



2016 AVMA Report on
**VETERINARY
MARKETS**



AVMATM

*Veterinary
Economics*



2016 AVMA Report on **VETERINARY MARKETS**

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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

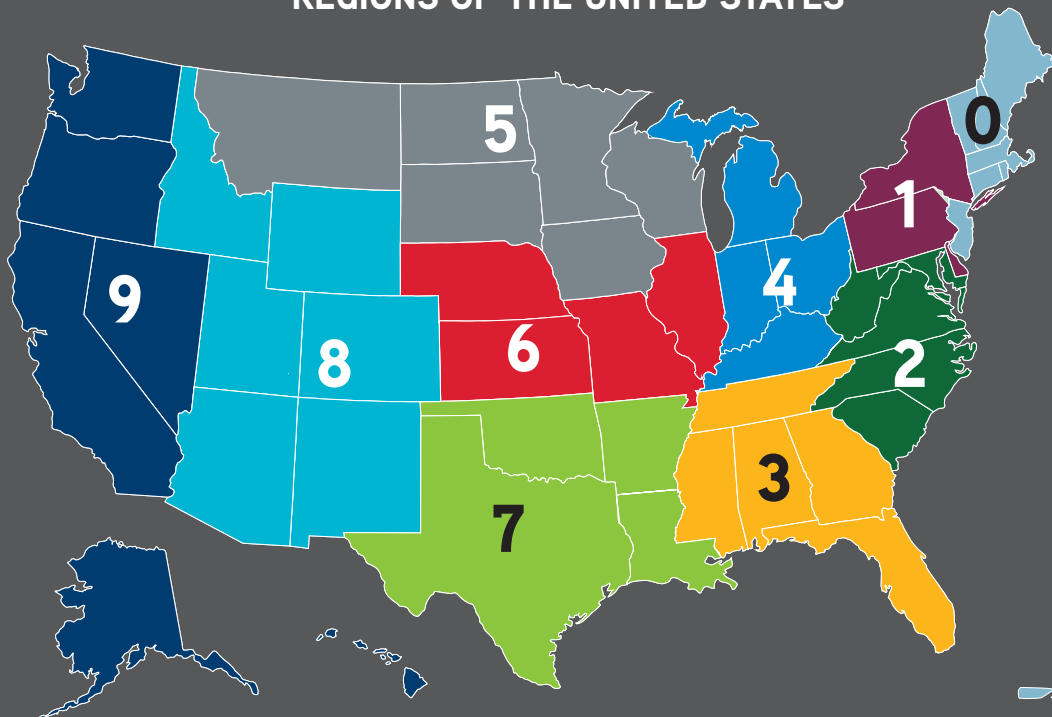


Figure 1



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 29,901¹ as well as a lower-end estimate of 25,000², on average, each veterinary hospital produces veterinary services worth an average of roughly \$751,145 to \$898,400. The average number of veterinary FTE's per practice is roughly 1.9 (total number of veterinarians per practice is higher) suggesting an average revenue per veterinary FTE of \$395,340 to \$472,842 and an average income per FTE of \$79,068 to \$94,568.

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

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

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

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

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

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

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

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

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

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

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



BUSINESS CYCLE

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

Historically, the average period of contraction has been 11 months and the average period of expansion has been 61 months

for an average length of cycle (peak to peak) of 72 months. The last recession began in December of 2007 and ended in June of 2009 (18 months), making this the longest recessionary period in the last 10 business cycles. The current expansion period has reached 79 months (as of January 2016), well above the 61 month average period of expansion but still well below the expansion period of recent economic expansions.

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

LENGTH OF THE U.S. BUSINESS CYCLES

Recession Periods	Peak to Trough	Previous Trough to this Peak
July 1953 - May 1954	10	45
August 1957 - April 1958	8	39
April 1960 - February 1961	10	24
December 1969 - November 1970	11	106
November 1973 - March 1975	16	36
January 1980 - July 1980	6	58
July 1981 - November 1982	16	12
July 1990 - March 1991	8	92
March 2001 - November 2001	8	120
December 2007 - June 2009	18	79
Average, 1953-2009 (10 cycles)	11	61

Source: National Bureau of Economic Research

Table 3

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

The business cycle can be described simply as the build-up and draw-down of inventories. At the bottom of a recession businesses have more excess capacity than optimum. They may

have laid-off employees or reduced employee hours in an attempt to reduce production until accumulated inventories are drawn down. As inventories are reduced such that production plus inventories can no longer meet demand the business must begin to increase production. The increased production will require increased work hours or an increased number of employees and reducing the amount of excess production capacity of the firm. The increasing number of employees and hours worked stimulates the demand for more products and the business must increase production again. During this economic expansion, firms work to fill orders, increasing economic activity. Eventually, consumers have all the new durable goods they need and inventories start to accumulate sending a signal to businesses to begin to cut back production and a new economic contraction occurs. This business cycle is highly dependent on the demand for durable goods and the amount of inventories of these goods relative to that demand.

LEADING ECONOMIC INDEX

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

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

The Leading Economic Index (LEI) incorporates the data from 10 different economic data time series that have been demonstrated to have peaked or bottomed in advance of economic expansions or contractions. Each of the 10 economic series is weighted

based on its relative predictive strength to produce the index of indicators. The conference board produces a monthly value for the LEI and reports this normally on the third Thursday of every month.

The chart below shows the LEI for the most recent 15-year period, with the gray vertical bars indicating periods of recession. The most recent recession began in December of 2007 and ended June of 2009. The LEI peaked in March of 2006 and thus the decline in the LEI began 21 months prior to the last recession. The LEI continued to advance through November to 124.6, just shy of the peak before the last recession. The continued rise through November would indicate that the economy is likely to continue to expand well into 2016 but also that the probability of a recession is beginning to increase with each passing month as the LEI reaches a new all-time level and the length of the current expansion is well past the historic average.

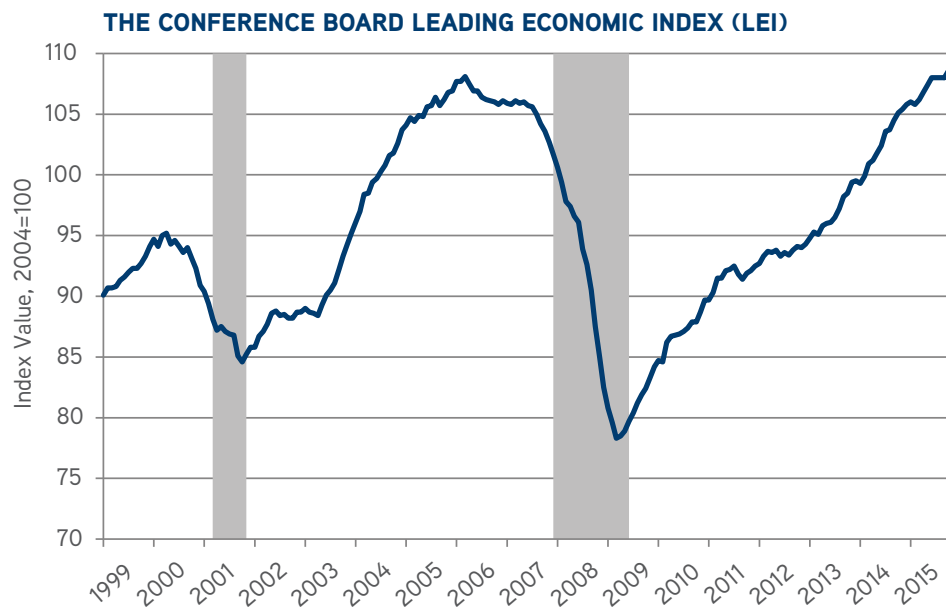


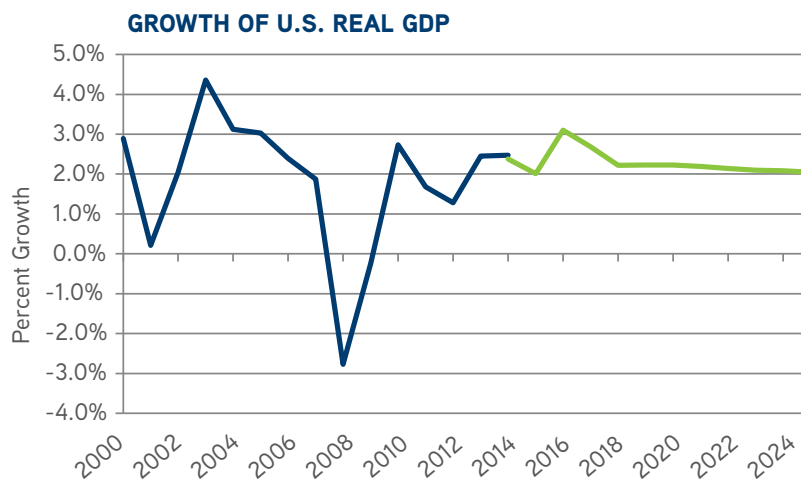
Figure 2

MACROECONOMIC FORECAST

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

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

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



Source: Congressional Budget Office; Bureau of Economic Analysis

Figure 3

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

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

REAL AND POTENTIAL U.S. GDP IN 2009 DOLLARS

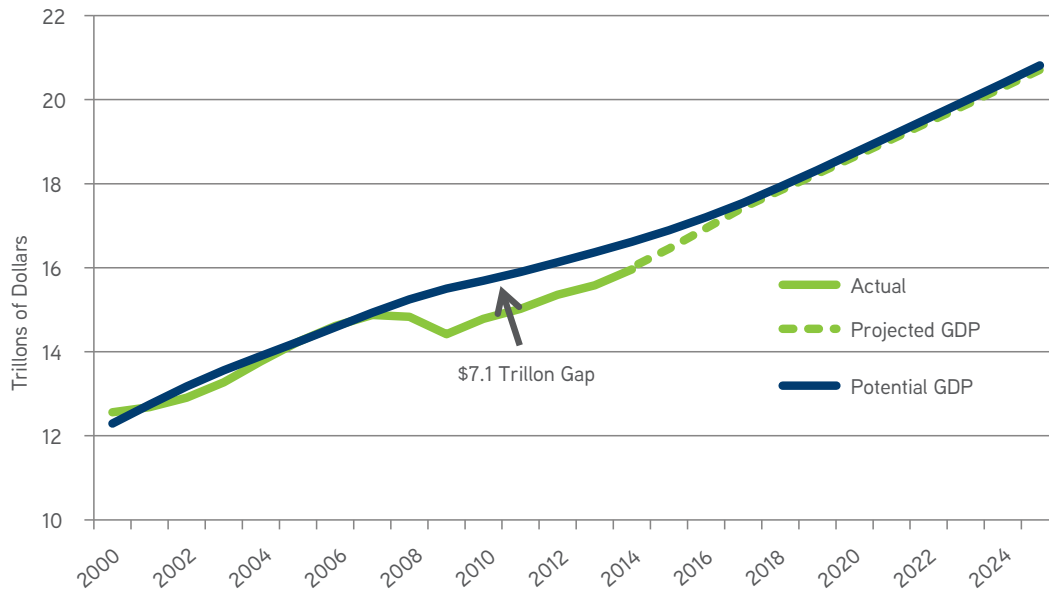


Figure 4

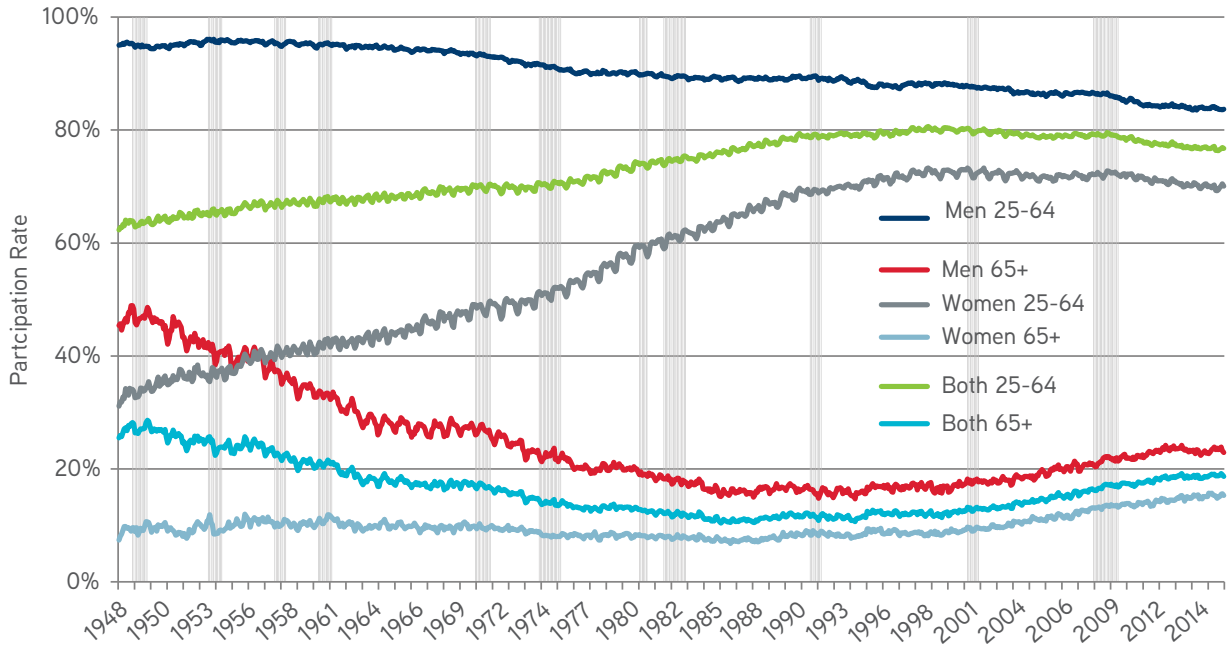
The slower growth rate in GDP and the length of time to close the gap between the actual and potential GDP may be due to the changing demographics of the workforce. While baby boomers are working longer, the millennials are joining the workforce later. These are the two largest components of the population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

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

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

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

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



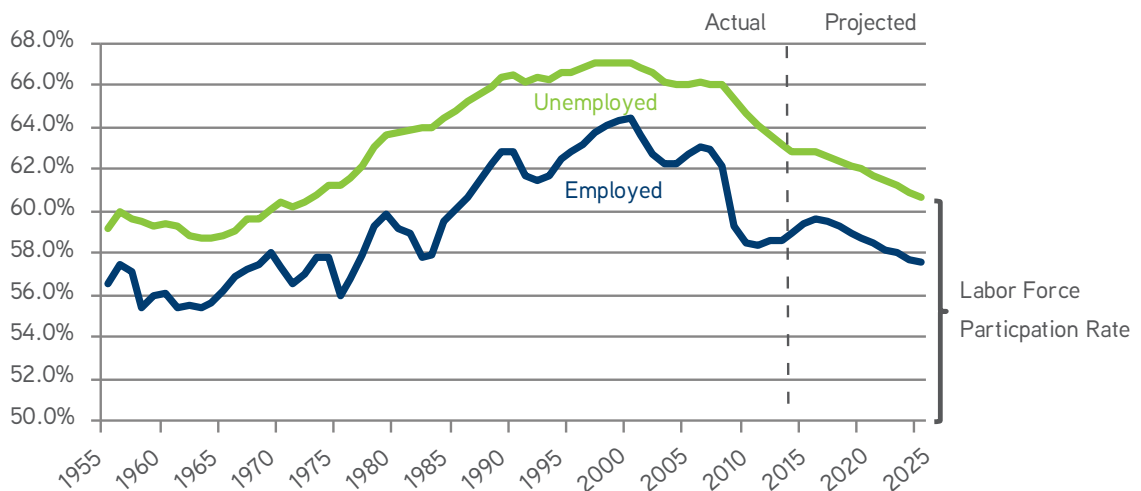
Source: Bureau of Labor Statistics

Figure 5

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

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

U.S. LABOR FORCE EMPLOYMENT AND UNEMPLOYMENT



Sources: Congressional Budget Office; Bureau of Economic Analysis.

Figure 6

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

From the information presented we can conclude that:

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

GROSS DOMESTIC PRODUCT AND STARTING SALARIES

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

In the first step, we use regression analysis on a repeated cross-sectional data comprised of 15 years' worth of DVM graduates. This regression explains the variation in income (starting salaries) as determined by the variation in the explanatory variables of year, practice type, hours worked per week, gender, region and DVM debt. The resulting coefficients from this estimation are then used to estimate a time series of real weighted income, one for each of the 15 years of observations.

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

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

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

At current GDP, when the market is in equilibrium, we estimate the mean 2015 starting salary is \$72,229. If the market were to return to potential GDP, we estimate that the mean 2015 starting salary would be \$73,774. Consequently, GDP not only affects demand for veterinary services as stated above, but this in turn increases the number of new veterinarians able to find employment and thus increases mean starting salaries. According to our model, a 3.3 percent increase in GDP, from current to potential, would result in a 2.1 percent increase in the mean starting salary, based on the projected number of graduates.





MARKET FOR VETERINARY EDUCATION



The ability to provide veterinary services begins in the market for veterinary education, the source of labor in the veterinary markets supply chain. The supply begins with the applicants who apply for the available veterinary medical college seats.

Data on applicants is obtained from the Association of American Veterinary Medical Colleges (AAVMC) Veterinary Medical College Application Service (VMCAS) and information provided to AAVMC by member colleges. As a result our data are limited to U.S. resident applicants and the information available from the 30 U.S. veterinary colleges and the 19 International, U.S. accredited colleges.

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

SUPPLY OF VETERINARY EDUCATION

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

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

CHANGE IN TUITION, 1999 TO 2015

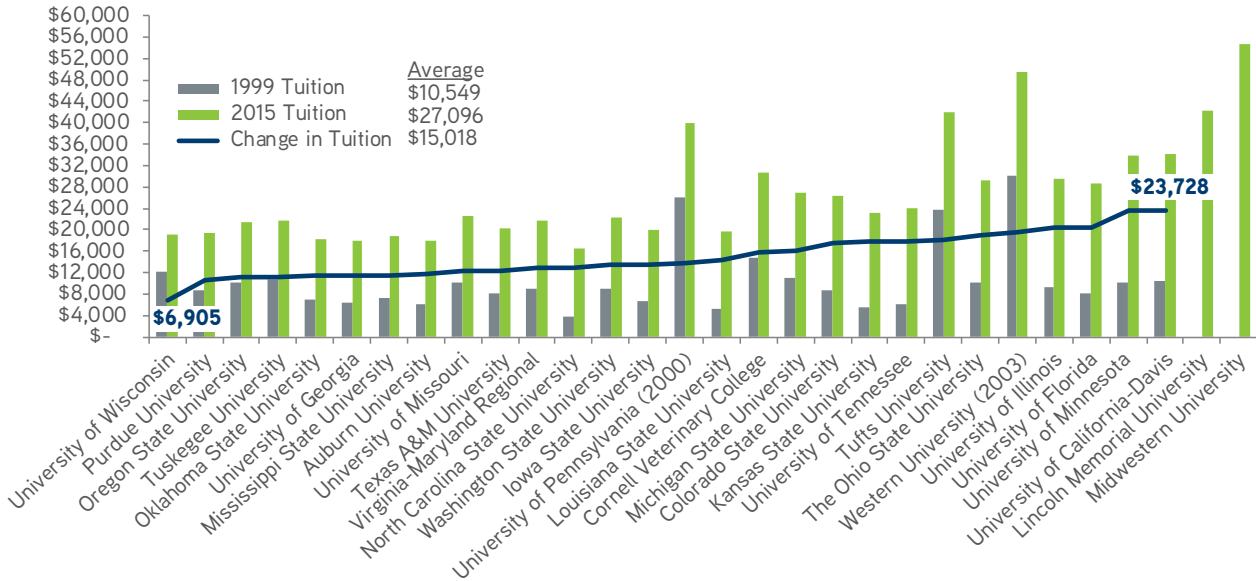
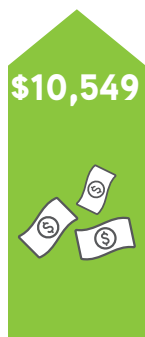
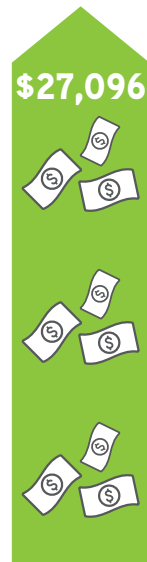


Figure 7

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



1999



2015



SUPPLY OF U.S. ACCREDITED DOMESTIC SCHOOLS

The supply curve for veterinary education is the cost of each seat provided. In the 2014-15 school year, there were 3,219 seats at the U.S. veterinary medical colleges, with 1,798 resident, 1,226 non-resident and 195 contract seats. However, not all resident seats are “discounted” (tuition and fees reduced for residents). There were 1,881 discounted seats and 1,338 non-discounted seats. The total four-year tuition and fees of the 30 U.S. schools for 1999 and 2015 are provided in the previous figure.

In 2015 there were 2,921 graduates of the 30 U.S. veterinary medical colleges. A survey of these graduates in the spring of 2015 by the American Veterinary Medical Association (AVMA) garnered 2,608 responses (a 92.7 percent response rate). The

basis for a supply curve is the production function. How many units of veterinary education (seats) can be provided given the resources (structures, equipment, faculty)? The number of seats is the quantity of output the veterinary colleges are willing to provide, and the tuition and fees represent the price at which they are willing to offer those seats.

The four-year cost of each seat (tuition and fees) is reported for U.S. colleges of veterinary medicine for the 2015 graduates. The four-year cost is an estimate and likely over-estimates the actual price that the students actually pay for each seat. While the colleges report the number of resident and non-resident students each year, they don’t report the actual price paid for each seat.

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

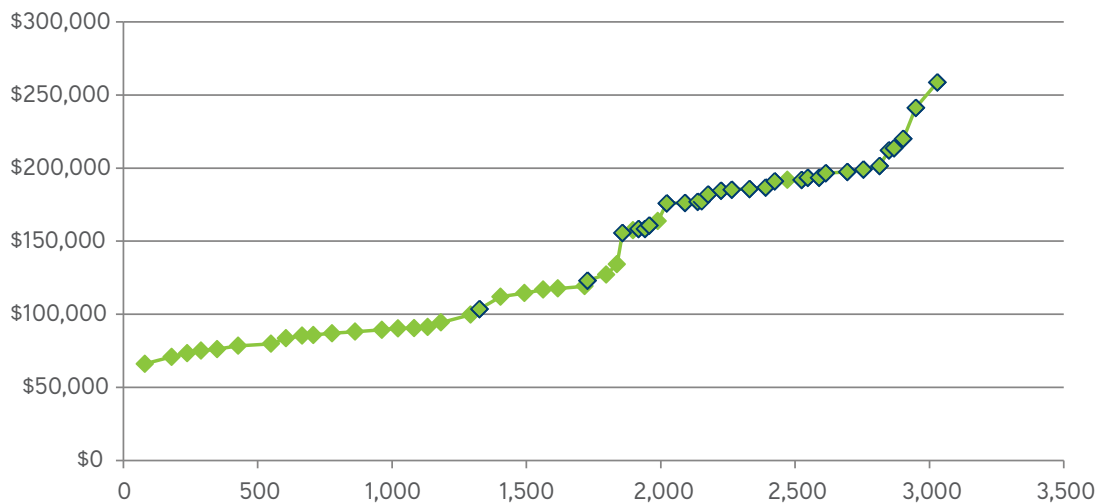


Figure 8

While data for the number of seats available for U.S. residents at veterinary colleges outside the United States have not been collected in the past, we do have an estimate of the number of total graduates from all U.S. accredited veterinary colleges and all other non-U.S. accredited veterinary colleges. The number of students passing the North American Veterinary Licensing Exam (NAVLE) provides some indication of the number of seats available for U.S. students both domestically and internationally.

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

IN THE 2014-15 SCHOOL YEAR, THERE WERE 3,219 SEATS AT THE U.S. VETERINARY MEDICAL COLLEGES, WITH 1,798 RESIDENT, 1,226 NON-RESIDENT AND 195 CONTRACT SEATS.

NUMBER OF TEST-TAKERS PASSING NAVLE

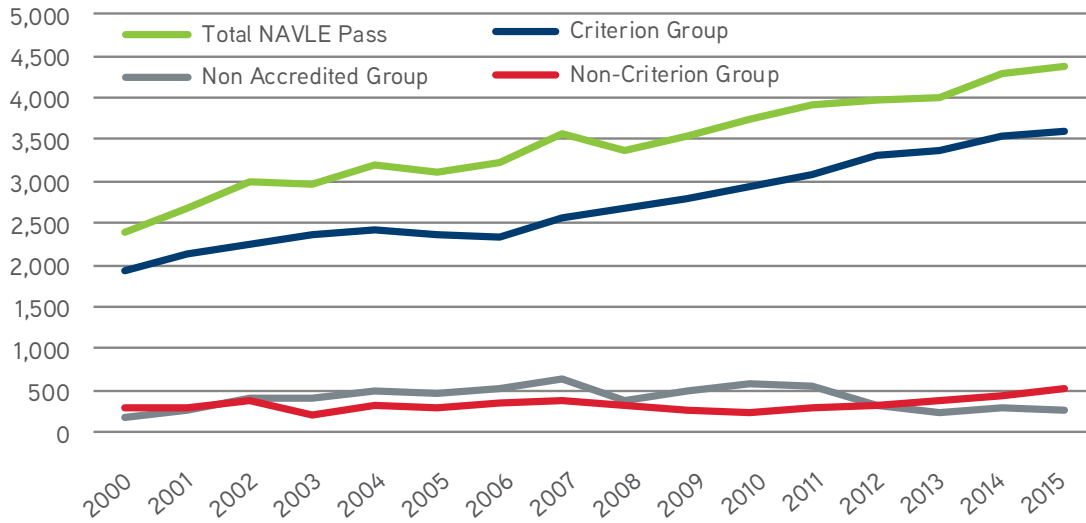


Figure 9

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

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

2015 RESIDENT TUITION, & FEES AND LIVING EXPENSES

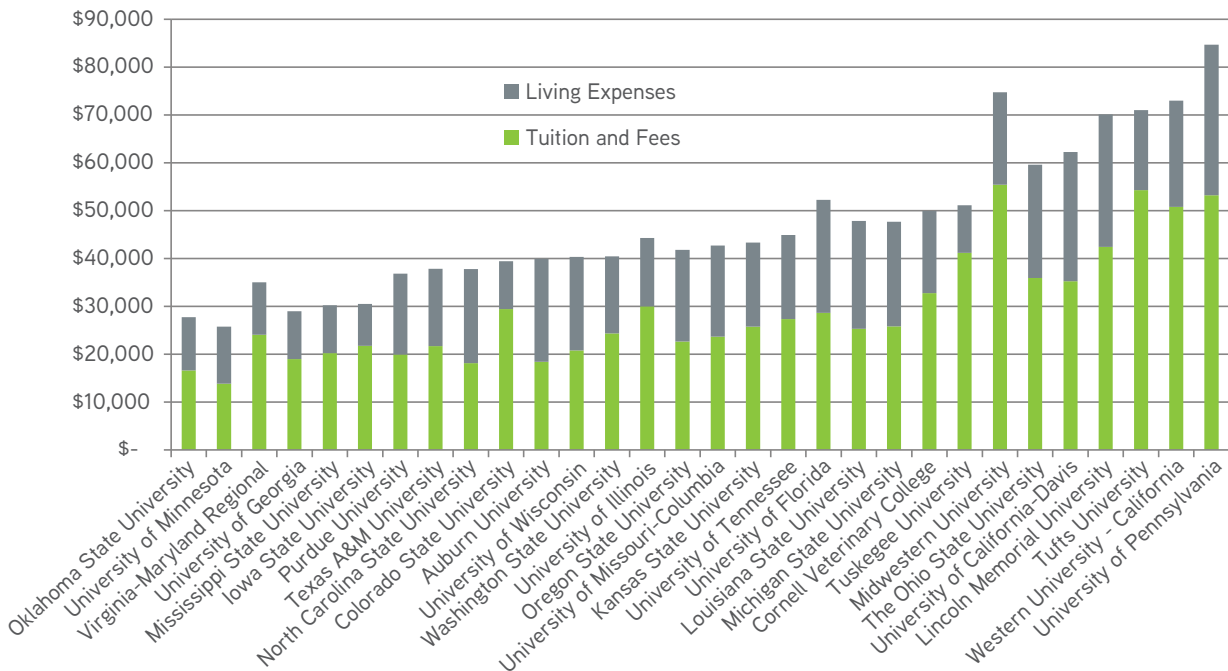


Figure 10

The mean value of living expenses for four years across all U.S. veterinary colleges was \$66,671 for the 2015 graduates, or \$16,668 per year. Some students may have more than this due to health issues, family emergencies, interest expenses on borrowed funds, expenses for pets or other animals, and other personal

needs. The mean discounted tuition paid by 2015 graduates (based on rates provided by each school) was \$103,327, and \$191,710 for non-discounted seats. Thus, the mean value of total costs was \$170,008 for discounted seats, and \$258,381 for non-discounted seats.

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

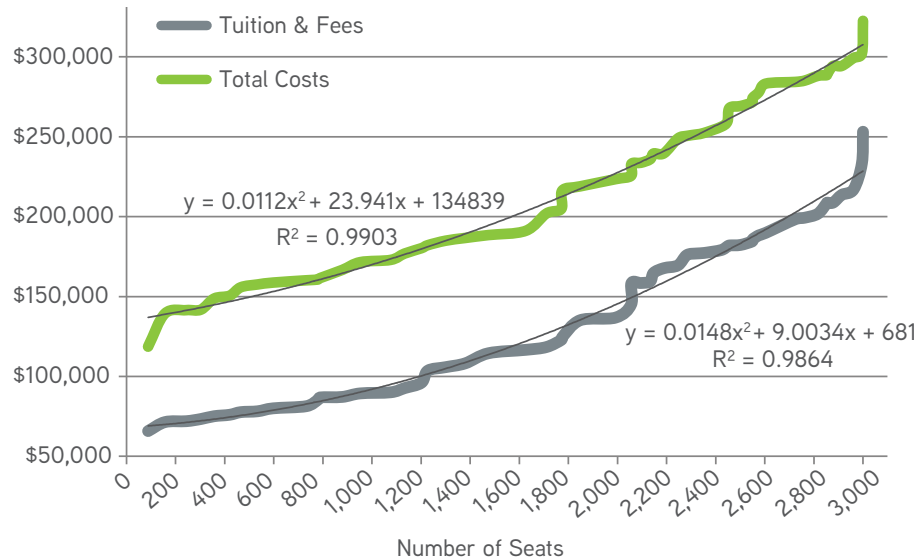
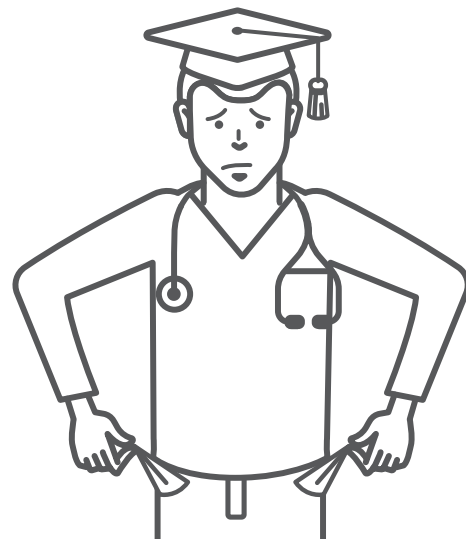


Figure 11

Mean debt acquired while in veterinary college reported by the 2015 graduates was \$141,000, with a range of \$0 (11.2 percent) to greater than \$300,000 (10 percent). Overlaying the debt reported by the 2015 graduates with the four-year cost of tuition and fees, and then total costs with living expenses added, would indicate that the students are generally managing their finances within reason and providing some level of contribution to offset

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

MEAN DEBT ACQUIRED WHILE IN VETERINARY COLLEGE REPORTED BY THE 2015 GRADUATES WAS \$141,000, WITH A RANGE OF \$0 (11.2%) TO GREATER THAN \$300,000 (10%). OVERLAYING THE DEBT REPORTED BY THE 2015 GRADUATES WITH THE FOUR YEAR COST OF TUITION AND FEES, AND THEN TOTAL COSTS WITH LIVING EXPENSES ADDED, WOULD INDICATE THAT THE STUDENTS ARE GENERALLY MANAGING THEIR FINANCES WITHIN REASON.



SUPPLY OF EDUCATION AND DVM DEBT, 2015

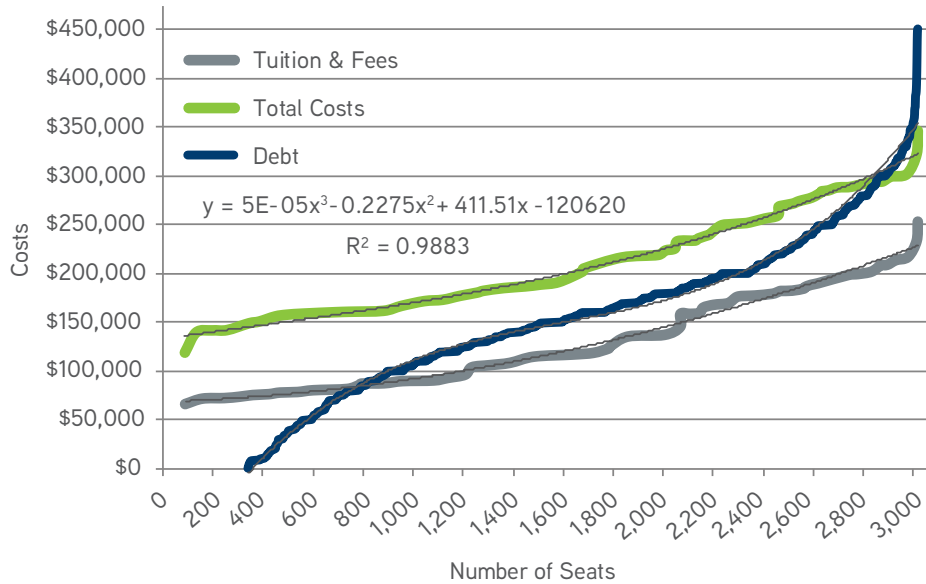


Figure 12

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

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

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

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

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

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

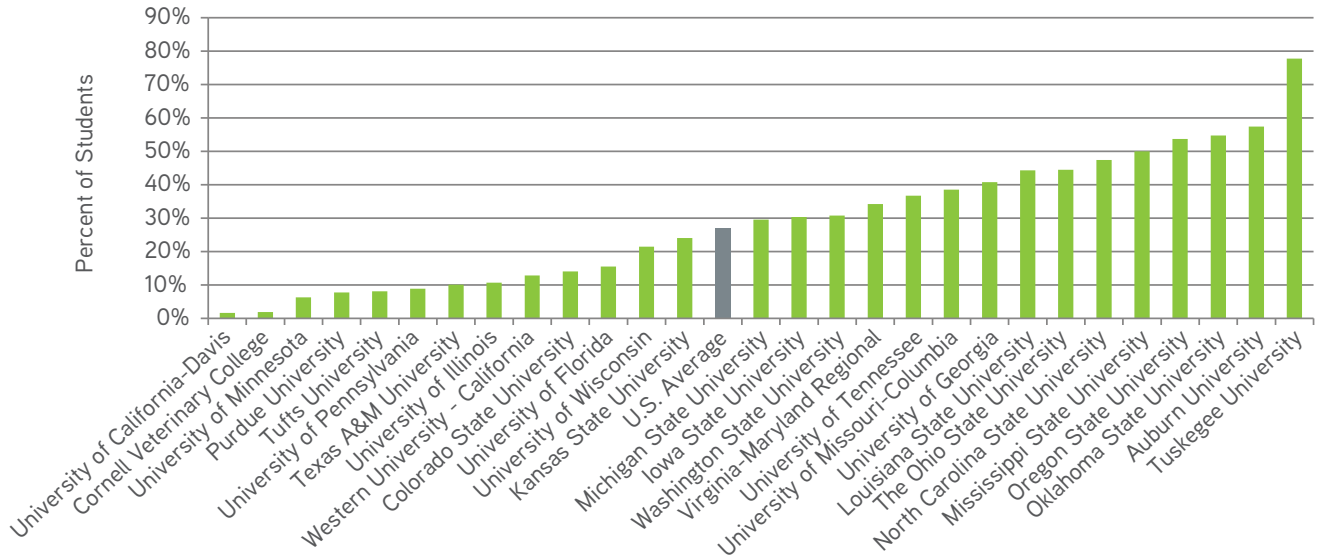


Figure 13

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

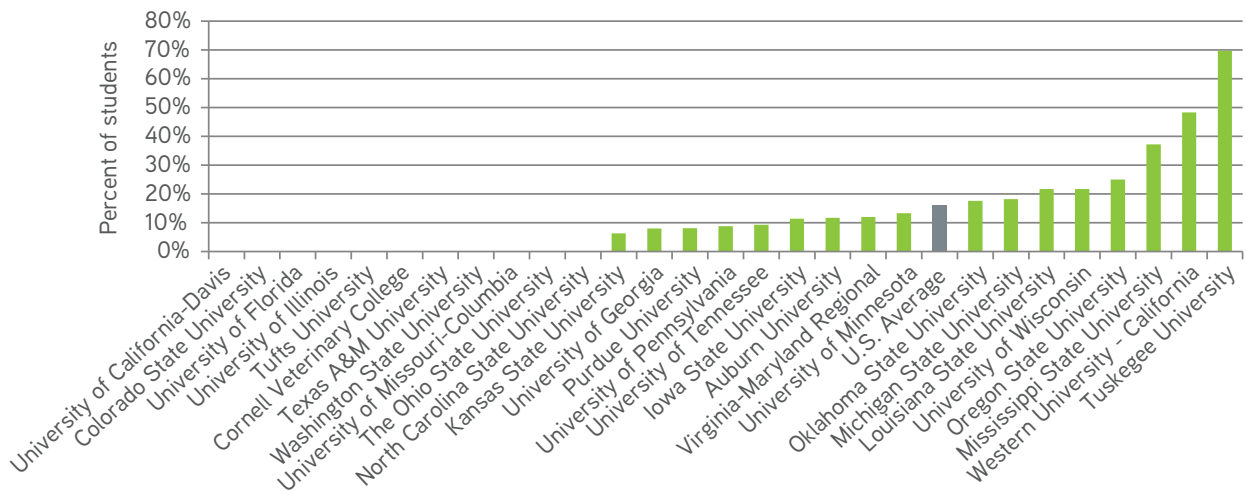


Figure 14

DEMAND FOR VETERINARY EDUCATION

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

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

TOTAL APPLICANTS OVER TIME

The number of applicants for veterinary colleges that have been recorded through the VMCAS has been cyclical over the last three decades, with peaks near 7,000 applicants in 1980, 1999 and 2014 and troughs around 4,000 in 1990 and 2002. This is illustrated in the accompanying chart. If this cycle continues into

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

AAVMC VETERINARY SCHOOL APPLICANT FIGURES



Figure 15

More important than the total number of applicants is the number of applicants per available seat. Here again, even with the expansion of the number of schools and the number of seats at each school, the number of applicants per seat is cyclical. The peaks in this cycle have been declining over time, while the bottom of the cycle has been roughly constant. The current ratio of total applicants to the number of seats at the 30 U.S. colleges is roughly 2.25:1. But if the seats available to U.S. students at both domestic and international U.S. accredited schools are considered, that ratio drops to 1.56:1. If the cycle in applicants follows past trends and the number of applicants drops into the range of 4,000, the number of available seats will exceed the applicants. Further exacerbating this potential situation is the fact that not all applicants meet the current eligibility requirements for veterinary school. Those requirements are necessary to ensure a

sufficient NAVLE pass rate which ultimately allows the veterinary college to continue to receive accreditation. As a result of these factors, colleges with the higher-priced seats may find it difficult to fill those seats in the near term, and the competition for quality students amongst schools may increase to such a degree that non-resident tuition and fees may be reduced or eliminated and new sources or means to reduce tuition and fees may be offered.

The difficulty of filling seats with quality applicants may increase if new seats are added. As the cost of education continues to climb, and as college students become increasingly knowledgeable of the financial hardships associated with the profession's high debt-to-income ratio, this applicant-to-seat ratio is forecast to decline even with a constant number of available seats through 2025.

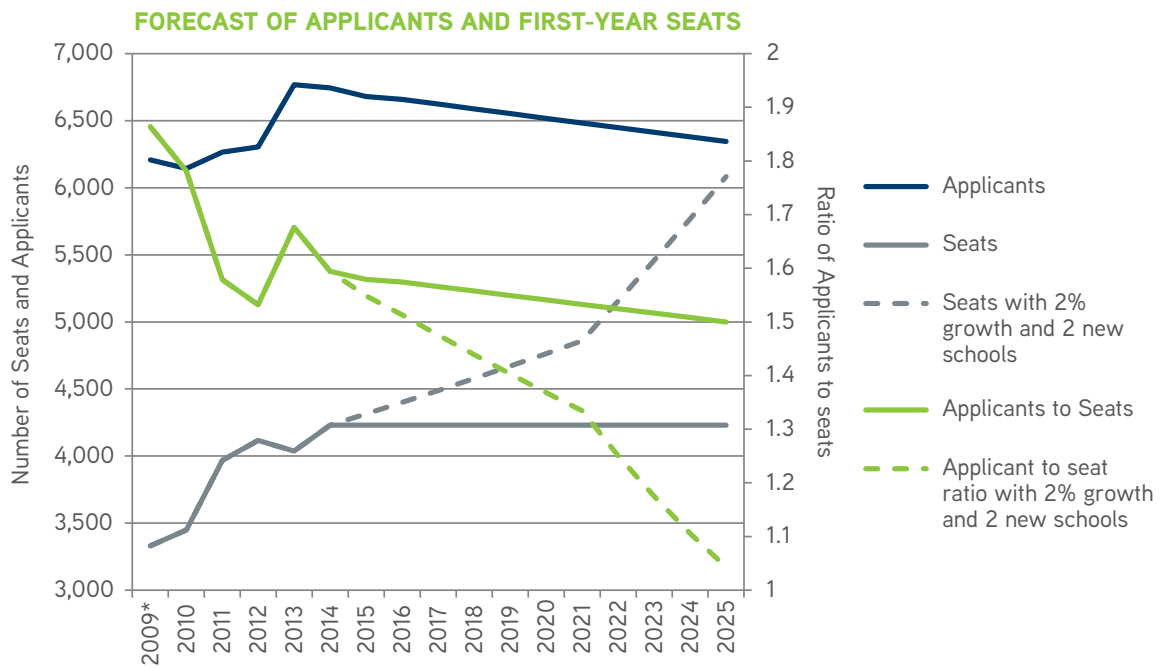


Figure 16

However, if the rate of increase in the number of seats at existing schools continues the long-term trend and two new schools are added, then the combination of new seats and declining applicants will bring the applicant-to-seat ratio to an estimated 1.04:1 by 2025. While this is likely to be a worst-case scenario, the competitive environment among veterinary schools is currently increasing from highly competitive to extremely competitive; veterinary schools will in the near term have to compete for students. With the addition of even more seats, the market for veterinary education would become a buyer's market, meaning that each applicant (the buyers in this case) would face less competition for seats at veterinary colleges (the sellers in this case).

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

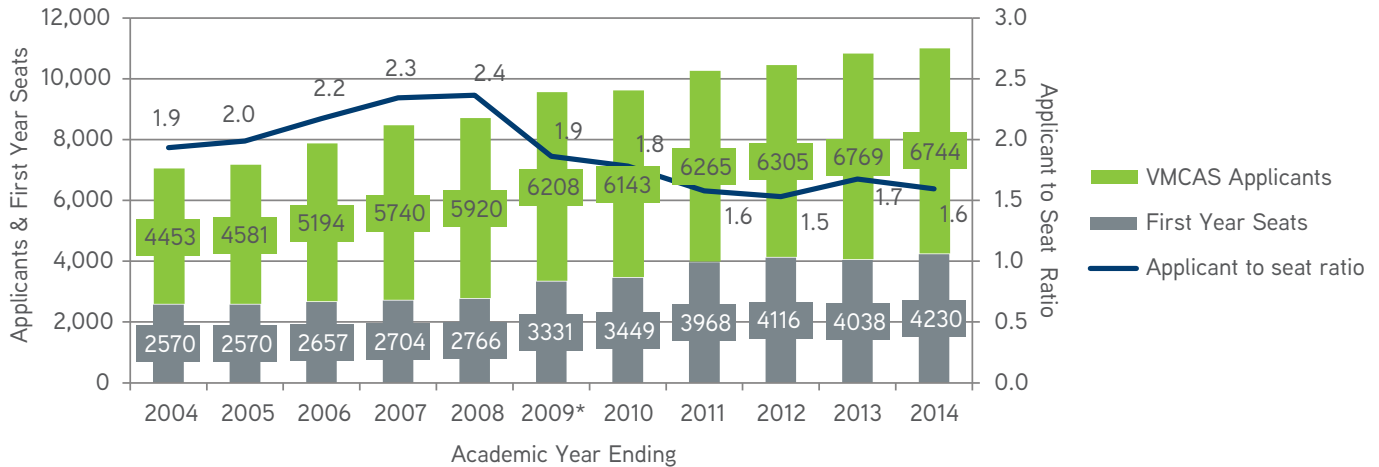
the number of applicants decreases, and recent analysis has shown that this threshold may be declining. Those schools whose total costs fall in the top 20th percentile are currently above that threshold. Thus, the addition of new seats that cost more than the threshold in this increasingly competitive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

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



WITH THE ADDITION OF EVEN MORE SEATS, THE MARKET FOR VETERINARY EDUCATION WOULD BECOME A BUYER'S MARKET, MEANING THAT EACH APPLICANT (THE BUYERS IN THIS CASE) WOULD FACE LESS COMPETITION FOR SEATS AT VETERINARY COLLEGES (THE SELLERS IN THIS CASE).

VMCAS APPLICANTS AND FIRST-YEAR SEATS



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

Figure 17

WILLINGNESS TO PAY

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

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

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

APPLICANT DEMAND FOR VETERINARY EDUCATION

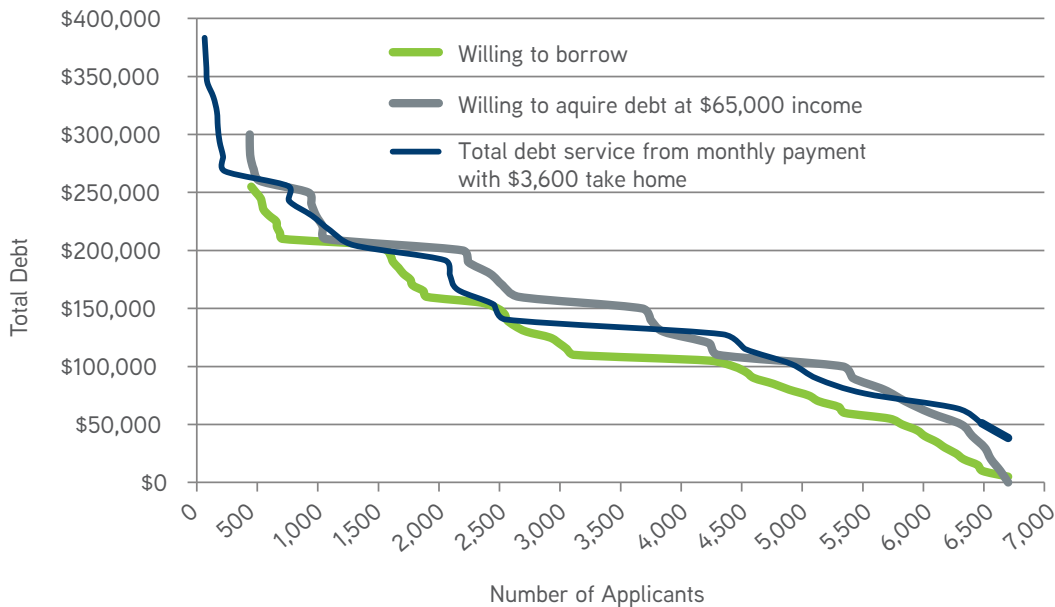


Figure 18

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

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

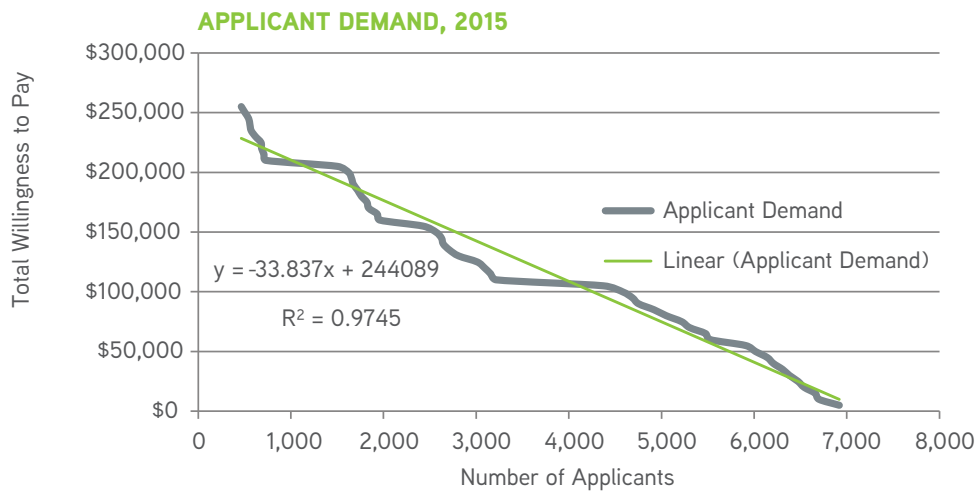


Figure 19

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

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

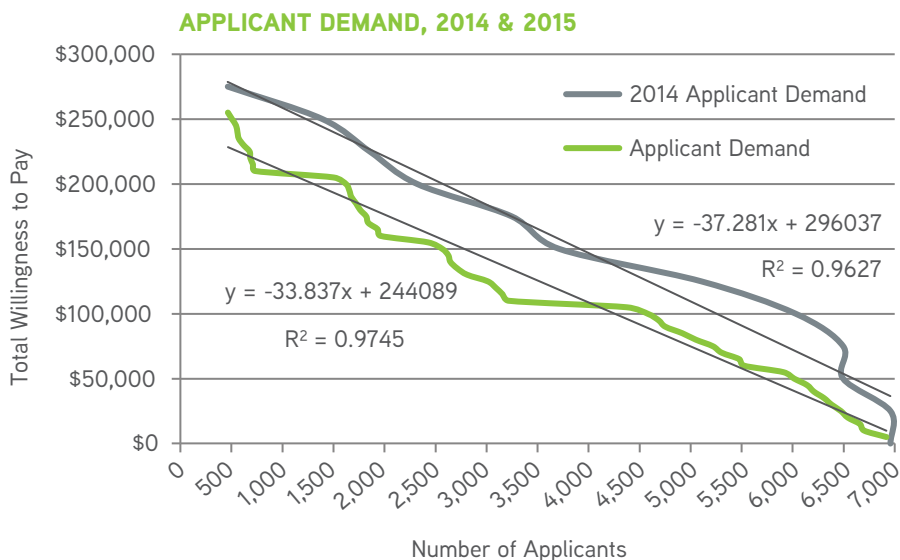


Figure 20

EQUILIBRIUM IN THE VETERINARY EDUCATION MARKET

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

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

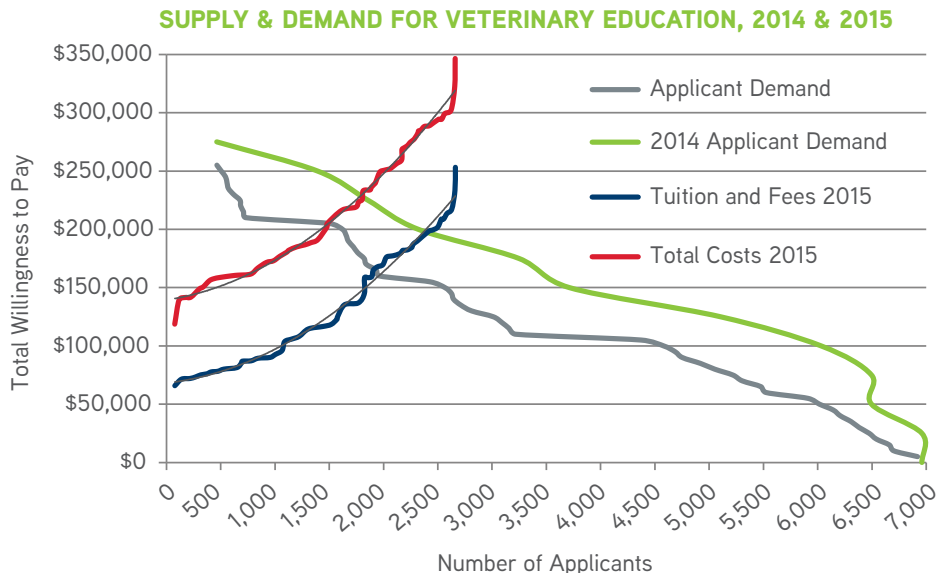


Figure 21

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

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

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

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

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

**2015 APPLICANT ESTIMATES OF CURRENT
AVERAGE DEBT LOAD FOR 2014 GRADUATES**

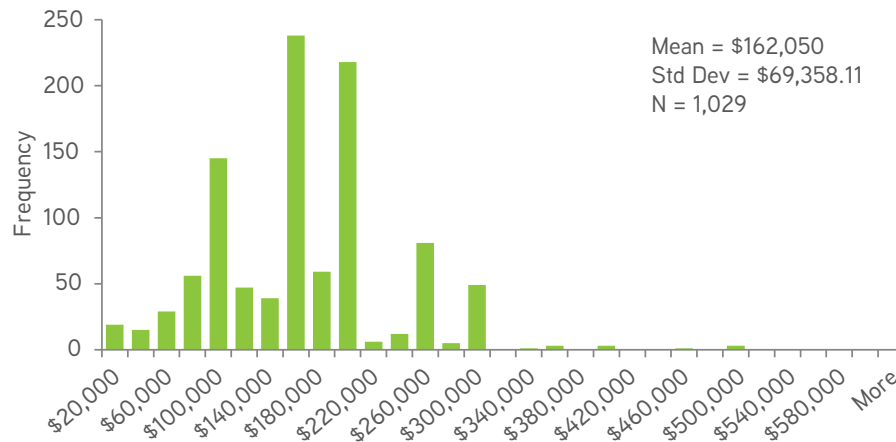


Figure 22

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

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

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

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

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



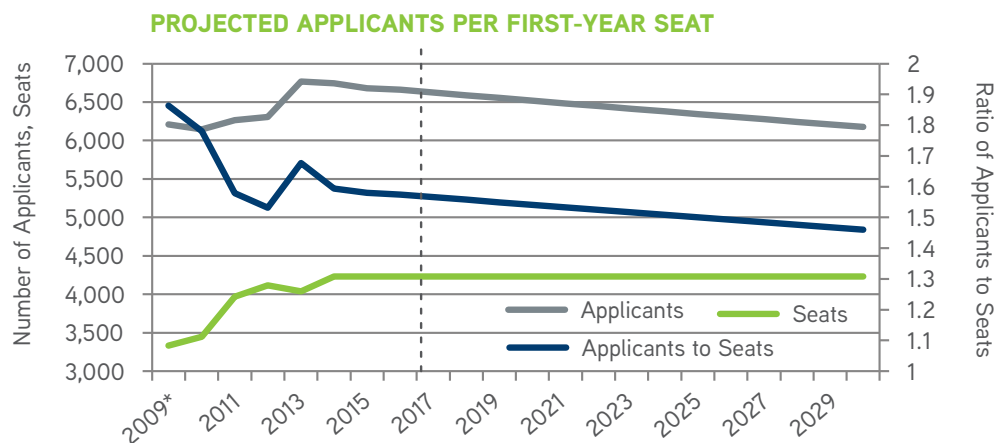


Figure 23

MAJOR FINDINGS

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

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

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

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

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



MARKET FOR VETERINARIANS



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

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

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

VETERINARY POPULATION, 2015

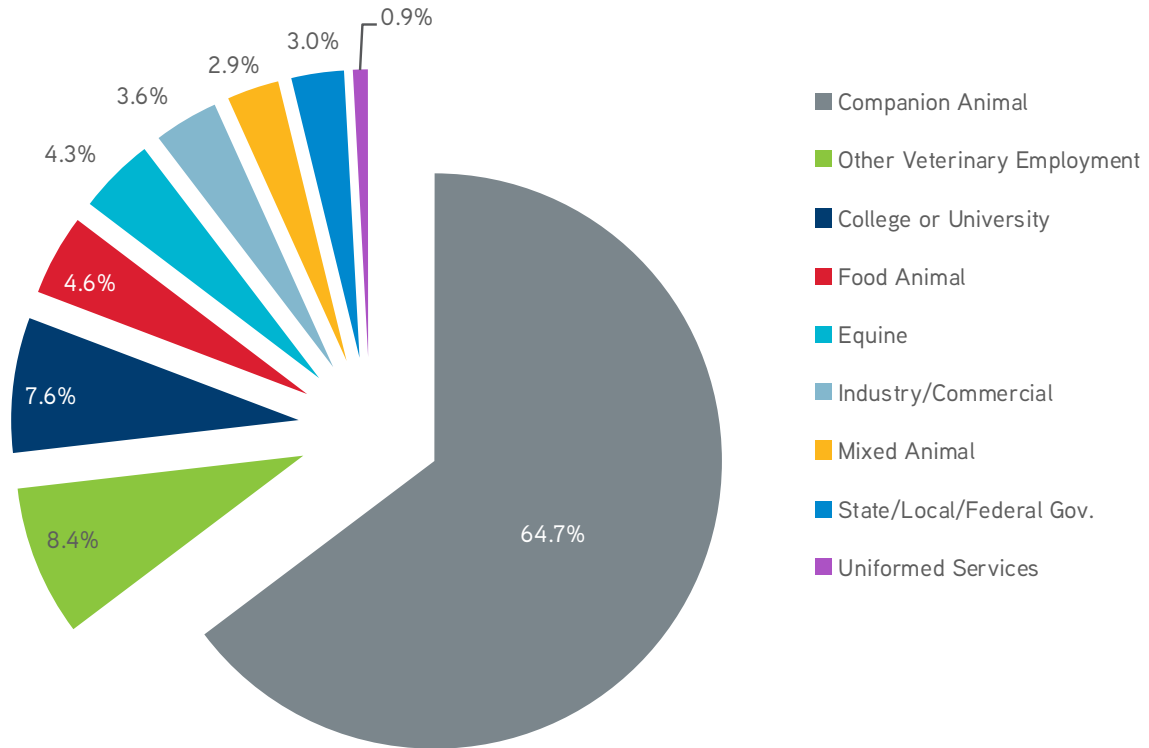


Figure 24



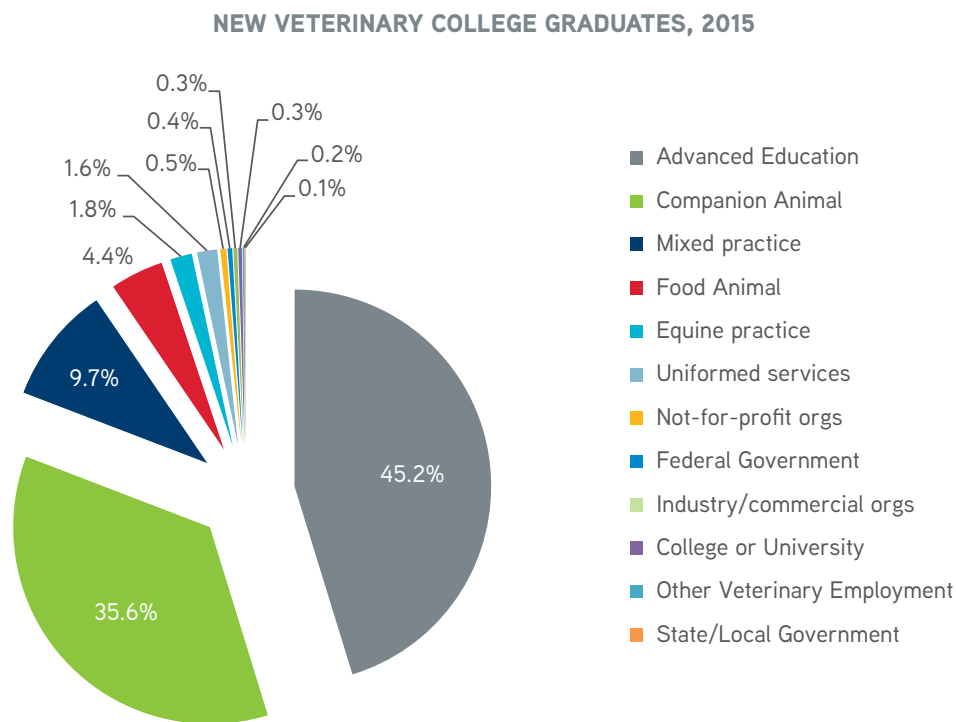
NEW VETERINARIANS

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

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

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

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



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

Figure 25



SUPPLY OF NEW VETERINARIANS

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

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

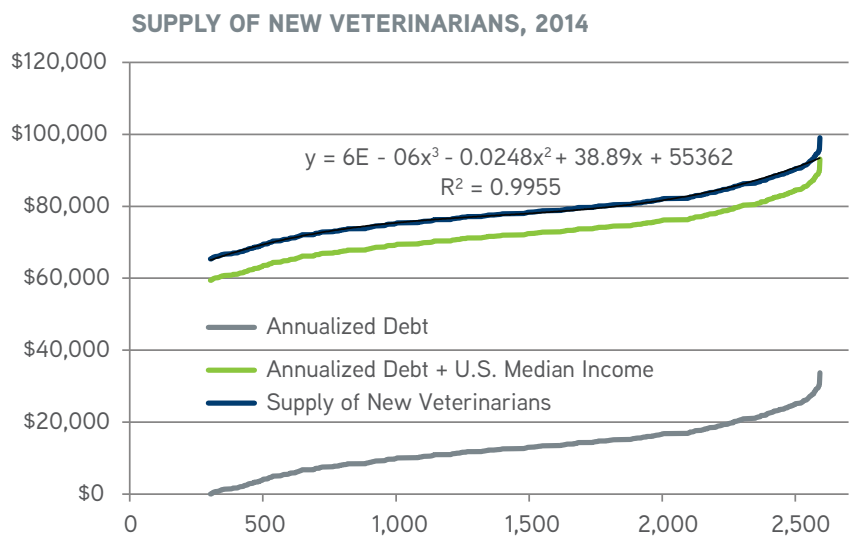


Figure 26

DEMAND FOR NEW VETERINARIANS

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

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

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

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

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

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

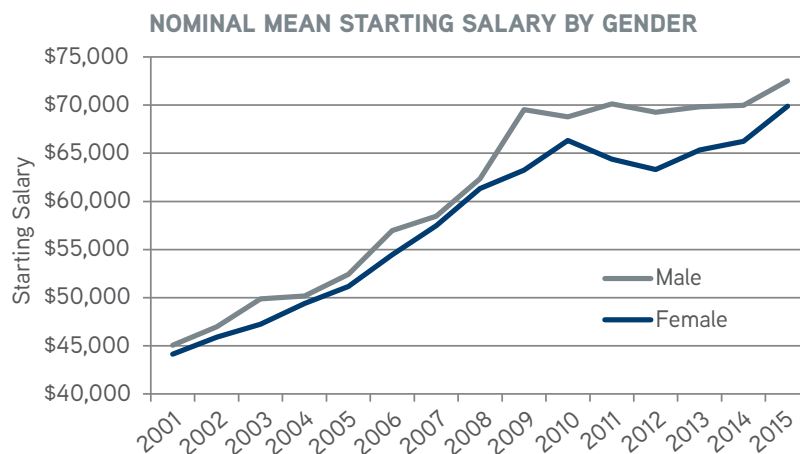


Figure 27

INDEXED REAL WEIGHTED MEAN INCOME (RWI)

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

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

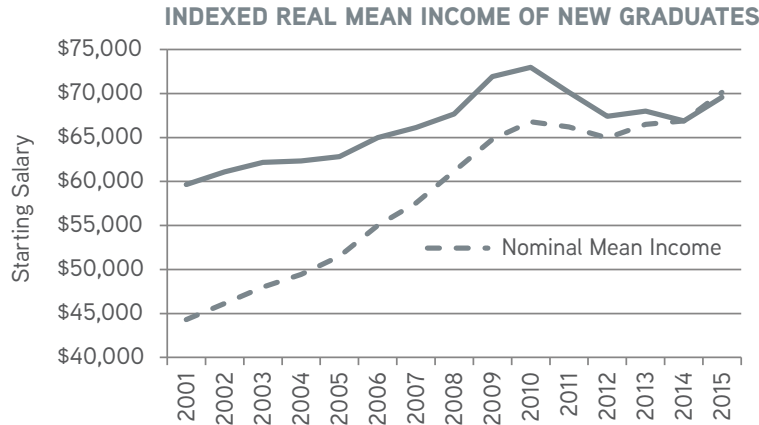


Figure 28

NOMINAL MEAN DEBT BY GENDER

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

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

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

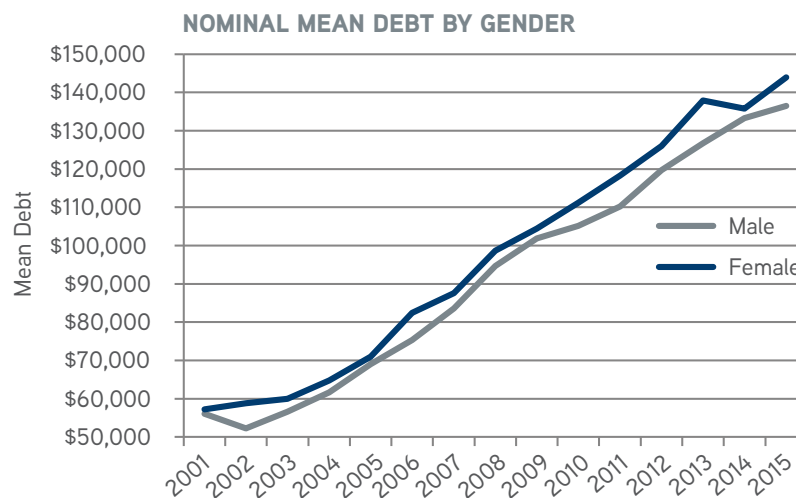


Figure 29

DEBT AND INCOME OF NEW GRADUATES

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

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

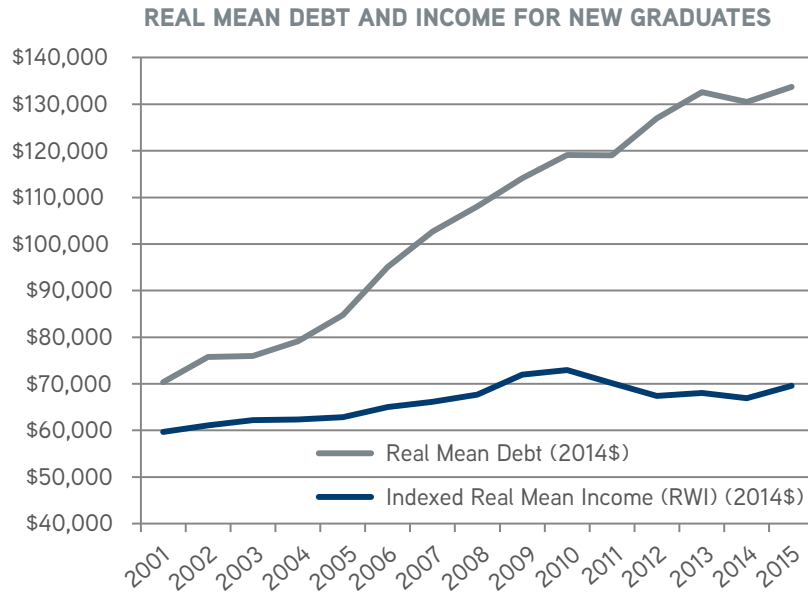


Figure 30

REAL DEBT-TO-INCOME RATIO

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

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

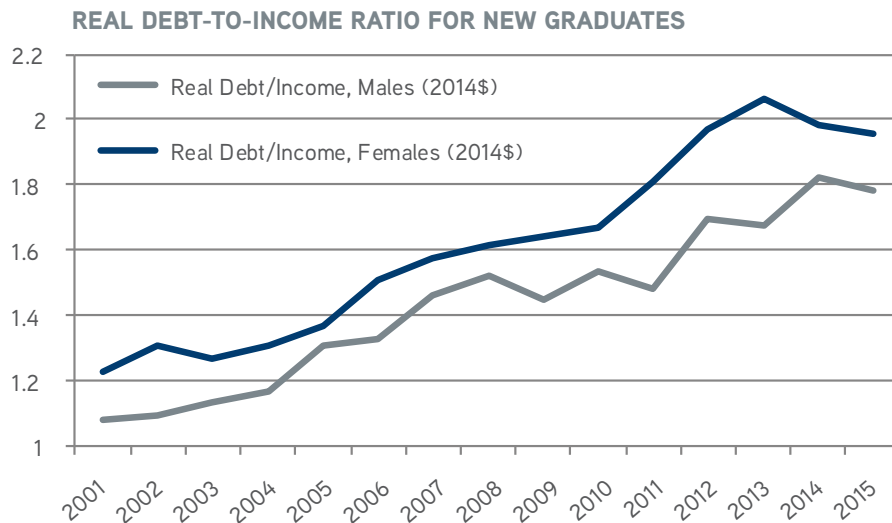


Figure 31

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

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

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

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

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

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

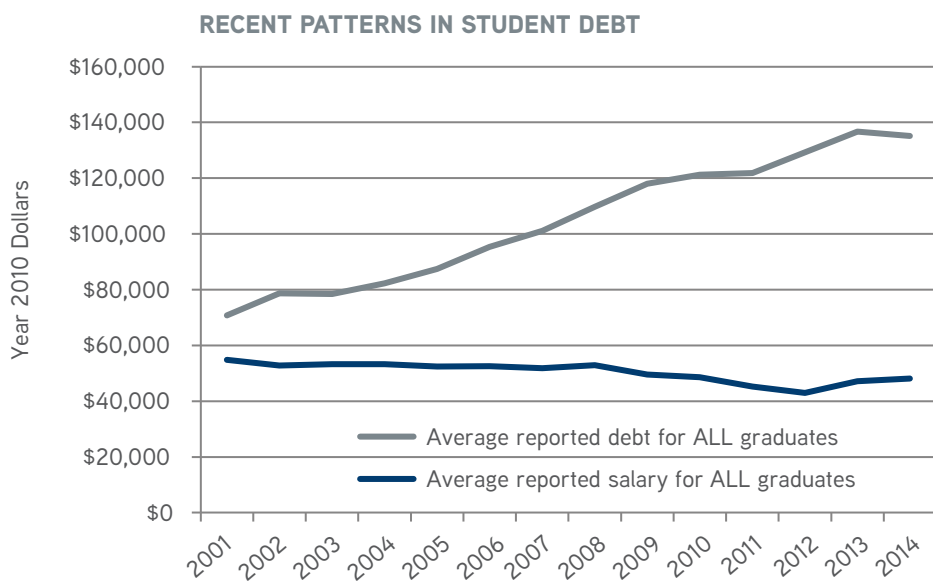


Figure 32

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

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

INTERNSHIPS AS A PERCENT OF TOTAL GRADUATES

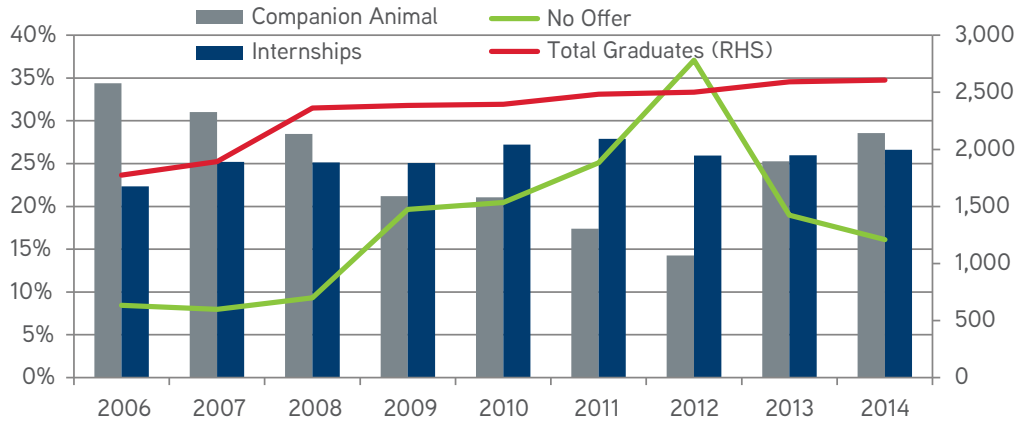


Figure 33

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

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

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

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

INTERNSHIPS RISE AS COMPANION ANIMAL JOBS DECLINE

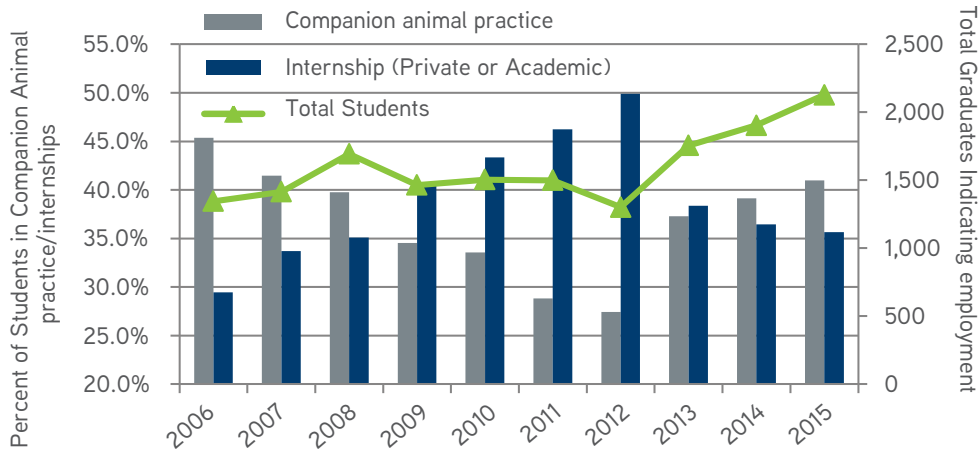


Figure 34

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

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

NUMBER AND STARTING SALARY FOR NEW GRADUATES

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

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



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

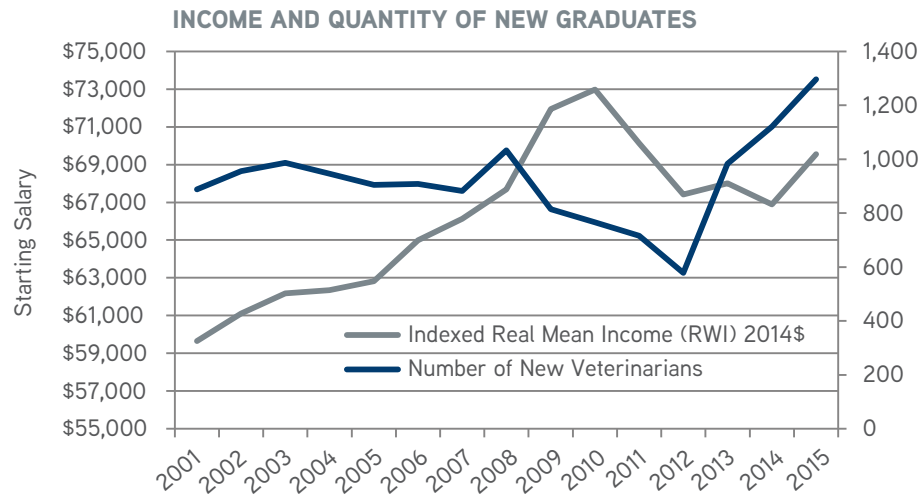


Figure 35

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

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

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

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

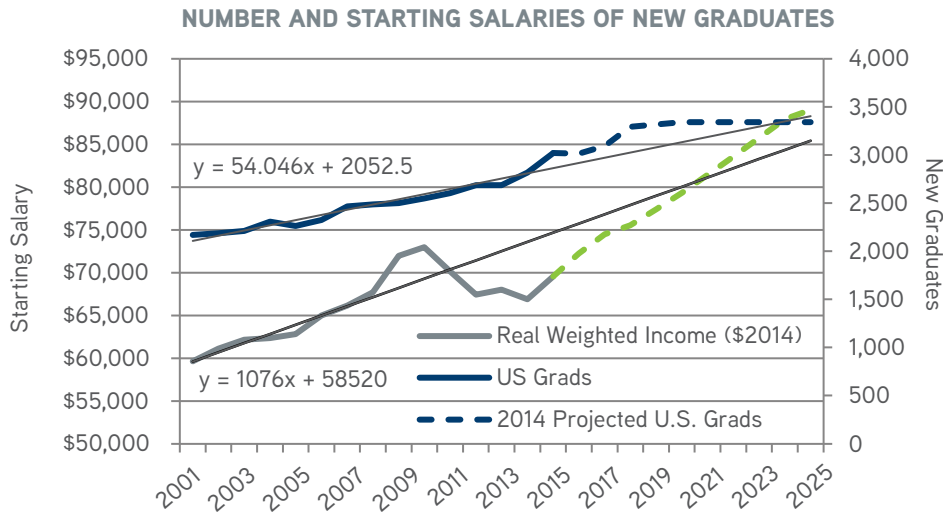


Figure 36

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

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

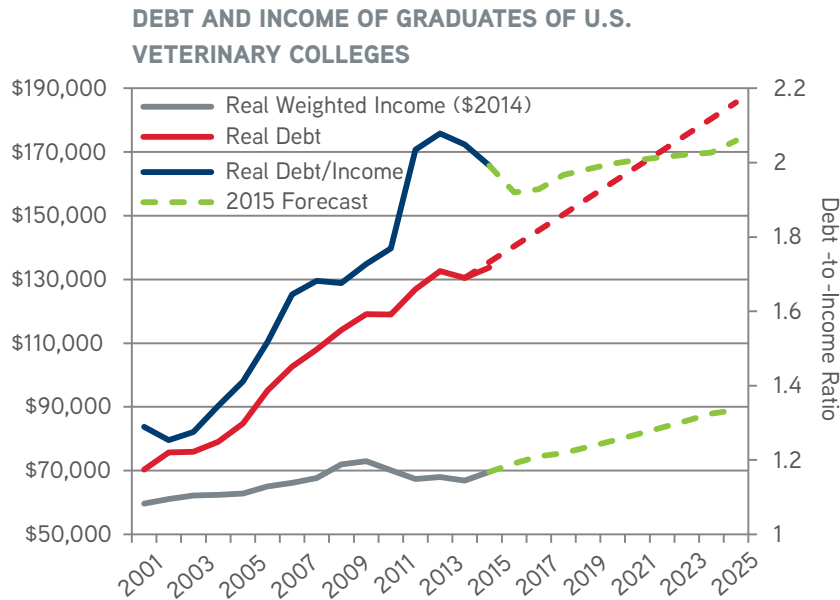


Figure 37

DEMAND FOR NEW VETERINARIANS, 2014-2015

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

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

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

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

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

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

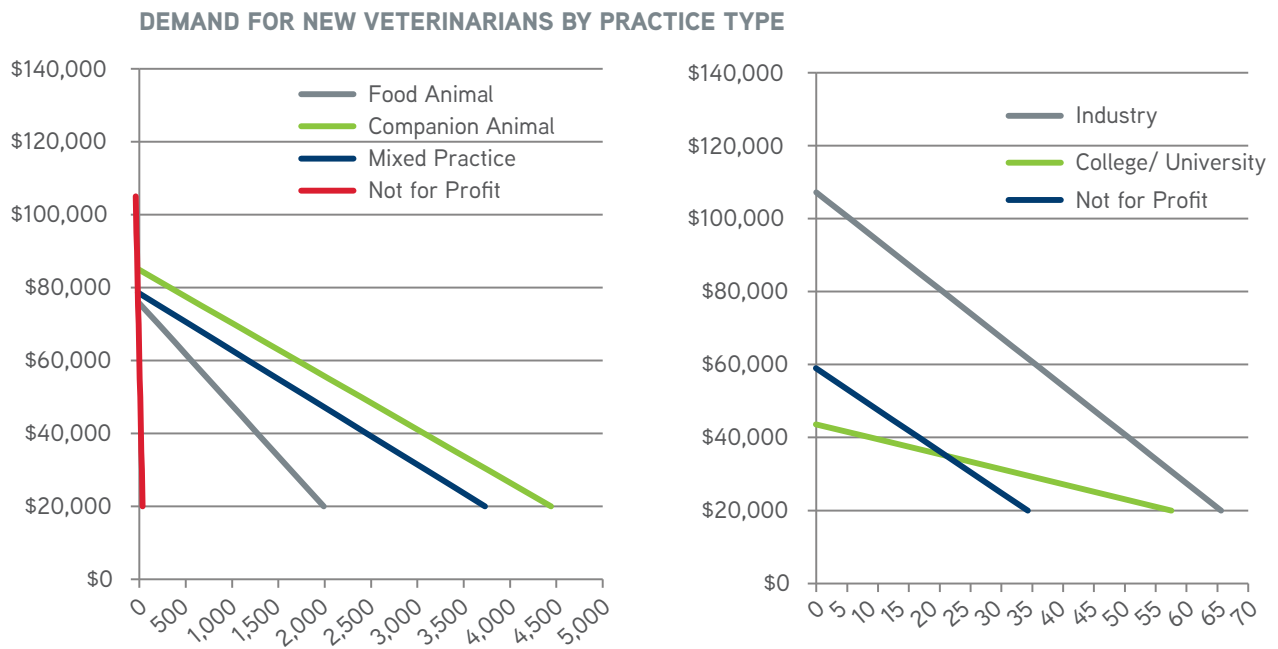


Figure 38

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

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

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

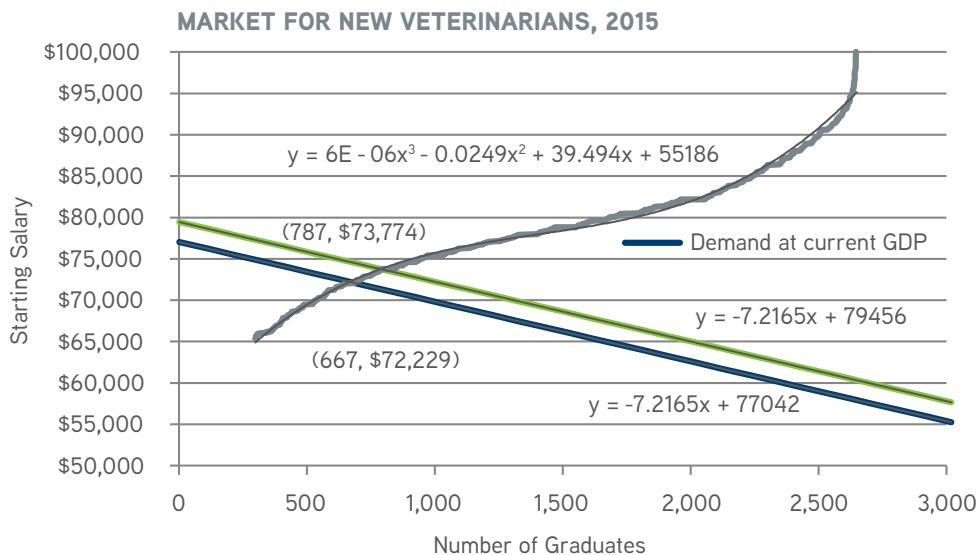


Figure 39

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

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

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

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

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

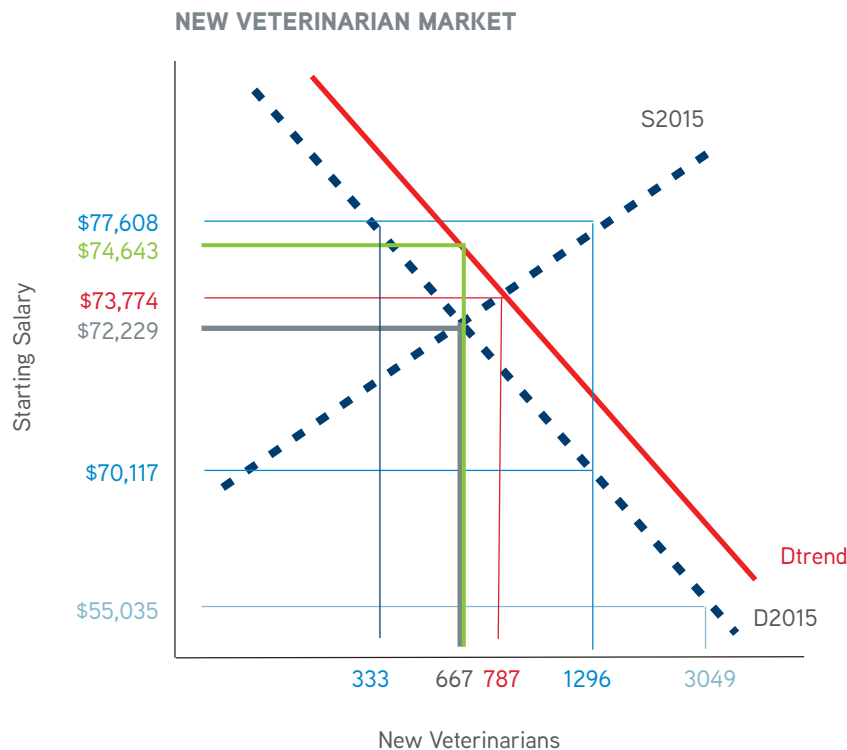


Figure 40

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

SUPPLY OF EXISTING VETERINARIANS

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

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

DISTRIBUTION OF U.S. VETERINARIANS

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

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

Table 4

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

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

GEOGRAPHIC DISTRIBUTION OF VETERINARIANS

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

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

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

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

LOCATION QUOTIENT OF VETERINARIANS, BY AREA, MAY 2014

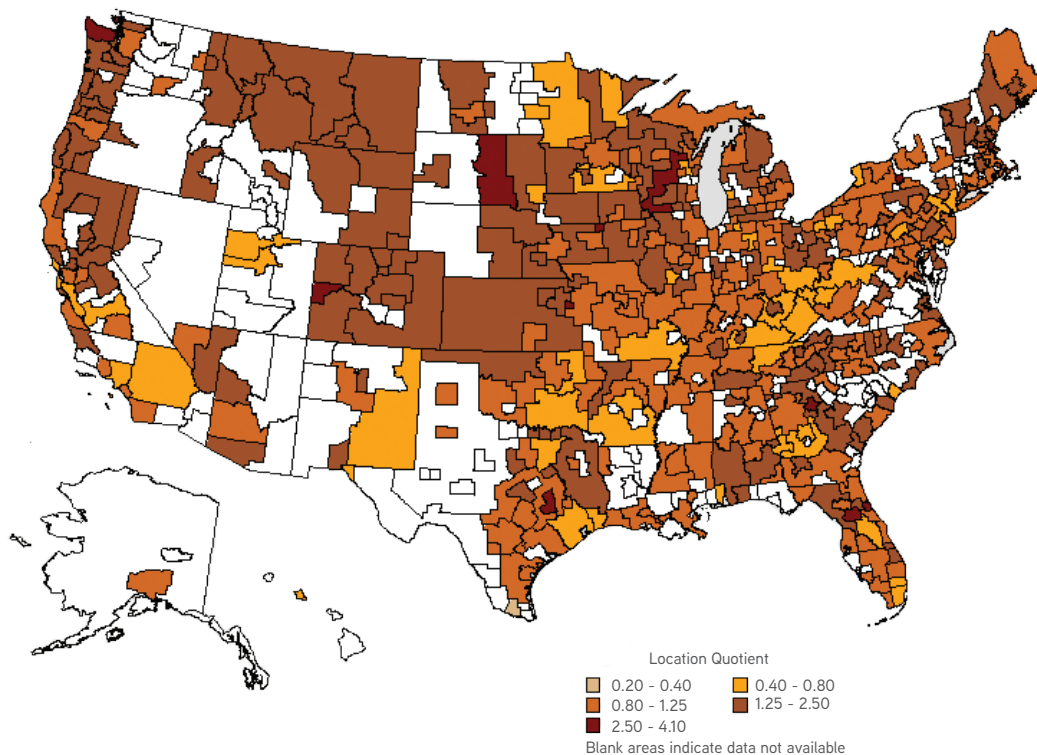


Image courtesy of <http://www.bls.gov/oes/current/ml291131.png>

Figure 41

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

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

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

DEMAND FOR ALL VETERINARIANS

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

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

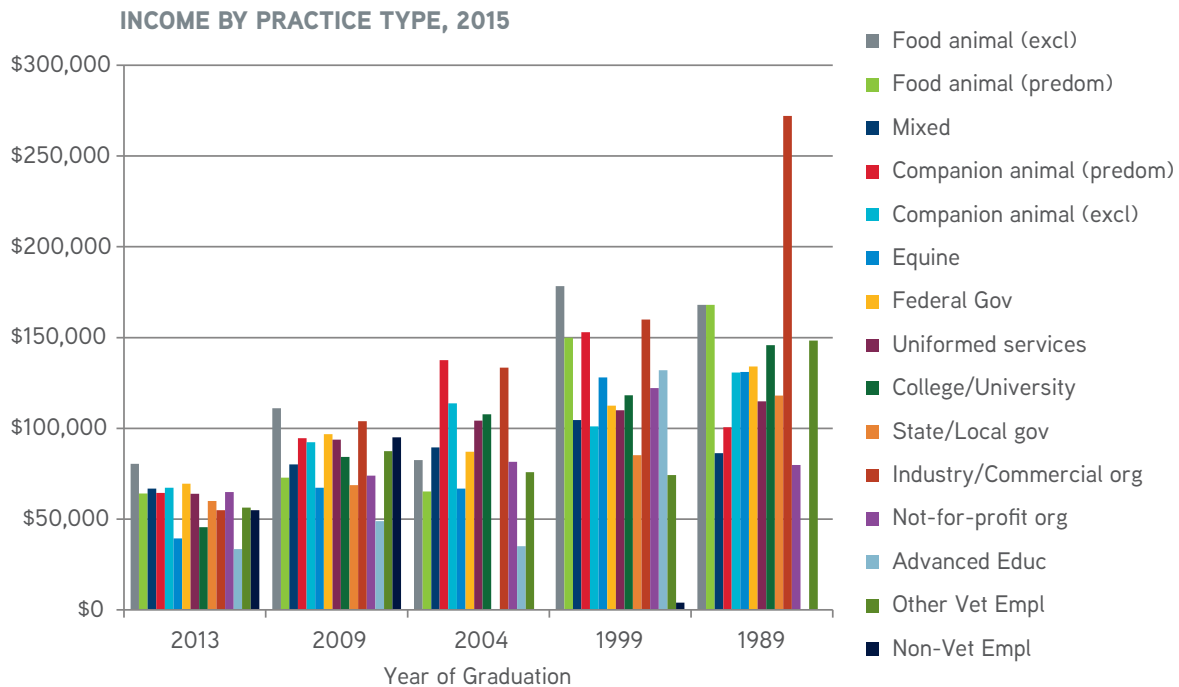


Figure 42

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

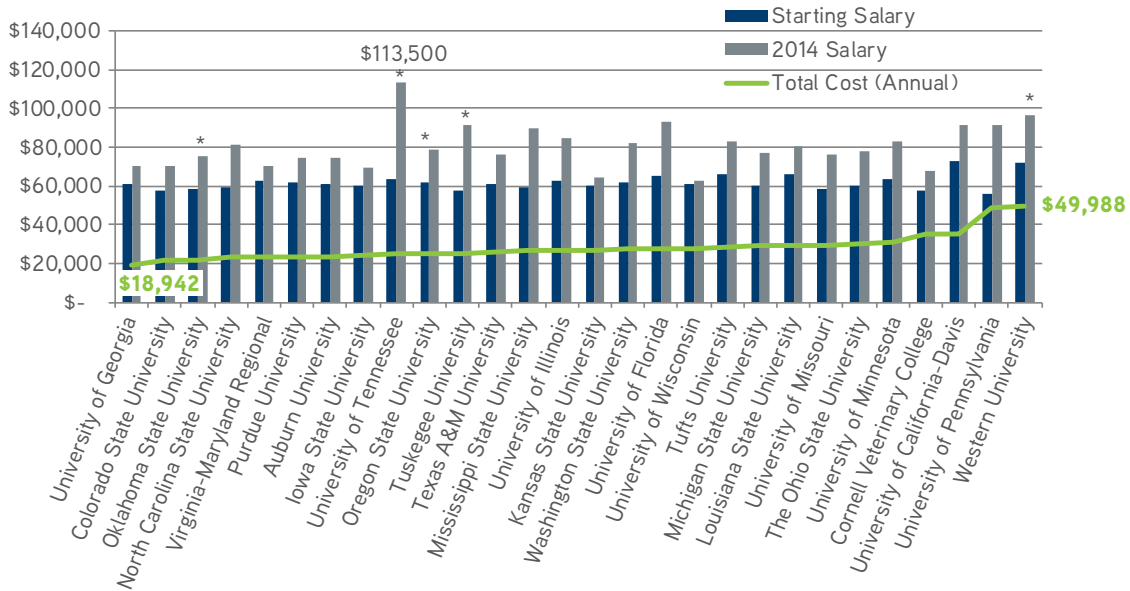
graduates from the 28 U.S. veterinary colleges. However, starting salaries are significantly affected by region as a result of differing costs of living. As a result, there are some colleges whose students received significantly higher starting salaries based on employment location, and others with significantly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

NEW GRADUATES 1, 5 AND 10 YEARS OUT

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

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

SALARIES AND COSTS OF 2008 GRADUATES, BY SCHOOL



*Less than 1 responses on 2014 salaries

Figure 43

2013 GRADUATES, TUITION AND FEES, INCOME AND STARTING SALARIES

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

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

SALARIES AND COSTS OF 2013 GRADUATES, BY SCHOOL

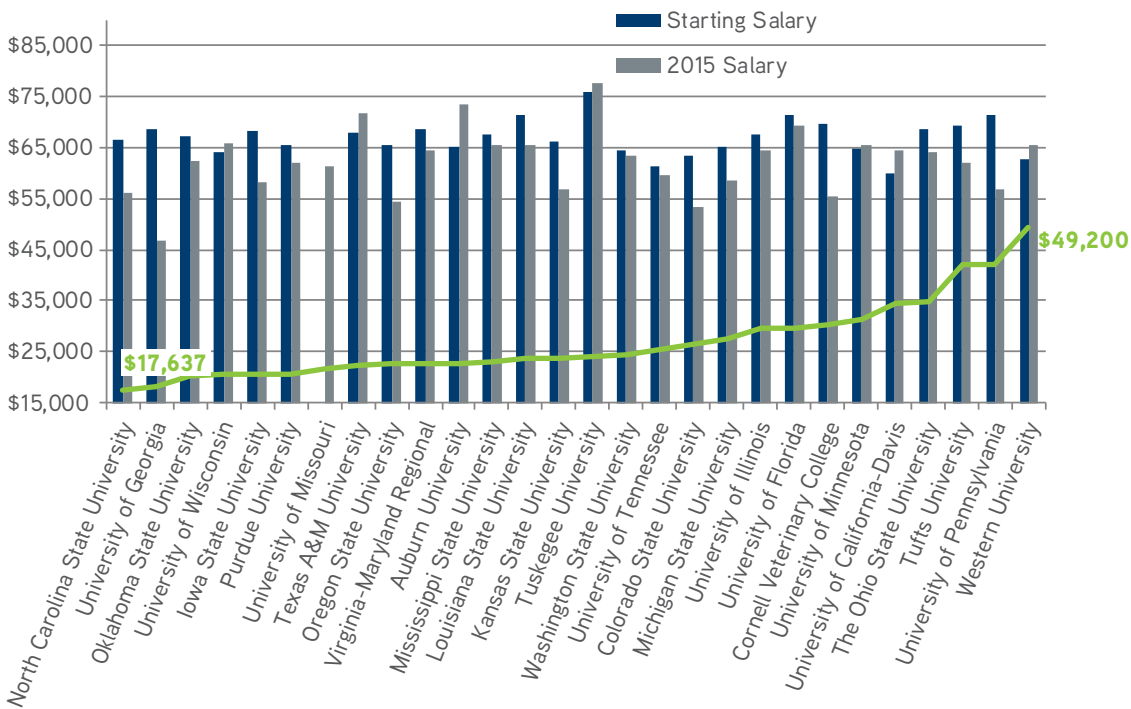


Figure 44

2009 GRADUATES, TUITION AND FEES, INCOME AND STARTING SALARIES

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

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

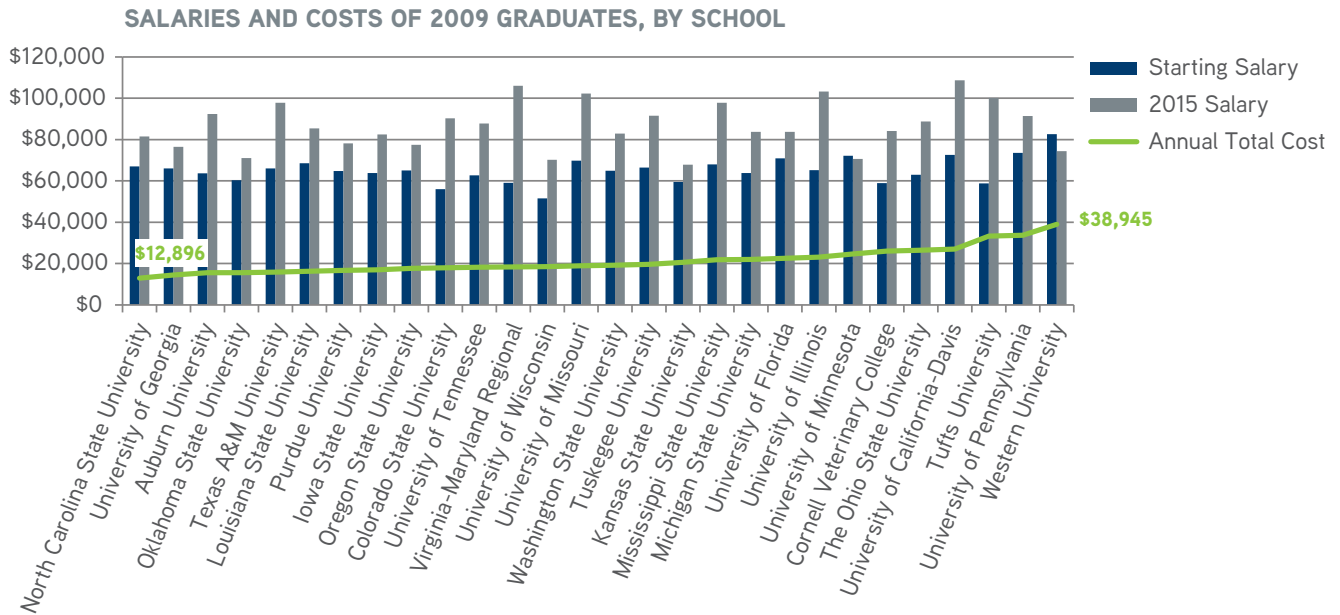


Figure 45

2004 GRADUATES, TUITION AND FEES, INCOME AND STARTING SALARIES

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

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

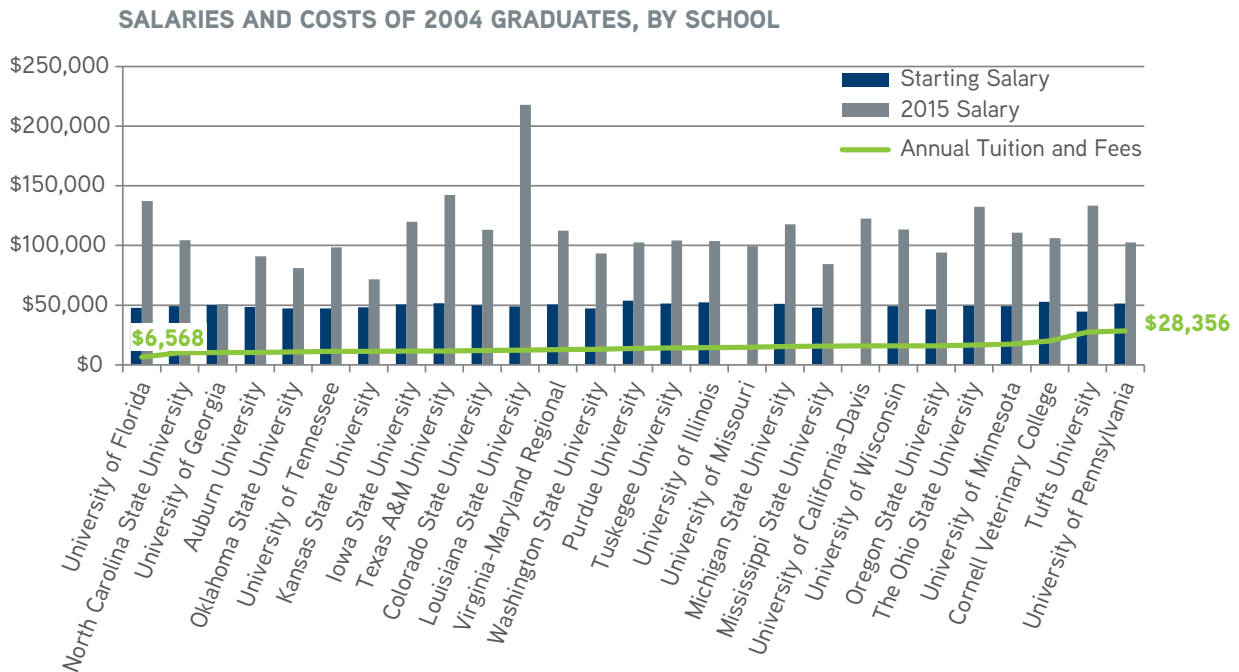


Figure 46

UNEMPLOYMENT AND UNDEREMPLOYMENT

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

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

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

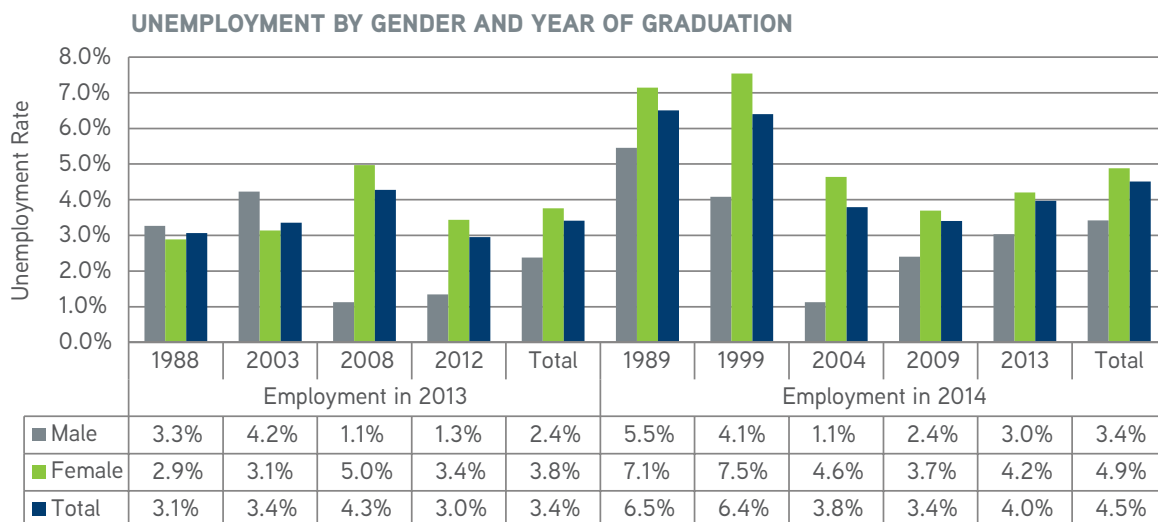


Figure 47

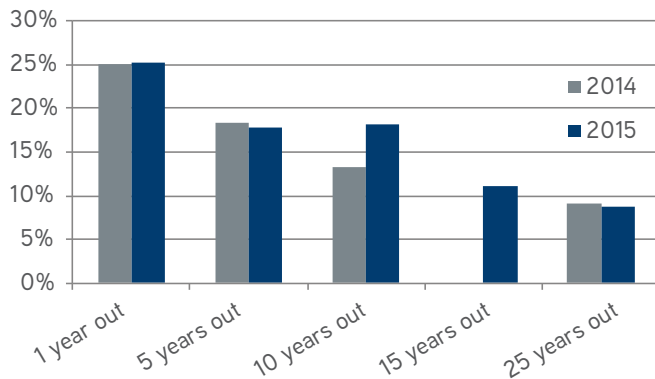


UNEMPLOYMENT WAS ESTIMATED AT 4.5 PERCENT IN 2014 COMPARED WITH 3.4 PERCENT IN 2013. THERE IS NO STATISTICALLY SIGNIFICANT DIFFERENCE BETWEEN THESE TWO RATES AND BOTH ARE BELOW THE U.S. NATIONAL RATE (6.1 PERCENT) AND THE NATURAL RATE (5.6 PERCENT).

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

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

MALE WORK PREFERENCE: DESIRE TO WORK ADDITIONAL HOURS PER WEEK



MALE WORK PREFERENCE: DESIRE TO WORK FEWER HOURS PER WEEK

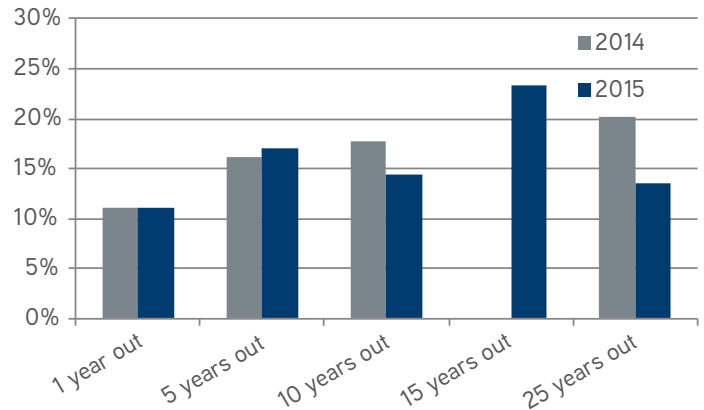
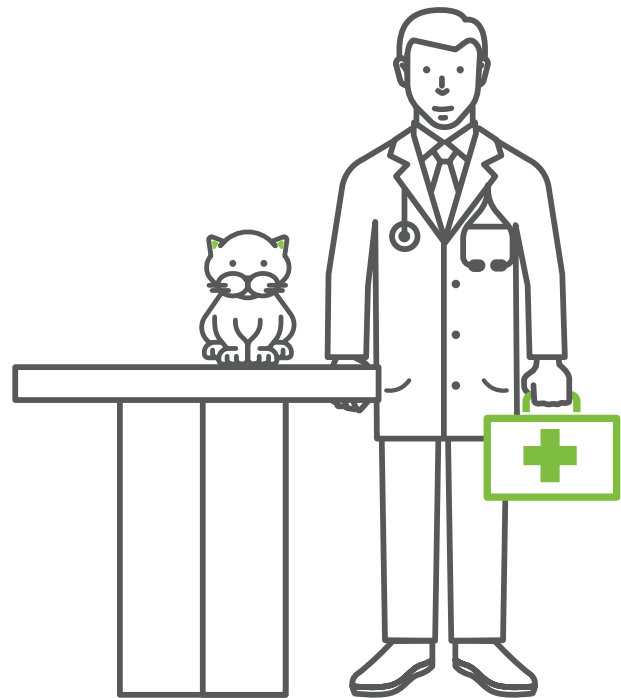


Figure 48

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



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

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

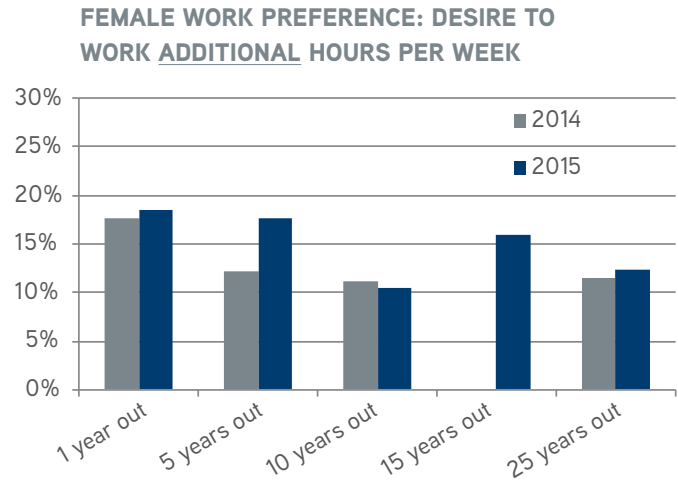
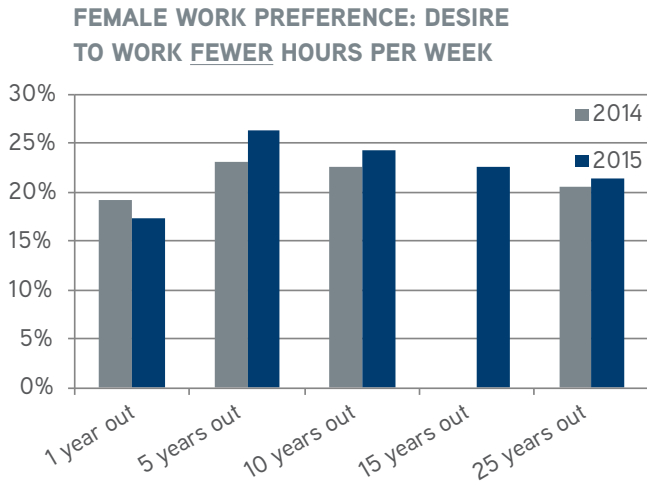
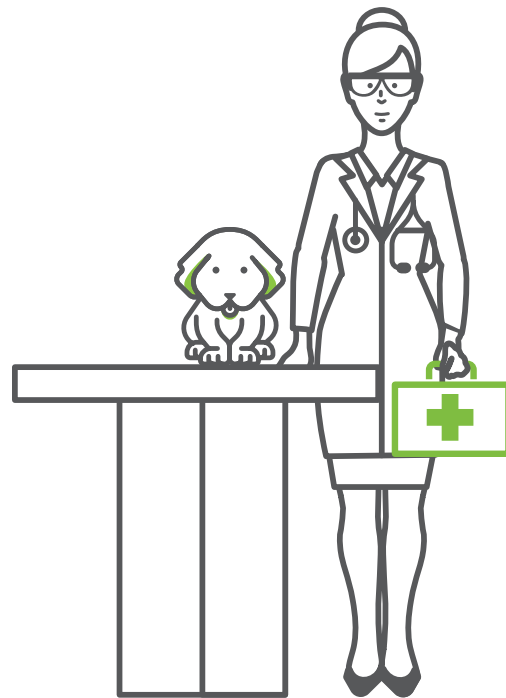


Figure 49

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



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

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

ENHANCING THE DEMAND FOR VETERINARIANS

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

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

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

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

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

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

HUMAN DISEASE BURDEN

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

Table 5

MAJOR FINDINGS

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

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

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

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

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

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

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

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



MARKET FOR VETERINARY SERVICES



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

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

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

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

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

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

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

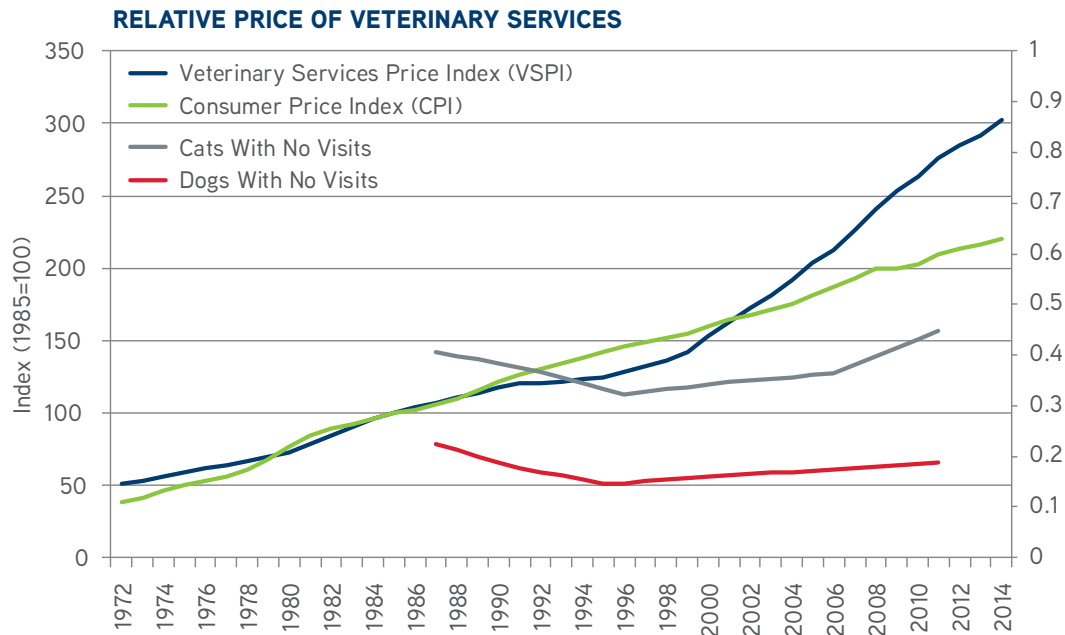


Figure 50

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

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

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

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

VETERINARY SERVICES PRICING AND PATRONAGE TRENDS

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

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

Table 6

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

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

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

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

Table 7

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

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

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

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

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

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

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

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

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

practice on the quantity of that product or service demanded.

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

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

WORKFORCE CAPACITY UTILIZATION

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


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

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

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

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

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



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

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

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

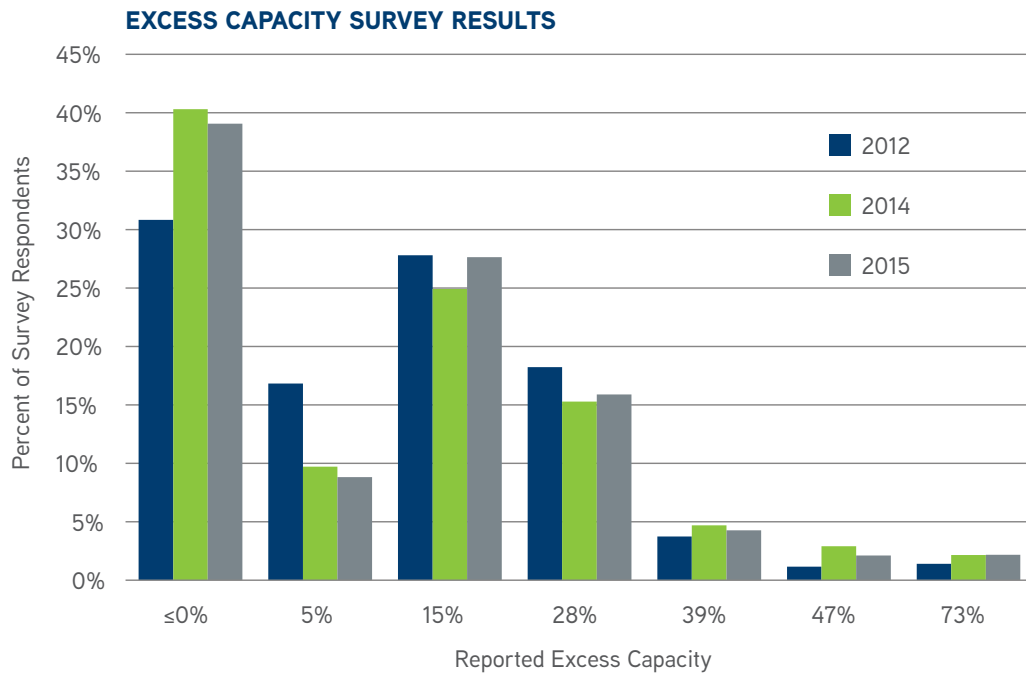


Figure 51

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

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

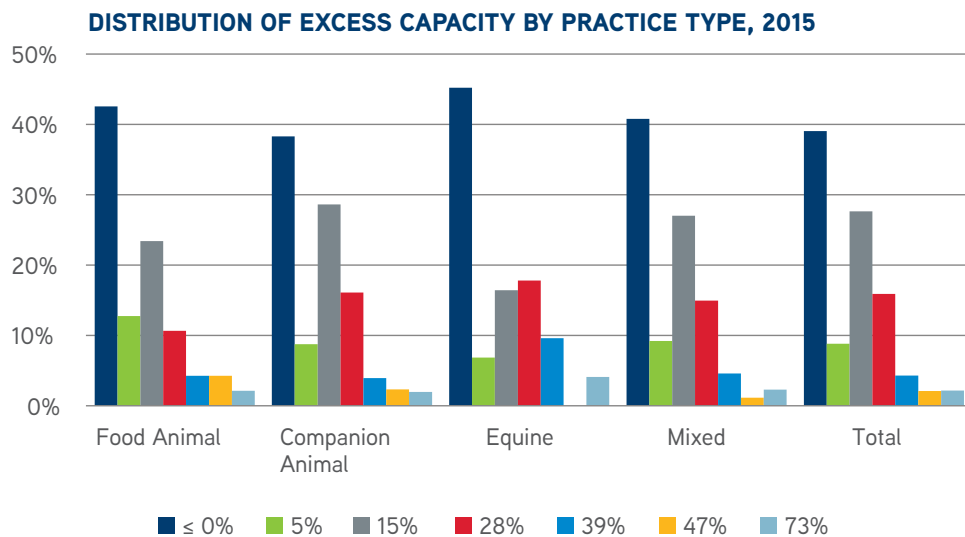


Figure 52

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

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

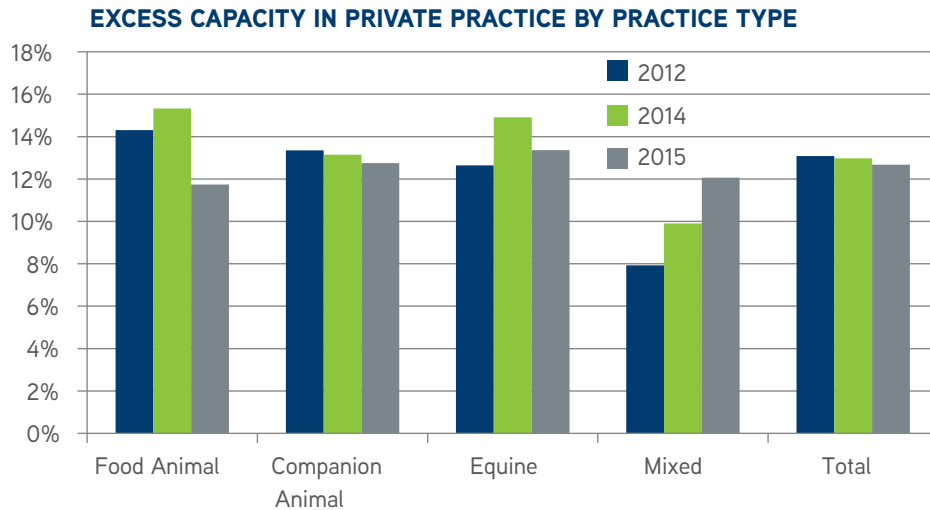


Figure 53

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

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

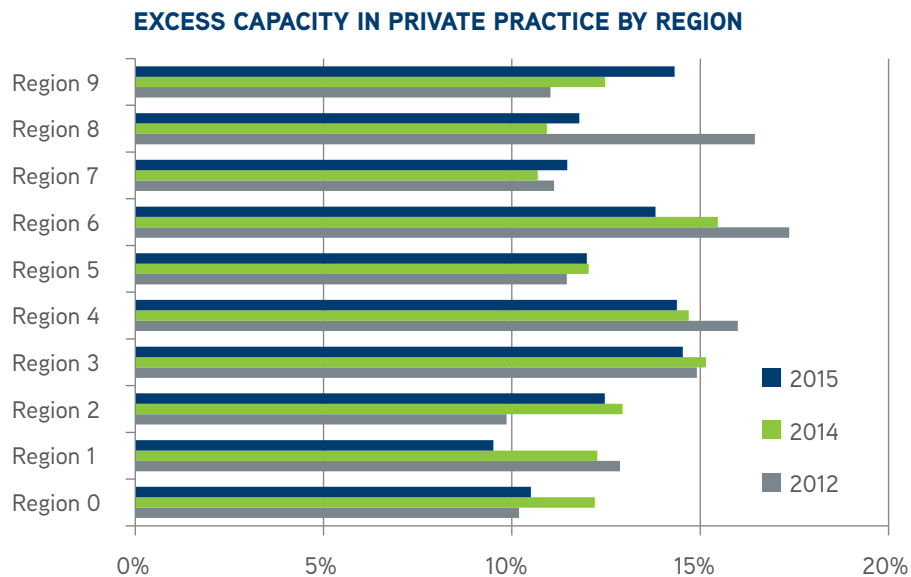


Figure 54

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

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

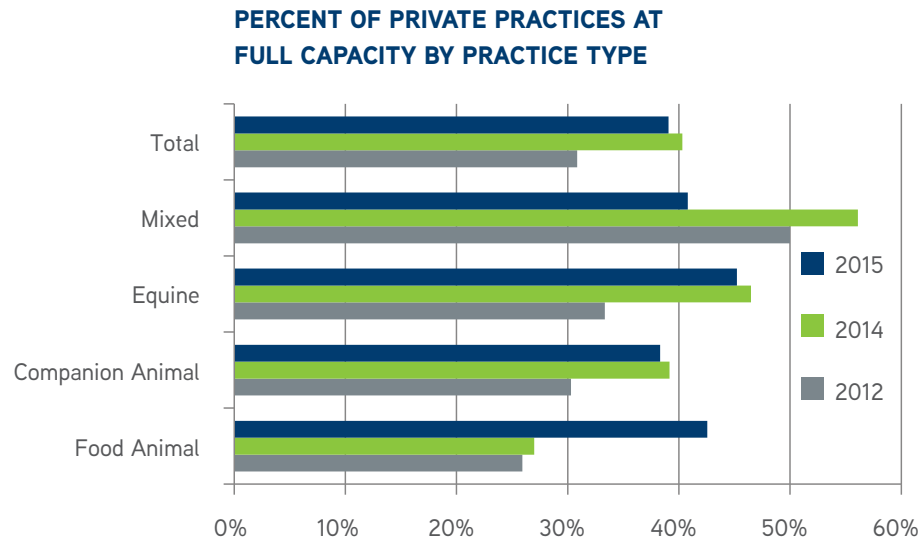


Figure 55

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.

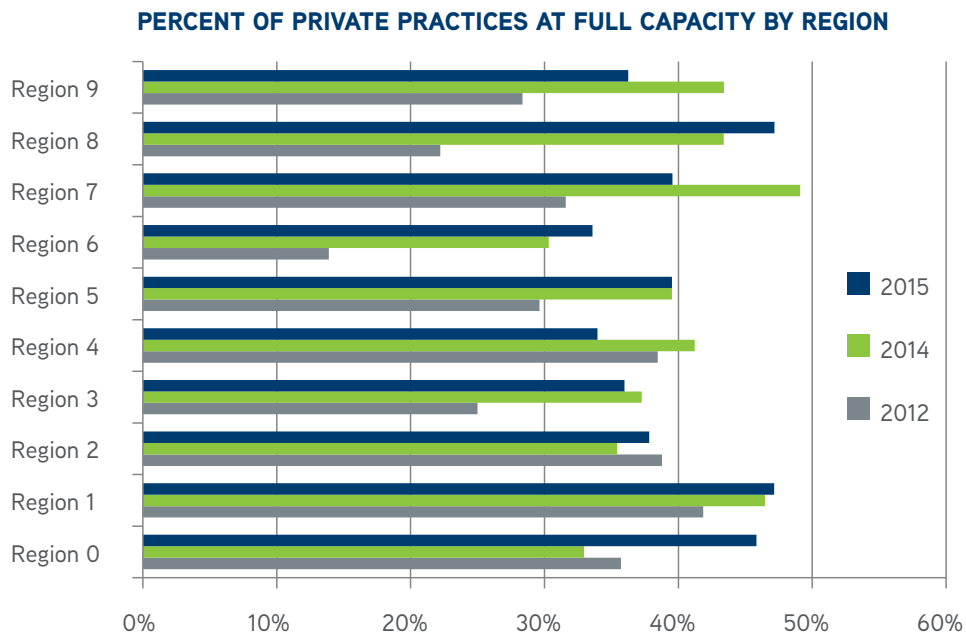


Figure 56

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

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

ANNUAL WORKFORCE MODEL UPDATE

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

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

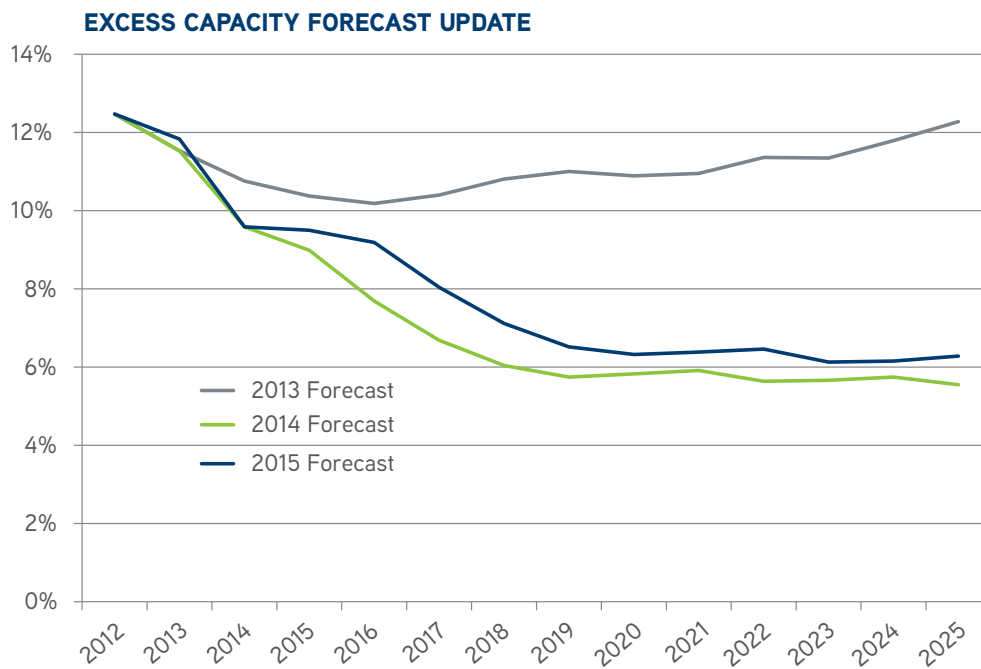


Figure 57

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



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

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

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

VETERINARY PRACTICE PERFORMANCE

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

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

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

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

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

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

Normalized EBITDA is calculated by:

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

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

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

GROWTH OF REVENUE, INVOICES, AND NORMALIZED EBITDA

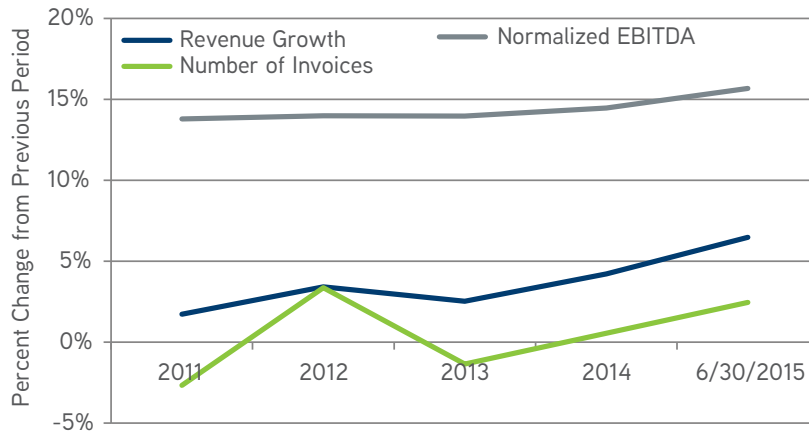


Figure 58

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

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

GROSS REVENUE PER VETERINARIAN FTE

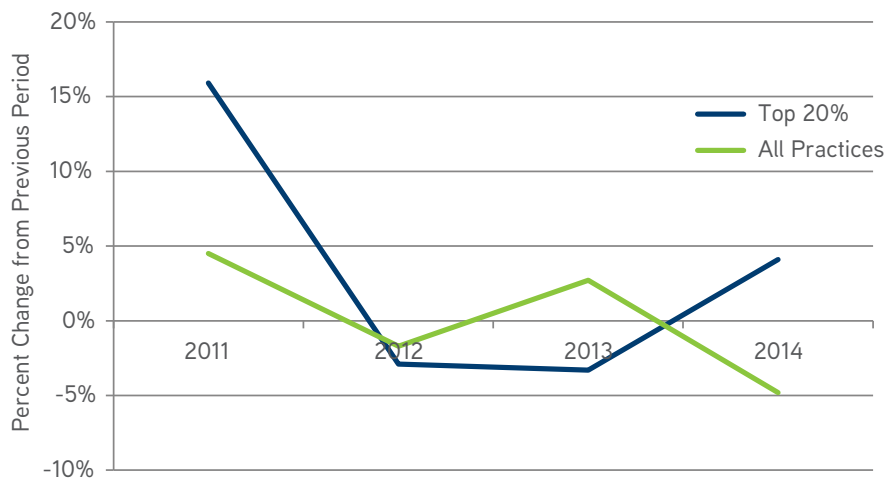


Figure 59

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

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

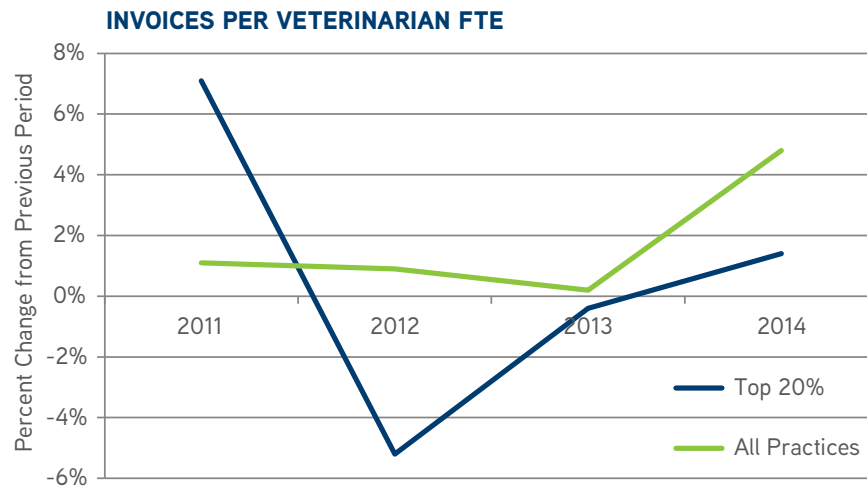


Figure 60

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

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

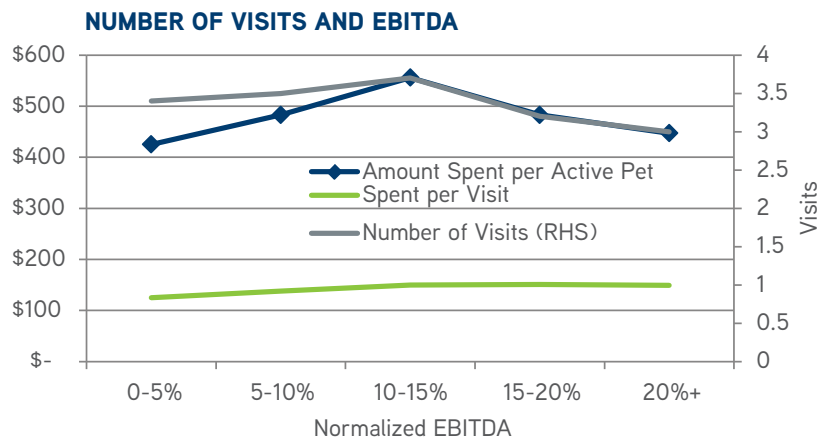


Figure 61

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

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

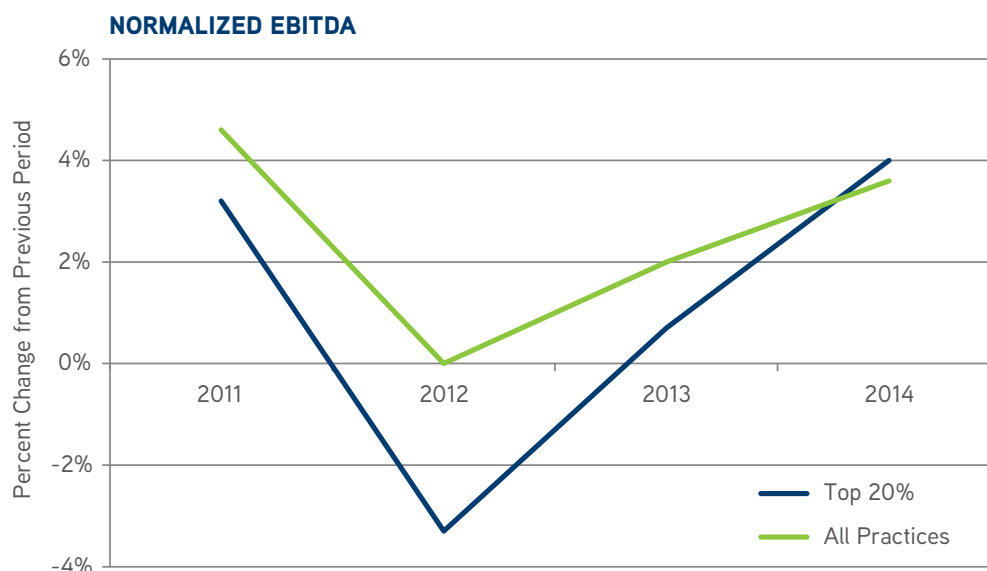


Figure 62

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

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

2014 EXPENSES

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

Table 8

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

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

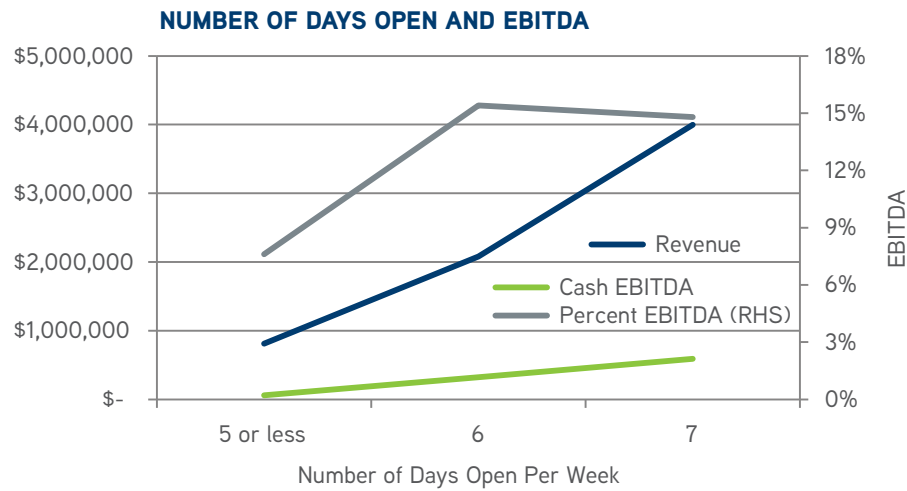
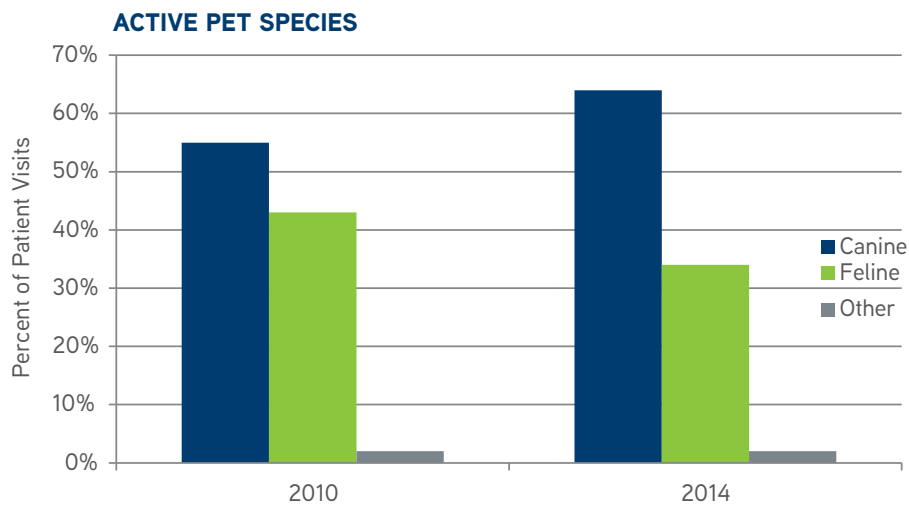


Figure 63

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

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



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

Figure 64

DISCUSSION

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

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

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

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

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

Market for Education

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

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

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

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



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

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

Market for Veterinarians

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

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

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

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

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

Market for Veterinary Services

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

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

Unresolved Research Questions

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

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

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

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

New Approaches

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

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

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

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

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

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

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

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



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- Are you part of a practice that is struggling with making money?
- Do you want to know what to expect from the economy?
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- **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:

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.