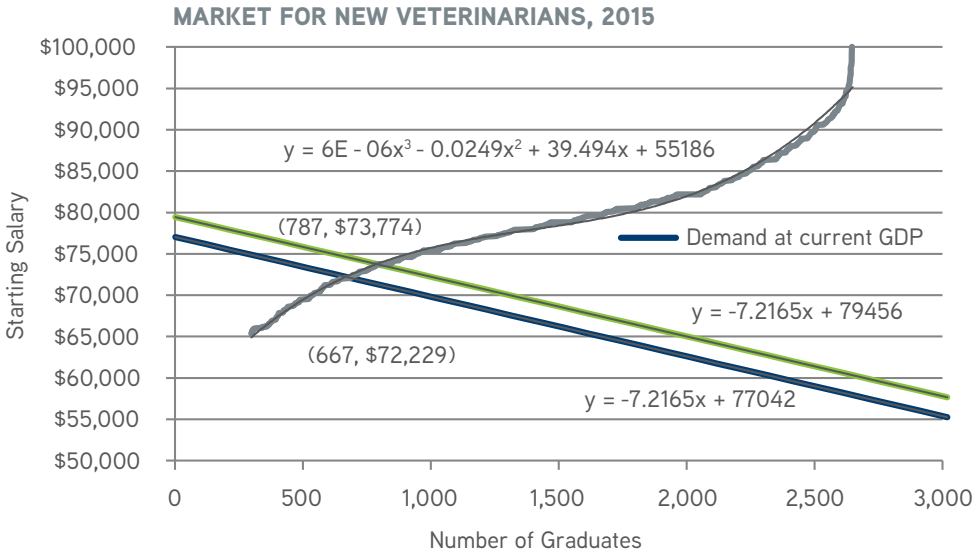


Figure 39

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.

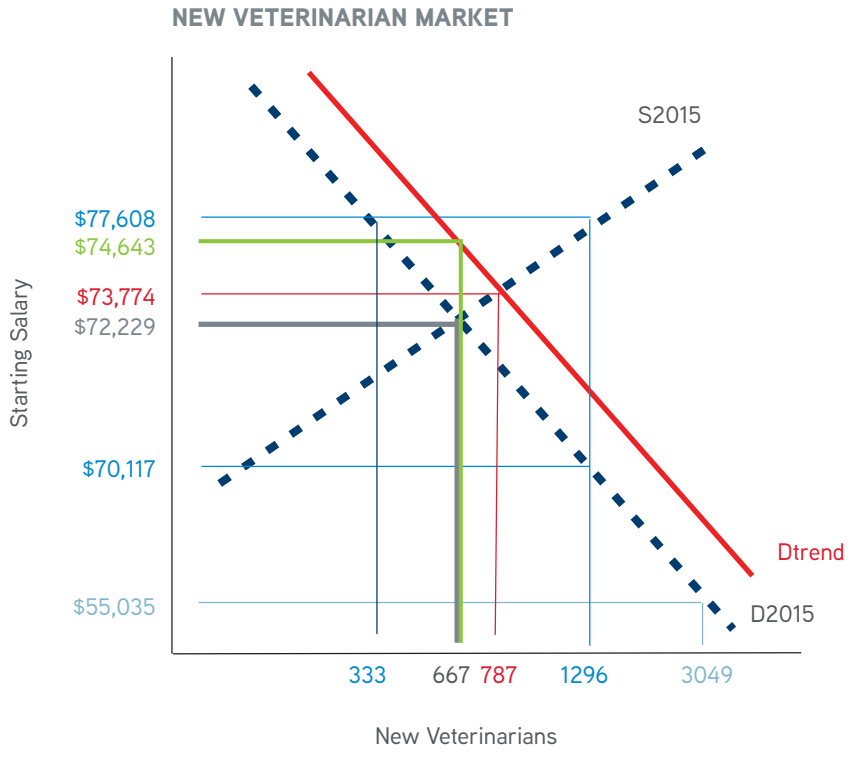


Figure 40

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

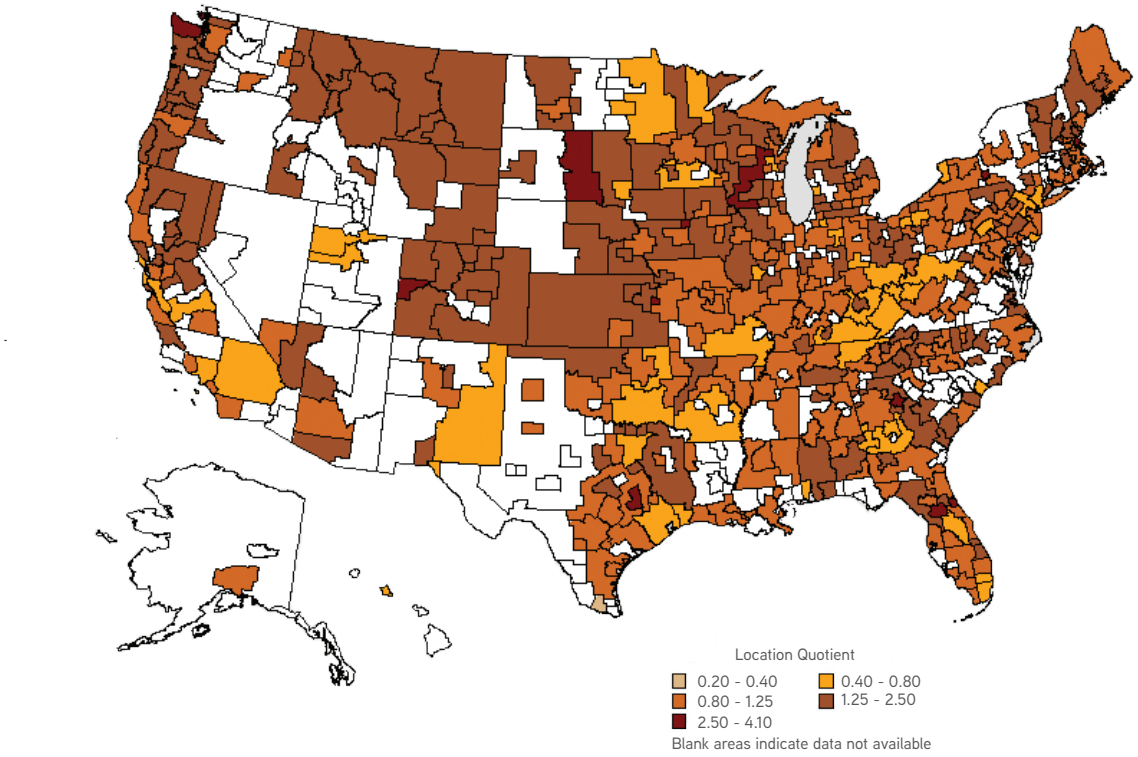


Image courtesy of http://www.bls.gov/oes/current/ml291131.png

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.

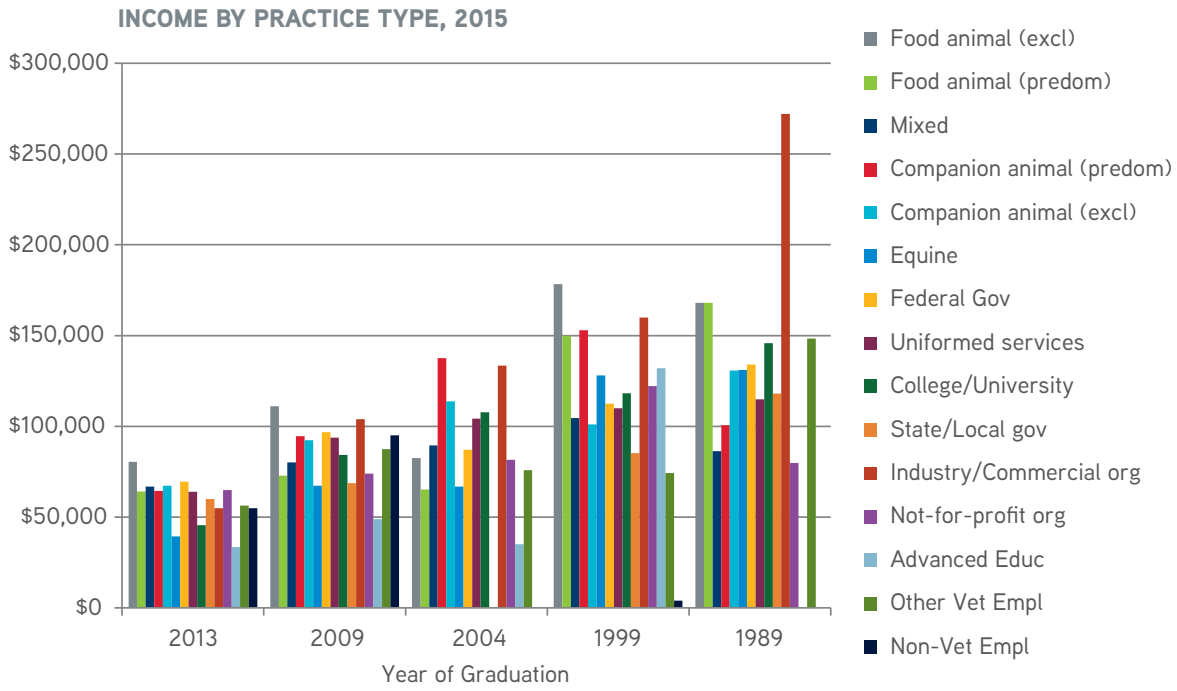


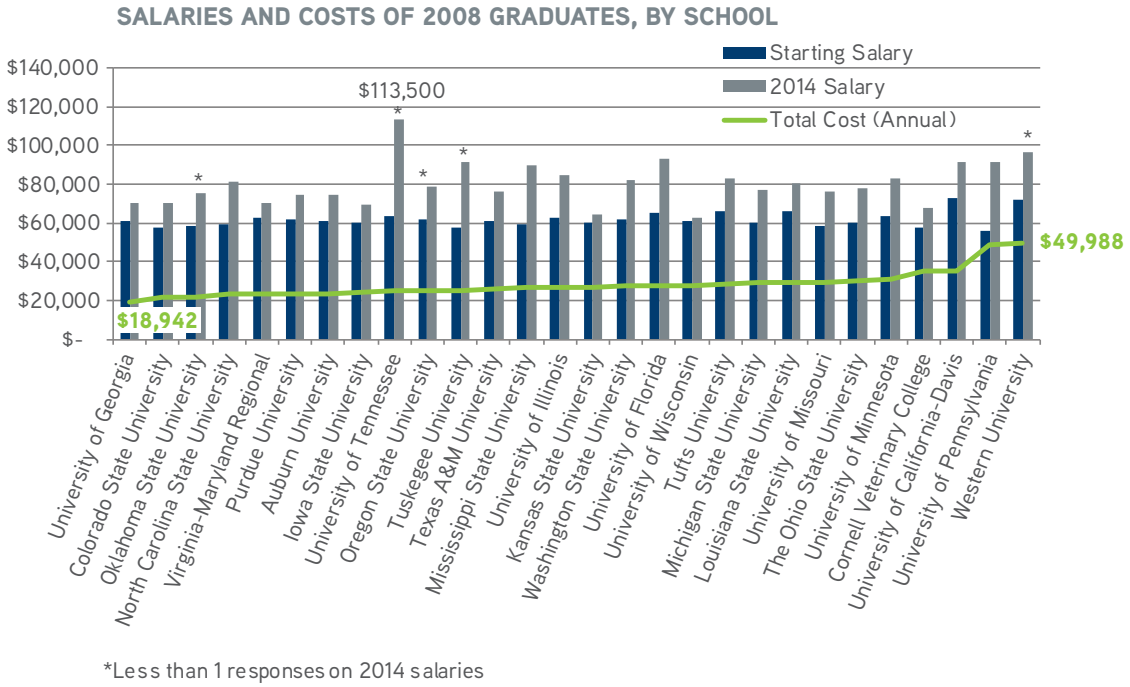
Figure 42

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.



*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.

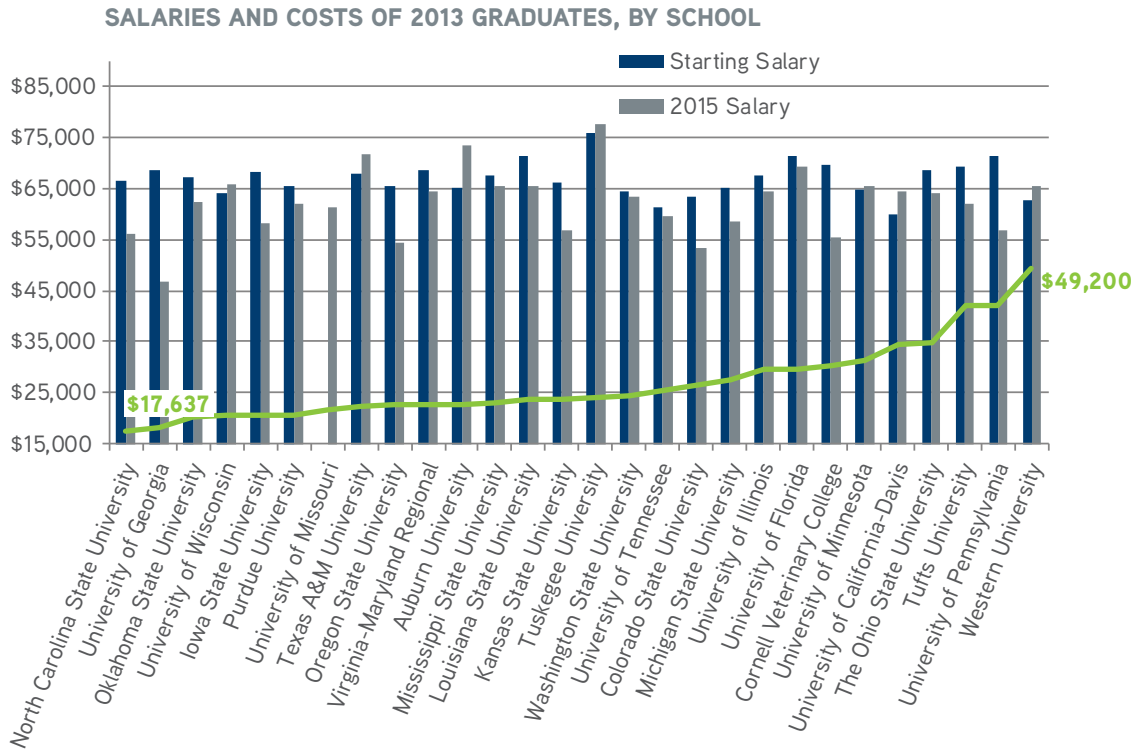


Figure 44

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.

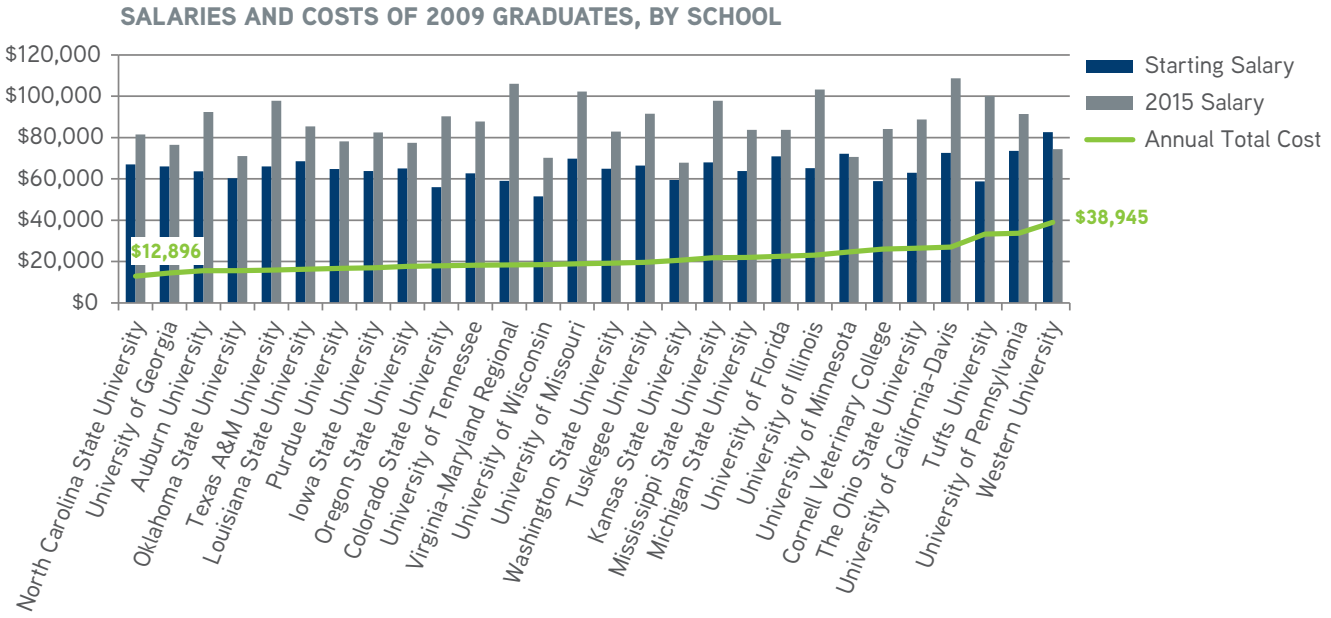


Figure 45

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.

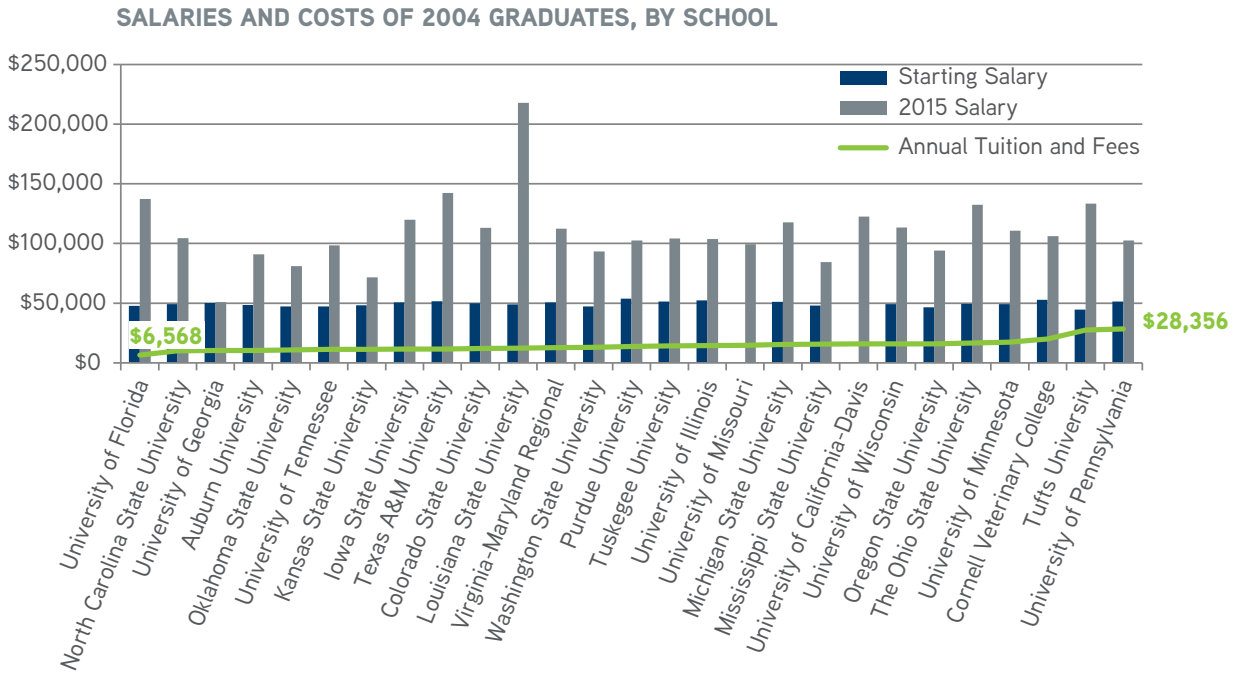


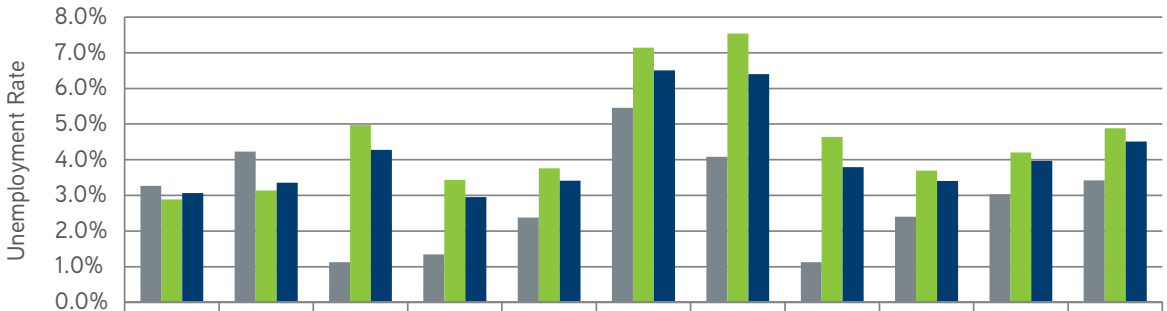
Figure 46

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.

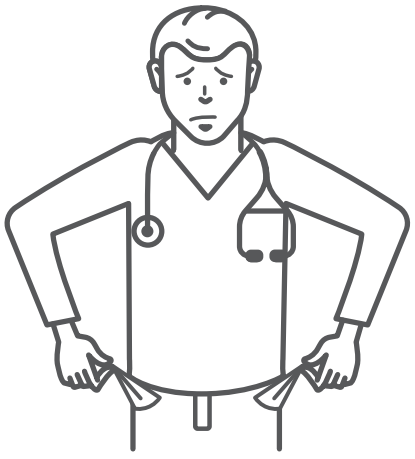
The main objective of the Employment Survey was to determine the amount of unemployment and underemployment in the profession. Unemployment was estimated at 4.5 percent in 2014 compared with 3.4 percent in 2013. There is no statistically significant difference between these two rates and both are below 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.

UNEMPLOYMENT BY GENDER AND YEAR OF GRADUATION



	Employment in 2013					Employment in 2014					
	1988	2003	2008	2012	Total	1989	1999	2004	2009	2013	Total
Male	3.3%	4.2%	1.1%	1.3%	2.4%	5.5%	4.1%	1.1%	2.4%	3.0%	3.4%
Female	2.9%	3.1%	5.0%	3.4%	3.8%	7.1%	7.5%	4.6%	3.7%	4.2%	4.9%
Total	3.1%	3.4%	4.3%	3.0%	3.4%	6.5%	6.4%	3.8%	3.4%	4.0%	4.5%

Figure 47

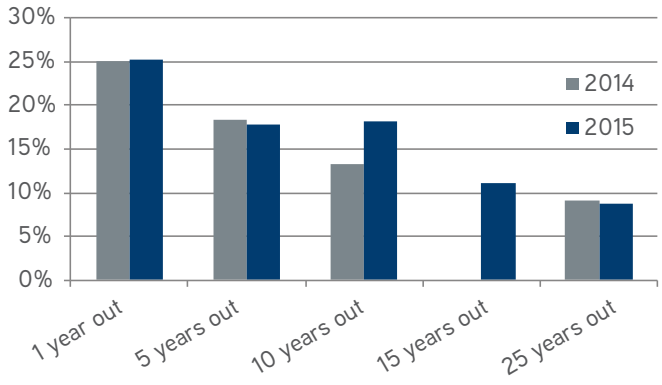


UNEMPLOYMENT WAS ESTIMATED AT 4.5 PERCENT IN 2014 COMPARED WITH 3.4 PERCENT IN 2013. THERE IS NO STATISTICALLY SIGNIFICANT DIFFERENCE BETWEEN THESE TWO RATES AND BOTH ARE BELOW THE U.S. NATIONAL RATE (6.1 PERCENT) AND THE NATURAL RATE (5.6 PERCENT).

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

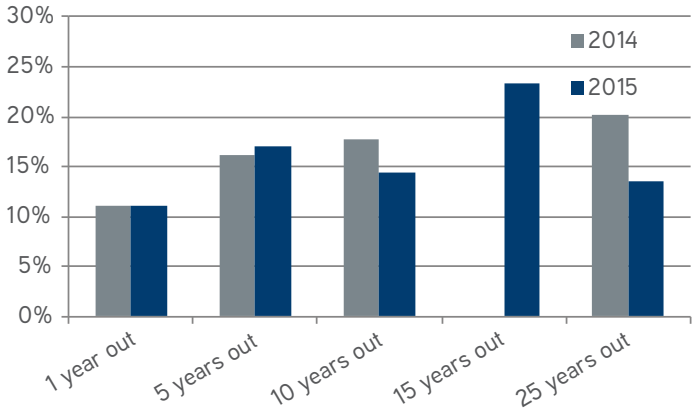
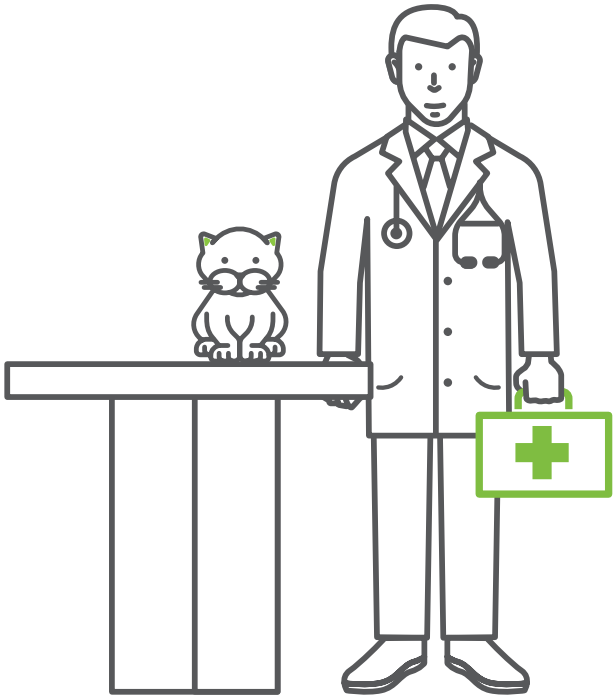


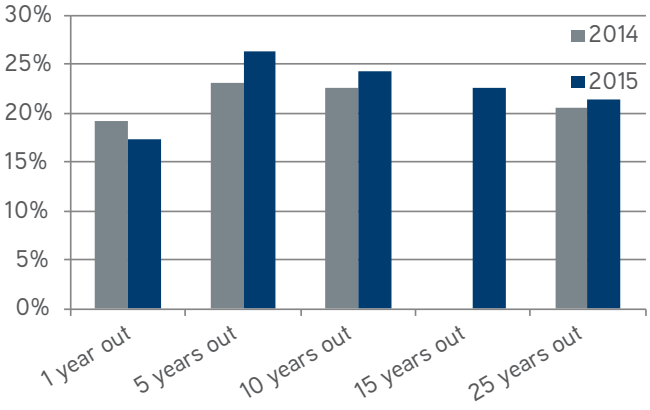
Figure 48

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.

FEMALE WORK PREFERENCE: DESIRE TO WORK FEWER HOURS PER WEEK



FEMALE WORK PREFERENCE: DESIRE TO WORK ADDITIONAL HOURS PER WEEK

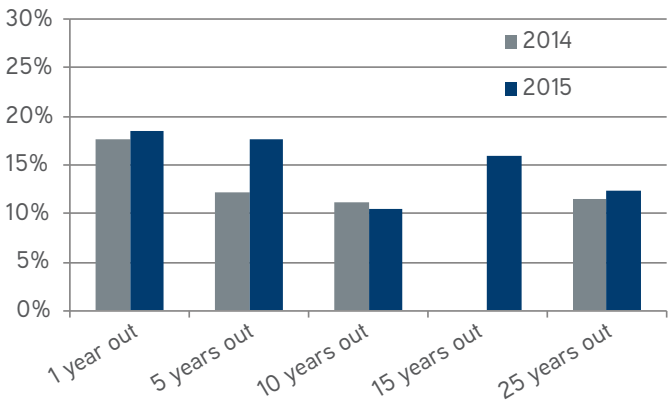
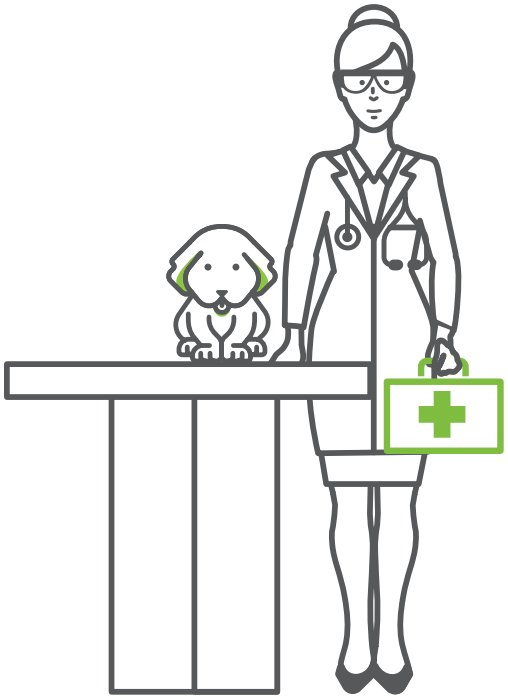


Figure 49

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 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.

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.

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.

RELATIVE PRICE OF VETERINARY SERVICES

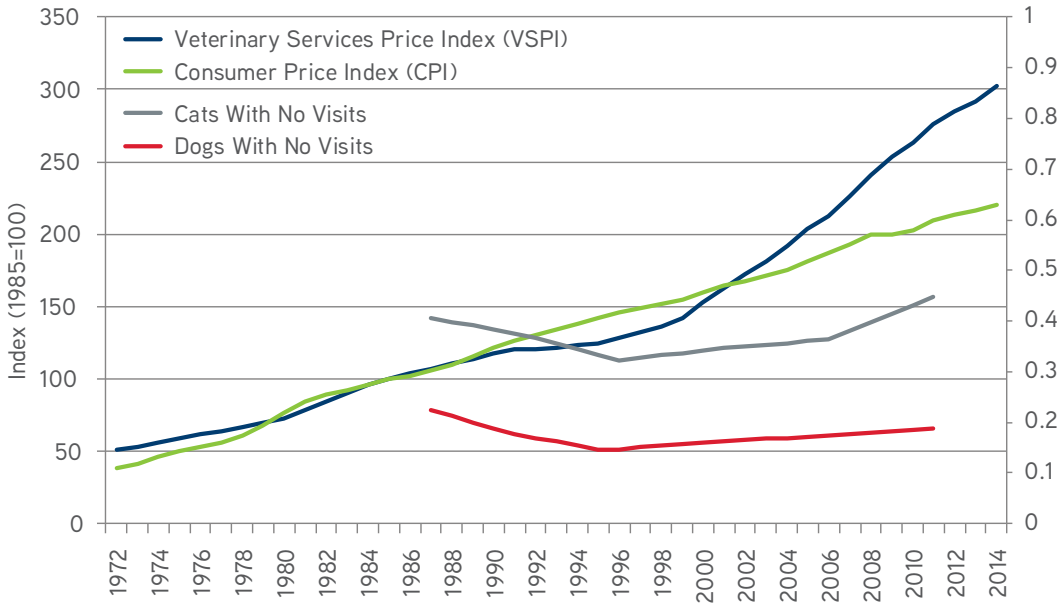


Figure 50

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
Consimer 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 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.

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 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.

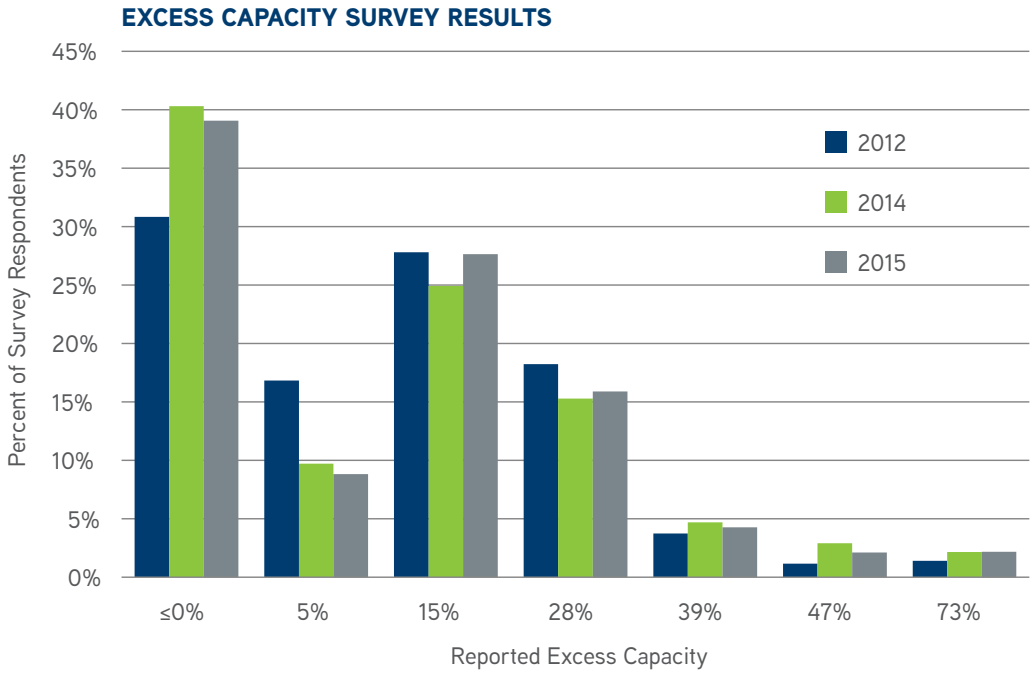


Figure 51

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.

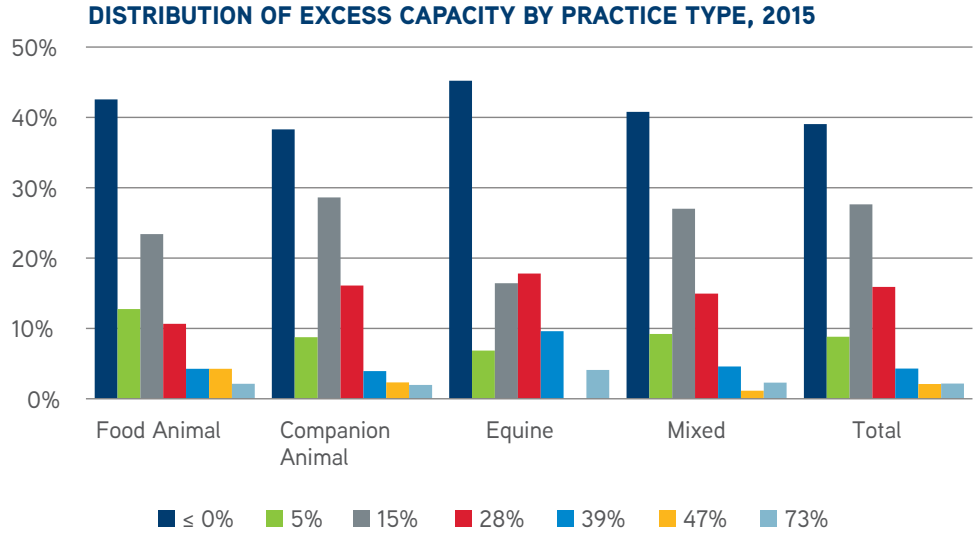


Figure 52

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.

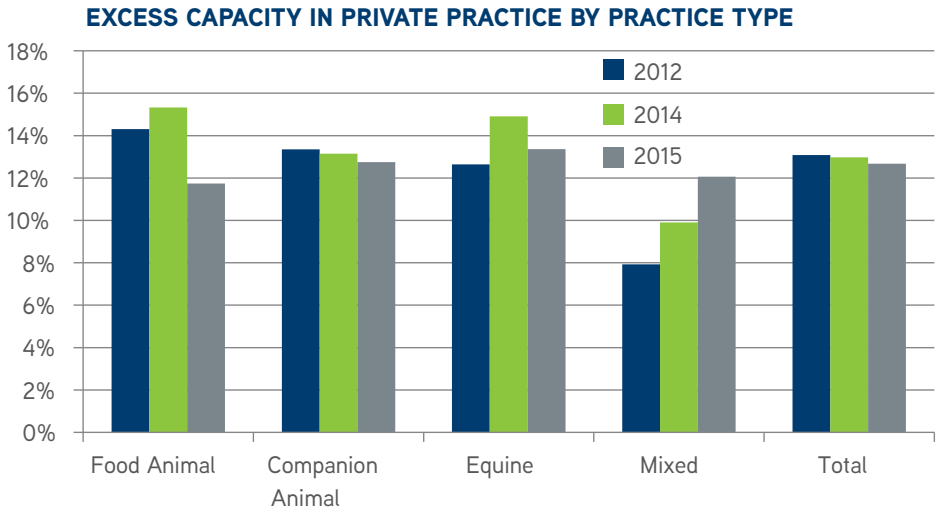


Figure 53

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.

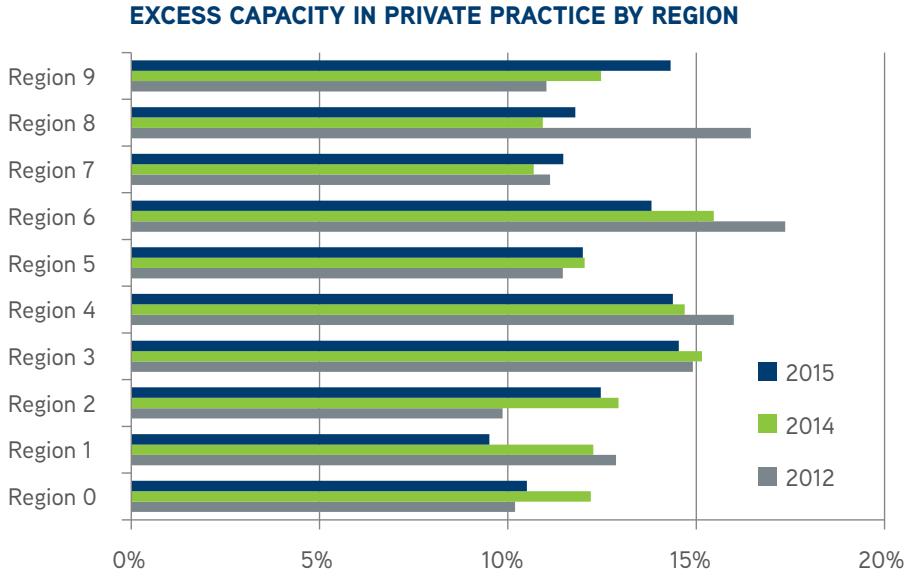


Figure 54

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

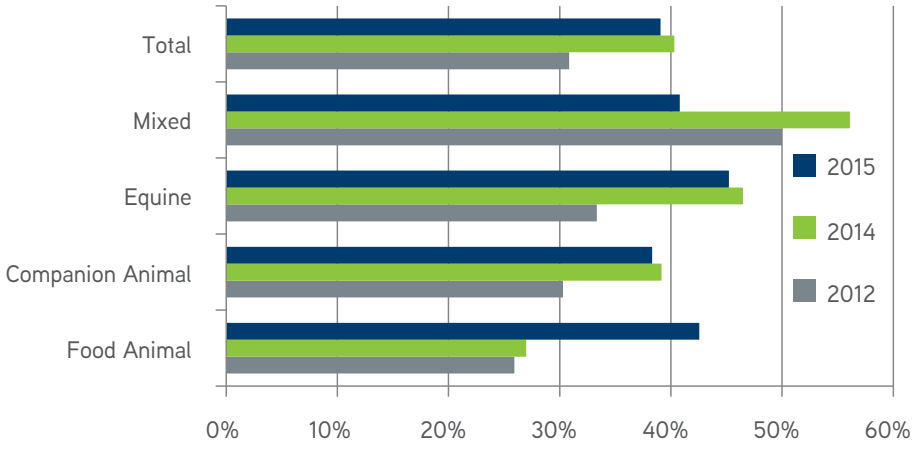


Figure 55

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

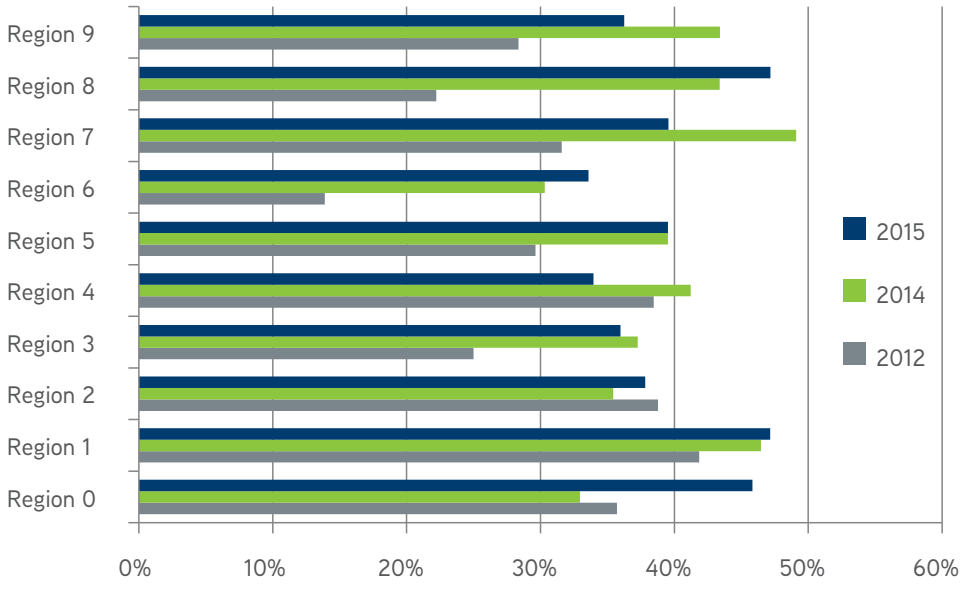


Figure 56

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.

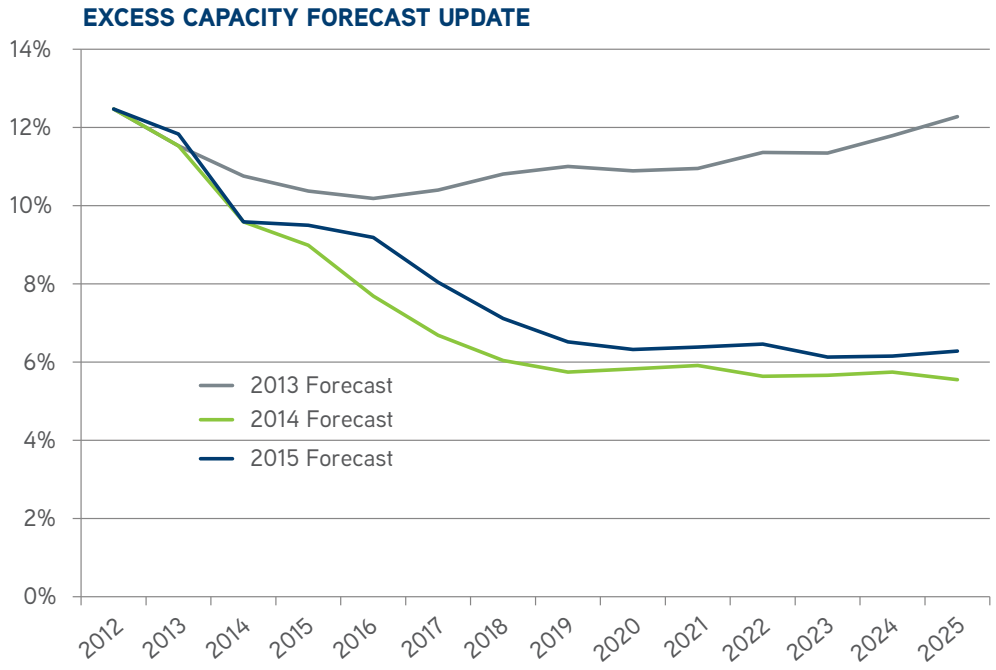


Figure 57

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 Veteirnary 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. 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.

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 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.

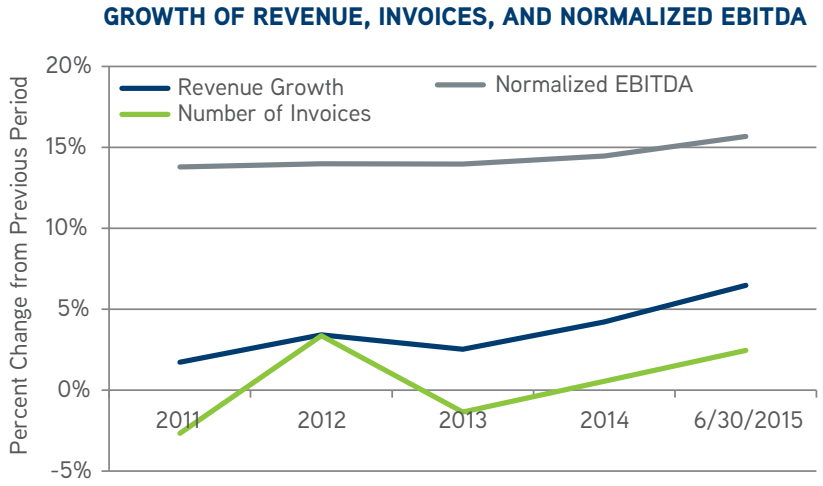


Figure 58

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, respectfully, 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.

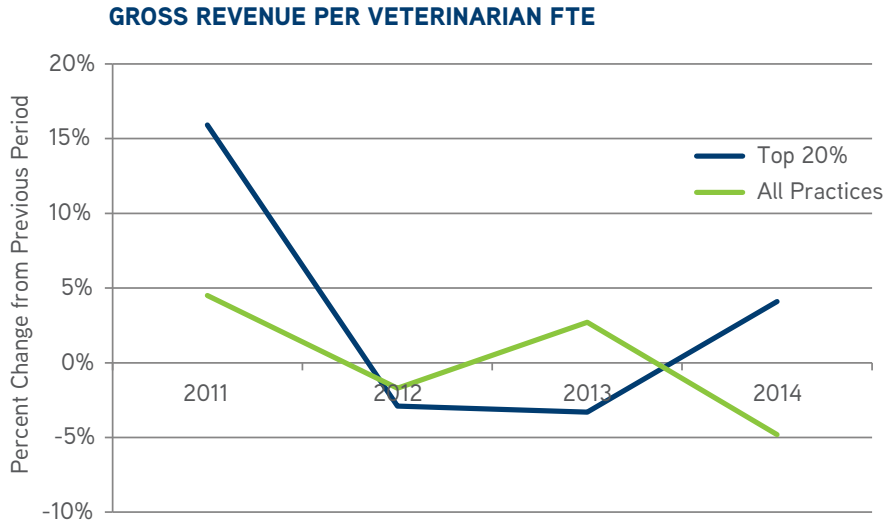


Figure 59

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.

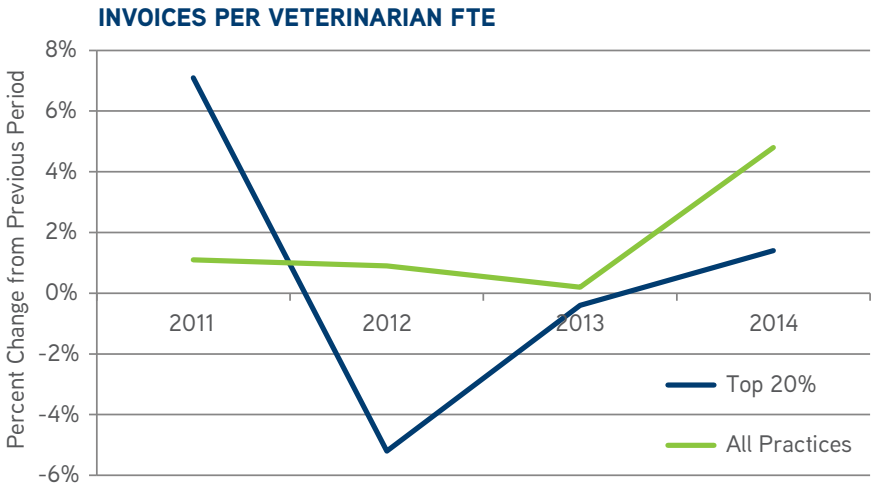


Figure 60

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.

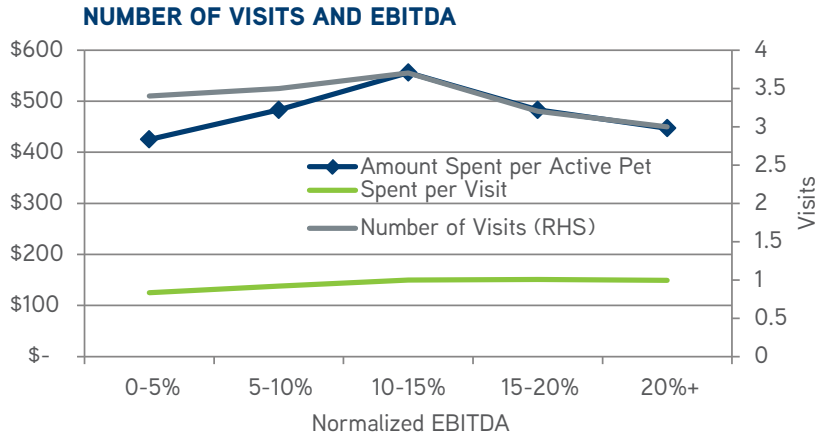


Figure 61

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.

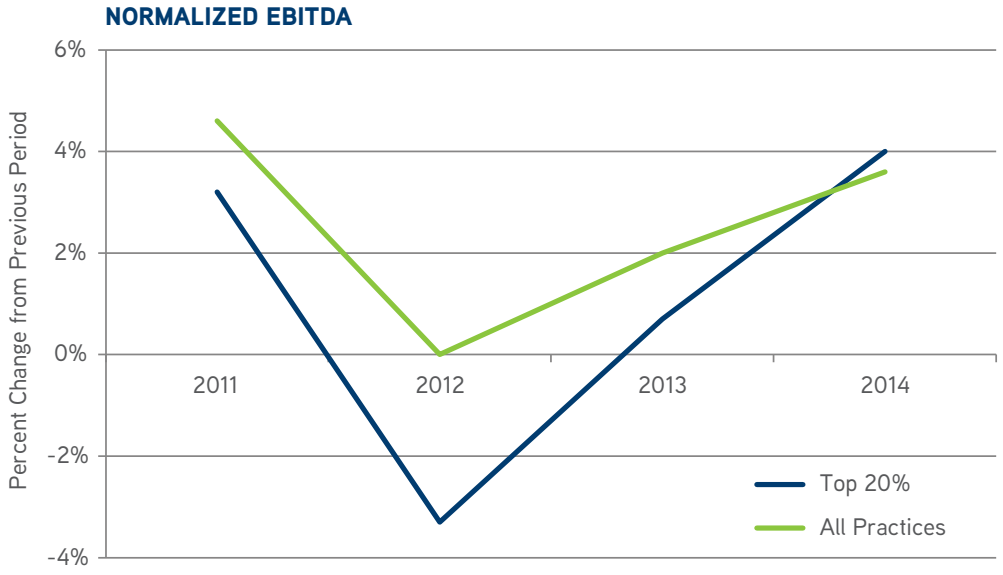


Figure 62

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.

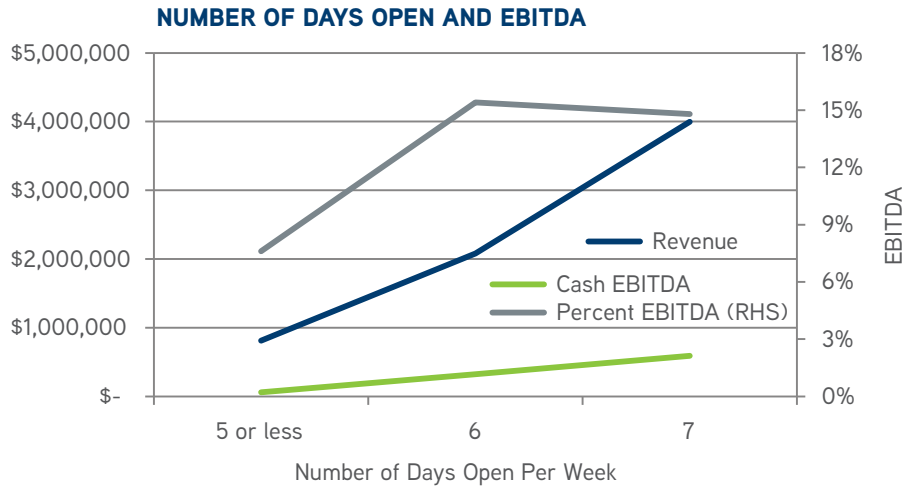


Figure 63

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.

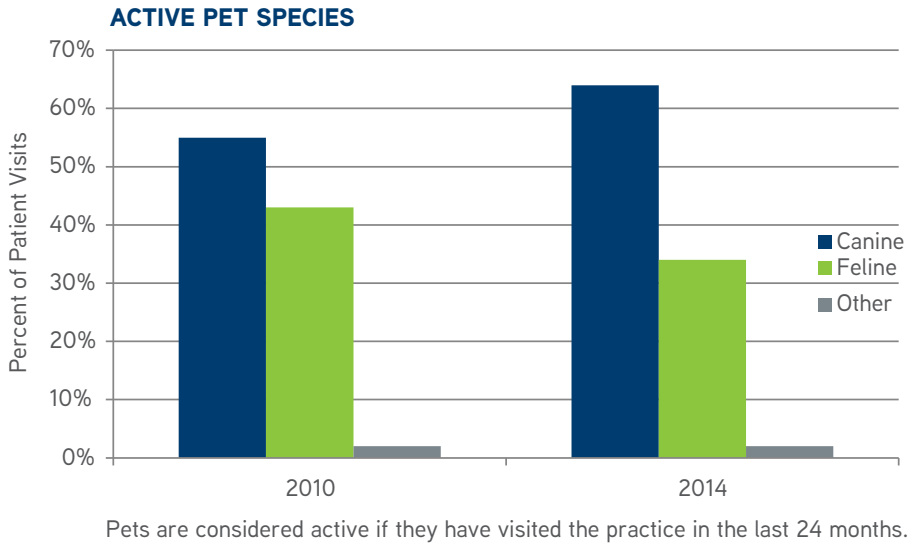


Figure 64

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 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.

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.

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, 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 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 counties[6]. 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 verses 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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- Are you looking to improve the workplace of your organization?

Main focus areas:

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

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THE AVMA 2016 ECONOMIC REPORTS INCLUDE:

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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.

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2016 AVMA & AAVMC Report on

THE MARKET FOR VETERINARY EDUCATION

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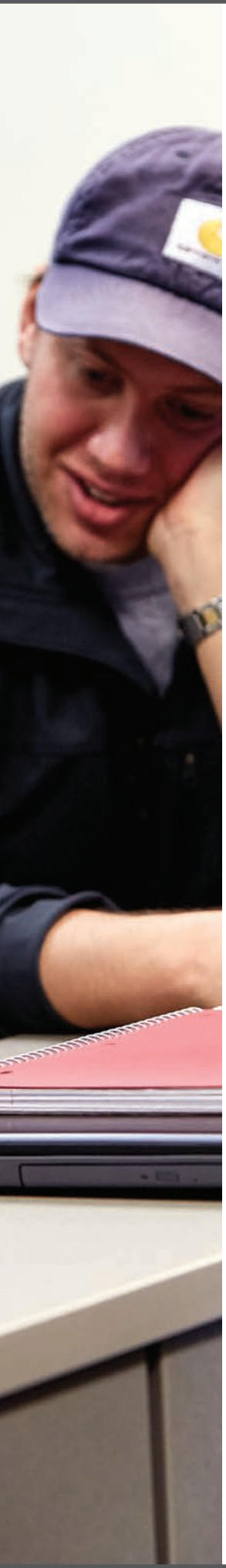

2016 AVMA & AAVMC Report on

THE MARKET FOR VETERINARY EDUCATION

Veterinary Economics Division
American Veterinary Medical Association
April 2016

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SUMMARY

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

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

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

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

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

Starting salaries for new graduates and the number of new graduates that are obtaining full-time employment opportunities prior to graduation are increasing. These changes are due to an increase in disposable income that occurs in an economic expansion. The real (2014$) weighted mean income (RWI) for new veterinarians receiving full-time employment prior to graduation was $69,558 in 2015, an increase of approximately 4.5 percent over 2014. Even more impressive was the more than 10 percent increase in full-time employment positions obtained before graduation to an all-time high of approximately 1,300. These two statistics suggest that the demand for veterinarians in 2015 was very strong in comparison to recent years.

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

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

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

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

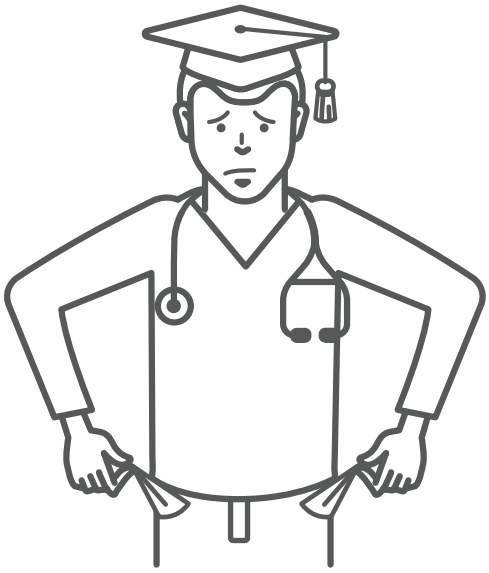
A more sustainable DIR (although certainly not optimal) would be 1.4:1, and the profession, in total, must begin to develop strategies to move in this direction to avoid a market correction. While colleges and students are doing what is necessary to ensure that

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

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

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

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



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

INTRODUCTION

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

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

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

Analysis of the Senior Survey data revealed that there are several statistically significant factors (e.g., demographic characteristics of veterinary graduates) that explain the variation in mean income. The factors which we include are: gender; age; practice type; location of place of employment; debt accumulated in graduate school; and anticipated work hours per week. As a result, we were able to determine that a change in these demographics would easily change the mean starting salary and thereby enable the reader to conclude that perhaps this change is attributable to market conditions. That is, an increase in starting salary indicated an increased demand for new veterinarians and a decrease in starting salary indicated a decreased demand for new veterinarians. However, demand is the relationship between price and quantity, all other things being equal. Without controlling for the changing demographic characteristics of the graduates, a change in mean starting salary may be a result of the changing population of new veterinarians, rather than a change in the number of new graduates.

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

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

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

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

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

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

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

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

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

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

MARKET FOR EDUCATION KPI

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

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

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

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

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

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

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

The question becomes, "What values to report?" Do we include those who have zero debt in our mean figures? Should we include those who are pursuing continuing education? Do we assume that those graduates not responding are distributed in a similar manner to those who have responded? The question is answered best based upon the objective for reporting the values. Again, the objective of the AVMA Veterinary Economics Division is to improve the economics of the profession. To do so requires a measuring stick that provides the best indication of the economics of the profession, and does so uniformly through time so that year to year comparisons can be made.

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

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

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

THE APPLICANT POOL FOR VETERINARY COLLEGES

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

Last year, we reported that the number of applicants to colleges of veterinary medicine was cyclical. In 2013, the number of applicants peaked at 6,769, dropped slightly to 6,744 in 2014 and dropped again in 2015 to 6,600. However, for 2016, the number of applicants increased slightly to 6,667. As noted in the chart below, the peak during the last cycle occurred in 1998 at 6,783 applicants. While we have been unable to determine a specific factor, or set of factors, that may be responsible for the cycle of applicants, by observation, the cycle may have reached its zenith in 2013. The rise in the number of applicants that began in 2002 has shown no increase since 2013. If the previous pattern in applicant numbers persists, then we could expect the number of applicants to continue to fall at least over the next decade.

COLLEGES SUPPLY OF SEATS

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

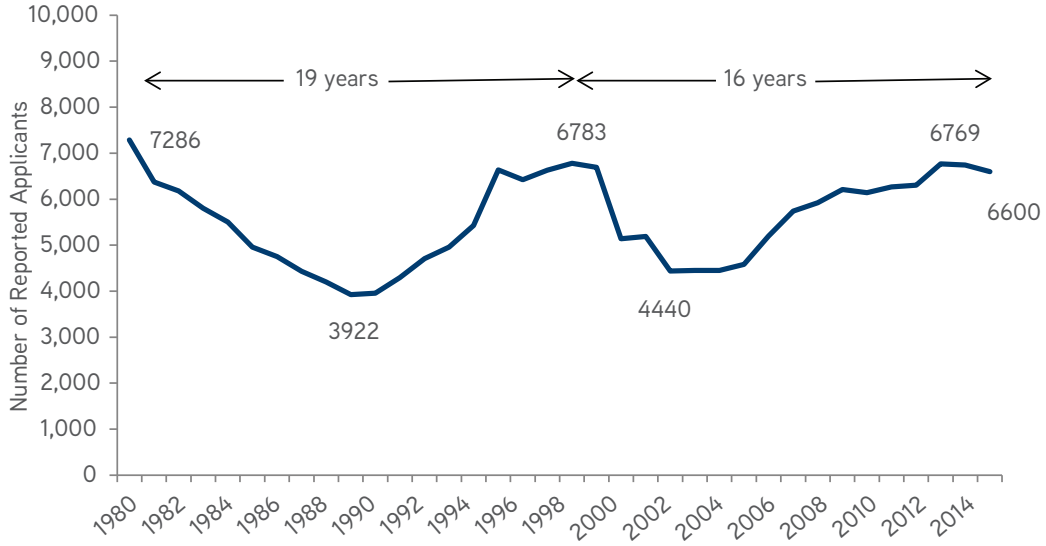
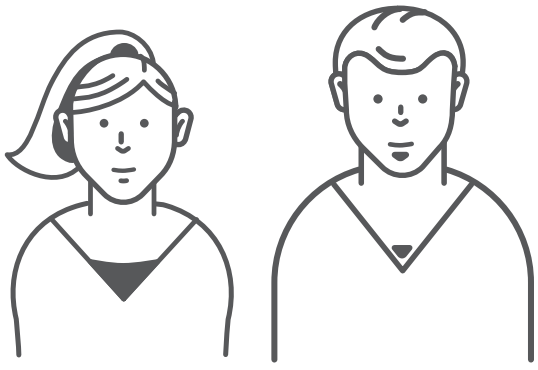


Figure 1



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

DEMAND FOR VETERINARY COLLEGE SEATS

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

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

APPLICANT DEMAND, 2014, 2015 & 2016

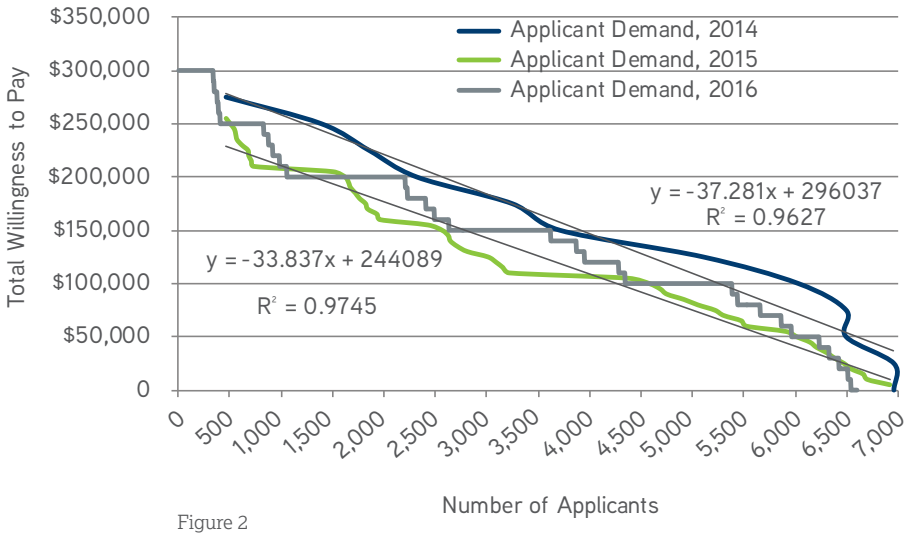
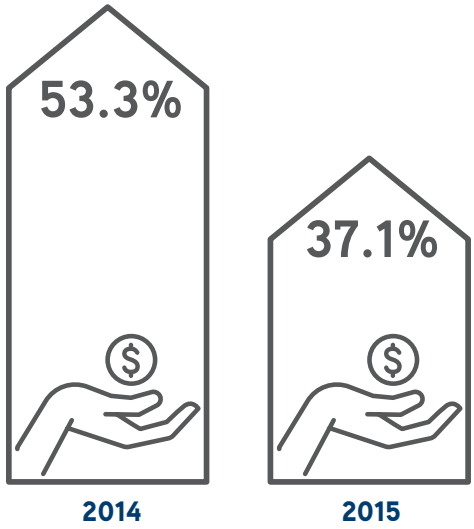


Figure 2

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.

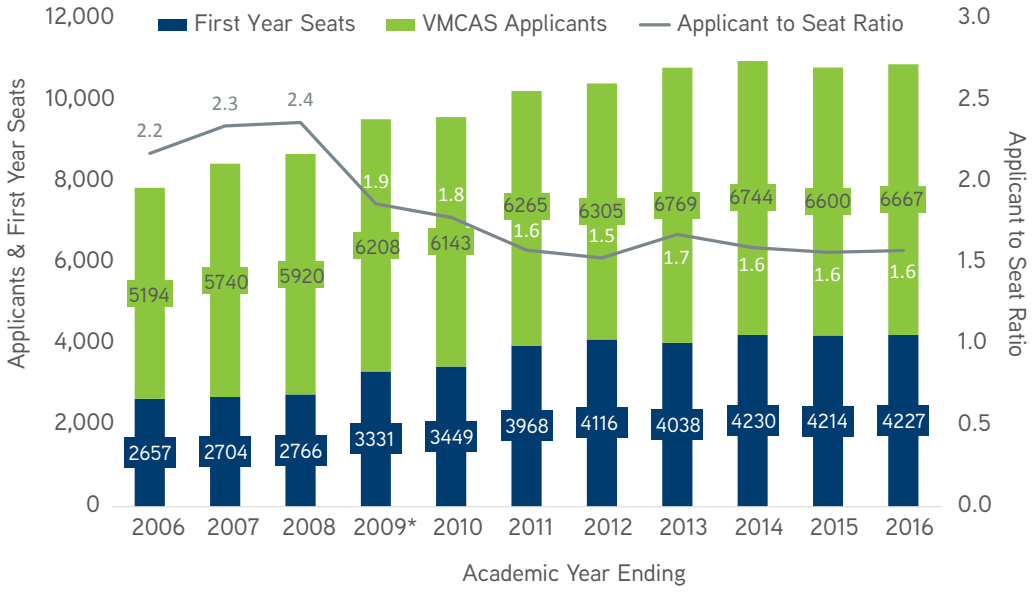


APPLICANT-TO-SEAT RATIO

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.

U.S. VETERINARY GRADUATES, ALL SOURCES

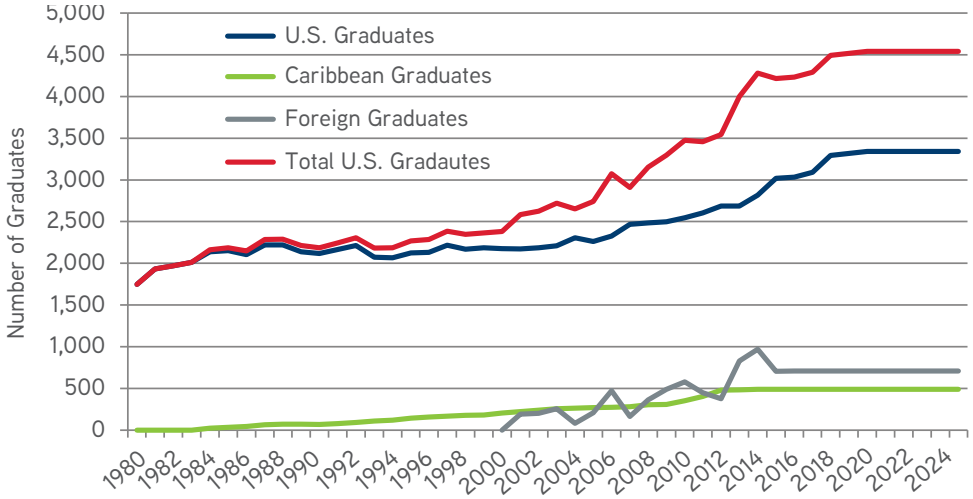


Figure 4

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.

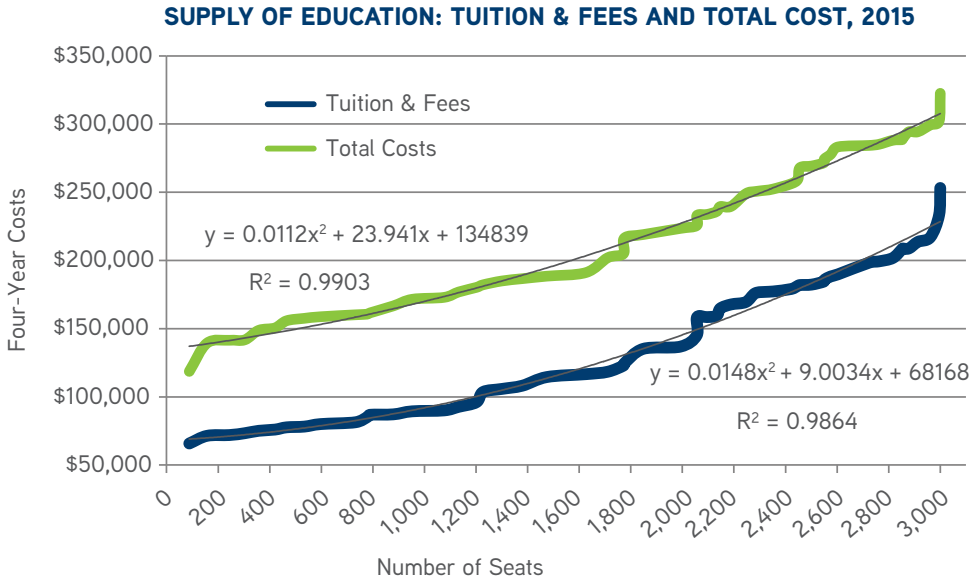


Figure 5

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.

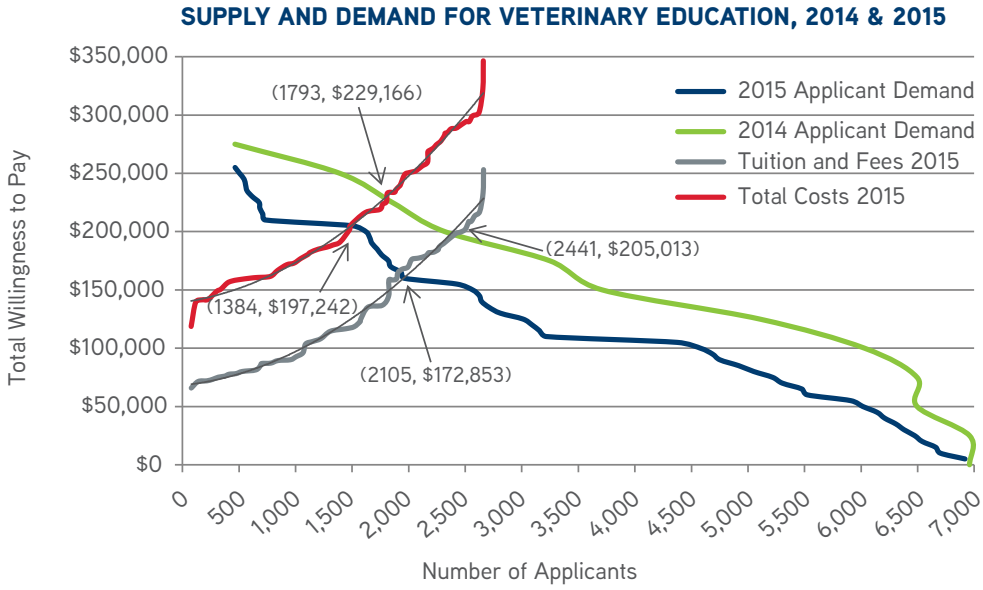


Figure 6

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

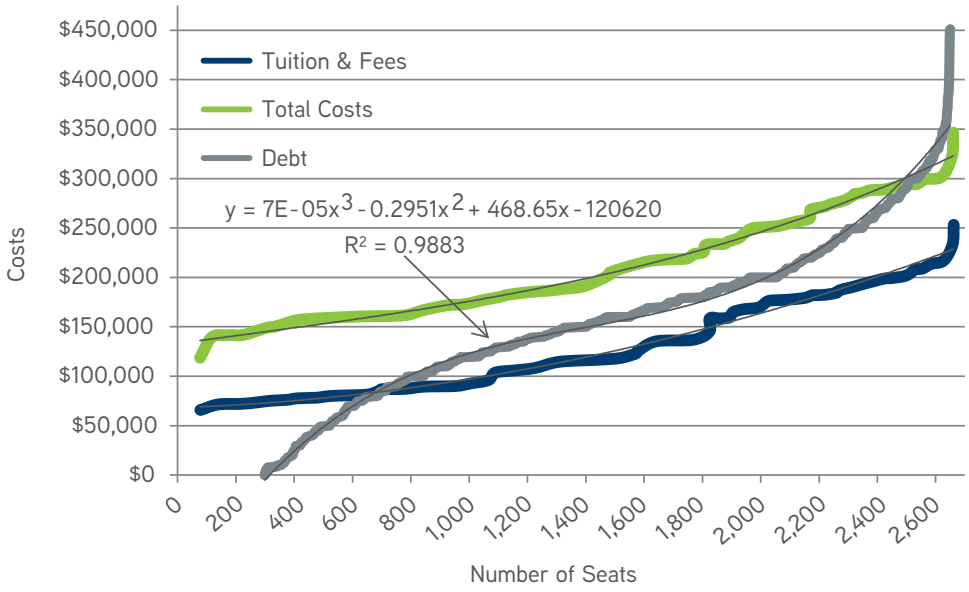


Figure 7

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

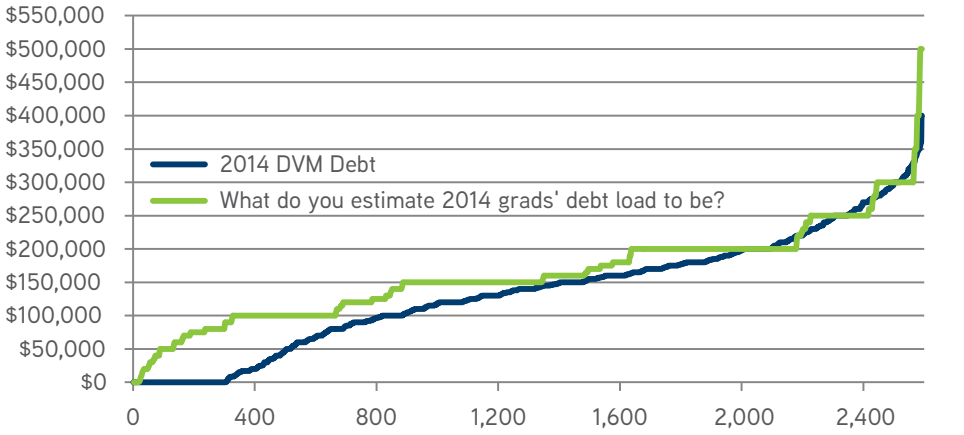


Figure 8

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.

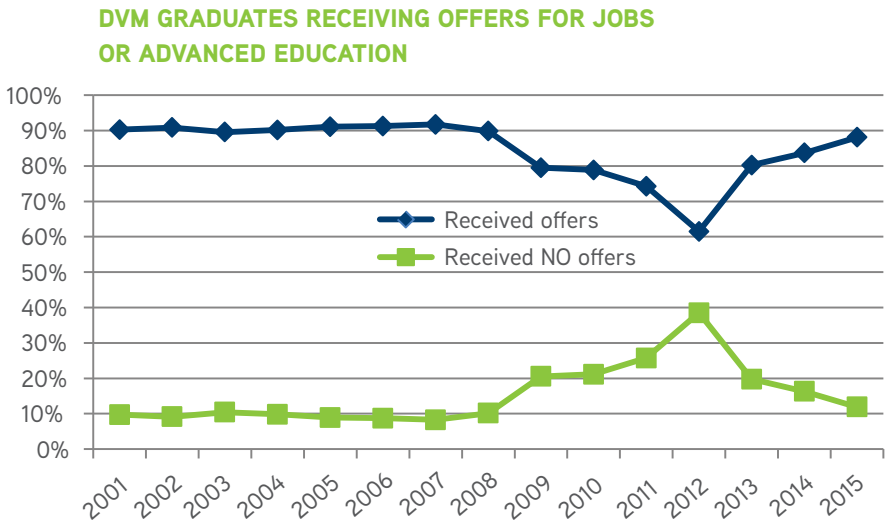


Figure 9

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.

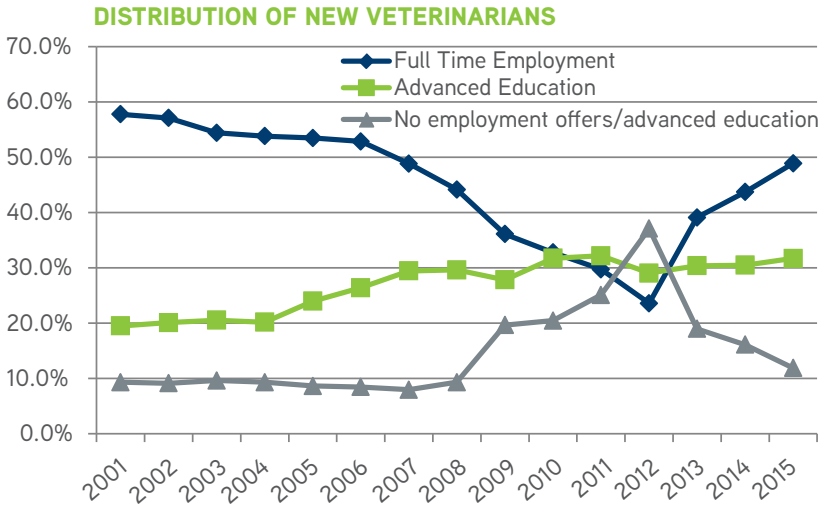


Figure 10

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.

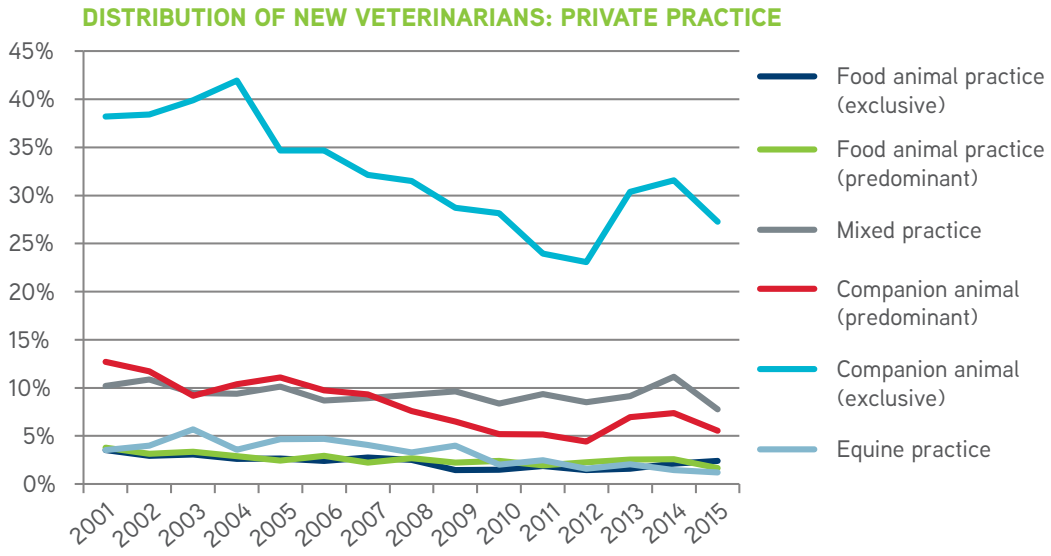


Figure 11

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.

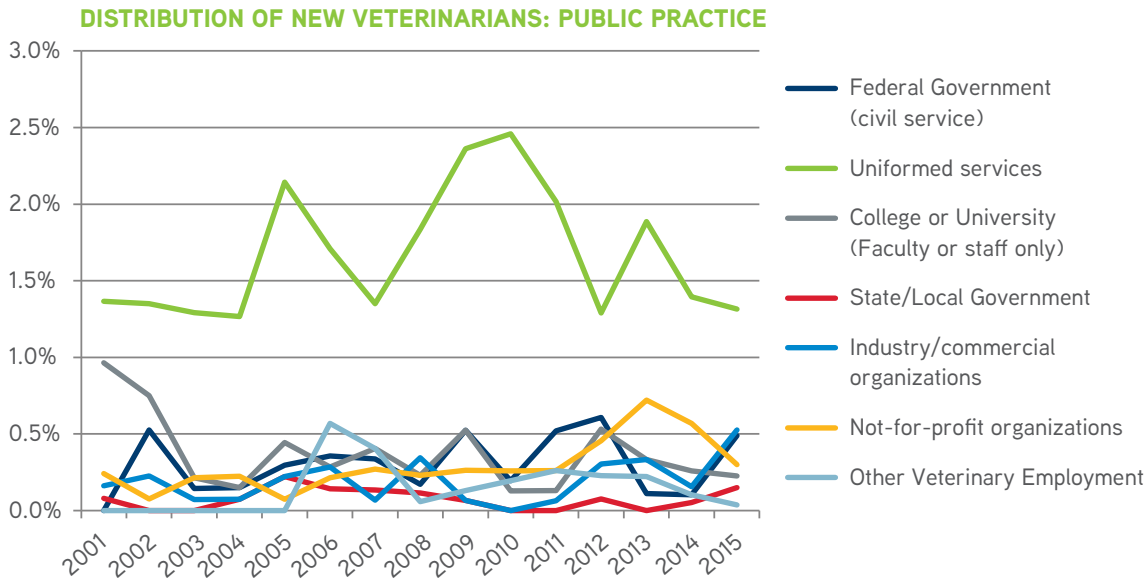


Figure 12

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

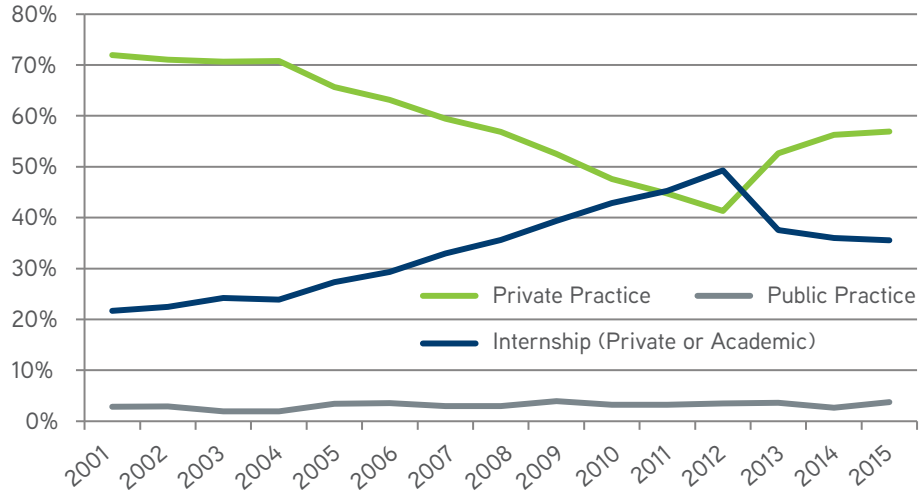


Figure 13

SPECIES FOCUS OF INTERNSHIP

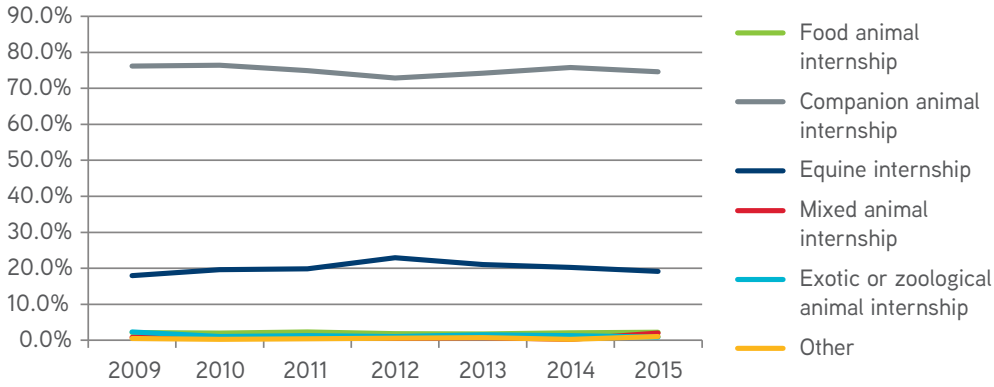


Figure 14

DISTRIBUTION OF NEW VETERINARIANS IN ADVANCED EDUCATION

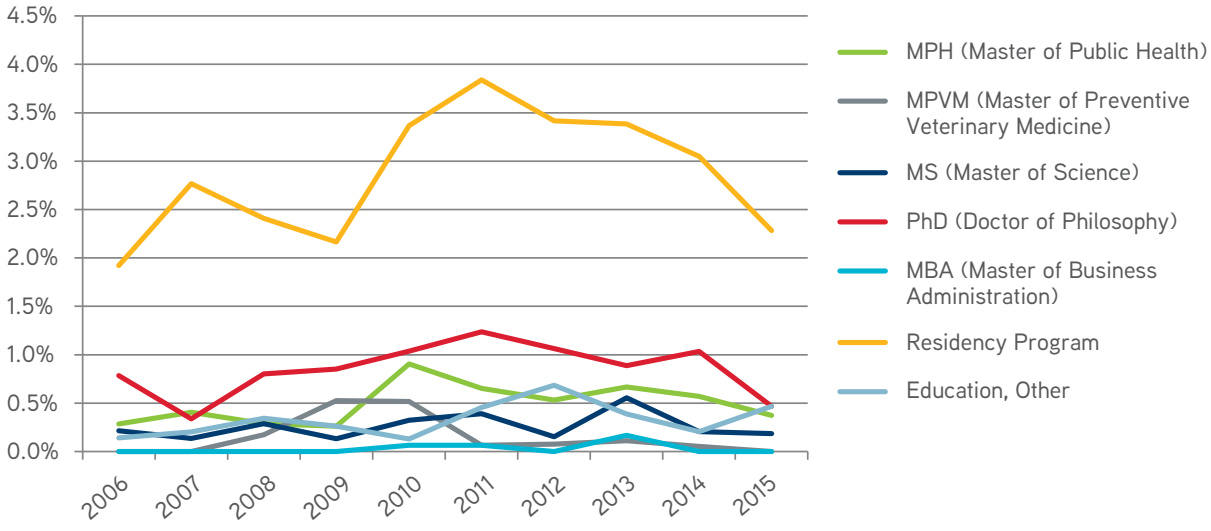


Figure 15

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.

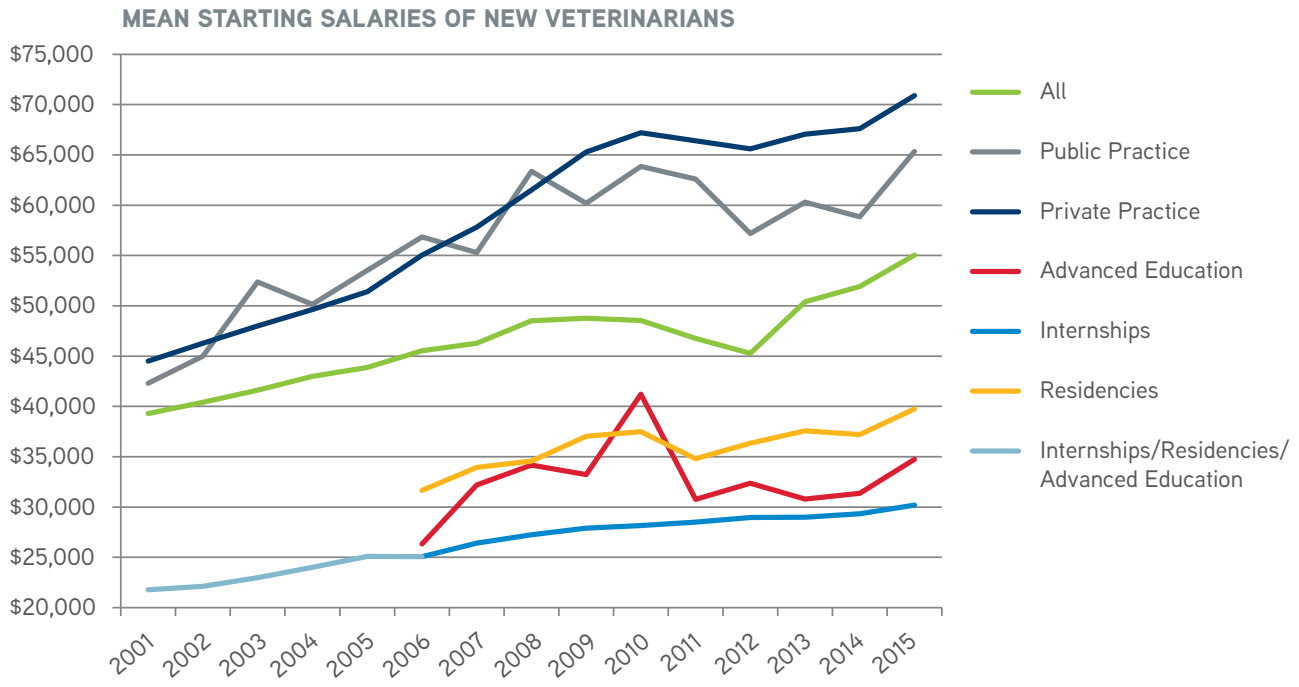


Figure 16

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.

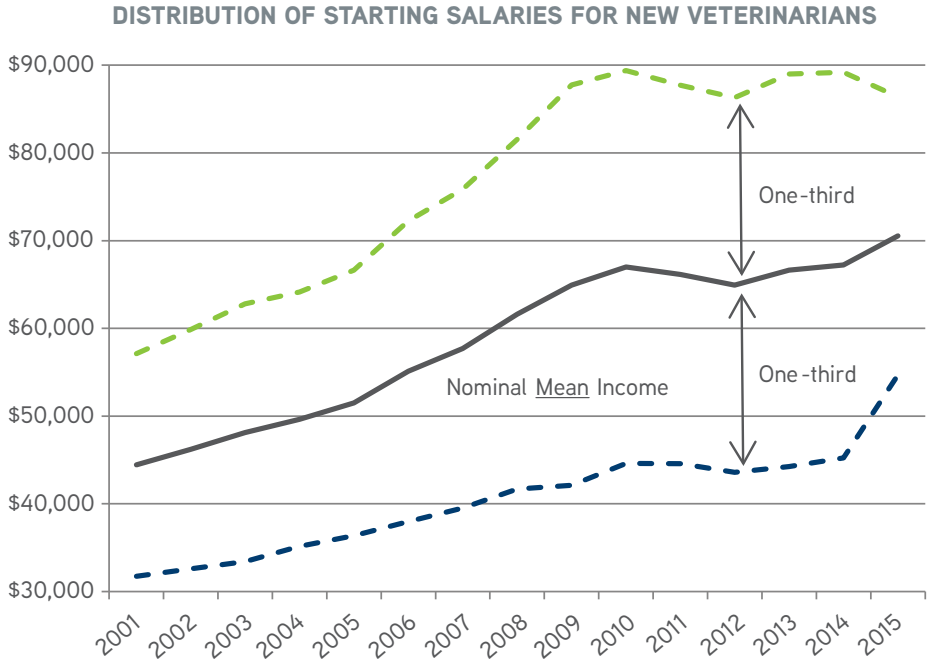


Figure 17

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.

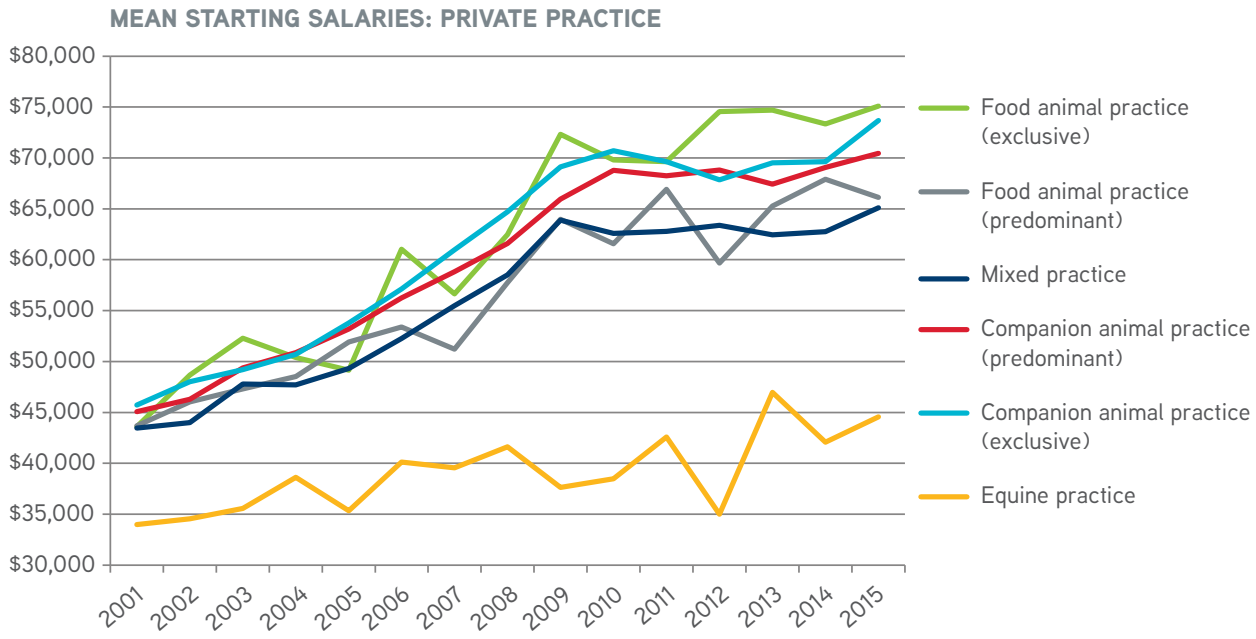


Figure 18

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.

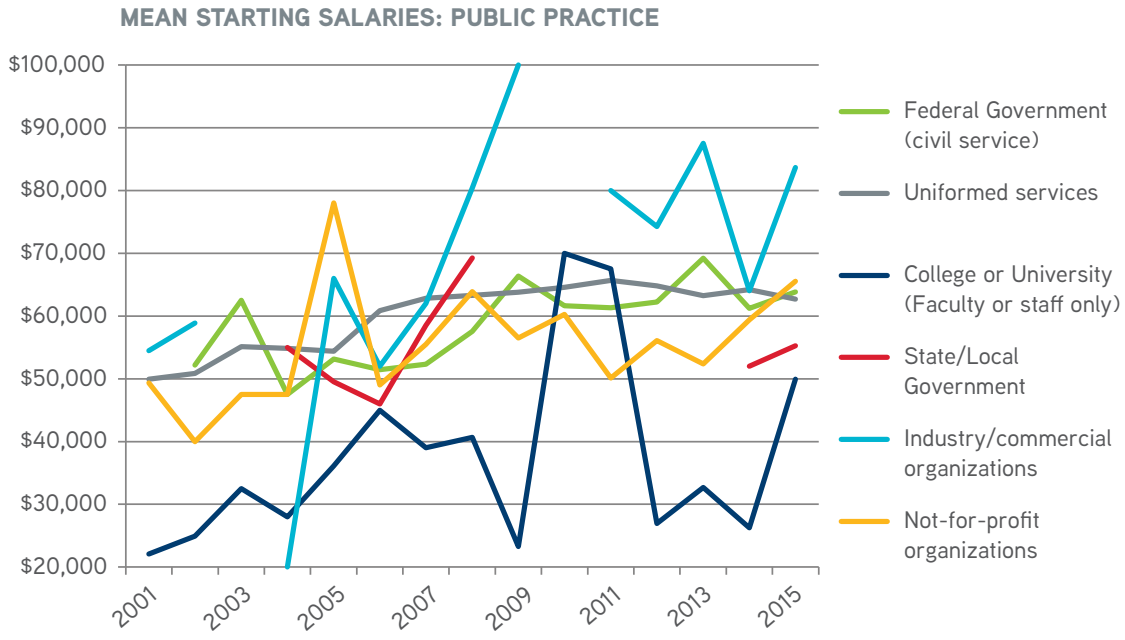


Figure 19

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.

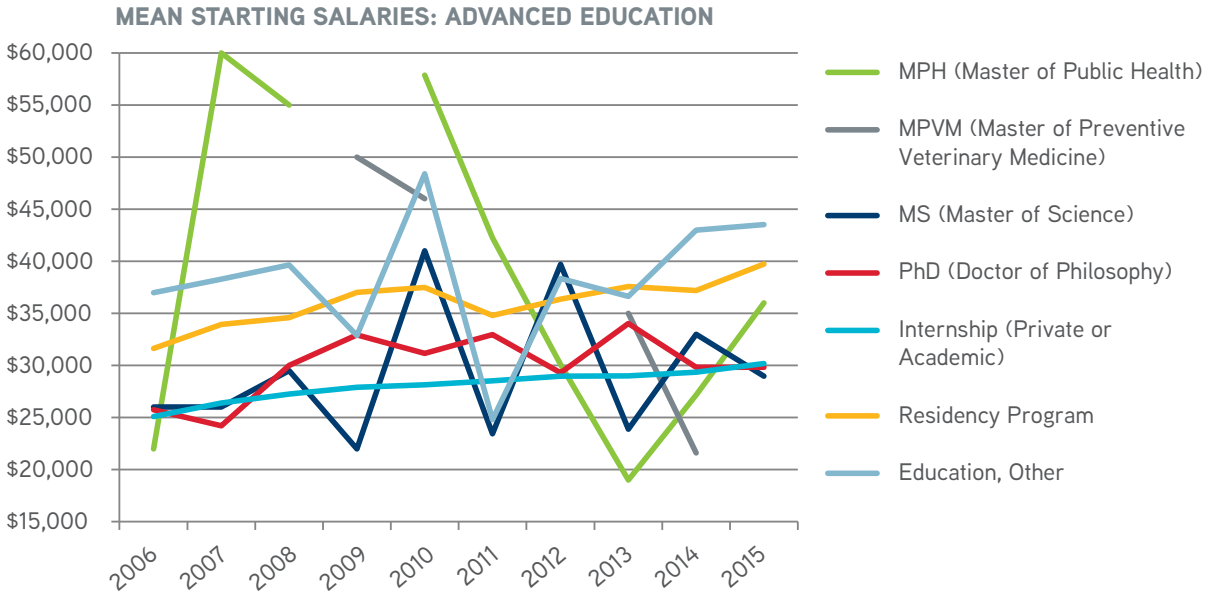


Figure 20

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.

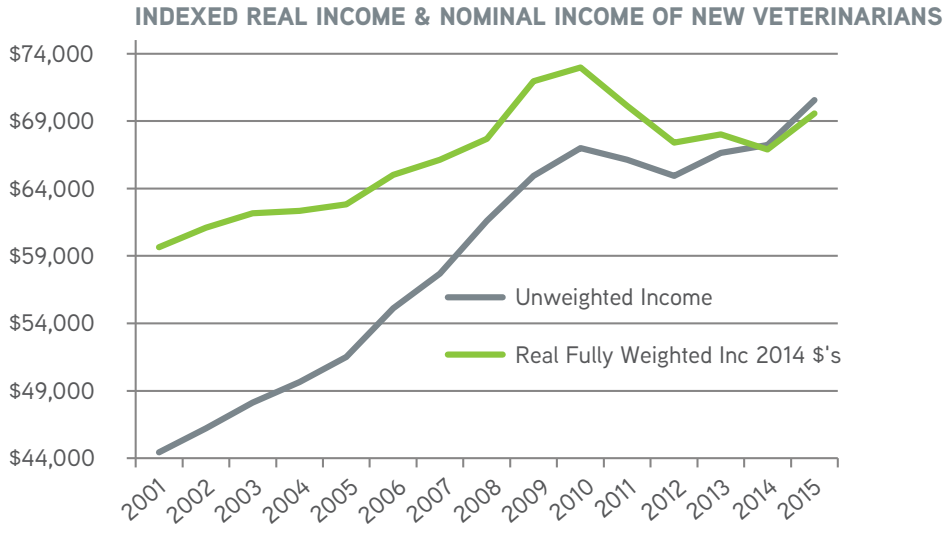


Figure 21

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).

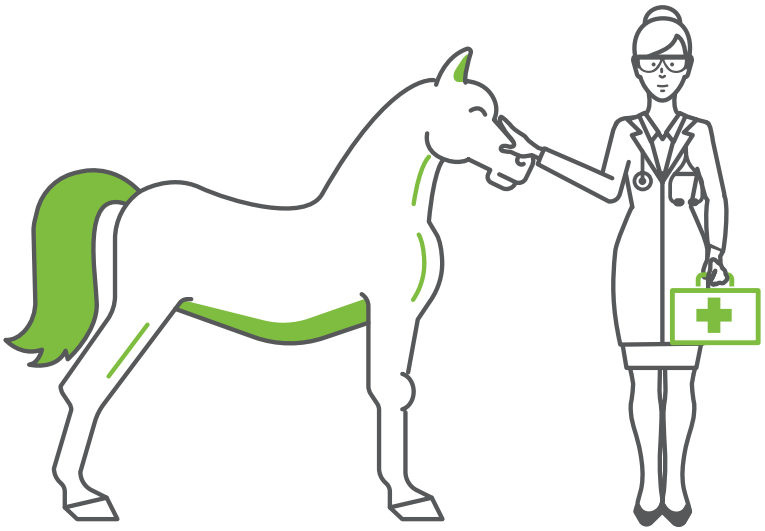
The final column labelled "sig" represents the significant variables. These values, also known as the p-values, are such that for a "sig" less than 0.05, the coefficient of "B" is statistically, significantly different from "0." For instance, for Region 4 the p value is 0.927; this means it is not statistically,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

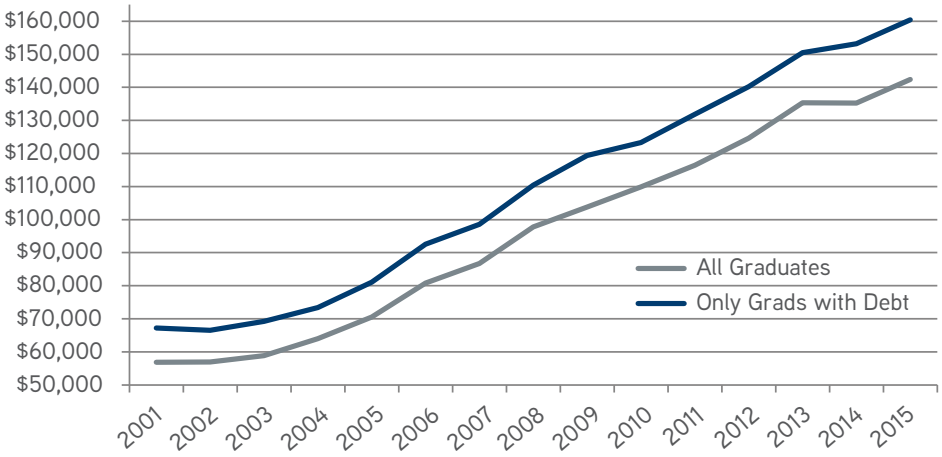


Figure 22

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

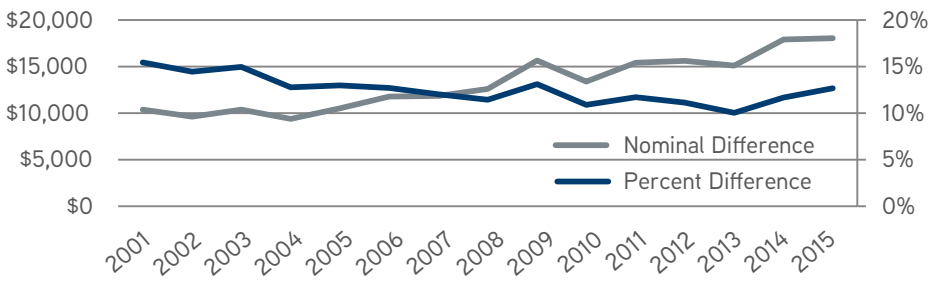


Figure 23

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

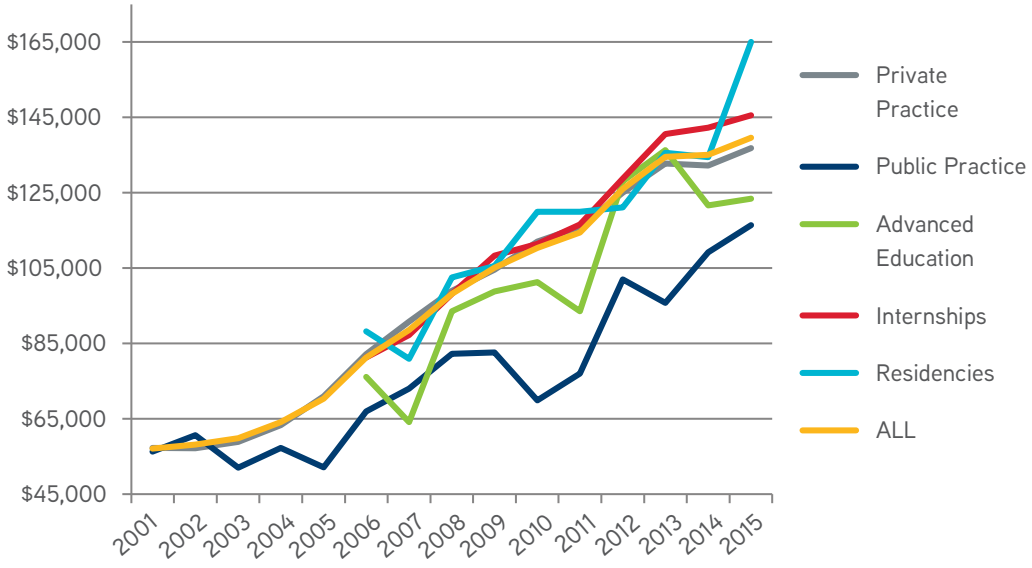


Figure 24

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.

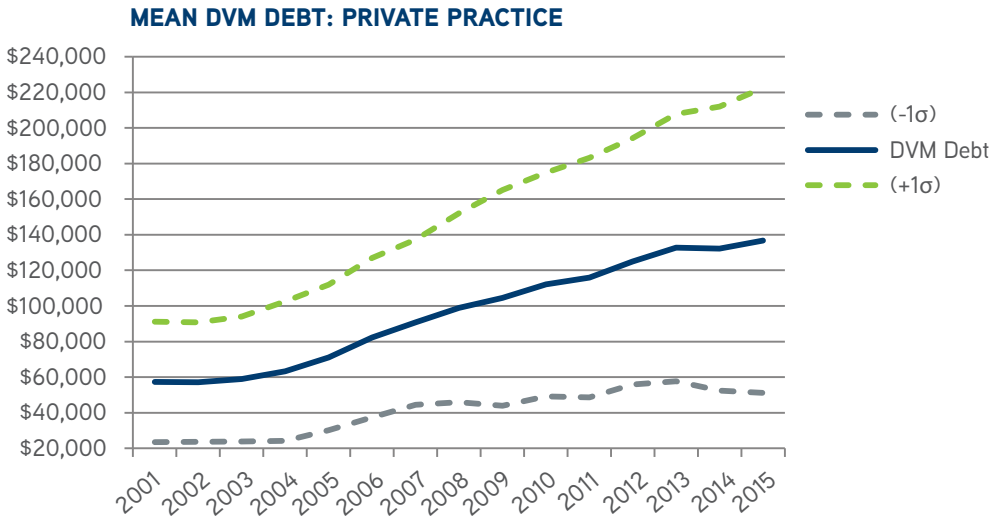


Figure 25

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.

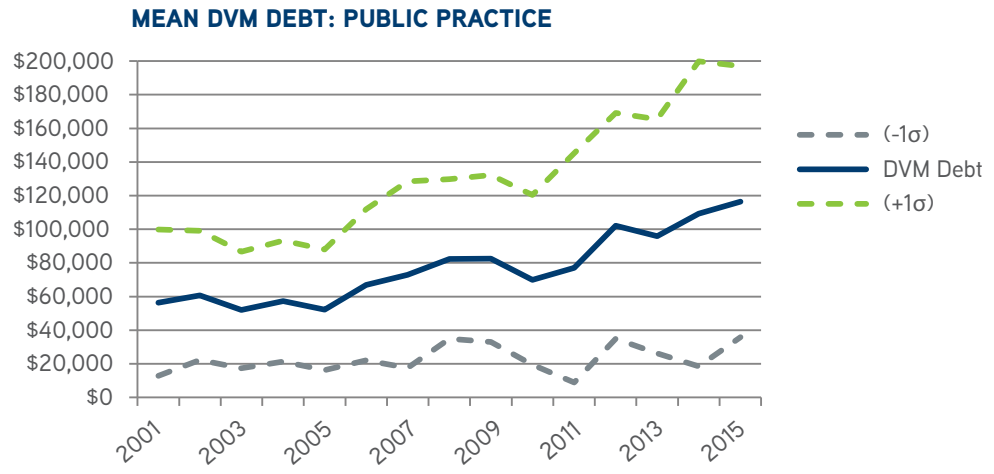


Figure 26

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.

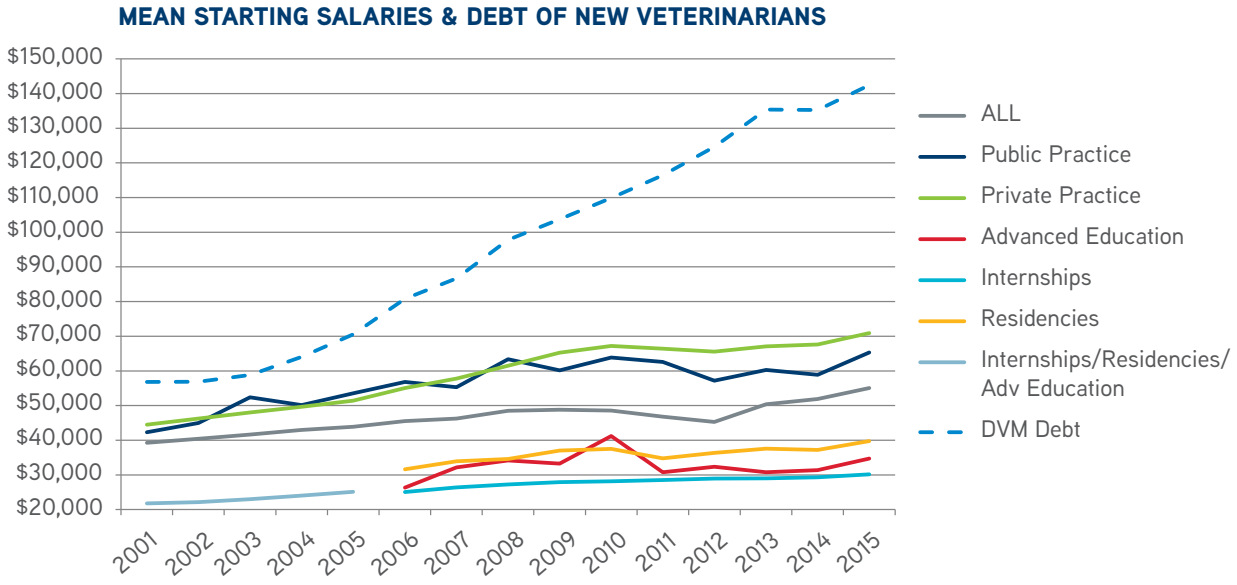


Figure 27

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.

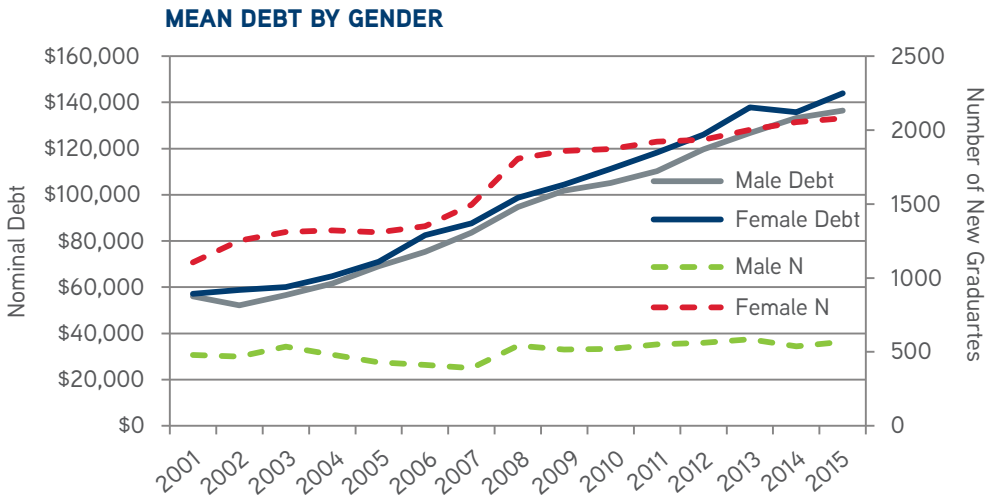


Figure 28

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

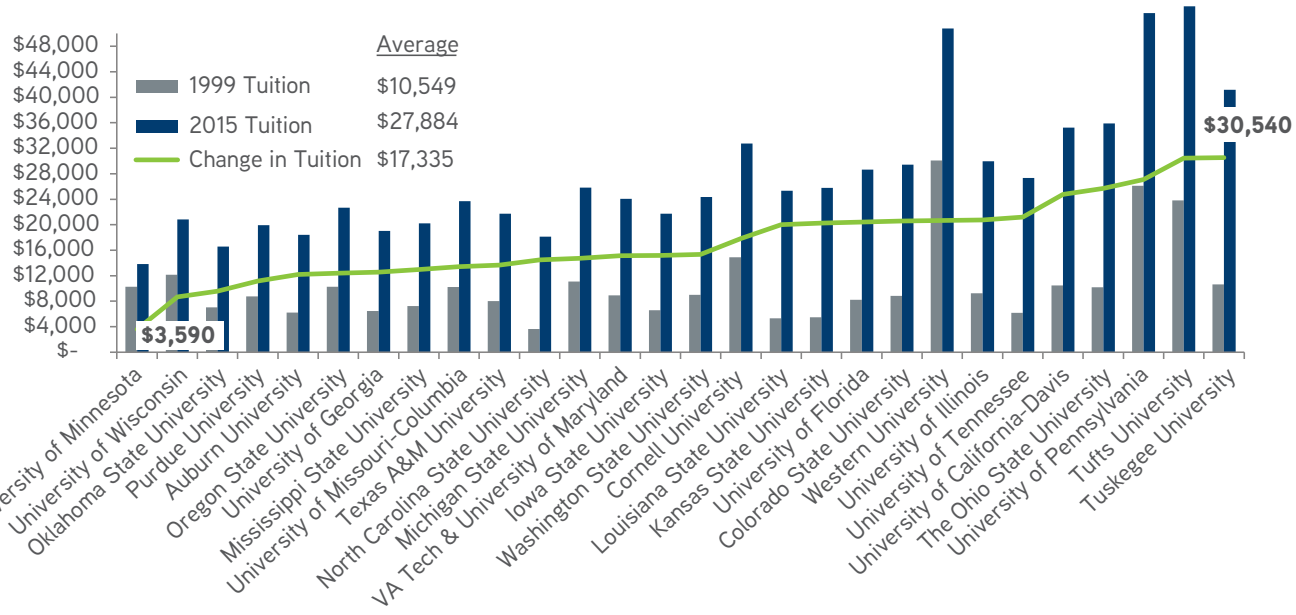


Figure 29

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.

RESIDENT AND NON-RESIDENT DEBT

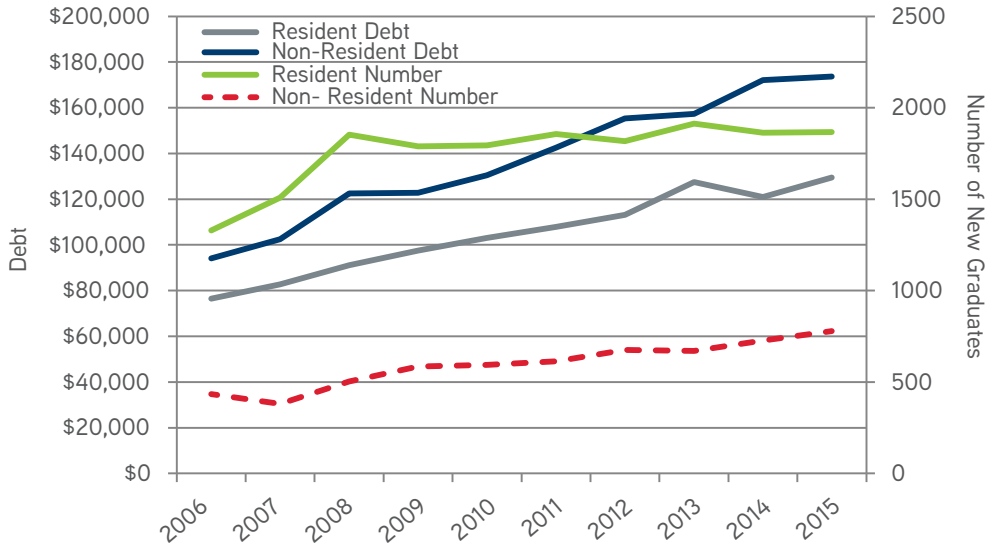


Figure 30

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.

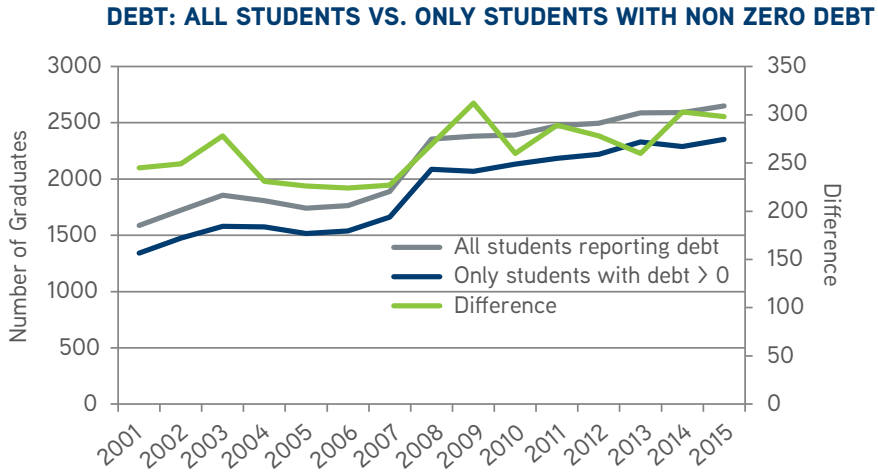


Figure 31

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

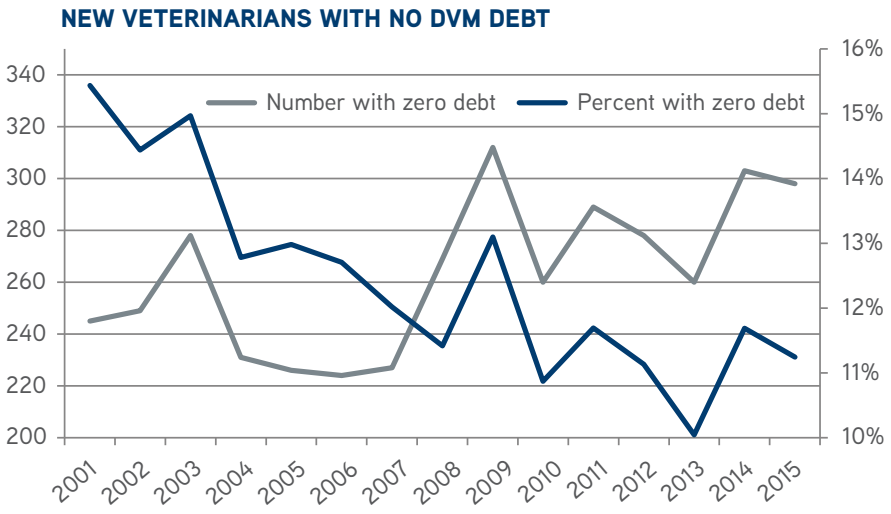


Figure 32

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

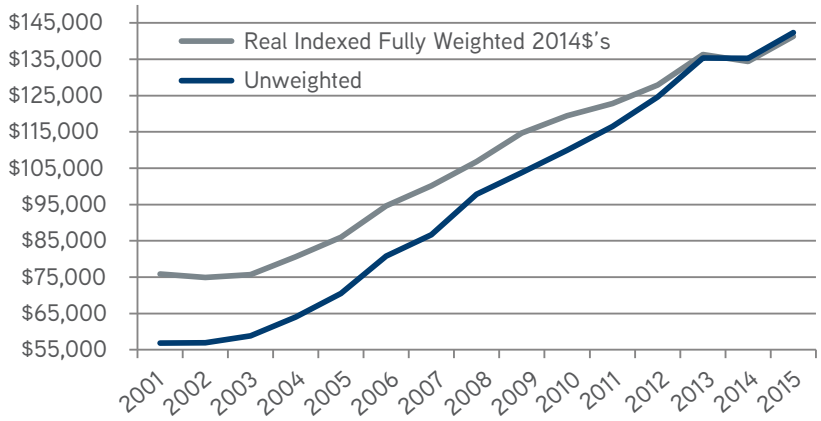


Figure 33

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 tuition 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.

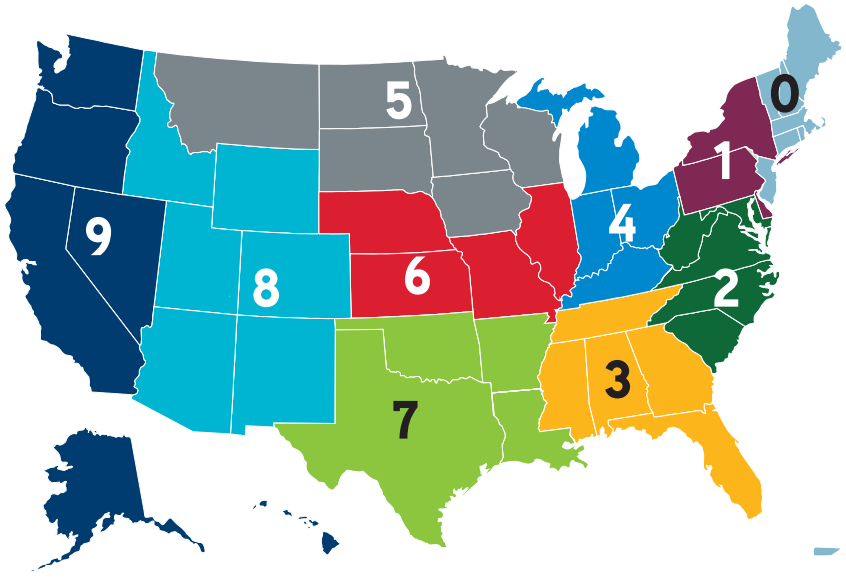
According to our regression model, new veterinarians graduating from schools in Region 6 had $8,604 more debt than new veterinarians graduating from schools in Region 3, and new veterinarians graduating from schools with "pricey tuition" had $66,793 more debt than those graduating from schools with "low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

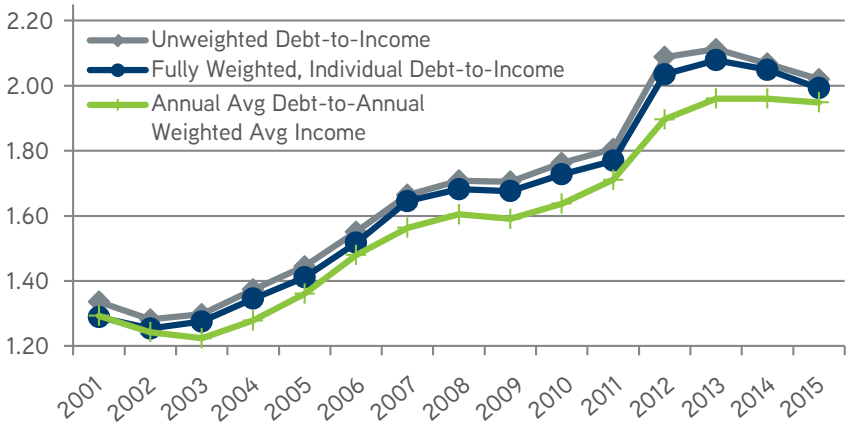


Figure 34

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

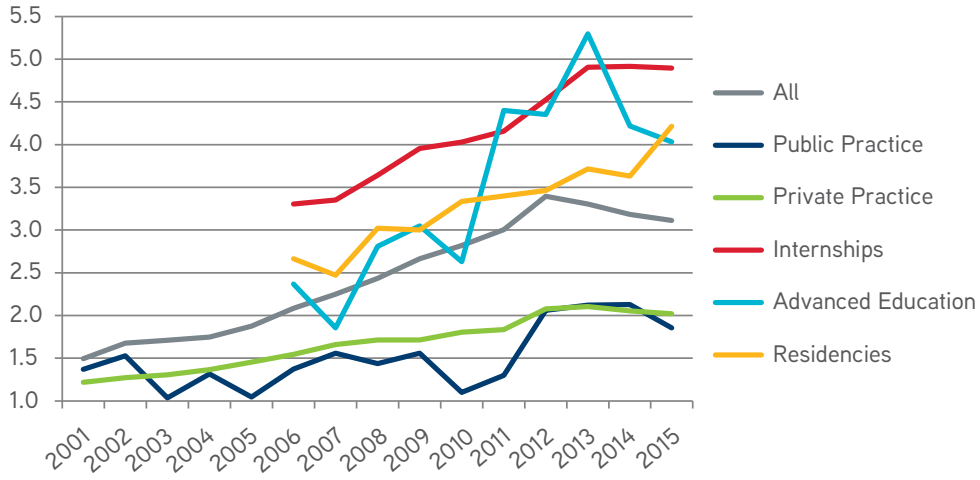


Figure 35

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.

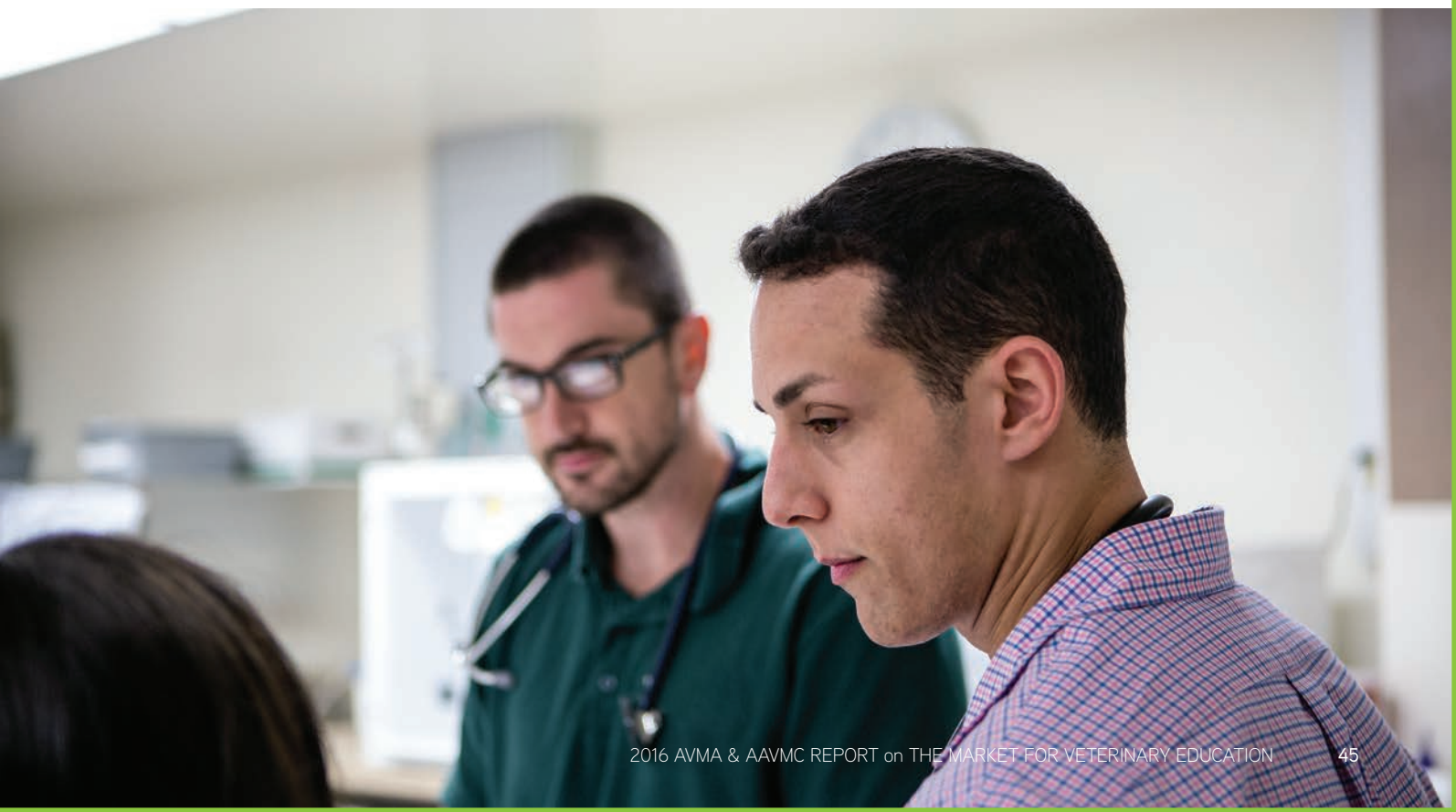
As a baseline for comparison with the other variables in the respective groups, Texas A & M University (the university with the lowest mean debt, by school) and companion animal exclusive (the most populated sector for full-time employment) were omitted from the model.

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		
		B	Std. Error	Beta	t	Sig.
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		
		B	Std. Error	Beta	t	Sig.
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.

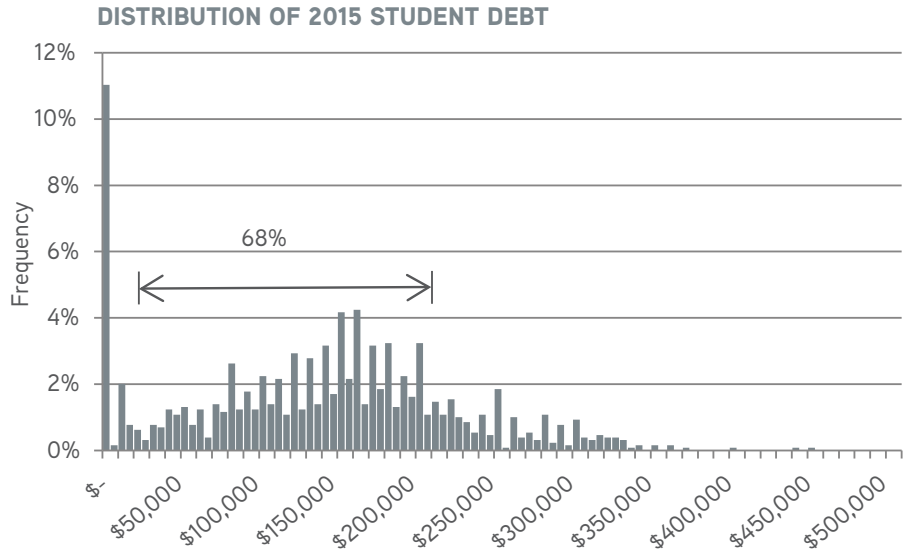


Figure 36

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.

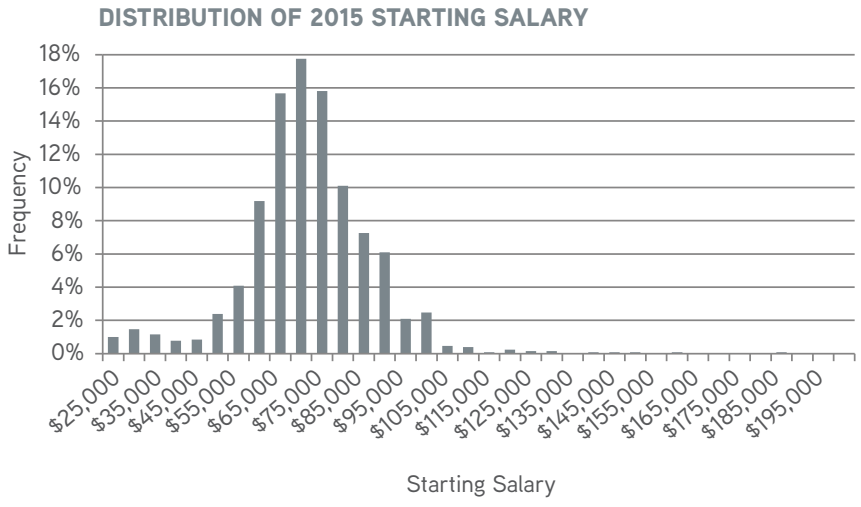


Figure 37

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.

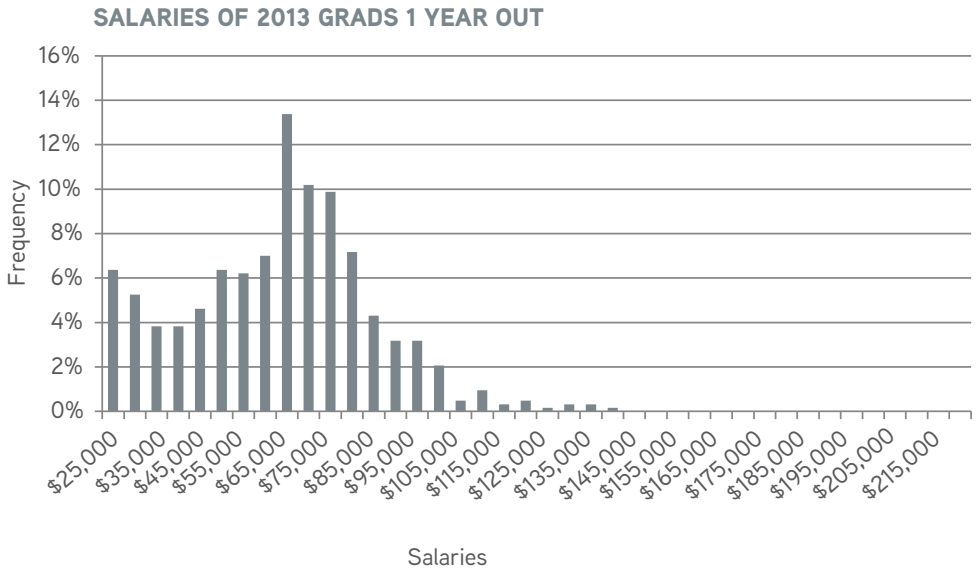


Figure 38

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.

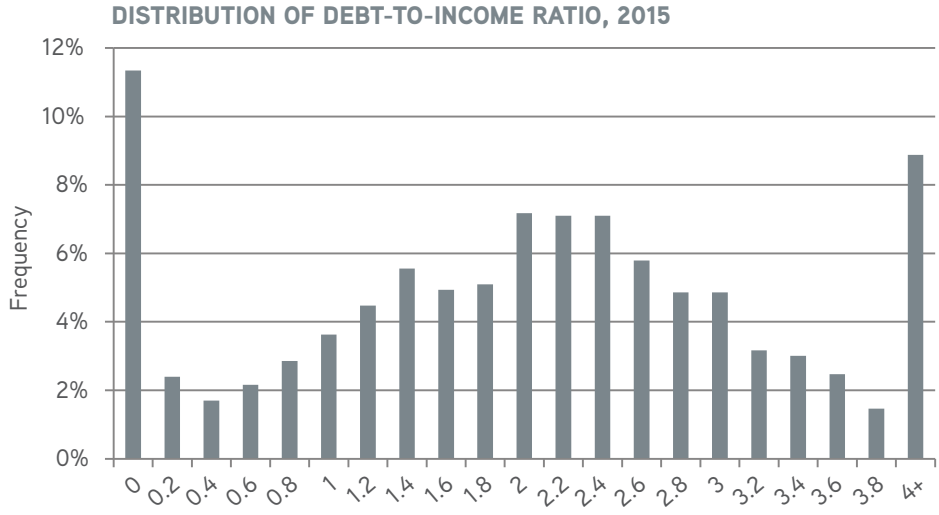


Figure 39

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.

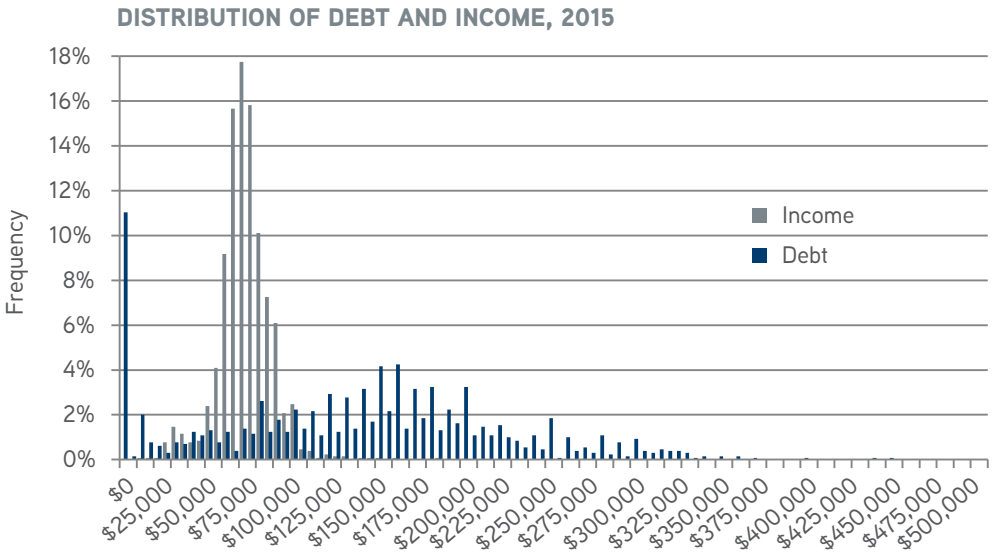


Figure 40

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.

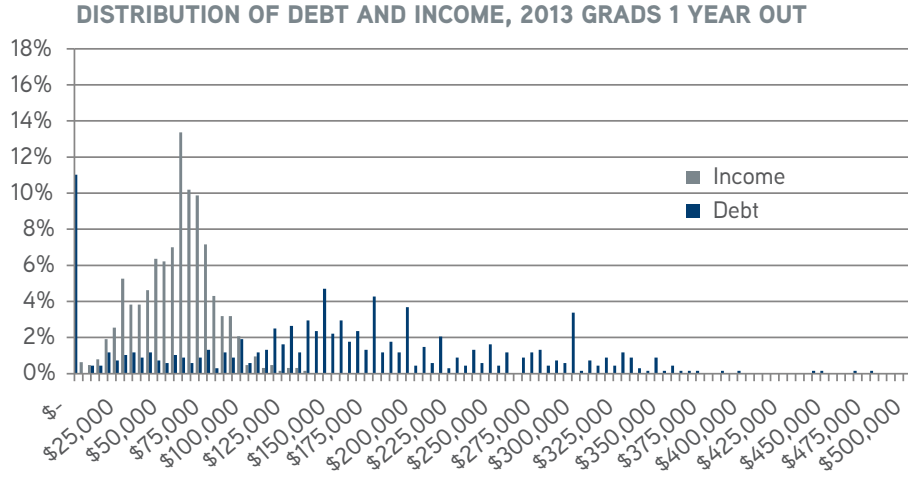


Figure 41

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.

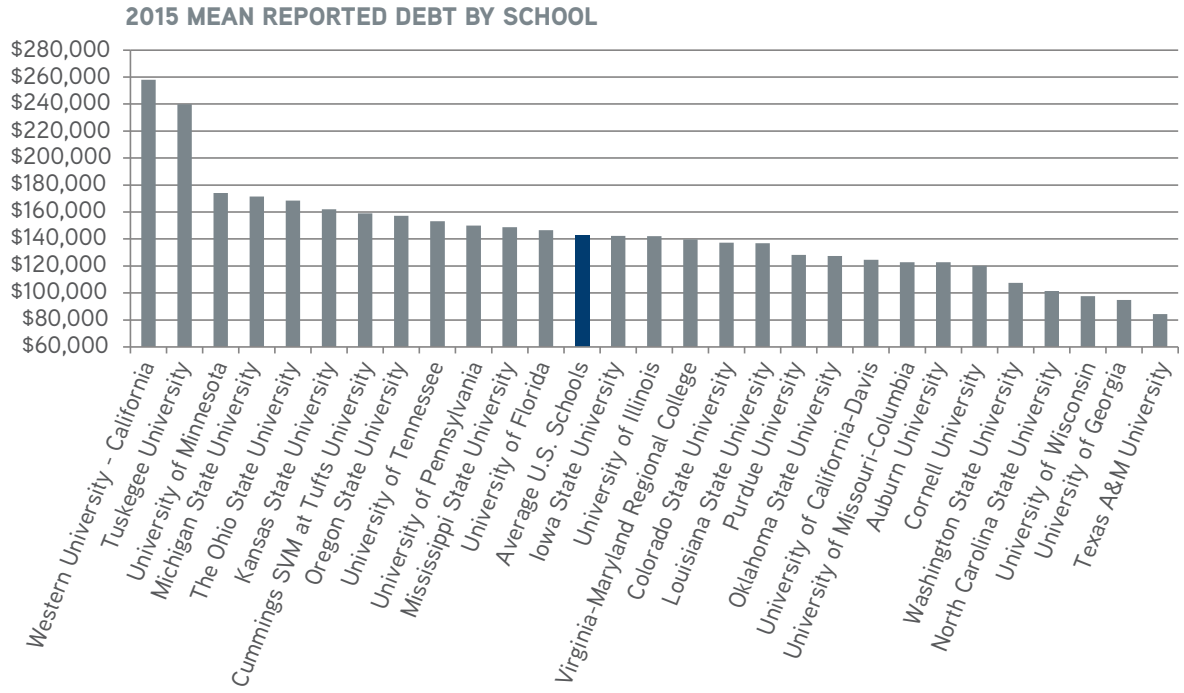


Figure 42

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.

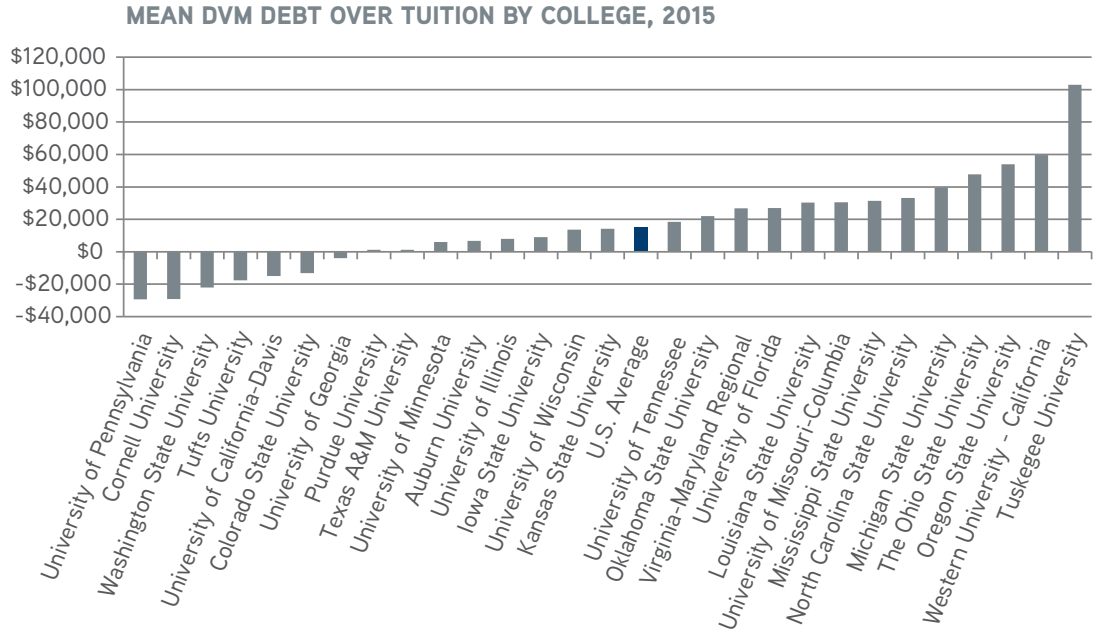


Figure 43

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.

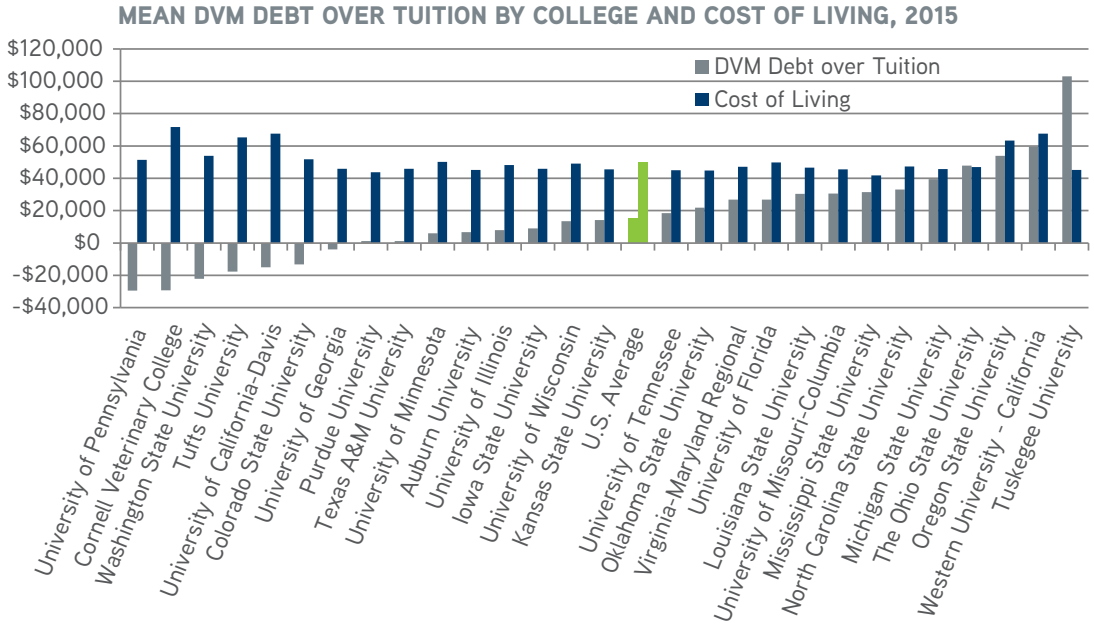


Figure 44

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 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 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.

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

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

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

IMPROVING THE DEBT-TO-INCOME RATIO

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

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

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

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

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

HISTORICAL PERSPECTIVE

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

The growth in tuition occurred during and just after the recessions of 2001 and 2008, as state and federal legislators cut taxes to stimulate the economy and reduced public support of colleges both in response to declining budgets and shifting priorities. The result of the reduced public support was the increasing share of the total cost that was paid by students as indicated below. It must be noted that during each recession federal and state budgets were cut or held constant in nominal dollars and thus public education, which is a large share of most state budgets, had to be cut. But during the economic expansions following each recession, education budgets rarely returned to where they had been prior to the recession. The result was the step increase in the percent of public higher education that tuition accounted for, each step up resulting from the recession that occurred before it.

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

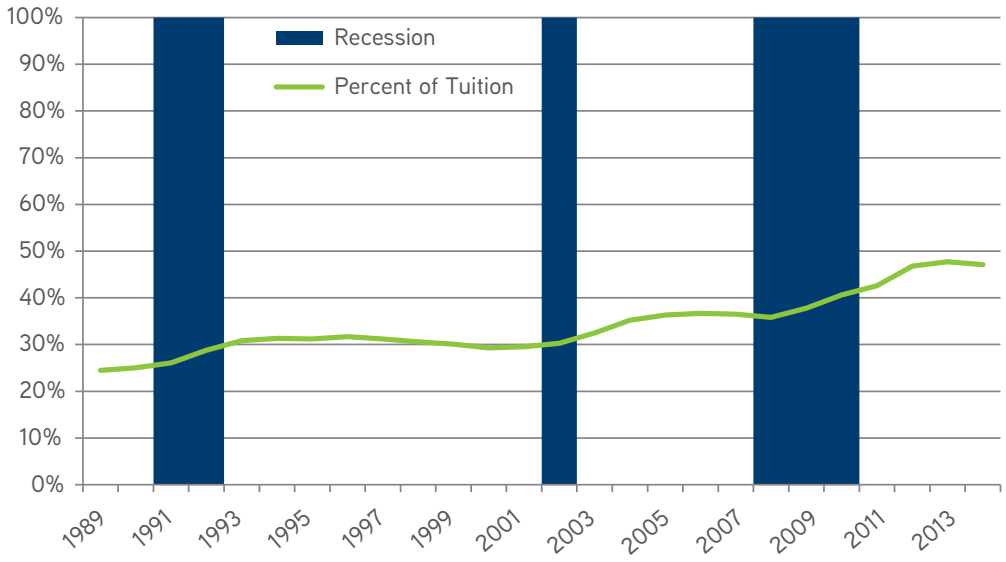


Figure 45

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

A deeper look at the budgets of the universities finds that growth in professional staff between 2001 and 2011 occurred at a rate of 37.1 percent for all higher education institutions, but only at a rate of 26.2 percent for public institutions. At the same time, there has been an overall decline in nonprofessional staff at both institutions of higher education and public institutions. Faculty has been the main component of increased staffing, adding over 400,000 positions, while roughly 250,000 other professionals have been added. The increasing number of graduate assistants and other professionals may well reflect the growing trend for non-tenure track teaching and research positions, and the need for professional services to manage federal and state reporting requirements.

DISTRIBUTION OF FACULTY AT UNIVERSITIES

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

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

Table 9

During the 2001 to 2011 time period, employment growth in private institutions occurred at a faster rate than that for public institutions of higher education. Non-professional staff saw greater reduction in the public versus the private institutions. A major component of the reduction in non-professional staff was the reduction in clerical and secretarial staff at the public institutions. The reduced clerical and secretarial staff resulted from the adoption of improved communication and word processing technology, and the transfer of some duties to professional staff.

DISTRIBUTION OF FACULTY AT PUBLIC INSTITUTIONS

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

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

Table 10

Over the period from 2001 to 2011, the full-time equivalent enrollment increased from just fewer than 16 million to nearly 21 million students, a 32 percent increase. During the same period, professional and non-professional staff increased from just over 3 million to roughly 3.8 million, a 24.6 percent increase. The combination of increasing students and increased staff led to an increasing student-to-staff ratio of 5.2:1 to 5.5:1, with the number of students to faculty falling from 14.3:1 to 13:8 to 1.

DISTRIBUTION OF FACULTY AND TOTAL STUDENTS

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

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

Table 11

In real dollars, annual tuition costs actually fell between 2001 and 2014, from $12,664 to $12,266 per student as the real dollar value of state support for public higher education fell from $86 billion to $77 billion.

REVENUES AND STATE SUPPORT

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

Table 12

In many institutions, the protection of undergraduates from tuition and fee increases as a matter of political necessity shifted more of the burden for off-setting declining public revenues and increasing cost to the graduate and professional programs. The only source of revenue that was available to these programs was tuition and fees, and this could be gained through raising the price of a seat or increasing the number of seats without increasing staff or fixed expenses. While the colleges have continually been admonished by members of the veterinary profession for increasing the number of seats, failure to have done so would have driven the costs of seats considerably higher.

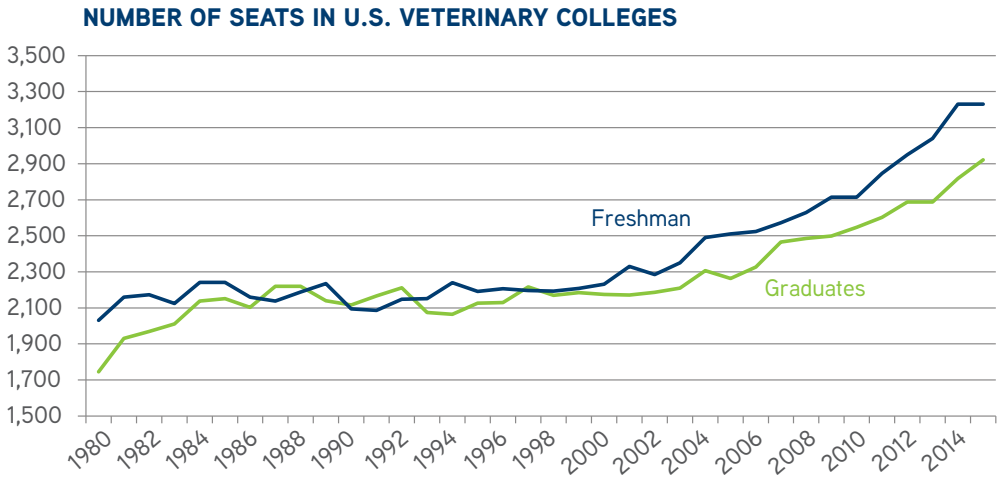


Figure 46

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

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

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

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

SETTING A NEW TARGET

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

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

DEBT-TO-INCOME RATIO

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

Table 13

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

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

TOTAL COST-TO-INCOME RATIO

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

Table 14

There is no method, using only the survey responses, to determine the accuracy of the reported debt values, whether the values include interest charges, when debts were incurred, or the value of interest charges that would have accumulated (what year or semester the costs were incurred). The interest charges can be estimated, assuming that the total costs were distributed over the total number of semesters and a 7.0 percent interest rate was charged. The total interest payments that would have accumulated with full payment of tuition and living expenses are computed for the veterinary college education provided at each college for discounted and non-discounted seats. The following table provides the ratio of total cost to income assuming the interest charges are included as part of the costs.

TOTAL COST PLUS INTEREST-TO-INCOME RATIO

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

Table 15

The tables above can be combined to provide an indication of how well students have been able to keep debt below costs. That is, have they had some method of ensuring that they keep a lid on expenses such that the amount of debt that they accumulate while in veterinary college is less than the total cost of attending? This should not be used as an indicator of the students' ability to manage their finances, but rather an indication of the ability of the students to draw upon other sources of income or be frugal in managing their finances.

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

TOTAL COST PLUS INTEREST/INCOME

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

Table 16

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

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

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

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

Table 17

We can apply the same criteria to all students that reported debt, inclusive of those that did not report having taken a full-time employment opportunity prior to graduation (2,661 of 3,018). There remain 11 colleges that exceed the national average percent of students with excessive debt, but two schools moved their position relative to the national average, Ohio State University and Tuskegee. On the basis of all students reporting debt, the percent of Ohio State students with excessive debt is now larger than the national average; while Tuskegee now has less than the national average percent of students with excessive debt. Using all students reporting debt, we found that 273 out of 2,661 (10.3 percent) students had excessive debt. That is, these 273 students had more debt than was estimated for the cost from tuition and fees, living expenses and interest charges. The total amount of excessive debt was $9,181,367.99.

DEBT BELOW AND ABOVE TOTAL COST PLUS INTEREST

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

Table 18

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

Total debt for the 2015 graduates from the U.S. Veterinary colleges was estimated at $427,502,116. The estimate of the total cost of tuition and fees for 2015 is $382,559,375, with another $240,623,655 in estimated living expenses for a total estimated cost of $623,183,030 for all of the 3,018 U.S. veterinary college graduates in 2015. The interest expense for borrowing these funds would have been an additional $81,924,168, bringing the total cost of the education to $705,107,198. However, students applied various outside sources of funds to pay for some or all of these expenses and thus total debt was only 61 percent of total cost. This total debt can be partitioned as $396,300,563 for tuition and living expenses, $22,020,185 in interest expenses and $9,181,368 from all expenditures beyond what was necessary to meet the costs of tuition, living expenses and interest.

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

1. **ELIMINATE THE INTEREST ON STUDENT LOANS WHILE THE STUDENT IS IN SCHOOL.**
   Savings of $22,020,185 and a reduction to 1.89 in the Debt-to-Income ratio.

2. **ELIMINATE THE EXCESSIVE DEBT OF STUDENTS THROUGH BETTER MANAGEMENT OF EXPENDITURES.**
   SAVINGS OF $9,181,368 AND A REDUCTION TO 1.95 IN THE DEBT-TO-INCOME RATIO.

3. **REDUCE EDUCATION OUTLAYS OF STUDENTS BY 10 PERCENT.**
   SAVINGS OF $39,630,056 AND A REDUCTION TO 1.79 IN THE DEBT-TO-INCOME RATIO.

4. **INCREASE STARTING SALARIES BY 10 PERCENT.**
   INCREASE REVENUE $21,482,518.38 AND A REDUCTION TO 1.81 IN THE DEBT-TO-INCOME RATIO.

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

STRATEGIES TO REACH THE GOAL

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

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

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

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

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

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

THE GENERAL PUBLIC STRATEGIES

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

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

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

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

VETERINARY COLLEGE APPLICANT AND STUDENT STRATEGIES

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

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

2. Increase the awareness of the cost of veterinary education

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

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

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

VETERINARY COLLEGE STRATEGIES

1. Institutionalize a connection between the education and veterinary markets

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

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

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

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

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

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

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

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

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

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

6. Economies of size and/or specialization of schools

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

7. Veterinary graduate readiness/confidence improvement

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

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.

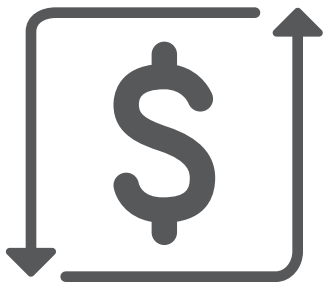
2. Enhance the demand for Veterinarians

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.

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.



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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THE AVMA 2016 ECONOMIC REPORTS INCLUDE:

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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.

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2016 AVMA Report on

THE MARKET FOR VETERINARIANS

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Body Condition System

2016 AVMA Report on
THE MARKET FOR VETERINARIANS

Veterinary Economics Division
American Veterinary Medical Association
October 2016

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SUMMARY

The market for veterinarians is the market of convergence between the market for veterinary education and the market for veterinary services. In this market, the equilibrium price and quantity in the market for veterinary services collides with the price and quantity equilibrium from the market for veterinary education. The number of veterinarians produced by veterinary colleges at a specific cost per veterinarian confront an income offer derived by the willingness of animal owners to purchase veterinary services from veterinary hospitals. While all three of these markets will rarely, if ever, have equilibriums that are in alignment, the markets should tend to induce resources to move in the direction of the equilibrium prices and quantities. That is, in each of the markets, there should be a movement of resources to produce a quantity of output that just meets demand at a price that is acceptable to both consumers and producers.

We estimate that in 2015 there were a total of roughly 105,000 veterinarians that were actively engaged in the profession in public or private practice, and roughly 15,000 veterinary students training to become veterinarians. The largest segment of the profession is engaged to provide medical services to animals in private and corporate practices. Of these practices, companion animal practices employed the largest number of veterinarians, followed by food animal, equine and mixed animal practices. In public practice, colleges and universities employee the most veterinarians, followed by industry and state and local governments.

The national market for veterinarians remains robust for the second straight year. The single largest source of this improvement has been the growth in the U.S. economy. The market for veterinarians has witnessed the second straight year of low unemployment, negative underemployment, applicant-to-jobs ratios of one or less, and increasing mean salaries. But the market may not be robust in every locality or in every practice type. To the extent that veterinarians are mobile both in location and practice type, the differences in the market that occur as a result of maldistribution should be self-correcting: lower-income, unemployed or underemployed veterinarians should seek higher-paying employment opportunities. To the extent that mobility is constrained as a result of licenses, experience, technical skills, living costs and/or family situations, the variation in incomes will persist.

In 2015, unemployment remained below the national average and was not significantly different from 2014. Several factors were found to be statistically significantly correlated with a higher probability of being employed, including being a graduate from three U.S. colleges of veterinary medicine (University of California-Davis, Colorado State University and University of Georgia). Being board certified or in regions 1, 2, 3 and 5 also are highly correlated with a higher probability of being employed. The only statistically significant factor that was correlated with higher unemployment in 2015 was having additional degrees.

Underemployment was again negative in 2015, with more veterinarians indicating they wish to work fewer hours for less compensation than those that wish to work additional hours for more compensation. The total number of veterinarians that would be required to eliminate the negative underemployment was 1,833 if each were to work 40 hours per week. Of course the indivisibility of labor makes eliminating the negative underemployment difficult, as few veterinarians will wish to work the 5-10 hours per week in several practices that would be required because underemployment, both positive and negative, occurs in small numbers of hours distributed throughout the nation and practice types.

The ability of markets to adjust depends on information. Veterinarians will not relocate or change career paths without knowledge of the benefits that may be accrued as a result of the move. For this reason, the AVMA's Veterinary Economics Division is providing "salary calculators," tools that provide the

relative importance of various demographic factors in determining veterinary incomes. Of course these are mean incomes and there is still a great deal of variation in income not accounted for by the factors in the model. Some of these factors are unique to the individual, such as personality, lifestyle and energy level. To the extent that the constraints to mobility allow, the availability of this information to the profession should reduce the income difference between veterinarians over time and also reduce the time required for those changes to occur.

The Debt-to-Income Ratio (DIR) reported in the 2016 AVMA Report on the Market for Veterinary Education provides a Key Performance Indicator for the efficiency with which the markets for veterinary education and veterinarians interact to guide resources to their best use. A high DIR would suggest that the market for education is out of alignment with the market for veterinarians. The demand for veterinarians is insufficient to provide a price (income) that enables veterinary graduates to easily service the debt (cost of education). The high DIR is sending a signal to the veterinary education market that colleges should reduce the cost of education, and that veterinary applicants should reduce the demand for veterinary education. The signal to the market for veterinary services to practice owners is to lower the cost of veterinary services and to users of veterinary services to pay more practices to increase the demand for services.

The Net Present Value (NPV) presented in this report is a Key Performance Indicator for the efficiency with which the markets for veterinarians and veterinary services interact to guide resources to their best use. A low NPV would suggest that the market for veterinarians is out of alignment with the market for veterinary services. The demand for veterinary services is insufficient to provide income to veterinarians at a level that would provide a normal economic return (cover variable and fixed costs and produce a return on investment equivalent to those found in similar markets). The low NPV is sending a signal to the market for veterinarians: for veterinarians to move to higher-valued employment opportunities and for veterinary employers to expand markets or lower costs to increase veterinary compensation.

The NPV reported on here is computed with a specific formulation and set of assumptions. Changes to the formulation or set of assumptions will change the NPV. Thus, the actual value is less important than the year-to-year change in the value and the relative importance of the factors that cause this change. One of the most important assumptions of NPV is the opportunity cost: the income earning potential that was given up to become a veterinarian. This opportunity cost is the earning path that would have occurred had the individual not become a veterinarian, and we have used the earning path of the average bachelor's of science recipient as a proxy for this opportunity cost. Because men and women veterinarians have demonstrated different earnings paths over their careers, and those same differences do not occur between men and women with bachelor's degrees, the opportunity cost for men to become veterinarians is higher than for women and this lowers the NPV for men relative to women. As the NPV formulation is based on historic data, its value as a predictive tool is only useful if the future resembles the past with respect to earnings paths.

Finally, the report illustrates a new research thrust of AVMA's Veterinary Economics Division to begin to look more closely at the potential differences in local compared to national market conditions. This report provides results of an analysis of veterinarians in Indiana, and next year we will provide the results for Arizona, Colorado, Texas, bovine practices, equine practices and a segment of specialists, the lab animal practitioners. Workforce characteristics in Indiana and the U.S. are compared, and the value of the veterinary services sector to the Indiana economy is computed.

INTRODUCTION

The market for veterinarians may be thought of as the market for veterinarian labor. As such, this market is linked to other labor markets as veterinarians compete with many other professionals for employment opportunities not directly involved in the care of animals. The largest markets for veterinarians are those of private practice (e.g., companion animal, food animal, equine and mixed animal), comprising roughly three-quarters of all active veterinarians. Other markets, such as education, research, industry, government, non-profits, banking and consulting, employ the remaining quarter of all active veterinarians.

Markets that employ veterinarians are "linked" through the prices paid for veterinary labor. Theoretically, over time, as the price of labor in one market rises compared to another, more labor will be drawn to the higher-priced market. This movement in labor from the lower-priced to higher-priced market continues until the supply-demand ratio in both markets is no longer differentiable and thus the price in both markets eventually becomes similar.

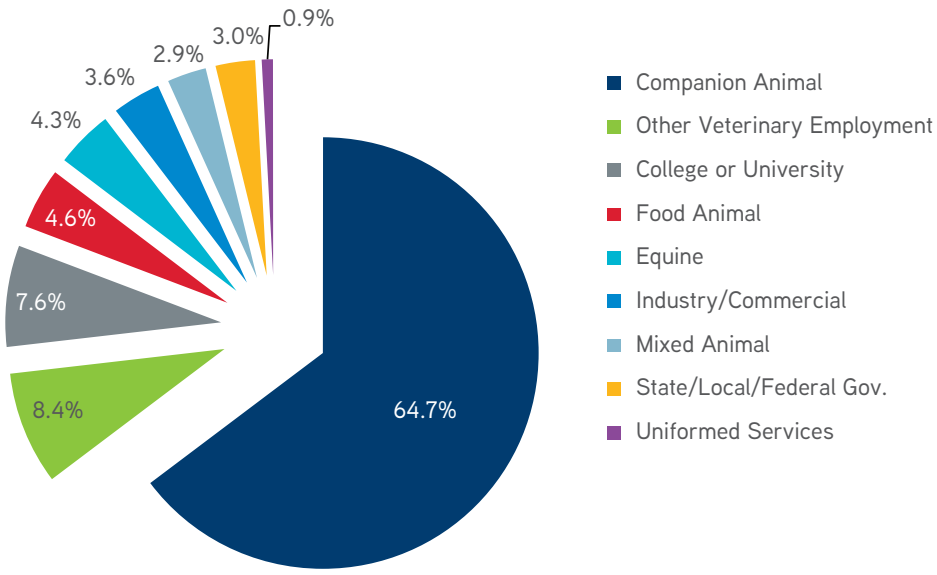
This process of labor resource allocation and reallocation, in reality, is constrained by the process of selecting applicants for veterinary education, the training received by the veterinary student, and the specialized experiences gained in practice.

In addition, not every potential applicant will be willing to use their veterinary skills to maximize their earning potential in the highest-paying employment opportunity. Every individual will weigh the tangible benefits of employment (compensation and benefits) with the intangibles (e.g., location, type of practice and duties). Some differences in compensation found between practice types and location may be due to the weighting of intangibles versus tangibles by veterinarians and thus reallocation of labor may not occur based only on differences in compensation (controlling for living costs).

Some students have focused on obtaining the education for a specific type of veterinary practice that makes mobility between types of practice difficult, and active veterinarians that have been in practice have acquired specific skills that may not be needed in alternative markets and thus not compensated. Specialized skills, degrees and certifications required for employment act as barriers to entry, reducing the supply of labor and increasing the price of that labor.

All of these factors affect the incomes of new graduates and experienced veterinarians. We have provided the analysis of these factors to demonstrate the relative impacts of each on the variation in incomes between veterinarians.

VETERINARY POPULATION, 2015



Estimated number of veterinarians as of December 31, 2015: 105,358

Figure 1

One of the major factors that affects the demand for veterinarians is the demand for veterinary services. A greater demand for veterinary services will create a greater demand for veterinarians. And, with a greater demand for veterinarians relative to the supply of veterinarians, income levels will be higher. Because the demand for veterinary services depends on the number of animal owners, the incomes of those owners and the effect of the economy on those incomes, the demand for veterinarians, as well as the level of veterinarian incomes, will grow as the economy grows.

The market for veterinarian labor is connected through price to all other labor markets. Increases in the demand for veterinarians, in theory, should move in the same direction as the national level of demand for labor. As the demand for goods and services throughout the economy increases, firms will hire new labor to produce the new output needed to meet this demand. The number of jobs (people employed) will rise, and unemployment will fall. Thus, national employment estimates from the Bureau of Labor Statistics provide a good indicator for what may be happening in the market for veterinarians.

The Conference Board provides an indicator of the job market through their Help Wanted Online (HWOL) Data Series. The Conference Board is a global independent business membership and research association working in the public interest. "The Conference Board HWOL was first published in July 2005 and provides data on online advertised job demand. HWOL fills a critical gap in the current U.S. economic indicators by providing timely monthly measures of labor demand (advertised vacancies) at the national, regional, state, and metropolitan area levels. These monthly measures are comparable in timing and geographic detail to the Bureau of Labor Statistics' (BLS) monthly measures of labor supply (unemployment) and employment. The Conference Board HWOL program is one of the earliest published monthly indicators of economic activity in the previous month with data publication centered around the first of each month. The program provides measures of levels and rates for both Total Online Ads and New Online Ads. The online vacancy program is one of the few indicators to provide extensive occupational detail with national estimates published at the major occupational group level and state and MSA estimates at higher-level aggregates" Conference Board (2016).

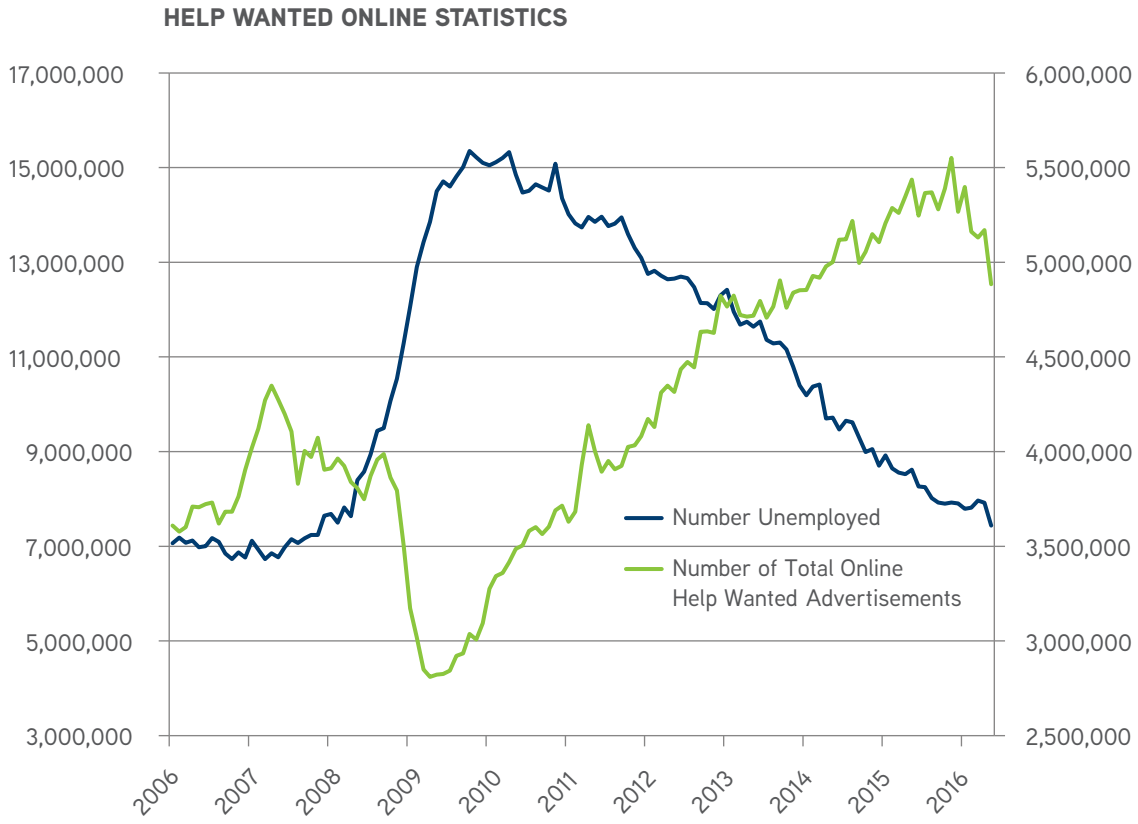


Figure 2

The HWOL series (labor demand), in combination with the BLS measure of unemployment (labor supply), provides an overall picture of the U.S. labor market. The HWOL job listings began to decline in 2007 and reached a bottom in early 2009. They had shown continued growth until the fall of 2015. The number of jobs posted nationally peaked in November of 2015 at just over 5.5 million and has declined since reaching a low of just under 4.9 million jobs posted in May of 2016. Unemployment mirrored the trend in the HWOL data. The low point for unemployment occurred at the same time that the posted jobs in HWOL hit a high. Unemployment then began to climb and reached a peak at the same time that the number of jobs posted online hit the low point. Unemployment has declined continually since 2009, hitting a low of just under 7.8 million in January of 2016. As noted in the 2016 AVMA Report on Veterinary Markets, these are important indications that the economy may have reached its zenith in the business cycle.

A simplified measure of the national labor markets is the supply/demand (S/D) ratio. The S/D ratio is the number of unemployed persons divided by the number of jobs posted online. The S/D ratio provides an indication of the general tightness of the national labor market and indicates the extent to which the national labor supply and demand is out of balance. At the height of the recession, there were more than five unemployed persons seeking each available employment opportunity. Relative scarcity of labor was very low, and wage growth suffered. The S/D ratio has fallen continuously since that high mark in 2009 and is now roughly 1.6:1. This suggests that there are three unemployed persons for every two employment opportunities and thus the relative scarcity of labor is quite high compared to what it was in 2009. The declining S/D ratio, or increasing labor scarcity, should create increasing pressure on wage growth.

While providing an overall indicator of the national aggregate labor market, the S/D ratio may vary considerably by occupation and geographic location. Over time, the S/D ratios across regions and occupations would begin to equilibrate (become similar) if individuals were equally mobile, had information on all employment opportunities and there were no barriers to entry into the various occupations. In practice, none of these conditions hold and thus the S/D ratio maintains differences between occupations and locations even though all may change over time. The table below provides the S/D ratio for the 10 top occupations by posted jobs and the associated mean hourly wage rate for two different periods. In June of 2013, the national S/D ratio was 2.45:1, and, as noted earlier, the national S/D ratio is now approximately 1.6:1. For some of the occupations listed below, such as "Food preparation and related," the S/D ratio declined between the two periods but remained above the national average. For "Computer and Mathematical Science" and "Management," the S/D ratio increased between the two periods but remained far below the national average.

The relationship between the wage rate and the S/D ratio and can be easily illustrated by plotting the wage rate of the various occupations against the S/D ratio of each occupation. As relative scarcity of labor in a specific market increases (S/D declines), the wage rate increases.

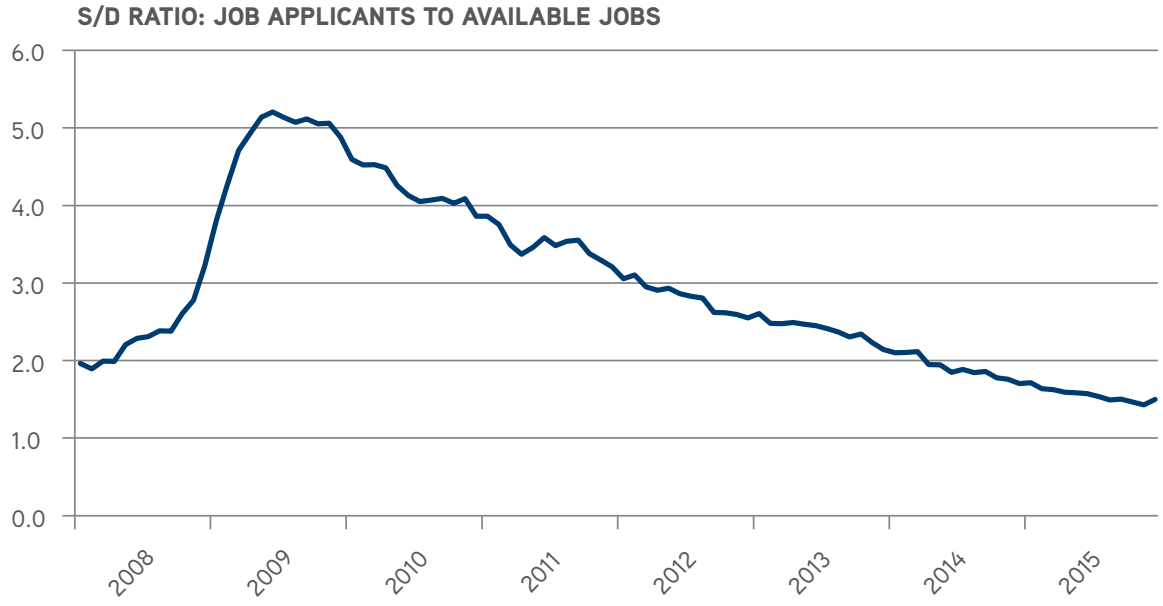


Figure 3

S/D RATIO AND WAGE RATES FOR HELP WANTED ONLINE, 2013 AND 2016

Occupation	June 2013 HWOL		May 2016 HWOL	
	Ratio	Mean Wage	Ratio	Mean Wage
Sales and Related	1.54	$18.37	1.29	$18.59
Computer and Mathematical Science	0.17	$39.43	0.21	$40.37
Office and Administrative Support	1.75	$16.78	1.72	$17.08
Healthcare Practitioners and Technical	0.44	$35.93	0.26	$36.54
Management	0.77	$53.15	0.83	$54.08
Transportation and Material Moving	1.72	$16.28	1.44	$16.57
Business and Financial Operations	0.87	$34.14	0.79	$34.81
Food Preparation and Serving Related	3.45	$10.38	2.58	$10.57
Installation, Maintenance, and Repair	0.94	$21.35	1.30	$21.74
Architecture and Engineering	0.57	$38.51	0.64	$39.19

Table 1

The veterinary profession or the veterinary occupation is one of the labor markets that comprise this national market. Within that veterinary occupation are various specializations (practice types) that have unique S/D ratios and thus create variations in mean incomes by practice type. The characteristics of the unique labor markets within the veterinary profession, as well as the aggregate labor market for the veterinary profession, are the focus of this report.

This report provides a measure of income and the information about the factors that may affect income. As noted in the discussion above, the S/D ratio, or relative scarcity of labor, affects the wage rate (income) and thus we examine the factors that may affect the supply and demand for veterinary labor. Those factors include; work hours, unemployment and underemployment, desire to increase or decrease working hours, job satisfaction, burn-out scores, general health and the analysis of expenditures. The report also provides forecasts of the most likely future paths of variables and key information surrounding the key performance indicator (KPI) for the market for veterinarians: Net Present Value of the DVM degree.

THE WAGE RATE AND S/D RATIO RELATIONSHIP

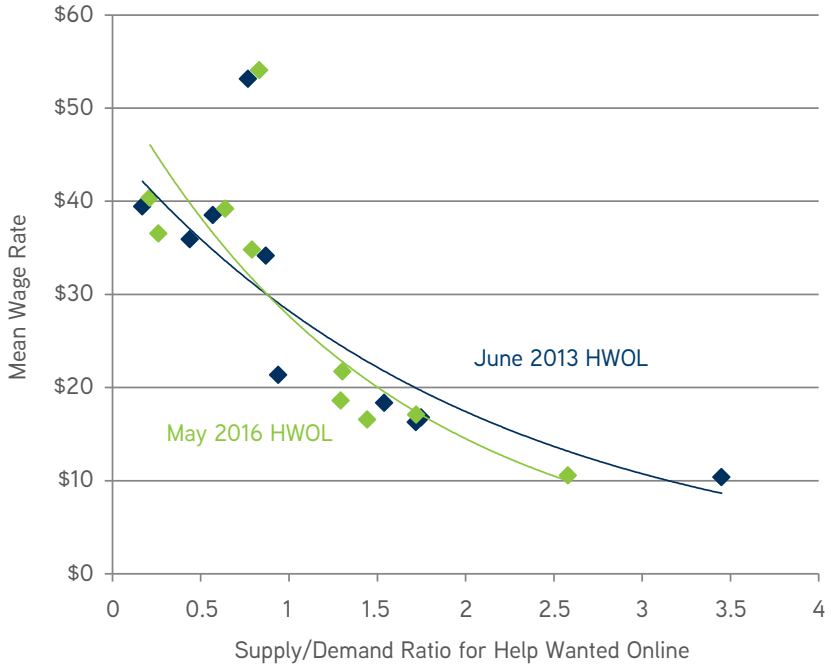


Figure 4

EMPLOYMENT

Because of the differences in distribution by practice type, region and gender, and between surveys, descriptive statistics for each survey must be weighted to reflect the change in the distribution of veterinarians across these factors to provide an accurate measure for each variable over time.

THE EMPLOYMENT AND COMPENSATION SURVEYS

In 2015 two AVMA surveys collected data on employment and income of U.S. veterinarians. The first survey, the Employment Survey, was initiated in 2014 with the purpose of quantifying unemployment and underemployment. The sample frame for the Employment Survey was drawn from the AVMA database of veterinarians that includes all graduates from U.S. veterinary schools; U.S. graduates from AVMA accredited foreign colleges; and any other veterinarian that has sought AVMA membership at any time in the past. The sample frame included AVMA members and non-members who graduated 1, 5, 10, 15 (only in the 2015 survey), and 25 years prior.

The second survey, the Veterinary Compensation Survey, formerly known as the Biennial Economic Survey, is conducted to gauge compensation trends within the veterinary profession. The sample frame is randomly drawn from all veterinarians for whom the AVMA has contact information.

The respondents to both surveys represented the distribution of veterinarians across the profession by practice type and region[2] generally, but there were not sufficient responses to provide detailed information for each practice type in each region.

The distribution of gender varies by survey and, again, generally represents a larger share of females in the profession compared to males.

[2] Region is identified by the first digit of the zip code. A map of the regions can be found on page 13 of the 2016 AVMA Report on the Veterinary Markets.

Because of the differences in distribution by practice type, region and gender, and between surveys, descriptive statistics for each survey must be weighted to reflect the change in the distribution of veterinarians across these factors to provide an accurate measure for each variable over time.

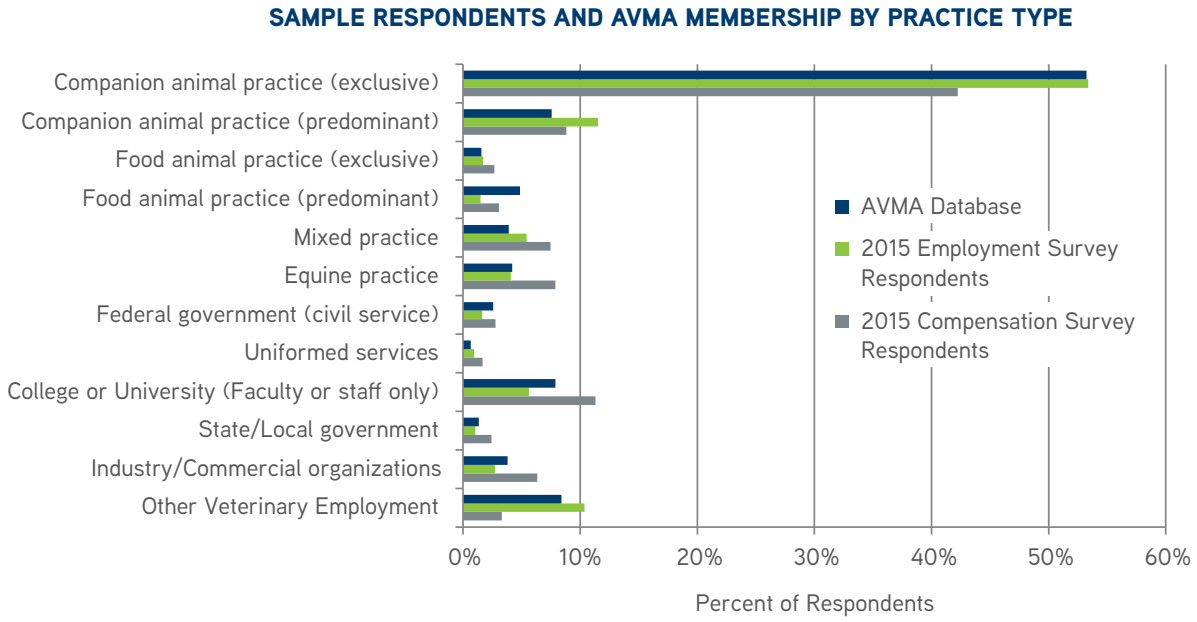


Figure 5

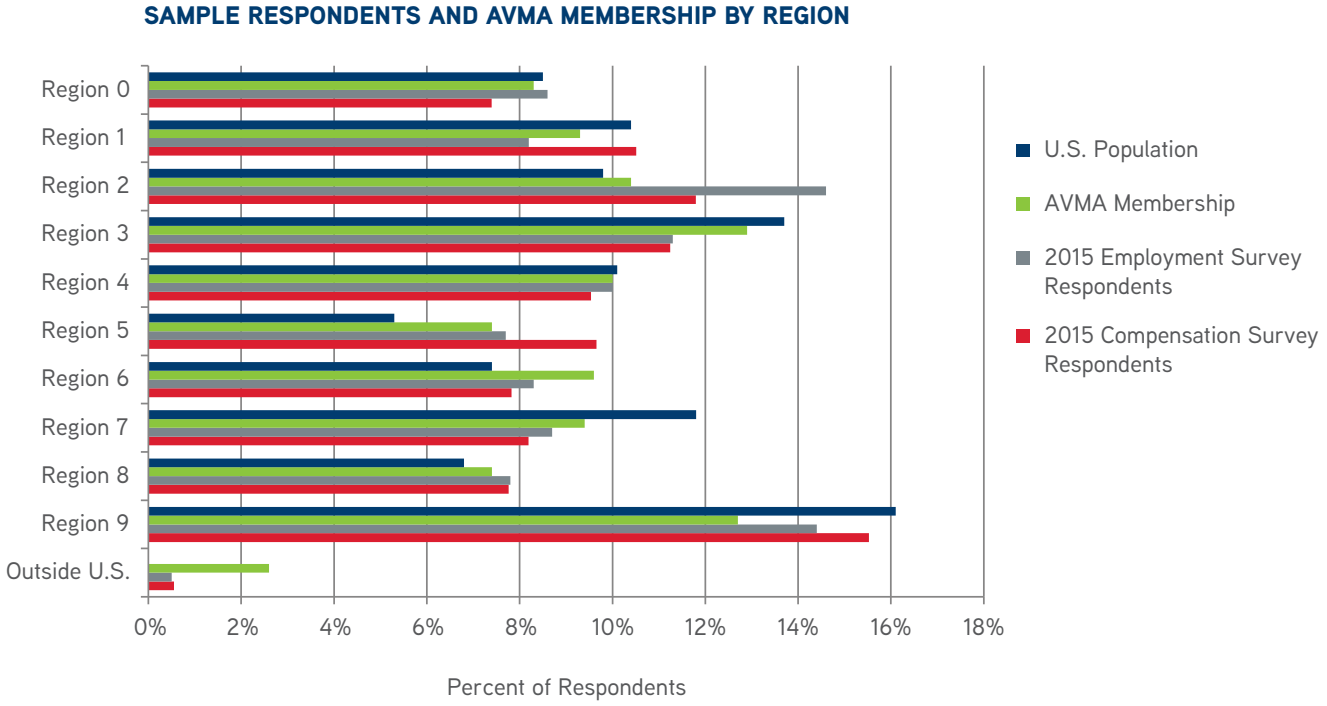


Figure 6

SAMPLE RESPONDENTS AND AVMA MEMBERSHIP BY GENDER

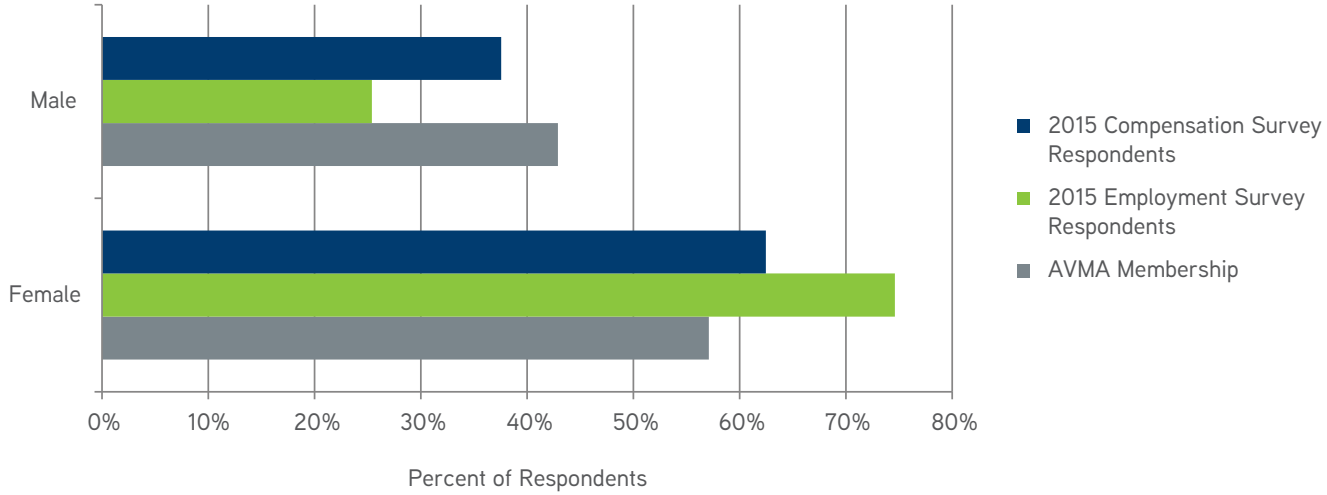


Figure 7

SAMPLE RESPONDENTS BY GRADUATION YEAR, EMPLOYMENT SURVEY

	Sample		AVMA Database	
Graduation Year	N	Percent	N	Percent
1989	299	13.4%	2507	16.6%
1999	300	13.5%	2680	17.8%
2004	375	16.8%	2954	19.6%
2009	566	25.4%	3248	21.6%
2013	684	30.7%	3671	24.4%
Total	2224	99.9%	15060	
Missing	2	0.1%		
Total	2226	100.0%	15060	

Table 2

UNEMPLOYMENT

In 2014 the AVMA undertook the task of simultaneously estimating the unemployment rate, the underemployment rate and veterinary education outcomes assessments for the veterinary profession. To this end, the Economics Division instituted an Employment Survey and surveyed every veterinarian who had graduated 1, 5, 10 and 25 years prior. The 2015 survey added graduates from 15 years out.

Summary Statistics

For the 2014 Employment Survey, the unweighted unemployment rate was 3.3 percent, with 1.7 percent of respondents not responding to the question. For the 2015 Employment Survey, the unweighted unemployment rate was 4.4 percent, with 1.2 percent of respondents not responding to the question. The confidence interval around the 2014 and 2015 surveys was 0.81 percentage points and 0.85 percentage points, respectively, and thus the two rates are not statistically different.

Of those reporting unemployment in 2015, the mean number of weeks they have been unemployed was 47.9 weeks over a mean of 2.1 separate periods, less than 2014's sample of an average of 55.7 weeks over 1.7 periods.

Women were more likely than men to be unemployed, with an unemployment rate of 4.9 percent, compared to an unemployment rate of 3.4 percent for men.

The highest rate of unemployment came from people currently living in Regions 3, 8 and 9, with 5.0, 4.8 and 4.9 percent, respectively, of respondents from these regions indicating they were unemployed.

CURRENTLY EMPLOYED

Are you Currently Employed?	2014 Employment Survey	2015 Employment Survey
Yes	95.0%	94.4%
No	3.3%	4.4%
Missing	1.7%	1.2%

Table 3

LENGTH AND DURATION OF UNEMPLOYMENT

		Mean	N	Std. Dev.	Minimum	Maximum
2014 Employment Survey	How many weeks have you been unemployed in veterinary medicine?	55.7	60	49.7	1	156
	How many isolated periods of unemployment have you had?	1.7	57	1.3	1	10
	For approximately how many days, in total have you been unemployed during your veterinary career?	371.2	56	307.5	0	1000
2015 Employment Survey	How many weeks have you been unemployed in veterinary medicine?	47.9	65	48.5	0	156
	How many isolated periods of unemployment have you had?	2.1	63	1.7	1	10
	For approximately how many days in total have you been unemployed during your veterinary career?	325.8	62	323.2	0	1000

Table 4

UNEMPLOYMENT BY GENDER

Gender	AVMA Membership	Are you currently employed?		Total
		No	Yes	
Female	57.1%	4.9%	95.1%	100.0%
Male	42.9%	3.4%	96.6%	100.0%
Total	100.0%	4.5%	95.5%	100.0%

Table 5

OF THOSE REPORTING UNEMPLOYMENT IN 2015, THE MEAN NUMBER OF WEEKS THEY HAVE BEEN UNEMPLOYED WAS 47.9 WEEKS OVER A MEAN OF 2.1 SEPARATE PERIODS, LESS THAN 2014'S SAMPLE OF AN AVERAGE OF 55.7 WEEKS OVER 1.7 PERIODS.

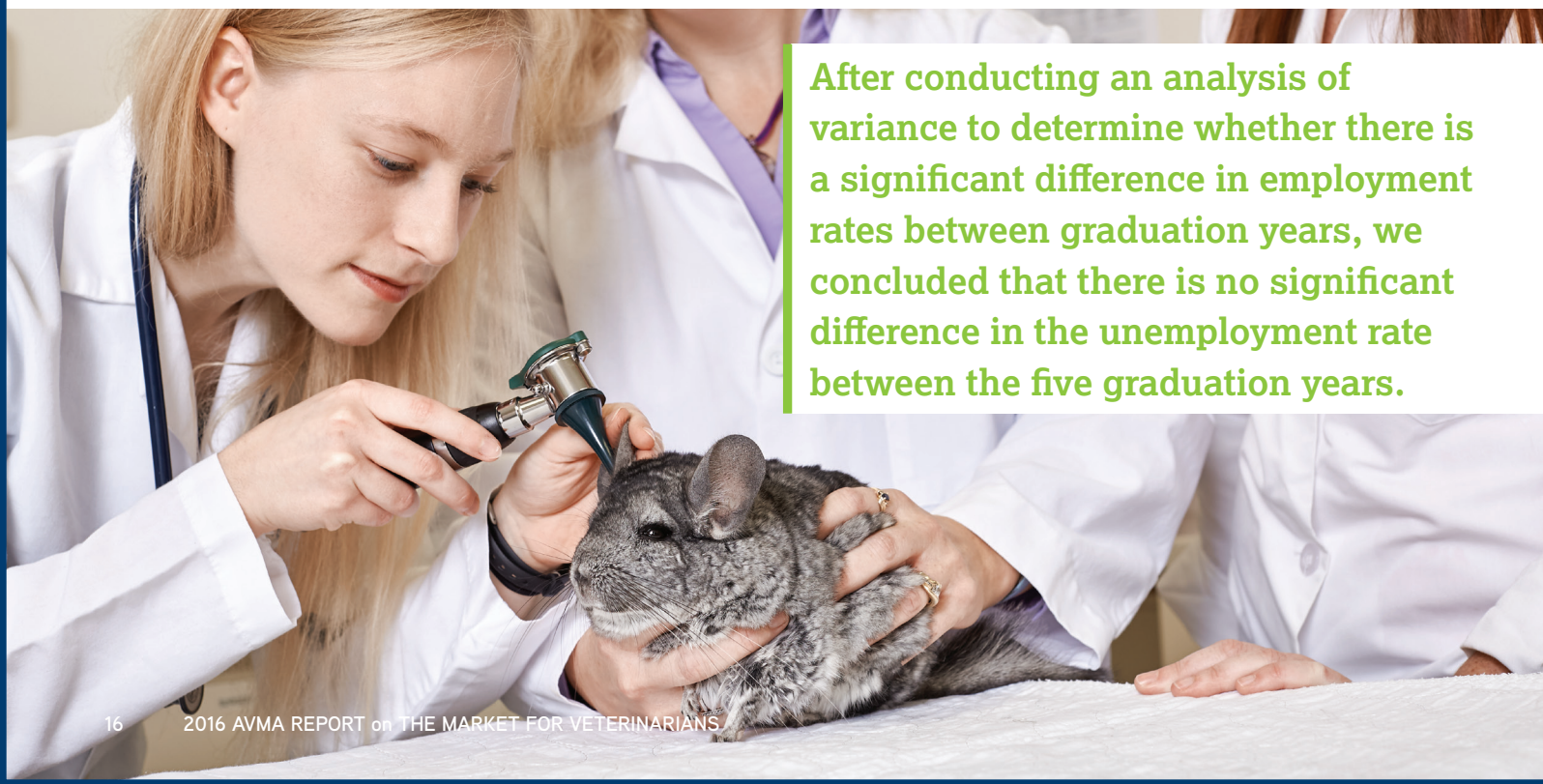
UNEMPLOYMENT BY REGION

Region of Residence	AVMA Membership	Are you currently employed?		Total
		No	Yes	
Region 0	8.3%	3.8%	96.2%	100.0%
Region 1	9.3%	2.3%	97.7%	100.0%
Region 2	10.4%	3.5%	96.5%	100.0%
Region 3	12.9%	5.0%	95.0%	100.0%
Region 4	10.0%	3.3%	96.7%	100.0%
Region 5	7.4%	2.4%	97.6%	100.0%
Region 6	9.6%	1.7%	98.3%	100.0%
Region 7	9.4%	3.2%	96.8%	100.0%
Region 8	7.4%	4.8%	95.2%	100.0%
Region 9	12.7%	4.9%	95.1%	100.0%
Outside US	2.6%	0.0%	0.0%	0.0%
Total	100.0%	3.6%	96.4%	100.0%

Table 6

Of the veterinarians who reported being currently unemployed, those who had selected companion animal practitioner as their first position in veterinary medicine had the highest unemployment rate among private practitioners, with an unemployment rate of 4.0 percent in 2015. However, the survey results show that within the public practice areas the unemployment rate is alarmingly high at 23.1 percent for those who were employed in state or local government as their first professional position, and at 8.3 percent in both federal government as first position and for those whose first employment type is not listed.

Differences in the unweighted employment rates did vary by year of graduation and gender, with the 1989 graduates having the highest unemployment rate (6.5 percent) and the 2009 graduates having the lowest unemployment rate (3.4 percent). Females who graduated in 1999 had the highest unemployment rate (7.5 percent), while males who graduated in 2004 had the lowest unemployment rate (1.1 percent). However, after conducting an analysis of the variance to determine whether there is a significant difference in employment rates between graduation years, we concluded that there is no significant difference in the unemployment rate between the five graduation years.



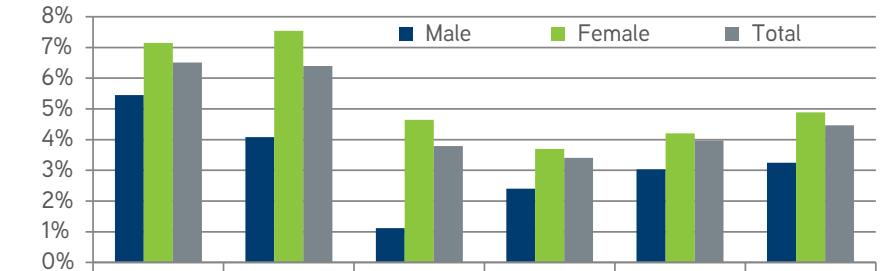
After conducting an analysis of variance to determine whether there is a significant difference in employment rates between graduation years, we concluded that there is no significant difference in the unemployment rate between the five graduation years.

UNEMPLOYMENT BASED ON FIRST VETERINARY POSITION

Sector of First Veterinary Position	AVMA Membership	Are you currently employed?		Total
		No	Yes	
Food animal practice (exclusive)	6.1%	7.0%	93.0%	100.0%
Food animal practice (predominant)	0.0%	2.4%	97.6%	100.0%
Mixed practice	3.9%	2.8%	97.2%	100.0%
Companion animal practice (predominant)	66.5%	4.0%	96.0%	100.0%
Companion animal practice (exclusive)	0.0%	4.8%	95.2%	100.0%
Equine practice	4.4%	2.6%	97.4%	100.0%
Federal Government (civil service)	1.3%	8.3%	91.7%	100.0%
Uniformed services	0.6%	0.0%	100.0%	100.0%
College or University (Faculty or staff only)	6.3%	2.6%	97.4%	100.0%
State/Local government	0.9%	23.1%	76.9%	100.0%
Industry/commercial organizations	3.1%	3.7%	96.3%	100.0%
Not-for-profit organizations	6.9%	3.1%	96.9%	100.0%
Other	0.0%	8.3%	91.7%	100.0%
Currently a resident/ post-doc/ in grad school	0.0%	4.5%	95.5%	100.0%

Table 7

UNEMPLOYMENT BY GENDER AND GRADUATION YEAR



	1989	1999	2004	2009	2013	Total
Male	5.5%	4.1%	1.1%	2.4%	3.0%	3.2%
Female	7.1%	7.5%	4.6%	3.7%	4.2%	4.9%
Total	6.5%	6.4%	3.8%	3.4%	4.0%	4.5%

Figure 8

Unemployment rates also varied across colleges and practice types. The largest number of veterinarians who reported being unemployed at the time of the survey were graduates of Ross University, accounting for 7.1 percent of unemployed veterinarians in the sample. The University of Florida and Michigan State University followed closely, with each contributing 6.1 percent of the sample's unemployment.

The highest rate of unemployment among veterinarians under age 60 came from persons ages 31-40, 3.7 percent of whom reported being unemployed, whereas 20.7 percent of those over the age of 60 reported being unemployed.

UNEMPLOYMENT BY VETERINARY COLLEGE

	Percent
Ross University	7.1%
University of Florida	6.1%
Michigan State University	6.1%
Virginia-Maryland Regional	5.1%
Colorado State University	4.1%
Kansas State University	4.1%
Tufts University	4.1%
Auburn University	3.1%
Cornell University	3.1%
Texas A&M University	3.1%
The Ohio State University	3.1%
Oregon State University	3.1%
North Carolina State University	3.1%
University of Minnesota	2.0%
University of Pennsylvania	2.0%
University of Tennessee	2.0%
University of California-Davis	1.0%
University of Georgia	1.0%
University of Illinois	1.0%
Iowa State University	1.0%
Louisiana State University	1.0%
Purdue University	1.0%
Oklahoma State University	1.0%
University of Missouri-Columbia	1.0%
University of Wisconsin	1.0%
Western University-California	1.0%
St. George's University	1.0%
St. Matthew's University	1.0%
Other	26.5%
Total	100.0%

Total unemployed: 98 veterinarians

Table 8

EMPLOYMENT STATUS BY AGE GROUP

Age	N	Percent	Employed	Unemployed	Total
18-30	581	26.1%	95.9%	4.1%	100.0%
31-40	939	42.2%	96.3%	3.7%	100.0%
41-50	376	16.9%	94.9%	5.1%	100.0%
51-60	276	12.4%	94.6%	5.4%	100.0%
61+	29	1.3%	79.3%	20.7%	100.0%
Missing	25	1.1%	100.0%	0.0%	100.0%
Total	2226	100.0%	95.5%	4.5%	100.0%

Table 9

As noted earlier, the national mean unemployment rate for veterinarians must be weighted to reflect the actual distribution of veterinarians by practice type, region and gender to determine the unemployment rate for the profession. Using the unemployment rate for gender, region and type of practice and applying these rates to the distribution of veterinarians across these demographic variables produces a national mean unemployment rate for the profession. The adjustments for gender, region and practice type are provided below. Adjusting for gender produces an unemployment rate of 4.3 percent, adjusting for the region produces an unemployment rate of 3.7 percent and adjusting for the type of practice in first employment yields an unemployment rate of 4.4 percent. The combined weighting of these three demographic characteristics yields a weighted mean rate of 3.2 percent in 2014 and 4.1 percent in 2015 for the entire profession.

These two weighted mean unemployment rates are not statistically different and both remain below the U.S. national average unemployment rate. However, like the U.S. unemployment rate, the percent of veterinarians that may be employed in positions where they are not fully employed (underemployed), such as those that may be working part time or as relief because they cannot find full-time employment, is not captured in this unemployment rate.

The U.S. unemployment rate has been declining since 2009, and, as of May 2016, stands at 4.7 percent, far below its peak of 10.0 percent in October 2009 (BLS, 2016).

WEIGHTED UNEMPLOYMENT RATE

	2014	2015
Unemployment Rate by Gender	3.2%	4.3%
Unemployment Rate by Region	3.1%	3.7%
Unemployment Rate by First Veterinary Employment	3.3%	4.4%
Weighted Unemployment Rate	3.2%	4.1%

Table 10

U.S. UNEMPLOYMENT RATE

Source: Bureau of Labor Statistics

Figure 9

LIKE THE U.S. UNEMPLOYMENT RATE, THE PERCENT OF VETERINARIANS THAT MAY BE EMPLOYED IN POSITIONS WHERE THEY ARE NOT FULLY EMPLOYED (UNDEREMPLOYED), SUCH AS THOSE THAT MAY BE WORKING PART TIME OR AS RELIEF BECAUSE THEY CANNOT FIND FULL-TIME EMPLOYMENT, IS NOT CAPTURED IN THIS UNEMPLOYMENT RATE.

Factors Correlated With Unemployment

The primary objective of this study was twofold: first to determine the level of unemployment/underemployment in the profession, and second to determine the factors affecting unemployment/underemployment within the veterinary profession.

To determine factors affecting unemployment within the profession, we calculated several binary logistic regressions with a series of combinations of independent variables. The binary logistic regression is similar to the simple linear regression where the relationships between the variable of interest (dependent variable) and the factors (independent variables) hypothesized to affect the variable of interest are mathematically computed. However, in the binary logistic regression the dependent variable has only two values (1=yes, 0=no) and the relationship measured is the probability of the dependent variable occurring when the factor occurs.

With each of the different regressions, we eliminated the characteristics that were not statistically significant in improving the probability that the dependent variable (employment) was likely to occur, while adding new variables to determine their impact on the likelihood of being employed. The dependent variable was "are you currently employed," of which the responses were 1:Yes or 0:No.

The factors (independent variables) that were used to attempt to explain the probability of being unemployed included: age, gender, marital status, educational level, student debt, veterinary college, regional mobility, health, location, internship participation, board certification and practice type.

In this table, the "B values" are used to calculate the probability of an individual respondent falling into a specific category (employed or unemployed). The main criterion is to observe whether the B values are positive or negative. This will indicate the direction of the relationship, i.e., negative is more likely to lead to unemployment and positive more likely to lead to employment.

The "Exp (B)" column is the odds ratios (OR) for each of the independent variables. As noted in Tabachnick and Fidell (2013; pg.8), the OR represents "the change in odds of being in one of the categories of outcome (employed or unemployed) when the value of one of the independent variables (predictors) increases by one point." To determine the likelihood of these outcomes, we use a Wald Test in which the variables that significantly contribute to predictive ability of the model would have a p-value of .05 or less in the column labeled "Sig."

Being a graduate of UC Davis, Colorado State University or University of Georgia improved the probability of being employed, as did being male, board certified and located in regions 1, 2 and 5. The only factor that increased the probability of unemployment was for those who noted they had acquired "other" degrees.

FACTORS CORRELATED WITH UNEMPLOYMENT

Binary Logistic Regression : Dependent Variable: 1 - Employed / 0 - Unemployed						
	B	S.E.	Wald	df	Sig.	Exp(B)
Other degrees	-1.563	.509	9.437	1	.002	.210
University of California-Davis	3.334	1.144	8.489	1	.004	28.054
Gender	1.282	.453	8.007	1	.005	3.605
Colorado State University	3.078	1.132	7.391	1	.007	21.710
Board Certified	2.229	.864	6.660	1	.010	9.295
Region 5	1.601	.673	5.661	1	.017	4.958
Region 1	1.655	.696	5.655	1	.017	5.235
Region 2	1.642	.761	4.661	1	.031	5.167
University of Georgia	2.372	1.149	4.257	1	.039	10.715
Region 3	1.107	.580	3.643	1	.056	3.026
Texas A & M University	1.635	.921	3.152	1	.076	5.132
University of Wisconsin	2.186	1.234	3.138	1	.076	8.903
Region 7	1.441	.831	3.012	1	.083	4.227
University of Illinois	1.915	1.152	2.762	1	.097	6.785
Region 4	.985	.596	2.736	1	.098	2.679
Oregon State University	1.534	.937	2.680	1	.102	4.636
University of Pennsylvania	1.876	1.158	2.625	1	.105	6.525
Doctorate degree (Ph.D., Ed.D., etc.)	-1.219	.813	2.247	1	.134	.295
Health: 5 = Excellent / 1 = Poor	.257	.173	2.221	1	.136	1.293
Oklahoma State University	1.722	1.175	2.146	1	.143	5.595
Ohio State University	1.141	.789	2.089	1	.148	3.129
Kansas State University	1.292	.918	1.979	1	.159	3.639
DVM Debt	.000	.000	1.928	1	.165	1.000
Louisiana State University	1.639	1.183	1.922	1	.166	5.152
North Carolina State University	1.231	.927	1.764	1	.184	3.425
First Veterinary Employment: Equine	1.831	1.384	1.749	1	.186	6.238
Do not hold any other degrees	.995	.755	1.738	1	.187	2.704
Own / Don't own home	.478	.363	1.736	1	.188	1.613
First Veterinary Employment: State and Local Government	-1.778	1.366	1.695	1	.193	.169
First Veterinary Employment: Mixed Practice	1.433	1.106	1.681	1	.195	4.193
Cornell University	1.101	.883	1.557	1	.212	3.009
University Missouri-Columbia	1.429	1.188	1.446	1	.229	4.175
Virginia Maryland Regional	.974	.829	1.379	1	.240	2.649
Region 9	.764	.663	1.331	1	.249	2.148
Region 8	.748	.653	1.312	1	.252	2.112
University of Minnesota	1.236	1.081	1.309	1	.253	3.442
Age	-.021	.019	1.179	1	.278	.979
St Georges University	1.125	1.151	.955	1	.328	3.079
Auburn University	.893	.915	.952	1	.329	2.442
Tennessee State University	.850	.920	.852	1	.356	2.339

Table 11

FACTORS CORRELATED WITH UNEMPLOYMENT CONT'D.

Binary Logistic Regression : Dependent Variable: 1 - Employed / 0 - Unemployed						
	B	S.E.	Wald	df	Sig.	Exp(B)
Michigan State University	.645	.703	.842	1	.359	1.906
Single	.629	.714	.776	1	.378	1.876
Bachelor's degree	.439	.547	.645	1	.422	1.551
Separated	-1.072	1.342	.639	1	.424	.342
Tufts University	.639	.832	.589	1	.443	1.894
First Veterinary Employment: Industry	-1.041	1.420	.537	1	.464	.353
Region 6	.558	.847	.433	1	.510	1.747
Ross University	.406	.713	.324	1	.569	1.500
Divorced	.473	.962	.241	1	.623	1.605
Master's in Business Administration	.475	1.176	.163	1	.686	1.608
University Of Florida	-.309	.778	.158	1	.691	.734
First Veterinary Employment: Companion Animal Practice	.357	.945	.143	1	.706	1.429
Married	-.221	.657	.113	1	.737	.802
Master's in Arts	-.364	1.237	.087	1	.768	.695
First Veterinary Employment: Food Animal Exclusive	-.392	1.368	.082	1	.775	.676
First Veterinary Employment: College / University	-.199	1.193	.028	1	.868	.820
First Veterinary Employment: Other	-.152	1.065	.020	1	.887	.859
First Veterinary Employment: Companion Animal Exclusive	-.067	.831	.007	1	.936	.935
Master's in Science (M.S.)	.023	.501	.002	1	.964	1.023
Iowa State University	19.161	3602.928	.000	1	.996	209557448.751
St Matthew's University	.007	1.377	.000	1	.996	1.007
Master's in Public Health (M.P.H.)	18.198	4486.359	.000	1	.997	80043416.972
Washington State University	19.464	5014.057	.000	1	.997	283829788.073
Purdue University	19.142	5304.326	.000	1	.997	205698020.134
First Veterinary Employment: Food Animal Predominant	17.221	6024.691	.000	1	.998	30118434.726
Western University-California	19.640	7119.050	.000	1	.998	338455261.681
Mississippi State University	18.670	7111.397	.000	1	.998	128265329.342
Tuskegee University	19.432	7633.913	.000	1	.998	275035692.221
Other Master's degree	18.370	7238.856	.000	1	.998	95015648.460
First Veterinary Employment: Not For Profit	17.560	7198.330	.000	1	.998	42306269.121
First Veterinary Employment: Uniformed Services	17.234	7255.835	.000	1	.998	30514230.522
First Veterinary Employment: Federal Government	17.296	7927.406	.000	1	.998	32475823.000
Specialized professional degrees (J.D., M.D., etc.)	18.160	19457.489	.000	1	.999	77045490.007
Widowed	16.496	25599.249	.000	1	.999	14592250.689
Constant	-.425	1.544	.076	1	.783	.653

Table 11 Cont'd.

AVMA Veterinary Career Center Data

An additional piece of evidence of the health of the market for veterinarians comes from data collected by the AVMA Veterinary Career Center (VCC). The VCC serves as a frequently updated and highly useful source of data on trends in the market for veterinarians. The VCC is one of the leading marketplaces for veterinary practices to post help-wanted ads and for veterinary practice staff to find employment.

Since the beginning of the last recession, new job seekers have outnumbered the number of searchable jobs, until recently. Though both have been increasing over time, the number of jobs has increased sharply since the beginning of 2015 and the number of new job seekers has markedly declined.

THE MARKET FOR VETERINARIANS DIDN'T BEGIN TO IMPROVE UNTIL WELL AFTER THE RECESSION (4-5 YEARS). THIS OBSERVATION IS IN-LINE WITH OTHER DATA ON VETERINARY SALARIES THAT SHOWED SALARIES DID NOT BEGIN TO INCREASE AGAIN AFTER THE RECESSION UNTIL 2014.

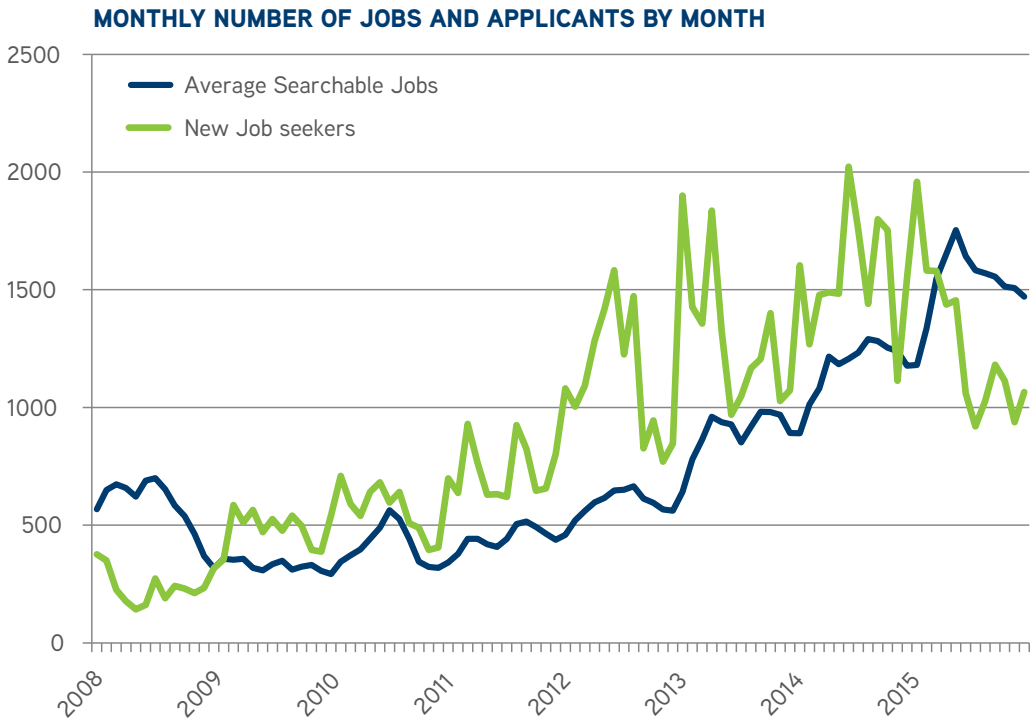


Figure 10

The VCC data series is quite volatile, so it helps to summarize the information as a ratio, as is shown in the following figure. This figure also shows a smoothed line representing a 12-month moving average of the ratio of applicants to available jobs. This chart illustrates that the ratio of applicants to available jobs increased from the last recession until reaching the peak of about 2:1 and has been decreasing since. This is an important illustration for two reasons. First, the market for veterinarians didn't begin to improve until well after the recession (4-5 years). This observation is in-line with other data on veterinary salaries that showed salaries did not begin to increase again after the recession until 2014. The increasing salaries from 2013 to 2015 are consistent with the improving applicant-to-jobs ratio and thus this ratio provides a good indicator for future salary growth.

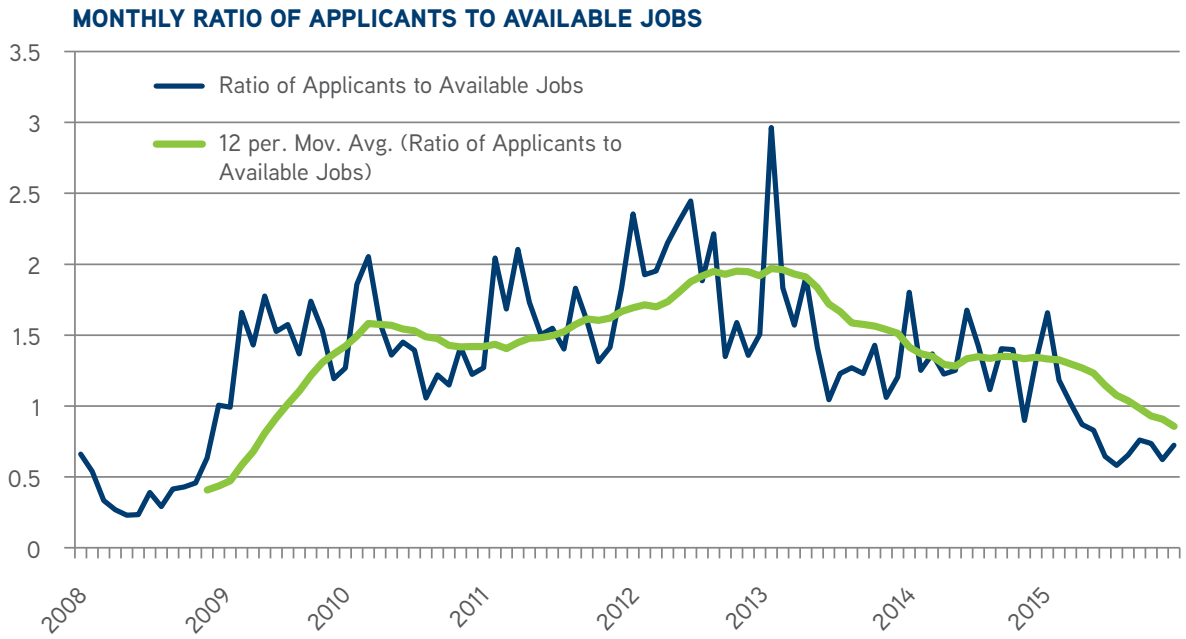
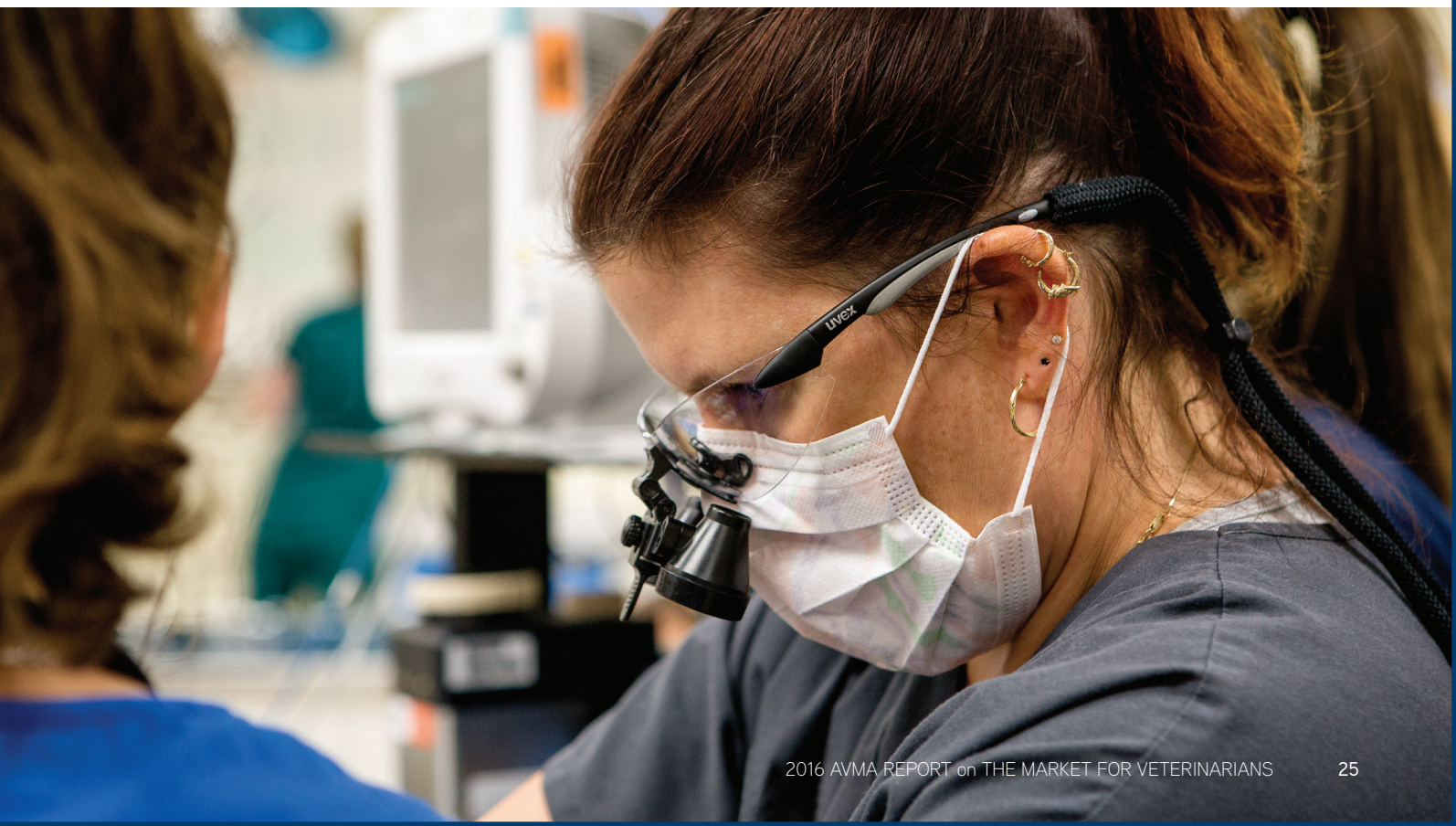
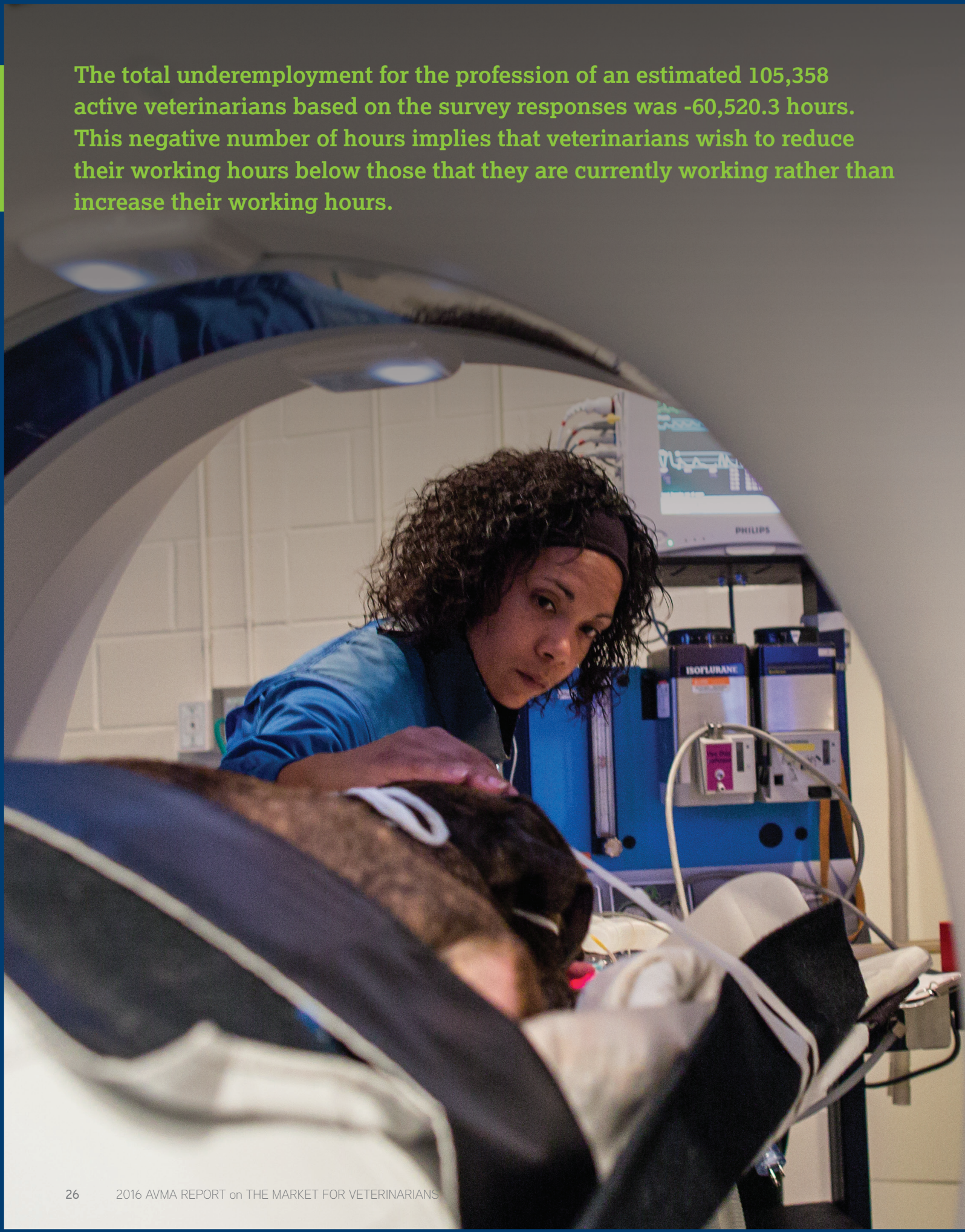


Figure 11



The total underemployment for the profession of an estimated 105,358 active veterinarians based on the survey responses was -60,520.3 hours. This negative number of hours implies that veterinarians wish to reduce their working hours below those that they are currently working rather than increase their working hours.



UNDEREMPLOYMENT

The argument always arises that the unemployment rate doesn't measure the true number of people who are looking for work, because it does not count those who have given up or those who are underemployed. Few would argue with this criticism. However, on the one hand, this doesn't particularly matter, because the point of the statistic is to act as an indicator for employment conditions. The point of an indicator is to measure the exact same thing consistently over time, not necessarily to put an exact measurement on a broad concept with multiple interpretations. Generally, these indicators are not meant to give accurate point estimates, but to provide an indication as to whether conditions are improving.

The AVMA Employment Survey was designed to measure underemployment. Underemployment is two-fold: it is first caused by a worker not being able to work as many hours as he or she would like, or it can also be manifest in a person accepting employment below one's training and experience.

Underemployment has two definitions. The first definition of underemployment is when a veterinarian may be keeping busy all the time but would be able to see more clients and perform more productive work with additional veterinary technicians or physical space. The second definition of underemployment, as measured in total hours, represents the number of hours that veterinarians desire to work above what they are currently working. This was measured as the desire to increase/decrease hours worked for an equivalent increase/decrease in compensation. The most important aspect of the question pertaining to hours worked was the associated compensation. The survey question asked if veterinarians wish to work more for greater compensation or work less for less compensation.

Summary Statistics

The total underemployment for the profession of an estimated 105,358 active veterinarians based on the survey responses was -75,800 hours. This negative number of hours implies that veterinarians wish to reduce their working hours below those that they are currently working rather than increasing their working hours. Some 1,895 new veterinarians, each working 40-hour work weeks, would be required in order to offset the net total hours of those veterinarians who wish to work less and those who wish to work additional hours during their work week. In total, 19.2 percent of respondents indicated they wish to reduce the hours they work by a mean 13.1 hours, while only 15.0 percent of respondents wish to increase the hours they work by a mean 11.6 additional hours per week.

However, as with unemployment, these estimates do not reflect the true level of underemployment in the profession, since the sample of respondents does not reflect the demographics of the profession. The weighted values are provided below by gender, region and type of practice. Based on the reweighting of the sample to reflect the population of veterinarians, 24.7 percent of veterinarians want to work less, while 22.6 percent wish to work more. The total hours of weighted underemployment are -73,320 hours, equivalent to a need for an additional 1,833 veterinarians.

As with unemployment, underemployment varies by gender, region and practice type. More females want to work fewer hours than want to work additional hours, while there is a slightly larger number of men who wish to work additional hours compared to those who want to work fewer hours.

Regionally, most of the regions followed the national trend with more veterinarians wanting to work fewer hours than the number of veterinarians wanting to work additional hours. However, in Region 1 there are more veterinarians that wish to work additional hours than those that wish to work fewer hours.

Underemployment by practice type also generally followed the national trend with most practice types having more veterinarians that wish to work fewer hours for less compensation than those who wish to work additional hours for more compensation.

AS WITH UNEMPLOYMENT, UNDEREMPLOYMENT VARIES BY GENDER, REGION AND PRACTICE TYPE. MORE FEMALES WANT TO WORK FEWER HOURS THAN WANT TO WORK ADDITIONAL HOURS, WHILE THERE IS A SLIGHTLY LARGER NUMBER OF MEN WHO WISH TO WORK ADDITIONAL HOURS COMPARED TO THOSE WHO WANT TO WORK FEWER HOURS.

WORK < HOURS

WORK > HOURS

UNDEREMPLOYMENT BY GENDER

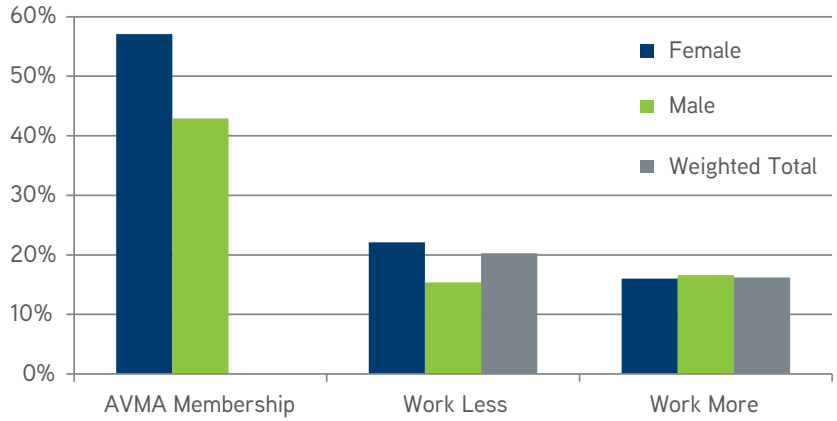


Figure 12

UNDEREMPLOYMENT BY REGION

Region of Residence	AVMA Membership	Work Less	Work More
Region 0	8.3%	19.4%	16.6%
Region 1	9.3%	12.2%	20.9%
Region 2	10.4%	22.7%	13.7%
Region 3	12.9%	21.3%	18.3%
Region 4	10.0%	20.9%	16.0%
Region 5	7.4%	23.4%	17.7%
Region 6	9.6%	22.1%	18.6%
Region 7	9.4%	16.6%	14.9%
Region 8	7.4%	22.0%	15.7%
Region 9	12.7%	21.1%	12.2%
Outside U.S.	2.6%	0.0%	0.0%
Weighted Total	100.0%	20.4%	16.1%

Table 12

UNDEREMPLOYMENT BY FIRST VETERINARY POSITION

First Veterinary Position	AVMA Membership	Work Less	Work More
Food animal practice (exclusive)	6.1%	12.5%	27.5%
Food animal practice (predominant)	6.1%	17.5%	10.0%
Mixed practice	3.9%	23.2%	14.2%
Companion animal practice (predominant)	66.5%	21.6%	13.7%
Companion animal practice (exclusive)	66.5%	20.7%	16.3%
Equine practice	4.4%	15.2%	22.3%
Federal Government (civil service)	1.3%	23.8%	14.3%
Uniformed services	0.6%	26.9%	3.8%
College or University (Faculty or staff only)	6.3%	24.0%	16.0%
State/Local government	0.9%	14.3%	28.6%
Industry/commercial organizations	3.1%	11.5%	3.8%
Not-for-profit organizations	6.9%	19.4%	29.0%
Other	0.0%	17.0%	13.2%
Currently a resident/post-doc/in grad school	0.0%	22.6%	21.0%
Total	0.0%	20.6%	16.1%

Table 13

The number of hours respondents indicated they currently work varied widely, ranging from 1 hour to 100 hours, but the majority of respondents (67.4 percent) indicated their current hourly work weeks were predominately in the five-hour increments between 30 and 60 hours per week.

Comparing the distribution of hours currently worked per week with the distribution that would exist if the respondents were able to work their desired number of hours per week shows little difference. However, the optimal distribution would include more veterinarians working 40-49 hours per week than is currently occurring.

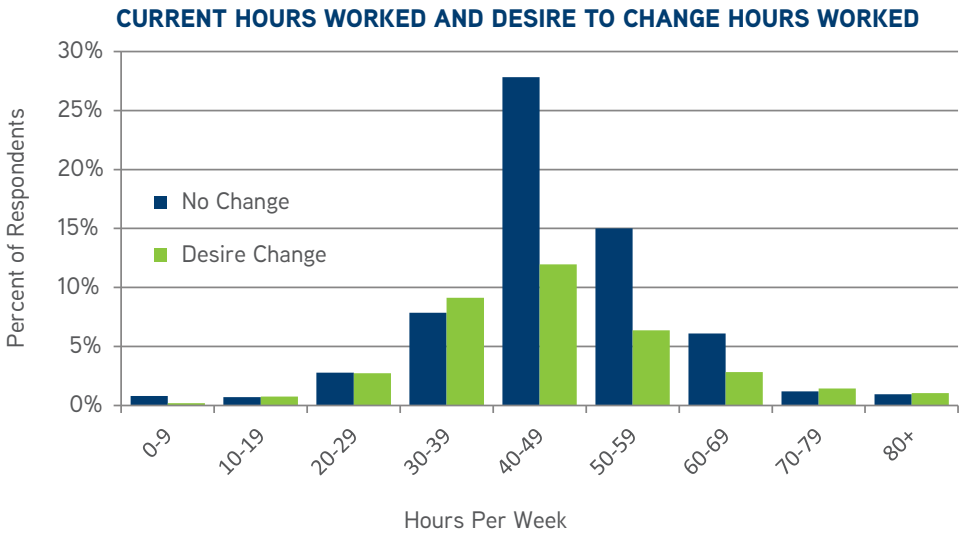


Figure 13

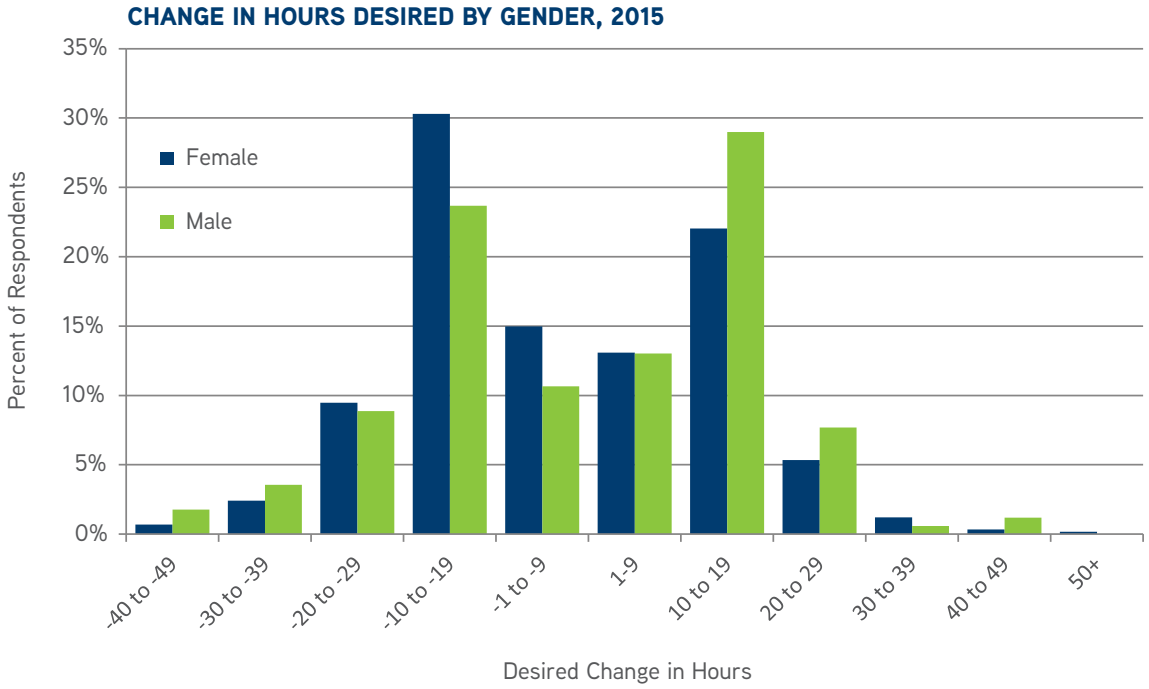


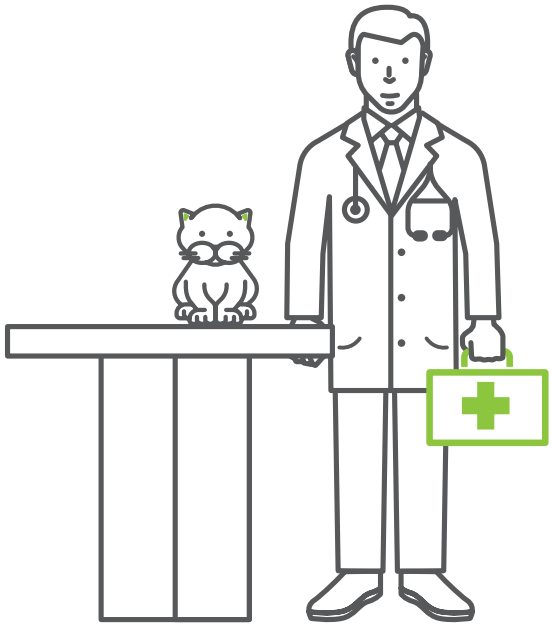
Figure 14

The distribution of the change in hours among those veterinarians who wish to change their hourly work week varies from a reduction of 40 hours per week to an increase of 50 hours per week from their current hourly work week. A majority of female respondents wish to reduce their work week by 10 hours. On the other hand, male respondents are roughly equal in their desires. Some wish to reduce their work week by 10 hours, while others desire a 10-hour increase.

Of the veterinarians who desire a reduction in the number of hours they work per week with a consequence of lower compensation, the mean number of hours that they would like to work weekly, as a group, is less than 40 hours per week. This is in contrast to the group that wants to increase the hours they work to over 50 hours a week accompanied by increased compensation.

The distribution of the desired hourly work per week reflects what each respondent claimed to be their ideal. For those that did not indicate a desire to either increase or decrease their current hours, the current hours worked was used as their desired level. For those that wished to increase or decrease their hours worked per week, the desired change was added to their current hours to obtain their desired hourly work week.

The difference between genders is observable in the distribution, with 20.9 percent of women having a strong preference for a 40-hour work week. But that preference is skewed strongly to the left, indicating 33.6 percent wishing to work less than 40 hours per week. For women, 30.1 percent desire to work 40 to 49 hours per week and 15.3 percent wish to work more than 50 hours per week. For men, the distribution is different. Most notably, only 18.8 percent of men expressed a desire to work less than 40 hours per week. Of the others, 21.1 percent want to work 40 hours per week, 32.6 percent want to work between 40 and 49 hours per week and 27.4 percent wish to work more than 50 hours per week.



FOR MEN, THE DISTRIBUTION IS DIFFERENT. MOST NOTABLY, ONLY 18.8 PERCENT OF MEN EXPRESSED A DESIRE TO WORK LESS THAN 40 HOURS PER WEEK.

NET HOURS DESIRED BY GENDER, 2015

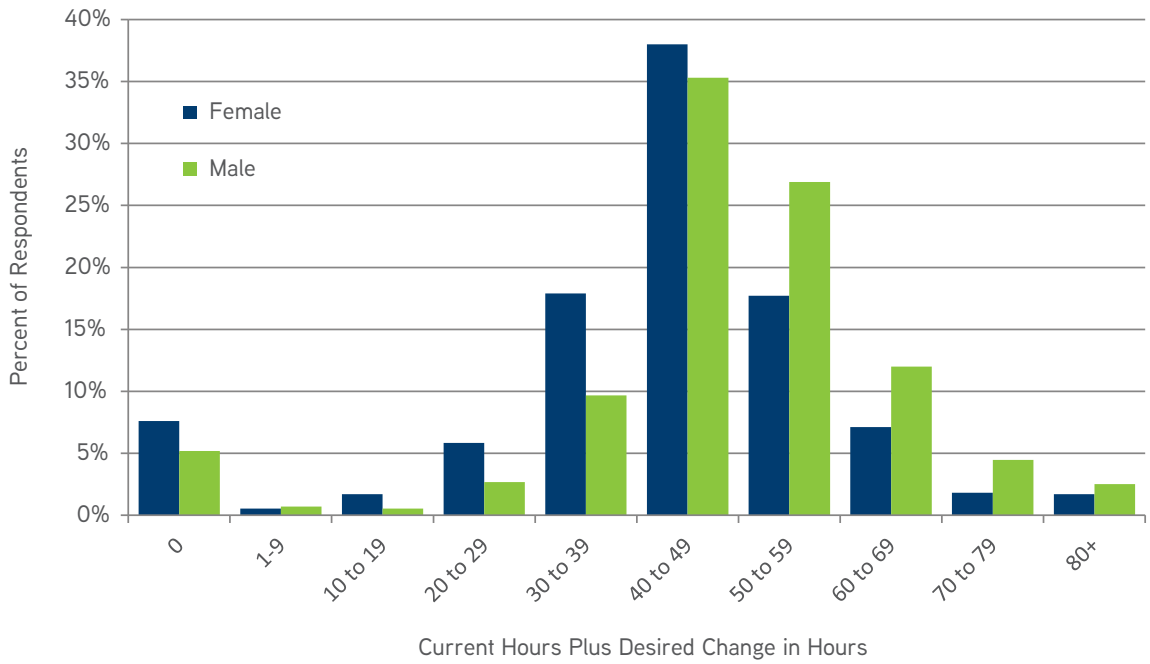


Figure 15

In summary, the veterinary profession does not have an aggregate problem with underemployment, but rather is experiencing negative underemployment, according to the results of the 2015 Employment Survey. There are more veterinarians that wish to work fewer hours than those who wish to work additional hours. If the hours of all veterinarians could be adjusted to align the hours that they wish to work with the hours they actually work, 1,833 additional veterinarians would be required to fill the void. Unfortunately, this presents an unattainable solution because it would require these additional veterinarians to work in multiple practices and geographic areas simultaneously. That is, of course, unless a specific employer had numerous veterinary employees working more hours than they desired, and this is unlikely to be the case. More typically, the indivisibility of veterinary labor (or that of any professional) most typically comes in 40-50 hour blocks. A veterinary employer who may only have 20-30 hours of negative underemployment of veterinarians in their practice would probably opt for hiring a new veterinarian, thereby creating a condition of underemployment and excess capacity.

IF YOU COULD CHANGE THE NUMBER OF HOURS YOU WORK PER WEEK, AT YOUR CURRENT RATE, WOULD YOU:

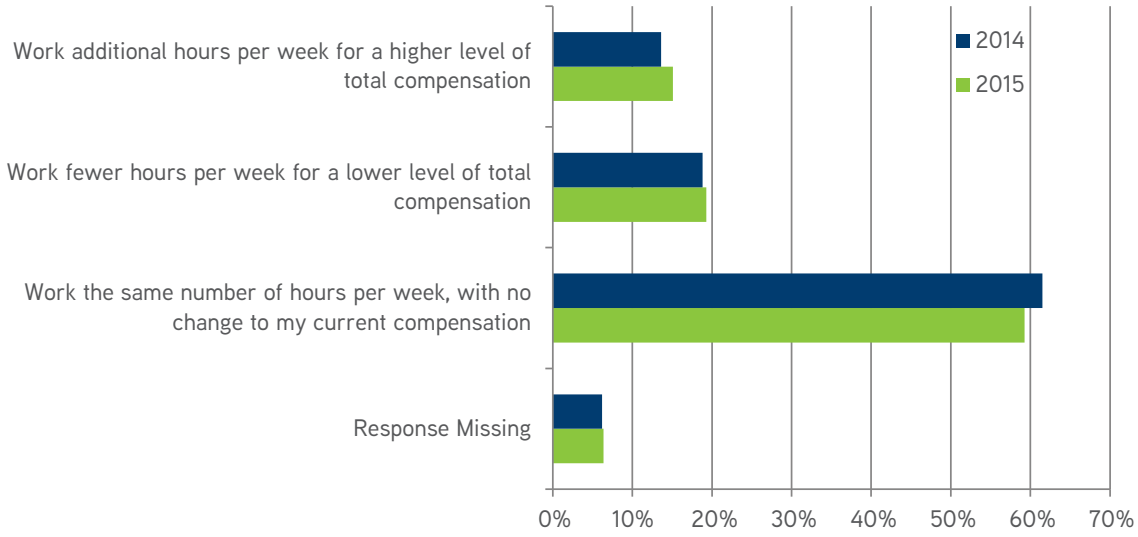


Figure 16

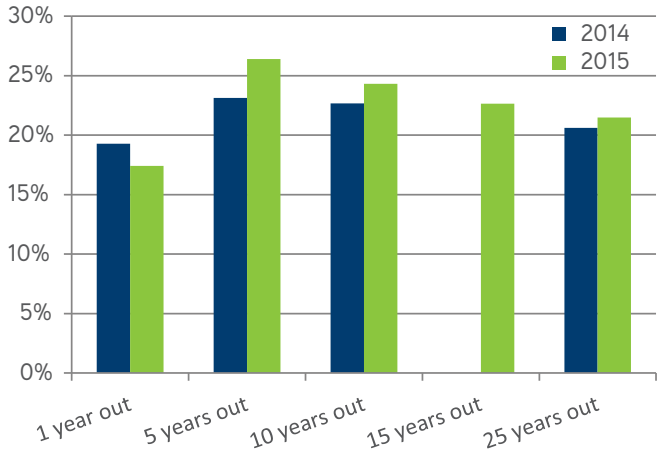
The different pattern in work hours, both current and desired, that exists between genders may partially explain the difference in the level of compensation between male and female veterinarians. Across all five graduating classes included in the survey, women generally want to work less. That is, in each of the graduating years, more women want to work fewer hours for less compensation than want to work more for more compensation.

For men, the pattern is different. Generally, newer graduates wanted to work more, but that proportion declines with age. For the three newest classes of graduates, the number of veterinarians who wish to work additional hours for more compensation exceeds the number that wish to work less for less compensation. At 15 and 25 years post-graduation, the men who wish to work less hours for less compensation began to outnumber those who wish to work more hours for greater compensation.

The level of underemployment differed by practice type, with some practice types having positive net underemployment (e.g., equine, food animal exclusive, state and local government, and other veterinary sector) and other practice types having negative net underemployment.

Significant at the 10 percent level, there is no difference in underemployment among colleges. Tabulations show that graduates of St. Matthew's University desire the largest mean increase in hours of 3.4, whereas graduates of the University of Florida desire the largest mean decrease in hours of 3.1. The work preference of all other colleges fell within that range.

FEMALE WORK PREFERENCE:
DESIRE TO WORK FEWER HOURS PER WEEK



FEMALE WORK PREFERENCE:
DESIRE TO WORK ADDITIONAL HOURS PER WEEK

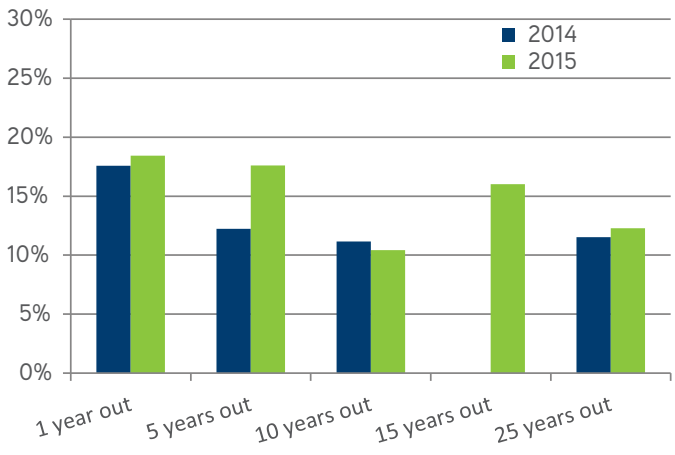
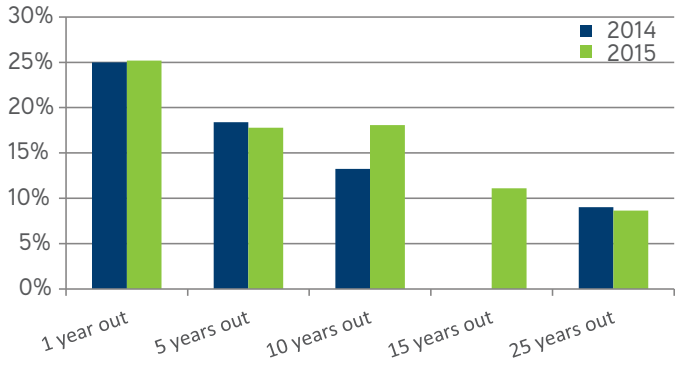


Figure 17

MALE WORK PREFERENCE:
DESIRE TO WORK FEWER HOURS PER WEEK



MALE WORK PREFERENCE:
DESIRE TO WORK ADDITIONAL HOURS PER WEEK

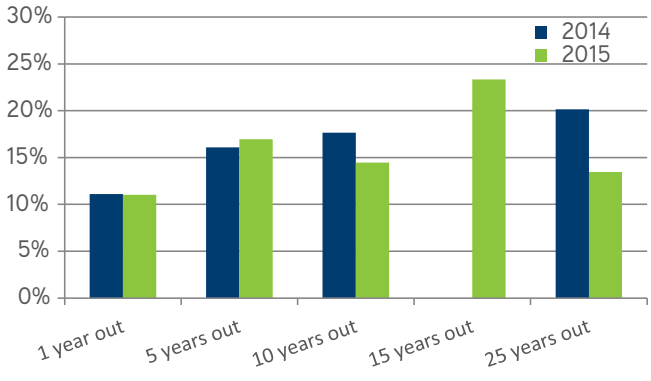
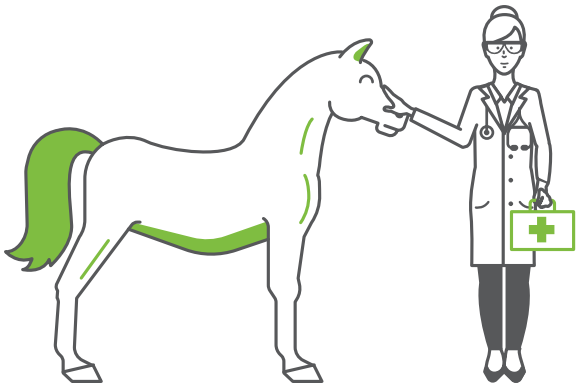


Figure 18

WORK PREFERENCE BY PRACTICE TYPE, 2015

Figure 19

THE LEVEL OF UNDEREMPLOYMENT DIFFERED BY PRACTICE TYPE, WITH SOME PRACTICE TYPES HAVING POSITIVE NET UNDEREMPLOYMENT (E.G., EQUINE, FOOD ANIMAL EXCLUSIVE, STATE AND LOCAL GOVERNMENT, AND OTHER VETERINARY SECTOR) AND OTHER PRACTICE TYPES HAVING NEGATIVE NET UNDEREMPLOYMENT.



UNDEREMPLOYMENT BY VETERINARY COLLEGE, 2015

Graduate School	Mean change in hours desired	N	Std. Deviation
St. Matthew's University	3.36	11	15.699
Auburn University	1.52	54	6.345
Purdue University	0.85	52	8.544
St. George's University	0.63	30	10.928
University of Wisconsin	0.16	64	10.803
University of Tennessee	0.15	54	8.559
Michigan State University	0.12	89	8.351
Tuskegee University	0.08	26	8.231
The Ohio State University	-0.07	101	8.482
Ross University	-0.32	109	7.109
University of Pennsylvania	-0.57	75	8.383
Oklahoma State University	-0.62	45	8.853
Mississippi State University	-0.70	30	8.061
Colorado State University	-0.80	99	9.452
Cornell Veterinary College	-0.82	78	9.878
University of Minnesota	-0.83	69	9.041
Texas A&M University	-0.90	79	5.755
University of Georgia	-1.13	68	11.321
Iowa State University	-1.22	103	9.300
Louisiana State University	-1.35	47	7.678
Oregon State University	-1.39	33	8.685
Virginia-Maryland Regional	-1.54	80	7.637
North Carolina State University	-1.56	70	8.571
Western University-California	-1.59	29	8.846
University of Missouri-Columbia	-1.61	66	9.413
University of California-Davis	-1.63	96	9.337
Washington State University	-1.64	66	7.002
Kansas State University	-2.21	68	8.391
Tufts University	-2.42	66	7.915
University of Illinois	-2.60	78	7.248
University of Florida	-3.05	40	8.202
Other	0.97	106	9.955
Total	-0.81	2081	8.724
Missing		145	
Total		2226	

Table 14

Veterinarians Who Wish to Work More (Underemployment)

Within the sample, 15.0 percent of veterinarians indicated wanting to work a mean of 11.6 additional hours per week. Of the veterinarians who indicated that they would like to work additional hours per week, those who graduated in 2012 currently work the most hours per week in veterinary medicine.

Of those wishing to work more, the average female currently works less than 40 hours per week and wishes to increase the hourly work week to 49 hours. On the other hand, men who wish to work more hours currently work roughly 45 hours and wish to increase that to over 55 hours.

UNDEREMPLOYMENT BY GENDER, 2015

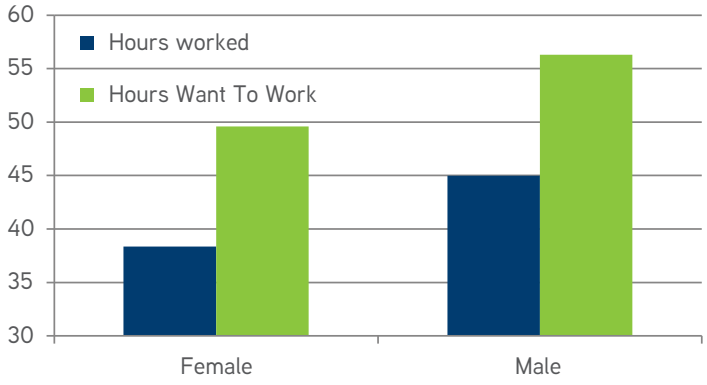


Figure 20

The level of underemployment for those that wish to work more hours for greater compensation also varies by practice type. Food animal practitioners (predominant), mixed animal and those veterinarians in advanced education that wish to work more hours reported already working more than 50 hours per week and on average were looking to increase that hourly work week to more than 60 hours per week. However, for the most part, those veterinarians that indicated they wish to work more hours were working less than 40 hours per week and wish to increase their hourly work week to more than 45 hours per week.

Of those veterinarians who desired to work additional hours, the group in "other employment" work the fewest hours per week currently and indicated a desire to move to a 40-hour work week. The low number of respondents in some of the categories and high standard deviations suggest caution in using the means to describe the situation of those considered underemployed. The values reflect the great diversity in and between the types of practices.

UNDEREMPLOYMENT BY FIRST VETERINARY POSITION PRACTICE TYPE, 2015

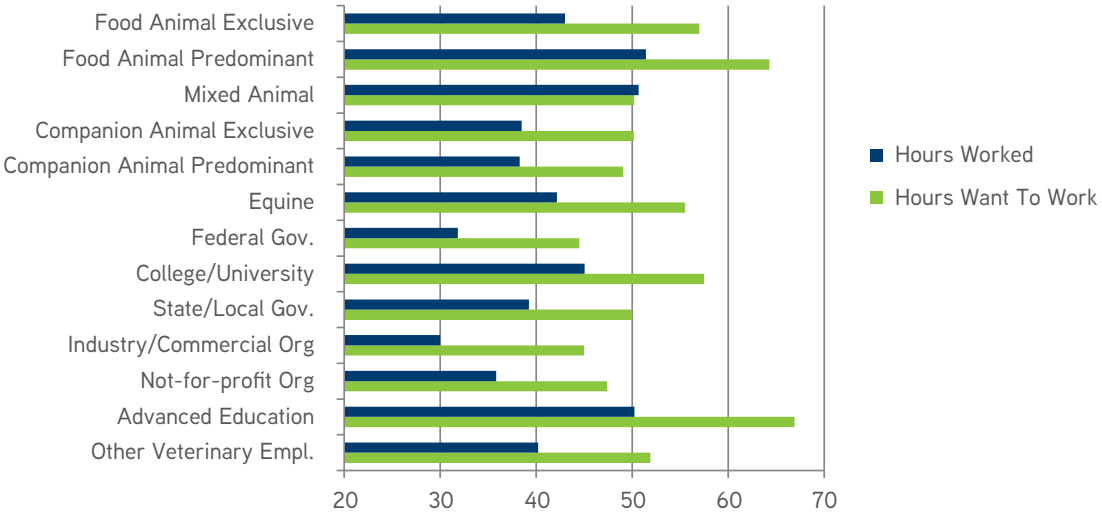


Figure 21

UNDEREMPLOYMENT BY REGION, 2015

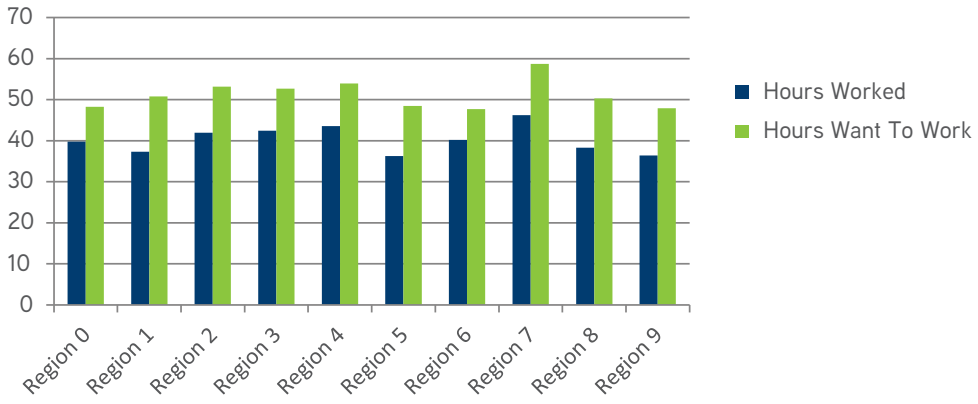
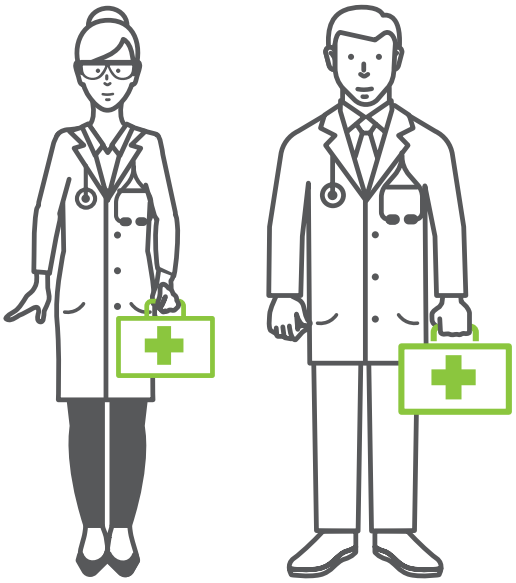


Figure 22

AGGREGATE UNDEREMPLOYMENT BY REGION

	Number of Additional Work Hours Desired	N	Mean Additional Work Hours Desired per Week
Region 0	230	27	8.5
Region 1	471	35	13.5
Region 2	451	40	11.3
Region 3	420	41	10.2
Region 4	366	31	11.8
Region 5	343	28	12.3
Region 6	313	31	10.1
Region 7	325	25	13.0
Region 8	301	25	12.0
Region 9	391	34	11.5
Total	3611	317	11.4

Table 15



OF THOSE WISHING TO WORK MORE, THE AVERAGE FEMALE CURRENTLY WORKS LESS THAN 40 HOURS PER WEEK AND WISHES TO INCREASE THE HOURLY WORK WEEK TO 49 HOURS. ON THE OTHER HAND, MEN WHO WISH TO WORK ADDITIONAL HOURS CURRENTLY WORK ROUGHLY 45 HOURS AND WISH TO INCREASE THAT TO OVER 55 HOURS.

Veterinarians Who Wish to Work Less (Negative Underemployment)

In contrast to those who indicated a desire to work additional hours for increased compensation, 18.7 percent of the respondents indicated wanting to work an average of nearly 13 hours less per week for less compensation. Among the veterinarians who indicated that they would like to work fewer hours per week, those who graduated in 2012 worked the most hours (mean = 53.5 hours), while those who graduated in 2003 had the lowest mean hourly work week. The 2012 graduates who indicated they would like to work fewer hours also indicated the lowest number of hours they would like to reduce, while the veterinarians who graduated in 1988 wanted to reduce their hours per week by a mean of 13.6 hours, from their current average work week of 44.1 hours per week.

The group that wishes to work less is working roughly 10 hours more per week than the group that wishes to work more. And both want to change their work hours per week by over 12 hours. However, because the number of veterinarians who desire to work less (351) exceeds the number who desire to work more (253), and those that want to work less desire to reduce their work week by 12.86 hours while those that want to work more want to increase their work week by 12.51 hours, the total level of underemployment in the profession is negative. A negative underemployment indicates the need to add veterinarians to the workforce. However, because this negative underemployment occurs in different practice types and regions of the country and may not be sufficiently large enough to warrant adding an additional veterinarian in any specific practice or place of employment, the total number of veterinarians defined by the total hours of negative underemployment cannot be used to define a level of excess demand. Indeed this misdistribution of underemployment and negative underemployment describes the importance of labor indivisibility in the veterinary profession.

For the group of veterinarians that want to work fewer hours for less compensation, gender differences are less pronounced than for those who wish to work additional hours. For both males and females, the average number of hours currently working is near 50 while the hours they wish to work is less than 40.

NEGATIVE UNDEREMPLOYMENT BY GENDER

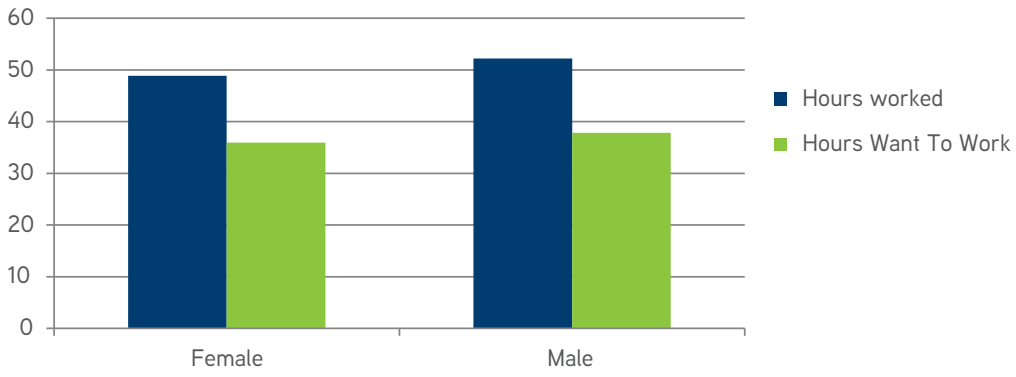


Figure 23

Differences in the current work week of veterinarians reporting they wish to work fewer hours for lower compensation are dramatic, with equine veterinarians and those in advanced education indicating a mean current hourly work week exceeding 60 hours and a desire to reduce this by a sufficient number of hours to move closer to the 40-45 hour work week. As a result, equine practitioners and those in advanced education had the largest level of negative underemployment.

THIS MALDISTRIBUTION OF UNDEREMPLOYMENT AND NEGATIVE UNDEREMPLOYMENT DESCRIBES THE IMPORTANCE OF LABOR INDIVISIBILITY IN THE VETERINARY PROFESSION.

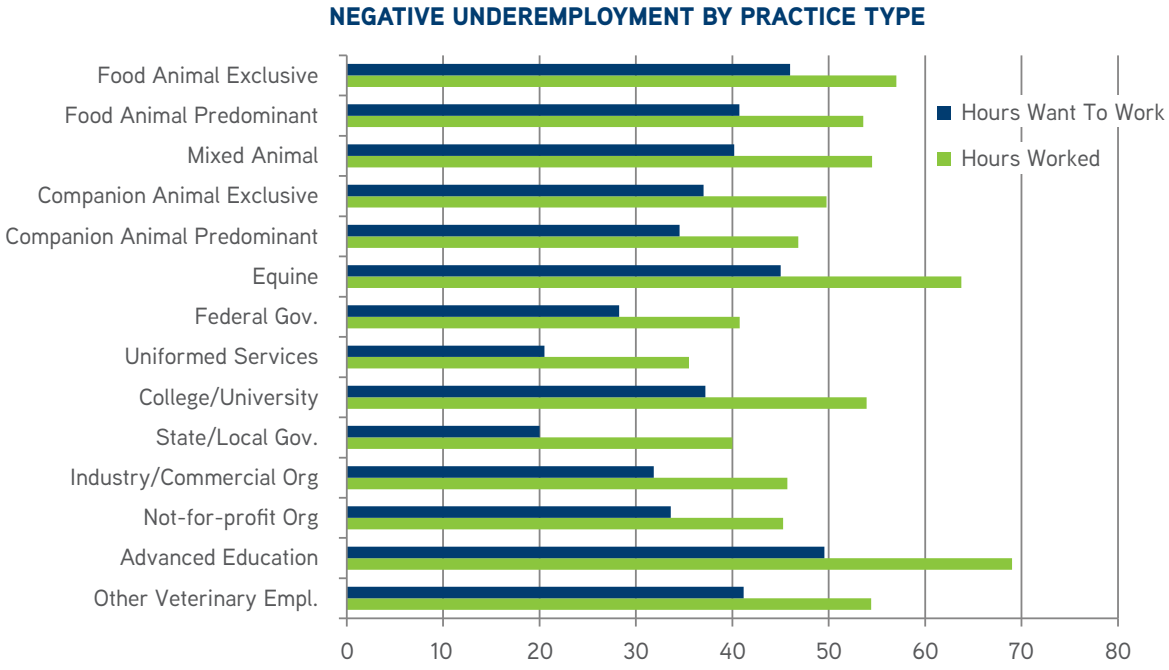


Figure 24

While there were considerable differences in underemployment by practice type, there was little difference across regions. In general, for veterinarians who indicated a desire to reduce their hourly work week for less compensation, the average current hourly work week in each region was near the 50-hour mark. These veterinarians wished to reduce their hourly work week to get under the 40-hour work week. Region 3 had the lowest mean number of hours worked per week at 43.8.

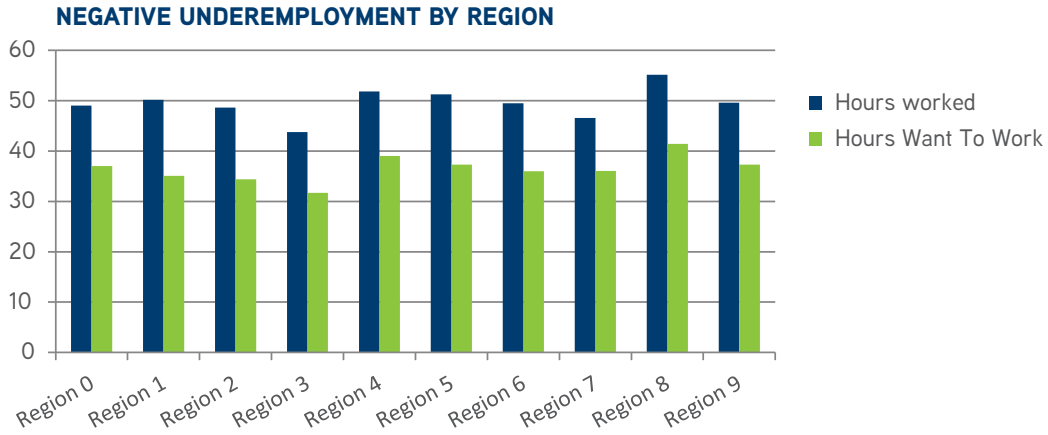


Figure 25

Within our sample of 2,226 respondents, there was reported underemployment of 3,895 hours per week and negative underemployment of 5,580 hours per week. The majority of those underemployed were in Region 9, with the total number of veterinarians reporting that they want to work a total of 510 hours more per week. The lowest underemployment reported occurred in Region 0, with veterinarians reporting that they want to work 127 hours more per week (see Appendix for the number of responses in each region).

Only in Region 5 did the number of additional hours that veterinarians want to work exceed the decreased number of hours that veterinarians desired. Again, this indicates that underemployment on average is not a problem in the profession, but that there is a maldistribution.

AGGREGATE NEGATIVE UNDEREMPLOYMENT BY REGION

	Reduction in work-hours desired	N	Average reduction in work- hours desired
Region 0	372	31	12.0
Region 1	377	25	15.1
Region 2	904	67	13.5
Region 3	544	45	12.1
Region 4	550	43	12.8
Region 5	475	33	14.4
Region 6	512	38	13.5
Region 7	306	29	10.6
Region 8	467	34	13.7
Region 9	739	60	12.3
Total	5246	405	13.0

Table 16

Factors correlated with underemployment

Following the methods used to identify the factors that are correlated with employment, a similar method was used to determine the factors that are correlated with underemployment. In the following estimated equation, we identify factors that affect the number of hours veterinarians work. An ordinary least squares regression was estimated and included the following variables: veterinary practice type, graduating university, workplace location, gender, internship participation, debt, board certification, marital status, mobility and health. The following table yields the results.

An ordinary least squares regression is an equation in which unknown parameters are estimated such that the difference between observed and predicted variables is minimized.

The resulting model can be expressed in a formula such that controlled variations in the independent variables are used to predict the dependent variable (the variable being explained). The dependent variable is desired change in hours worked (underemployment) and the independent variables explaining this variation are health, gender, internships, practice type, board certification, veterinary college, additional degrees held, student debt and marital status.

In this regression, underemployment is hypothesized to be a function of veterinary practice type, graduating university, workplace location, gender, internship participation, debt, board certification, marital status, mobility and health.

FACTORS CORRELATED WITH UNDEREMPLOYMENT

	B	Std. Error	Beta	t	Sig.
(Constant)	-6.847	5.991		-1.143	.254
Income	-4.037E-05	.000	-.194	-4.326	.000
Other Master's Degree	14.481	5.728	.112	2.528	.012
Satisfaction with your current employment	1.315	.565	.100	2.328	.020
Please indicate your gender: 0=F, 1=M	3.231	1.393	.095	2.320	.021
State/Local government	16.283	7.279	.089	2.237	.026
Work Region 7	6.740	3.021	.127	2.231	.026
Mixed practice	-5.114	2.493	-.084	-2.051	.041
Companion animal practice (predominant)	-3.217	1.779	-.074	-1.809	.071
Uniformed services	-13.582	7.798	-.075	-1.742	.082
Food animal practice (exclusive)	7.209	4.329	.068	1.665	.096
Single	2.514	1.562	.080	1.609	.108
Work Region 1	4.412	2.833	.086	1.557	.120
Separated	14.762	10.120	.057	1.459	.145
Equine practice	4.008	2.776	.059	1.444	.149
University of Florida	-6.318	4.428	-.077	-1.427	.154
Divorced	-3.428	2.473	-.057	-1.386	.166
Other Degree	4.023	3.055	.055	1.317	.188
Work Region 3	3.718	2.847	.087	1.306	.192
Louisiana State University	-6.337	4.896	-.062	-1.294	.196
University of Illinois	-5.249	4.122	-.068	-1.273	.203
Board Certification Yes=1, No=0	-2.820	2.291	-.059	-1.231	.219
Kansas State University	-4.746	4.082	-.062	-1.163	.245
Own/Don't Own	-1.719	1.488	-.058	-1.155	.248
Auburn University	4.805	4.482	.057	1.072	.284
Texas A&M University	-4.865	4.607	-.053	-1.056	.291
Advanced Education (inclusive of internships and residencies)	-3.512	3.336	-.045	-1.053	.293
Master's of Arts MA	6.136	6.255	.041	.981	.327
Cornell Veterinary College	-3.772	3.994	-.053	-.944	.345
North Carolina State University	-3.893	4.312	-.047	-.903	.367
Ross University	-3.692	4.115	-.057	-.897	.370
Tufts University	-3.635	4.074	-.047	-.892	.373
Internship Participation Yes=1, No=0	-1.261	1.414	-.041	-.892	.373
Oklahoma State University	-4.151	4.813	-.044	-.862	.389
University of California-Davis	-3.516	4.140	-.048	-.849	.396
St. George's University	3.843	4.560	.042	.843	.400
Master's of Business MBA	-3.189	3.815	-.036	-.836	.404
DVM debt	7.629E-06	.000	.047	.826	.409
Purdue University	3.439	4.238	.041	.811	.418
University of Missouri-Columbia	-3.513	4.455	-.043	-.789	.431
University of Georgia	-3.230	4.343	-.038	-.744	.457
Mississippi State University	-3.949	5.438	-.034	-.726	.468

Table 17

FACTORS CORRELATED WITH UNDEREMPLOYMENT CONT'D.

	B	Std. Error	Beta	t	Sig.
Health 1: poor, 5= excellent	.518	.714	.031	.726	.468
Michigan State University	2.816	4.102	.037	.686	.493
Specialized Professional Degree	-7.011	10.334	-.027	-.678	.498
Work Region 0	1.911	2.866	.037	.667	.505
Work Region 6	1.917	2.960	.039	.648	.518
Do not hold any other degree	1.715	3.162	.035	.542	.588
University of Wisconsin	2.208	4.084	.033	.541	.589
Other Veterinary Employment	1.650	3.053	.022	.541	.589
Tuskegee University	2.799	5.471	.023	.512	.609
Colorado State University	1.809	3.781	.029	.478	.633
College or University (Faculty or staff only)	1.292	2.863	.020	.451	.652
Doctorate PhD	1.452	3.507	.019	.414	.679
Master's of Science MS	.796	2.022	.017	.394	.694
Oregon State University	2.297	5.930	.019	.387	.699
University of Tennessee	1.700	4.445	.020	.382	.702
The Ohio State University	-1.394	3.999	-.019	-.349	.728
Iowa State University	-1.372	3.969	-.020	-.346	.730
Bachelor's Degree	.877	2.604	.024	.337	.736
Work Region 8	.836	2.751	.016	.304	.761
Virginia-Maryland Regional College	-1.120	3.922	-.017	-.286	.775
St. Matthew's University	1.832	7.133	.011	.257	.797
Master's of Public Health MPH	-.993	3.875	-.010	-.256	.798
Partner	-.547	2.594	-.009	-.211	.833
Work Region 5	.634	3.125	.012	.203	.839
University of Minnesota	.859	4.507	.011	.191	.849
Have children- Yes=1 , No= 2	-.231	1.405	-.008	-.165	.869
Federal Government (civil service)	-.618	4.209	-.006	-.147	.883
Industry/Commercial organizations	-.593	4.689	-.005	-.126	.899
Work Region 4	-.327	2.823	-.007	-.116	.908
Western University-California	-.668	5.776	-.006	-.116	.908
Graduation Year	-.010	.102	-.006	-.101	.920
Washington State University	-.336	4.501	-.004	-.075	.941
University of Pennsylvania	-.176	4.358	-.002	-.040	.968
Food animal practice (predominant)	-.159	4.319	-.002	-.037	.971
Not-for-profit organizations	-.083	2.941	-.001	-.028	.978
Work Region 2	-.005	2.593	.000	-.002	.998

a. Dependent Variable: Change in hours desired

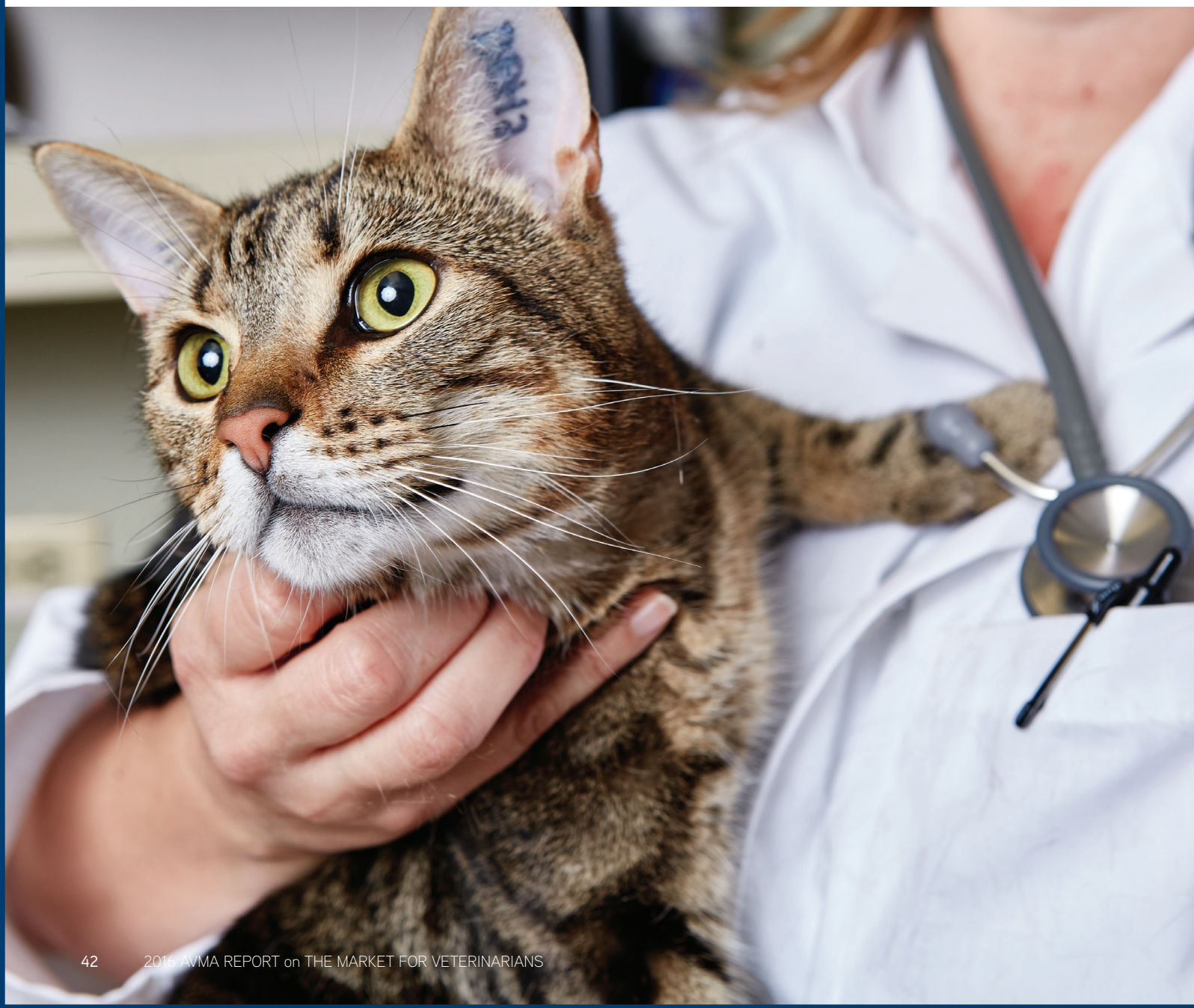
Table 17 Cont'd.

FACTORS CORRELATED WITH UNDEREMPLOYMENT CONT'D.

	Sum of Squares	df	Mean Square	F	Sig.
Regression	22754.585	77	295.514	1.583	.002b
Residual	109054.458	584	186.737		
Total	131809.044	661			

R	R Square	Adjusted R Square	Std. Error of the Estimate
.415a	.173	.064	13.66518

Table 17 Cont'd.



According to our model, the factors found to be significant (sig. < .05) in explaining underemployment are: income, with persons making more money wanting to work less; master's degree; satisfaction with current employment; gender, with males wanting to work more; persons in mixed practice wanting to work less; state and local government employment; employment in region 7 and mixed animal practice type.

To determine the factors significant in explaining the variation in job satisfaction, mobility and wellness, the following nested equations were estimated:

- Regional mobility is a function of location preference, and marital status.
- Job Satisfaction is a function of (∑(expectations-actual experience)i , where i is the assessment outcomes of importance to the profession.
- Wellness is a function of hours worked per week, desired hours per week, size of practice, and work environment.

FACTORS CONSIDERED IN EXPLAINING MOBILITY

	B	S.E.	Wald	df	Sig.	Exp(B)
Single	-1.536	.136	127.888	1	.000	.215
Divorced	-.609	.259	5.533	1	.019	.544
Widowed	20.389	21325.766	.000	1	.999	716181108.792
Separated	.183	.825	.049	1	.825	1.200
Partner	-1.161	.249	21.691	1	.000	.313
Have children: Yes =1, No=2	-1.216	.149	66.825	1	.000	.296
Prefer smaller work place	.125	.241	.268	1	.605	1.133
Prefer larger work place	-.370	.139	7.098	1	.008	.691
Prefer smaller community	-.347	.192	3.260	1	.071	.706
Prefer larger community	.119	.170	.484	1	.487	1.126
Willing to relocate up to 25 miles	-.883	.184	22.939	1	.000	.414
Willing to relocate up to 50 miles	-1.034	.235	19.295	1	.000	.356
Willing to relocate up to 100 miles	-1.292	.255	25.772	1	.000	.275
Willing to relocate wherever the jobs are	-1.411	.143	97.945	1	.000	.244
Constant	4.255	.268	251.698	1	.000	70.491

Omnibus Tests of Model Coefficients

	Chi-square	df	Sig.
Step	634.927	14	.000
Block	634.927	14	.000
Model	634.927	14	.000

Model Summary

-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1863.565a	.276	.384

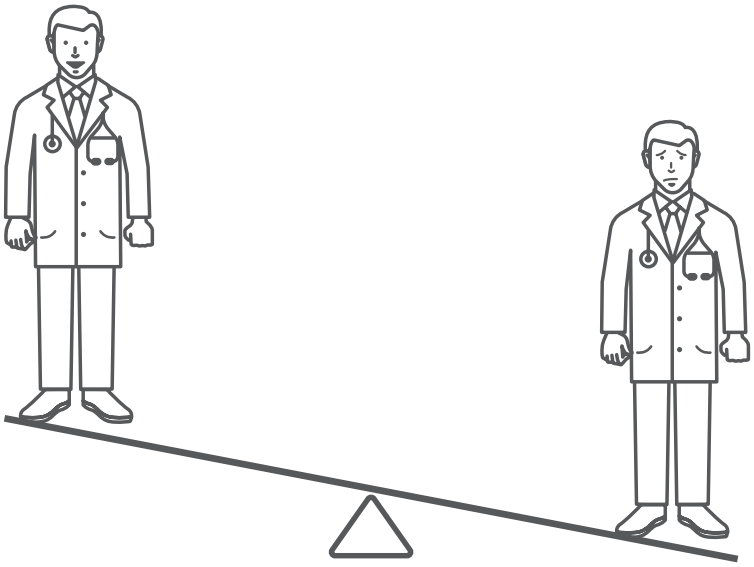
Table 18

Regional mobility was determined by using home ownership as a proxy. Omitted variable categories, which serve as a base for interpretation, are married and no change in the size of work community desired. Results of this equation indicate that, in comparison to married persons, single persons are 88.2 percent less likely to own a home (0.118-1), making them more mobile. When compared to persons wanting no change in the size of their work community, persons preferring a larger work community were 29.5 percent less likely to be homeowners (0.705-1), again making them more mobile.

WELL-BEING

In an effort to address the growing concern over the wellness of veterinarians, the AVMA has been collecting data through the Employment Survey on self-reported wellness of veterinarians. The point of this collection has been to attempt to find correlations of well-being with employment and demographic characteristics. To quantify the concerns about wellness in the veterinary profession, it is important to know the characteristics of those who are at the highest risk of wellness issues.

The structure of this section follows from the data available on the possible causes of negative well-being: employment status (employed versus unemployed), the average number of hours worked, student debt load, job satisfaction, expenditure patterns, burn-out scores and self-reported health evaluations.



THE AVMA HAS BEEN COLLECTING DATA THROUGH THE EMPLOYMENT SURVEY ON SELF-REPORTED WELLNESS OF VETERINARIANS IN AN ATTEMPT TO FIND CORRELATIONS OF WELL-BEING WITH EMPLOYMENT AND DEMOGRAPHIC CHARACTERISTICS. IT IS IMPORTANT TO KNOW THE CHARACTERISTICS OF THOSE WHO ARE AT THE HIGHEST RISK OF WELLNESS ISSUES.

Debt

The debt of practicing veterinarians is a widely studied subject. However, literature tends to focus on debt at graduation, since this amount is fairly easy to measure and most graduates are at about the same place in their lives. Less studied is how that debt changes over time according to the experiences of practitioners who have been out of school. Admittedly, the problem of large student loan debts has accelerated in recent years, but there are few studies to show, beyond qualitative and personal stories, how well DVMs are managing their educational debt. The following figures describe the debt at the start of a veterinarians' career and currently for respondents according to when an individual graduated from veterinary school.

The first figure shows the average debt incurred by graduating class, with those graduating before 2004 grouped together. In-line with the general population, debt incurred generally has followed an upward trend, with exceptions most likely due to the sample nature of the data. Of those who incurred debt, the current amount owed is less than the original balance. Again, this balance generally rises for those who have graduated at a later date.

The second debt chart shows the dynamics of how that student loan debt has been paid off. Virtually no veterinarians who graduated before 1990 still owe money on their student loans,

but the proportion of borrowers who still owe on their loans increases proportionally according to their year of graduation, with less than 20 percent of year 2001+ graduates having paid off their loans.

It is interesting to note that, although student loan debt was significantly lower in previous decades, the years spent repaying were generally 4-10 years. With student loan balances much higher now, both in nominal dollars and as a percent of income, one would expect that time to repay loans will be significantly higher in the future. Indeed, income-based student loan repayment programs allow a borrower to be in repayment for up to 25 years. Going forward, this will create a very different dynamic as older veterinarians would have already paid off their debt after an equal length of time. Going forward, student debt will noticeably affect the career satisfaction and well-being of veterinarians.

TIME TAKEN TO REPAY STUDENT LOANS, 2015

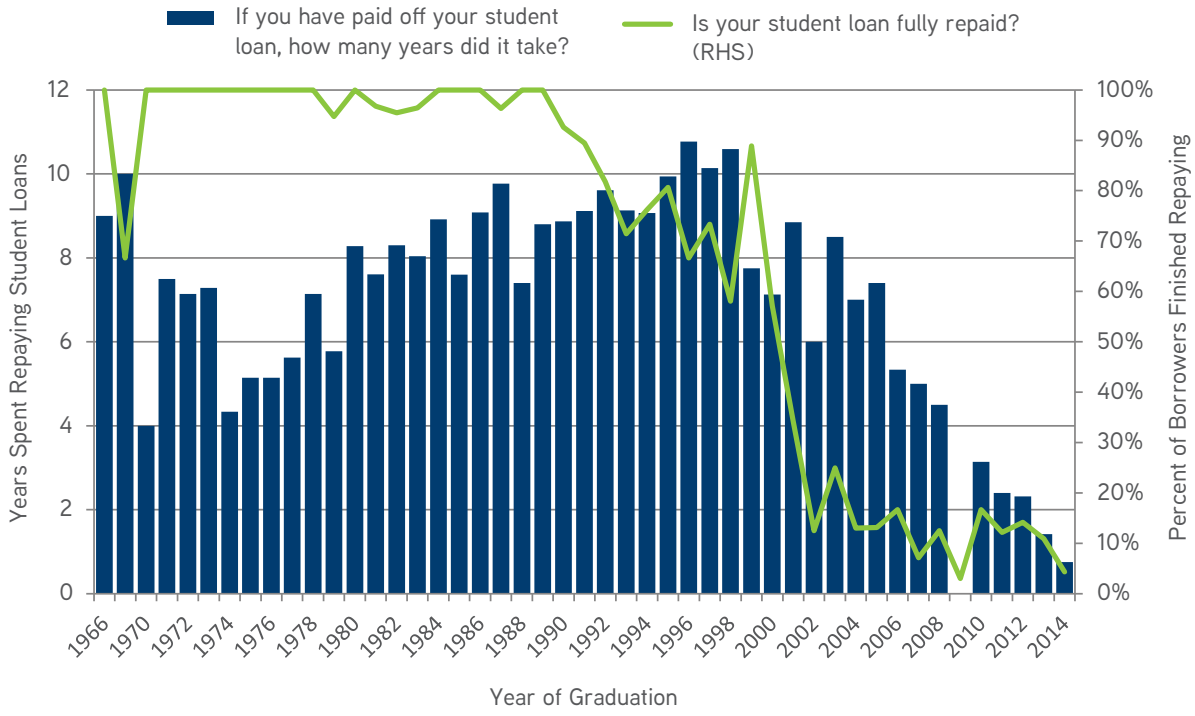


Figure 26

VETERINARY COLLEGE DEBT BY GRADUATION YEAR, 2015 COMPENSATION SURVEY

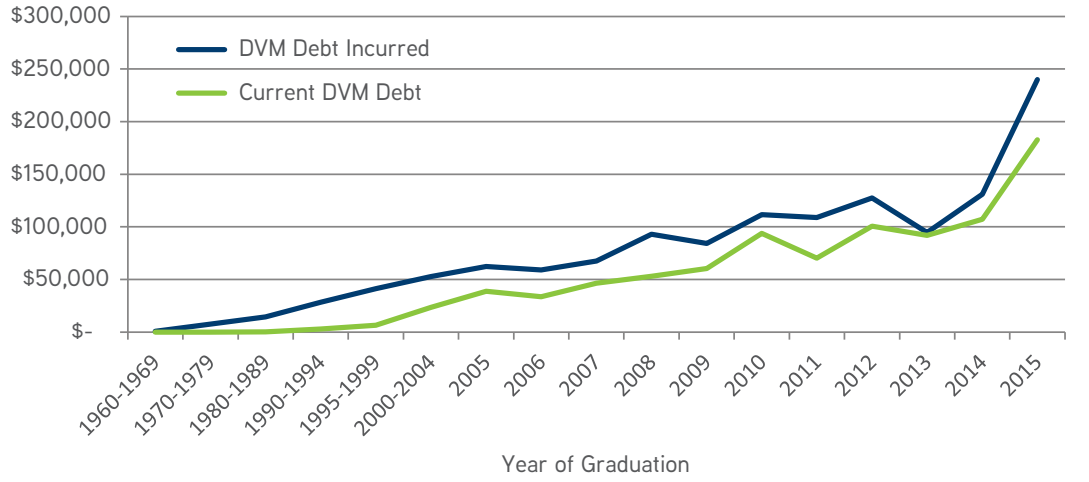


Figure 27

Job/Career Satisfaction and Income

The compensation that a veterinarian receives from an employer should represent the price at which the veterinarian is willing to sell her labor and the price at which the employer is willing to pay for that labor. In a perfectly competitive market for veterinarians, the level of compensation conceptually represents an equilibrium point: that level of compensation where the willingness of the veterinarian to sell her labor is equal to the willingness of the employer to purchase the same amount of labor. The level of compensation and hours of labor provided is a negotiated settlement between the labor provider and the employer. In this case, the hours of labor and total compensation pair represents a point on both the curve of the demand for veterinary labor (veterinarians) and the curve of the supply of veterinary labor. Veterinarians are not homogenous products and each veterinarian can be differentiated by differences in veterinary medical skills, business acumen, client services and individual characteristics, meaning, there will be considerable variation in compensation at any point in time.

In terms of supply, the relationship is between the number of hours veterinarians are willing to provide and the compensation required to provide them. The important question to answer pertains to veterinarians' willingness to provide hours of labor at specific levels of compensation. An argument can be made that because of veterinarians' limited ability to use their DVM for other employment opportunities with similar compensation, they are forced to accept employment out of the need to repay the high cost of their education. Thus, the level of compensation does not correctly reflect their willingness to sell their labor for their current level of compensation. That is, it may be that they are taking what they can get but are not satisfied with what they are earning.

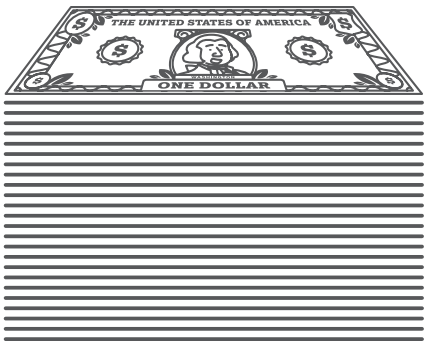
To discover veterinarians' willingness to provide the quantity of labor at the level of compensation they currently earn, answers to questions about underemployment can reveal some insight. From the AVMA Employment Survey, it is clear that there were both veterinarians working more hours and less hours than they wished. More specifically, some veterinarians indicated they wished to work additional hours for more compensation while others indicated they wished to work fewer hours for less compensation. However, this leaves open the question, "Would you like to work fewer hours at the same level of compensation?" and "Would you be willing to work more hours for the same level of compensation?"

The addition of these two questions would close the gap in the decision process but still would not adequately address the issue of willingness to sell. To address that question specifically requires an understanding of the schedule of number of hours that each veterinarian is willing to work and the compensation at each amount of hours worked.

Unfortunately, obtaining objective information on willingness of the individual veterinarian to sell their labor is difficult. Instead, another approach is to measure the level of satisfaction veterinarians report for their current employment and the relationship between that satisfaction and income. If income is an important factor in determining the level of satisfaction, then the relationship between satisfaction and income should be both economically and statistically significant. An analysis of the respondents to both the 2015 Employment Survey and the 2015 Compensation Survey found a large and statistically significant relationship between income and job satisfaction.

From the Employment Survey, the relationship between the expressed level of satisfaction on a 5-point scale where "1" was "not at all satisfied" and "5" was "very satisfied" is best defined by those whose level of compensation exceeds $100,000. Very few of these higher-income earners indicated they were not satisfied (a 1 or 2 on the 5-point scale), while the majority of higher earners indicated they were at least somewhat satisfied (a 3 to 5 on the 5-point scale). However, there were low earners (below $60,000) that indicated all levels of satisfaction.

Over 90 percent of respondents were at least somewhat satisfied (3) with their current employment, while the largest number of respondents indicated they were satisfied (4). The next largest group included those indicating they were very satisfied (5) with their current employment.



IN A PERFECTLY COMPETITIVE MARKET FOR VETERINARIANS, THE LEVEL OF COMPENSATION CONCEPTUALLY REPRESENTS AN EQUILIBRIUM POINT: THAT LEVEL OF COMPENSATION WHERE THE WILLINGNESS OF THE VETERINARIAN TO SELL HER LABOR IS EQUAL TO THE WILLINGNESS OF THE EMPLOYER TO PURCHASE THE SAME AMOUNT OF LABOR.

INCOME AND SATISFACTION WITH CURRENT EMPLOYMENT, EMPLOYMENT SURVEY

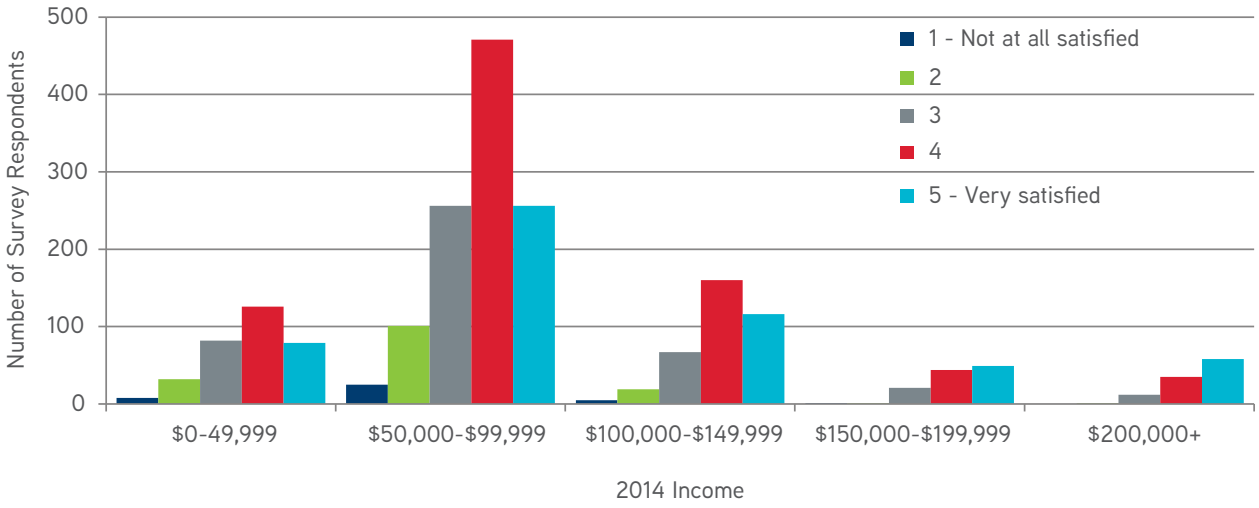


Figure 28

SATISFACTION WITH CURRENT EMPLOYMENT, EMPLOYMENT SURVEY

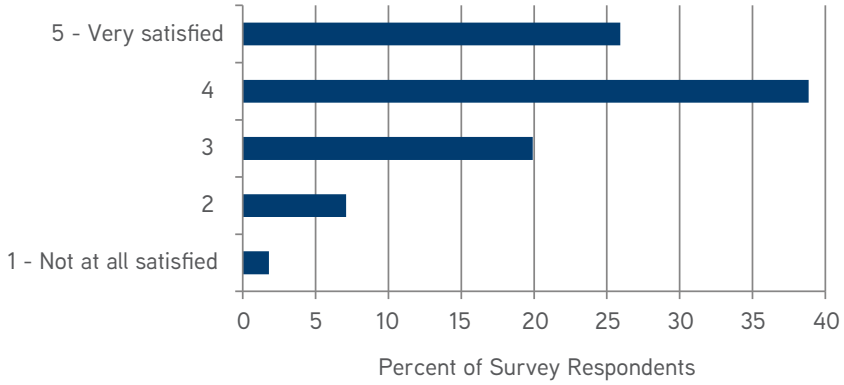


Figure 29

SATISFACTION AND MEAN INCOME, ACTUAL AND ESTIMATED, EMPLOYMENT SURVEY

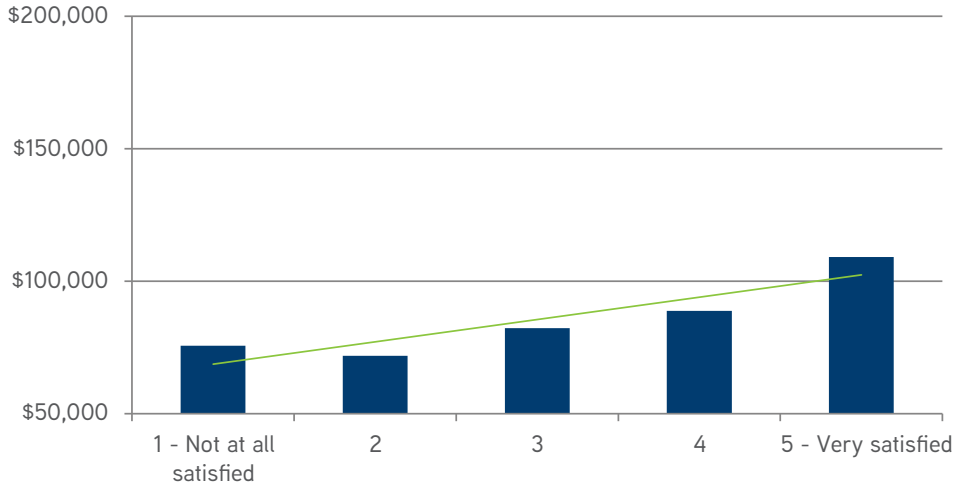


Figure 30

Statistically, the relationship between the level of income and satisfaction was found to be just over $11,000 per degree of satisfaction. That is, to gain one additional level of satisfaction, for example moving from somewhat satisfied (3) to satisfied (4), would require an additional $11,000 of annual compensation.

Of course, many factors contribute to satisfaction with employment, including actual hours worked compared to the amount and scheduling of hours worked, internal relationships, number of clients per day and level of debt. But there is a clear relationship between the level of income and satisfaction. This is important, especially to pre-veterinary and veterinary students and new veterinarians who may harbor the belief that compensation is unimportant as long as they are "doing what they love to do." While these data certainly suggest that this outlook may be true for some, generally this is not the case.

The results are similar in an analysis of the 2015 Compensation Survey data. The survey asked the question "How satisfied are you with your career?" Respondents could answer from 1 (not at all satisfied) to 7 (extremely satisfied). The proportion of respondents that indicate the higher levels of satisfaction (5-7) are noticeably larger in the higher-level income categories while the proportion of those respondents indicating the lower level of satisfaction (1-3) are larger in the lower-income categories.

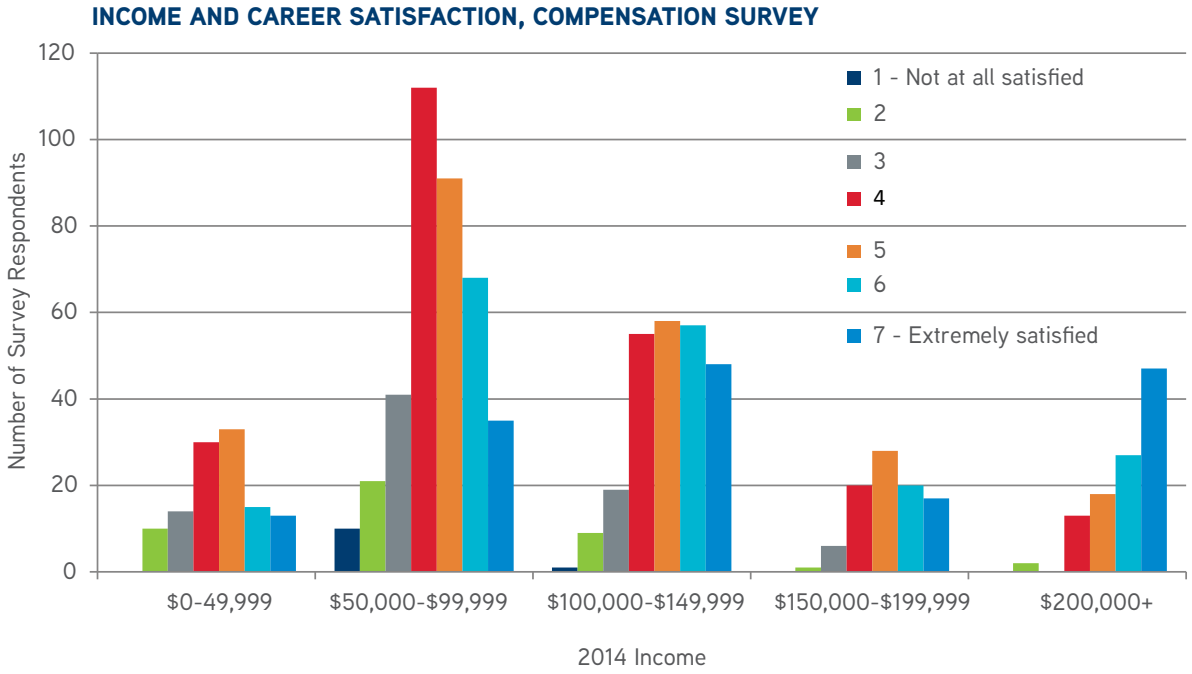


Figure 31

The seven levels of responses caused a larger range of mean incomes, from a low of $78,773 from those who responded with a 1 (not at all satisfied), to a high of $195,749 from those who responded with a 7 (extremely satisfied). The linear relationship predicts a $14,617 difference between each level of satisfaction. The important point to take away from this is that the patterns of responses and levels of income are consistent across the two datasets, indicating the existence of a very real, measurable pattern: that higher levels of compensation are correlated with higher levels of satisfaction.

Most important is that veterinarians generally seem to be satisfied with their career choice with more than 60% of respondents indicating that they are at least very satisfied.

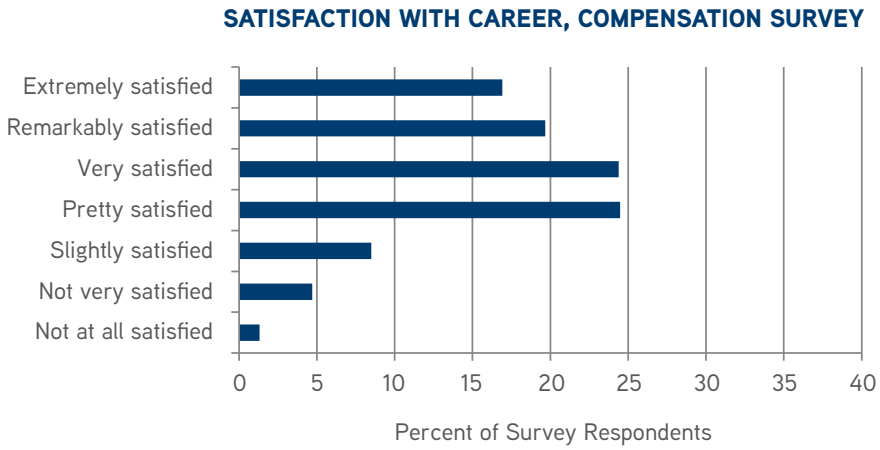


Figure 32

Eighty-five percent of respondents claimed to be at least a 4 (pretty satisfied) on the satisfaction scale.

The willingness of veterinarians to provide veterinary service labor, based on this simple analysis, increases as compensation increases. And this analysis suggests that a satisfaction level of 4 would generally require a level of compensation in the range of $110,000 to $120,000. In addition, based on previous findings, this level of compensation should occur at the optimum level of hours worked: 42.4 hours for women and 48.8 hours for men. While the relationship between compensation and number of hours of labor available defines the supply relationship, understanding the factors that affect the willingness of veterinarians to supply labor is important to determining the number of veterinarians needed to meet the demands for veterinary services.

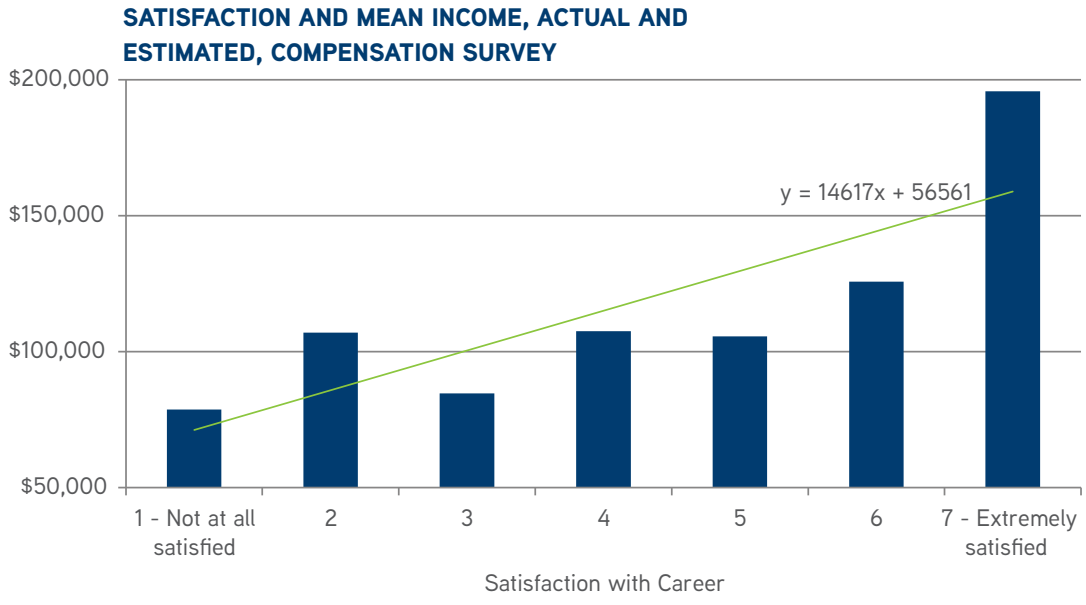


Figure 33

The challenges in estimating the demand for veterinarians are similar to those for estimating the supply. Demand is the relationship between the hours of veterinarian labor and the compensation the employer is willing to pay for those hours. The market demand is the summation of all of the individual employer relationships between hours and level of compensation. As with supply, developing this relationship would require obtaining the willingness-to-pay information from employers.

Our data contains points where the veterinarian and the employer have agreed to a level of compensation and number of hours of labor. For each of these transactions, the employer may have been willing to pay more, but was not forced to because the veterinarian accepted less. Or, the veterinarian received a greater level of compensation than she was willing to accept in return for the hours of labor required. Under normal market circumstances, the veterinarian would not provide labor for less than the compensation they were willing to accept, and the employer of veterinarian labor would not pay more for the labor needed than they were willing to pay. An abundance of labor and few opportunities for employment would cause the level of compensation to fall. A scarcity of labor in a market with many employment opportunities would cause the level of compensation to rise for the same amount of labor. Thus, over time, the changes in the level of compensation and the number of veterinarians employed would provide insight into the changing willingness of employers to pay for, and veterinarians to sell, veterinary labor.

In the market for new veterinarians, the compensation and number of veterinarians employed contains 14 aggregate annual observations (supply and demand equilibriums), while in the market for current veterinarians there are currently only eight such equilibrium points. This quantity of points is generally insufficient to estimate the demand relationship.

Expenditure Patterns

In the 2015 calendar year, a sample of 56 recent graduates completed the Personal Financial Planning Tool available on the AVMA website (https://www.avma.org/PracticeManagement/BusinessIssues/Pages/personal-financial-planning-tool.aspx). "Recent graduate" is defined as anyone who graduated between 2011 and 2015, which are the five most recent graduation years. The expenditures of these early career veterinarians were aggregated by expense category and compared to a similar age-group national average for the U.S. See the appendix for detailed category definitions.

COMPARISON OF EXPENSES

	Veterinarian Household, Recent Graduate, 2015	General Population, 25-34 Years Old, 2014
Demographics		
Age	30	30
Household Size	1.5	2.8
Home Ownership Rate	20%	39%
College Education Rate	100%	71%
Gross Household Income	$87,983	$61,042
Expenses		
Federal and State Taxes	$16,093	$6,420
Student Loan Payments	$9,360	N/A*
Credit Card Debt Payments	$2,045	N/A*
Housing	$13,806	$17,404
Transportation	$6,224	$8,908
Food	$5,852	$6,632
Healthcare, Insurance and Medicare	$5,826	$4,560
Professional Development	$1,035	$1,087
Recreation and Leisure	$4,110	$4,055
Savings, Retirement and Social Security	$12,247	$6,407
Personal and Miscellaneous	$3,464	$3,609
Child Care**	$258	N/A*
Pet Expenses	$1,021	$441
Annual Expenditures	$81,340	$59,523

**These categories are not separately recorded in the BLS CE survey.*

***For those recent graduates with children, average expenses are $2,403.*

Sources: AVMA Estimates and the Bureau of Labor Statistics Consumer Expenditure Survey.

Table 19

A SCARCITY OF LABOR IN A MARKET WITH MANY EMPLOYMENT OPPORTUNITIES WOULD CAUSE THE LEVEL OF COMPENSATION TO RISE FOR THE SAME AMOUNT OF LABOR. THUS, OVER TIME, THE CHANGES IN THE LEVEL OF COMPENSATION AND THE NUMBER OF VETERINARIANS EMPLOYED WOULD PROVIDE INSIGHT INTO THE CHANGING WILLINGNESS OF EMPLOYERS TO PAY FOR, AND VETERINARIANS TO SELL, VETERINARY LABOR.

There are quite a few similarities between the veterinarian and similar-aged general population households. For one, recreation and leisure spending is almost identical, though the general population spends about a third more of their income on recreation and leisure. Personal and miscellaneous spending is similar, as is healthcare.

While the similarities are interesting, the differences are even more so. First, notice that the average household size of 1.5 for recent graduates versus 2.8 for the general population. This occurs because only 21 veterinarians in the sample are married and only six have children. Contrast this with the general population where the mean number of children in the sample is one per household. Furthermore, the home ownership rate in the general population is twice that of veterinarians, presumably because those in the general population have had additional years to work to save and are less burdened by student loan debt than recent veterinary graduates. Second, the amount of taxes paid by the general population is far less than those paid by veterinarians. While part of this may be an artifact of incomplete information – the taxes are estimated for veterinarians, but are actual taxes paid by the general population – the difference would still be large with any methodological adjustments. This indicates that the home ownership deduction, tax exemptions for spouses and dependents, and lower absolute and marginal tax rates do indeed have an effect on the effective tax rate of veterinarians.

The second difference to point out is how much more the general population spends on housing compared to recent veterinary graduates. This may be a combination of things. Part of the difference may come about because recent veterinary graduates are very likely to live in a suburban setting while 25-34 year-olds are much more likely to live in an urban setting. Second, it could be an effect of wealth or income, whereby 25-34 year-olds have more disposable income, and so choose to spend more of that income on more upscale housing.

The third large difference is in the amount spent on transportation. 25-34 year-olds spend twice as much of a proportion of their salary on transportation compared to recent veterinary graduates. This is likely associated with the higher incidence of marriage amongst the general population, where there would be a need for two cars or could be as simple as the ownership of newer or more expensive vehicles.

The fourth difference is that the general population of this age group spends a third more money on food. This includes both food from restaurants (eating out and takeout) and groceries. Presumably this extra amount is used to pay for the additional household size. Indeed, veterinarians spend about $3,900 per person in the household for food (4.4 percent) whereas the 25-34 year-olds pay about $2,400 per person (3.9 percent).

The census data does not specifically itemize school loans or credit card debt and thus a comparison cannot be made, but recent graduates pay an average of $9,360 in student loan payments and pay off an average of $2,045 in credit card debt each year.

Burnout Scores

Another way to assess the well-being of veterinarians is through burnout scores. As the name suggests, a burnout score measures the cumulative effects of stress and compassion fatigue with respect to one's occupation. Burnout scores are easily obtained from survey data by asking a series of questions and using the responses to compute an index for each individual. The AVMA Student Leaders recommended using burnout scores as one measure of well-being for veterinarians.

Burnout scores have been used in the veterinary medical profession in several recent studies. Chigerwe , Boudreaux, Ilkiw (2014) used a type of burnout score, the Maslach Burnout Inventory-Educational Survey, to conclude that burnout scores are an acceptable instrument for assessing burnout in veterinary students, so application to the veterinary profession is not untoward. However, the results presented below contrast markedly with those obtained in Moore et al. (2014), who found that nearly a quarter of their sample scored high for both exhaustion and cynicism, while this current study has found very few veterinarians at high risk of burnout.

Using the Employment Survey data, burnout scores were calculated for the respondents who completed the necessary portion of the survey. According to http://www.proqol.org/uploads/ProQOL_Concise_2ndEd_12-2010.pdf, burnout scores have a distribution in the general population. A low score, indicating that someone is not imminently approaching burnout, is a score of 22 or less. An average score is a score of 23-41, and a score of 42 or higher is someone at the highest risk of burnout. The following tables display the burnout scores collected from the 2014 Employment Survey arranged according to graduation year, board certification, region, income, gender, practice type and according to DVM debt.

These burnout scores indicate burnout for the veterinary population is relatively low. Of course, burnout scores capture only one aspect of mental health: how one feels about their work and not the other myriad dimensions that comprise the full spectrum of mental health. But on the positive side, this shows that, on average, veterinarians may not be suffering from as much burnout as some recent anecdotal evidence has suggested.

THESE BURNOUT SCORES INDICATE BURNOUT FOR THE VETERINARY POPULATION IS RELATIVELY LOW. OF COURSE, BURNOUT SCORES CAPTURE ONLY ONE ASPECT OF MENTAL HEALTH: HOW ONE FEELS ABOUT THEIR WORK AND NOT THE OTHER MYRIAD DIMENSIONS THAT COMPRISE THE FULL SPECTRUM OF MENTAL HEALTH.

BURNOUT SCORE BY GRADUATION YEAR

Graduation Year	Mean	N	Std. Deviation
2013	23.8671	647	5.87836
2009	24.0726	537	6.09749
2004	23.4674	353	6.04948
1999	22.9110	281	6.28569
1989	21.4818	274	5.33164
Missing	16.0000	1	
Total	23.4080	2093	6.00635

Table 20

BURNOUT SCORE BY BOARD CERTIFICATION

Board Certified	Mean	N	Std. Deviation
No	23.4629	1873	5.99197
Yes	22.9409	220	6.12139
Total	23.4080	2093	6.00635

Table 21

BURNOUT SCORE BY REGION

Regions	Mean	N	Std. Deviation
Region 0	23.2184	174	5.73988
Region 1	24.1006	169	5.48444
Region 2	23.5932	295	6.27575
Region 3	22.9348	230	5.98762
Region 4	22.9660	206	6.12423
Region 5	24.0577	156	6.14160
Region 6	22.8503	167	6.42063
Region 7	21.5920	174	5.50041
Region 8	24.0000	159	5.53241
Region 9	23.8517	290	5.89781
Out of U.S.	23.5000	10	4.47834
Total	23.3365	2030	5.96553

Table 22

BURNOUT SCORE BY INCOME

Income Ranges	Mean	N	Std. Deviation
Less than $10,000	24.9583	24	4.29842
$10,000 to $19,999	23.1250	24	8.05045
$20,000 to $29,999	23.5500	60	5.32479
$30,000 to $39,999	24.9767	86	6.79788
$40,000 to $49,999	23.8583	120	5.83426
$50,000 to $59,999	23.1111	144	5.76717
$60,000 to $69,999	23.1725	255	5.65839
$70,000 to $79,999	23.0597	268	5.69744
$80,000 to $89,999	24.1564	243	5.81536
$90,000 to $99,999	24.0123	163	6.11312
$100,000 to $124,999	23.5179	251	5.62589
$125,000 to $149,999	23.0510	98	5.55641
$150,000 to $174,999	21.6538	78	6.38551
$175,000 to $199,999	21.1351	37	6.15161
$200,000 to $249,999	22.4074	54	6.45892
$250,000 and over	20.0980	51	5.51817
Total	23.3369	1956	5.90223

Table 23

BURNOUT SCORE BY GENDER

Please indicate your gender:	Mean	N	Std. Deviation
Male	22.6787	526	6.12080
Female	23.6540	1558	5.95080
Total	23.4079	2084	6.00765

Table 24

BURNOUT SCORE BY EMPLOYMENT SECTOR

Please indicate your current employment position.	Mean	N	Std. Deviation
Food animal practice (exclusive)	20.3056	36	5.66604
Food animal practice (predominant)	21.1429	28	5.26142
Mixed practice (at least 25% companion and 25% food or equine)	23.0278	108	5.44550
Companion animal practice (predominant)	23.4397	232	5.89341
Companion animal practice (exclusive)	23.5671	1065	5.79291
Equine practice	23.0494	81	6.60284
Federal Government (civil service)	24.0000	33	7.31010
Uniformed services	22.9474	19	6.01363
College or University (Faculty or staff only)	22.5688	109	6.29722
State/Local government	21.2727	22	4.90075
Industry/Commercial organizations	21.6731	52	6.96130
Not-for-profit organizations	23.9273	55	5.68902
Advanced Education (inclusive of internships and residencies)	24.7031	64	6.68730
Other Veterinary Employment (specify):	22.6905	84	5.36381
Non-Veterinary Employment (specify):	25.1250	8	5.91457
Total	23.2971	1996	5.92919

Table 25

BURNOUT SCORE BY DVM DEBTLOAD

Ranges for DVM Debt	Mean	N	Std. Deviation
Less than $10,000	22.68	393	5.98
$10,000 to $19,999	21.81	63	5.24
$20,000 to $29,999	21.76	87	4.94
$30,000 to $39,999	21.64	84	4.96
$40,000 to $49,999	23.64	89	6.41
$50,000 to $59,999	23.38	82	5.71
$60,000 to $69,999	22.92	112	5.77
$70,000 to $79,999	22.75	83	5.79
$80,000 to $89,999	23.96	99	5.68
$90,000 to $99,999	23.07	60	7.40
$100,000 to $124,999	23.73	214	6.17
$125,000 to $149,999	24.34	161	6.03
$150,000 to $174,999	24.06	157	6.16
$175,000 to $199,999	24.78	110	5.93
$200,000 to $249,999	25.21	111	5.83
$250,000 and over	23.90	171	6.17
Total	23.42	2076	6.00

Table 26

Health

The 2015 Employment Survey asked respondents to broadly evaluate their own health. Of the Employment Survey's 2,080 respondents who report being currently employed, 36 percent report being in excellent health, 45 percent in very good health, 17 percent in good health, 2 percent in fair health and only 0.14 percent in poor health. This contrasts with the health of 98 currently unemployed veterinarians, 33 percent of whom report being in excellent health, 32 percent in very good health, 26 percent in good health, 6 percent in fair health and 4 percent in poor health. The overall health of unemployed veterinarians is lower than for employed veterinarians; however it would be premature to say that one factor causes the other.

The self-reported health scores varied by practice type. Food animal veterinarians indicated the largest percentage of practitioners excellent health and uniformed services indicated the lowest level of excellent health. However, combining excellent and very good categories, the uniformed services veterinarians were near the top in percentage of respondents, while federal government veterinarians had the lowest percentage in the two categories.

SELF-REPORTED HEALTH BY EMPLOYMENT STATUS

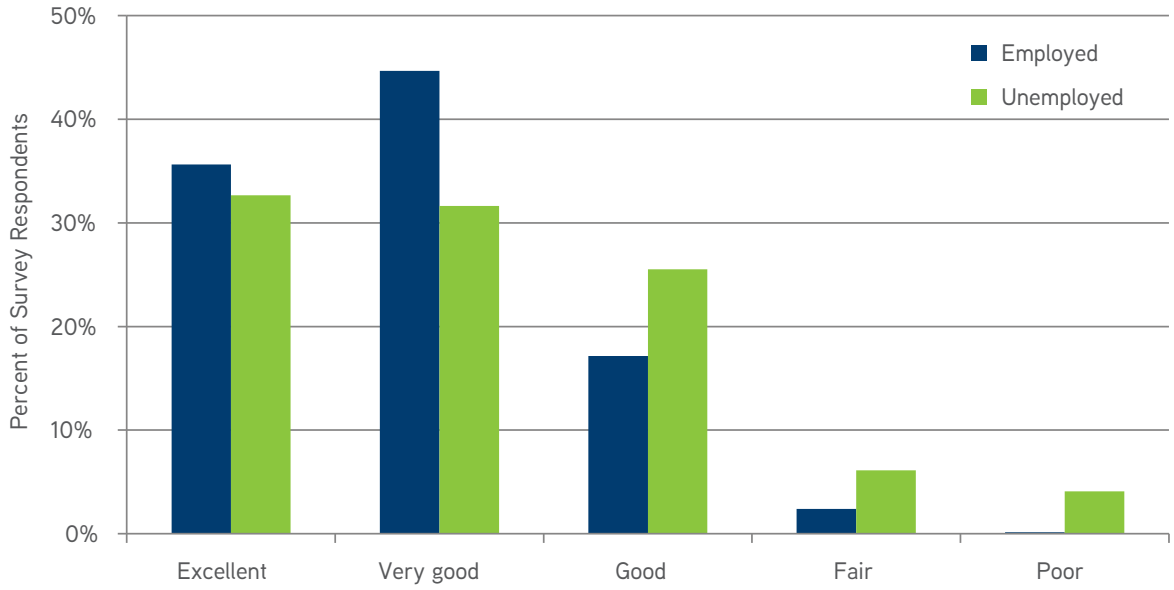


Figure 34

SELF-REPORTED HEALTH BY PRACTICE TYPE

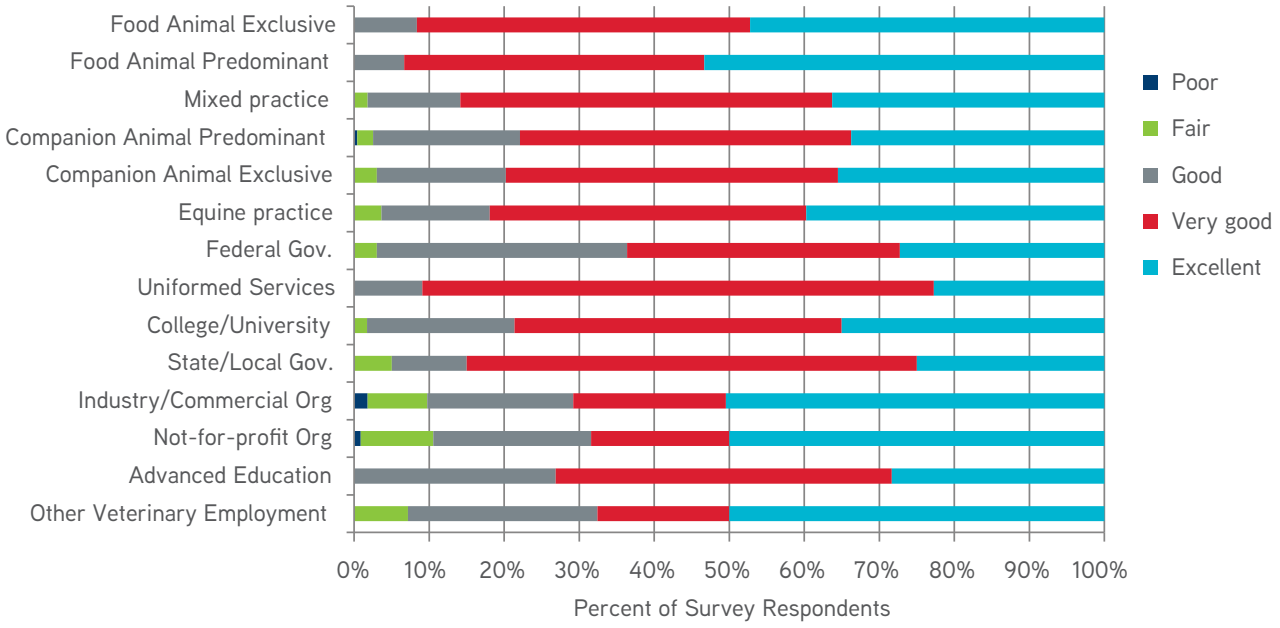


Figure 35

SELF-REPORTED HEALTH BY GENDER

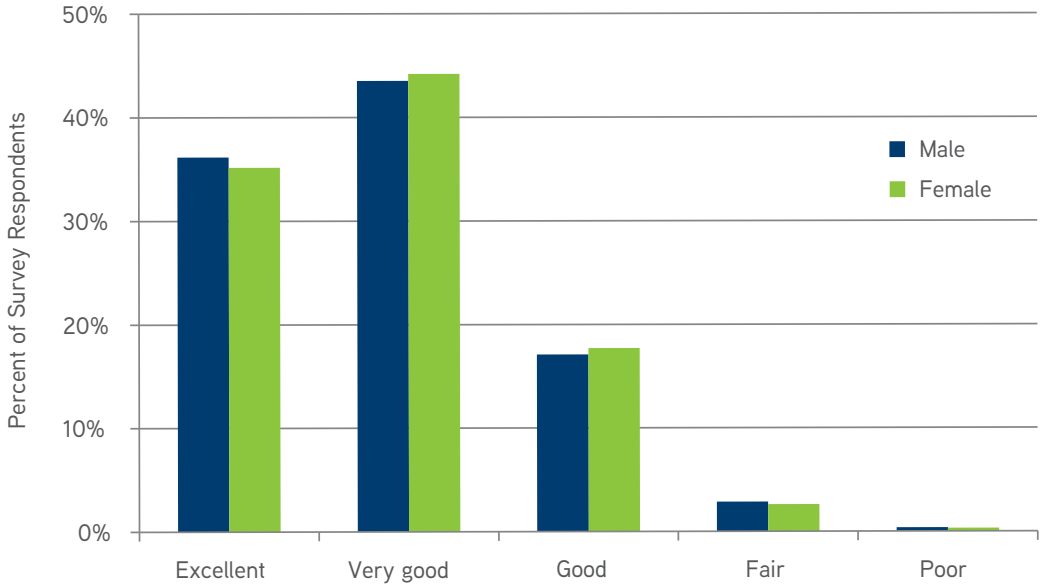


Figure 36

There was little difference in the self-reported health rating by gender with both the mean value and the distribution being very similar.

Also found in the data is the lack of difference in the self-reported health scores by year of graduation. Younger veterinarians have only a slight edge over older veterinarians in scoring themselves as in very good and excellent health.

SELF-REPORTED HEALTH BY GRADUATION YEAR

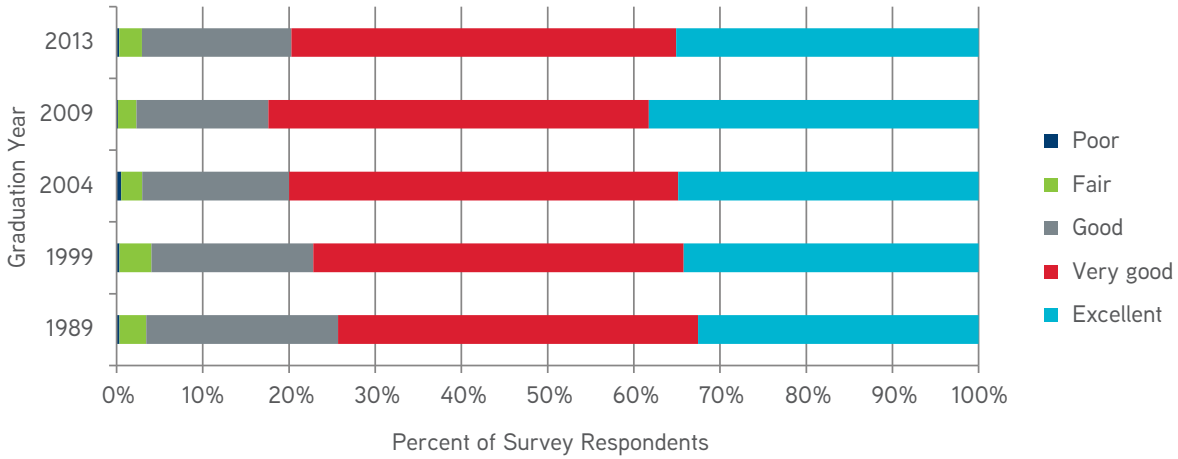


Figure 37

INCOME

After converting to real 2013 Dollars, the values comprising the estimates herein represent only those above $20,000 and below $500,000, those who worked an average between 30 hours and 120 hours per week, those who claim to earn less than $1,000 per hour, and those who are between the ages of 22 and 94.

SUMMARY STATISTICS

Data in this section were collected once every two years from 2000-2014 from AVMA's Biennial Economic Survey, with each survey year representing data from the previous year. As a consequence, the data available for income actually ranged from 1999 to 2013. In 2015, the survey changed to collect annual data, so the latest available estimates on income are from 2014. All values have been converted into real 2013 U.S. Dollars.

The data have been cleaned of outlying observations. After converting to real 2013 Dollars, the values comprising the estimates herein represent only those above $20,000 and below $500,000, those who worked an average between 30 hours and 120 hours per week, those who claim to earn less than $1,000 per hour, and those who are between the ages of 22 and 94. Observations outside these ranges likely represent either input errors or are so far removed from the mean that they are not representative of the population at large. While values outside of these ranges may be of interest to some studies, they are not representative of the realities of a typical, full-time veterinarian and may cause undue upward or downward bias on the estimates. For example, a veterinarian working full time but making less than $20,000 is most likely doing so as a personal choice. He or she may easily enter the mainstream veterinary labor market and earn a significantly higher salary.

The two following charts show the difference in real mean income by employment sector. Perhaps the most interesting characteristic is the change in 2014 of large animal veterinarians, both exclusive and predominant, in increasing income compared to the previous year. This could have been caused by a number of factors, but perhaps the most relevant is that the price of livestock increased sharply in 2014 due to strong demand for and a weaker supply of animal protein.

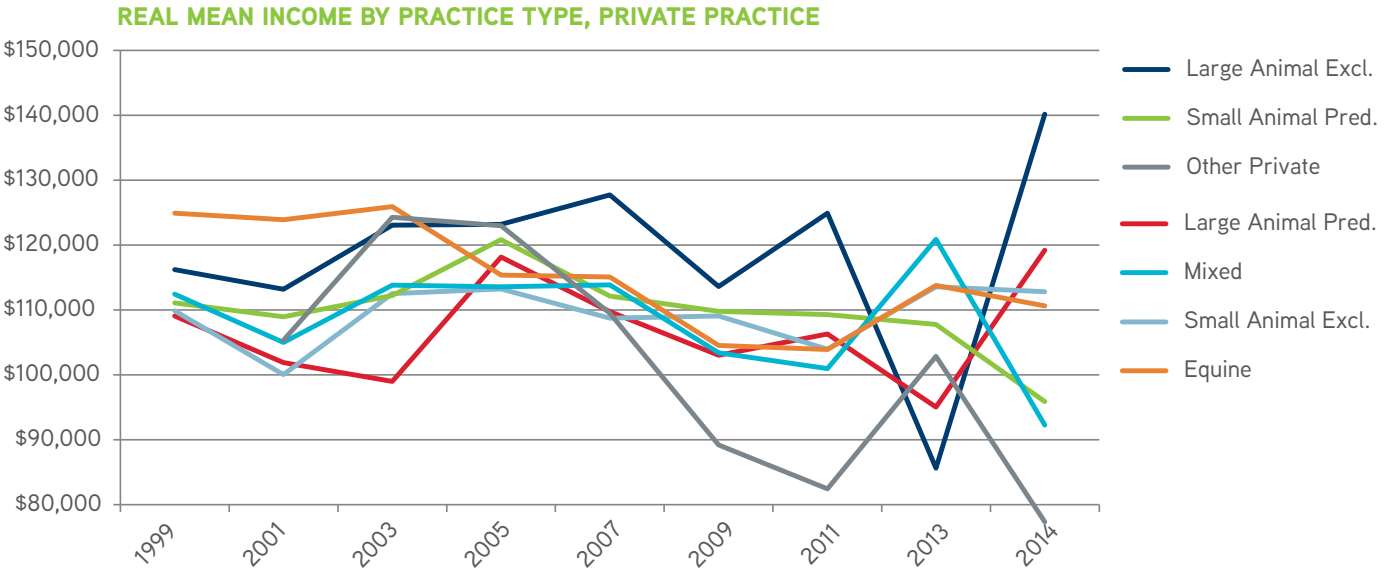


Figure 38

Generally, the trend over this period for private practice veterinarians is flat to declining for each of the practice types with a slight decline in total. Only the small animal exclusive showed a slight increase in salaries over the period.

In the public sector, the prevailing patterns appear to have held steady or slightly climbed, with the relative salaries of each public practice type remaining generally unchanged over the period. Industry veterinarians, however, have received much higher levels of compensation over the period and that compensation has been rising fairly steadily.

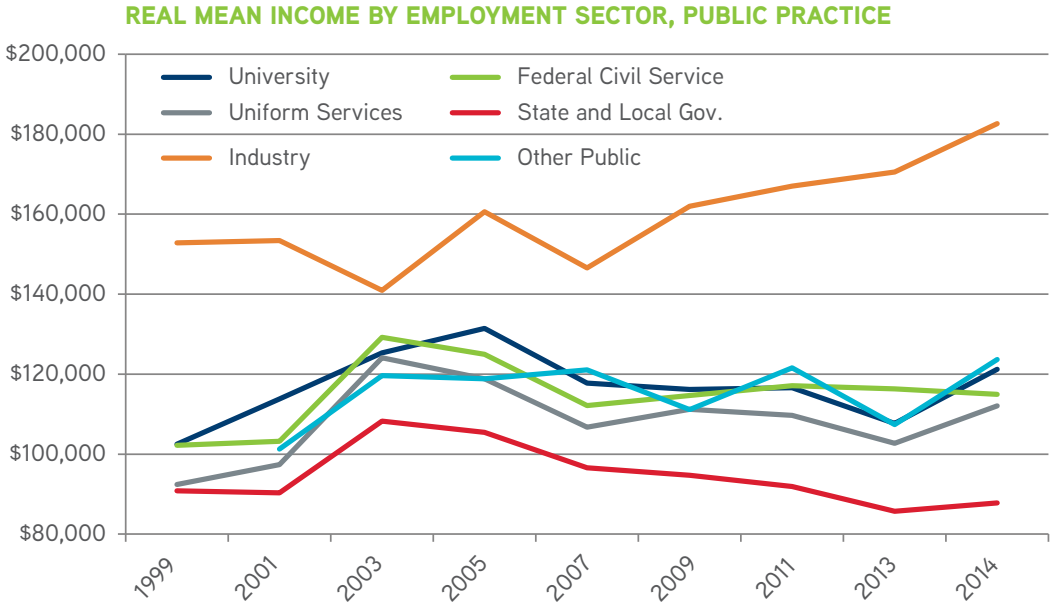


Figure 39

Separating income into segments by years of experience is another way to examine income. In all professions, earnings generally rise with experience. However, after a few decades in the workforce, it is common to see the average income reach a peak and then decline. The first part of this pattern, the increase in income, comes about because as someone performs their job, they become better at it, and are rewarded for their performance and often increase their efficiency. However, after a point, increases in efficiency and competency reach a plateau because a person has reached his or her capacity. After that point, income tends to stay at the same level or even decrease. This effect is compounded by the fact that as people age, they tend to want to focus less on work, and often attempt semi-retirement while still staying active in the labor force.

The region of employment also has a pronounced impact on income. Regions in the following figure are based on the first digit of their zip code, with similar zip codes generally being located near to one another. Region 10 consists of those survey respondents from outside the United States. Research at the AVMA has shown regions to be one of the consistent factors in explaining variation in income. In 2015, regions 1 and 6 are the highest earning regions.

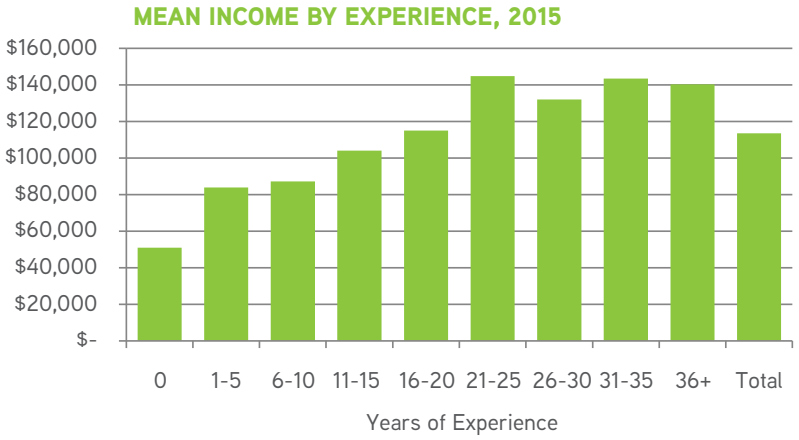


Figure 40

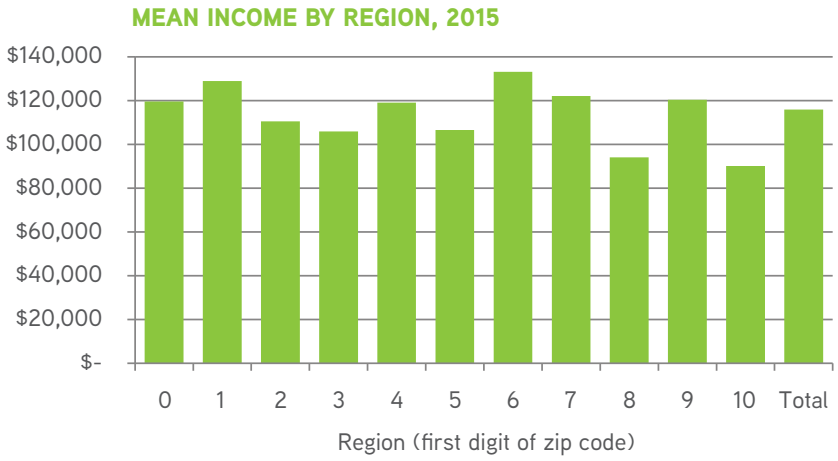


Figure 41

In the private sector, it is common to see veterinarians acting as managers and practice owners, typically with differences in income based on those responsibilities. The following figure shows that the same is true in the public sector, where veterinarians holding executive positions earn a substantial premium, and managers are also highly compensated.

Education level also frequently affects the level of income. Data on MBAs was collected for the first time in the most recent Compensation Survey. Prior to 2013, MBAs were grouped with the other master's degrees. Interestingly, veterinarians with MBA degrees earned virtually the same as every other group, in contradiction to last year's results that showed MBAs to be the highest compensated group.

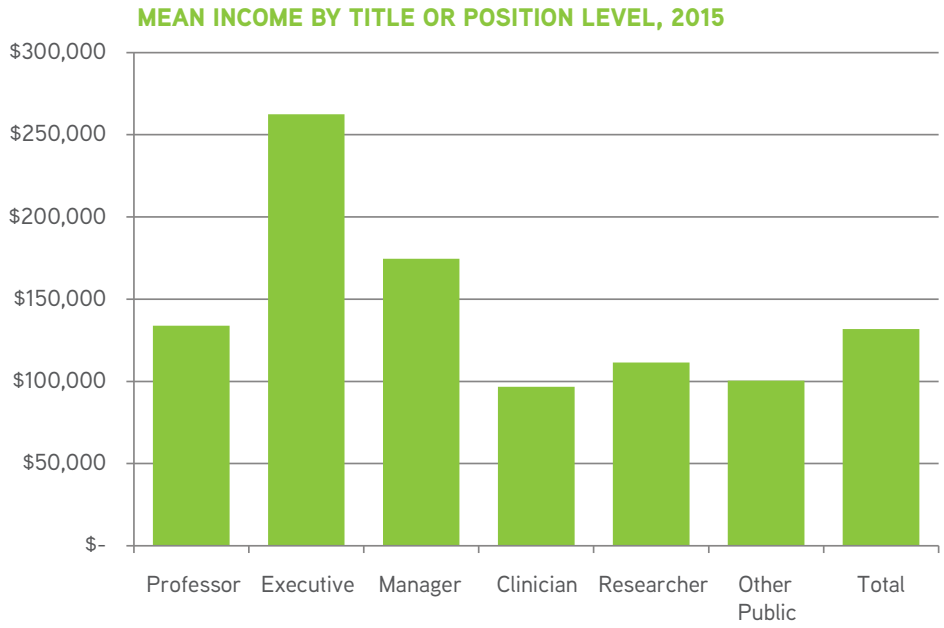


Figure 42

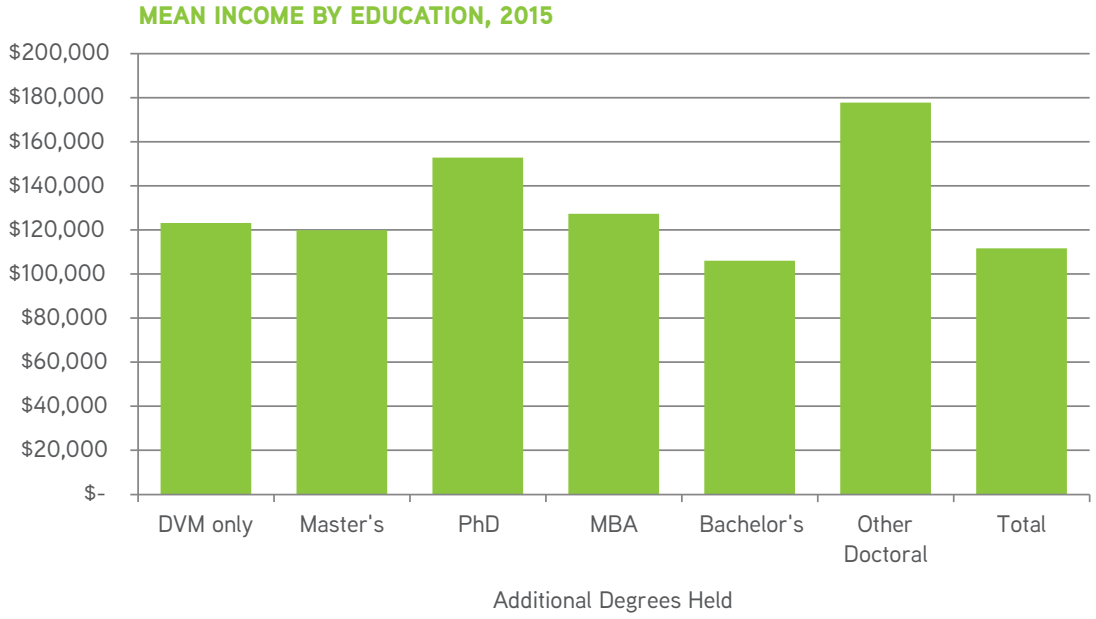


Figure 43

INCOME CALCULATORS

The above cross-tabulations are useful to gain an overall picture of trends across large portions of the population of veterinarians. However, because of the changing demographics of the profession and changing macroeconomic conditions, these averages fail to fully capture the long-run trends in compensation; specifically, what factors are associated with higher or lower compensation and by how much? These questions can be answered with a multiple regression analysis with the available data.

In previous years, the AVMA has biennially published the AVMA Report on Veterinary Compensation, the last of which was published in 2015 containing 2013 compensation data. This publication was over 100 pages of cross-tabulations that displayed the mean and median incomes of veterinarians in a variety of ways: across practice types, ages, experience levels, advanced education levels and other variables of interest. The AVMA Economics team has developed a single table to replace this publication. This table contains the coefficient estimates of a linear regression with the annual income as the dependent variable. The independent, or explanatory variables, are the same as in the previous publication.

We encourage you to download and fill-out one of the AVMA's salary calculators, either for new graduates or for experienced veterinarians. These calculators predict what the mean wage is for your employment situation. While everyone's situation is unique, these calculators estimate the mean income in a particular situation. They do not take all factors into consideration and they do not necessarily reveal the amount that someone should be paid, but do estimate the mean compensation for the given input.

EXPERIENCED VETERINARIAN SALARY CALCULATOR

Category	Description	My Input	Male	Female	Product
Step 1	For ALL of the following items, enter a value in the "My Input" column:				
Basic Information	Constant	1	$19,518	$17,227	
	Last Two Digits of the Current Year	16	$3,143	$1,373	
	Mean Work Hours Per Week		$580	$428	
	Practice Owner (1=yes, 0=no)		$9,738	$3,065	
Step 2	For ONE of the following experience categories, enter a "1" in the "My Input" column:				
Years of Experience[1]	1		$3,310	$6,208	
	2-3		$8,039	$13,824	
	4-6		$15,325	$23,019	
	7-9		$23,119	$29,841	
	10-14		$31,770	$34,309	
	15-19		$40,011	$37,387	
	20-29		$46,435	$44,302	
	30+		$44,623	$57,907	
Step3	For ONE of the following U.S. regions, enter a "1" in the "My Input" column:				
Employment Region (first digit of zip code)	Region 0 (ME, NH, VT, MA, CT, RI, NJ, PR)		$8,567	$13,589	
	Region 1 (DE, PA, NY)		$0	$7,194	
	Region 2 (DC, MA, NC, SC, VA, WV)		$3,064	$4,624	
	Region 3 (AL, FL, GA, MS, TN)		$0	$0	
	Region 4 (IN, KY, MI, OH)		$0	$0	
	Region 5 (IA, MN, MT, ND, SD, WI)		-$9,862	-$4,820	
	Region 6 (IL, KS, MO, NE)		-$10,020	$0	
	Region 7 (AR, LA, OK, TX)		$0	$0	
	Region 8 (AZ, CO, ID, NM, UT, WY)		-$7,127	$0	
	Region 9 (AK, CA, HI, NV, OR, WA)		$8,277	$7,026	
Step 4	For ONE of the following practice types, enter a "1" in the "My Input" column:				
Private Practice	Food Animal (exclusive)		$0	-$6,074	
	Food Animal (predominant)		-$12,516	-$12,109	
	Mixed Practice		-$4,837	-$5,048	
	Companion Animal (exclusive)		$0	$0	
	Companion Animal (predominant)		$0	$0	
	Equine		$0	-$6,007	
Public Practice	Federal Government		-$9,169	$4,244	
	Uniformed Services		-$15,163	-$5,107	
	College or University		-$5,733	-$7,580	
	State or Local Government		-$28,733	-$12,579	
	Industry		$25,202	$31,696	
	Other Public		$0	$0	
Step 5	For ANY of the following Additional Qualifications, enter a "1" in the "My Input" column:				
Additional Qualifications	Master's Degree (MS, MBA, MA, etc)		$1,889	$4,463	
	Doctorate Degree (besides DVM)		$9,976	$9,484	
	Residency Completed		$3,732	$2,527	
	Board Certified		$14,599	$16,388	
Step 6	For EVERY entry in the "My Input" column, multiply by the number in either the "Male" or "Female" column and enter the result in the "Product" column.				
Step 7	Add ALL of the entries in the "Product" column. This is the mean salary for your situation:				

[1]For "Years of Experience", take the current year and subtract your year of graduation from veterinary college, as well as any time spent out of the workforce or as a full-time student.

Table 27

INTERNSHIPS

The question of internships remains a debatable issue in the profession. On the one hand, internships provide a year of valuable post-graduate training. On the other hand, interns take a major salary cut in exchange for the training, and it's unknown whether or not they would receive equivalent training in the regular course of practicing medicine.

The following table tabulates internship participation rates according to the graduates responding to the Senior Survey. A few entries in 2006 and 2007 were omitted due to an insufficient number of observations.

A simple analysis that compares the mean (or conditional mean in a regression analysis) of a group that completed internships to a group that did not complete internships is one possible way to analyze the data. However, the difficulty in measurement comes about because of selection bias. If students are entering internships because they feel unprepared for their profession, then the extra time spent training in this learning environment could be yielding benefits that they might otherwise not be able to obtain. The difficulty comes about because we don't know the counterfactual: we don't know how the veterinarian would fare

INTERNSHIP PARTICIPATION RATES BY SCHOOL, 2006-2015

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Auburn University	13%	18%	21%	13%	22%	22%	17%	11%	20%	22%
Tuskegee University	19%	12%	20%	22%	16%	14%	20%	20%	38%	29%
University of California-Davis		31%	40%	29%	31%	31%	43%	33%	39%	62%
Colorado State University	29%	37%	25%	28%	37%	41%	19%	26%	31%	34%
University of Florida	43%	31%	24%	31%	38%	31%	26%	23%	36%	34%
University of Georgia	25%	35%	28%	25%	32%	23%	26%	25%	21%	21%
University of Illinois	20%	20%	25%	20%	26%	20%	19%	22%	26%	22%
Iowa State University	12%	20%	20%	21%	21%	11%	12%	19%	15%	19%
Kansas State University	20%		23%	23%	20%	26%	26%	32%	26%	20%
Louisiana State University	23%	17%	19%	25%	28%	17%	23%	24%	23%	12%
Tufts University	49%	45%	57%	36%	53%	58%	50%	40%	41%	30%
Michigan State University	20%	26%	25%	28%	33%	37%	31%	28%	30%	22%
University of Minnesota	15%	26%	21%	31%	25%	25%	21%	19%	26%	28%
Mississippi State University	19%	19%	27%	14%	27%	19%	22%	14%	21%	18%
Purdue University	25%	9%	14%	16%	18%	28%	22%	20%	13%	19%
Cornell Veterinary College	45%	46%	35%	35%	34%	38%	48%	43%	52%	52%
Oklahoma State University	25%	15%	12%	26%	20%	27%	19%	22%	15%	24%
University of Pennsylvania	33%		44%	38%	41%	51%	37%	60%	47%	59%
Texas A&M University	22%	20%	17%	18%	18%	14%	21%	24%	14%	28%
Washington State University	16%	28%	23%	22%	21%	31%	19%	16%	17%	14%
University of Missouri	39%	28%	14%	19%	24%	17%	18%	20%	12%	21%
The Ohio State University	13%	18%	30%	24%	27%	31%	18%	19%	25%	28%
Oregon State University	6%	24%	19%	13%	14%	30%	34%	30%	21%	30%
University of Tennessee	20%	21%	20%	24%	22%	21%	20%	24%	28%	33%
Virginia-Maryland Regional	19%	22%	18%	24%	21%	19%	22%	22%	18%	23%
North Carolina State University	31%	28%	31%	28%	26%	27%	32%	26%	32%	33%
University of Wisconsin	20%	31%	41%	29%	40%	37%	29%	29%	25%	19%
Western University		25%	35%	37%	31%	41%	42%	39%	48%	42%
Total	23%	26%	26%	25%	28%	28%	26%	26%	27%	29%

Table 28

in their career had they not pursued an internship. In fact, their income could have been less over their lifetime had they forgone the internship (if they were never able to achieve a higher level of confidence), or it could have been more (if they had not needed to make that initial $40,000 sacrifice). Because no individual can take two career paths simultaneously (internship and no internship), directly measuring the impact of an internship on the lifelong earnings of a veterinarian is not possible.

To counter this selection bias and provide an estimate for the impact of an internship on the lifelong earnings of veterinarians who pursue an internship, an instrumental variables (IV) approach is very appealing (see Angrist and Pischke (2009). The IV approach is used to estimate causal relationships when controlled experiments are not feasible. In a simple linear regression model, the effect a specific factor (independent variable) on the variable of interest (dependent variable) is determined. In the case of IV the impact of the instrument is measured on the independent variable. Since we know the relationship between the independent and dependent variable, we can deduce the impact of the instrumental variable on the dependent variable.

We can leverage tens of thousands of observations from the previous decade across the Biennial Economic (BES) and Employment surveys. The proposed instrument variable is the veterinary school attended. Some schools, such as the University of Pennsylvania, Cornell University and Western University all have consistently high rates of internships over the years. Other schools have consistently low rates of internships. This is useful because we know that school attended does not have a statistically significant correlation with income (the IV exclusion restriction) but the school attended does have an effect on whether someone pursues an internship (instrument is correlated with the variable of interest).

The estimation uses a bootstrapped standard error, with clusters based on the year of graduation. The null hypothesis being tested is that internships do not have a statistically significant effect on income.

INTERNSHIP INSTRUMENTAL VARIABLES REGRESSION, 2014

Log (Income, 2014)	Coef.	Std. Err.	z	p-value
Completed Internship	0.256	0.167	1.54	0.125
Completed Residency	0.080	0.055	1.46	0.145
Board Certified	0.064	0.037	1.72	0.086
Female (1=yes, 0=no)	-0.268	0.096	-2.78	0.005
Male Experience	0.034	0.006	5.47	0.000
(Male Experience)^2	-0.001	0.000	-4.57	0.000
Female Experience	0.114	0.036	3.16	0.002
(Female Experience)^2	-0.009	0.004	-2.47	0.014
(Female Experience)^3	0.000	0.000	2.09	0.037
(Female Experience)^4	0.000	0.000	-1.74	0.082
Owner	0.235	0.047	5.01	0.000
Female Owner	-0.389	0.064	-6.04	0.000
Married	0.150	0.028	5.37	0.000
Log (Year Hours)	0.223	0.040	5.54	0.000
Hispanic	0.320	0.180	1.78	0.076
Executive	0.305	0.048	6.35	0.000
Manager	0.113	0.030	3.72	0.000
MBA	0.269	0.084	3.19	0.001
Doctorate	0.169	0.038	4.49	0.000
Region 0	0.110	0.082	1.34	0.180
Region 1	0.093	0.066	1.41	0.159
Region 2	0.055	0.050	1.1	0.274
Region 4	0.054	0.042	1.28	0.199
Region 5	-0.013	0.042	-0.31	0.756
Region 6	-0.036	0.068	-0.53	0.595
Region 7	0.008	0.047	0.17	0.869
Region 8	-0.039	0.070	-0.56	0.575
Region 9	0.126	0.056	2.23	0.026
Food Animal Exclusive	-0.007	0.099	-0.07	0.946
Food Animal Predominant	-0.207	0.092	-2.24	0.025
Companion Animal Predominant	-0.065	0.049	-1.33	0.182
Mixed Animal	-0.237	0.052	-4.56	0.000
Equine	-0.247	0.083	-2.98	0.003
Other Private Practice	-0.042	0.134	-0.31	0.753
College/University	-0.192	0.046	-4.21	0.000
Federal Gov.	-0.006	0.044	-0.13	0.894
Uniformed Services	-0.156	0.053	-2.96	0.003
State/Local Gov.	-0.313	0.051	-6.19	0.000
Industry/Commercial Org	0.219	0.055	3.97	0.000
Other Veterinary Empl.	-0.179	0.113	-1.58	0.115
Constant	9.321	0.335	27.8	0.000

Table 29

INTERNSHIP INSTRUMENTAL VARIABLES REGRESSION, 2014 CONT'D.

Log (Income, 2014)	Coef.	Std. Err.	z	p-value
Number of Observations	1782			
Wald Chi-Square (40)	3097.050			
Prob > Chi-Square	0.000			
R-Squared	0.285			
Adjusted R-Squared	0.268			
Root MSE	0.543			
Number of Clusters (Grad Years)	49			

Table 29 Cont'd.

We fail to reject the null hypothesis and cannot conclude that internships have an effect on income. Using the methods described herein, there is no evidence to suggest internships have an effect. This is not to say that they don't but with the methods and data as stated, there is no evidence of an effect. Future methodologies will involve leveraging more data, using a time-varying instrumental variable and using propensity score matching.

KEY PERFORMANCE INDICATOR: NET PRESENT VALUE

Just as the debt-to-income ratio is the key performance indicator (KPI) for the efficiency of the price linkage between the market for veterinary education and the market for veterinarians (how efficiently resources are being used to produce veterinarians at a cost that is justified by the income they receive), the Net Present Value (NPV) of the DVM degree is the KPI for the efficiency of the price linkage between the market for veterinarians and the market for veterinary services (does society's willingness to pay for veterinary services provide a normal economic return on the investment required to produce a veterinarian). There are many possible formulations that could be used to compute the NPV. As with all indicators, the value of the indicator is less important than understanding the factors that contribute to the direction of change in the value of the indicator. This section provides the estimates of the NPV for newly graduated veterinarians and also explores the implications of the changes to the formulation and factors used in its estimation.

Net Present Value (NPV) provides a measure of the relative, current value of a stream of benefits and costs over a specified period. That is, the value to an individual to receive the net income today of a lifetime of earnings. The net income is the value of the DVM degree less the value of what could have been earned in the next best opportunity (BS degree) and the cost of obtaining the DVM degree (tuition and fees, living expenses and interest on funds borrowed to pay for these expenses). Unlike the debt-to-income ratio that provides a measure of the current-year value of the DVM degree versus the costs of obtaining the degree that indicates the relative difficulty of maintaining a standard of living as a veterinary professional at a specific point in time, the NPV provides an indication of the value added to tangible benefits (lifelong earnings) as a result of becoming a Doctor of Veterinary Medicine.

A positive NPV indicates that the tangible benefits of obtaining the degree are greater than not obtaining the degree. A negative NPV indicates that the tangible benefits of not earning the degree exceed those of earning the degree. We acknowledge that, like all other professions, veterinarians obtain intangible benefits (non-monetary or non-measurable benefits) from practicing veterinary medicine. No attempt is made here to compute these intangible benefits.

UNLIKE THE DEBT-TO-INCOME RATIO THAT PROVIDES A MEASURE OF THE CURRENT-YEAR VALUE OF THE DVM DEGREE VERSUS THE COSTS OF OBTAINING THE DEGREE THAT INDICATES THE RELATIVE DIFFICULTY OF MAINTAINING A STANDARD OF LIVING AS A VETERINARY PROFESSIONAL AT A SPECIFIC POINT IN TIME, THE NPV PROVIDES AN INDICATION OF THE VALUE ADDED TO TANGIBLE BENEFITS (LIFELONG EARNINGS) AS A RESULT OF BECOMING A DOCTOR OF VETERINARY MEDICINE.

Age-Earnings Profiles

A major component of the Net Present Value is an individual's lifetime earning potential with and without the DVM degree. As a result, a change in the assumptions related to an individual's lifetime earnings will affect the NPV estimate. A person's future earnings are, of course, unknowable. An individual may decide to work harder or make a career-changing decision to increase or decrease lifetime income. However, basing the predicted future earnings path on the mean earnings path of older veterinarians provides the best estimate of the likely earnings path of future veterinarians. It is also important to acknowledge that this assumes that the work and lifestyle characteristics of the past veterinarians will be duplicated by the new veterinarians.

To capture how an individual's actions will affect the mean earnings path, the mean effect of certain decisions that are known to impact compensation are estimated. For this purpose, age-earnings profiles are used to estimate the average salary of the average person over a length of time. For a veterinarian, that length of time is measured from the date of graduation from veterinary college to retirement. The new veterinarian's earning path can be estimated by using the incomes of those who are already in the labor force at different points in their career. While the individual pattern may vary due to personal choices and the pattern of a cohort of graduates from year to year may change as a result of shifting demographics, the overall mean pattern for the profession is unlikely to have any significant change in the short term.

The same methods of estimation will apply to determining the opportunity costs associated with the DVM degree. The opportunity costs are what the average person would have earned had he or she decided to forgo the path of becoming a veterinarian. How much would that person earn each year in the labor force? As with the discussion pertaining to estimating the impact of internships on incomes, computing how much a person would make both as a DVM and with only a BS is not possible individually. We cannot say that this is the "effect" of the DVM degree because, again, it is unknowable how this person would have fared in the other career path. Instead, this is simply the estimate of other similar post-baccalaureate individual earning paths. The collection of these various earning paths into an average provides a measure of the amount of income over time that veterinarians give up both while they were in school and after they become veterinarians. This forgone income is the opportunity cost of the veterinary medical degree.

First consider the age-earnings profile of a veterinarian. This is the expected labor income at any given age. The shape of lifetime earnings is similar to an inverted-U shape: earnings increase quickly at the beginning of one's career as each person quickly accumulates human capital (experience), reaches a peak around age 55, and then decreases as people tend to want to work fewer hours since they've accumulated all of the human capital necessary to fulfill their job.

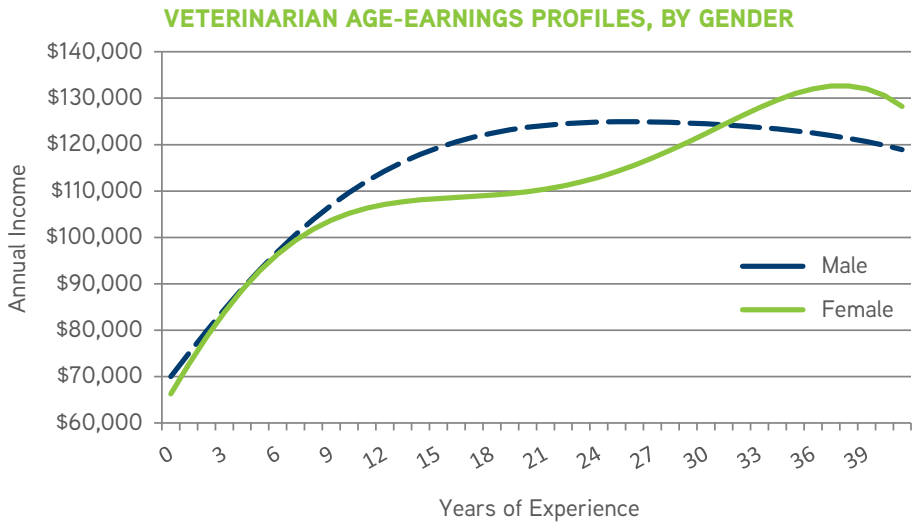


Figure 44

In economics literature, these are always called "age-earnings profiles," but what does that really mean? Age is typically used in because it is a proxy for one's years of experience. An older person is clearly more likely to have more years of experience. But the better measure is to actually use experience, which the surveys contain. The surveys ask the year of graduation and how many years someone was inactive as a veterinarian. So simply take the year of the survey, subtract one because it measures the previous year's salary, and subtract the year of graduation. This gives an estimated number of years of active work experience as a veterinarian. Since we have a very good estimate of work experience, and because not everyone follows a traditional path to veterinary school, work experience is the logical choice to use for the age-earnings profiles.

The next issue to tackle in estimating the age-earnings profiles is to adjust for possible biases in the data. For example, during a recession, consumer spending may slump and cause a decrease in the compensation of companion animal veterinarians. Or an increase in beef prices could increase the demand for food animal veterinarians. For this reason, the best approach to estimate the differences between various practice types, education levels and ownership status is to pool together veterinary income observations from multiple periods of time. Digital records for the AVMA's Biennial Economic Survey (BES) are available every two years from 2000 to 2014 (data covers the previous year, so the periods under consideration are actually from 1999 to 2013). This period covers various macroeconomic conditions and should be sufficient to estimate the parameters needed for the model. In order to make the years comparable to one another, salaries were converted to 2013 dollars using the Consumer Price Index.

The shape of the age-earnings profiles was estimated with a regression equation. In previous versions of the table, a single equation was used to estimate both men's and women's age-earnings profiles. It turns out that the age-earnings profile of women in the veterinary profession differs from those of men. For this reason, the appropriate estimation technique is to use two separate regression equations.

When using two separate regression equations, the shape of the age-earnings profiles differs substantially. Instead of an inverted U-shaped curve, female veterinarians' salaries increase more quickly than that of men early on in their careers, but levels off more quickly at about 10 years of work experience. It then accelerates again after about 25 years of experience, and levels off once more, 10 years later, at a level above that for males. To estimate these equations we used the BES data and included experience variables from the first to the second power for males and from the first to the fourth power for females.

Finally, consider alternative career paths or the opportunity costs associated with becoming a veterinarian. The opportunity costs are the earnings that a veterinarian will forgo as a result of pursuing the DVM degree. Had the veterinarian stopped the educational experience at the bachelor degree, the earnings path that would have been followed represents a lost opportunity. The previously published NPV figures that estimate the ratio of the growth rate between professional and doctoral degree holders to bachelor's degree holders was extracted from Gohmann, McCrickard, and Slesnick (1998). This uses an old data series and is indirect. A more direct way to estimate what a person would be earning without the DVM degree is to estimate the age-earnings profiles from a relevant data set. To estimate these age-earnings profiles, the 2013 American Community Survey data from the U.S. Census Bureau was used. Two regression equations were then estimated; one for males and one for females. The male regression model best fit the data by using age up to the second power and the female regression model best fit the data by using age up to the fourth power, the same as was estimated for veterinarians. The regressions considered only those who reported 16 years of education, worked at least 35 hours per week for 48 or more weeks in the past year, and earned an income of more than $0 but less than $300,000. This exercise yielded a usable age-earnings profile for the opportunity cost.

SINCE WE HAVE A VERY GOOD ESTIMATE OF WORK EXPERIENCE, AND BECAUSE NOT EVERYONE FOLLOWS A TRADITIONAL PATH TO VETERINARY SCHOOL, WORK EXPERIENCE IS THE LOGICAL CHOICE TO USE FOR THE AGE-EARNINGS PROFILES.

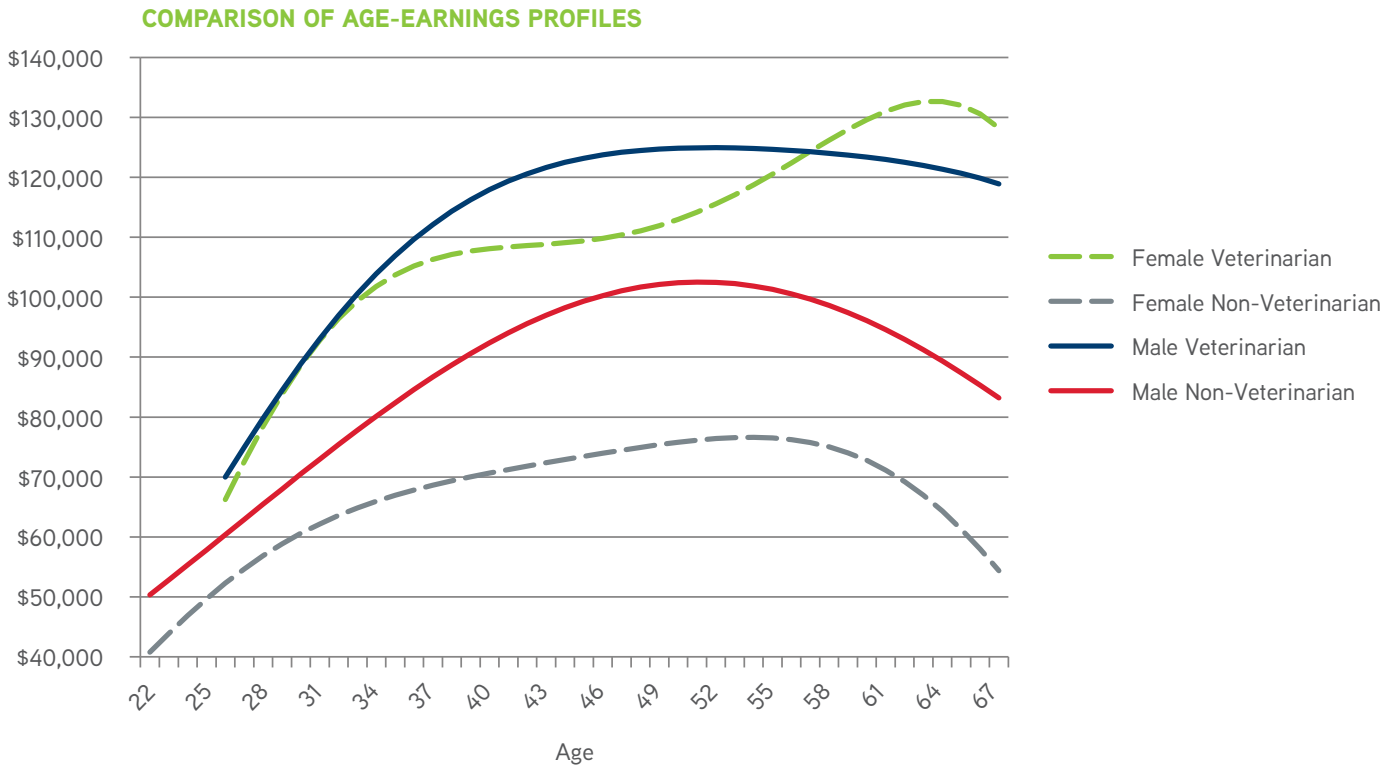


Figure 45

Baseline NPV

Net Present Value has been declining since the earliest data were available in 2010. The primary reason for this decline in NPV is the increasing opportunity costs: starting salaries for bachelor's degree holders grew 19 percent over this period, whereas starting salaries for DVM degree holders grew about 5.5 percent.

The increase in opportunity cost contributed to 128 percent of the decline in NPV for men and 134 percent for women, whereas debt contributed to 14 percent of the decline for men and 19 percent for women, while starting salaries reduced the difference in NPV by 42 percent for men and 54 percent for women (percentages may not sum to 100 due to rounding). In other words, almost the entire decline in NPV over this period has been caused by the faster rate of increase in the starting salaries for bachelor's degree holders compared to veterinary graduates.

That bachelor's degree holders have been doing quite well is certainly a good thing, but their fortune has increased the angst that veterinarians feel about the added value of their education. If the earnings gap between DVM and bachelor's degree holders continues to narrow, veterinary students will continue to view the DVM degree as less valuable and less likely to be worth the price of admission to the veterinary profession. Because the decline in the NPV for men has been steeper than for women, this may be the reason for the changing gender distribution in the profession. Males have a much larger opportunity cost to become a DVM than do women.

ALMOST THE ENTIRE DECLINE IN NPV OVER THIS PERIOD HAS BEEN CAUSED BY THE FASTER RATE OF INCREASE IN THE STARTING SALARIES FOR BACHELOR'S DEGREE HOLDERS COMPARED TO VETERINARY GRADUATES.

NET PRESENT VALUE BY GENDER, 2010-2015

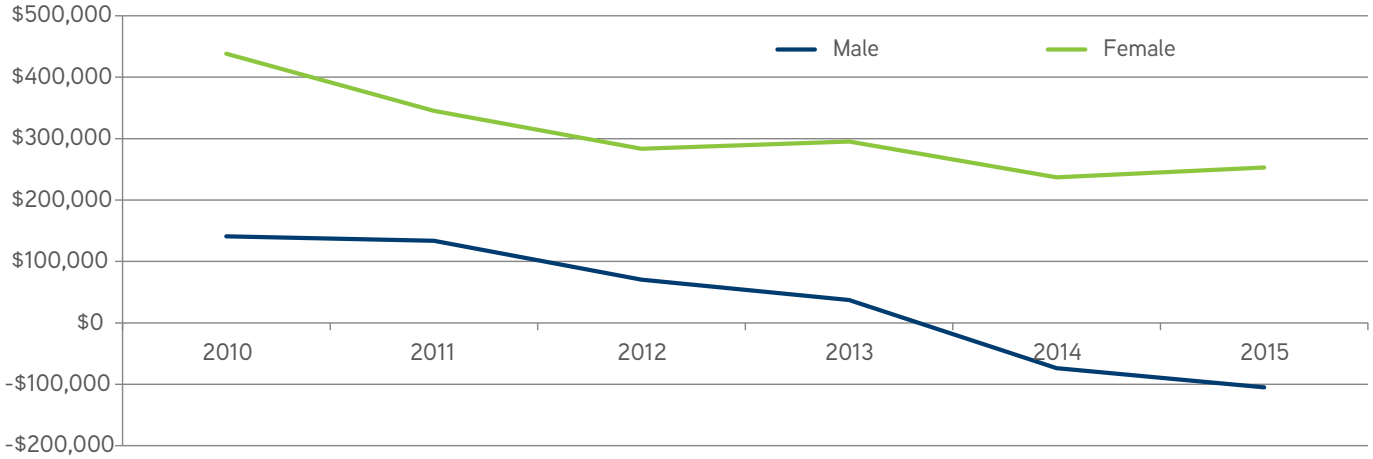
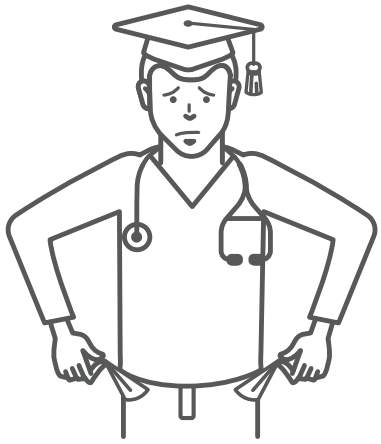


Figure 46

Changing Assumptions

Differences in Net Present Value Based on Practice Type

Net Present Value clearly differs by practice type. From the regression with the BES data, we were able to estimate the differences between salaries for each practice type. Those differences are summarized in the following table. For clarity, we elected to keep all of the different employment sectors, regardless of whether or not the differences were statistically significant. In many cases, the effect of various sectors has an opposite effect. For example, male equine veterinarians make a higher salary compared to their peers in companion animal exclusive practice. On the other hand, females specializing in equine practice make less money than their peers in companion animal medicine. The opposite is true for those with employment in state and local government.



IF THE EARNINGS GAP BETWEEN DVM AND BACHELOR'S DEGREE HOLDERS CONTINUES TO NARROW, VETERINARY STUDENTS WILL CONTINUE TO VIEW THE DVM DEGREE AS LESS VALUABLE AND LESS LIKELY TO BE WORTH THE PRICE OF ADMISSION TO THE VETERINARY PROFESSION.

NET PRESENT VALUE BY PRACTICE TYPE, PRIVATE PRACTICE

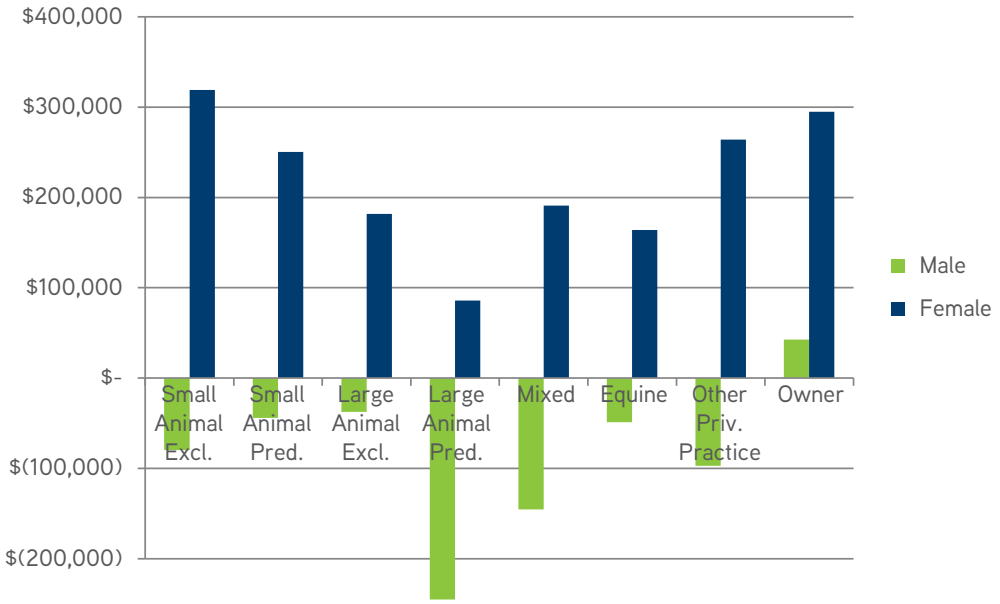


Figure 47

NET PRESENT VALUE BY PRACTICE TYPE, PUBLIC PRACTICE

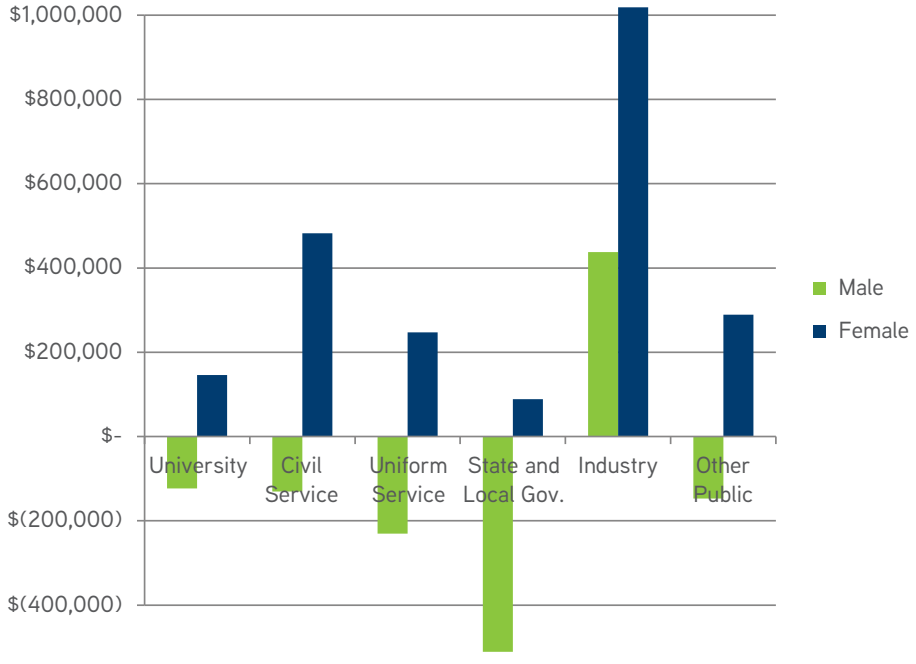


Figure 48

Another interest is to establish if there exists a difference in the effect of additional education on Net Present Value. There are four scenarios to consider. First, the effect of a master's degree: Master's degrees are sought by veterinarians either as advanced preparation for the DVM degree or afterward to complement the skills learned, most often with a Master's of Public Health (MPH) degree. Assuming that the master's degree is earned in two years and costs an additional $20,000 per year in educational expenses with no additional income, a lower NPV will result for both men and women.

Second, the effect of a PhD on the earnings path was estimated. A large number of PhD holders are employed either as professors in universities or in research positions in industry and both of these practice types earn a higher than average income. However, the PhD typically has a much lower direct cost, since many are paid teaching or research assistantships. For this analysis, those with both a DVM and PhD are assumed to first obtain their DVM degree and then spend an additional three years in graduate school to obtain the PhD degree. During this time in school, the debt is assumed not to increase and a stipend of $20,000 is received per year. After the three additional years of school, the individual earns their regular DVM salary, starting at zero years of experience, plus a premium in salary of 8.7 percent for males and 10.7 percent for females.

Third, the effect of the MBA on the earnings path was estimated. Data for veterinarians holding a Master's of Business Administration (MBA) degree is only available for the two most recent years, 2013 and 2014. Regressions with this data show that female MBA holders earn a 30.5 percent premium on their salary, all else equal, and males earn a 34.9 percent premium on their salary.

In addition, when the MBA variable is included in the regression, the coefficient on master's degrees is no longer statistically significant. For MBA holders, we assume an additional two years of education at a cost of $40,000 per year. The opportunity cost remains the same, and we assume that the individual makes no additional income during this time. Interestingly, when MBAs are included in the regression as a variable separate from other master's degrees, the coefficient on other master's degrees decreases and becomes statistically insignificant, suggesting that the majority of the wage premium attributable to a master's degree is disproportionately earned by MBA holders.

And fourth and finally, the effect of board certification on the earnings path was estimated. Assuming that board certification requires a one-year internship followed by a three-year residency, each of which pay $30,000 per year, followed by board-certification that pays a premium of 17.2 percent for men and 19.9 percent for women.

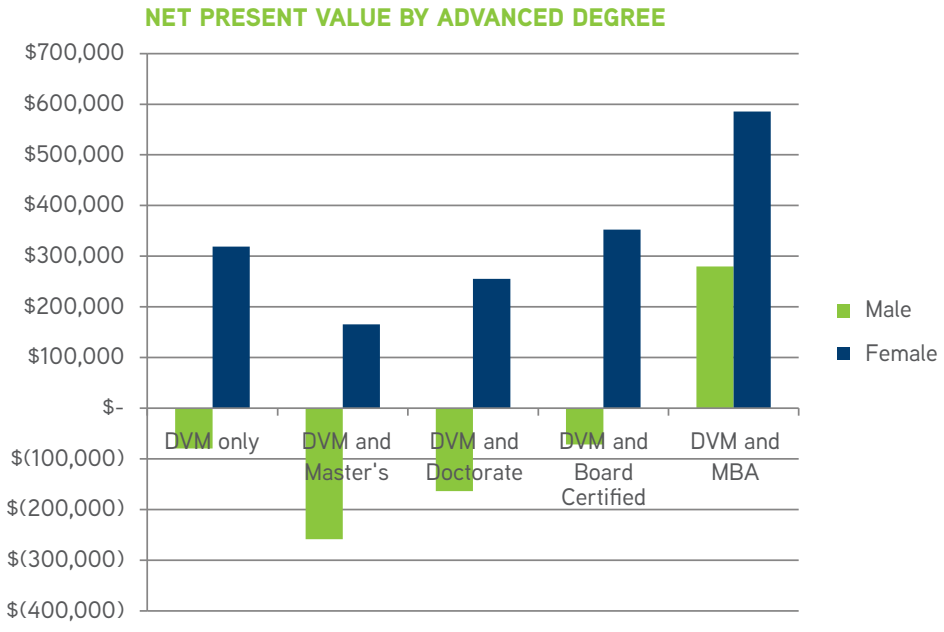


Figure 49

The discount rate provides the value that an individual places on the value of a dollar at some point in the future compared to today. An individual's exact discount rate is unknown and may differ between any two individuals. The discount rate is a measure of an individual's time preference and this is different than the expected return on investment or the interest rate of an investment. A person who is indifferent to being paid $100 today or $105 in a year has a discount rate of 5 percent. Whether that person chooses to invest or spend that money will depend on whether the interest rate is above or below his 5 percent discount rate.

Discount rates are unique to individuals, so despite the estimates aforementioned, there is much value to having multiple estimates. The table below illustrates the effect of changing the discount rate on the NPV assuming discount rates in the range of 1 to 10 percent for both men and women. The preferences of an extremely patient person would be represented by 1 percent, while 10 represents the preferences of a very impatient person. The true value for the population is likely somewhere in the middle. The estimates provided for NPV in the all other tables in this publication use a discount rate of 4 percent.

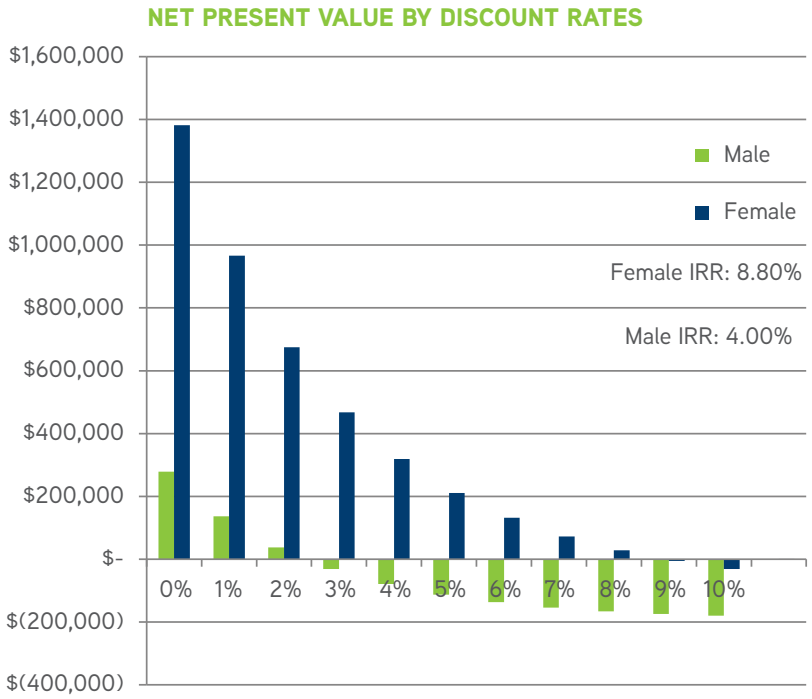


Figure 50

The effect of a change in the interest rate on NPV is illustrated below. The effect is relatively small: for both men and women a 5 percentage point increase in the interest rate decreases NPV by less than $70,000. The real interest rate is very commonly confused with an individual's discount rate. This is because they are theoretically equal. In a perfect, closed market economy, where costs equal benefits and consumers are motivated by consumption smoothing across all time periods, the social cost of saving is equal to the social benefit of saving. So if the social cost of saving is determined by the average of every person's discount rate, then the benefit of saving is given by the real interest rate. Again, in a perfect, closed market economy these two values are equal, but in reality the actual economy does not follow these strict assumptions, so there will be some differences between discount rates and interest rates. Because of these confounding factors, no one actually knows the true discount rate, despite over one hundred experiments to estimate it (Frederick, Loewenstein, and O'Donoghue, 2002). However, estimates for discount rates in the range of 2 to 5 percent are typical in the literature, based on the long-term, real interest rate.

Retiring later leads to the accumulation of more years of earnings and thus higher financial lifetime earnings. However, the value to NPV or the addition of income in later years is increasingly diminished as a result of the discount rate. Using a discount rate of 4 percent the value of adding $100,000 30 years in the future only adds $30,832 to the NPV and only adds $20,829 if the $100,000 is gained 40 years in the future.

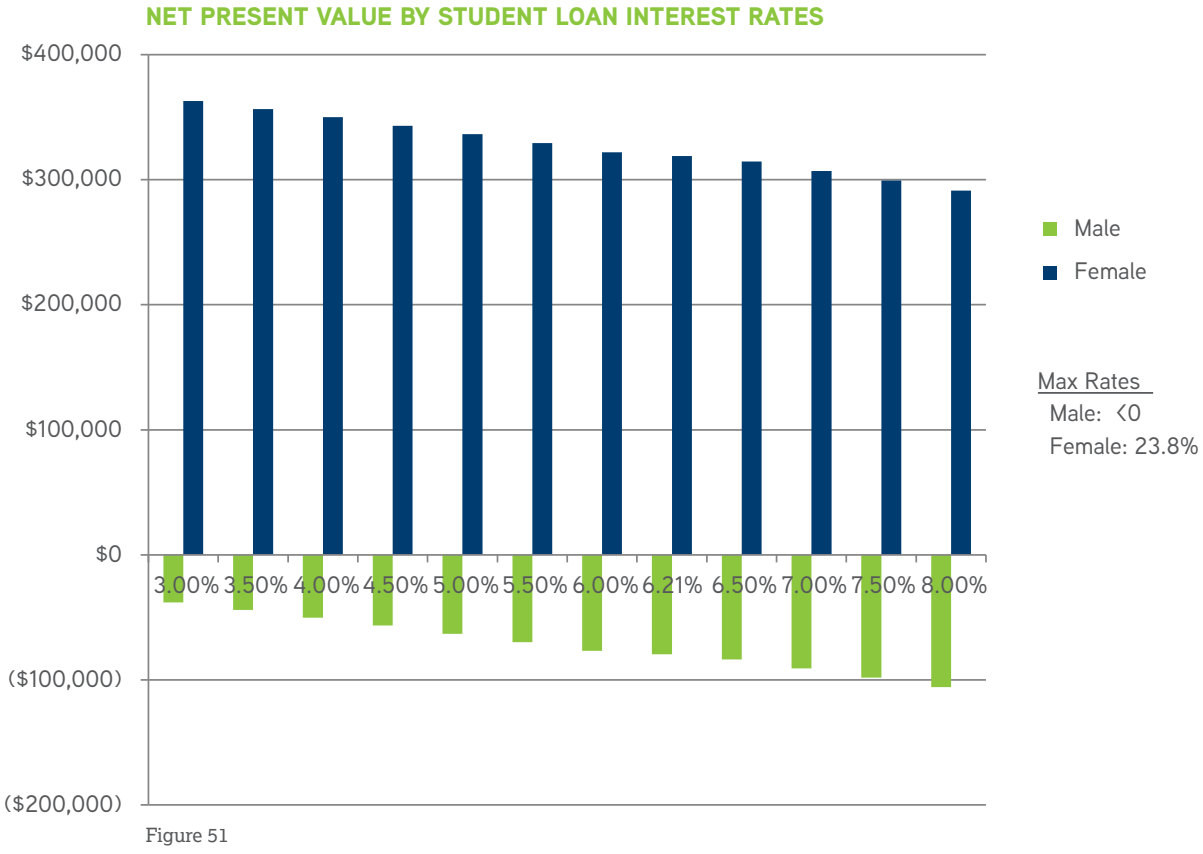


Figure 51

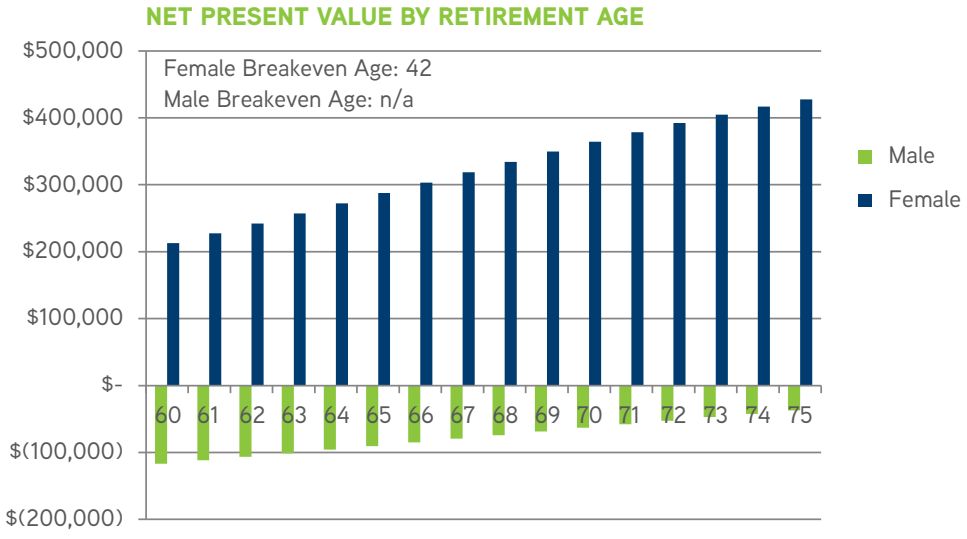


Figure 52

Finally, what is the impact on the NPV of a change in debt, starting salaries or the debt-to-income ratio? The following sets of tables provide the means for determining how various levels of debt and income affect the debt-to-income ratio and then how this same combination of debt and income affects the NPV. Because of the difference between the earning paths of men and women these tables are provided by gender. These tables will allow a veterinary student to identify the earnings path (NPV) that represents the mean for the profession based on their starting debt and income level.

DEBT-TO-INCOME AND NET PRESENT VALUE, MALES

Debt	Income						
	$30,000	$40,000	$50,000	$60,000	$65,000	$70,000	$75,000
$ -	(1,120,876)	(840,868)	(560,860)	(280,853)	(140,849)	(845)	139,159
$50,000	(1,175,639)	(895,631)	(615,623)	(335,615)	(195,612)	(55,608)	84,396
$100,000	(1,230,402)	(950,394)	(670,386)	(390,378)	(250,375)	(110,371)	29,633
$150,000	(1,285,165)	(1,005,157)	(725,149)	(445,141)	(305,138)	(165,134)	(25,130)
$200,000	(1,339,928)	(1,059,920)	(779,912)	(499,904)	(359,901)	(219,897)	(79,893)
$250,000	(1,394,691)	(1,114,683)	(834,675)	(554,667)	(414,663)	(274,660)	(134,656)
$300,000	(1,449,454)	(1,169,446)	(889,438)	(609,430)	(469,426)	(329,423)	(189,419)
$400,000	(1,558,980)	(1,278,972)	(998,964)	(718,956)	(578,952)	(438,949)	(298,945)
Break-even debt:	n/a	n/a	n/a	n/a	n/a	n/a	$127,056

Table 30

DEBT-TO-INCOME AND NET PRESENT VALUE, MALES CONT'D.

Income			Break-even income:
$80,000	$90,000	$100,000	
279,163	559,171	839,179	$70,030
224,400	504,408	784,416	$71,986
169,637	449,645	729,653	$73,942
114,874	394,882	674,890	$75,898
60,111	340,119	620,127	$77,854
5,348	285,356	565,364	$79,809
(49,415)	230,593	510,601	$81,765
(158,941)	121,067	401,075	$85,677
$254,883	$510,537	$766,192	

Table 30 cont'd.

DEBT-TO-INCOME AND ANNUAL AVERAGE RETURN ON INVESTMENT, MALES

Debt	Income									
	$30,000	$40,000	$50,000	$60,000	$65,000	$70,000	$75,000	$80,000	$90,000	$100,000
$ -	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
$50,000	<0	<0	<0	<0	<0	<0	3.9%	10.3%	23.2%	36.1%
$100,000	<0	<0	<0	<0	<0	<0	0.7%	3.9%	10.4%	16.8%
$150,000	<0	<0	<0	<0	<0	<0	<0	1.8%	6.1%	10.4%
$200,000	<0	<0	<0	<0	<0	<0	<0	0.7%	3.9%	7.1%
$250,000	<0	<0	<0	<0	<0	<0	<0	0.0%	2.6%	5.2%
$300,000	<0	<0	<0	<0	<0	<0	<0	<0	1.8%	3.9%
$400,000	<0	<0	<0	<0	<0	<0	<0	<0	0.7%	2.3%

Table 31

DEBT-TO-INCOME AND NET PRESENT VALUE, FEMALES

Debt	Income						
	$30,000	$40,000	$50,000	$60,000	$65,000	$70,000	$75,000
$ -	(680,031)	(390,014)	(99,998)	190,019	335,028	480,036	625,045
$50,000	(734,794)	(444,777)	(154,760)	135,256	280,265	425,273	570,282
$100,000	(789,557)	(499,540)	(209,523)	80,493	225,502	370,510	515,519
$150,000	(844,320)	(554,303)	(264,286)	25,731	170,739	315,747	460,756
$200,000	(899,083)	(609,066)	(319,049)	(29,032)	115,976	260,984	405,993
$250,000	(953,846)	(663,829)	(373,812)	(83,795)	61,213	206,222	351,230
$300,000	(1,008,609)	(718,592)	(428,575)	(138,558)	6,450	151,459	296,467
$400,000	(1,118,135)	(828,118)	(538,101)	(248,084)	(103,076)	41,933	186,941
Break-even debt:	n/a	n/a	n/a	$173,500	$409,737	$438,290	$570,680

Table 32

DEBT-TO-INCOME AND NET PRESENT VALUE, FEMALES CONT'D.

Income			Break-even income:
$80,000	$90,000	$100,000	
770,053	1,060,070	1,350,087	$53,448
715,290	1,005,307	1,295,324	$55,337
660,527	950,544	1,240,561	$57,225
605,764	895,781	1,185,798	$59,113
551,001	841,018	1,131,035	$61,001
496,238	786,255	1,076,272	$62,890
441,475	731,492	1,021,509	$64,778
331,950	621,966	911,983	$68,554
$703,078	$967,870	$1,232,666	

Table 32 cont'd.

DEBT-TO-INCOME AND ANNUAL AVERAGE RETURN ON INVESTMENT, FEMALES

Debt	Income							Income		
	$30,000	$40,000	50,000	$60,000	$65,000	$70,000	$75,000	$80,000	$90,000	$100,000
$-	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
$50,000	<0	<0	<0	6.2%	12.9%	19.6%	26.3%	33.0%	46.3%	59.7%
$100,000	<0	<0	<0	1.9%	5.2%	8.5%	11.9%	15.2%	21.9%	28.6%
$150,000	<0	<0	<0	0.4%	2.6%	4.8%	7.1%	9.3%	13.8%	18.2%
$200,000	<0	<0	<0	<0	1.3%	3.0%	4.7%	6.3%	9.7%	13.0%
$250,000	<0	<0	<0	<0	0.6%	1.9%	3.2%	4.6%	7.2%	9.9%
$300,000	<0	<0	<0	<0	0.0%	1.2%	2.3%	3.4%	5.6%	7.8%
$400,000	<0	<0	<0	<0	<0	0.2%	1.1%	1.9%	3.6%	5.3%

Table 33

The last two charts in this section summarize the relationship between educational debt, starting salaries, and NPV. The points plotted on each chart are the break-even points given in the NPV tables above. These points represent, for a given level of income, the amount of educational debt that will result in a net present value of zero and, equivalently, for a given level of debt, the starting salary that will result in a net present value of zero. An individual plotted above this line is most likely to benefit from a positive net present value of their DVM degree. Any individual below this line is likely to have a negative net present value. For a new DVM graduate to calculate his or her minimum required starting salary, one that may mean the difference between a positive or negative Net Present Value, multiply student debt by 0.04 and add $70,030 if male or $53,199 if female. For example, a female graduate with $100,000 of debt will need a starting salary of $100,000 x 0.04 + $53,199 = $57,199 to break even in her educational investment. A male with an equivalent debt would need $74,030 to break even.

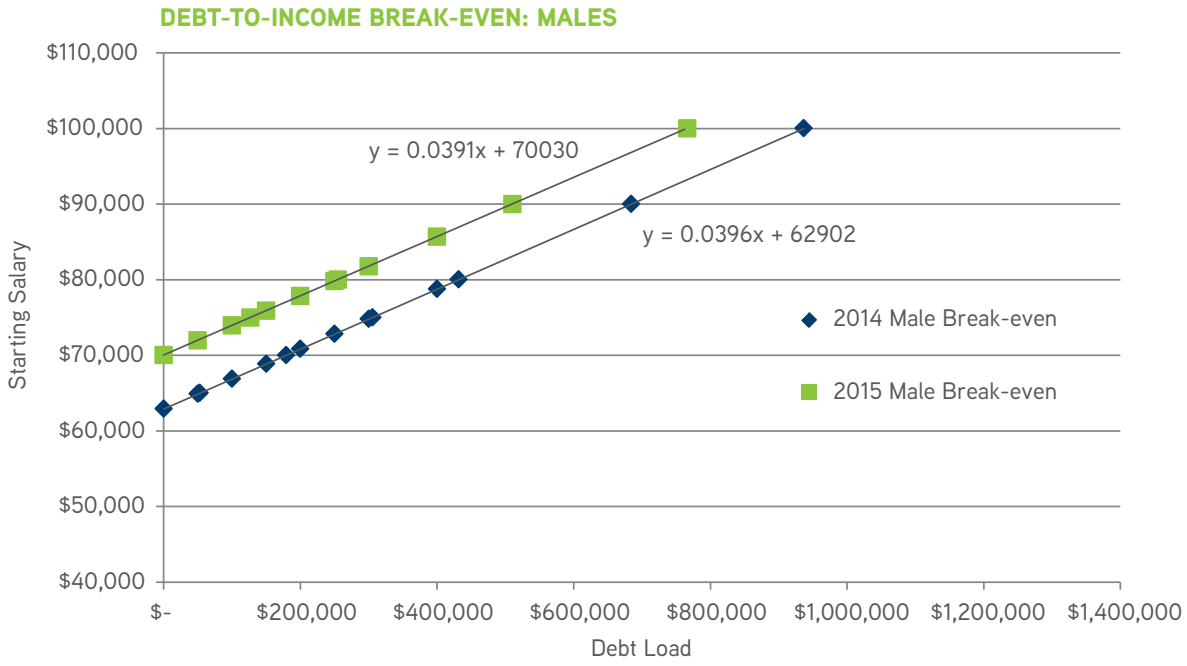


Figure 53

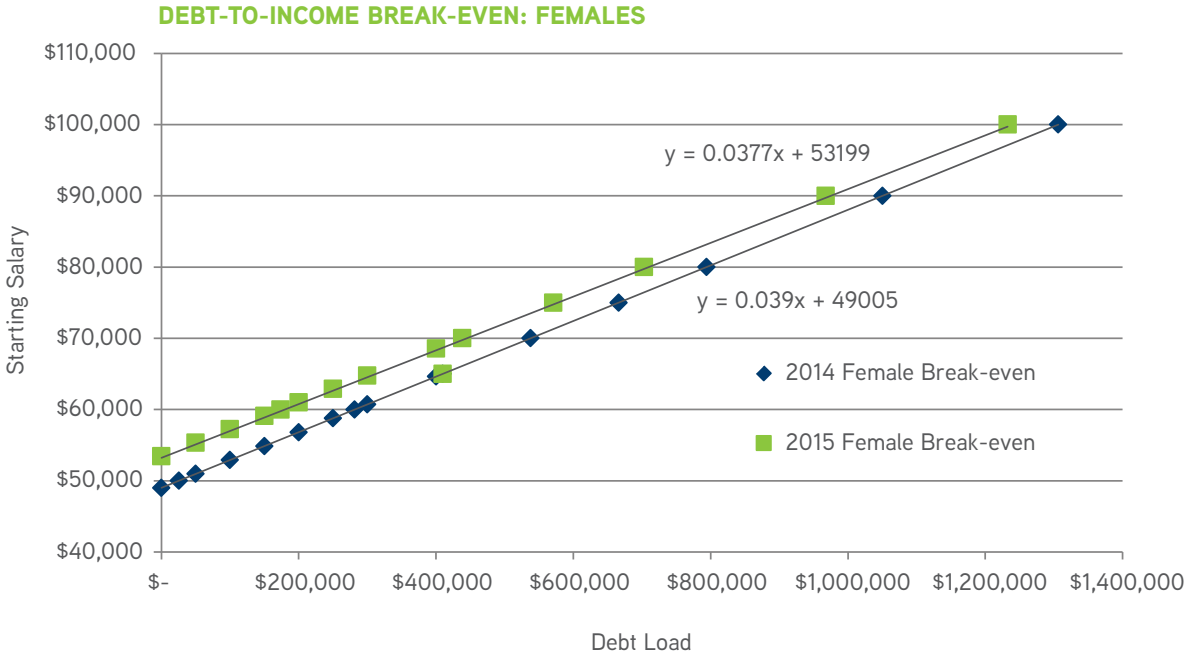


Figure 54

Overall, the financial condition of new veterinarians is declining as debt has increased faster than incomes. However, what is interesting is that, conceptually, starting salaries have kept pace with rising debt. Debt has risen from a weighted value of around $75,000 in 2001 to $135,000 in 2014. According to break-even graphs, the mean wage must have risen by about $2,400 to keep the NPV at the same level. Over this time period the average real, weighted starting salary has, in fact, risen by about $5,000. Even with a change in assumptions, this most probably indicates that starting salaries are in fact keeping pace with debt, at least at the mean.

This is not to say that the financial condition of new veterinarians is rosy. Having a debt the size of a mortgage can lead to considerable stress and can severely restrict available financial choices, as a large amount of an individual's income must be budgeted for debt service. Furthermore, these values are means, and approximately half of all new graduates are faring worse. In addition, federal student loan repayment plans are complicated, with income-based repayment plans and loan forgiveness possibly distorting financial incentives.

Taken together, all of the evidence in this section on NPV presents one possible explanation for why the sex ratio of the profession has become skewed towards a female majority in recent years. Even though females typically receive lower salaries than males, they have a higher NPV.

Why are there more males practice owners and in board certified specializations? Two possible reasons. First, these areas increase the return on the DVM degree. As a result, those with a low financial return are seeking to increase that return. Second, because the mean return is relatively low, the only males who are entering veterinary medicine are those who see it as having especially low costs or especially high returns. Theoretically, those who spend the least amount of effort to obtain the degree have a lower cost in human capital.

Chiappori, Iyigun and Weiss (2009) created an economic model to explain the reason for an increasing proportion of females earning advanced degrees: specifically, why females outnumber males in earning doctoral-level degrees. They concluded that although there exists a wage gap at every level of education, that wage gap declines as the minimum education level increases. So at every level of education, females have a greater financial incentive compared to men to obtain higher education levels. Their model is consistent with the findings of this NPV study: females have a higher incentive to earn advanced degrees, which may explain, at least partially, is why the gender ratio in the veterinary medical profession has changed so dramatically over the last two decades.

Consider the issue in terms of starting salaries. The difference in starting salaries between males and females for college graduates is about a 20 percent gap, or $10,000. The difference in starting salaries for male and female veterinarians in 2015 is only about $3,000. Therefore, females are giving up less and gaining relatively more from the DVM degree, which in turn equates to a higher Net Present Value.

DISCUSSION

Of interest to economists is whether there are geographic differences in markets. As noted throughout the text, we have indicated regional differences but are unable to report on geographical differences of smaller political boundaries as the national surveys do not have enough responses to determine statistically significant differences. As a result, in 2015 we began to partner with state and other veterinary medical associations to begin to evaluate the uniformity and differences between state and national veterinary markets.

The AVMA Veterinary Economics Division (VED) also has the modeling capability to measure the value of the veterinary profession to the local economy (county, multicounty, and/or state) and has provided this capability to the states that elect to conduct the AVMA national surveys at the state level.

ECONOMIC IMPACT STUDIES

To pilot this effort, the AVMA VED chose one state association (Indiana Veterinary Medical Association (IVMA)), one practice type association (American Association of Bovine Practitioners (AABP)), and one specialty group association (American Society of Laboratory Animal Practitioners (ASLAP) and the American College of Laboratory Animal Medicine (ACLAM)) as pilot groups. Reports for each of these will be available in 2016. In addition, in 2016 the states of Arizona, Colorado and Texas were added and the reports on these efforts will be available in 2017.

The Veterinary Profession in Indiana

This study contains two parts: an analysis of the veterinary workforce in Indiana and an analysis of the state's veterinary practices on Indiana's economy (the economy-wide impacts). For the workforce study, the two AVMA national surveys discussed above, the employment and the compensation surveys, were used. The two surveys yielded response rates of 27.5 percent and 16.0 percent, respectively, for the employment and the compensation survey. The economic impact analysis used additional secondary data from the AVMA 2015 Report on Veterinary Compensation and the AVMA 2013 Report on Veterinary Practice Business Measures. The IMPLAN software was used to determine the economic contributions of the veterinary services sector in Indiana.

Unemployment in the Veterinary Industry

The unemployment rate in a given state provides insights on the overall health of the economy, but could also signal inefficiencies in a given sector of the economy. A person is considered unemployed when she is actively looking for employment with appropriate qualifications but is unable to find work. Information collected from the employment survey was used to assess the level of unemployment in the veterinary industry in Indiana. The level of unemployment of the AVMA membership survey was then used as a benchmark to compare that of the state of Indiana.

In Indiana, the percentage of people facing unemployment is higher (11.9 percent) than the AVMA sample respondents (3.3 percent). The z-score for independent group proportions indicates that the two rates are statistically different at the 5 percent significance level, with a z-value of 5.7023. The length and duration of unemployment were determined using the average number of weeks of unemployment, the average isolated number of periods of unemployment and the average total number of days of unemployment. Table 1 presents the summary statistics of the two groups. The results show that, on average, the length of unemployment is longer in Indiana than it is for the AVMA members.

Unemployment of Indiana veterinarians by gender and by first veterinary position is presented in Tables 2 and 3 and is compared with the AVMA national sample respondents. The unemployment rate is higher among males in Indiana (15.8 percent). Uniformed service is affected by unemployment more than all other sectors. About 46 percent of veterinarians in this sector are actively looking for a job - unsuccessfully.

Income and Debt

Unlike unemployment, there are few statistically significant differences in the mean work patterns, income, debt and age characteristics of the national and Indiana veterinarians. Mean practice owner incomes and variation in incomes among practitioners is similar between the U.S. and Indiana respondent populations.

LENGTH AND DURATION OF UNEMPLOYMENT IN INDIANA

	AVMA	INDIANA
How many weeks have you been unemployed in veterinary medicine?	55.72 (49.7)	68.25 (72.74)
How many isolated periods of unemployment have you had?	1.74 (1.30)	1 (0)
For approximately how many days, in total have you been unemployed during your veterinary career?	371.23 (307.5)	308.3 (409.40)

Table 34

UNEMPLOYMENT BY GENDER IN INDIANA

	Are you currently employed?			
	AVMA		INDIANA	
	YES	NO	YES	NO
FEMALE	96.20%	3.80%	92.90%	7.10%
MALE	97.60%	2.40%	84.20%	15.80%
TOTAL	96.60%	3.40%	88.10%	11.90%

Table 35

UNEMPLOYMENT OF VETERINARIANS BASED ON FIRST VETERINARY EMPLOYMENT IN INDIANA

	Are you currently employed?			
	AVMA		INDIANA	
	NO	YES	NO	YES
Food animal practice (excl.)	0.00%	100.00%	0.00%	100.00%
Food animal practice (pred.)	0.00%	100.00%	11.50%	88.50%
Mixed practice	1.60%	98.40%	8.80%	91.20%
Companion animal practice (pred.)	2.80%	97.20%	9.50%	90.50%
Companion animal practice (excl.)	3.20%	96.80%	10.30%	89.70%
Equine practice	6.30%	93.80%	16.70%	83.30%
Federal Government	0.00%	100.00%	0.00%	100.00%
Uniformed services	0.00%	100.00%	46.20%	53.80%
College or University	2.10%	97.90%	16.70%	83.30%
State/Local government	0.00%	100.00%	0.00%	100.00%
Industry/Commercial organizations	0.00%	100.00%	0.00%	100.00%
Not-for-profit organizations	10.70%	89.30%	0.00%	100.00%
Other	14.70%	85.30%	33.00%	67.00%
Currently a resident/Post-doc	3.60%	96.40%	50.00%	50.00%

Table 36

SUMMARY STATISTICS FOR PRIVATE PRACTICE OWNERS IN INDIANA

	Owner			
	AVMA		IVMA	
Variable	Mean	Std Dev	Mean	Std Dev
How many years have you been with current employer?	19.12	11.92	21.09	13.34
How many weeks did you work during 2014?	48.94	4.26	49.67	1.93
How many regular hours did you work during a typical week in 2014?	46.91	11.87	47.24	11.59
How many emergency or afterhours did you work during a typical week in 2014?	5.60	8.28	1.71	2.61
In 2014, what was your total personal income, before taxes, from all veterinary medical related activities?	$184,434	$161,964	$190,197	$177,652
Please estimate the total amount of educational debt you borrowed for your time as a veterinary medical student	$48,080	$57,891	$42,861	$100,215
How many years have you been actively repaying your educational debt?	10.55	5.56	11.33	5.51
How many years did it take you to repay your educational debt?	8.14	3.89	10.83	13.83
What is your age?	51.76	10.62	51.58	13.74

Table 37

Practice owners in Indiana are similar to those in the U.S. and appear to be on average 10 years older than non-owners. In addition, non-owners have been with their current employer roughly one-third of the time that owners have been with the same practice. And as with the owners, the salaries of non-owners appear to be similar for both Indiana and the U.S. respondents.

SUMMARY STATISTICS FOR PRIVATE AND PUBLIC PRACTICE EMPLOYEES IN INDIANA

	Non-Owner			
	AVMA		IVMA	
Variable	Mean	Std Dev	Mean	Std Dev
How many years have you been with current employer?	6.36	7.06	7.90	9.33
How many weeks did you work during 2014?	48.19	5.06	48.01	5.87
How many regular hours did you work during a typical week in 2014?	45.89	9.46	41.32	15.71
How many emergency or afterhours did you work during a typical week in 2014?	6.32	8.94	6.62	9.81
In 2014, what was your total personal income, before taxes, from all veterinary medical related activities?	$105,449	$55,589	$99,227	$58,898
Please estimate the total amount of educational debt you borrowed for your time as a veterinary medical student	$90,368	$87,371	$71,741	$67,007
How many years have you been actively repaying your educational debt?	6.93	17.94	4.80	5.02
How many years did it take you to repay your educational debt?	8.07	4.77	7.87	4.92
What is your age?	40.26	10.93	39.34	11.75

Table 38

SUMMARY STATISTICS FOR PUBLIC SECTOR EMPLOYEES IN INDIANA

	Non-Owner Public Sector			
	AVMA		IVMA	
Variable	Mean	Std Dev	Mean	Std Dev
How many years have you been with current employer?	9.86	8.36	12.92	10.98
How many weeks did you work during 2014?	47.89	4.45	48.92	1.74
How many regular hours did you work during a typical week in 2014?	47.00	9.15	39.67	18.20
How many emergency or afterhours did you work during a typical week in 2014?	6.34	9.28	6.12	7.99
In 2014, what was your total personal income, before taxes, from all veterinary medical related activities?	$129,302	$70,863	$120,223	$47,291
Please estimate the total amount of educational debt you borrowed for your time as a veterinary medical student	$51,925	$67,207	$46,333	$50,087
How many years have you been actively repaying your educational debt?	8.29	5.88	9.14	8.40
How many years did it take you to repay your educational debt?	8.70	4.60	9.40	5.89
What is your age?	47.04	11.29	47.67	10.49

Table 39

Non-practice owner veterinarians who are working in the public sector earn more on average and have a lower debt level than non-owner private practitioners. The mean annual personal income from veterinary related activities for a veterinarian in the public sector is around $120,223 and that for a veterinarian in the private sector is about $88,943. But the public sector veterinarian has a mean age significantly different from the non-owner private practitioner, with more than a 10 year mean difference in age that may contribute to the difference in mean incomes. And again, there was no statistical difference between the U.S. and Indiana veterinarians.

SUMMARY STATISTICS FOR PRIVATE PRACTICE ASSOCIATES IN INDIANA

	Non-Owner Private Sector			
	AVMA		IVMA	
Variable	Mean	Std Dev	Mean	Std Dev
How many years have you been with current employer?	4.51	5.50	5.45	7.35
How many weeks did you work during 2014?	48.36	5.21	47.57	7.04
How many regular hours did you work during a typical week in 2014?	44.80	9.77	42.83	13.28
How many emergency or afterhours did you work during a typical week in 2014?	6.50	9.18	7.00	11.19
In 2014, what was your total personal income, before taxes, from all veterinary medical related activities?	$94,132	$40,584	$88,943	$61,672
Please estimate the total amount of educational debt you borrowed for your time as a veterinary medical student	$111,243	$92,103	$84,715	$71,199
How many years have you been actively repaying your educational debt?	5.61	4.50	3.82	3.40
How many years did it take you to repay your educational debt?	8.62	7.59	6.17	3.02
What is your age?	35.96	9.12	35.27	10.13

Table 40

Economic Impact of Veterinary Services in Indiana

IMPLAN modeling software was used to determine the economic contributions of the veterinary industry to the Indiana economy, and the results are summarized in terms of direct, indirect and induced impacts.

- Direct impacts: GDP and jobs generated directly by the veterinary businesses.
- Indirect impacts: GDP and jobs generated by businesses from where veterinarians purchase their inputs (products, equipment, materials, etc.).
- Induced impacts: GDP and jobs generated by the spending patterns of those employed directly or indirectly by the veterinary businesses.

The report provides an estimate of the measurable impacts of the veterinary services sector within Indiana on the state's economy. It does not provide an estimate of the non-measurable benefits associated with the provision of veterinary services in the state. These non-measurable veterinary services include services such as reduced health care costs associated with lower incidence of zoonotic diseases, the positive impacts on human health from an improved human-animal experience, or lower prices of protein resulting from lower incidence of morbidity or mortality in food animals. The non-measurable impacts may exceed the value of the measurable impacts provided here.

Effects on Employment

We distinguished between jobs directly linked to veterinary services and indirectly related jobs. Direct jobs are employed veterinarians and all persons employed in the veterinary practices. Our estimate indicates that the veterinary services sector generates a total of 12,745 jobs in the state of Indiana, with 9,901 being directly related to veterinary services, about 983 indirect jobs and approximately 1,860 induced jobs.

Effects on Labor Income

The direct effect on labor income is the total amount of money injected into the economy as payroll by the veterinary services sector. This amount of money is estimated at $254,238,000. Because some sectors outside of the veterinary service sector provide intermediate inputs to the veterinary service sector, indirect effects on employee compensation exist that must be accounted for in the total compensation effect. These indirect effects and the induced effects at the state level are $50,459,840 and $75,804,088, respectively. That is, some $50 million is paid to employees that provide goods and service to veterinary practices (e.g., pharmaceutical sales reps, builders that construct veterinary practices or repairmen that fix problems at the practices) and another $75 million is paid to the labor that provides general goods and services to those who are directly or indirectly involved with the sector (e.g., fast-food workers, gas station attendants, retail outlet laborers).

Effects on Total Value Added

The total value added as a result of the existence of the veterinary services sector in the state of Indiana is estimated at $652,874,177, with the direct effects corresponding to approximately $439,024,550, the indirect effects at $76,730,550 and the induced effects at about $137,119,050. The direct effects represent the total value of goods and services sold by veterinary practices less the cost of those goods and services.

Effects on Output

The total industry output is the dollar value of all services produced by the veterinary services sector. The overall effect to the state of Indiana is worth $1,076,603,121. The value of total value added as a percent of total industry output is roughly 43 percent and represents the return to capital, management and land for all veterinary practices before amortization, depreciation, interest and taxes.

Effects on State and Local Taxes

Part of the employee compensation is paid to the state government in the form of taxes. In total, the state receives $281,221 from employees whose income is paid by the veterinary services sector. Products produced by the veterinary services and related industries are also taxed in the form of tax on production or tax on imports. From these types of taxes, the state of Indiana receives $19,697,453 annually. Households and corporations also pay taxes for their links to the veterinary sectors or because they are using veterinary services. Examples of such taxes can be pet taxes, pet food taxes or veterinary service taxes paid by households. This analysis shows that in Indiana, households are paying (each year) an equivalent of an estimated $10,429,509 in taxes due to the existence of the veterinary services sector. Corporations are paying $1,999,835 per year.

Effects on Federal Taxes

Workers in Indiana also pay federal income taxes, both in the form of taxes on employee compensation and in an additional category of "Proprietor income tax." This tax is paid, for instance, by the veterinary hospital owners. In total, Indiana received an estimated $6,658,829 of proprietor income taxes for the year 2014. The total employee compensation taxes paid to the federal government are estimated at $26,491,729. The taxes on production and imports are approximately $2.5 million. Households and corporations pay to the federal government $23,918,613 and $17,824,206, respectively.

CONCLUSION

Data shows a tightening in the market for veterinarians. While the 2015 unemployment rate increased from 2014, the difference is not statistically significant. Men continue to want to work additional hours per week while women continue to want to work fewer, with the overall weighted average desired change in hours requiring an additional 1,833 veterinarians working 40-hour work weeks, up from 1,655 in 2014. Also on the positive side, well-being is a major issue in the market for veterinarians, and, while there is a lack of data to create a time trend, burn-out does not seem to be a major factor for the vast majority of veterinarians. Despite recent graduates devoting an average of 10.6 percent of their gross income to servicing their student loan debts, their other expenditure patterns appear normal and health-related issues are not a problem for most veterinarians.

Veterinarians' incomes and the value of the DVM degree continue to be important issues for the profession. Through an econometric study outlined above, there is still no evidence that internships affect income later in a veterinarian's career. Despite the improving market for veterinarians, the Net Present Value of the DVM degree has been declining since tracking started in 2010, mainly due to the relative success of bachelor's degree holders. Lastly, veterinary services play a large part in the economy and the AVMA is conducting impact analysis studies around the country. The initial finding out of the state of Indiana is that the effect of veterinary practices on the economy of Indiana is large, contributing to three-tenths of a percent of the state's total output.

Overall the market for veterinarians is improving, with incomes increasing and underemployment declining. However, pressures on the market for veterinarians include the rising level of educational debt, rising outside opportunities, and well-being metrics that must be carefully collected and tracked in the future.

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APPENDIX

RECENT GRADUATE EXPENDITURE CATEGORIES

Income

Personal Income

Spouse/Partner Income

Supplemental Income

Federal and State Taxes

Federal Taxes (Calculated)

State Taxes (Calculated)

Student Loan Payments

Student Loan Payments

Credit Card Debt Payments

Credit Card Payments

Housing

Mortgage

Property Taxes

Homeowners Insurance

Homeowners Association Fees

Home Repairs and Maintenance

Rent

Renters Insurance

Moving and Storage Expenses

Home Furnishings

Other Insurance

Landline Phone

Heating Gas

Heating Oil

Electricity

Water

Sewer

Garbage Removal

Transportation

Vehicle Loan Payment

Vehicle Purchase Down Payment

Vehicle Lease

Vehicle Insurance Premium

Vehicle Repairs Maintenance

Fuel

Driver License Fees

Vehicle Registration Fees

Parking Fees, Tolls, Etc

Public Transit Costs

Food

Groceries

Dining Out

Healthcare, Insurance and Medicare

General Health Care

Dental Care

Vision Care

Prescriptions and OTC Medications

HAS and FSA Contributions

Life Insurance

LongTerm Disability Insurance

Other HealthCare Expenses

Medicare (Calculated)

Professional Development

Tuition and Fees

Textbooks

CE Fees

CE Travel Expenses

Local Regional VMA Memberships

State VMA Memberships

AVMA or SAVMA Membership

Specialty Organization Memberships

State Veterinary License Fees

DEA License Fee

CSR License Fees

Professional Liability Insurance

Job Search Expenses

Recreation and Leisure

Periodicals and Personal Reading

Vacation Expenses

Entertainment

Gym Membership

Sports Clubs

Civic Organizations

Cable or Satellite TV

Internet

Cell Phone

Savings, Retirement and Social Security

Personal Savings

Other Investments

Other Retirement Contributions

Social Security (Calculated)

Personal and Miscellaneous

Gifts, Flowers, and Cards

Charitable Gifts

Health and Beauty Expenses

Clothing and Accessories for Self

Clothing and Accessories for Significant Other

Misc Financial Fees

Other Debt Payments

Pet Expenses

Pet Medical Care

Pet Expenses non-Medical

Child Care

Daycare and Nanny

Children's Education

Diapers

Clothing and Accessories for Children

A1

SELF-SCORED COMPETENCIES, BY COLLEGE

	National		Auburn University		Tuskegee University		UC-Davis		Colorado State University		University of Florida	
	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N
On a scale of 1 through 5, please rate each category based on your college preparedness (how well you thought your college training had prepared you before you started working)												
Physical examination	4.20	1187	4.18	39	4.00	16	4.42	45	3.70	63	4.18	22
History taking	4.35	1186	4.08	39	4.06	16	4.27	45	4.30	63	4.59	22
Diagnosis of lameness	3.49	1177	3.54	39	3.20	15	3.53	45	3.69	62	3.64	22
Diagnosis/Treatment of parasitic diseases	3.85	1183	4.18	38	4.13	16	3.67	45	3.31	62	4.09	22
Anesthesia	3.88	1181	3.54	39	3.56	16	3.71	45	4.10	62	4.32	22
Fluid therapy	3.80	1182	3.67	39	3.50	16	4.04	45	3.95	62	3.77	22
Intravenous injection	4.03	1180	3.61	38	4.00	16	4.36	45	3.90	63	4.45	22
Development/Adaptation of vaccination protocols	3.64	1182	3.92	39	3.88	16	3.78	45	3.65	62	4.05	22
Advising clients on nutrition	2.99	1185	2.87	39	3.13	16	3.13	45	2.94	62	3.36	22
Developing diagnostic plans for difficult cases	3.65	1187	3.44	39	3.38	16	3.69	45	3.61	62	3.68	22
Investigation of potential toxin exposure	3.16	1183	3.15	39	3.31	16	3.41	44	3.29	63	2.91	22
Prescribing medications	3.66	1185	3.51	39	3.88	16	3.67	45	3.79	62	3.71	21
On a scale of 1 through 5, please rate each category based on your satisfaction with your experience while on the job (what you have found since working)												
Physical examination	4.35	1156	4.44	39	4.13	15	4.26	43	4.16	62	4.40	20
History taking	4.42	1160	4.23	39	4.25	16	4.23	44	4.44	63	4.65	20
Diagnosis of lameness	3.66	1138	3.87	39	3.40	15	3.42	43	3.90	62	3.55	20
Diagnosis/Treatment of parasitic diseases	4.00	1147	4.36	39	4.31	16	3.75	44	3.62	60	4.25	20
Anesthesia	3.95	1143	3.89	38	3.94	16	3.84	43	4.30	61	4.26	19
Fluid therapy	3.96	1138	4.05	39	4.06	16	3.93	42	4.13	61	3.74	19
Intravenous injection	4.37	1147	4.26	38	4.31	16	4.40	43	4.40	63	4.74	19
Development/Adaptation of vaccination protocols	4.00	1127	4.36	39	4.13	15	4.00	42	3.92	59	4.05	20
Advising clients on nutrition	3.32	1143	3.47	38	3.63	16	3.30	43	3.31	61	3.47	19
Developing diagnostic plans for difficult cases	3.88	1159	4.08	39	4.25	16	3.84	44	3.89	62	3.90	20
Investigation of potential toxin exposure	3.41	1137	3.55	38	3.88	16	3.60	43	3.52	61	3.30	20
Prescribing medications	4.07	1153	4.28	39	4.31	16	3.84	43	4.16	61	4.06	17

A2

	National		Auburn University		Tuskegee University		UC-Davis		Colorado State University		University of Florida	
	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N
On a scale of 1 through 5, please rate each category based on your college preparedness (how well you thought your college training had prepared you before you started working)												
Interpretation of cytologic specimens	3.30	1176	3.28	39	3.38	16	3.50	44	3.27	63	3.86	22
Interpretation of post-mortem specimens	3.49	1168	3.21	39	3.69	16	3.74	43	3.54	63	3.50	22
Interpretation of ultrasound examinations	2.63	1164	3.38	39	2.63	16	3.69	45	2.66	62	3.33	21
Interpretation of radiographs	3.61	1178	3.54	39	4.13	16	3.82	45	3.37	63	3.77	22
Interpretation of hematologic values	3.92	1176	3.85	39	3.94	16	3.82	45	3.87	63	4.14	22
On a scale of 1 through 5, please rate each category based on your satisfaction with your experience while on the job (what you have found since working)												
Interpretation of cytologic specimens	3.30	1139	3.36	39	3.06	16	3.23	44	3.32	63	3.50	20
Interpretation of post-mortem specimens	3.32	1017	3.33	36	3.00	14	3.48	40	3.42	57	3.55	20
Interpretation of ultrasound examinations	2.90	1052	3.50	32	2.47	15	3.43	42	3.08	59	3.50	16
Interpretation of radiographs	3.60	1129	3.66	38	3.94	16	3.56	43	3.68	63	3.63	19
Interpretation of hematologic values	3.97	1147	3.85	39	3.88	16	3.91	44	4.13	62	3.95	20
On a scale of 1 through 5, please rate each category based on your college preparedness (how well you thought your college training had prepared you before you started working)												
Diagnosis/Therapy of gastrointestinal disease	3.76	1165	3.72	39	3.88	16	3.93	43	3.61	62	4.18	22
Diagnosis/Therapy of dermatological disease	3.46	1163	3.85	39	3.69	16	3.44	43	3.31	62	3.95	22
Diagnosis/Therapy of endocrine disease	3.55	1164	3.67	39	3.81	16	3.65	43	3.40	62	3.55	22
Diagnosis/Therapy of cardiac disease	3.27	1164	3.08	39	3.63	16	3.23	43	3.24	62	3.36	22
Diagnosis/Therapy of respiratory disease	3.37	1165	3.38	39	3.69	16	3.53	43	3.27	62	3.50	22
Diagnosis/Therapy of renal disease	3.76	1162	3.77	39	3.88	16	3.88	43	3.62	61	3.91	22
Diagnosis/Therapy of neurological disease	3.36	1166	3.44	39	2.94	16	3.77	43	3.21	62	3.05	22
Diagnosis/Therapy of ocular disorders	3.19	1164	2.69	39	3.00	16	3.79	43	3.08	62	3.55	22

	National		Auburn University		Tuskegee University		UC-Davis		Colorado State University		University of Florida	
	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N
On a scale of 1 through 5, please rate each category based on your satisfaction with your experience while on the job (what you have found since working)												
Diagnosis/Therapy of gastrointestinal disease	4.00	1136	4.08	39	4.13	16	3.95	42	3.97	62	4.20	20
Diagnosis/Therapy of dermatological disease	3.67	1126	4.03	39	4.06	16	3.55	42	3.57	60	4.16	19
Diagnosis/Therapy of endocrine disease	3.71	1122	4.03	39	4.13	16	3.62	42	3.74	61	3.74	19
Diagnosis/Therapy of cardiac disease	3.42	1121	3.54	39	3.88	16	3.24	42	3.40	62	3.20	20
Diagnosis/Therapy of respiratory disease	3.56	1132	3.79	38	3.94	16	3.55	42	3.52	62	3.55	20
Diagnosis/Therapy of renal disease	3.98	1119	4.05	39	4.19	16	3.95	42	3.95	61	4.10	20
Diagnosis/Therapy of neurological disease	3.43	1131	3.56	39	3.06	16	3.64	42	3.50	62	3.10	20
Diagnosis/Therapy of ocular disorders	3.30	1127	3.23	39	3.31	16	3.64	42	3.25	61	3.45	20
On a scale of 1 through 5, please rate each category based on your college preparedness (how well you thought your college training had prepared you before you started working)												
Orthopedic surgery	2.02	1136	2.51	39	2.69	16	1.76	38	1.87	61	2.59	22
Soft tissue surgery	3.01	1165	3.28	39	3.88	16	2.91	43	2.53	62	3.59	22
Spay/Neuter	3.65	1161	3.54	39	4.00	16	3.69	42	3.05	62	4.18	22
On a scale of 1 through 5, please rate each category based on your satisfaction with your experience while on the job (what you have found since working)												
Orthopedic surgery	2.25	881	2.55	33	2.67	12	1.89	28	2.38	50	2.61	18
Soft tissue surgery	3.52	1094	4.03	39	4.00	15	3.36	39	3.34	59	4.00	19
Spay/Neuter	4.02	1075	4.36	39	4.20	15	4.03	37	3.63	59	4.58	19
On a scale of 1 through 5, please rate each category based on your college preparedness (how well you thought your college training had prepared you before you started working)												
Management of reproductive programs	2.70	1121	3.21	38	2.87	15	2.58	38	2.51	59	3.05	21
Evaluation of disease outbreaks	2.95	1129	2.97	38	2.87	15	2.78	40	3.00	60	3.24	21
On a scale of 1 through 5, please rate each category based on your satisfaction with your experience while on the job (what you have found since working)												
Management of reproductive programs	2.77	858	3.03	31	2.62	13	2.69	29	2.40	47	2.94	16
Evaluation of disease outbreaks	3.00	894	3.13	31	2.92	13	3.10	30	2.78	51	3.72	18

	National		Auburn University		Tuskegee University		UC-Davis		Colorado State University		University of Florida	
	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N
On a scale of 1 through 5, please rate each category based on your college preparedness (how well you thought your college training had prepared you before you started working)												
Evaluation of new drugs/ products	3.18	1158	3.31	39	3.19	16	3.18	44	3.03	62	3.27	22
Interpretation of medical literature	3.69	1167	3.79	39	3.25	16	3.57	44	3.57	63	4.18	22
On a scale of 1 through 5, please rate each category based on your satisfaction with your experience while on the job (what you have found since working)												
Evaluation of new drugs/ products	3.58	1110	3.74	39	3.75	16	3.46	41	3.38	61	3.50	20
Interpretation of medical literature	3.80	1142	3.97	39	3.56	16	3.64	42	3.79	63	4.15	20
On a scale of 1 through 5, please rate each category based on your college preparedness (how well you thought your college training had prepared you before you started working)												
Dealing with people	3.49	1171	3.05	39	3.63	16	3.59	44	3.97	63	3.55	22
Veterinary Medicine as a business	2.53	1166	2.08	39	2.06	16	2.58	43	2.90	62	3.18	22
Giving educational presentations to the community	2.93	1116	3.08	38	2.87	15	2.92	39	2.92	61	2.71	21
Client Communications	3.74	1171	3.77	39	3.87	15	3.73	44	4.14	63	3.95	22
On a scale of 1 through 5, please rate each category based on your satisfaction with your experience while on the job (what you have found since working)												
Dealing with people	4.07	1158	4.05	38	3.56	16	4.14	44	4.30	63	4.00	20
Veterinary Medicine as a business	2.98	1089	2.97	39	2.57	14	3.00	41	3.23	60	3.35	20
Giving educational presentations to the community	3.51	971	3.81	32	2.92	13	3.59	34	3.42	57	3.28	18
Client Communications	4.18	1152	4.36	39	3.88	16	4.23	43	4.40	62	3.95	20

	National		University of Georgia		University of Illinois		Iowa State University		Kansas State University		Louisiana State University	
	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N
On a scale of 1 through 5, please rate each category based on your college preparedness (how well you thought your college training had prepared you before you started working)												
Physical examination	4.20	1187	4.40	40	4.05	44	4.28	53	3.92	38	3.96	26
History taking	4.35	1186	4.36	39	4.18	44	4.38	52	4.18	38	4.04	25
Diagnosis of lameness	3.49	1177	3.58	40	3.45	44	3.25	51	3.43	37	3.58	24
Diagnosis/Treatment of parasitic diseases	3.85	1183	4.35	40	3.61	44	3.69	52	4.21	38	4.00	26
Anesthesia	3.88	1181	3.90	39	3.72	43	3.62	53	3.78	36	3.92	26
Fluid therapy	3.80	1182	4.03	39	3.61	44	3.62	53	3.54	37	3.72	25
Intravenous injection	4.03	1180	4.25	40	3.89	44	4.02	53	4.00	36	4.00	26
Development/Adaptation of vaccination protocols	3.64	1182	4.20	40	2.75	44	3.51	51	3.47	38	3.44	25
Advising clients on nutrition	2.99	1185	3.67	39	2.55	44	2.49	53	2.46	37	2.73	26
Developing diagnostic plans for difficult cases	3.65	1187	3.78	40	3.57	44	3.53	53	3.13	38	3.65	26
Investigation of potential toxin exposure	3.16	1183	3.35	40	3.23	44	3.08	51	2.71	38	3.31	26
Prescribing medications	3.66	1185	3.75	40	3.39	44	3.49	53	3.55	38	3.73	26
On a scale of 1 through 5, please rate each category based on your satisfaction with your experience while on the job (what you have found since working)												
Physical examination	4.35	1156	4.56	39	4.36	42	4.35	51	4.11	38	4.50	24
History taking	4.42	1160	4.58	40	4.42	43	4.31	51	4.22	37	4.38	24
Diagnosis of lameness	3.66	1138	3.76	38	3.51	41	3.42	48	3.42	38	4.00	23
Diagnosis/Treatment of parasitic diseases	4.00	1147	4.45	38	3.81	43	3.70	50	4.05	38	4.33	24
Anesthesia	3.95	1143	4.13	38	3.74	42	3.61	51	3.78	37	4.13	24
Fluid therapy	3.96	1138	4.21	38	3.83	42	3.82	49	3.76	37	4.09	23
Intravenous injection	4.37	1147	4.49	39	4.40	42	4.18	50	4.30	37	4.63	24
Development/Adaptation of vaccination protocols	4.00	1127	4.41	37	3.78	41	3.94	49	3.63	38	4.13	23
Advising clients on nutrition	3.32	1143	3.71	38	3.27	41	2.88	49	3.00	37	3.08	24
Developing diagnostic plans for difficult cases	3.88	1159	3.85	39	3.84	43	3.78	51	3.66	38	3.92	24
Investigation of potential toxin exposure	3.41	1137	3.45	40	3.54	41	3.31	48	2.95	38	3.79	24
Prescribing medications	4.07	1153	4.08	40	4.05	42	3.82	51	3.95	38	4.29	24

	National		University of Georgia		University of Illinois		Iowa State University		Kansas State University		Louisiana State University	
	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N
On a scale of 1 through 5, please rate each category based on your college preparedness (how well you thought your college training had prepared you before you started working)												
Interpretation of cytologic specimens	3.30	1176	3.21	39	3.47	43	3.13	52	2.89	37	3.12	25
Interpretation of post-mortem specimens	3.49	1168	3.53	40	3.30	43	3.57	51	3.43	37	3.40	25
Interpretation of ultrasound examinations	2.63	1164	2.54	37	2.47	43	1.98	50	2.42	36	2.48	25
Interpretation of radiographs	3.61	1178	3.72	39	3.56	43	3.33	52	3.41	37	3.68	25
Interpretation of hematologic values	3.92	1176	3.80	40	3.81	43	3.75	52	3.67	36	3.72	25
On a scale of 1 through 5, please rate each category based on your satisfaction with your experience while on the job (what you have found since working)												
Interpretation of cytologic specimens	3.30	1139	3.33	40	3.44	41	3.22	50	3.05	37	3.30	23
Interpretation of post-mortem specimens	3.32	1017	3.22	37	2.92	37	3.60	43	3.36	33	3.36	22
Interpretation of ultrasound examinations	2.90	1052	2.79	33	2.50	36	2.69	45	2.44	34	2.65	23
Interpretation of radiographs	3.60	1129	3.56	39	3.43	40	3.48	50	3.30	37	3.91	23
Interpretation of hematologic values	3.97	1147	3.72	39	4.10	42	3.86	51	3.56	36	3.78	23
On a scale of 1 through 5, please rate each category based on your college preparedness (how well you thought your college training had prepared you before you started working)												
Diagnosis/Therapy of gastrointestinal disease	3.76	1165	4.05	40	3.53	43	3.54	52	3.55	38	3.76	25
Diagnosis/Therapy of dermatological disease	3.46	1163	3.73	40	3.33	43	3.75	52	3.14	37	4.00	25
Diagnosis/Therapy of endocrine disease	3.55	1164	3.75	40	3.63	43	3.33	52	3.35	37	3.48	25
Diagnosis/Therapy of cardiac disease	3.27	1164	3.31	39	2.12	43	3.19	52	2.73	37	3.32	25
Diagnosis/Therapy of respiratory disease	3.37	1165	3.35	40	2.84	43	3.33	52	3.21	38	3.52	25
Diagnosis/Therapy of renal disease	3.76	1162	3.70	40	3.58	43	3.45	51	3.54	37	3.80	25
Diagnosis/Therapy of neurological disease	3.36	1166	3.80	40	2.40	43	3.17	52	2.89	38	3.04	25
Diagnosis/Therapy of ocular disorders	3.19	1164	3.48	40	3.88	43	2.86	51	3.24	37	3.52	25

	National		University of Georgia		University of Illinois		Iowa State University		Kansas State University		Louisiana State University	
	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N
On a scale of 1 through 5, please rate each category based on your satisfaction with your experience while on the job (what you have found since working)												
Diagnosis/Therapy of gastrointestinal disease	4.00	1136	4.24	38	3.88	41	3.84	50	3.87	38	4.13	23
Diagnosis/Therapy of dermatological disease	3.67	1126	3.87	38	3.66	41	3.76	50	3.41	37	4.22	23
Diagnosis/Therapy of endocrine disease	3.71	1122	3.79	38	3.88	41	3.45	49	3.54	37	3.61	23
Diagnosis/Therapy of cardiac disease	3.42	1121	3.54	37	3.05	41	3.24	50	3.11	37	3.43	23
Diagnosis/Therapy of respiratory disease	3.56	1132	3.45	38	3.24	41	3.60	50	3.43	37	3.83	23
Diagnosis/Therapy of renal disease	3.98	1119	3.92	38	4.02	41	3.75	48	3.65	37	3.91	23
Diagnosis/Therapy of neurological disease	3.43	1131	3.82	38	2.93	41	3.34	50	3.18	38	3.52	23
Diagnosis/Therapy of ocular disorders	3.30	1127	3.45	38	3.79	42	3.27	49	3.24	37	3.74	23
On a scale of 1 through 5, please rate each category based on your college preparedness (how well you thought your college training had prepared you before you started working)												
Orthopedic surgery	2.02	1136	1.97	34	1.61	41	1.96	51	1.65	37	1.88	25
Soft tissue surgery	3.01	1165	2.97	38	2.49	43	3.37	52	2.32	37	3.28	25
Spay/Neuter	3.65	1161	3.21	38	3.26	43	4.12	52	3.05	37	3.76	25
On a scale of 1 through 5, please rate each category based on your satisfaction with your experience while on the job (what you have found since working)												
Orthopedic surgery	2.25	881	2.30	27	1.84	32	2.16	37	2.19	32	2.19	21
Soft tissue surgery	3.52	1094	3.74	35	3.13	40	3.79	48	3.14	37	3.55	22
Spay/Neuter	4.02	1075	4.08	37	3.90	41	4.21	47	3.84	37	3.95	21
On a scale of 1 through 5, please rate each category based on your college preparedness (how well you thought your college training had prepared you before you started working)												
Management of reproductive programs	2.70	1121	2.86	37	2.33	42	2.76	50	2.36	36	2.88	25
Evaluation of disease outbreaks	2.95	1129	3.00	37	2.76	41	3.08	50	2.71	38	2.96	25

	National		University of Georgia		University of Illinois		Iowa State University		Kansas State University		Louisiana State University	
	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N
On a scale of 1 through 5, please rate each category based on your satisfaction with your experience while on the job (what you have found since working)												
Management of reproductive programs	2.77	858	3.00	27	2.33	30	2.98	43	2.69	26	3.10	20
Evaluation of disease outbreaks	3.00	894	3.23	30	2.55	31	3.13	45	2.77	31	3.20	20
On a scale of 1 through 5, please rate each category based on your college preparedness (how well you thought your college training had prepared you before you started working)												
Evaluation of new drugs/ products	3.18	1158	3.25	40	2.93	43	3.10	50	2.84	38	3.13	24
Interpretation of medical literature	3.69	1167	3.70	40	3.33	43	3.55	53	3.27	37	3.24	25
On a scale of 1 through 5, please rate each category based on your satisfaction with your experience while on the job (what you have found since working)												
Evaluation of new drugs/ products	3.58	1110	3.68	38	3.37	41	3.64	47	3.31	36	3.77	22
Interpretation of medical literature	3.80	1142	3.77	39	3.43	42	3.61	51	3.61	36	3.78	23
On a scale of 1 through 5, please rate each category based on your college preparedness (how well you thought your college training had prepared you before you started working)												
Dealing with people	3.49	1171	3.80	40	3.37	43	3.08	52	2.71	38	3.42	24
Veterinary Medicine as a business	2.53	1166	2.78	40	2.23	43	2.10	51	1.74	38	3.16	25
Giving educational presentations to the community	2.93	1116	2.86	37	2.53	43	2.76	51	2.26	35	3.17	24
Client Communications	3.74	1171	4.08	40	3.37	43	3.33	52	3.21	38	3.71	24
On a scale of 1 through 5, please rate each category based on your satisfaction with your experience while on the job (what you have found since working)												
Dealing with people	4.07	1158	4.35	40	3.88	42	3.60	52	3.55	38	4.08	24
Veterinary Medicine as a business	2.98	1089	3.35	40	2.63	41	2.73	45	2.37	38	3.36	22
Giving educational presentations to the community	3.51	971	3.57	35	3.17	35	3.46	46	2.97	31	3.76	21
Client Communications	4.18	1152	4.43	40	4.05	43	3.80	51	3.66	38	4.39	23

	National		Tufts University		Michigan State University		University of Minnesota		Mississippi State University		Purdue University	
	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N
On a scale of 1 through 5, please rate each category based on your college preparedness (how well you thought your college training had prepared you before you started working)												
Physical examination	4.20	1187	4.28	43	4.17	46	4.03	34	4.45	20	4.43	23
History taking	4.35	1186	4.42	43	4.30	46	4.34	35	4.60	20	4.65	23
Diagnosis of lameness	3.49	1177	3.45	42	3.48	46	3.27	33	3.65	20	4.09	23
Diagnosis/Treatment of parasitic diseases	3.85	1183	3.51	43	3.54	46	3.47	34	4.35	20	3.78	23
Anesthesia	3.88	1181	4.21	43	3.80	46	3.29	34	4.45	20	4.13	23
Fluid therapy	3.80	1182	3.88	43	3.87	46	3.68	34	4.35	20	4.30	23
Intravenous injection	4.03	1180	3.84	43	3.76	46	4.00	33	4.45	20	4.43	23
Development/Adaptation of vaccination protocols	3.64	1182	2.86	43	3.11	46	3.76	34	4.15	20	3.91	23
Advising clients on nutrition	2.99	1185	3.84	43	2.78	46	2.74	35	3.25	20	2.83	23
Developing diagnostic plans for difficult cases	3.65	1187	3.86	43	3.44	45	3.41	34	3.90	20	4.04	23
Investigation of potential toxin exposure	3.16	1183	3.37	43	2.65	46	3.09	34	3.55	20	3.22	23
Prescribing medications	3.66	1185	4.02	43	3.48	46	3.18	34	3.95	20	3.96	23
On a scale of 1 through 5, please rate each category based on your satisfaction with your experience while on the job (what you have found since working)												
Physical examination	4.35	1156	4.33	43	4.18	45	4.29	34	4.40	20	4.41	22
History taking	4.42	1160	4.53	43	4.27	45	4.37	35	4.47	19	4.50	22
Diagnosis of lameness	3.66	1138	3.67	42	3.73	45	3.59	32	3.84	19	4.05	22
Diagnosis/Treatment of parasitic diseases	4.00	1147	3.79	43	3.66	44	3.94	34	4.39	18	3.95	21
Anesthesia	3.95	1143	4.00	43	3.84	45	3.76	33	4.30	20	4.05	21
Fluid therapy	3.96	1138	3.93	43	3.98	45	3.79	33	4.32	19	4.32	22
Intravenous injection	4.37	1147	4.26	43	4.16	45	4.32	34	4.25	20	4.62	21
Development/Adaptation of vaccination protocols	4.00	1127	3.56	43	3.41	44	4.25	32	4.30	20	4.40	20
Advising clients on nutrition	3.32	1143	3.95	43	3.00	45	3.09	35	3.50	20	3.30	20
Developing diagnostic plans for difficult cases	3.88	1159	3.98	43	3.60	45	3.68	34	4.11	19	4.05	22
Investigation of potential toxin exposure	3.41	1137	3.31	42	2.93	44	3.47	32	3.80	20	3.38	21
Prescribing medications	4.07	1153	4.12	43	3.98	44	4.03	34	4.45	20	4.18	22

	National		Tufts University		Michigan State University		University of Minnesota		Mississippi State University		Purdue University	
	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N
On a scale of 1 through 5, please rate each category based on your college preparedness (how well you thought your college training had prepared you before you started working)												
Interpretation of cytologic specimens	3.30	1176	3.67	43	3.22	45	2.74	34	3.25	20	3.26	23
Interpretation of post-mortem specimens	3.49	1168	3.42	43	3.24	45	3.56	34	3.80	20	3.74	23
Interpretation of ultrasound examinations	2.63	1164	3.09	43	2.56	45	2.48	33	2.60	20	2.04	23
Interpretation of radiographs	3.61	1178	3.86	43	3.38	45	3.32	34	3.45	20	3.65	23
Interpretation of hematologic values	3.92	1176	4.19	43	3.89	45	3.94	34	3.70	20	4.41	22
On a scale of 1 through 5, please rate each category based on your satisfaction with your experience while on the job (what you have found since working)												
Interpretation of cytologic specimens	3.30	1139	3.53	43	3.35	43	2.97	31	3.60	20	2.91	22
Interpretation of post-mortem specimens	3.32	1017	3.15	33	3.14	37	3.45	31	3.67	18	3.32	19
Interpretation of ultrasound examinations	2.90	1052	2.95	41	2.87	39	2.60	30	2.88	16	2.75	20
Interpretation of radiographs	3.60	1129	3.56	43	3.47	43	3.28	32	3.90	20	3.39	23
Interpretation of hematologic values	3.97	1147	4.21	43	3.74	43	4.00	33	4.00	20	4.18	22
On a scale of 1 through 5, please rate each category based on your college preparedness (how well you thought your college training had prepared you before you started working)												
Diagnosis/Therapy of gastrointestinal disease	3.76	1165	3.80	40	3.53	45	3.68	34	3.85	20	4.04	23
Diagnosis/Therapy of dermatological disease	3.46	1163	3.10	40	3.09	46	3.88	34	3.55	20	2.43	23
Diagnosis/Therapy of endocrine disease	3.55	1164	3.80	40	3.46	46	3.41	34	4.00	20	3.70	23
Diagnosis/Therapy of cardiac disease	3.27	1164	3.88	40	3.13	46	3.32	34	3.15	20	2.91	23
Diagnosis/Therapy of respiratory disease	3.37	1165	3.48	40	2.98	46	3.47	34	3.55	20	3.61	23
Diagnosis/Therapy of renal disease	3.76	1162	4.23	40	3.57	46	3.88	34	3.90	20	4.13	23
Diagnosis/Therapy of neurological disease	3.36	1166	4.00	40	2.78	46	3.00	34	3.60	20	3.83	23
Diagnosis/Therapy of ocular disorders	3.19	1164	3.40	40	2.93	46	2.94	34	2.75	20	3.70	23

	National		Tufts University		Michigan State University		University of Minnesota		Mississippi State University		Purdue University	
	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N
On a scale of 1 through 5, please rate each category based on your satisfaction with your experience while on the job (what you have found since working)												
Diagnosis/Therapy of gastrointestinal disease	4.00	1136	3.85	40	3.84	45	4.00	32	4.20	20	4.04	23
Diagnosis/Therapy of dermatological disease	3.67	1126	3.25	40	3.29	45	4.00	32	3.95	20	3.05	22
Diagnosis/Therapy of endocrine disease	3.71	1122	3.74	39	3.69	45	3.63	32	4.00	20	3.78	23
Diagnosis/Therapy of cardiac disease	3.42	1121	3.65	40	3.22	45	3.48	31	3.45	20	2.96	23
Diagnosis/Therapy of respiratory disease	3.56	1132	3.43	40	3.31	45	3.66	32	3.85	20	3.61	23
Diagnosis/Therapy of renal disease	3.98	1119	4.18	40	3.76	45	4.07	30	4.10	20	4.09	23
Diagnosis/Therapy of neurological disease	3.43	1131	3.58	40	3.00	45	3.22	32	3.60	20	3.74	23
Diagnosis/Therapy of ocular disorders	3.30	1127	3.08	40	3.13	45	3.25	32	3.25	20	3.45	22
On a scale of 1 through 5, please rate each category based on your college preparedness (how well you thought your college training had prepared you before you started working)												
Orthopedic surgery	2.02	1136	2.15	41	1.93	46	1.82	33	2.89	19	2.41	22
Soft tissue surgery	3.01	1165	2.95	41	3.02	46	2.94	34	4.00	19	3.43	23
Spay/Neuter	3.65	1161	3.34	41	3.46	46	3.62	34	4.80	20	4.39	23
On a scale of 1 through 5, please rate each category based on your satisfaction with your experience while on the job (what you have found since working)												
Orthopedic surgery	2.25	881	2.26	27	2.29	38	2.09	23	2.75	16	2.50	18
Soft tissue surgery	3.52	1094	3.33	40	3.49	45	3.47	30	4.21	19	3.78	23
Spay/Neuter	4.02	1075	3.71	41	3.91	43	4.14	29	4.58	19	4.50	22
On a scale of 1 through 5, please rate each category based on your college preparedness (how well you thought your college training had prepared you before you started working)												
Management of reproductive programs	2.70	1121	2.38	39	2.16	45	3.06	31	3.40	20	2.57	23
Evaluation of disease outbreaks	2.95	1129	2.70	40	2.53	45	3.03	32	3.40	20	3.26	23
On a scale of 1 through 5, please rate each category based on your satisfaction with your experience while on the job (what you have found since working)												
Management of reproductive programs	2.77	858	2.26	27	2.23	31	3.43	21	3.26	19	2.90	20
Evaluation of disease outbreaks	3.00	894	2.70	27	2.62	34	3.50	24	3.38	16	3.32	19

	National		Tufts University		Michigan State University		University of Minnesota		Mississippi State University		Purdue University	
	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N
On a scale of 1 through 5, please rate each category based on your college preparedness (how well you thought your college training had prepared you before you started working)												
Evaluation of new drugs/ products	3.18	1158	3.25	40	2.74	46	3.00	33	3.45	20	3.96	23
Interpretation of medical literature	3.69	1167	4.10	41	3.46	46	3.53	34	4.00	20	4.30	23
On a scale of 1 through 5, please rate each category based on your satisfaction with your experience while on the job (what you have found since working)												
Evaluation of new drugs/ products	3.58	1110	3.63	40	3.30	43	3.63	32	3.75	20	4.09	22
Interpretation of medical literature	3.80	1142	3.93	41	3.64	45	3.67	33	4.00	20	4.09	22
On a scale of 1 through 5, please rate each category based on your college preparedness (how well you thought your college training had prepared you before you started working)												
Dealing with people	3.49	1171	3.61	41	3.22	46	3.59	34	3.75	20	3.65	23
Veterinary Medicine as a business	2.53	1166	2.65	40	2.40	45	2.56	34	3.60	20	3.17	23
Giving educational presentations to the community	2.93	1116	2.92	36	3.04	45	2.97	34	3.39	18	3.68	22
Client Communications	3.74	1171	3.71	41	3.65	46	3.65	34	4.10	20	3.96	23
On a scale of 1 through 5, please rate each category based on your satisfaction with your experience while on the job (what you have found since working)												
Dealing with people	4.07	1158	4.29	41	4.00	44	4.09	33	3.85	20	4.09	23
Veterinary Medicine as a business	2.98	1089	2.92	37	2.85	41	2.97	32	3.45	20	3.30	23
Giving educational presentations to the community	3.51	971	3.27	33	3.59	37	3.44	27	3.43	14	3.80	20
Client Communications	4.18	1152	4.12	41	4.14	44	4.12	33	4.25	20	4.00	23

	National		Cornell Veterinary College		Oklahoma State University		University of Pennsylvania		Texas A&M University		Washington State University	
	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N
On a scale of 1 through 5, please rate each category based on your college preparedness (how well you thought your college training had prepared you before you started working)												
Physical examination	4.20	1187	4.48	48	4.05	20	4.27	33	4.46	37	4.14	37
History taking	4.35	1186	4.52	48	4.35	20	4.30	33	4.54	37	4.30	37
Diagnosis of lameness	3.49	1177	3.53	49	3.25	20	2.97	33	3.76	37	3.32	37
Diagnosis/Treatment of parasitic diseases	3.85	1183	3.69	48	4.25	20	3.55	33	4.05	37	3.92	37
Anesthesia	3.88	1181	3.67	48	3.75	20	3.42	33	4.05	37	3.78	37
Fluid therapy	3.80	1182	4.04	48	3.80	20	3.67	33	3.86	37	3.62	37
Intravenous injection	4.03	1180	3.92	48	3.65	20	3.73	33	4.30	37	3.76	37
Development/Adaptation of vaccination protocols	3.64	1182	3.79	48	3.65	20	3.48	33	3.95	37	3.89	36
Advising clients on nutrition	2.99	1185	2.98	48	2.70	20	2.72	32	3.24	37	2.81	36
Developing diagnostic plans for difficult cases	3.65	1187	4.02	48	3.55	20	3.42	33	3.97	37	3.73	37
Investigation of potential toxin exposure	3.16	1183	3.10	48	3.45	20	3.00	33	3.11	37	3.78	37
Prescribing medications	3.66	1185	3.88	48	3.35	20	3.45	33	3.65	37	3.75	36
On a scale of 1 through 5, please rate each category based on your satisfaction with your experience while on the job (what you have found since working)												
Physical examination	4.35	1156	4.52	48	4.16	19	4.50	32	4.51	37	4.26	35
History taking	4.42	1160	4.65	48	4.21	19	4.56	32	4.51	37	4.14	35
Diagnosis of lameness	3.66	1138	3.65	49	3.68	19	3.25	32	3.76	37	3.43	35
Diagnosis/Treatment of parasitic diseases	4.00	1147	3.69	48	4.42	19	3.69	32	4.22	37	3.80	35
Anesthesia	3.95	1143	3.67	48	4.00	19	3.63	30	4.11	37	3.91	34
Fluid therapy	3.96	1138	4.02	48	3.95	19	3.81	32	4.11	37	3.56	34
Intravenous injection	4.37	1147	4.29	48	4.42	19	4.22	32	4.46	37	3.97	34
Development/Adaptation of vaccination protocols	4.00	1127	4.08	48	3.84	19	3.74	31	4.28	36	3.91	35
Advising clients on nutrition	3.32	1143	3.29	48	3.37	19	2.97	32	3.73	37	3.03	35
Developing diagnostic plans for difficult cases	3.88	1159	4.02	48	3.89	19	3.56	32	4.03	37	3.89	35
Investigation of potential toxin exposure	3.41	1137	3.37	46	3.63	19	3.16	32	3.54	37	3.74	35
Prescribing medications	4.07	1153	4.19	48	3.74	19	3.81	32	4.30	37	3.83	35

	National		Cornell Veterinary College		Oklahoma State University		University of Pennsylvania		Texas A&M University		Washington State University	
	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N
On a scale of 1 through 5, please rate each category based on your college preparedness (how well you thought your college training had prepared you before you started working)												
Interpretation of cytologic specimens	3.30	1176	3.52	48	3.30	20	2.84	32	3.62	37	3.28	36
Interpretation of post-mortem specimens	3.49	1168	3.50	46	3.30	20	3.22	32	3.30	37	3.46	35
Interpretation of ultrasound examinations	2.63	1164	2.81	47	1.84	19	2.41	32	2.38	37	2.40	35
Interpretation of radiographs	3.61	1178	3.57	47	3.75	20	3.56	32	3.65	37	3.53	36
Interpretation of hematologic values	3.92	1176	4.26	47	3.65	20	3.81	32	4.00	37	3.92	36
On a scale of 1 through 5, please rate each category based on your satisfaction with your experience while on the job (what you have found since working)												
Interpretation of cytologic specimens	3.30	1139	3.39	46	3.58	19	2.88	32	3.46	35	3.26	34
Interpretation of post-mortem specimens	3.32	1017	3.67	42	3.11	18	3.23	26	2.97	35	3.26	34
Interpretation of ultrasound examinations	2.90	1052	3.19	43	2.00	17	2.71	31	2.76	34	2.68	34
Interpretation of radiographs	3.60	1129	3.42	45	3.58	19	3.78	32	3.69	35	3.65	34
Interpretation of hematologic values	3.97	1147	4.11	46	3.89	19	3.91	32	4.06	36	4.12	34
On a scale of 1 through 5, please rate each category based on your college preparedness (how well you thought your college training had prepared you before you started working)												
Diagnosis/Therapy of gastrointestinal disease	3.76	1165	3.70	46	3.45	20	3.52	31	4.16	37	3.71	35
Diagnosis/Therapy of dermatological disease	3.46	1163	3.50	46	3.00	20	3.61	31	3.53	36	2.71	35
Diagnosis/Therapy of endocrine disease	3.55	1164	3.80	46	3.25	20	3.58	31	3.76	37	3.54	35
Diagnosis/Therapy of cardiac disease	3.27	1164	3.57	46	2.75	20	3.39	31	3.84	37	2.94	35
Diagnosis/Therapy of respiratory disease	3.37	1165	3.59	46	2.80	20	3.29	31	3.78	37	3.37	35
Diagnosis/Therapy of renal disease	3.76	1162	3.83	46	3.45	20	3.65	31	3.92	37	3.60	35
Diagnosis/Therapy of neurological disease	3.36	1166	3.41	46	3.25	20	3.10	31	3.78	37	3.29	35
Diagnosis/Therapy of ocular disorders	3.19	1164	3.37	46	3.15	20	2.81	31	2.24	37	2.63	35

	National		Cornell Veterinary College		Oklahoma State University		University of Pennsylvania		Texas A&M University		Washington State University	
	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N
On a scale of 1 through 5, please rate each category based on your satisfaction with your experience while on the job (what you have found since working)												
Diagnosis/Therapy of gastrointestinal disease	4.00	1136	4.00	45	3.84	19	3.94	31	4.19	36	3.79	34
Diagnosis/Therapy of dermatological disease	3.67	1126	3.51	45	3.58	19	3.71	31	3.81	36	3.09	34
Diagnosis/Therapy of endocrine disease	3.71	1122	3.71	45	3.58	19	3.74	31	3.78	36	3.76	33
Diagnosis/Therapy of cardiac disease	3.42	1121	3.40	45	3.00	19	3.35	31	3.61	36	3.24	33
Diagnosis/Therapy of respiratory disease	3.56	1132	3.51	45	3.16	19	3.35	31	3.89	36	3.42	33
Diagnosis/Therapy of renal disease	3.98	1119	3.81	43	3.79	19	3.90	30	4.08	36	3.88	33
Diagnosis/Therapy of neurological disease	3.43	1131	3.46	46	3.21	19	3.29	31	3.58	36	3.36	33
Diagnosis/Therapy of ocular disorders	3.30	1127	3.47	45	3.42	19	2.81	31	2.60	35	2.88	33
On a scale of 1 through 5, please rate each category based on your college preparedness (how well you thought your college training had prepared you before you started working)												
Orthopedic surgery	2.02	1136	1.91	45	1.74	19	1.94	31	2.22	37	1.85	34
Soft tissue surgery	3.01	1165	2.83	46	2.80	20	2.55	31	3.24	37	2.86	36
Spay/Neuter	3.65	1161	3.30	46	4.00	20	3.10	29	4.14	37	3.47	36
On a scale of 1 through 5, please rate each category based on your satisfaction with your experience while on the job (what you have found since working)												
Orthopedic surgery	2.25	881	2.32	34	1.82	17	2.04	23	2.50	30	2.30	27
Soft tissue surgery	3.52	1094	3.36	44	3.53	19	3.00	29	3.89	35	3.36	33
Spay/Neuter	4.02	1075	3.83	42	4.37	19	3.46	28	4.18	33	3.64	33
On a scale of 1 through 5, please rate each category based on your college preparedness (how well you thought your college training had prepared you before you started working)												
Management of reproductive programs	2.70	1121	2.89	45	2.61	18	2.33	30	2.94	35	2.41	34
Evaluation of disease outbreaks	2.95	1129	3.22	45	2.88	17	2.57	30	3.14	36	2.83	35
On a scale of 1 through 5, please rate each category based on your satisfaction with your experience while on the job (what you have found since working)												
Management of reproductive programs	2.77	858	2.97	36	2.67	15	2.55	22	3.03	29	2.65	26
Evaluation of disease outbreaks	3.00	894	3.27	33	2.81	16	2.90	20	3.16	31	2.86	28

	National		Cornell Veterinary College		Oklahoma State University		University of Pennsylvania		Texas A&M University		Washington State University	
	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N
On a scale of 1 through 5, please rate each category based on your college preparedness (how well you thought your college training had prepared you before you started working)												
Evaluation of new drugs/ products	3.18	1158	3.32	47	2.65	20	2.87	30	3.61	36	3.03	36
Interpretation of medical literature	3.69	1167	3.94	47	3.45	20	3.61	31	4.08	36	3.47	36
On a scale of 1 through 5, please rate each category based on your satisfaction with your experience while on the job (what you have found since working)												
Evaluation of new drugs/ products	3.58	1110	3.79	43	3.11	19	3.25	28	3.89	35	3.38	34
Interpretation of medical literature	3.80	1142	3.89	47	3.65	20	3.60	30	3.97	35	3.53	34
On a scale of 1 through 5, please rate each category based on your college preparedness (how well you thought your college training had prepared you before you started working)												
Dealing with people	3.49	1171	3.83	47	3.05	20	2.71	31	3.24	37	3.53	36
Veterinary Medicine as a business	2.53	1166	2.49	47	2.00	19	2.68	31	2.54	37	2.61	36
Giving educational presentations to the community	2.93	1116	3.38	47	2.72	18	2.64	25	3.06	35	2.86	35
Client Communications	3.74	1171	3.96	47	3.80	20	3.10	31	3.68	37	3.86	36
On a scale of 1 through 5, please rate each category based on your satisfaction with your experience while on the job (what you have found since working)												
Dealing with people	4.07	1158	4.15	47	3.95	19	3.74	31	3.97	36	4.00	35
Veterinary Medicine as a business	2.98	1089	2.90	42	2.67	18	2.92	26	2.91	34	2.97	32
Giving educational presentations to the community	3.51	971	3.74	46	3.29	17	3.11	19	3.87	31	3.43	30
Client Communications	4.18	1152	4.26	47	4.32	19	3.87	31	4.20	35	3.97	35

	National		University of Missouri-Columbia		The Ohio State University		Oregon State University		University of Tennessee		Virginia-Maryland Regional	
	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N
On a scale of 1 through 5, please rate each category based on your college preparedness (how well you thought your college training had prepared you before you started working)												
Physical examination	4.20	1187	4.38	42	4.31	51	4.00	23	4.00	30	4.11	54
History taking	4.35	1186	4.40	42	4.55	51	4.13	23	4.50	30	4.24	55
Diagnosis of lameness	3.49	1177	3.64	42	3.46	50	3.30	23	3.23	30	3.51	55
Diagnosis/Treatment of parasitic diseases	3.85	1183	3.95	42	3.82	51	3.26	23	4.30	30	3.95	55
Anesthesia	3.88	1181	4.07	42	3.94	51	4.13	23	4.30	30	4.09	55
Fluid therapy	3.80	1182	3.80	41	3.63	51	3.30	23	4.17	30	3.75	55
Intravenous injection	4.03	1180	4.33	42	4.08	51	3.65	23	4.30	30	4.22	54
Development/Adaptation of vaccination protocols	3.64	1182	3.74	42	3.80	51	2.87	23	3.57	30	3.82	55
Advising clients on nutrition	2.99	1185	3.12	42	2.84	51	2.35	23	3.77	30	3.16	55
Developing diagnostic plans for difficult cases	3.65	1187	3.60	42	3.57	51	3.48	23	4.00	30	3.64	55
Investigation of potential toxin exposure	3.16	1183	3.38	42	2.86	50	2.43	23	3.23	30	3.25	55
Prescribing medications	3.66	1185	3.69	42	3.67	51	3.04	23	3.83	30	3.87	55
On a scale of 1 through 5, please rate each category based on your satisfaction with your experience while on the job (what you have found since working)												
Physical examination	4.35	1156	4.67	42	4.20	49	4.17	23	4.07	29	4.20	54
History taking	4.42	1160	4.63	41	4.44	50	4.30	23	4.48	29	4.42	52
Diagnosis of lameness	3.66	1138	3.69	42	3.57	47	3.35	23	3.78	27	3.64	53
Diagnosis/Treatment of parasitic diseases	4.00	1147	4.41	41	3.96	48	3.48	23	4.31	29	4.00	53
Anesthesia	3.95	1143	4.22	41	3.84	49	4.00	23	4.10	29	4.12	52
Fluid therapy	3.96	1138	4.10	41	3.63	48	3.74	23	4.17	29	3.92	52
Intravenous injection	4.37	1147	4.69	42	4.29	48	4.13	23	4.57	28	4.36	53
Development/Adaptation of vaccination protocols	4.00	1127	4.18	40	3.88	50	3.70	23	4.00	28	4.17	53
Advising clients on nutrition	3.32	1143	3.40	42	3.06	48	2.96	23	3.89	28	3.19	52
Developing diagnostic plans for difficult cases	3.88	1159	3.90	42	3.63	49	3.83	23	4.20	30	3.83	52
Investigation of potential toxin exposure	3.41	1137	3.52	42	3.09	46	3.13	23	3.60	30	3.42	50
Prescribing medications	4.07	1153	4.26	42	3.88	49	3.65	23	3.93	29	4.17	53

	National		University of Missouri-Columbia		The Ohio State University		Oregon State University		University of Tennessee		Virginia-Maryland Regional	
	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N
On a scale of 1 through 5, please rate each category based on your college preparedness (how well you thought your college training had prepared you before you started working)												
Interpretation of cytologic specimens	3.30	1176	3.76	41	3.34	50	3.30	23	3.37	30	2.84	55
Interpretation of post-mortem specimens	3.49	1168	3.71	42	3.24	49	3.43	23	3.76	29	3.42	55
Interpretation of ultrasound examinations	2.63	1164	2.56	41	2.39	51	2.13	23	2.50	30	2.51	53
Interpretation of radiographs	3.61	1178	3.51	41	3.55	51	3.22	23	4.23	30	3.67	55
Interpretation of hematologic values	3.92	1176	4.05	41	3.90	51	3.65	23	4.33	30	3.87	55
On a scale of 1 through 5, please rate each category based on your satisfaction with your experience while on the job (what you have found since working)												
Interpretation of cytologic specimens	3.30	1139	3.70	40	3.27	48	3.35	23	3.38	29	2.88	51
Interpretation of post-mortem specimens	3.32	1017	3.42	33	3.15	41	3.19	21	3.32	25	3.33	43
Interpretation of ultrasound examinations	2.90	1052	2.89	37	2.64	44	3.00	20	2.96	28	3.11	46
Interpretation of radiographs	3.60	1129	3.59	39	3.54	48	3.35	23	4.00	28	3.70	50
Interpretation of hematologic values	3.97	1147	4.23	40	3.90	48	3.78	23	4.23	30	4.00	54
On a scale of 1 through 5, please rate each category based on your college preparedness (how well you thought your college training had prepared you before you started working)												
Diagnosis/Therapy of gastrointestinal disease	3.76	1165	3.76	42	3.70	50	3.39	23	3.93	29	3.89	53
Diagnosis/Therapy of dermatological disease	3.46	1163	3.37	41	3.74	50	2.39	23	4.24	29	3.15	53
Diagnosis/Therapy of endocrine disease	3.55	1164	3.27	41	3.32	50	2.96	23	4.03	29	3.53	53
Diagnosis/Therapy of cardiac disease	3.27	1164	3.27	41	3.48	50	3.83	23	3.24	29	3.41	54
Diagnosis/Therapy of respiratory disease	3.37	1165	3.50	42	3.38	50	2.91	23	3.34	29	3.43	53
Diagnosis/Therapy of renal disease	3.76	1162	3.83	41	3.76	50	3.17	23	4.14	29	3.85	53
Diagnosis/Therapy of neurological disease	3.36	1166	3.52	42	3.40	50	3.35	23	4.03	29	3.68	53
Diagnosis/Therapy of ocular disorders	3.19	1164	3.64	42	3.48	50	2.09	23	4.34	29	3.13	53

	National		University of Missouri-Columbia		The Ohio State University		Oregon State University		University of Tennessee		Virginia-Maryland Regional	
	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N
On a scale of 1 through 5, please rate each category based on your satisfaction with your experience while on the job (what you have found since working)												
Diagnosis/Therapy of gastrointestinal disease	4.00	1136	4.10	41	3.94	47	3.70	23	4.18	28	4.00	52
Diagnosis/Therapy of dermatological disease	3.67	1126	3.53	40	3.72	47	3.17	23	4.18	28	3.51	49
Diagnosis/Therapy of endocrine disease	3.71	1122	3.44	39	3.48	46	3.48	23	4.21	28	3.67	48
Diagnosis/Therapy of cardiac disease	3.42	1121	3.67	39	3.64	47	3.68	22	3.48	27	3.59	49
Diagnosis/Therapy of respiratory disease	3.56	1132	3.61	41	3.62	47	3.43	23	3.50	28	3.69	51
Diagnosis/Therapy of renal disease	3.98	1119	4.00	40	3.94	47	3.68	22	4.32	28	4.06	48
Diagnosis/Therapy of neurological disease	3.43	1131	3.50	42	3.43	47	3.68	22	3.67	27	3.58	50
Diagnosis/Therapy of ocular disorders	3.30	1127	3.64	42	3.61	46	2.87	23	3.82	28	3.22	49
On a scale of 1 through 5, please rate each category based on your college preparedness (how well you thought your college training had prepared you before you started working)												
Orthopedic surgery	2.02	1136	2.37	41	2.04	49	1.74	23	1.79	29	1.71	52
Soft tissue surgery	3.01	1165	3.19	42	3.22	50	3.22	23	3.03	29	2.55	53
Spay/Neuter	3.65	1161	3.78	41	4.10	50	4.09	23	3.83	29	3.28	53
On a scale of 1 through 5, please rate each category based on your satisfaction with your experience while on the job (what you have found since working)												
Orthopedic surgery	2.25	881	2.69	29	2.06	33	1.94	18	1.88	24	2.29	35
Soft tissue surgery	3.52	1094	3.62	39	3.45	44	3.39	23	3.44	27	3.19	48
Spay/Neuter	4.02	1075	4.13	38	4.14	43	4.33	21	4.11	27	3.81	48
On a scale of 1 through 5, please rate each category based on your college preparedness (how well you thought your college training had prepared you before you started working)												
Management of reproductive programs	2.70	1121	2.86	42	2.88	49	2.23	22	2.89	28	2.55	49
Evaluation of disease outbreaks	2.95	1129	3.02	42	3.24	50	2.59	22	3.00	28	2.94	50
On a scale of 1 through 5, please rate each category based on your satisfaction with your experience while on the job (what you have found since working)												
Management of reproductive programs	2.77	858	2.87	30	3.17	36	2.13	15	3.00	20	2.54	35
Evaluation of disease outbreaks	3.00	894	3.13	30	3.19	42	2.47	15	3.23	22	3.00	38

	National		University of Missouri-Columbia		The Ohio State University		Oregon State University		University of Tennessee		Virginia-Maryland Regional	
	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N
On a scale of 1 through 5, please rate each category based on your college preparedness (how well you thought your college training had prepared you before you started working)												
Evaluation of new drugs/ products	3.18	1158	3.31	42	3.43	49	2.74	23	3.39	28	3.09	53
Interpretation of medical literature	3.69	1167	3.86	42	3.66	50	3.65	23	3.97	29	3.51	53
On a scale of 1 through 5, please rate each category based on your satisfaction with your experience while on the job (what you have found since working)												
Evaluation of new drugs/ products	3.58	1110	3.73	41	3.71	48	3.27	22	3.59	27	3.47	51
Interpretation of medical literature	3.80	1142	3.79	42	4.02	48	3.95	22	3.72	29	3.81	53
On a scale of 1 through 5, please rate each category based on your college preparedness (how well you thought your college training had prepared you before you started working)												
Dealing with people	3.49	1171	3.36	42	3.84	49	2.96	23	4.17	29	3.51	53
Veterinary Medicine as a business	2.53	1166	2.12	42	2.82	49	2.30	23	2.69	29	2.56	52
Giving educational presentations to the community	2.93	1116	3.08	40	2.73	48	2.78	23	3.22	27	2.47	51
Client Communications	3.74	1171	3.67	42	4.10	49	3.09	23	4.24	29	3.66	53
On a scale of 1 through 5, please rate each category based on your satisfaction with your experience while on the job (what you have found since working)												
Dealing with people	4.07	1158	4.05	42	4.22	49	3.96	23	4.41	29	4.09	53
Veterinary Medicine as a business	2.98	1089	2.93	40	3.04	47	2.77	22	3.08	25	2.86	44
Giving educational presentations to the community	3.51	971	3.76	37	3.59	41	3.75	20	3.75	20	3.37	41
Client Communications	4.18	1152	4.24	42	4.16	49	3.91	23	4.50	28	4.19	52

	National		North Carolina State University		University of Wisconsin		Western University - California		Ross University		St. George's University	
	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N
On a scale of 1 through 5, please rate each category based on your college preparedness (how well you thought your college training had prepared you before you started working)												
Physical examination	4.20	1187	4.21	34	4.00	33	4.27	30	4.31	81	4.61	23
History taking	4.35	1186	4.41	34	4.18	33	4.43	30	4.52	81	4.57	23
Diagnosis of lameness	3.49	1177	3.24	34	3.03	32	3.87	30	3.79	80	3.83	23
Diagnosis/Treatment of parasitic diseases	3.85	1183	4.06	32	3.48	33	3.77	30	4.22	81	4.22	23
Anesthesia	3.88	1181	3.76	33	3.70	33	3.41	29	4.41	81	4.30	23
Fluid therapy	3.80	1182	3.39	33	3.27	33	3.70	30	4.15	81	4.17	23
Intravenous injection	4.03	1180	4.15	33	3.27	33	3.97	29	4.30	81	4.43	23
Development/Adaptation of vaccination protocols	3.64	1182	3.50	34	3.38	32	4.20	30	3.86	81	3.87	23
Advising clients on nutrition	2.99	1185	3.06	34	2.09	33	3.27	30	3.30	81	3.30	23
Developing diagnostic plans for difficult cases	3.65	1187	3.76	34	3.45	33	3.73	30	3.81	81	4.00	23
Investigation of potential toxin exposure	3.16	1183	3.00	34	2.52	33	3.50	30	3.47	81	3.00	23
Prescribing medications	3.66	1185	3.74	34	3.24	33	3.63	30	4.00	81	3.74	23
On a scale of 1 through 5, please rate each category based on your satisfaction with your experience while on the job (what you have found since working)												
Physical examination	4.35	1156	4.36	33	4.52	33	4.52	29	4.42	81	4.68	22
History taking	4.42	1160	4.48	33	4.55	33	4.55	29	4.53	81	4.52	21
Diagnosis of lameness	3.66	1138	3.42	33	3.52	31	4.03	29	3.90	78	4.10	21
Diagnosis/Treatment of parasitic diseases	4.00	1147	4.19	32	4.21	33	4.14	29	4.23	81	4.30	20
Anesthesia	3.95	1143	3.75	32	3.61	33	3.66	29	4.31	80	4.48	21
Fluid therapy	3.96	1138	3.81	32	3.79	33	3.83	29	4.21	80	4.05	20
Intravenous injection	4.37	1147	4.50	32	4.12	33	4.41	29	4.50	80	4.41	22
Development/Adaptation of vaccination protocols	4.00	1127	4.00	32	4.14	29	4.33	27	3.99	79	4.15	20
Advising clients on nutrition	3.32	1143	3.27	33	2.94	33	3.55	29	3.55	80	3.50	20
Developing diagnostic plans for difficult cases	3.88	1159	3.97	33	3.88	33	4.10	30	3.94	80	4.14	21
Investigation of potential toxin exposure	3.41	1137	3.31	32	2.94	33	3.90	30	3.48	80	3.30	20
Prescribing medications	4.07	1153	4.18	33	4.12	33	4.21	29	4.17	81	4.19	21

	National		North Carolina State University		University of Wisconsin		Western University - California		Ross University		St. George's University	
	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N
On a scale of 1 through 5, please rate each category based on your college preparedness (how well you thought your college training had prepared you before you started working)												
Interpretation of cytologic specimens	3.30	1176	3.18	33	3.06	33	3.50	30	3.49	81	3.61	23
Interpretation of post-mortem specimens	3.49	1168	3.32	34	3.25	32	3.70	30	3.66	79	3.68	22
Interpretation of ultrasound examinations	2.63	1164	2.39	33	2.18	33	3.53	30	2.80	81	2.82	22
Interpretation of radiographs	3.61	1178	3.33	33	3.58	33	3.63	30	3.85	81	3.87	23
Interpretation of hematologic values	3.92	1176	4.12	33	3.91	33	3.83	30	4.06	81	4.09	23
On a scale of 1 through 5, please rate each category based on your satisfaction with your experience while on the job (what you have found since working)												
Interpretation of cytologic specimens	3.30	1139	2.97	32	3.00	33	3.70	30	3.34	80	3.74	19
Interpretation of post-mortem specimens	3.32	1017	3.19	27	3.22	27	3.46	28	3.39	69	3.18	17
Interpretation of ultrasound examinations	2.90	1052	2.79	29	2.68	31	3.57	28	2.99	77	2.79	19
Interpretation of radiographs	3.60	1129	3.19	31	3.67	33	3.79	29	3.80	79	3.86	21
Interpretation of hematologic values	3.97	1147	4.09	32	4.18	33	4.10	30	3.91	80	3.90	21
On a scale of 1 through 5, please rate each category based on your college preparedness (how well you thought your college training had prepared you before you started working)												
Diagnosis/Therapy of gastrointestinal disease	3.76	1165	3.97	34	3.70	33	3.57	30	3.95	79	4.13	23
Diagnosis/Therapy of dermatological disease	3.46	1163	3.71	34	3.52	33	3.20	30	3.72	79	3.74	23
Diagnosis/Therapy of endocrine disease	3.55	1164	3.71	34	3.36	33	3.40	30	3.65	79	3.91	23
Diagnosis/Therapy of cardiac disease	3.27	1164	3.56	34	3.24	33	3.13	30	3.37	79	3.52	23
Diagnosis/Therapy of respiratory disease	3.37	1165	3.65	34	3.15	33	3.33	30	3.52	79	3.50	22
Diagnosis/Therapy of renal disease	3.76	1162	3.82	34	3.61	33	3.87	30	3.97	79	4.09	23
Diagnosis/Therapy of neurological disease	3.36	1166	3.50	34	3.52	33	3.33	30	3.41	79	3.61	23
Diagnosis/Therapy of ocular disorders	3.19	1164	3.35	34	3.21	33	2.83	30	3.19	79	3.39	23

	National		North Carolina State University		University of Wisconsin		Western University - California		Ross University		St. George's University	
	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N
On a scale of 1 through 5, please rate each category based on your satisfaction with your experience while on the job (what you have found since working)												
Diagnosis/Therapy of gastrointestinal disease	4.00	1136	4.00	33	4.03	33	4.07	30	4.12	78	4.18	22
Diagnosis/Therapy of dermatological disease	3.67	1126	3.73	33	3.91	33	3.72	29	3.81	78	3.91	22
Diagnosis/Therapy of endocrine disease	3.71	1122	3.70	33	3.58	33	3.90	30	3.76	78	3.82	22
Diagnosis/Therapy of cardiac disease	3.42	1121	3.52	33	3.31	32	3.45	29	3.50	78	3.57	21
Diagnosis/Therapy of respiratory disease	3.56	1132	3.67	33	3.45	33	3.63	30	3.63	78	3.50	22
Diagnosis/Therapy of renal disease	3.98	1119	3.97	33	3.91	32	4.13	30	4.17	78	4.32	22
Diagnosis/Therapy of neurological disease	3.43	1131	3.61	33	3.42	33	3.63	30	3.39	76	3.41	22
Diagnosis/Therapy of ocular disorders	3.30	1127	3.42	33	3.03	33	3.23	30	3.24	78	3.57	21
On a scale of 1 through 5, please rate each category based on your college preparedness (how well you thought your college training had prepared you before you started working)												
Orthopedic surgery	2.02	1136	1.88	32	1.79	28	2.20	30	2.28	79	2.61	23
Soft tissue surgery	3.01	1165	2.91	33	2.67	33	3.10	30	3.48	80	3.61	23
Spay/Neuter	3.65	1161	3.82	33	3.13	32	3.93	30	3.99	80	4.22	23
On a scale of 1 through 5, please rate each category based on your satisfaction with your experience while on the job (what you have found since working)												
Orthopedic surgery	2.25	881	1.82	28	1.88	24	2.52	27	2.32	59	2.50	16
Soft tissue surgery	3.52	1094	3.31	32	3.34	32	3.76	29	3.81	78	3.63	19
Spay/Neuter	4.02	1075	3.97	32	3.72	29	4.18	28	4.16	76	4.55	20
On a scale of 1 through 5, please rate each category based on your college preparedness (how well you thought your college training had prepared you before you started working)												
Management of reproductive programs	2.70	1121	2.42	33	2.33	33	2.90	29	2.79	75	3.26	23
Evaluation of disease outbreaks	2.95	1129	2.82	33	2.53	34	3.40	30	3.00	74	3.09	22

	National		North Carolina State University		University of Wisconsin		Western University - California		Ross University		St. George's University	
	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N
On a scale of 1 through 5, please rate each category based on your satisfaction with your experience while on the job (what you have found since working)												
Management of reproductive programs	2.77	858	2.29	28	2.52	25	3.13	23	2.63	62	3.19	16
Evaluation of disease outbreaks	3.00	894	2.70	27	2.81	27	3.12	25	2.90	62	2.69	16
On a scale of 1 through 5, please rate each category based on your college preparedness (how well you thought your college training had prepared you before you started working)												
Evaluation of new drugs/ products	3.18	1158	3.55	33	2.91	33	3.63	30	3.42	78	3.05	22
Interpretation of medical literature	3.69	1167	3.76	33	3.45	33	4.30	30	3.77	78	3.64	22
On a scale of 1 through 5, please rate each category based on your satisfaction with your experience while on the job (what you have found since working)												
Evaluation of new drugs/ products	3.58	1110	3.61	33	3.41	32	4.00	29	3.63	78	3.80	20
Interpretation of medical literature	3.80	1142	3.71	34	3.59	32	4.30	30	3.84	79	3.95	21
On a scale of 1 through 5, please rate each category based on your college preparedness (how well you thought your college training had prepared you before you started working)												
Dealing with people	3.49	1171	3.62	34	3.03	34	4.13	30	3.74	80	3.65	23
Veterinary Medicine as a business	2.53	1166	2.76	34	1.88	34	2.80	30	2.74	80	2.00	23
Giving educational presentations to the community	2.93	1116	3.03	32	2.33	33	3.47	30	3.14	76	2.85	20
Client Communications	3.74	1171	3.88	34	3.44	34	4.37	30	3.84	80	4.00	23
On a scale of 1 through 5, please rate each category based on your satisfaction with your experience while on the job (what you have found since working)												
Dealing with people	4.07	1158	4.18	34	3.97	34	4.43	30	4.23	80	4.36	22
Veterinary Medicine as a business	2.98	1089	3.09	32	2.45	33	2.85	27	3.22	78	2.82	22
Giving educational presentations to the community	3.51	971	3.41	29	3.24	29	3.36	28	3.76	66	3.63	16
Client Communications	4.18	1152	4.30	33	4.09	34	4.60	30	4.31	80	4.64	22

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.

AVMA™ | *Veterinary Economics*

2016 AVMA Report on

THE MARKET FOR VETERINARY SERVICES

AVMA™ | Veterinary Economics

2016 AVMA Report on
THE MARKET FOR VETERINARY SERVICES

Veterinary Economics Division
American Veterinary Medical Association
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SUMMARY

Wrapping up the AVMA Economics Division's 2016 endeavor to produce four major reports examining the three vertically related veterinary markets, this final edition takes an analytical look at the market for veterinary services, presenting narratives relative to product and service delivery — and opportunity. It does so by discussing a key performance indicator (KPI) addressing concerns voiced in the industry about capacity relative to demand; by revisiting a workforce model that presents useful information about regional and practice type variations; as well as by relating findings of studies that offer insight into the seasonality of business activity, and the prospects for enterprise growth that might be expected with the expansion of pet health insurance, along with presenting data that emerged from a breakdown of practices by state, and from an appraisal of customer inclinations in one selected U.S. metro region veterinary market.

A Sum of Moving Parts

The excess capacity KPI is a concept that can be viewed through its moving parts: demand, supply and price. Changing any one of these factors will affect the level of excess capacity; that is, the degree that services delivered exceed the quantity of services demanded at a specific price. Excess capacity is calculated by subtracting from total capacity the amount of capacity currently being utilized, and dividing the difference by total capacity. While excess capacity should be measured annually using a consistent, analytical process to appraise the profession's economic health, it is important to keep in mind that as a KPI it yields insufficient information about the financial health of the profession, as a decline in excess capacity not caused by a reduction in profitability could very well be a positive indicator.

In both 2014 and 2015, the AVMA conducted surveys that posed a set of queries that were similar to but expanded on a previous effort from 2012, details of which were included in the 2013 AVMA Workforce Study. All three of these studies were organized in the interest of measuring excess capacity in the profession. The line of inquiry involved successive scenarios presented to respondents whose average profile is characterized by a clinic of 3,478 square feet in size with just over three exam rooms, and which serves 70 patients per veterinarian per week.

These newer studies sought information about perceptions relative to productivity and competition. Individual survey responses from the 2015 AVMA Capacity Survey show a pattern wherein the most frequent answer among all practice types is that veterinary practices are operating at or above full capacity. Likewise, a pattern is observed in geographic analysis of capacity reporting, with the most common survey response indicating that the veterinary practice is at full capacity. In comparing findings of all three surveys, a statistically significant drop in excess capacity in 2015 was identified over that cited two years earlier. Modest change was observed when comparing survey responses in 2015 to 2014, while the change from 2012 to 2014 was substantially more pronounced with a greater number of practices reporting to be at or above full capacity in the latter. Noteworthy, food animal practices saw a significant jump from 2014 to 2015 in the number of practices at full capacity, while mixed animal practices saw a drop, and equine and companion animal practices only modest change.

According to the 2012 AVMA Workforce Survey, excess capacity in private practices was 17.2 percent. Plugging this number into the AVMA Workforce Model and reweighting by both state and employment sector resulted in a baseline excess capacity of 12.5 percent for the profession. According to the 2015 AVMA Capacity Survey, total excess capacity in private practice was 13.3 percent. Running this value through the model and applying reweighting yielded an estimated industry-wide excess capacity of 7.7 percent in 2014. Between 2012 and 2015, the mean level of excess capacity declined in half the number of regions and increased in the other. It declined for companion animal and food animal practice types, but increased slightly for equine, and more so for mixed animal practices. Projections for the years 2016 to 2025 indicate that excess capacity will decline over the period, suggesting that supply and demand in the veterinary services market are moving towards alignment – factoring in new entrants to and departures from the field, and assuming constant prices against continued growth in gross domestic product (GDP). An exception is seen in livestock trends, a decline attributed to various factors, and implying lower U.S. economic growth.

Pointing to Opportunities, Acknowledging Challenges

The AVMA has tapped agency statistics and partnered with institutions to examine factors that could have significant bearing on market directions. Among these is an evaluation of seasonal revenue trends among companion animal veterinary practices. U.S. consumer spending habits were examined, with data describing frequently purchased items – including veterinary services. A quarter-by-quarter assessment spotted recurrence in such spending. Statistical evaluation tells that, compared to the fourth quarter, veterinary expenditures are historically higher in the first, second and third quarters, with each outpacing the fourth quarter in terms of veterinary practice revenue. Controlling for the

effects of seasonality showed that overall spending on veterinary services for a specific sample size dropped between 2005 and 2014. Likewise, the number of visits by this constant sample size declined annually during this time. The average expenditure per veterinary visit, however, increased, suggesting either a decline in number of pets, or that pets are taken to veterinary service providers less often. Those who do take their pet to a veterinarian make higher cash outlays each time.

How might the habits observed be altered with the expansion of pet health insurance across the pet-owning population? A joint study by the AVMA and Mississippi State University sought information about the willingness of pet owners to purchase pet health insurance and preferences among various potentially available policy options. Consumer demand, motivations and behavior as well as market characteristics and policy attributes were taken into account. As the utility evaluation of options is linked to a buyer's risk tolerance, the study also probed risk aversion. While most respondents ranked their risk preferences to be about the same as their neighbors, perceptions of risk were more pronounced, prompting exploration of other factors, namely socio-demographic and pet-relationship variables. Pet owners who consider their pet to be part of the family and ones who expected a pet to require medical care were found more likely to purchase pet health insurance. While the study found no evidence to suggest that income affects the decision to buy insurance, the ability to tolerate the cost of a medical emergency affects the probability that an owner will.

Industry Impact, Establishment Distribution

The next section in this report looks at the composition, employment and output, and geographic distribution of the veterinary firms that comprise what is a $31 billion industry, as computed using a model that measures economic impact based on the degree of relationship between different industries within the economy. The relationship is typically shown through a set of multipliers depicting the impact of a one-dollar investment made by an industry, and tracking how production plan changes in one industry affect the output of contributing industries. A state-by-state look at industry characteristics showed, among other observations, that heavily populated states have the highest number of veterinary establishments. A deeper dig into the data ascertains whether a state has fewer or more veterinarians than the national average.

Finally, in addition to building and improving upon previous studies concerning pet health care purchasing habits, a new "pilot" study conducted under AVMA direction sought to analyze potential differences among local and national markets. Asking where dog owners in the combined statistical area of Raleigh-Durham, N.C., brought their pet for care, how often, and what they paid for care, the Metro Pilot Study researched choices made in obtaining pet care products and services. To better understand what kinds of health concerns prompted pet owners to seek care, the study asked about reasons for visits, and details about routine check-ups presumed to include vaccinations. A veterinary clinic or hospital emerged as the choice for routine check-ups among the vast majority of respondents who indicated that they had taken their dog somewhere for this type of exam in the previous 12 months. This study disclosed that veterinarians serving the community surveyed confront minimal competition from public clinics or animal shelters for this set of services, though face some competition in retail sales from "big box" pet stores.

Measuring Pilot survey data against actual purchase records showed a tendency to underreport actual visits, and earlier survey data were ineffectual in determining how often special visits are made to a veterinary clinic for chronic or episodic pet health issues. Hence, accuracy relative to some product and service realization might be questioned. Survey responses confirmed by purchase records indicate that non-routine check-ups specifically for de-worming is uncommon, and since the procedure is frequently part of what dog owners deem a routine checkup, they might fail to recall treatment. Likely little surprise comes with learning that customers procuring boarding services demand more days as the cost charged drops, while pricier providers see less demand in terms of days. Data on purchasing patterns for product types and providers of such showed that pet-focused retail stores led in special food and dental products, and that internet/online sources, and grocery or other retail outlets, led in vitamin supplement purchases. Veterinary clinics and hospitals, though, maintain advantage in flea/tick product purchases among the survey community.

To validate responses concerning total expenditures made on visits for the year, the Pilot study finds that, on average, consumers can accurately recall the total amount spent on veterinary services in the past 12 months, though the improved questions from the Pilot appear to better capture answers that reflect true outlays for specific, routine visits. Generally, the new questions asked in the Pilot were more effective in deriving accurate data relative to quantities of services purchased and frequency of visits, and offer useful insights into the market for veterinary services.

INTRODUCTION

The concept of excess capacity is new to the veterinary profession, having been first introduced in the 2013 AVMA Workforce Study. Confusion over the difference between oversupply and excess capacity, however, lingers in the profession. The difference is the use of price. In most industries the term used is "capacity utilization" rather than excess capacity. That is, understanding the capacity of a business to produce output, and then reporting how much of this capacity is being utilized. Excess capacity is the unused portion of total capacity.

The reporting of capacity utilization assumes the understanding that the level of total available capacity utilized is at the current prices charged for outputs. It is also assumed that the level of capacity utilization reflects the capability of the business to meet demand for the output at prevailing prices, rather than some strategic decision about the amount of output to place on the market. Finally, capacity utilization is understood to be affected by the prices charged for the outputs, given the current general economic conditions.

On the other hand, oversupply refers to the inability to clear the market of all possible output at any price. As an example, oversupply occurs at garage sales where one's purpose is to dispose of unwanted items, and price is set to ensure that at the end of the day all items are gone. When there are unsold items that have been offered for free, these remaining items represent an oversupply. Obviously this is not the case for veterinary medicine. Providing veterinary services to all of the pets that currently do not see a veterinarian would require a large increase in the number of veterinarians.

A similar situation exists in human medicine where a shortage of doctors exists. The shortage is created because, due to insurance coverage, consumers of medical services are able to obtain these services regardless of their ability to pay — price has been taken out of the equation in most cases when insurance is involved. If we introduce price into the equation for determining the capacity of human medical professionals to provide services, a shortage of professionals exists. Likewise, if we take price out of the equation for the capacity of veterinary medical doctors to provide medical services, again a shortage of professionals would exist. Pet insurance is not widespread, however, so prices are relevant to the veterinary profession, meaning there is not a shortage of veterinarians. For these reasons, we have elected to use the term "excess capacity" to describe the economic condition of the veterinary markets rather than excess supply (oversupply) and excess demand.

This report focuses on the market for veterinary services. In the three vertically related veterinary markets, the market for veterinary services is a combination of the need for veterinary medical services or other skills and training that veterinarians have to offer, and the ability of the profession to provide these services by educating, training and certifying veterinary medical professionals. The demand for veterinary services comes from a variety of sources, among them consumers and the general public.

Definition of Excess Capacity

Excess capacity means that services are being provided in excess of the quantity demanded at a specific price. To measure excess capacity, take total capacity, subtract the amount of capacity that is currently being utilized, and divide by total capacity. Equivalently, subtract the capacity utilization rate from 100 percent.

Three components comprise excess capacity: demand, supply and price. Changing any one of these factors will change the level of excess capacity. While some past workforce studies have

addressed oversupply, the difference in our latest research, while subtle, is important. In general, an oversupply of the quantity of services that can be provided exceeds the demand, regardless of price. But this is not the case in veterinary services. The need for veterinary services continues to outpace the ability to supply those services at prices consumers are willing to pay. However, that need is not captured as demand because those services are not available at prices that adequately compensate veterinarians for the time and effort they've invested. There is little disagreement that there are companion and food animal, equine and various non-animal-related veterinary services that are needed but not provided. Take, for instance, the number of animals that do not receive regular veterinary care or appropriate vaccinations, or the monitoring and prevention of zoonotic diseases. What we are really experiencing in the profession is excess capacity, not oversupply.

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 economic health of the profession. However, excess capacity 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. The 2013 AVMA Workforce Study included several assumptions because data were not available. As these assumptions are replaced with data, the baseline value of excess capacity computed for 2012 may change. Going forward, as new data are collected, the impact of this new data to the baseline estimate of excess capacity will be provided. In the meantime, let's take a look at the current estimate of 12.7 percent excess capacity in the veterinary services market. Is that considered high? And can it be compared to other markets?

The Federal Reserve Board measures and tracks capacity utilization in the manufacturing, mining and utilities sectors. Excess capacity is the complement of capacity utilization. The Federal Reserve Board estimates that excess capacity in 2015 was 23.3 percent, up from 21.8 percent in 2014 and 23.1 percent in 2013. The average excess capacity from 1994-2015 was 21.3 percent, and from 1972-2015 was 20.0 percent (Federal Reserve Board 2016). But excess capacity in the manufacturing, mining and utilities sectors refers to physical capacity rather than labor capacity.

Currently the AVMA Economics Division knows of no measures of excess labor capacity in other service industries, so we cannot make an accurate comparison. Additionally, the problem becomes even more complicated because measuring labor for veterinary services can suffer from substitution bias. For example, the primary functions of a veterinarian include making diagnoses, and prescribing treatment and medications. A veterinary technician works alongside the veterinarian and often performs functions such as creating radiographic images, collecting and performing diagnostic tests on blood samples, and explaining follow-up care and compliance. A veterinarian might often take over these or other duties. In doing so, this is not wasted time, but it may be more efficient and economical for the veterinarian to perform the medical and diagnostic functions for which they are highly trained and delegate routine tasks to a veterinary technician.

EXCESS CAPACITY

This survey provided the following information: The average size of a clinic is 3,478 square feet, has just over three exam rooms, and serves 70 patients per veterinarian per week.

THE 2015 AVMA CAPACITY SURVEY

The first survey on veterinary capacity was conducted by the research organization IHS Healthcare and Pharma, and the Center for Health Workforce Studies at the University at Albany, State University of New York. The details of this 2012 study can be found in Appendix A of the 2013 AVMA Workforce Study. That study used two questions to measure excess capacity, which will be referred to as the first and second scenarios. These two scenario questions take into account the fact that excess capacity can also include the concept of underemployment: A veterinarian might be busy all the time, but with additional veterinary technicians or physical space, that same veterinarian may be able to see more clients and perform more work.

The first scenario includes the following three assumptions: "1. There are no changes in the way the practice is organized; 2. There are no changes in the number of veterinarians or support staff; 3. There is an unlimited supply of clients and patients. In such a scenario, my practice could increase its productivity by: 0-10 percent, 11-25 percent, 26-50 percent, 51-75 percent, 76-100 percent." Here, the definition of "productivity" is left up to the survey respondent.

Scenario 2 is similar but has four assumptions: "1. There is an unlimited supply of clients and patients; 2. This supply of clients and patients enables you to hire additional good technicians and support staff; 3. The staff is well-trained in providing great medical care and is very efficient;

4. You add no square footage to the practice, but do some minor remodeling to increase efficiencies in work and client flow. In such a scenario, my practice could increase its productivity by: 0-10 percent, 11-25 percent, 26-50 percent, 51-75 percent, 76-100 percent."

The AVMA conducted a second capacity survey in August 2014 and a third survey in August 2015, both of which asked questions similar to the previous survey but added new questions with the primary objective being to find alternative ways to measure excess capacity. The 2015 survey was electronically distributed to 17,830 practice owners, and responses were received from 2,583 of them for a response rate of 14.4 percent. Most importantly, in the 2015 survey 1,678 and 1,538 responded to the first and second scenario questions, respectively.

The 2015 survey was designed to measure capacity utilization using multiple methods. The first method was to ask two questions: "What is the average number of patients seen per week by each veterinarian?" This was followed by, "On average, what is the ideal number of patients per week seen by each veterinarian?" The ratio of actual to ideal is one measure of capacity utilization for veterinary labor. The mean of this ratio was 93.0 percent.

The second method was to ask the following two questions about physical capacity utilization: "How many total hours per week is your practice open?" And "How many hours per week are your exam rooms being used?" This resulted in a sample mean of 69.0 percent capacity utilization, lower than the 2014 estimate of 75.6 percent. Weighted by each clinic's number of exam rooms (a mean of 3.2 per clinic) yielded 80.3 percent capacity utilization. Alternately, weighted by a clinic's square footage, the sample mean was 63.9 percent, indicating that larger clinics were more likely to have higher excess capacity.

The third method, which is the AVMA's current method to estimate excess capacity, is through the use of the first scenario. This estimation technique resulted in a sample excess capacity mean of 13.3 percent.

The fourth method used to estimate excess capacity is through the second scenario, as described above. The sample mean was 75.6 percent capacity utilization, and weighted by veterinarians' work hours was 71.7 percent. This measurement technique is distinct from the first scenario because it is a measure of underemployment. Underemployment has both quantitative and qualitative components. The quantitative component is working fewer hours than desired, and the qualitative component is being under-utilized in performing assigned duties. An example would be a veterinarian whose responsibilities significantly overlap with those of a veterinary technician. A veterinarian who uses all of her time completing routine tasks that could be assigned to a veterinary technician is under-utilizing her skillset and is thus experiencing underemployment.

The fifth and final method is an open-ended version of the two scenarios. It is as follows: "Given the number of exam rooms and the number of doctors available at your practice today, estimate the percentage increase in total patients that could be seen each week." The mean of this method was 21.4 percent and the median was 14.3 percent.

The summary statistics of the 2015 AVMA Capacity Survey are as listed in the following tables. The first table details the summary statistics pertaining to practice characteristics, the number of patients seen, and the excess capacity measures explained earlier. This survey provided the following information: The average size of a clinic is 3,478 square feet, has just over three exam rooms, and serves 70 patients per veterinarian per week.

The second table lists the summary statistics related to practices' perceptions of competition. The following two variables, "The Number of Competing Veterinarians" and "The Number of Competing Veterinary Clinics," are both measured on a scale of 1-5: with 1 representing "Far Too Few" and 5 representing "Far Too Many."

2015 CAPACITY SURVEY SUMMARY STATISTICS: PRACTICE CHARACTERISTICS

Variable	Observations	Mean	Std. Dev.
Single Owner	2,258	76%	43%
Part Owner	2,258	15%	36%
Rural	2,258	32%	47%
Suburban	2,258	54%	50%
Urban	2,258	14%	35%
Referral Practice	2,258	4%	19%
Physical Clinic	2,258	73%	45%
Mobile Clinic	2,258	3%	16%
Ambulatory Clinic	2,258	8%	27%
Physical and Ambulatory Clinic	2,258	16%	37%
Food Animal Exclusive	2,258	2%	13%
Food Animal Predominant	2,258	2%	13%
Companion Animal Exclusive	2,258	62%	48%
Companion Animal Predominant	2,258	17%	37%
Mixed Animal	2,258	8%	27%
Equine	2,258	5%	21%
Other	2,258	4%	20%
Years in Business	1,358	30.4	55.3
Clinic Square Feet	2,103	3,759.6	7,445.9
Number of Exam Rooms	2,144	3.2	3.4
Number of Days Per Week Open	2,110	5.8	0.7
Number of Hours Per Week Open	2,148	58.2	26.2
Number of Hours Per Week Exam Rooms Used	2,079	37.7	22.8
Number of Patient Visits in Previous 12 months	1,369	168,559	4,220,038
Patients Per Vet Per Week	1,946	69.6	56.6
Ideal Number of Patients Per Vet Per Week	1,894	79.6	71.4
Veterinarian Capacity Utilization	1,880	85%	18%
Veterinary Clinic Capacity Utilization	1,962	69%	22%

Table 1

2015 CAPACITY SURVEY SUMMARY STATISTICS: COMPETITION

	Obs	Mean	Std. Dev.
Number of Competing Practices	1,468	8.2	8.5
Not-for-Profit Shelters	1,503	0.6	1.6
Vaccine Clinics	1,498	0.6	1.2
Spay/Neuter Clinics	1,500	0.5	0.8
Private Clinical Practices	1,500	5.7	6.0
Mobile Practices	1,505	0.9	2.0
Corporate Practices	1,502	0.7	1.6
Retail Businesses	1,488	0.5	2.2
Internet Businesses	1,472	0.2	1.4
Other Businesses	1,474	0.1	0.8
Number of Competing Veterinarians*	1,533	3.6	0.8
Number of Competing Veterinary Clinics*	1,529	3.6	0.7
Scenario 1**	1,517	2.2	1.0
Scenario 2**	1,502	2.8	1.1

*1=Far Too Few, 2=Too Few, 3=Just Right, 4=Too Many, 5=Far Too Many

**See text for question detail

Table 2

CORRELATION BETWEEN MEASURES OF EXCESS CAPACITY, 2015

	Vet. Cap. Util.	Clinic Cap. Util.	Scenario 1	Scenario 2	% Increase Customers
Vet. Cap. Util.	1				
Clinic Cap. Util.	0.1637	1			
Scenario 1	-0.647	-0.136	1		
Scenario 2	-0.3563	-0.2407	0.576	1	
% Increase Customers	-0.9763	-0.1699	0.6049	0.3556	1

Table 3

The table above displays the correlation coefficients between the five measures of capacity. The variables appear in the same order in which they were described in the text above. Recall that both "Vet Cap. Util." and "Clinic Cap. Util." are measures of capacity utilization, whereas the remaining three are measures of excess capacity. Hence, the first two are positively correlated with each other and negatively correlated with the last three. And, subsequently, the three excess capacity measures are positively correlated with each other while negatively correlated with the capacity utilization measures.

Identifying Systematic Patterns

Looking beyond simple correlation measures, how does the perception that there are too many veterinarians and measures of excess capacity differ across practice types? The following contingency table shows the survey responses in which respondents were asked about the number of competing veterinarians in their service area. A chi-square test on this table, which compares the proportions of each category, has a value of 75.95, and the critical value with 16 degrees of freedom at the 5 percent significance level is 26.3. This means that there is a systematic pattern between practice type and the perception of the number of competing veterinarians.

PERCEPTION OF COMPETING VETERINARIANS, 2015

	Companion Animal	Food Animal	Equine	Mixed	Unspecified	Total
Far Too Few	5	1	0	0	0	6
Too Few	52	13	1	15	3	84
Just Right	512	29	25	61	31	658
Too Many	484	8	37	39	24	592
Far Too Many	148	5	15	8	6	182
Total	1,201	56	78	123	64	1,522

Q: In the area served by your practice, how would you characterize the *number of veterinarians* currently serving the same animal population?

Table 4

The next table shows the responses given when respondents were asked about the number of competing veterinary practices in their service area. The chi-square test on this contingency table has a value of 105.48 and the critical value is 26.3, meaning that there is statistical evidence of a systematic pattern between practice type and the perception of the number of competing veterinary practices.

PERCEPTION OF COMPETING VETERINARY CLINICS, 2015

	Companion Animal	Food Animal	Equine	Mixed	Unspecified	Total
Far Too Few	4	0	0	0	0	4
Too Few	22	12	1	9	3	47
Just Right	515	32	29	68	29	673
Too Many	516	10	35	38	28	627
Far Too Many	141	2	13	7	4	167
Total	1,198	56	78	122	64	1,518

Q: In the area served by your practice, how would you characterize the *number of veterinary clinics* currently serving the same animal population?

Table 5

The next table shows the responses when survey respondents were asked the first scenario question, which was described previously. The chi-square test on this contingency table has a value of 22.26, less than the chi-squared critical value of 31.41 (at the 5 percent significance level, with 20 degrees of freedom), meaning that there is no evidence of a systematic pattern between practice type and excess capacity.

EXCESS CAPACITY, SCENARIO 1, 2015

	Companion Animal	Food Animal	Equine	Mixed	Unspecified	Total
0%	578	24	36	63	30	731
1-10%	118	9	5	10	10	152
11-25%	351	14	15	33	14	427
26-50%	193	5	13	20	9	240
51-75%	47	2	8	6	2	65
76-100%	51	3	3	2	4	63
Total	1,338	57	80	134	69	1,678

Table 6

Lastly, the fourth table shows the responses when survey respondents were asked the second scenario question, which was also described previously. The chi-square test on this contingency table has a value of 53.61, meaning that there is a systematic pattern between practice type and excess capacity.

EXCESS CAPACITY, SCENARIO 2, 2015

	Companion Animal	Food Animal	Equine	Mixed	Unspecified	Total
0%	117	1	0	13	9	140
1-10%	90	12	9	17	10	138
11-25%	369	14	23	40	19	465
26-50%	391	13	22	32	9	467
51-75%	121	1	8	11	10	151
76-100%	135	10	12	11	9	177
Total	1,223	51	74	124	66	1,538

Table 7

Looking at the individual survey responses from the 2015 AVMA Capacity Survey reveals the patterns found in the following two figures. Across all practice types, the most frequent answer is that veterinary practices are operating at or above full capacity. Beyond that answer there are some differences between the practice types, but they follow similar patterns, with three of the four having 28 percent excess capacity as the next most common answer. Here the percentages represent the implied excess capacity from the first scenario question. Specifically, we take the midpoint of the answer to the question, call it "X" and feed it into the expression 1-1/(1+X), resulting in the level of excess capacity implied by the question. And if the survey respondent answered that their ideal number of patients per week is equal to or greater than their current number of patients per week, then we code the excess capacity of that clinic as zero.

ACROSS ALL PRACTICE TYPES, THE MOST FREQUENT ANSWER IS THAT VETERINARY PRACTICES ARE OPERATING AT OR ABOVE FULL CAPACITY.

DISTRIBUTION OF EXCESS CAPACITY BY PRIVATE PRACTICE TYPE

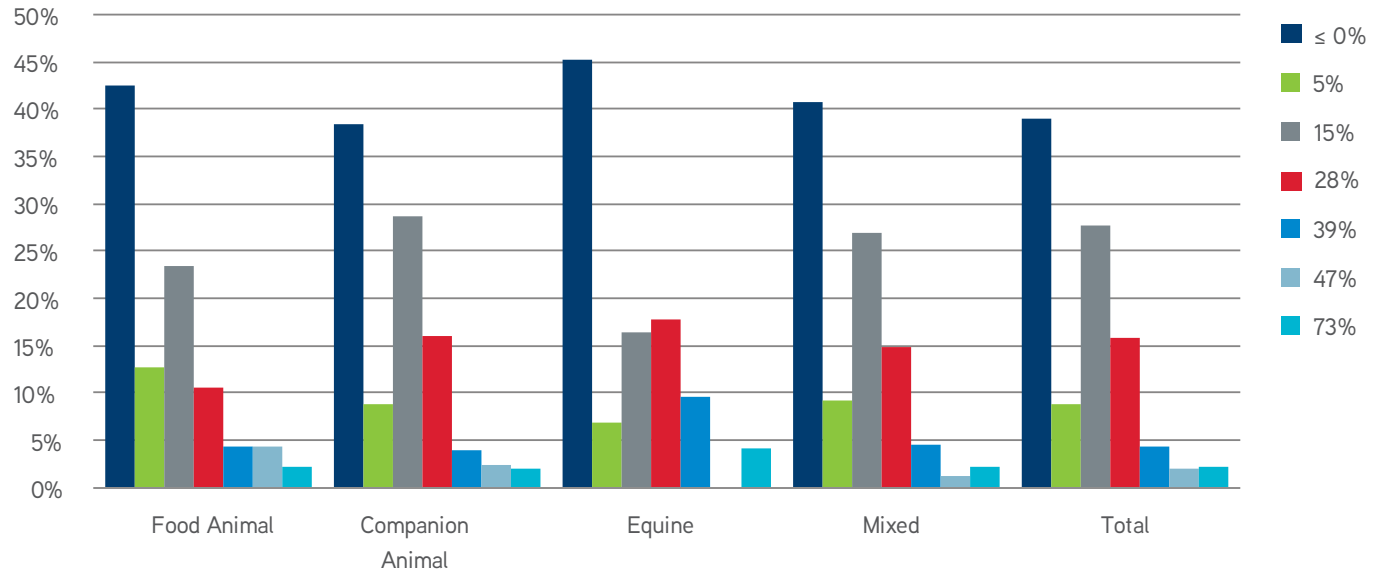


Figure 1

Geographically, a similar pattern emerges, with the most common survey response being that the veterinary practice is at full capacity. The second most common response is that the practice has 15 percent excess capacity, with considerably less variation by geography than by practice type.

The regions of the United States are illustrated in the figure on the opposite page. The number of the region refers to the first digit of the zip code.

GEOGRAPHIC DISTRIBUTION OF EXCESS CAPACITY

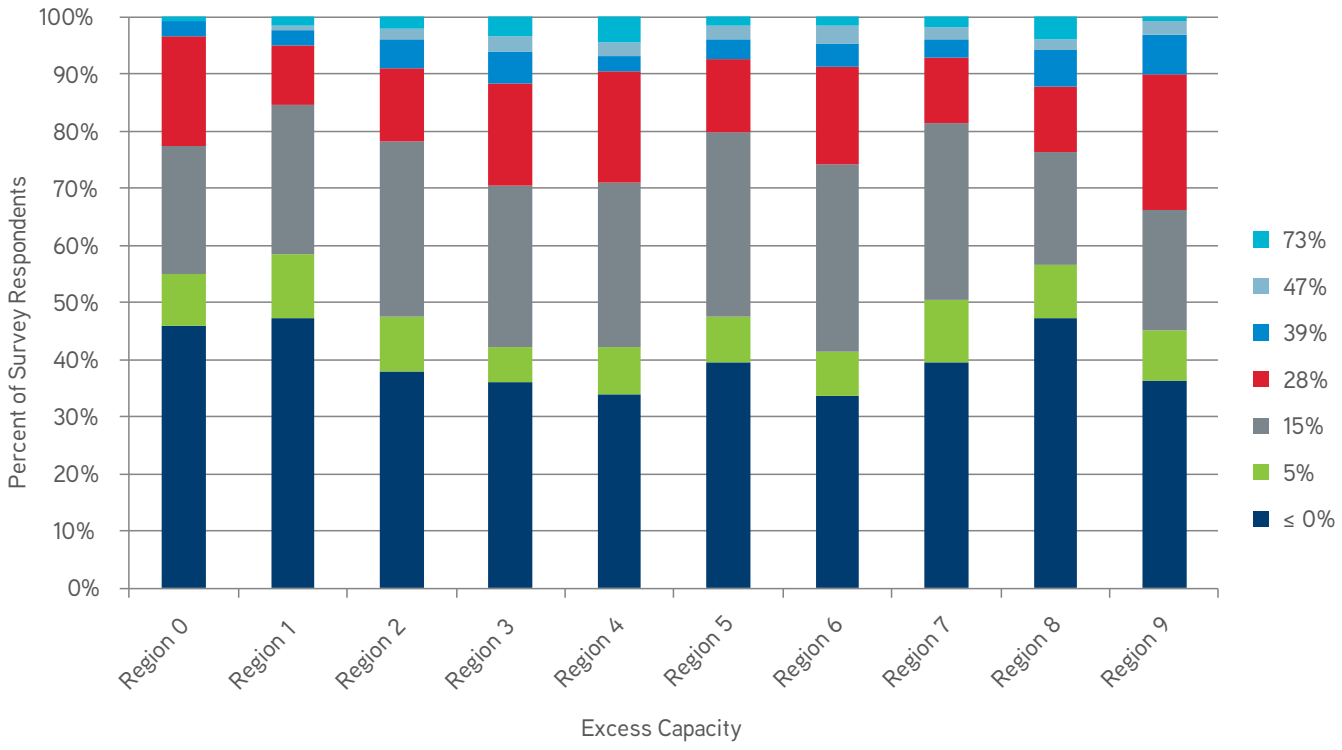


Figure 2

REGIONS OF THE UNITED STATES

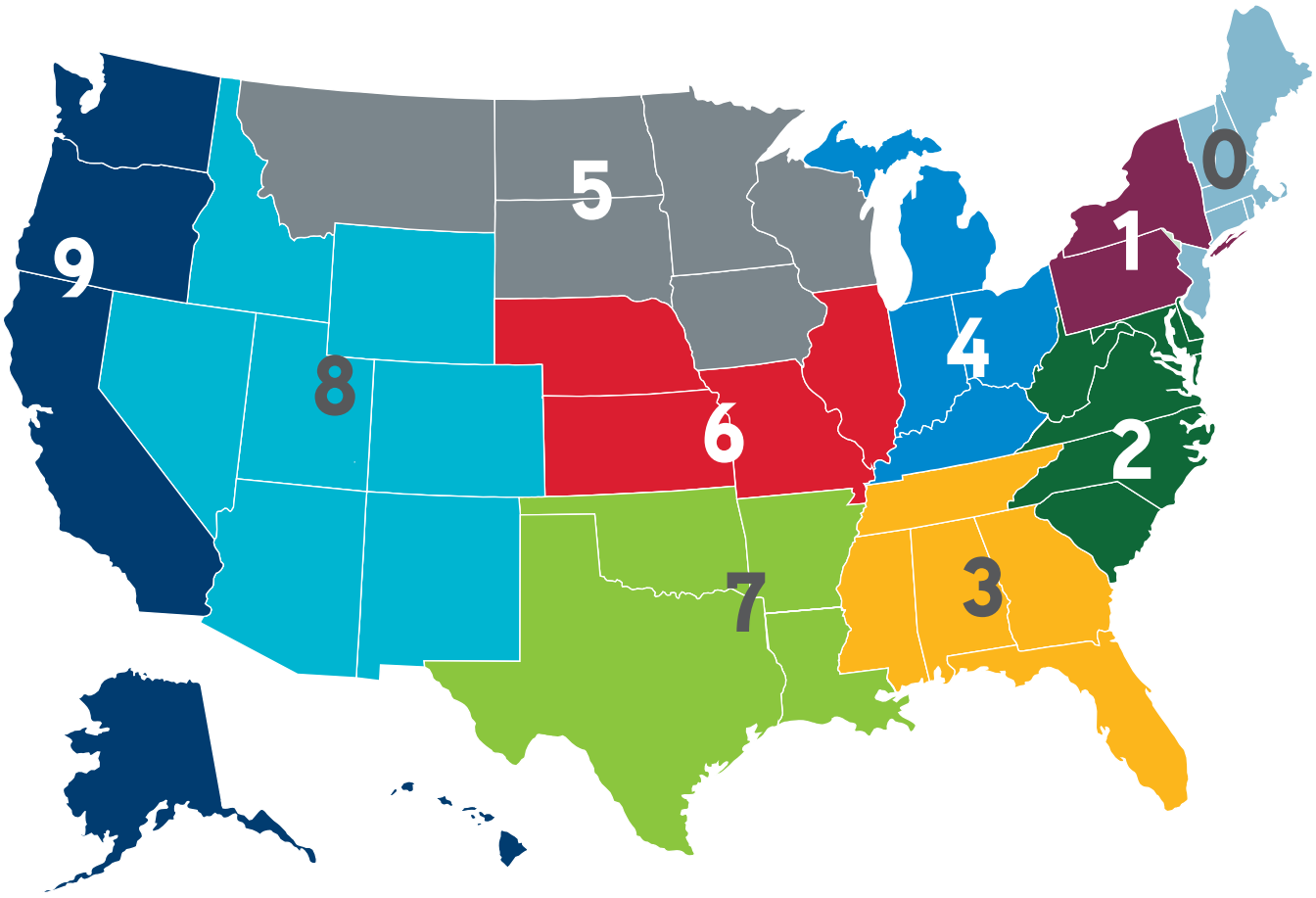


Figure 3

COMPARISON OF CAPACITY SURVEYS

Excess capacity declined in 2015 relative to the two previous years. However, as the chart below shows, there was little change in the survey responses in 2015 compared to 2014.

The change from 2012 to 2014 was much more pronounced, however, with more practices claiming to be at or above full capacity in 2014 compared to 2012.

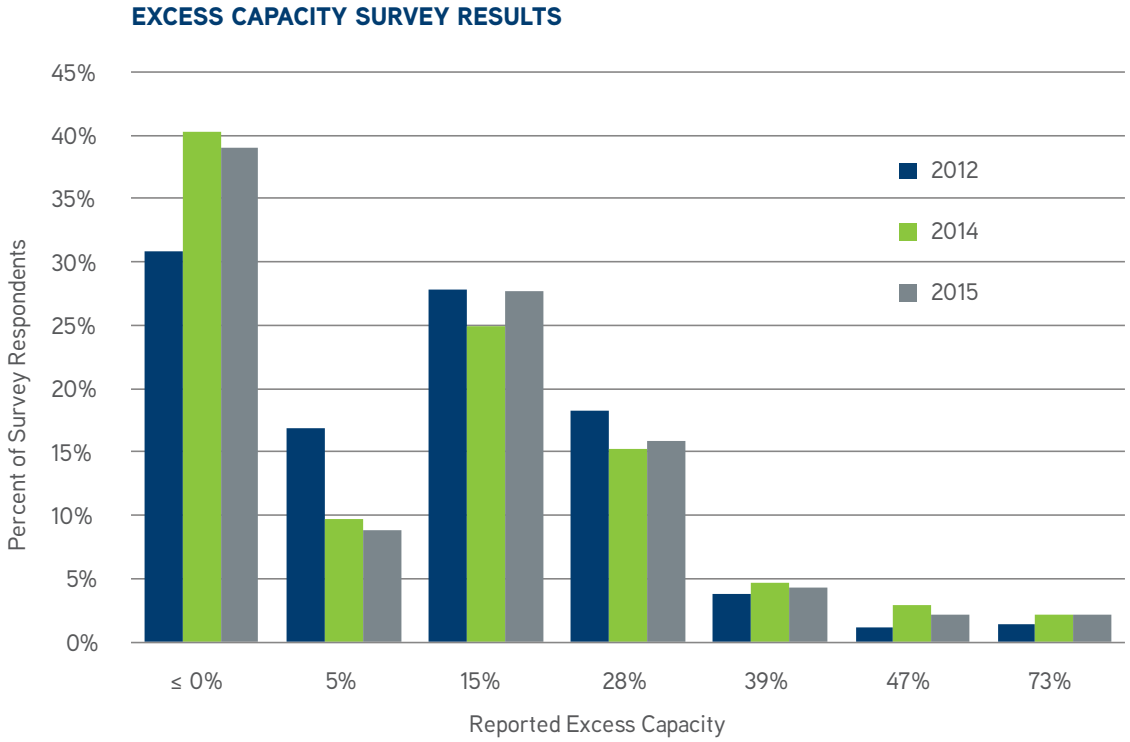


Figure 4

More telling is the percent of practices indicating they are working at full capacity. As the following figure illustrates, Region 9 had the highest percent of practices reporting high excess capacity, followed closely by Regions 3 and 4. In every region of the United States, the number of practices working at full capacity has increased. Most regions indicate that more than 50 percent of their practices are working at full capacity, compared to 2012 when only one region showed greater than 35 percent of practices operating at full capacity.

The percentage of practices that indicated they were working at full capacity increased substantially between 2012 and 2015, with the greatest increases in the number of practices reporting operating at full capacity occurring in Regions 6 and 8. The differences between 2014 and 2015, on the other hand, do not appear to be following any clear patterns, as some regions have seen an increase in practices at full capacity while some have seen a decrease.

MOST REGIONS INDICATE THAT MORE THAN 50 PERCENT OF THEIR PRACTICES ARE WORKING AT FULL CAPACITY, COMPARED TO 2012 WHEN ONLY ONE REGION SHOWED GREATER THAN 35 PERCENT OF PRACTICES OPERATING AT FULL CAPACITY.

PRIVATE PRACTICES AT FULL CAPACITY, BY REGION

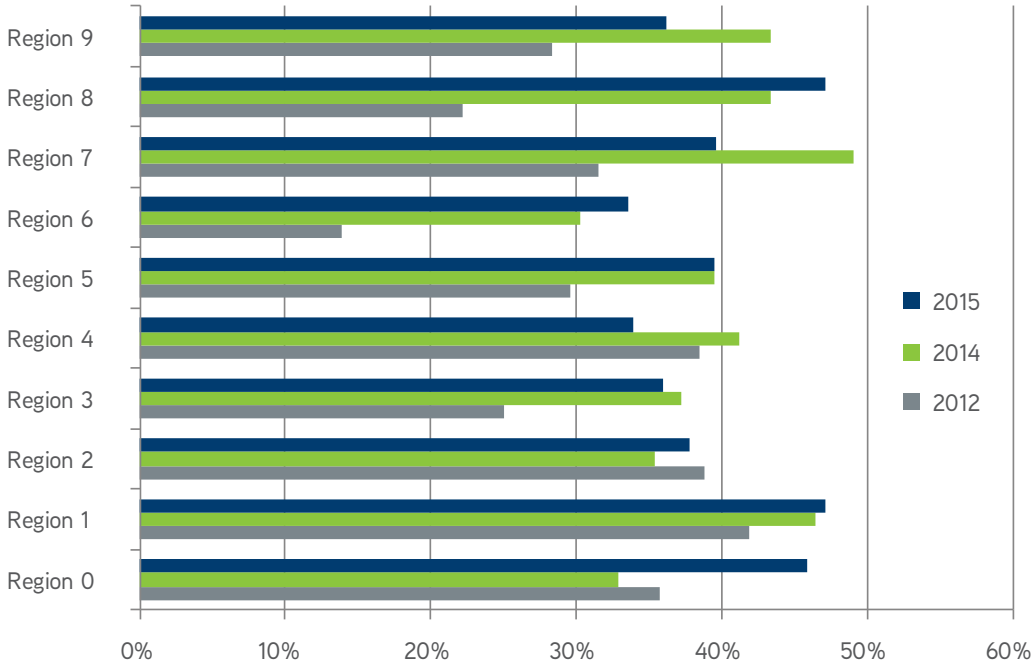


Figure 5

The more telling story about practices at full capacity comes from when they are separated by practice type. In 2015 compared to 2014, food animal practices have seen a large increase in the number of practices at full capacity while mixed animal practice have seen a decline. Equine and companion animal practices have changed very little, and, because companion animal practices are the majority of practice types, the total change is a slight decrease in practices at full capacity.

PRIVATE PRACTICES AT FULL CAPACITY, BY PRACTICE TYPE

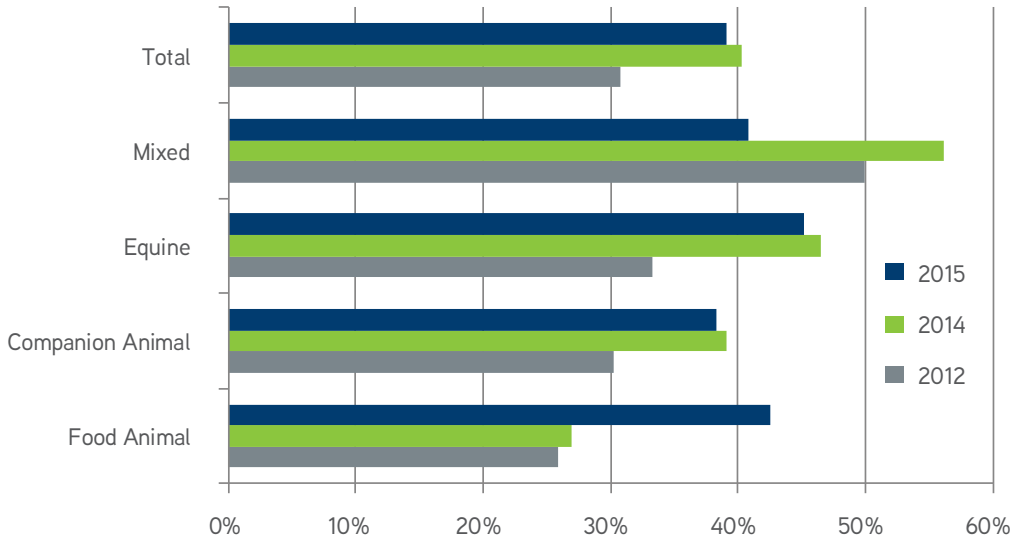


Figure 6

These differences in capacity utilization across years, which are correlated with both location and practice type, will make a difference when used as the initial input to the workforce model, as described in the following section.

WORKFORCE MODEL

Excess capacity is a KPI for the veterinary profession. Excess capacity in 2015 has declined relative to both 2012 and 2014. According to the 2012 AVMA Workforce Survey, excess capacity in private practices was 17.2 percent. Feeding this number into the AVMA Workforce Model and reweighting by both state and employment sector resulted in a baseline excess capacity of 12.5 percent for the veterinary profession. According to the 2014 AVMA Capacity Survey, total excess capacity in private practice was 13.3 percent. Again, updating this initial value in the AVMA Workforce Model and reweighting gave an estimate of industry-wide excess capacity of 7.7 percent in 2014. In the 2015 AVMA Capacity Survey, excess capacity was 12.7 percent and reweighting resulted in industry-wide excess capacity of 7.1 percent in 2015.

Projections for the years 2016 to 2025 indicate that excess capacity will decline over the forecast period. This implies that supply and demand in the veterinary services market are moving towards alignment, even as the number of new veterinarians will continue to grow through 2018 before reaching a plateau. Key assumptions driving this forecast include the flattening of the growth rate in the number of new veterinarians after 2018, continued growth in GDP over the entire period, an increasing retirement rate for veterinarians, and constant prices.

EXCESS CAPACITY FORECAST COMPARISON

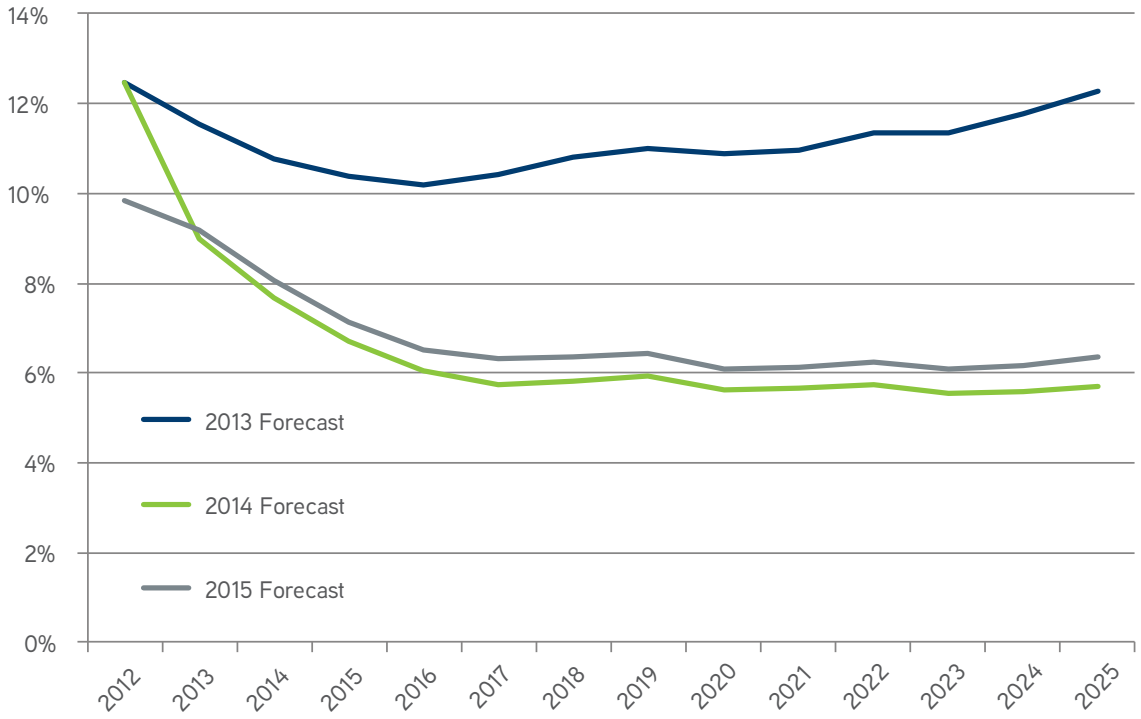


Figure 7

On the other hand, the debt-to-income ratio for veterinarians continues to increase as the cost of education continues to climb at veterinary colleges. Some sectors of the profession continue to do quite well, while other sectors continue to do poorly. Both of these groups continue to grow in numbers and in their share of the profession. Increasing student debt and declining mean veterinary productivity may well be the primary factors driving the two results (declining excess capacity, increasing debt-to-income ratio). Over a lifetime, female veterinarians put in fewer hours than male veterinarians. Thus, as a result of the increasing proportion of women in each successive graduating class, the volume of services that are provided by the average veterinarian will continue to decline. This means that the capacity to provide services will not increase at the same rate per veterinarian as in the past. Additionally, the potentially stagnate median incomes of the U.S. population mean that there is less disposable income to be spent on veterinary services.

Comparing the excess capacity for veterinary practices by region between 2012 and 2015, five out of 10 regions indicated a decline in the mean level of excess capacity, while five indicated an increase in the amount of excess capacity.

Excess capacity declined for both companion animal, and food animal practice types, while it has increased slightly for equine, and substantially for mixed animal practices.

EXCESS CAPACITY BY REGION

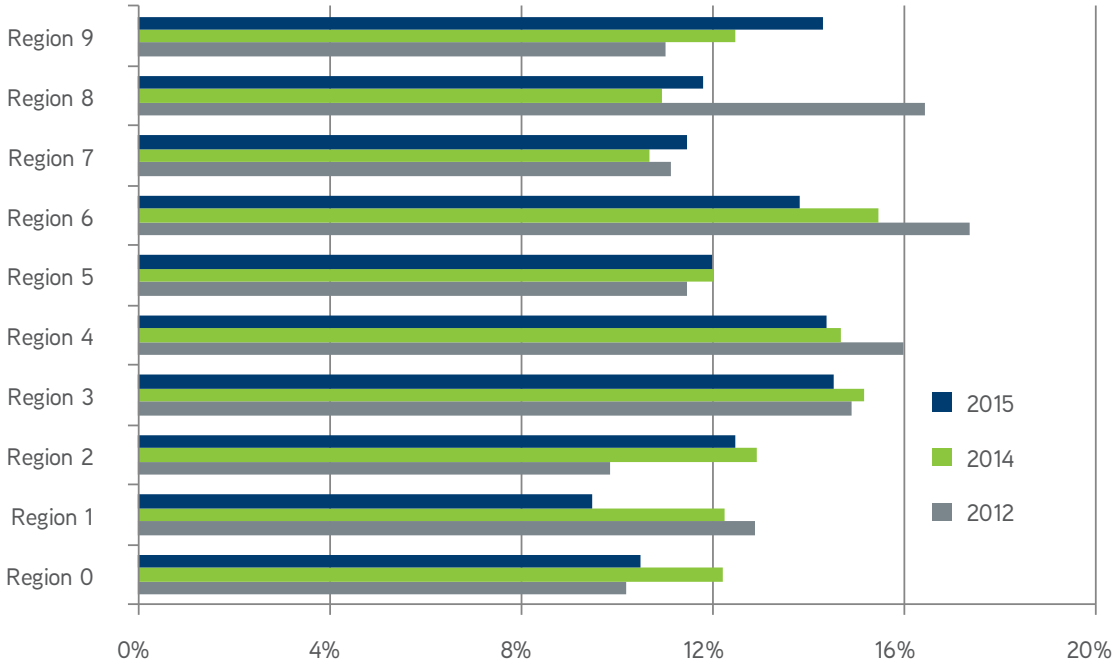


Figure 8

EXCESS CAPACITY BY PRACTICE TYPE

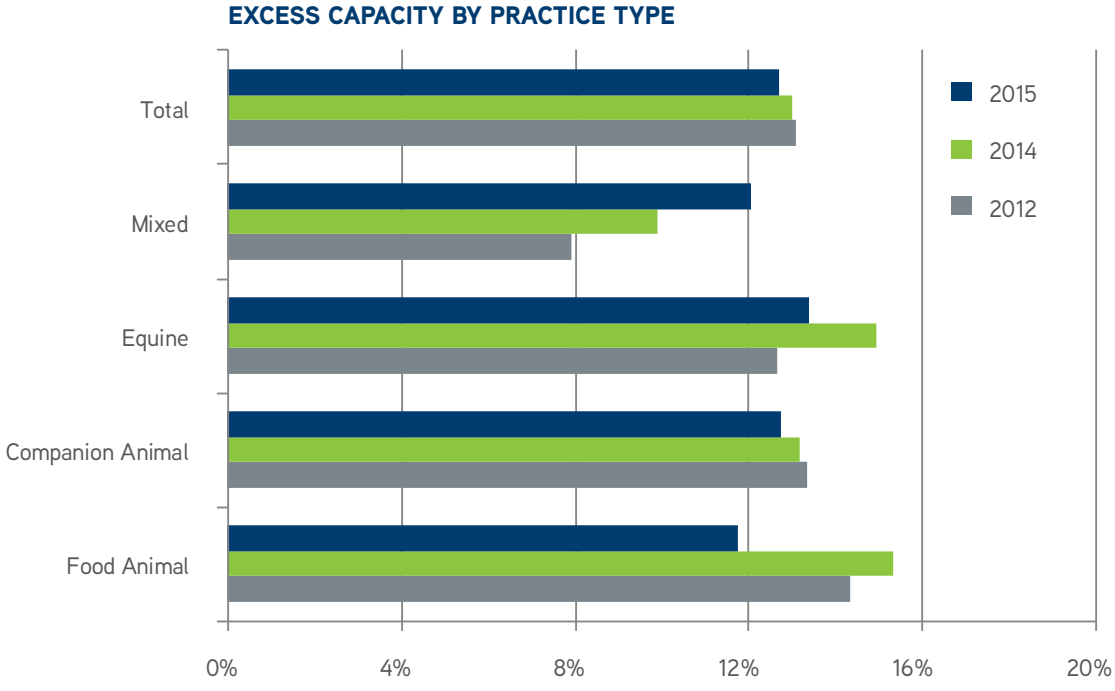


Figure 9

New Questions, New Priorities

The current analysis has, as have all previous studies, raised many new questions. The AVMA Veterinary Economic Strategy Committee will consider all of these questions and from them develop a set of research priorities for 2017 and beyond. Key among these for the AVMA Economics Division will be the continual updating and improvement of our market modeling. This model is based on the one described in the 2013 U.S. Veterinary Workforce Study: Modeling Capacity Utilization.

As mentioned above, excess capacity in the veterinary services market declined from 2012 to 2015. The forecast predicts it will decline to 5.7 percent in 2017 and remain flat through the remaining forecast period, which ends in 2025. This represents approximately a 5-6 percentage point reduction compared to the original 2012 forecast. The reduction can be attributed to two 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. 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. The macroeconomic forecast does not include any projection for recessionary periods between now and 2025, however, and it is highly unlikely that this span of time will be recession free. The macroeconomic forecast is obtained from the Congressional Budget Office (CBO) and is updated each year.

Second, 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. The forecast predicting the number of graduates is a key component of the decreasing excess capacity estimate.

WORKFORCE MODEL ASSUMPTION CHANGES

	2014 Model (2014 to 2024)	2015 Model (2015 to 2025)	Source	Units
Federal Uniformed Services	0.0%	-1.5%	CBO	per year
Federal Civil Service	-1.3%	-1.3%	BLS	per year
State and Local Government	0.5%	0.5%	BLS	per year
Dairy Cattle	-0.9%	-1.7%	USDA	% chg
Beef Cattle	11.0%	7.5%	USDA	% chg
Swine	13.8%	7.6%	USDA	% chg
Broilers and Layers	21.9%	15.9%	USDA	% chg
Sheep	-10.5%	-9.6%	USDA	% chg
Other Livestock (incl. Turkey)	16.9%	16.4%	USDA	% chg
Number of New Graduates in 2025	4,290	4,290	AVMA	per year

Table 8

Changes in these two assumptions account for approximately half of the decline in forecasted excess capacity. The other half of the decline in excess capacity is based on the newest estimates of current excess capacity, which is about two percentage points lower than in 2012.

The AVMA Workforce Model is a physical model: No prices or incomes are incorporated into the analysis. Prices are important in many ways. The price that the consumer pays determines how much or how often they seek veterinary care. The price, or salary, that veterinary clinics pay veterinarians is determined along with the number of hours that veterinarians are willing to work. Generally, a higher level of salary is associated with a higher willingness to work, but it may be, as the *2015 AVMA Report on the Market for Veterinarians* suggests, that there exists a backward-bending supply curve. The truth is simply not known at this time.

The workforce model currently captures the physical outputs from the market for veterinary education (new veterinarians), the market for veterinarians (hours of labor per full-time equivalent (FTE)) and the market for veterinary services (services provided). However, these markets are not linked by prices (they are not price endogenous) and thus provide no indication of how the market might react to changes in factors such as the cost of veterinary education, starting salaries, or the price of veterinary services. Future efforts will focus on adding price factors to these market computations.

Finally, the willingness of students to pay for veterinary education is not incorporated into the model. While the AVMA believes that the market for education is at or very near equilibrium (the availability of seats is equal to the number of students willing to pay for them), there does not yet seem to be a decline in demand for veterinary education. As with any market, rising prices for products (seats) and declining willingness of consumers (students) to pay could eventually lead to the most expensive seats being unfilled.

One of the key steps in the AVMA Workforce Model is the use of an ordered logit regression equation with the raw survey response data from the first scenario to impute missing data. The model can then be used to estimate excess capacity for every employment sector in every state, as seen in the following table. This is necessary because the sample does not capture every employment sector (of which there are 205) in every state, and the ordered logit regression allows the estimation of the missing values. For example, the AVMA may not have received statistically valid survey responses from food animal practitioners in a state with a smaller population such as Wyoming, Delaware or Vermont, but the AVMA may have received responses from these states' veterinarians as a whole and from food animal practitioners in other states. The ordered logit model is a procedure used to fill in those gaps in the data.

EXCESS CAPACITY BY STATE AND PRACTICE TYPE, 2015

State	Food Animal	Small Animal	Equine	Mixed
Alabama	14%	15%	15%	15%
Alaska	11%	11%	11%	11%
Arizona	11%	12%	12%	11%
Arkansas	11%	12%	12%	12%
California	13%	14%	14%	14%
Colorado	12%	13%	13%	12%
Connecticut	9%	9%	9%	9%
District of Columbia	0%	0%	0%	0%
Delaware	9%	10%	10%	9%
Florida	12%	13%	13%	13%
Georgia	13%	14%	14%	14%
Hawaii	12%	13%	13%	13%
Idaho	14%	15%	15%	15%
Illinois	11%	12%	12%	11%
Indiana	14%	15%	15%	15%
Iowa	10%	11%	10%	10%
Kansas	14%	15%	15%	14%
Kentucky	12%	13%	13%	13%
Louisiana	12%	13%	13%	13%
Maine	11%	12%	12%	12%
Maryland	11%	12%	12%	12%
Massachusetts	12%	13%	13%	12%
Michigan	11%	12%	12%	12%
Minnesota	12%	13%	13%	13%
Mississippi	12%	13%	13%	13%
Missouri	13%	13%	13%	13%
Montana	14%	14%	14%	14%
Nebraska	10%	11%	11%	11%
Nevada	16%	16%	16%	16%
New Hampshire	13%	14%	14%	13%

Table 9

Cont'd on next page

State	Food Animal	Small Animal	Equine	Mixed
New Jersey	13%	14%	14%	14%
New Mexico	14%	15%	15%	15%
New York	15%	16%	16%	15%
North Carolina	11%	12%	12%	11%
North Dakota	13%	13%	13%	13%
Ohio	12%	13%	13%	12%
Oklahoma	15%	16%	16%	15%
Oregon	14%	14%	14%	14%
Pennsylvania	14%	14%	14%	14%
Rhode Island	10%	11%	11%	10%
South Carolina	9%	10%	10%	9%
South Dakota	13%	14%	14%	13%
Tennessee	13%	14%	14%	13%
Texas	14%	15%	15%	15%
Utah	12%	13%	12%	12%
Vermont	13%	14%	14%	14%
Virginia	11%	12%	12%	11%
Washington	12%	13%	13%	12%
West Virginia	12%	12%	12%	12%
Wisconsin	13%	14%	14%	14%
Wyoming	10%	11%	11%	11%
U.S.	12.5%	13.4%	13.3%	13.0%

Table 9 Cont'd.

One of the key inputs to the workforce model is the growth rate of the workforce, and one of the most important indicators that is easy to track and predict is that of the forecast for the number of graduates of U.S. colleges of veterinary medicine. A problem with the original model was the assumption that veterinary student class sizes would increase by 2 percent per year in perpetuity. This would be a remarkable growth rate in whole numbers far exceeding past growth. Accomplishing a sustained 2 percent per year growth rate would require the equivalent of adding a new veterinary college each year over the forecast period. The average annual growth in the number of new graduates over the 14-year period between 2000 and 2014 was approximately 2 percent. However, this amounts to an actual average annual increase in the number of new students of approximately 45 per year. Because the base number of graduates has increased substantially over this period, a 2 percent growth rate would require that roughly 70 new seats would need to be added each year at each of the U.S. colleges.

FOR THIS REASON, WE THINK THAT THE NUMBER OF GRADUATES WILL STABILIZE AT ABOUT 4,290 (FROM ALL SOURCES) BEGINNING IN THE YEAR 2019, AND NOT INCREASE FOR THE REMAINDER OF THE FORECAST PERIOD.

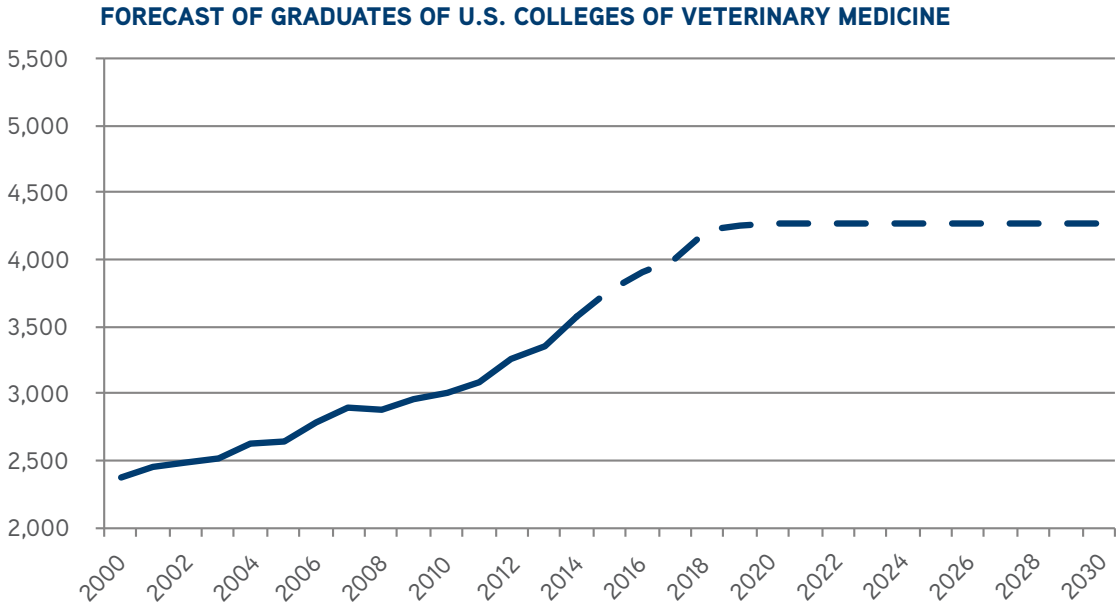


Figure 10

In reality, after Midwestern University and Lincoln Memorial University begin graduating students in 2018, we have assumed that no new universities will be opening in the foreseeable future. Further, because of the increasing costs for education and the current equilibrium in the market for education, current veterinary colleges are unlikely to remodel or add a substantial number of new students to their class sizes in the near future unless they can reduce the cost per seat. Even then, they will likely substitute less expensive seats for more expansive seats at other colleges as the willingness to pay for seats at higher prices declines. For this reason, we think that the number of graduates will stabilize at about 4,290 (from all sources) beginning in the year 2019, and not increase for the remainder of the forecast period.

The Bureau of Labor Statistics (BLS) forecasts that through 2022 the number of personnel in state governments will grow at a rate of 0.5 percent per year, and the number of personnel in federal government will decline at a rate of 1.6 percent per year. State and local governments in 2012 employed 19,103,200 people, while the federal government employed 2,814,000 people (BLS 2013). Combining the state and federal growth rates and weighting them by their relative sizes gives a combined positive growth rate of 0.23 percent per year for all state, local and federal government positions. This is an increase from the IHS model, which predicted a contraction of 0.5 percent of government employees per year. The IHS figure was arrived at by combining 0.8 percent state and local and -1.3 percent federal (BLS 2012) and was a simple average. However, the IHS forecast ignored the fact that combined state governments are seven times larger than the federal government. Rather than a declining number of jobs in state, local and federal government, the new model forecasts an increasing number of jobs. Combined, the number of government positions will increase the demand for veterinarians by 630 FTE veterinary positions by 2025. The 2015 estimate remains unchanged from 2014.

In terms of uniformed service personnel, the current CBO has forecast a decline of 1.5 percent per year through 2025 (CBO 2014). That number is actually a large increase from the previous year's estimate of an average annual contraction of 1.3 percentage points (CBO 2012).

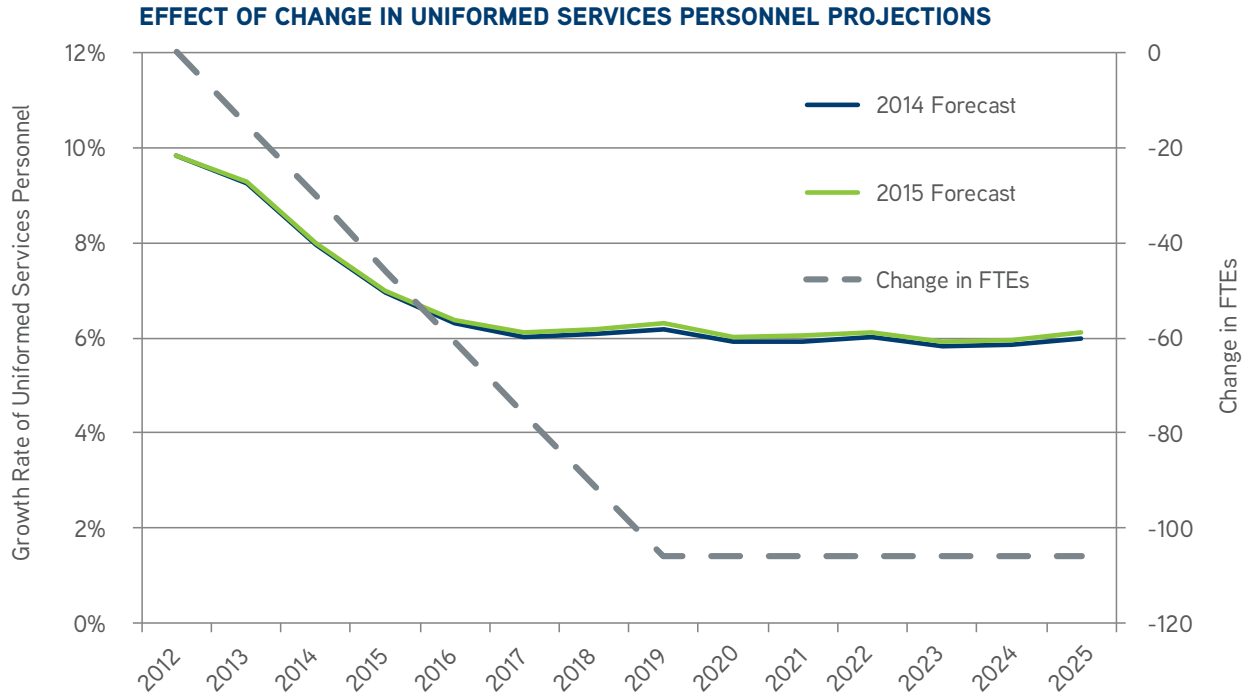


Figure 11

As shown in the following figures, the USDA has updated its forecast for the number of food production animals in the United States. The changes in food animals will, in turn, change the demand for food animal veterinarians. First, dairy cattle are forecast to increase substantially in the 2015 forecast compared to the 2014 forecast. The 2014 forecast was, in contrast, a decrease from its previous forecast, making the 2015 forecast more in line with previous forecasts. This will increase the demand for veterinarians by as much as 60 FTEs in 2020, but that increased demand will decline to be a null change by the end of the forecast period in 2025.

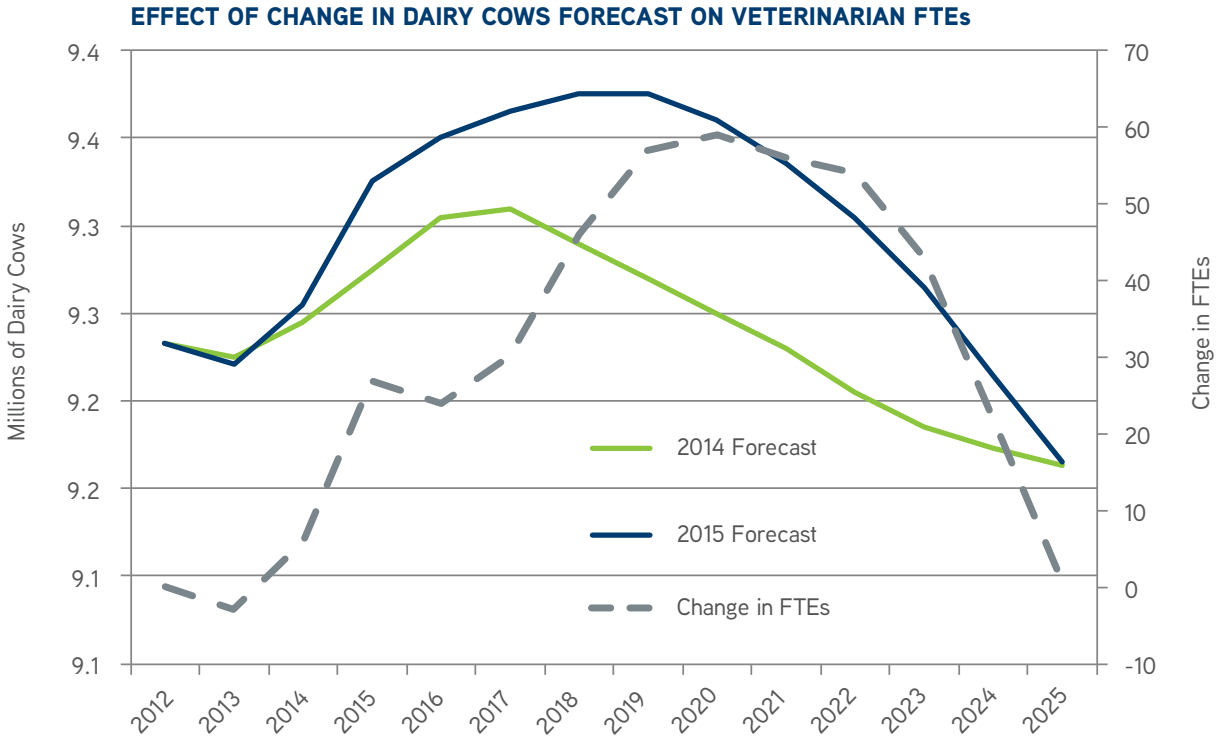


Figure 12

Due to the severe drought in the western United States, beef cattle herds have declined. The pace of that decline, however, is not as rapid as previously supposed. This change is compounded from a previously lowered forecast in 2014 compared to previous years. The decline in the cattle population will lead to about 140 fewer FTEs by the end of the forecast period.

EFFECT OF CHANGE IN BEEF CATTLE FORECAST ON VETERINARIAN FTEs

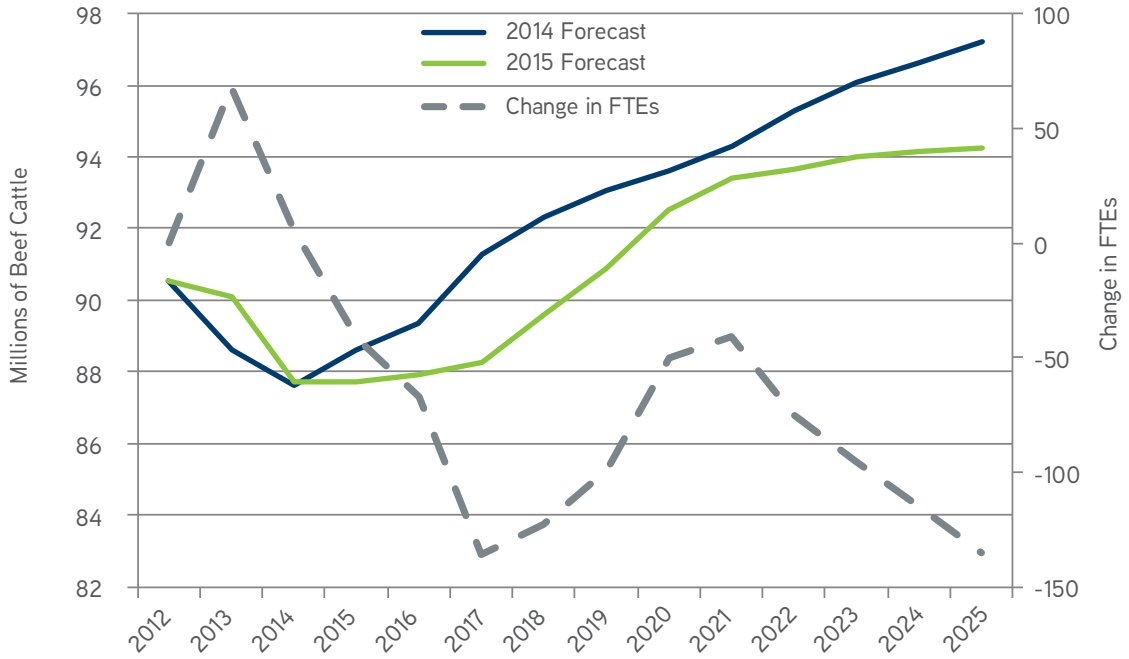


Figure 13

Perhaps predictions are foretelling a plateau in the bacon craze seen in recent years. The forecast reported will result in demand for 140 fewer veterinarian FTEs by 2025.

EFFECT OF CHANGE IN SWINE FORECAST ON VETERINARIAN FTEs

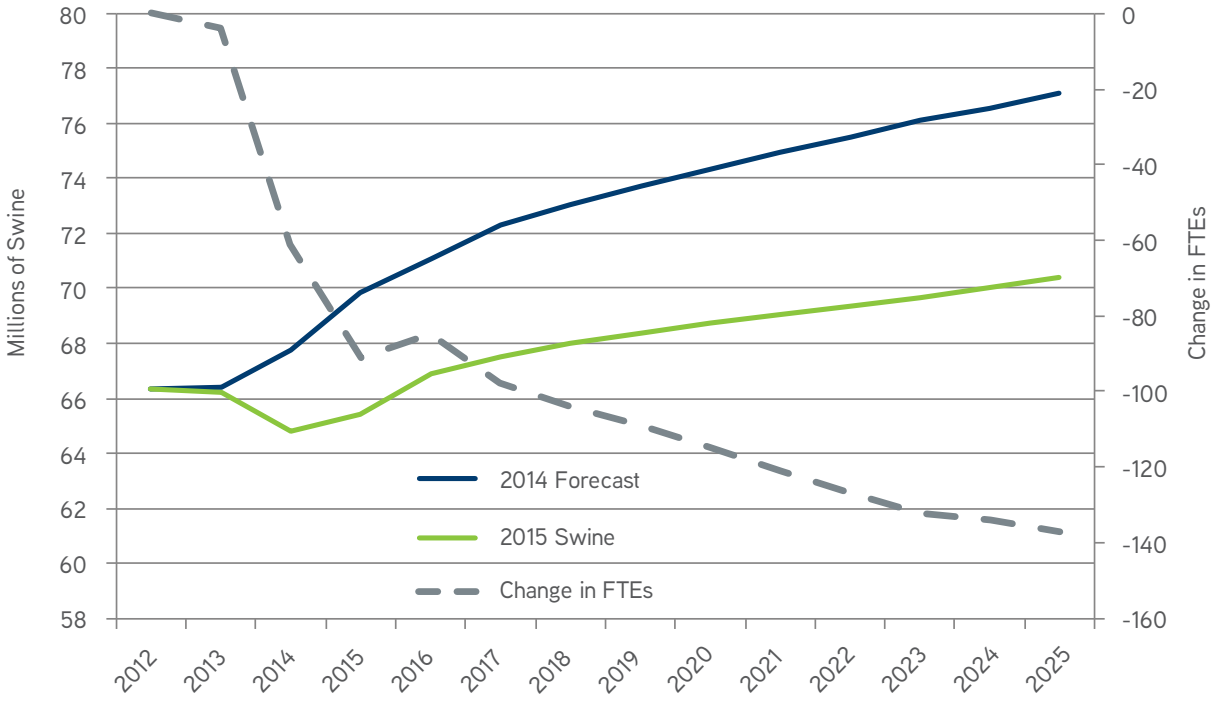


Figure 14

The USDA's 2015 forecast for poultry slightly decreased from 2014. However, it is important to note that the new forecast does not reflect the 2015 Avian Influenza outbreak. In reality, the Avian Influenza outbreak led to a massive increase in the demand for veterinary services. The total cost of the outbreak is estimated at a minimum of $1 billion, and it is too early to tell how much of a lingering effect the incident will have on the demand for veterinary services.

EFFECT OF CHANGE IN BROILERS AND LAYERS FORECAST ON VETERINARIAN FTEs

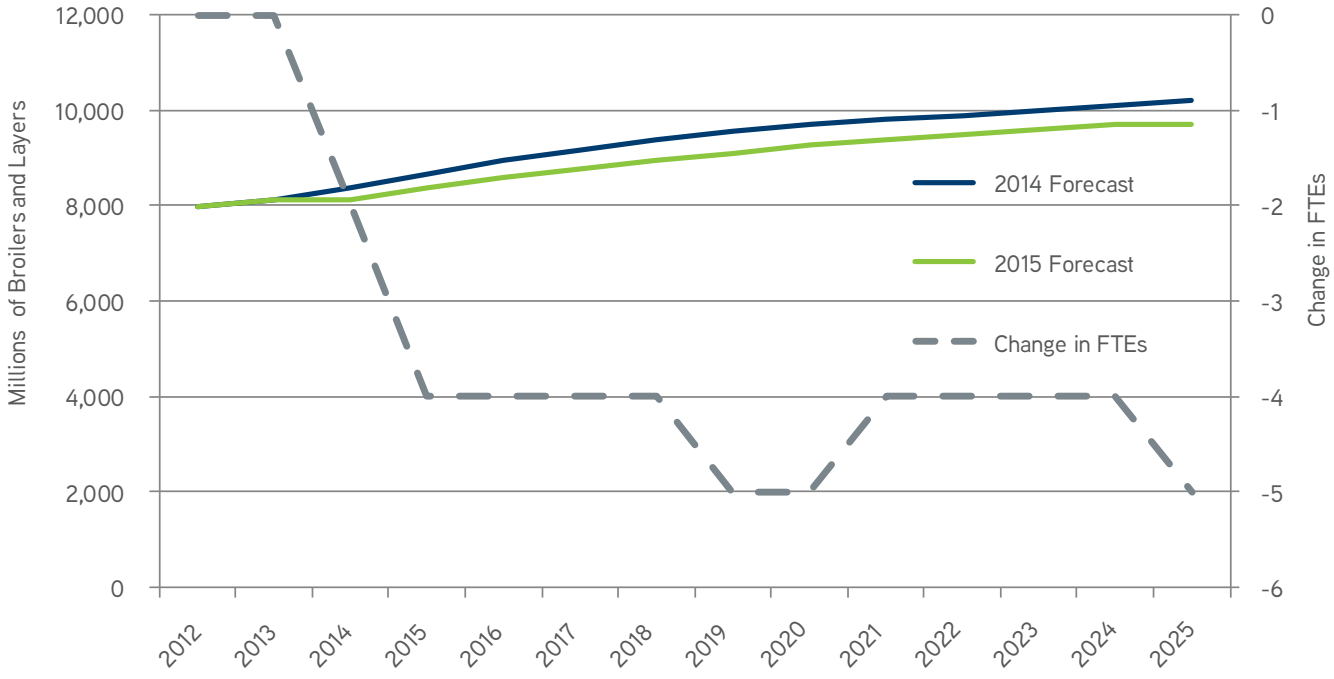


Figure 15

Lastly, the USDA's 2015 predictions concerning other livestock, including small ruminants, is slightly higher than in 2014. This will lead to an additional three to five FTEs over the forecast horizon.

EFFECT OF CHANGE IN OTHER LIVESTOCK FORECAST ON VETERINARIAN FTEs

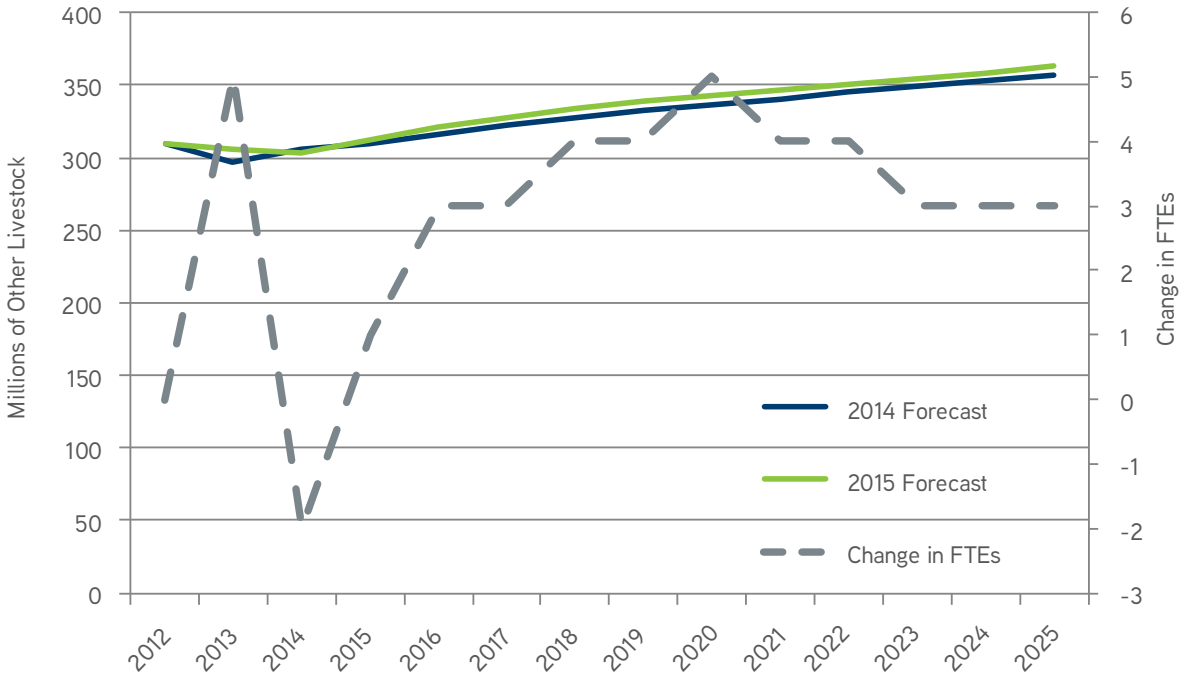


Figure 16

In total, livestock trends are having a negative effect on the demand for veterinary services. This overall decline is due to several idiosyncratic factors, including drought in the western United States, but the weakening is also indicative of the lowered growth forecast for the U.S. economy. Overall, by the end of the forecast period we expect an overall decline in the demand for food animal veterinarians equal to 300 FTEs, relative to the 2014 forecast.

In conclusion, the AVMA workforce model indicates that excess capacity will continue to decline for the veterinary profession, with the biggest decrease due to the revised estimates of current excess capacity. We expect excess capacity to continue to decline through the forecast period, despite the change in the forecast for the need for food animal veterinary services.

TOTAL EFFECT OF LIVESTOCK PROJECTIONS ON THE 2015 EXCESS CAPACITY FORECAST

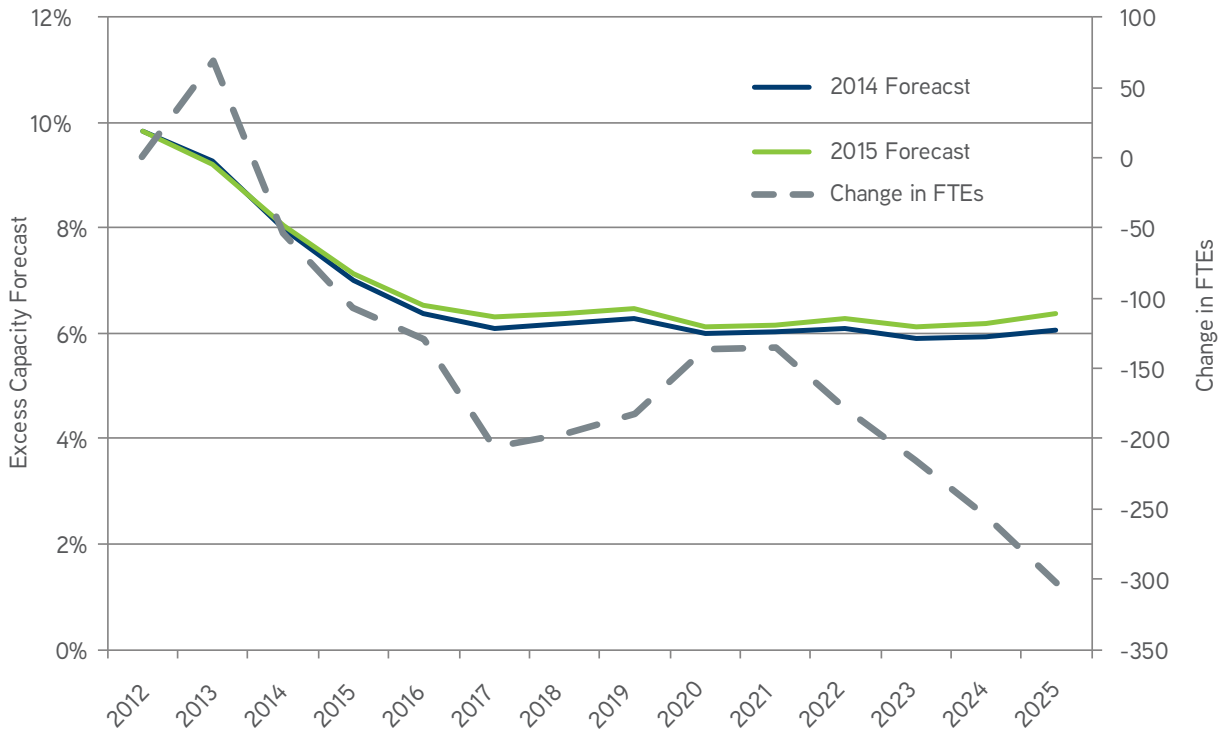


Figure 17

THE USDA'S 2015 FORECAST FOR POULTRY SLIGHTLY DECREASED FROM 2014. HOWEVER, IT IS IMPORTANT TO NOTE THAT THE NEW FORECAST DOES NOT REFLECT THE 2015 AVIAN INFLUENZA OUTBREAK. IN REALITY, THE AVIAN INFLUENZA OUTBREAK LED TO A MASSIVE INCREASE IN THE DEMAND FOR VETERINARY SERVICES.

STUDIES

27.9 percent of revenue in veterinary practices comes from the first quarter, 28.6 percent from the second, 24.9 percent from the third, and only 18.5 percent from the fourth.

In conjunction with partner institutions, the AVMA has conducted a number of studies on factors important in the market for veterinary services; their summaries follow.

SEASONALITY

What time of year should companion animal veterinary practices expect to see the highest – and lowest – amount of revenue? To help answer this question, we collected data from the Bureau of Labor Statistics (BLS) Consumer Expenditure Survey (CE) for the years 2005 through 2014. The CE collects information on the spending habits of U.S. consumers, and separates the data into categories of frequently purchased items, including veterinary services. The monthly spending observations were aggregated to form a quarterly time series. The quarterly expenditures on veterinary services for a sample of U.S. consumers are illustrated in the following figure.

Seasonality is a characteristic of time series data where regular and predictable changes recur at specific intervals throughout the year. Any predictable change or pattern in a time series that recurs or repeats over a one-year period can be said to

be seasonal. To estimate the effect of seasonality, a statistical procedure was used that allows for capturing the effect of the first, second, third and fourth quarters on the number of visits and total expenditures. The results show that, compared to the fourth quarter, veterinary expenditures are historically higher in the first, second and third quarters by 50.8 percent, 54.5 percent, and 34.5 percent, respectively. Simply put, 27.9 percent of revenue in veterinary practices comes from the first quarter, 28.6 percent from the second, 24.9 percent from the third, and only 18.5 percent from the fourth.

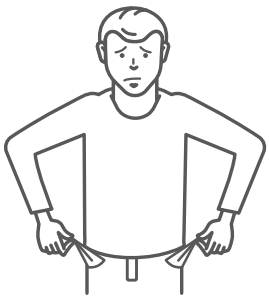
QUARTERLY VETERINARY EXPENDITURES, 2005-2014

Figure 18

Separating the Signal from the Noise

Having a better understanding of the seasonal spending patterns in the veterinary services industry allows practice managers to separate the signal (seasonal pattern) from the noise (weekly or monthly expenditures). Once the effects of seasonality are controlled, another valuable piece of information emerges: Overall spending on veterinary services for a specific sample size has decreased between 2005 and 2014. That is, even though the prices of veterinary services have been steadily increasing over this period (BLS, 2014), the amount spent at veterinary service providers is declining for the constant sample (population) size.

EVEN THOUGH THE PRICES OF VETERINARY SERVICES HAVE BEEN STEADILY INCREASING OVER THIS PERIOD (BLS, 2014), THE AMOUNT SPENT AT VETERINARY SERVICE PROVIDERS IS DECLINING FOR THE CONSTANT SAMPLE (POPULATION) SIZE.



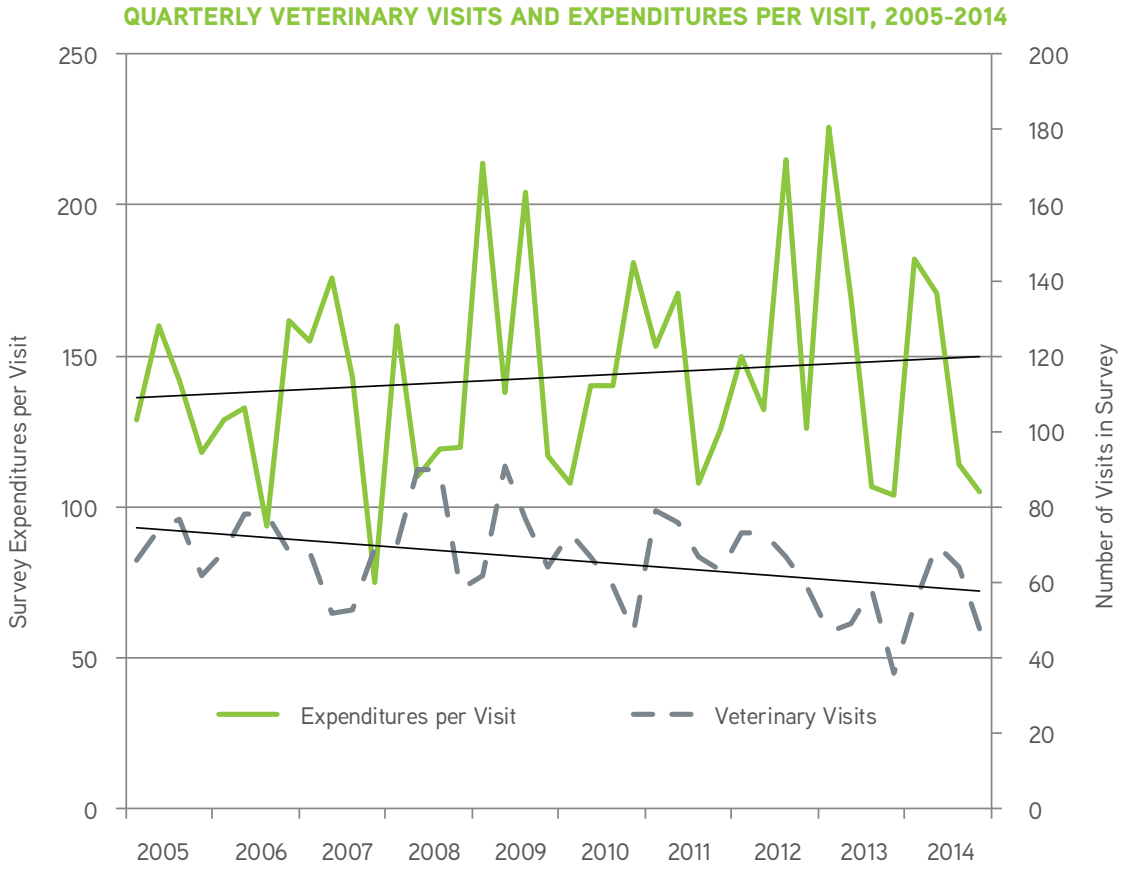


Figure 19

The number of visits by this constant sample size is, however, also declining by 2.6 percent per year over the period. The ratio of these two variables, the average expenditure per veterinary visit, is noticeably increasing. This indicates that either the constant sample size has a declining number of pets or that pet owners are taking their pets to veterinary service providers less often, a trend that has been occurring for the past 20 years (AVMA, 2012). And, those who do take their pet to a veterinarian are spending more money at each visit. The CE data in its current form cannot tell us why this is occurring, just that it is. But simply knowing the spending patterns of consumers can be a valuable tool for practice managers.

For experienced practitioners, this analysis likely only confirmed what you already know: Veterinary business is slowest in the winter. Is this effect due to weather or geography? The BLS data cannot tell us that. However, this analysis has quantified the effect, and shown what the national average looks like.

A Vital Factor in a Competitive Market

Being able to confidently predict your clinic's busy and slow seasons will allow you to make business decisions more effectively. For instance, if you or members of your staff want to take an extended amount of time off, or if you are planning a remodeling project for your clinic, it is best to schedule this time within the fourth quarter. Or you could take a more aggressive approach by offering seasonal promotions in the winter months in order to bring in more clients, smoothing out the seasonal effects. You are also more likely to experience cash flow problems in the winter, in which case you can use this information to save an appropriate cash reserve during the busier months. Making these types of decisions using your practice's business seasonality as a guide can help grow and maintain your customers' loyalty, a vital factor in a competitive market.

BEING ABLE TO CONFIDENTLY PREDICT YOUR CLINIC'S BUSY AND SLOW SEASONS WILL ALLOW YOU TO MAKE BUSINESS DECISIONS MORE EFFECTIVELY. FOR INSTANCE, IF YOU OR MEMBERS OF YOUR STAFF WANT TO TAKE AN EXTENDED AMOUNT OF TIME OFF, OR IF YOU ARE PLANNING A REMODELING PROJECT FOR YOUR CLINIC, IT IS BEST TO SCHEDULE THIS TIME WITHIN THE FOURTH QUARTER.

CONSUMER PREFERENCES FOR PET HEALTH INSURANCE

The nascent pet health insurance market appears to hold potential for insurance and pet health service providers, according to a study conducted jointly by the AVMA and Mississippi State University. In the study, pet owners expressed interest in insurance options, and a willingness to make such a purchase depending on a set of factors. To determine the propensity to purchase pet health insurance – and preferences among policy options potentially offered, the authors performed a discrete choice analysis, employing data from an online survey of pet owners. The results yield a glimpse into pet owners' initial preferences for insurance policy features – as well as the influence of pet owner characteristics and demographics on decisions to purchase pet health insurance.

The methodology considers consumer demand, motivations and behavior along with market characteristics and attributes of the product as provided by existing companies: Five plan attributes were presented to include in insurance policies: monthly base premium, annual deductible, reimbursement level, unlimited maximum annual benefits and wellness coverage. These attributes were identified as potentially influencing willingness to pay for insurance. As the utility evaluation of options also depends on a potential purchaser's risk tolerance, the model measured risk aversion, by asking respondents to speculate as to the likelihood their pet would become ill in the next year, as well as how risk averse they identified themselves. While most thought their risk preferences were about the same as their neighbors, their risk perceptions tended to vary much more – posing a challenge in predicting pet owner action, and calling for the examination of other factors in their lives that affect decisions. Hence, key socio-demographic and pet-relationship variables assessed the degree of owner-pet bond.

WHEN WE ASKED THESE RESPONDENTS WHAT THEY LOOKED FOR WHEN PURCHASING PET INSURANCE, 51 PERCENT REVEALED THAT THEY WERE LOOKING AT THE INSURANCE PREMIUM, 38 PERCENT AT THE TYPE OF INSURANCE, AND 10 PERCENT AT OTHER, UNKNOWN FACTORS.

Costs Incurred, Usage Gauged

From the sample of 526 respondents, the average amount spent on medical treatment for the selected pet was $248. Only 37 of the respondents covered the medical treatments with a pet insurance policy. From the group of respondents that used pet insurance on their medical treatment, an average of $396 was spent exclusively on medical treatment. When we asked these respondents what they looked for when purchasing pet insurance, 51 percent revealed that they were looking at the insurance premium, 38 percent at the type of insurance, and 10 percent at other, unknown factors.

Insurance buys, the study suggests, are sensitive to product pricing: As the price increases, the likelihood that a consumer will purchase pet health insurance drops. As a policy's reimbursement percentage increases, however, a consumer is more likely to buy pet health insurance. And, inclusion of unlimited benefits and a wellness plan will increase the probability that a consumer will purchase a pet health care plan. Finally, study findings suggest that the more likely a consumer expects a pet to require medical care, the more likely they are to purchase pet insurance.

Who and How Much?

Unsurprisingly, pet owners who consider their pet to be part of the family are more likely to purchase pet health insurance than those who do not consider their pet part of the family, though the respondent's location of residence is not likely to influence a pet owner's decision to purchase pet health insurance. Older respondents were less likely to purchase insurance than younger respondents, though the coefficients for income levels were not statistically significant, suggesting that the income categories as defined had no discernible bearing on a respondent's preference for pet health insurance. While income did not affect the decision to purchase insurance, the ability to tolerate the cost of a medical emergency for the pet does affect the probability that a pet owner will purchase pet health insurance.

Those who responded that an unanticipated $1,000 veterinary bill would present financial difficulty were found to be more likely to purchase pet health insurance. This suggests that those living paycheck to paycheck, regardless of income, would likely prefer a planned monthly expense in the form of an insurance premium than face a sudden and unexpected veterinary bill. In other words, a welcome trade-off materializes through policies that present manageable monthly premiums and circumvent infrequent, though costly, medical expenses. An average premium of $41.79 per month is considered manageable for plans that include unlimited benefits, with an extra $27.23 per month for plans that include wellness visits. Our conclusion: Pet insurance premium, reimbursement level, unlimited benefits and including wellness visits in a pet health insurance plan all have statistically significant effects on pet owners' purchase decisions.

VETERINARY PRACTICES

The market for veterinary services is a $31 billion industry made up of tens of thousands of firms. This section looks at the composition of these firms, their employment and output, and the distribution of them by state.

IMPLAN (Impact Analysis for Planning) is an economic input-output model designed for economic impact analysis. Originally developed by the USDA Forest Service and now maintained by a private group, it measures the economic and social impacts of a change in the economic environment for any given region in the United States. Part of the IMPLAN dataset includes estimates on the number of state-level distribution of firms in the veterinary industry.

Establishments, according to the IMPLAN definition, are not necessarily veterinary practices. This estimate includes establishments that may not necessarily be clinics, but rather could be animal control centers, animal shelters, veterinary-focused pharmaceutical companies, veterinary testing laboratories, and veterinarian independent contractors, many of whom are relief veterinarians.

The input-output account matrix provides information on the degree of relationship between different industries within the economy. The relationship is typically presented in a form of multipliers showing the share of the rest of the industries from a one-dollar investment made by an industry, for example, the veterinary services industry. These multipliers enable the tracking of the effect of a change in the production plan of the veterinary services industry on the output of all industries that contribute to the production of the output of the veterinary services industry.

The IMPLAN data provides for every industry the total number of employees, the industry labor income, and the total value of output. The employment, labor income and output associated with the industry of interest are called "direct effects." The multipliers enable us to determine the "indirect" and "induced" effects. These terms refer to the changes that occur in other industries due to the change in the veterinary services industry. For instance, a change in the demand for veterinary services will cause the pharmaceutical industry to revise its production plan to meet the new demand in the veterinary industry. The changes in the pharmaceutical industry are captured in the indirect effects.

Determining the Number of Practices by State

The number of establishments was obtained from the Barnes Reports on U.S. Industry & Market Outlook – Veterinary Services Industry. The veterinary service sector (54194) as defined by the North American Industry Classification System (NAICS) and used in the Barnes Reports comprises entities that sell veterinary services to animal owners as well as establishments that supply testing services to veterinary practices. The Barnes Reports provide an estimated number of establishments, employees, and the total value of output at the state and national level for the current year and give a prediction of these variables for the next two years. In addition to the state and the national data, the reports present the same variables for the U.S. metropolitan areas. The industry is divided by sub-groups relative to the size of establishment. In 2014, for example, the veterinary services industry encompassed 37,840 establishments composed of 9,306 establishments employing between one and four people; 8,736 establishments with a capacity of five to nine people; 8,832 establishments with 10 to 19 employees each; 3,376 establishments in the category of having 20 to 49 employees; 293 establishments with a total employee group of 50 to 99 workers; 58 establishments with 100 to 249 employees; 10 establishments with 250 employees or more; and 7,229 single-operator establishments. The following table presents the estimated and projected number of establishments, employees, and the value of industry sales from 2014 to 2018 as reported in the 2013 edition of the Barnes Report.

Table 2 shows the state total employment as estimated by Barnes Reports and as reported in the IMPLAN 2013 data. The difference in the total employment between the two sets of data might lie in the definition of the industry. In fact, the IMPLAN sector 459 (veterinary services) does not match the same definition as NAICS 54194. For instance, pet stores are included in retail stores (sector 400 – 401) in IMPLAN, not in sector 459.

7,229 SINGLE-OPERATOR ESTABLISHMENTS
9,306 EMPLOYING 1-4 PEOPLE
8,736 WITH 5-9 PEOPLE
8,832 WITH 10-19 EMPLOYEES

3,376 WITH 20-49 EMPLOYEES
293 WITH 50-99 WORKERS
58 WITH 100-249 WORKERS
10 WITH MORE THAN 249 EMPLOYEES

37,840
ESTABLISHMENTS

VETERINARY INDUSTRY NATIONAL FORECAST

Year	Number of Establishments	Number of Establishments with Employees	Employment	Industry Output ($ millions)
2014	37,840	30,611	331,474	$27,293
2015	39,938	32,308	349,856	$29,156
2016	42,022	33,994	368,113	$30,964
2017	44,301	35,838	388,075	$34,510
2018	46,880	37,924	410,671	$38,433

Table 10

The following table gives an estimate of the number of employees in the veterinary industry per state.

VETERINARY INDUSTRY EMPLOYMENT BY STATE, 2013

Alabama	5,501	Montana	1,804
Alaska	764	Nebraska	2,860
Arizona	7,079	Nevada	2,898
Arkansas	2,724	New Hampshire	2,191
California	35,373	New Jersey	8,579
Colorado	8,181	New Mexico	2,136
Connecticut	4,340	New York	17,178
Delaware	1,063	North Carolina	12,425
D. Columbia	267	North Dakota	759
Florida	21,235	Ohio	12,964
Georgia	10,630	Oklahoma	4,827
Hawaii	1,035	Oregon	6,545
Idaho	2,278	Pennsylvania	13,324
Illinois	13,620	Rhode Island	1,161
Indiana	7,839	South Carolina	4,518
Iowa	4,048	South Dakota	1,179
Kansas	5,144	Tennessee	7,544
Kentucky	4,895	Texas	26,522
Louisiana	4,756	Utah	2,382
Maine	1,957	Vermont	1,154
Maryland	7,598	Virginia	12,100
Massachusetts	7,464	Washington	9,279
Michigan	10,063	West Virginia	1,764
Minnesota	6,815	Wisconsin	8,050
Mississippi	2,751	Wyoming	996
Missouri	7,349	U.S.A.	351,010

Table 11

The number of private practice veterinarians per data, from AVMA data, is displayed in the map on the following page (Figure 20).

Mapping the number of veterinary establishments yields the next thematic illustration (Figure 21). States such as California, Texas, Florida and New York have the highest number of establishments. As expected, the number of firms closely follows total population.

NUMBER OF PRIVATE PRACTICE VETERINARIANS BY STATE, 2013

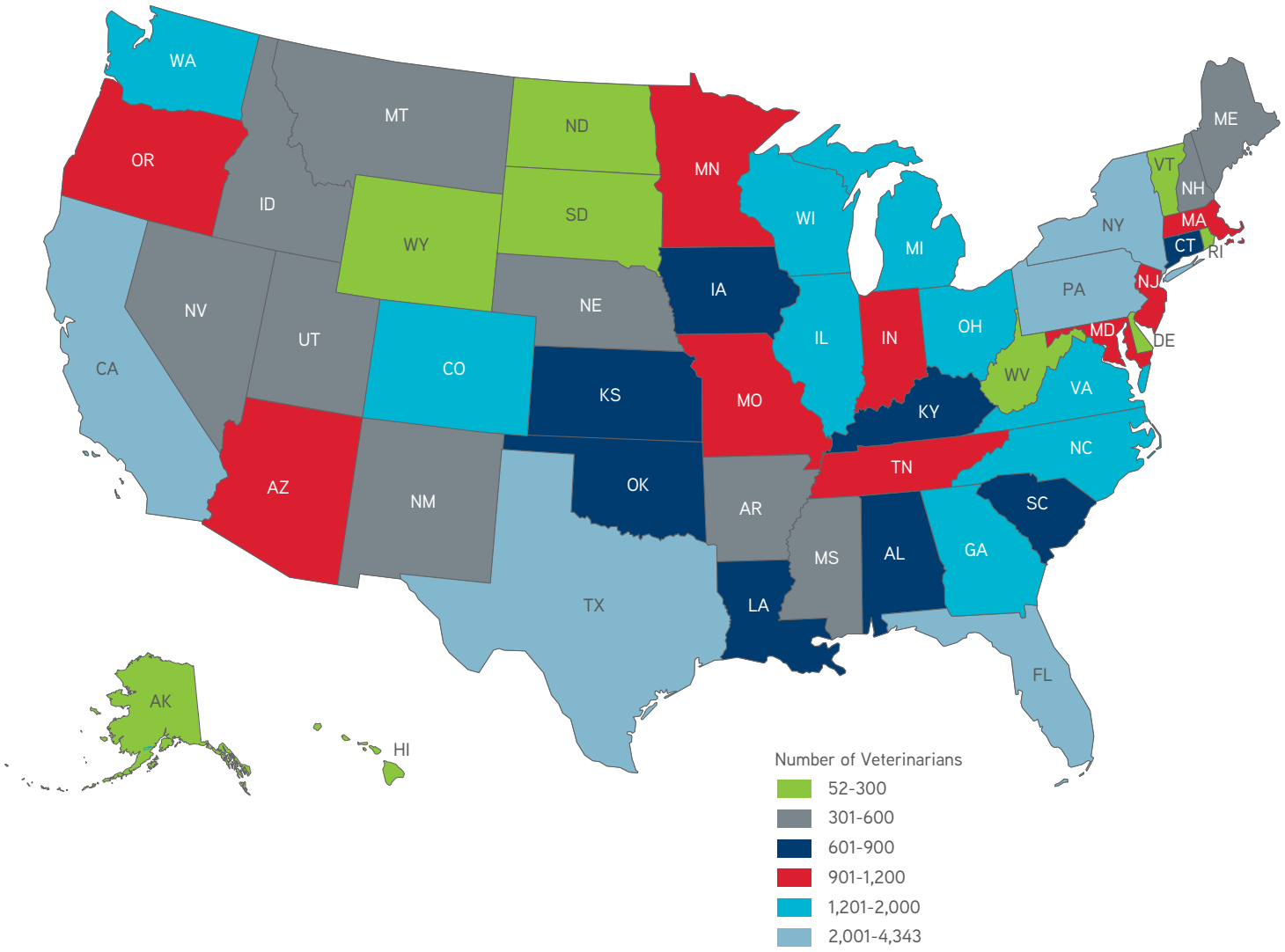


Figure 20

NUMBER OF VETERINARY ESTABLISHMENTS BY STATE, 2013

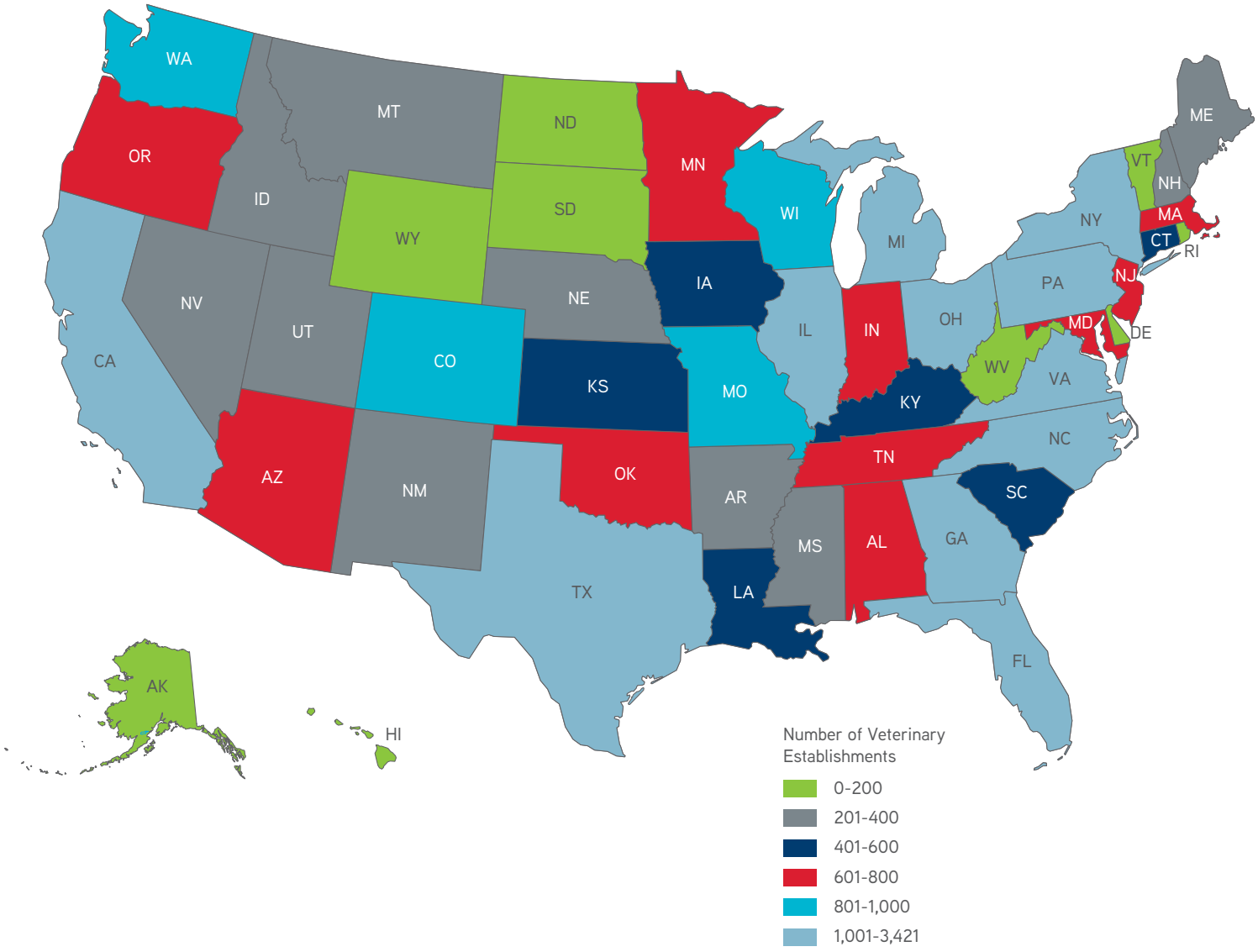


Figure 21

To view the veterinary services industry in a more useful way, one can remove the effect of population by examining the location quotient of veterinarians. The location quotient is simply the number of private practice veterinarians in a state, divided by the state's population, which is in turn divided by the ratio of the total number of private practice veterinarians in the entire United States divided by the U.S. population. When the ratio is below 1, this indicates that a state has fewer veterinarians than the national average, and when the ratio is above 1, this indicates that a state has more veterinarians compared to the national average.

VETERINARY INDUSTRY LABOR QUOTIENT BY STATE, 2013

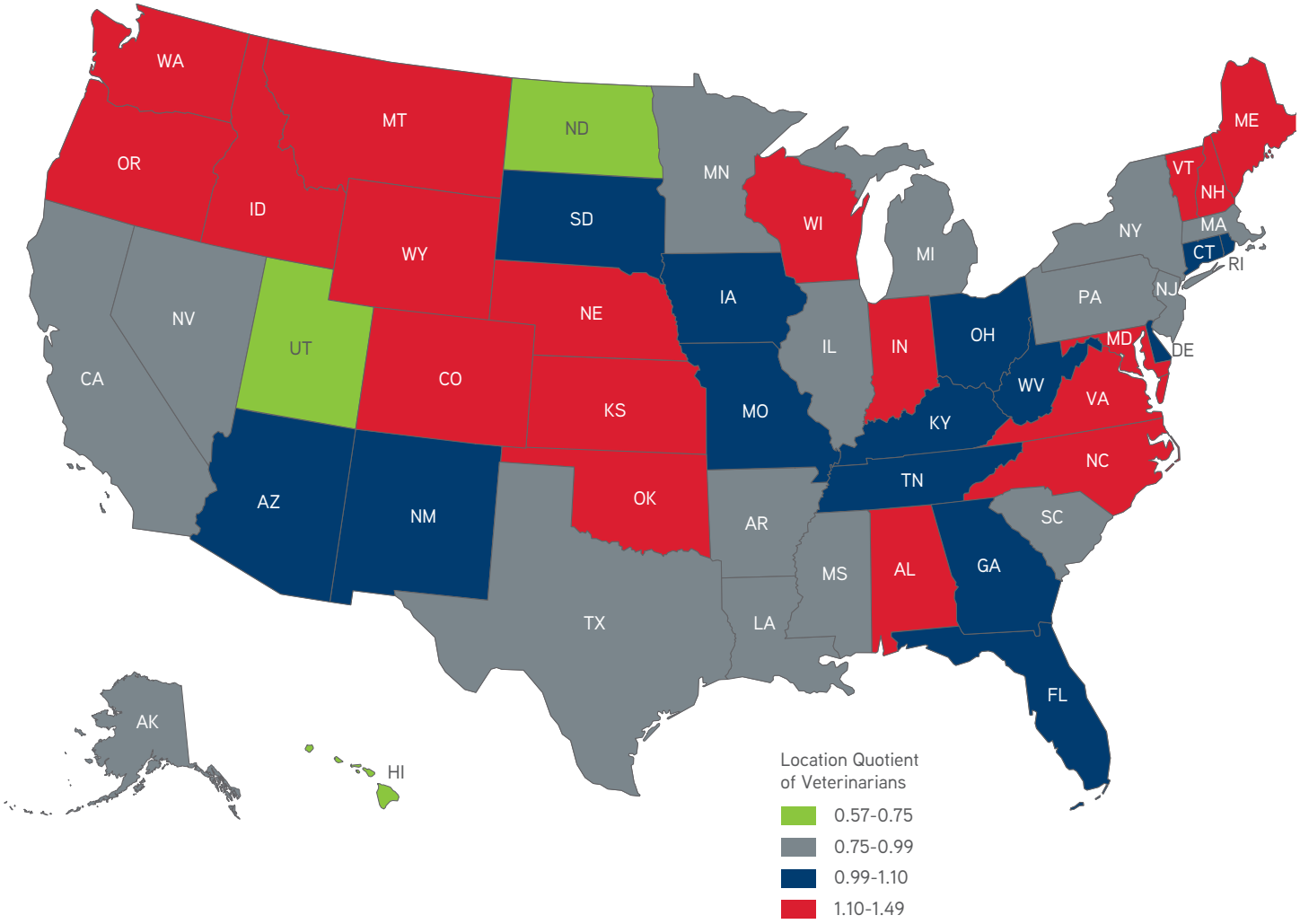


Figure 22

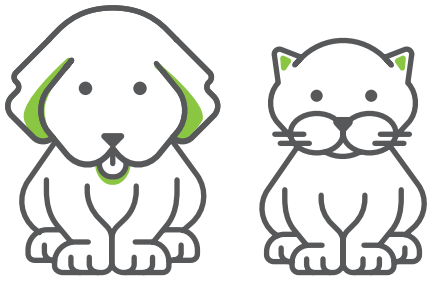
METRO MARKET PILOT STUDY

Along with augmenting data gathered in the AVMA's established national Pet Ownership and Demographics Survey (PDS), a geographic market-focused study conducted in 2015 as a "pilot" effort endeavored to validate responses from previous PDS studies, in part by comparing survey responses to the actual sales records of veterinary clinics. Seeking answers about where survey subjects took their dog for care, how often they sought care, and how much they paid for it, the Metro Pilot Study was conducted under the direction of the AVMA by the National Center for Food and Agricultural Policy, Washington, D.C., in association with the Iowa State University of Science and Technology Center for Survey Statistics and Methodology, Ames, Iowa. Concentrating on the combined statistical area (CSA) of Raleigh-Durham, N.C., the study sought valuable market research about the choices made by dog owners in procuring services and products for their pet's care. The survey was directed to a random sample of the CSA's general population, as well as to individuals who were identified as clients of veterinary clinics, isolating dog-owning households within each group. Clinic records indicate that some 90 percent of the households comprising the latter group owned three or fewer dogs.

According to the most recent (2012) PDS, 19 percent of dog-owning and 44 percent of cat-owning households did not visit a veterinarian with their pet during the previous year, findings that prompted questions that not only speak to market opportunity for veterinary enterprises, but to public health concerns, as well. As such, the Pilot survey aimed to develop an understanding of pet-owner behavior as it relates to the questions concerning whether households that evidently did not take their pet to a veterinary clinic or hospital seek care elsewhere; the number of pet-owning households that skip visiting any providers; and whether households reporting veterinarian visits go to a clinic or hospital or see a veterinarian working at some other type of establishment. While in some instances the study yielded no new information, in others it elicited new insights into the use of veterinary care alternatives and product patronization among the survey group. Two survey instruments – one including questions asked in the PDS, and one with new questions about health care visits – were offered in either an online or paper form. The latter, it was believed, would more effectively glean responses from a wider range of households by reaching into lower income groups, representation of which was judged deficient in the previous, online-only survey. Variables relative to the potential variety of service items received and the dates of their "transaction" were not calculated or reported since it is unclear as to whether they were associated with one or multiple visits.

What Prompted Visits – and to Where

To better comprehend the variety of health issues that sent pet owners to veterinarians or other care providers, the Pilot study included questions asking about reasons for visits. Previous study queries had merely asked whether owners had bought any of 20 services or products listed. Surmising that respondents might be better able to recall the reason for a visit, rather than the services or products received during said visit, Pilot study authors asked *why* a dog was taken for health care attention. The new information derived from this question is reflected in Figure 23 on the following page, which documents responses from distinct study groups as to what disorders received attention from a professional – either during a routine visit or through a special visit – and what types of conditions were treated at home. Findings revealed that while some health issues such as flea/tick problems, diarrhea/vomiting, and even injuries (lacerations, broken bones) were addressed at home, other issues – including intestinal worms, ear, eye, and dental problems, and skin/fur maladies – were more likely to be addressed during a routine check-up instead of a separate visit. All of the latter such excursions reported in the Pilot Study were to a veterinary clinic or hospital.



19% 44%

ACCORDING TO THE MOST RECENT (2012) PDS, 19 PERCENT OF DOG-OWNING AND 44 PERCENT OF CAT-OWNING HOUSEHOLDS DID NOT VISIT A VETERINARIAN WITH THEIR PET DURING THE PREVIOUS YEAR.

HOW DO PEOPLE HANDLE HEALTH ISSUES?

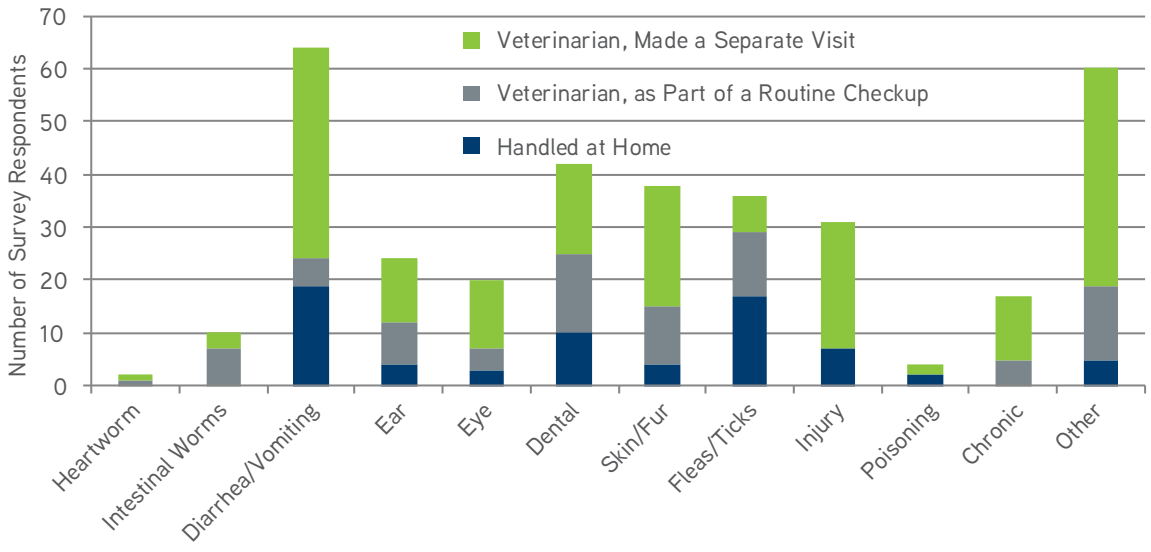


Figure 23

Details as to routine check-ups were sought in the Pilot through questions that explicitly inquired as to frequency and price paid for such visits (which were presumed to include vaccinations). A veterinary clinic or hospital proved to be the choice for obtaining a routine check-up for the vast majority of respondents (an average of 86 percent among two subgroups in the survey) who indicated that they had taken their dog somewhere for this type of exam in the previous 12 months. Veterinarians serving the community surveyed, according to the Pilot study, face minimal competition from public clinics or animal shelters for routine check-ups and vaccinations – though "big box" pet stores pose some competition. One category where the study identified a networthy level of market share – especially among veterinary clients – is that of mobile facilities.

Another category of care studied pertained to canine spaying and neutering and euthanasia – services identified as "once-in-a-lifetime care." Though purchase of this type of service occurs only once for an individual pet, the price charged for the package of veterinary procedures, medications and services either service entails could determine whether or not a dog owner opts for sterilization of the animal, and whether or not to euthanize. Within the Raleigh-Durham CSA, it was discovered through the Pilot, veterinarians face competition from animal shelters and public clinics for spaying and neutering dogs – a consumer decision, it could be speculated, influenced by the fact that sterilization is provided free of charge by humane societies and public clinic providers. The study concluded, however, that for the CSA surveyed, veterinary clinics or hospitals exclusively maintain the market for euthanizing dogs.

PURVEYORS OF PET CARE SUPPLIES

	Special Food	Flea/Tick Products	Dental Products	Vitamins & Supplements	OTC Medications
Products Purchased?	34%	66%	25%	26%	6%
Address Sample	30%	65%	18%	20%	5%
HSAH Sample	40%	67%	35%	35%	9%
If so, from where?					
Veterinary Clinic or Hospital	24%	44%	21%	11%	22%
Pet Shop	14%	7%	15%	7%	7%
Pet-Focused Retail Store	30%	14%	33%	14%	20%
Grocery or Other Retail	9%	9%	12%	24%	26%
Internet/Online	20%	23%	18%	43%	22%
Other	3%	3%	1%	1%	3%

Table 12

Bundled Services and Recall

When the survey data are paired with actual purchase records, it was observed, there tends to be an inclination among consumers to underreport actual visits. When it comes to discovering how often special visits are made to a veterinary clinic for chronic or episodic pet health issues, the PDS – which asked only if respondents did or did not obtain services as listed during the last visit to the vet, and during the whole prior year – was of little help. Comparisons of accuracy among surveys call into question PDS validity relative to deworming, dental care, grooming and food, however, indicate the study to be reasonably valid concerning exams, spay/neuter, euthanasia, boarding, medications and flea/tick products. Survey responses confirmed by purchase records indicate that non-routine check-up visits to a veterinarian specifically for de-worming is rather rare, and since the procedure is frequently part of what dog owners deem a routine checkup, they might forget that treatment was administered. Similarly is the case with dental care recall, and both hypotheses are testable. When the count of these services obtained only on dates when vaccines were not provided to the PDS survey responses is compared, the correspondence improves significantly. This analysis revealed that:

- The share of dog owners purchasing grooming during vaccine visits (15 percent) corresponds to the share of dog owners reporting they obtained grooming from a veterinarian in the past 12 months (17 percent). A larger share of respondents made special visits during which grooming services were purchased according to purchase records (36 percent), which were not reported on the survey.
- The share of dog owners purchasing dental care during special visits (28 percent) corresponds to the share of dog owners reporting they obtained dental care from a veterinarian in the past 12 months (32 percent).
- The share of dog owners purchasing de-worming care during special visits (23 percent), corresponds to the share of dog owners reporting they obtained de-worming from a veterinarian in the past 12 months (21 percent).

ACCURACY OF RECALL FOR SPECIFIC VETERINARY SERVICES

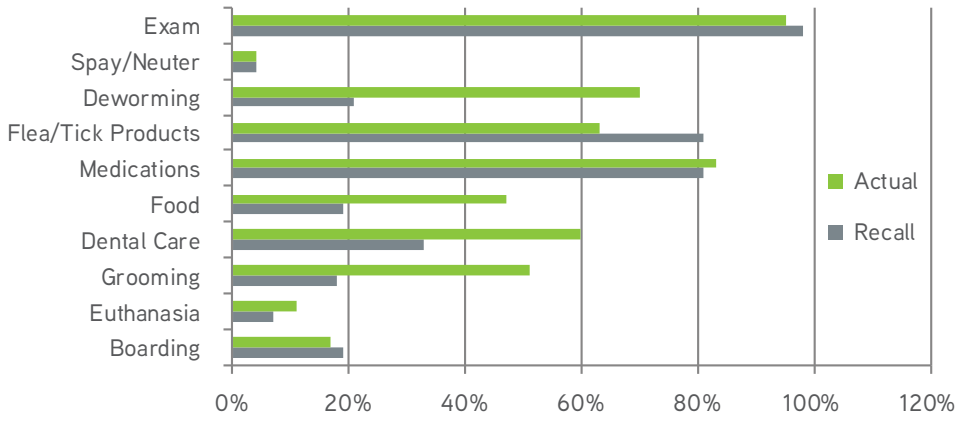


Figure 24

VETERINARIANS SERVING THE COMMUNITY SURVEYED, ACCORDING TO THE PILOT STUDY, FACE MINIMAL COMPETITION FROM PUBLIC CLINICS OR ANIMAL SHELTERS FOR ROUTINE CHECK-UPS AND VACCINATIONS – THOUGH "BIG BOX" PET STORES POSE SOME COMPETITION.

When survey respondents were asked to recall how many visits they made to the veterinarian in the past month, answers were compared to the number of visits reported by the veterinary clinic. The mean was around zero, with the vast majority of respondents within plus or minus two visits of the actual number, but with some respondents saying they visited 16 times more than the actual, and some reporting 18 times fewer than their actual number of visits.

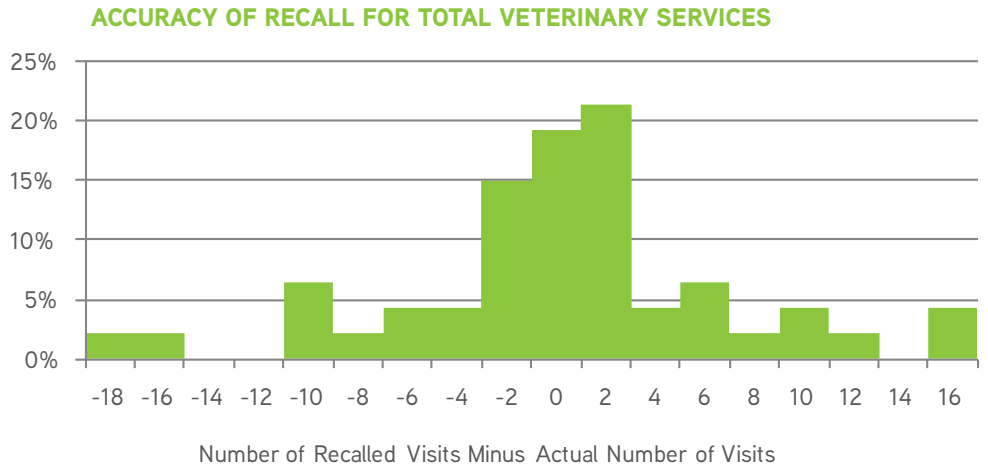


Figure 25

Boarding and Feeding

To learn more about patronization patterns for boarding, grooming and day care, the Pilot widened questioning beyond the original PDS questions, which restricted query to asking only if boarding and if grooming had been purchased from a veterinarian or not during the last visit, and during the last year. Hence, the Pilot was crafted to explicitly ask the number of days a pet was boarded, the times groomed, and the prices paid per day of boarding or for grooming. While kennels and boarders were cited as the top service provider group for dog boarding, veterinary clinics and hospitals took second place. The Pilot gathered responses relative to the "quantities" purchased and the average price paid per day boarded, by provider type. The study disclosed that respondents who reported having boarded the dog concerned did so for an average of 10 days per year. Daily boarding fees noted in the study range from $20 to $100 at kennels/boarders to $22 to $200 at a veterinarian establishment. The less expensive the provider, the report found, the more days were demanded by customers, with the opposite noted in the case of pricier providers.

In the final section to discern purchasing patterns among dog owners, responses yielded information relative to percentages of product types procured for the pet, as well as identified the types of providers patronized when dog owners bought special food, flea/tick products, dental products, vitamin supplements, digestive/urinary aids, and over-the-counter (OTC) medications. Pet-focused retail stores led in the special food and dental products categories; the two largest percentages of vitamin supplement purchases were through internet/online sources, and grocery or other retail outlets, respectively; but that veterinary clinics and hospitals manage to hold sway in the domain of flea/tick product purchases. More than a quarter of purchases of OTC medications, the study found, were made at a grocery or other retail establishment, with veterinary clinic or hospital tying internet/online sources for second place.

Examining Expenditures

In looking to validate respondents' reports of total expenditures made on visits for the year, analysis of responses indicate a pattern wherein some consumers recall spending more – about $100 more – than actual records indicate (though the Pilot appears to capture answers that reflect true outlays for specific, routine visits). Given the likelihood that a share of households – primarily those signifying a higher outlay – patronize more than one veterinarian, a future survey question might ask explicitly whether multiple veterinarians are seen – and whether a positive response to the question is associated with attention to multiple dogs. Study validation determined that the PDS, while fuzzy on details as to specific services obtained, did elicit accurate responses concerning how much was spent for veterinary services in the prior 12 months. The Pilot's questioning of average prices paid per visit also provides value, as the average response was $173 – considerably close to the average purchase record amount paid of $178!

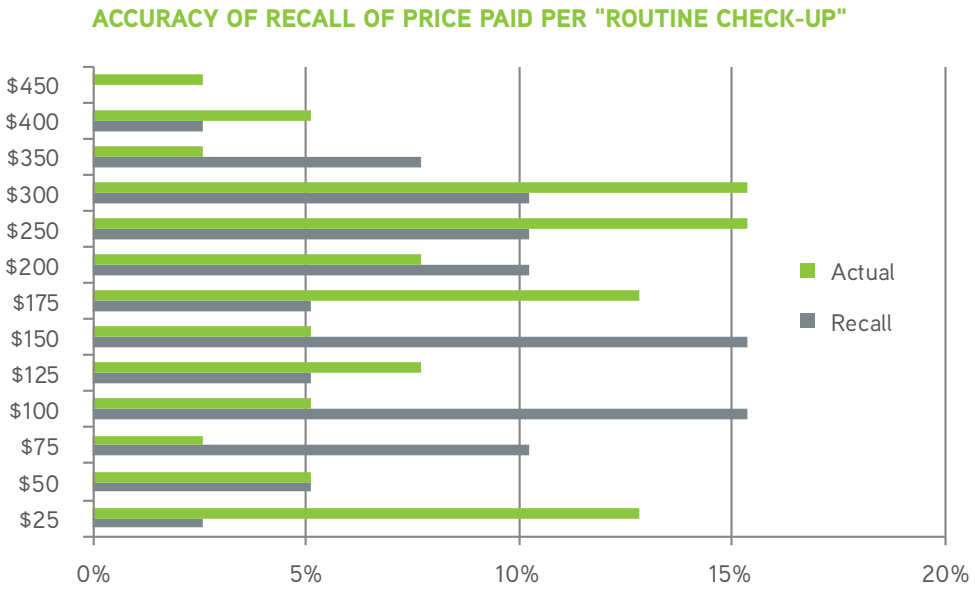


Figure 26

Overall, the new questions tested in the Pilot did a better job of ferreting out accurate data relative to quantities purchased and frequencies of visits to veterinarians – as well as more accurate information about prices paid for services rendered.

The results from this Pilot study will go a long way to informing the veterinary profession about the current state of the market for veterinary services.

DAILY BOARDING FEES NOTED IN THE STUDY RANGE FROM $20 TO $100 AT KENNELS/BOARDERS TO $22 TO $200 AT A VETERINARIAN ESTABLISHMENT. THE LESS EXPENSIVE THE PROVIDER, THE REPORT FOUND, THE MORE DAYS WERE DEMANDED BY CUSTOMERS, WITH THE OPPOSITE NOTED IN THE CASE OF PRICIER PROVIDERS.

DISCUSSION

The 2013 AVMA Workforce Study was conducted to estimate the amount of unutilized veterinary services capacity (excess capacity), but more importantly, to identify data shortfalls for obtaining accurate measures of the factors that affect the performance of veterinary markets. The 2013 study adequately achieved both goals, but as this report notes, improvements to the capacity utilization measures are both necessary and underway.

The most important factors in measuring excess capacity are prices of veterinary services and incomes of veterinary service consumers. As incomes rise, the price at which the same number of pet and animal owners are willing to purchase veterinary services increases. As the real price of veterinary services declines, the willingness of pet and animal owners to purchase these services will increase. And, just as important, as the pet and animal owner expectations on costs of veterinary services becomes more in line with the actual prices charged, the leakage of clients from veterinary practices will decline.

As the figure below illustrates, the prices that consumers pay at veterinary practices have been following a historical upward trend for some time above and reach beyond the normal rate of inflation. Through the mid-1990s, the price of veterinary services was generally in line with the rest of the economy, but in the late 1980s began declining. This decline coincided with a smaller share of companion animals forgoing yearly wellness visits. In the mid-to-late 1990s prices began accelerating much faster than the general price level in the United States. This subsequently coincided with an increase in the percent of companion animals forgoing yearly wellness exams.

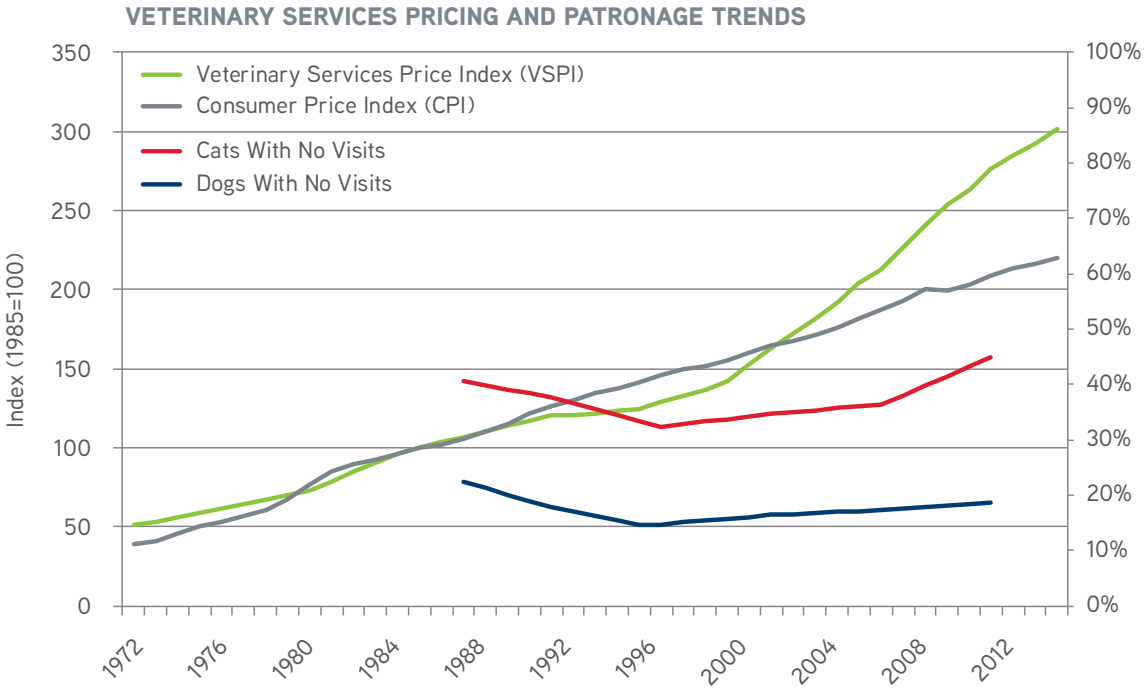


Figure 27

As we have indicated in previous reports, increases in consumer income increase demand, while a reduction in price increases the quantity demanded. To the untrained in Economics, a change in demand and a change in the quantity demanded might sound the same, but they are very different. Demand represents the price and quantity relationship for all pet/animal owners. At some price point, the demand can be segmented by those willing to pay and those who are unwilling to pay (even though they need the service). Each increase in price will expand the number of pet and animal owners who are unwilling to pay for the service, and reduce the number who *are* willing to pay. Of course, the important question is whether a price increase will generate more income than is lost through the reduction in the number of pet and animal owners willing to pay.

There have been numerous instances in the past where various veterinary practice management consultants have noted that all veterinary services are price inelastic, and thus veterinarians can continue to raise prices and increase revenue (for example Brown and Silverman 1999). However, our analysis suggests that this may not be the case. To the contrary, using the best data currently available and cutting-edge econometric techniques, we cannot say with confidence we know the elasticity of even one veterinary service (e.g. wellness exams), though our current analysis would suggest wellness exams are price elastic. Better data, however, are necessary to make that claim with certainty. Most important here is that even with the best available data and the application of the best available analytic methods, we are unable, for even a single veterinary service, to definitively provide price elasticities. Thus, we question any previous claim pertaining to the price elasticity of demand for veterinary services.

The income elasticity of demand is yet another problem. Demand, which is the combination of all price and quantity points, is increased as income increases. The recent recession drastically reduced income and thereby created a reduction in demand. As the price that veterinarians were charging for their services increased prior to the recession, the quantity demanded for those services dropped precipitously as a result of the recession's negative impact on personal disposable income. Any increase in real price (a rise in veterinary prices at a pace faster than the increase in inflation) during the recession would further exacerbate the decline in demand. How much the drop in income and increase in price each affected the drop in the quantity of demand for veterinary services is unknown due to the lack of knowledge about price and income elasticities.

The Why and the What

Excess capacity is the ability to provide services in excess of the quantity demanded at a price acceptable to both the buyer and the seller. The concept is different than excess supply (oversupply) because it includes price. Identifying the level of excess capacity that is a problem in the veterinary practice is of little use without understanding why it has occurred and what strategies can be used to ameliorate its adverse effects on practice profitability. Three strategies are possible: Reduce supply, increase demand, or lower the price of services so that their price level increases slower than the growth rate in general prices. Each of these strategies will provide a certain level of benefits at a specific cost. Understanding the relative benefits and costs of each strategy is imperative before a decision is made.

Many veterinarians have argued for a reduction in the number of veterinarians to reduce the supply of veterinary services and thus reduce excess capacity and increase practice profitability. Others have advocated for the increase in demand by increasing client visits and compliance. Still others have advocated for continued increase in prices. While it may be possible that any one of these might work, as yet there is not sufficient evidence to suggest which strategy or combination of strategies will produce the greatest return on investment. This is the point of the workforce model: to develop a method and process whereby these different strategies can be measured and compared. This process will not be easy to develop nor can it be developed in a short period of time. A workforce model that provides the appropriate strategies to improve the long-term sustainability of veterinary practices will require a considered and sustained effort, with participation from every veterinarian in the profession.

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